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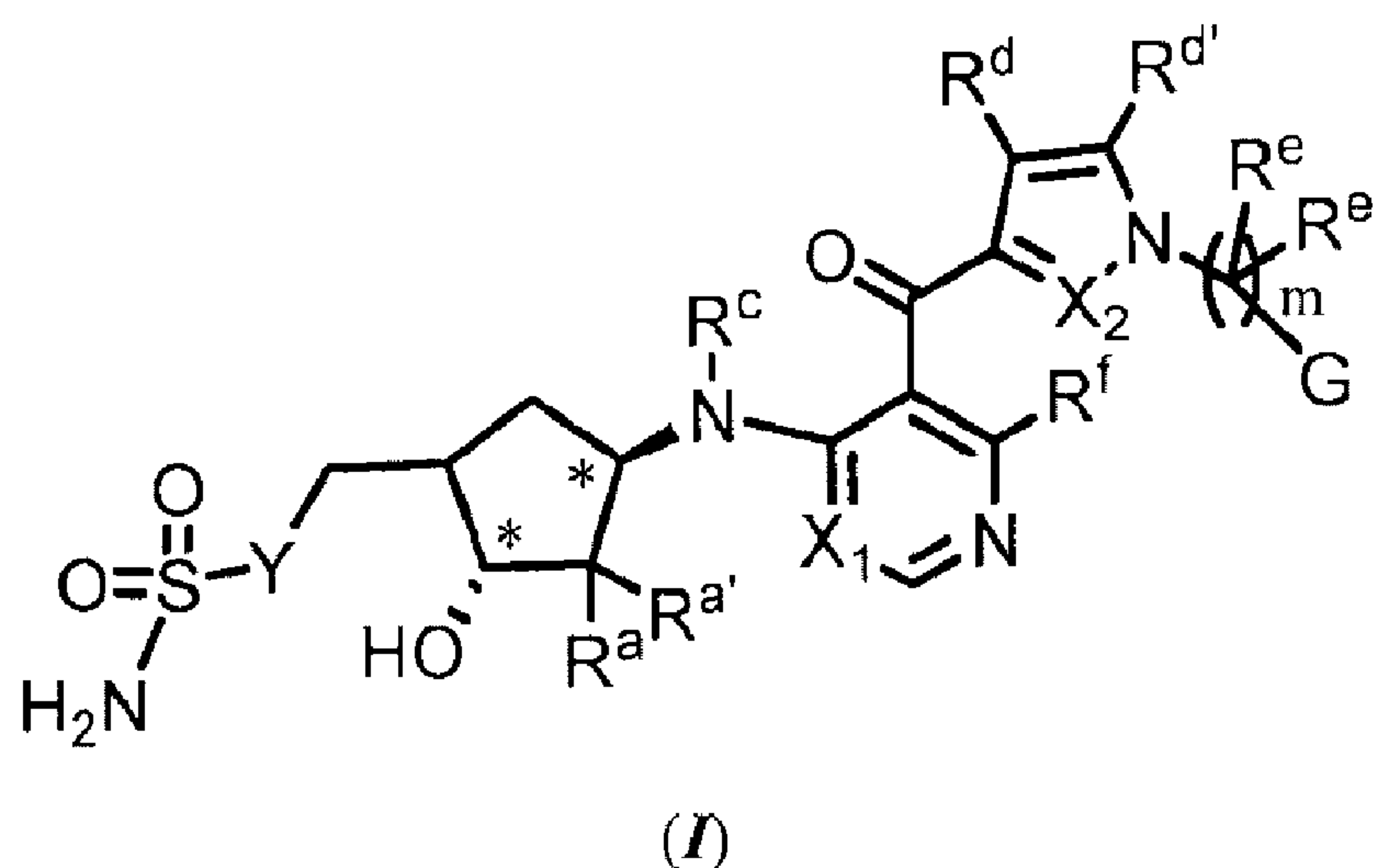
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(54) Title: HETEROARYL COMPOUNDS USEFUL AS INHIBITORS OF SUMO ACTIVATING ENZYME



(57) **Abrégé/Abstract:**

Disclosed are compounds of formula (I); or a pharmaceutically acceptable salt thereof; wherein Y, R^a, R^{a'}, R^c, R^f, X₂, R^d, R^{d'}, R^e, R^{e'}, m, and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate

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absolute stereochemistry, useful as inhibitors of Sumo Activating Enzyme (SAE). Further provided are pharmaceutical compositions comprising a compound of the disclosure and methods of using the compositions in the treatment of proliferative, inflammatory, cardiovascular and neurodegenerative diseases or disorders.

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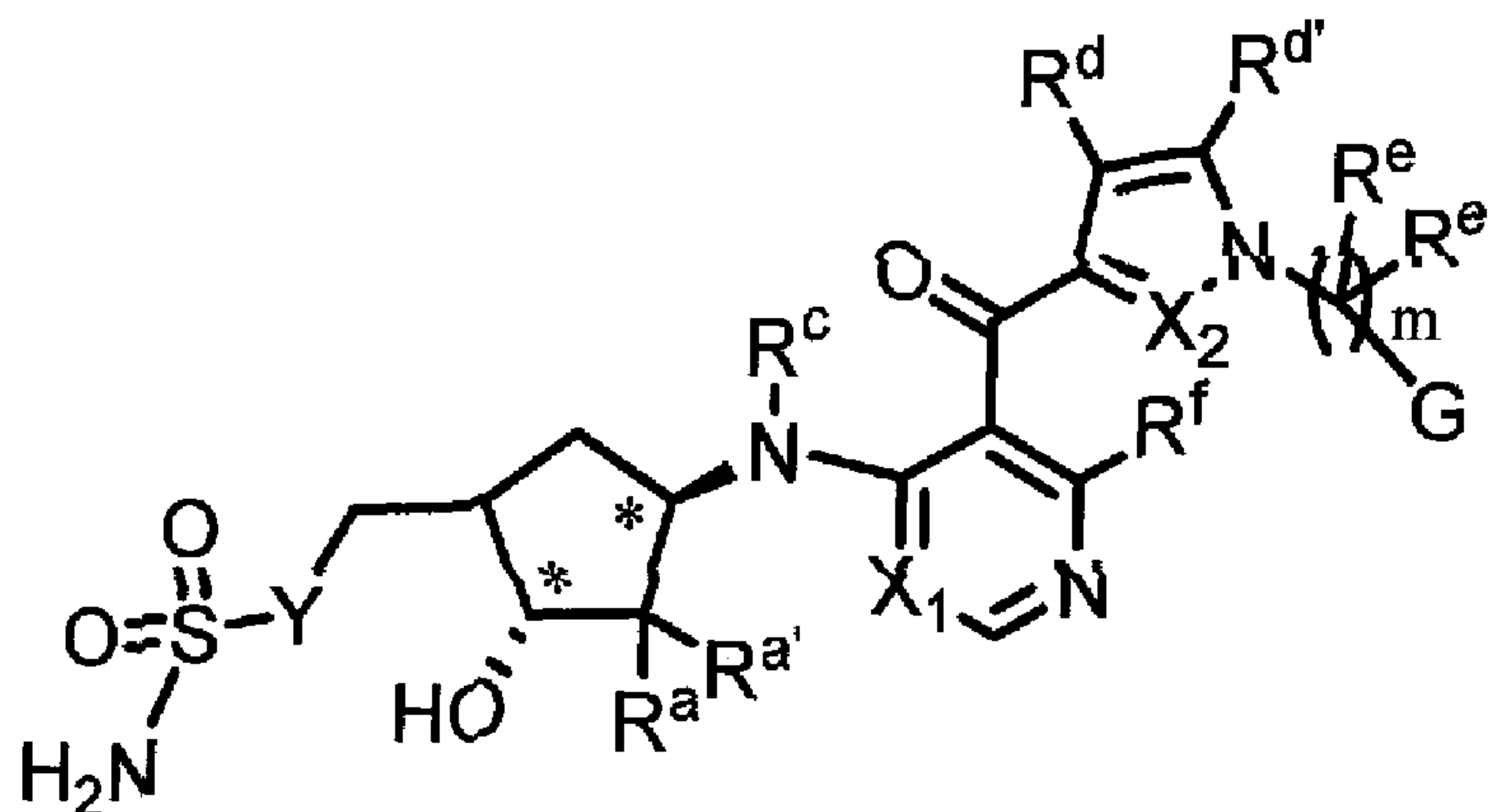
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(54) Title: HETEROARYL INHIBITORS OF SUMO ACTIVATING ENZYME



(I)

(57) Abstract: Disclosed are compounds of formula (I); or a pharmaceutically acceptable salt thereof; wherein Y, Ra, Ra', Rc, Rf, X2, Rd, Rd', Re, Re', 2, m, and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry, useful as inhibitors of Sumo Activating Enzyme (SAE). Further provided are pharmaceutical compositions comprising a compound of the disclosure and methods of using the compositions in the treatment of proliferative, inflammatory, cardiovascular and neurodegenerative diseases or disorders.



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DEMANDES OU BREVETS VOLUMINEUX

**LA PRÉSENTE PARTIE DE CETTE DEMANDE OU CE BREVETS
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CECI EST LE TOME __1__ DE __2__

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JUMBO APPLICATIONS / PATENTS

**THIS SECTION OF THE APPLICATION / PATENT CONTAINS MORE
THAN ONE VOLUME.**

THIS IS VOLUME __1__ OF __2__

NOTE: For additional volumes please contact the Canadian Patent Office.

HETEROARYL COMPOUNDS USEFUL AS INHIBITORS OF SUMO ACTIVATING ENZYME

INTRODUCTION

[0001] Small ubiquitin-like modifier (SUMO) is a member of the ubiquitin-like protein (Ubl) family that is covalently conjugated to cellular proteins in a manner similar to Ub-conjugation (Kerscher, O., Felberbaum, R., and Hochstrasser, M. 2006. Modification of proteins by ubiquitin and ubiquitin-like proteins. *Annu Rev Cell Dev Biol.* 22:159-80). Mammalian cells express three major isoforms: SUMO1, SUMO2 and SUMO3. SUMO2 and SUMO3 share ~95% amino acid sequence homology but have ~45% sequence homology with SUMO1 (Kamitani, T., Kito, K., Nguyen, H. P., Fukuda-Kamitani, T., and Yeh, E. T. 1998. Characterization of a second member of the sentrin family of ubiquitin-like proteins. *J Biol Chem.* 273(18):11349-53). SUMO proteins can be conjugated to a single lysine residue of a protein (monosumoylation) or to a second SUMO protein that is already conjugated to a protein forming a SUMO chain (polysumoylation). Only SUMO2/3 can form such chains because they possess internal consensus SUMO modification sites (Tatham, M. H., Jaffray, E., Vaughan, O. A., Desterro, J. M., Botting, C. H., Naismith, J. H., Hay, R. T. 2001. Polymeric chains of SUMO-2 and SUMO-3 are conjugated to protein substrates by SAE1/SAE2 and Ubc9. *J Biol Chem.* 276(38):35368-74). SUMO4 is an isoform found in kidney, lymph node and spleen cells, but it is not known whether SUMO4 can be conjugated to cellular proteins.

[0002] All three SUMOs are activated in an ATP-dependent manner by the SUMO-activating enzyme (SAE). SAE is a heterodimer that consists of SAE1 (SUMO-activating enzyme subunit 1) and SAE2 (UBA2). SAE, like other E1 activating enzymes, uses ATP to adenylate the C-terminal glycine residue of SUMO. In a second step, a thioester intermediate is then formed between the C-terminal glycine of SUMO and a cysteine residue in SAE2. Next, SUMO is transferred from the E1 to the cysteine residue of the SUMO conjugating enzyme (E2), UBC9. Unlike the Ub pathway that contains many E2 enzymes, Ubc9 is the only known conjugating enzyme for SUMO and functions with all 3 SUMO proteins. SUMO proteins are then conjugated to the target protein, either directly or in conjunction with an E3 ligase, through isopeptide bond formation with the epsilon amino group of a lysine side chain on a target protein. Several SUMO E3 ligases, including PIAS (protein inhibitor of activated signal transducer and activator of transcription protein) proteins and Ran-binding protein 2 (RanBP2), and polycomb 2 (Pc2), have been identified (Johnson, E. S., and Gupta, A. A. 2001. An E3-like factor that promotes

SUMO conjugation to the yeast septins. *Cell*. 106(6):735-44; Pichler, A., Gast, A., Seeler, J. S., Dejean, A., Melchior, F. 2002. The nucleoporin RanBP2 has SUMO1 E3 ligase activity. *Cell*. 108(1):109-20; Kagey, M. H., Melhuish, T. A., and Wotton, D. 2003. The polycomb protein Pc2 is a SUMO E3. *Cell*. 113(1):127-37). Once attached to cellular targets, SUMO modulates the function, subcellular localization, complex formation and/or stability of substrate proteins (Müller, S., Hoege, C., Pyrowolakis, G., and Jentsch, S. 2001. SUMO, ubiquitin's mysterious cousin. *Nat Rev Mol Cell Biol*. 2(3):202-10). SUMO-conjugation is reversible through the action of de-sumoylating enzymes called SENPs (Hay, R. T. 2007. SUMO-specific proteases: a twist in the tail. *Trends Cell Biol*. 17(8):370-6) and the SUMO proteins can then participate in additional conjugation cycles.

[0003] SAE-initiated SUMO-conjugation plays a major role in regulating diverse cellular processes, including cell cycle regulation, transcriptional regulation, cellular protein targeting, maintenance of genome integrity, chromosome segregation, and protein stability (Hay, R. T. 2005. SUMO: a history of modification. *Mol Cell*. 18(1):1-12; Gill, G. 2004. SUMO and ubiquitin in the nucleus: different functions, similar mechanisms? *Genes Dev*. 18(17):2046-59). For example, SUMO-conjugation causes changes in the subcellular localization of RanGAP1 by targeting it to the nuclear pore complex (Mahajan, R., Delphin, C., Guan, T., Gerace, L., and Melchior, F. 1997. A small ubiquitin-related polypeptide involved in targeting RanGAP1 to nuclear pore complex protein RanBP2. *Cell*. 88(1):97-1070). Sumoylation counteracts ubiquitination and subsequently blocks the degradation of I κ B, thereby negatively regulating NF- κ B activation (Desterro, J. M., Rodriguez, M. S., Hay, R. T. 1998. SUMO-1 modification of I κ B inhibits NF- κ B activation. *Mol Cell*. 2(2):233-9). Sumoylation has been reported to play an important role in transcription exhibiting both repressive and stimulatory effects. Many of the transcriptional nodes that are modulated play important roles in cancer. For example, sumoylation stimulates the transcriptional activities of transcription factors such as p53 and HSF2 (Rodriguez, M. S., Desterro, J. M., Lain, S., Midgley, C. A., Lane, D. P., and Hay, R. T. 1999. SUMO-1 modification activates the transcriptional response of p53. *EMBO J*. 18(22):6455-61; Goodson, M. L., Hong, Y., Rogers, R., Matunis, M. J., Park-Sarge, O. K., Sarge, K. D. 2001. Sumo-1 modification regulates the DNA binding activity of heat shock transcription factor 2, a promyelocytic leukemia nuclear body associated transcription factor. *J Biol Chem*. 276(21):18513-8). In contrast, SUMO-conjugation represses the transcriptional activities of transcription factors such as LEF (Sachdev, S., Bruhn, L., Sieber, H., Pichler, A., Melchior, F., Grosschedl, R. 2001. PIASy, a nuclear matrix-associated SUMO E3 ligase, represses LEF1 activity by sequestration into nuclear bodies. *Genes Dev*. 15(23):3088-103) and c-Myb (Bies, J., Markus, J., and Wolff, L. 2002. Covalent attachment of the SUMO-1 protein to the negative regulatory domain of the c-Myb transcription factor modifies its stability and transactivation capacity. *J*

Biol Chem. 277(11):8999-9009). Thus, SUMO-conjugation controls gene expression and growth control pathways that are important for cancer cell survival.

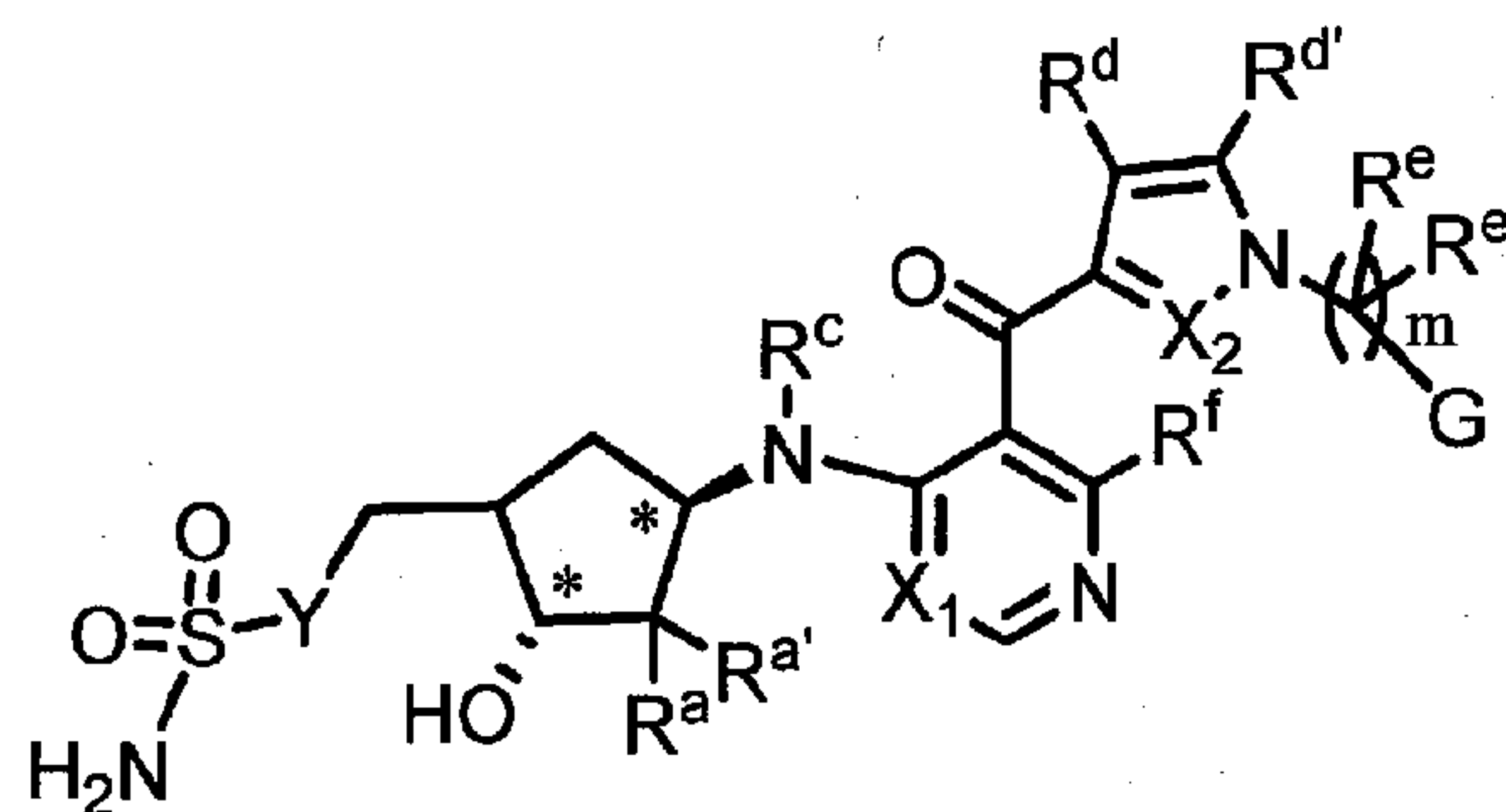
[0004] Altered expression of SAE pathway components have been noted in a variety of cancer types: (Moschos, S. J., Jukic, D. M., Athanassiou, C., Bhargava, R., Dacic, S., Wang, X., Kuan, S. F., Fayewicz, S. L., Galambos, C., Acquafondata, M., Dhir, R., and Becker, D. 2010. Expression analysis of Ubc9, the single small ubiquitin-like modifier (SUMO) E2 conjugating enzyme, in normal and malignant tissues. *Hum Pathol.* 41(9):1286-980); including multiple myeloma (Driscoll, J. J., Pelluru, D., Lefkimmatis, K., Fulciniti, M., Prabhala, R. H., Greipp, P. R., Barlogie, B., Tai, Y. T., Anderson, K. C., Shaughnessy, J. D. Jr., Annunziata, C. M., and Munshi, N. C. 2010. The sumoylation pathway is dysregulated in multiple myeloma and is associated with adverse patient outcome. *Blood.* 115(14):2827-34); and breast cancer (Chen, S. F., Gong, C., Luo, M., Yao, H. R., Zeng, Y. J., and Su, F. X. 2011. Ubc9 expression predicts chemoresistance in breast cancer. *Chin J Cancer.* 30(9):638-44). In addition, preclinical studies indicate that Myc-driven cancers may be especially sensitive to SAE inhibition (Kessler, J. D., Kahle, K. T., Sun, T., Meerbrey, K. L., Schlabach, M. R., Schmitt, E. M., Skinner, S. O., Xu, Q., Li, M. Z., Hartman, Z. C., Rao, M., Yu, P., Dominguez-Vidana, R., Liang, A. C., Solimini, N. L., Bernardi, R. J., Yu, B., Hsu, T., Golding, I., Luo, J., Osborne, C. K., Creighton, C. J., Hilsenbeck, S. G., Schiff, R., Shaw, C. A., Elledge, S. J., and Westbrook, T. F. 2012. A SUMOylation-dependent transcriptional subprogram is required for Myc-driven tumorigenesis. *Science.* 335(6066):348-53). Since SUMO-conjugation regulates essential cellular functions that contribute to the growth and survival of tumor cells, targeting SAE could represent an approach to treat proliferative disorders such as cancer.

[0005] SAE inhibitors may also be applicable for the treatment of other diseases and conditions outside of oncology. For example, SUMO modifies proteins that play important roles in neurodegenerative diseases (Steffan, J. S., Agrawal, N., Pallos, J., Rockabrand, E., Trotman, L. C., Slepko, N., Illes, K., Lukacsovich, T., Zhu, Y. Z., Cattaneo, E., Pandolfi, P. P., Thompson, L. M., Marsh, J. L. 2004. SUMO modification of Huntington and Huntington's disease pathology. *Science.* 304(5667):100-4); Dorval, V., and Fraser, P. E. 2006. Small ubiquitin-like modifier (SUMO) modification of natively unfolded proteins tau and alpha-synuclein. *J Biol Chem.* 281(15):9919-24; Ballatore, C., Lee, V. M., and Trojanowski, J. Q. 2007. Tau-mediated neurodegeneration in Alzheimer's disease and related disorders. *Nat Rev Neurosci.* 8(9):663-72). Sumoylation also has been reported to play important role in pathogenic viral infection, inflammation and cardiac function (Lee, H. R., Kim, D. J., Lee, J. M., Choi, C. Y., Ahn, B. Y., Hayward, G. S., and Ahn, J. H. 2004. Ability of the human cytomegalovirus IE1 protein to modulate sumoylation of PML correlates with its functional activities in transcriptional regulation and infectivity in cultured fibroblast cells. *J Virol.* 78(12):6527-42; Liu, B., and

Shuai, K. 2009. Summon SUMO to wrestle with inflammation. *Mol Cell*. 35(6):731-2; Wang, J., and Schwartz, R. J. 2010. Sumoylation and regulation of cardiac gene expression. *Circ Res*.107(1):19-29).

[0006] It would be beneficial therefore to provide new SAE inhibitors that possess good therapeutic properties, especially for the treatment of proliferative, inflammatory, cardiovascular and neurodegenerative disorders.

[0007] This application provides compounds which are inhibitors of SAE and accordingly are useful for the treatment of proliferative, inflammatory, cardiovascular and neurodegenerative disorders. The compounds of the present disclosure are represented by Formula (I):



(I);

or a pharmaceutically acceptable salt thereof;

wherein:

stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry;

Y is -O-, -CH₂-, -N(H)-;

R^a is hydrogen, fluoro, -NH₂, or -OH;

R^{a'} is hydrogen, or fluoro; provided that when R^a is -NH₂ or -OH, R^{a'} is hydrogen;

R^c is hydrogen or C₁₋₄ alkyl;

X₁ is C(H), C(F) or N;

X₂ is C(R^d)- or N;

each occurrence of R^d is independently hydrogen, halogen, cyano, C₁₋₄ aliphatic, or C₁₋₄ fluoroaliphatic;

R^{d'} is hydrogen, halogen, cyano, C₁₋₄ aliphatic, C₁₋₄ fluoroaliphatic, or -T₂-R³;

T_2 is a C_1 - C_2 alkylene chain optionally substituted with 0-3 independent occurrences of R^{3c} ;

R^3 is -CN, -NO₂, -N(R^{3a})₂, -OR^{3a}, -C(O) R^{3b} , -C(O)OR^{3a}, -C(O)N(R^{3a})₂, or -S(O)₂N(R^{3a})₂;

each occurrence of R^{3a} is independently hydrogen or C_{1-4} alkyl;

R^{3b} is C_{1-4} alkyl;

each occurrence of R^{3c} is independently C_{1-4} alkyl;

R^e is hydrogen or C_{1-4} alkyl;

$R^{e'}$ is hydrogen or C_{1-4} alkyl; or R^e is taken together with $R^{e'}$ to form a 3-6 membered cycloaliphatic ring;

m is 0-2;

R^f is hydrogen, chloro or C_{1-4} alkyl;

G is R^1 or - L_1 - R^1 ;

L_1 is , -C(O)-, or -SO₂-; provided that when L_1 is -SO₂-, m is zero;

R^1 is an optionally substituted group selected from C_{1-6} aliphatic, 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^1 is optionally substituted with n occurrences of R^2 ; wherein each occurrence of R^2 is independently - R^{2a} , - T_1 - R^{2d} , - T_1 - R^{2a} , or - V_1 - T_1 - R^{2d} ;

n is 1-5;

each occurrence of R^{2a} is independently halogen, -CN, -NO₂, - R^{2c} , -N(R^{2b})₂, -OR^{2b}, -SR^{2c}, -S(O) R^{2c} , -S(O)₂ R^{2c} , -C(O) R^{2b} , -C(O)OR^{2b}, -C(O)N(R^{2b})₂, -S(O)₂N(R^{2b})₂, -OC(O)N(R^{2b})₂, -N(R^{2c})C(O) R^{2b} , -N(R^{2c})SO₂ R^{2c} , -N(R^{2c})C(O)OR^{2b}, -N(R^{2c})C(O)N(R^{2b})₂, -N(R^{2c})SO₂N(R^{2b})₂, or Si(R^{2c})₃, or an optionally substituted C_1 - C_6 aliphatic or C_1 - C_6 haloaliphatic;

each occurrence of R^{2b} is independently hydrogen or an optionally substituted group selected from C_1 - C_6 aliphatic, C_1 - C_6 haloaliphatic, 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen,

and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, or two occurrences of R^{2b} , taken together with a nitrogen atom to which they are bound, form an optionally substituted 4- to -7-membered heterocyclyl ring having 0-1 additional heteroatoms selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{2c} is independently an optionally substituted group selected from C_1 - C_6 aliphatic, C_1 - C_6 haloaliphatic, 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{2d} is independently hydrogen or an optionally substituted group selected from 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{2e} is independently hydrogen or an optionally substituted C_{1-6} aliphatic group;

each occurrence of V_1 is independently $-N(R^{2e})-$, $-O-$, $-S-$, $-S(O)-$, $-S(O)_2-$, $-C(O)-$, $-C(O)O-$, $-C(O)N(R^{2e})-$, $-S(O)_2N(R^{2e})-$, $-OC(O)N(R^{2e})-$, $-N(R^{2e})C(O)-$, $-N(R^{2e})SO_2-$, $-N(R^{2e})C(O)O-$, $-N(R^{2e})C(O)N(R^{2e})-$, $-N(R^{2e})SO_2N(R^{2e})-$, $-OC(O)-$, or $-C(O)N(R^{2e})-O-$; and

T_1 is an optionally substituted C_1 - C_6 alkylene chain wherein the alkylene chain optionally is interrupted by $-N(R^4)-$, $-O-$, $-S-$, $-S(O)-$, $-S(O)_2-$, $-C(O)-$, $-C(O)O-$, $-C(O)N(R^4)-$, $-S(O)_2N(R^4)-$, $-OC(O)N(R^4)-$, $-N(R^4)C(O)-$, $-N(R^4)SO_2-$, $-N(R^4)C(O)O-$, $-N(R^4)C(O)N(R^4)-$, $-N(R^4)S(O)_2N(R^4)-$, $-OC(O)-$, or $-C(O)N(R^4)-O-$ or wherein T_1 or a portion thereof optionally forms part of an optionally substituted 3- to -7 membered cycloaliphatic or heterocyclyl ring, wherein R^4 is hydrogen or an optionally substituted C_{1-4} aliphatic group.

DETAILED DESCRIPTION

[0008] Compounds of the present disclosure include those described generally for formula (I), above, and are further illustrated by the classes, subclasses, and species disclosed herein. It will be appreciated that some subsets described for each variable herein can be used for any of the structural subsets as well. As used herein, the following definitions shall apply unless otherwise indicated.

[0009] As described herein, compounds of the present disclosure may be optionally substituted with one or more substituents, such as are disclosed generally above, or as exemplified by particular classes, subclasses, and species disclosed herein. It will be appreciated that the phrase “optionally substituted” is used interchangeably with the phrase “substituted or unsubstituted.” In general, the term “substituted”, whether preceded by the term “optionally” or not, means that a hydrogen radical of the designated moiety is replaced with the radical of a specified substituent, provided that the substitution results in a stable or chemically feasible compound. The term “substitutable”, when used in reference to a designated atom, means that attached to the atom is a hydrogen radical, which hydrogen atom can be replaced with the radical of a suitable substituent. Unless otherwise indicated, an “optionally substituted” group may have a substituent at each substitutable position of the group, and when more than one position in any given structure may be substituted with more than one substituent selected from a specified group, the substituent may be either the same or different at every position. Combinations of substituents envisioned by this disclosure are for instance, those that result in the formation of stable or chemically feasible compounds.

[0010] A stable compound or chemically feasible compound is one in which the chemical structure is not substantially altered when kept at a temperature from about -80°C to about $+40^{\circ}\text{C}$, in the absence of moisture or other chemically reactive conditions, for at least a week, or a compound which maintains its integrity long enough to be useful for therapeutic or prophylactic administration to a patient.

[0011] The phrase “one or more substituents”, as used herein, refers to a number of substituents that equals from one to the maximum number of substituents possible based on the number of available bonding sites, provided that the above conditions of stability and chemical feasibility are met.

[0012] As used herein, the term “independently selected” means that the same or different values may be selected for multiple instances of a given variable in a single compound.

[0013] As used herein, “a 3-7-membered saturated, partially unsaturated, or aromatic monocyclic ring having 0-3 heteroatoms independently selected from nitrogen, oxygen, or sulfur, or an 8-10-membered partially unsaturated, or aromatic bicyclic ring system having 0-5 heteroatoms independently selected from nitrogen, oxygen, or sulfur” includes cycloaliphatic, heterocyclic, aryl and heteroaryl rings.

[0014] As used herein, the term “aromatic” includes aryl and heteroaryl groups as described generally below and herein.

[0015] The term “aliphatic” or “aliphatic group”, as used herein, means an optionally substituted straight-chain or branched C_{1-12} hydrocarbon, or a cyclic C_{1-12} hydrocarbon which is completely saturated or which contains one or more units of unsaturation, but which is not aromatic (also referred to herein as “carbocycle”, “cycloaliphatic”, “cycloalkyl”, or “cycloalkenyl”). For example, suitable aliphatic groups include optionally substituted linear, branched or cyclic alkyl, alkenyl, alkynyl groups and hybrids

thereof, such as (cycloalkyl)alkyl, (cycloalkenyl)alkyl, or (cycloalkyl)alkenyl. Unless otherwise specified, in various embodiments, aliphatic groups have 1-12, 1-10, 1-8, 1-6, 1-5, 1-4, 1-3, or 1-2 carbon atoms.

[0016] The term “alkyl”, used alone or as part of a larger moiety, refers to an optionally substituted straight or branched chain hydrocarbon group having 1-12, 1-10, 1-8, 1-6, 1-5, 1-4, 1-3, or 1-2 carbon atoms.

[0017] The term “alkenyl”, used alone or as part of a larger moiety, refers to an optionally substituted straight or branched chain hydrocarbon group having at least one double bond and having 2-12, 2-10, 2-8, 2-6, 2-5, 2-4, or 2-3 carbon atoms.

[0018] The term “alkynyl”, used alone or as part of a larger moiety, refers to an optionally substituted straight or branched chain hydrocarbon group having at least one triple bond and having 2-12, 2-10, 2-8, 2-6, 2-5, 2-4, or 2-3 carbon atoms.

[0019] The terms “cycloaliphatic”, “carbocycle”, “carbocyclyl”, “carbocyclo”, or “carbocyclic”, used alone or as part of a larger moiety, refer to an optionally substituted saturated or partially unsaturated cyclic aliphatic ring system having from 3 to about 14 ring carbon atoms. In some embodiments, the cycloaliphatic group is an optionally substituted monocyclic hydrocarbon having 3-8 or 3-6 ring carbon atoms. Cycloaliphatic groups include, without limitation, optionally substituted cyclopropyl, cyclobutyl, cyclopentyl, cyclopentenyl, cyclohexyl, cyclohexenyl, cycloheptyl, cycloheptenyl, cyclooctyl, cyclooctenyl, or cyclooctadienyl. The terms “cycloaliphatic”, “carbocycle”, “carbocyclyl”, “carbocyclo”, or “carbocyclic” also include optionally substituted bridged or fused bicyclic rings having 6-12, 6-10, or 6-8 ring carbon atoms, wherein any individual ring in the bicyclic system has 3-8 ring carbon atoms.

[0020] The term “cycloalkyl” refers to an optionally substituted saturated ring system of about 3 to about 10 ring carbon atoms. Exemplary monocyclic cycloalkyl rings include cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, and cycloheptyl.

[0021] The term “cycloalkenyl” refers to an optionally substituted non-aromatic monocyclic or multicyclic ring system containing at least one carbon-carbon double bond and having about 3 to about 10 carbon atoms. Exemplary monocyclic cycloalkenyl rings include cyclopentyl, cyclohexenyl, and cycloheptenyl.

[0022] The terms “haloaliphatic”, “haloalkyl”, “haloalkenyl” and “haloalkoxy” refer to an aliphatic, alkyl, alkenyl or alkoxy group, as the case may be, which is substituted with one or more halogen atoms. As used herein, the term “halogen” or “halo” means F, Cl, Br, or I. The term “fluoroaliphatic” refers to a haloaliphatic wherein the halogen is fluoro, including perfluorinated aliphatic groups. Examples of fluoroaliphatic groups include, without limitation, fluoromethyl, difluoromethyl, trifluoromethyl, 2-fluoroethyl, 2,2,2-trifluoroethyl, 1,1,2-trifluoroethyl, 1,2,2-trifluoroethyl, and pentafluoroethyl.

[0023] The term “heteroatom” refers to one or more of oxygen, sulfur, nitrogen, phosphorus, or silicon (including, any oxidized form of nitrogen, sulfur, phosphorus, or silicon; the quaternized form of any basic nitrogen or; a substitutable nitrogen of a heterocyclic ring, for example N (as in 3,4-dihydro-2H-pyrrolyl), NH (as in pyrrolidiny) or NR^+ (as in N-substituted pyrrolidiny)).

[0024] The terms “aryl” and “ar-”, used alone or as part of a larger moiety, e.g., “aralkyl”, “aralkoxy”, or “aryloxyalkyl”, refer to an optionally substituted C_{6-14} aromatic hydrocarbon moiety comprising one to three aromatic rings. In at least one embodiment, the aryl group is a C_{6-10} aryl group. Aryl groups include, without limitation, optionally substituted phenyl, naphthyl, or anthracenyl. The terms “aryl” and “ar-”, as used herein, also include groups in which an aryl ring is fused to one or more cycloaliphatic rings to form an optionally substituted cyclic structure such as a tetrahydronaphthyl, indenyl, or indanyl ring. The term “aryl” may be used interchangeably with the terms “aryl group”, “aryl ring”, and “aromatic ring”.

[0025] An “aralkyl” or “arylalkyl” group comprises an aryl group covalently attached to an alkyl group, either of which independently is optionally substituted. In at least one embodiment, the aralkyl group is C_{6-10} aryl C_{1-6} alkyl, including, without limitation, benzyl, phenethyl, and naphthylmethyl.

[0026] The terms “heteroaryl” and “heteroar-”, used alone or as part of a larger moiety, e.g., “heteroaralkyl”, or “heteroaralkoxy”, refer to groups having 5 to 14 ring atoms, such as 5, 6, 9, or 10 ring atoms; having 6, 10, or 14 π electrons shared in a cyclic array; and having, in addition to carbon atoms, from one to five heteroatoms. A heteroaryl group may be mono-, bi-, tri-, or polycyclic, for instance mono-, bi-, or tricyclic, such as mono- or bicyclic. In the context of “heteroar” entities, the term “heteroatom” refers to nitrogen, oxygen, or sulfur, and includes any oxidized form of nitrogen or sulfur, and any quaternized form of a basic nitrogen. For example, a nitrogen atom of a heteroaryl may be a basic nitrogen atom and may also be optionally oxidized to the corresponding N-oxide. When a heteroaryl is substituted by a hydroxy group, it also includes its corresponding tautomer. The terms “heteroaryl” and “heteroar-”, as used herein, also include groups in which a heteroaromatic ring is fused to one or more aryl, cycloaliphatic, or heterocycloaliphatic rings. Nonlimiting examples of heteroaryl groups include thienyl, furanyl, pyrrolyl, imidazolyl, pyrazolyl, triazolyl, tetrazolyl, oxazolyl, isoxazolyl, oxadiazolyl, thiazolyl, isothiazolyl, thiadiazolyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, indoliziny, purinyl, naphthyridinyl, pteridinyl, indolyl, isoindolyl, benzothienyl, benzofuranyl, dibenzofuranyl, indazolyl, benzimidazolyl, benzthiazolyl, quinolyl, isoquinolyl, cinnoliny, phthalazinyl, quinazolinyl, quinoxalinyl, 4H-quinoliziny, carbazolyl, acridinyl, phenazinyl, phenothiazinyl, phenoxazinyl, tetrahydroquinolinyl, tetrahydroisoquinolinyl, and pyrido[2,3-b]-1,4-oxazin-3(4H)-one. The term “heteroaryl” may be used interchangeably with the terms “heteroaryl ring”, “heteroaryl group”, or “heteroaromatic”, any of which terms include rings that are optionally substituted. The term “heteroaralkyl” refers to an alkyl group

substituted by a heteroaryl, wherein the alkyl and heteroaryl portions independently are optionally substituted.

[0027] As used herein, the terms "heterocycle", "heterocyclyl", "heterocyclic radical", and "heterocyclic ring" are used interchangeably and refer to a stable 3- to 8-membered monocyclic or 7–10-membered bicyclic heterocyclic moiety that is either saturated or partially unsaturated, and having, in addition to carbon atoms, one or more, for instance one to four, heteroatoms, as defined above. When used in reference to a ring atom of a heterocycle, the term "nitrogen" includes a substituted nitrogen. As an example, in a saturated or partially unsaturated ring having 0–3 heteroatoms selected from oxygen, sulfur or nitrogen, the nitrogen may be N (as in 3,4-dihydro-2H-pyrrolyl), NH (as in pyrrolidinyl), or NR^+ (as in N-substituted pyrrolidinyl).

[0028] A heterocyclic ring can be attached to its pendant group at any heteroatom or carbon atom that results in a stable structure and any of the ring atoms can be optionally substituted. Examples of such saturated or partially unsaturated heterocyclic radicals include, without limitation, tetrahydrofuranyl, tetrahydrothienyl, piperidinyl, decahydroquinolinyl, oxazolidinyl, piperazinyl, dioxanyl, dioxolanyl, diazepinyl, oxazepinyl, thiazepinyl, morpholinyl, and thiamorpholinyl. A heterocyclyl group may be mono-, bi-, tri-, or polycyclic, for instance mono-, bi-, or tricyclic, such as mono- or bicyclic. The term "heterocyclylalkyl" refers to an alkyl group substituted by a heterocyclyl, wherein the alkyl and heterocyclyl portions independently are optionally substituted. Additionally, a heterocyclic ring also includes groups in which the heterocyclic ring is fused to one or more aryl rings.

[0029] As used herein, the term "partially unsaturated" refers to a ring moiety that includes at least one double or triple bond between ring atoms. The term "partially unsaturated" is intended to encompass rings having multiple sites of unsaturation, but is not intended to include aromatic (e.g., aryl or heteroaryl) moieties, as herein defined.

[0030] The term "alkylene" refers to a bivalent alkyl group. An "alkylene chain" is a polymethylene group, i.e., $-(\text{CH}_2)_n-$, wherein n is a positive integer, such as from 1 to 6, from 1 to 4, from 1 to 3, from 1 to 2, or from 2 to 3. An optionally substituted alkylene chain is a polymethylene group in which one or more methylene hydrogen atoms is optionally replaced with a substituent. Suitable substituents include those described below for a substituted aliphatic group and also include those described in the specification herein. It will be appreciated that two substituents of the alkylene group may be taken together to form a ring system. In certain embodiments, two substituents can be taken together to form a 3-7-membered ring. The substituents can be on the same or different atoms.

[0031] An alkylene chain also can be optionally interrupted by a functional group. An alkylene chain is "interrupted" by a functional group when an internal methylene unit is interrupted by the functional

group. Examples of suitable "interrupting functional groups" are described in the specification and claims herein, and include double and/or triple bonds between carbons in the alkylene chain.

[0032] For purposes of clarity, all bivalent groups described herein, including, e.g., the alkylene chain linkers described above, are intended to be read from left to right, with a corresponding left-to-right reading of the formula or structure in which the variable appears. Where a bivalent group, such as X_1 is part of an aromatic system such as an aryl or heteroaryl group, then aromaticity is maintained and the individual member of the bivalent group may be individually described as either X_1 , $-X_1-$ or $=X_1-$; for example when X_1 is N, this can be described as either N, $-N-$ or $=N-$.

[0033] An aryl (including aralkyl, aralkoxy, aryloxyalkyl and the like) or heteroaryl (including heteroaralkyl and heteroarylalkoxy and the like) group may contain one or more substituents and thus may be "optionally substituted". In addition to the substituents defined above and herein, suitable substituents on the unsaturated carbon atom of an aryl or heteroaryl group also include and are generally selected from $-\text{halo}$, $-\text{NO}_2$, $-\text{CN}$, $-\text{R}^+$, $-\text{C}(\text{R}^+)=\text{C}(\text{R}^+)_2$, $-\text{C}\equiv\text{C}-\text{R}^+$, $-\text{OR}^+$, $-\text{SR}^\circ$, $-\text{S}(\text{O})\text{R}^\circ$, $-\text{SO}_2\text{R}^\circ$, $-\text{SO}_3\text{R}^+$, $-\text{SO}_2\text{N}(\text{R}^+)_2$, $-\text{N}(\text{R}^+)_2$, $-\text{NR}^+\text{C}(\text{O})\text{R}^+$, $-\text{NR}^+\text{C}(\text{S})\text{R}^+$, $-\text{NR}^+\text{C}(\text{O})\text{N}(\text{R}^+)_2$, $-\text{NR}^+\text{C}(\text{S})\text{N}(\text{R}^+)_2$, $-\text{N}(\text{R}^+)\text{C}(=\text{NR}^+)-\text{N}(\text{R}^+)_2$, $-\text{N}(\text{R}^+)\text{C}(=\text{NR}^+)-\text{R}^\circ$, $-\text{NR}^+\text{CO}_2\text{R}^+$, $-\text{NR}^+\text{SO}_2\text{R}^\circ$, $-\text{NR}^+\text{SO}_2\text{N}(\text{R}^+)_2$, $-\text{O}-\text{C}(\text{O})\text{R}^+$, $-\text{O}-\text{CO}_2\text{R}^+$, $-\text{OC}(\text{O})\text{N}(\text{R}^+)_2$, $-\text{C}(\text{O})\text{R}^+$, $-\text{C}(\text{S})\text{R}^\circ$, $-\text{CO}_2\text{R}^+$, $-\text{C}(\text{O})-\text{C}(\text{O})\text{R}^+$, $-\text{C}(\text{O})\text{N}(\text{R}^+)_2$, $-\text{C}(\text{S})\text{N}(\text{R}^+)_2$, $-\text{C}(\text{O})\text{N}(\text{R}^+)-\text{OR}^+$, $-\text{C}(\text{O})\text{N}(\text{R}^+)\text{C}(=\text{NR}^+)-\text{N}(\text{R}^+)_2$, $-\text{N}(\text{R}^+)\text{C}(=\text{NR}^+)-\text{N}(\text{R}^+)-\text{C}(\text{O})\text{R}^+$, $-\text{C}(=\text{NR}^+)-\text{N}(\text{R}^+)_2$, $-\text{C}(=\text{NR}^+)-\text{OR}^+$, $-\text{N}(\text{R}^+)-\text{N}(\text{R}^+)_2$, $-\text{C}(=\text{NR}^+)-\text{N}(\text{R}^+)-\text{OR}^+$, $-\text{C}(\text{R}^\circ)=\text{N}-\text{OR}^+$, $-\text{P}(\text{O})(\text{R}^+)_2$, $-\text{P}(\text{O})(\text{OR}^+)_2$, $-\text{O}-\text{P}(\text{O})-\text{OR}^+$, and $-\text{P}(\text{O})(\text{NR}^+)-\text{N}(\text{R}^+)_2$, wherein R^+ , independently, is hydrogen or an optionally substituted aliphatic, aryl, heteroaryl, cycloaliphatic, or heterocyclyl group, or two independent occurrences of R^+ are taken together with their intervening atom(s) to form an optionally substituted 5-7-membered aryl, heteroaryl, cycloaliphatic, or heterocyclyl ring. Each R° is an optionally substituted aliphatic, aryl, heteroaryl, cycloaliphatic, or heterocyclyl group.

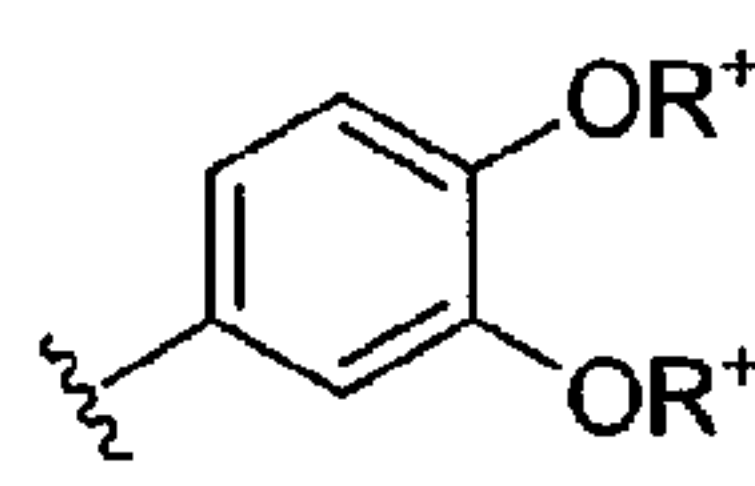
[0034] An aliphatic or heteroaliphatic group, or a non-aromatic carbocyclic or heterocyclic ring may contain one or more substituents and thus may be "optionally substituted". Unless otherwise defined above and herein, suitable substituents on the saturated carbon of an aliphatic or heteroaliphatic group, or of a non-aromatic carbocyclic or heterocyclic ring are selected from those listed above for the unsaturated carbon of an aryl or heteroaryl group and additionally include the following: $=\text{O}$, $=\text{S}$, $=\text{C}(\text{R}^*)_2$, $=\text{N}-\text{N}(\text{R}^*)_2$, $=\text{N}-\text{OR}^*$, $=\text{N}-\text{NHC}(\text{O})\text{R}^*$, $=\text{N}-\text{NHCO}_2\text{R}^\circ$, $=\text{N}-\text{NHSO}_2\text{R}^\circ$ or $=\text{N}-\text{R}^*$ where R° is defined above, and each R^* is independently selected from hydrogen or an optionally substituted C_{1-6} aliphatic group.

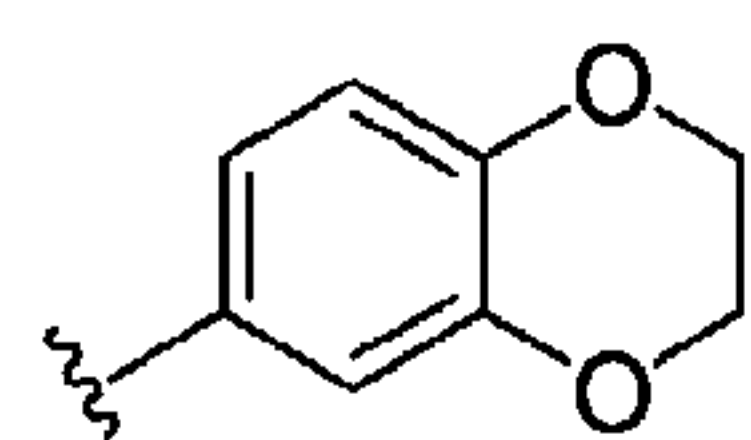
[0035] In addition to the substituents defined above and herein, optional substituents on the nitrogen of a non-aromatic heterocyclic ring also include and are generally selected from $-\text{R}^+$, $-\text{N}(\text{R}^+)_2$, $-\text{C}(\text{O})\text{R}^+$, $-\text{C}(\text{O})\text{OR}^+$, $-\text{C}(\text{O})\text{C}(\text{O})\text{R}^+$, $-\text{C}(\text{O})\text{CH}_2\text{C}(\text{O})\text{R}^+$, $-\text{S}(\text{O})_2\text{R}^+$, $-\text{S}(\text{O})_2\text{N}(\text{R}^+)_2$, $-\text{C}(\text{S})\text{N}(\text{R}^+)_2$, $-\text{C}(=\text{NH})-\text{N}(\text{R}^+)_2$, or $-\text{N}(\text{R}^+)\text{S}(\text{O})_2\text{R}^+$; wherein each R^+ is defined above. A

ring nitrogen atom of a heteroaryl or non-aromatic heterocyclic ring also may be oxidized to form the corresponding N-hydroxy or N-oxide compound. A nonlimiting example of such a heteroaryl having an oxidized ring nitrogen atom is N-oxidopyridyl.

[0036] As detailed above, in some embodiments, two independent occurrences of R^+ (or any other variable similarly defined in the specification and claims herein), are taken together with their intervening atom(s) to form a monocyclic or bicyclic ring selected from 3–13-membered cycloaliphatic, 3–12-membered heterocyclyl having 1–5 heteroatoms independently selected from nitrogen, oxygen, or sulfur, 6–10-membered aryl, or 5–10-membered heteroaryl having 1–5 heteroatoms independently selected from nitrogen, oxygen, or sulfur.

[0037] Exemplary rings that are formed when two independent occurrences of R^+ (or any other variable similarly defined in the specification and claims herein), are taken together with their intervening atom(s) include, but are not limited to the following: a) two independent occurrences of R^+ (or any other variable similarly defined in the specification or claims herein) that are bound to the same atom and are taken together with that atom to form a ring, for example, $N(R^+)_2$, where both occurrences of R^+ are taken together with the nitrogen atom to form a piperidin-1-yl, piperazin-1-yl, or morpholin-4-yl group; and b) two independent occurrences of R^+ (or any other variable similarly defined in the specification or claims herein) that are bound to different atoms and are taken together with both of those atoms to form a ring,

for example where a phenyl group is substituted with two occurrences of OR^+ , these two occurrences of R^+ are taken together with the oxygen atoms to which they are bound to form a fused 6-

membered oxygen containing ring: . It will be appreciated that a variety of other rings (e.g., spiro and bridged rings) can be formed when two independent occurrences of R^+ (or any other variable similarly defined in the specification and claims herein) are taken together with their intervening atom(s) and that the examples detailed above are not intended to be limiting.

[0038] Unless otherwise stated, structures depicted herein are also meant to include all isomeric (e.g., enantiomeric, diastereomeric, and geometric (or conformational)) forms of the structure; for example, the R and S configurations for each asymmetric center, (Z) and (E) double bond isomers, and (Z) and (E) conformational isomers. Therefore, single stereochemical isomers as well as enantiomeric, diastereomeric, and geometric (or conformational) mixtures of the present compounds are within the scope of the present disclosure. Unless otherwise stated, all tautomeric forms of the compounds disclosed herein are within the scope of the present disclosure. Additionally, unless otherwise stated, structures depicted herein are also meant to include compounds that differ only in the presence of one or more

isotopically enriched atoms. For example, compounds having the present structures where there is a replacement of hydrogen by deuterium or tritium, or a replacement of a carbon by a ^{13}C - or ^{14}C -enriched carbon are within the scope of this disclosure. Such compounds are useful, as a nonlimiting example, as analytical tools or probes in biological assays.

[0039] It is to be understood that, when a disclosed compound has at least one chiral center, the present disclosure encompasses one enantiomer of inhibitor free from the corresponding optical isomer, racemic mixture of the inhibitor and mixtures enriched in one enantiomer relative to its corresponding optical isomer. When a mixture is enriched in one enantiomer relative to its optical isomers, the mixture contains, for example, an enantiomeric excess of at least 50%, 75%, 90%, 95%, 99% or 99.5%.

[0040] The enantiomers of the present disclosure may be resolved by methods known to those skilled in the art, for example by formation of diastereoisomeric salts which may be separated, for example, by crystallization; formation of diastereoisomeric derivatives or complexes which may be separated, for example, by crystallization, gas-liquid or liquid chromatography; selective reaction of one enantiomer with an enantiomer-specific reagent, for example enzymatic esterification; or gas-liquid or liquid chromatography in a chiral environment, for example on a chiral support for example silica with a bound chiral ligand or in the presence of a chiral solvent. Where the desired enantiomer is converted into another chemical entity by one of the separation procedures described above, a further step is required to liberate the desired enantiomeric form. Alternatively, specific enantiomers may be synthesized by asymmetric synthesis using optically active reagents, substrates, catalysts or solvents, or by converting one enantiomer into the other by asymmetric transformation.

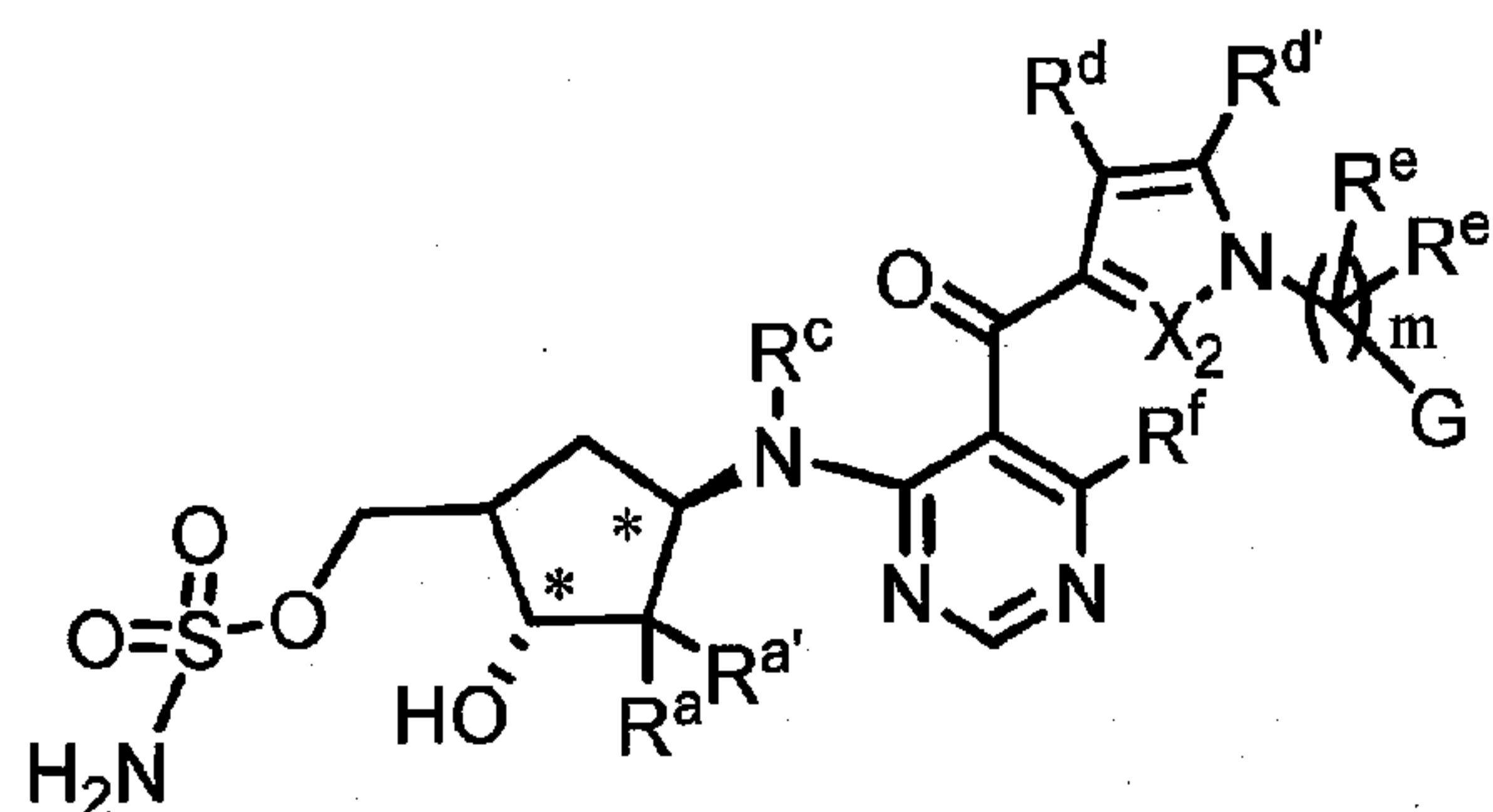
[0041] When a disclosed compound has at least two chiral centers, the present disclosure encompasses a diastereomer free of other diastereomers, a pair of diastereomers free from other diastereomeric pairs, mixtures of diastereomers, mixtures of diastereomeric pairs, mixtures of diastereomers in which one diastereomer is enriched relative to the other diastereomer(s) and mixtures of diastereomeric pairs in which one diastereomeric pair is enriched relative to the other diastereomeric pair(s). When a mixture is enriched in one diastereomer or diastereomeric pair(s) relative to the other diastereomers or diastereomeric pair(s), the mixture is enriched with the depicted or referenced diastereomer or diastereomeric pair(s) relative to other diastereomers or diastereomeric pair(s) for the compound, for example, by a molar excess of at least 50%, 75%, 90%, 95%, 99% or 99.5%.

[0042] The diastereoisomeric pairs may be separated by methods known to those skilled in the art, for example chromatography or crystallization and the individual enantiomers within each pair may be separated as described above. Specific procedures for chromatographically separating diastereomeric pairs of precursors used in the preparation of compounds disclosed herein are provided the examples herein.

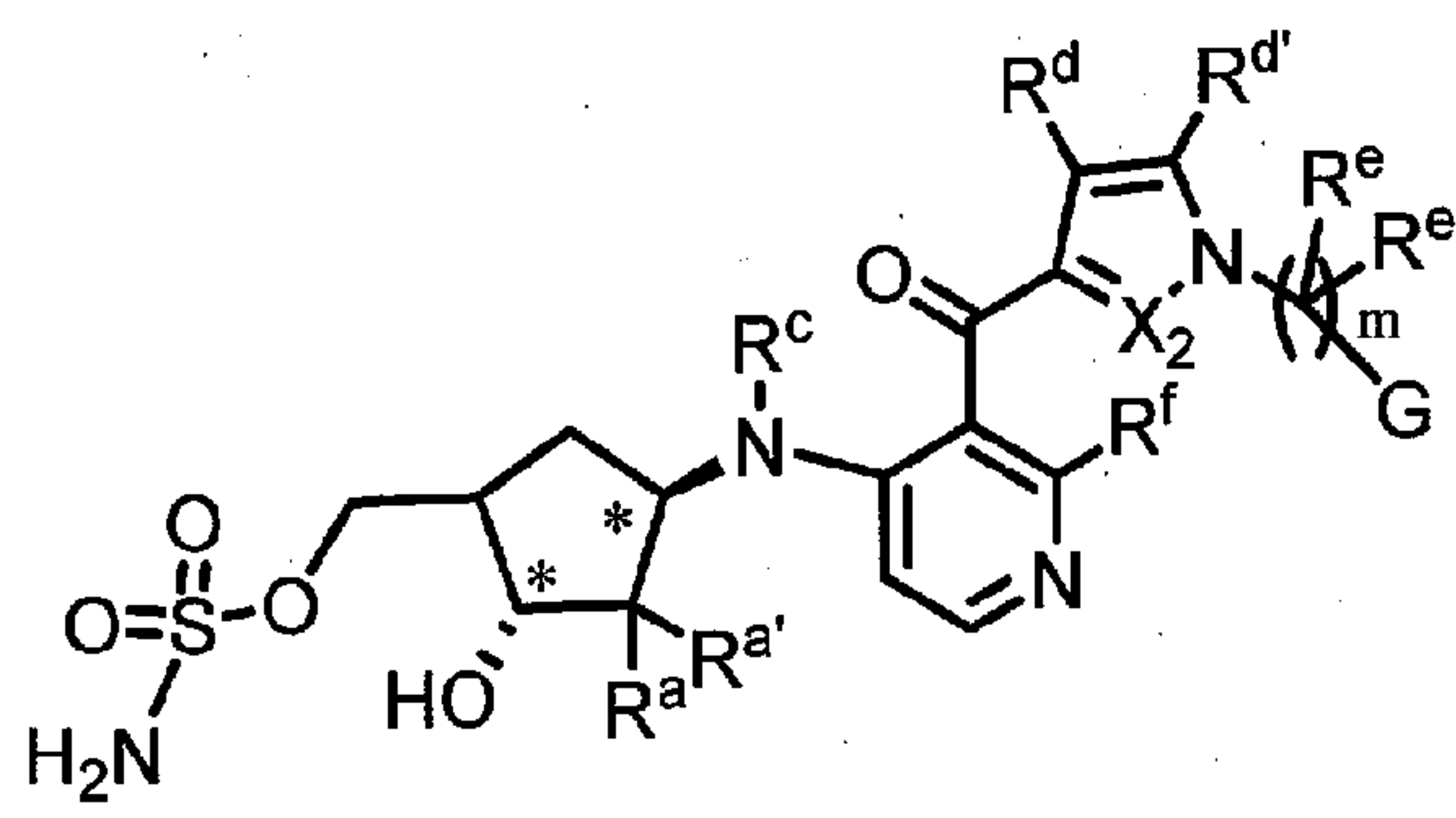
[0043] For the avoidance of doubt, for compounds described herein, where the compound is a single diastereomer and the absolute configuration of the chiral centers is known the name of the compound reflects the assigned configuration at each stereochemical center; for example compound **I-16**:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2,3,6-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate. Where the compound is a single diastereomer and the absolute configuration is known at some of the chiral centers but is unknown at one chiral center, the name reflects the two possibilities separated by an “or”; for example compound **I-10**: [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate. Where the compound is a mixture of two or more diastereomers the name reflects the two or more possibilities by using “and” between the names of the individual diastereomers that make up the mixture; for example compound **I-250**: [(1R,2R,3R,4R)-4-({5-[(1-{[(2R)-5,5-dimethyltetrahydrofuran-2-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl} amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate and [(1R,2R,3R,4R)-4-({5-[(1-{[(2S)-5,5-dimethyltetrahydrofuran-2-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl} amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate.

[0044] In some embodiments, the compounds of formula (I) is represented by formula (II-a) or (II-b):



(II-a)

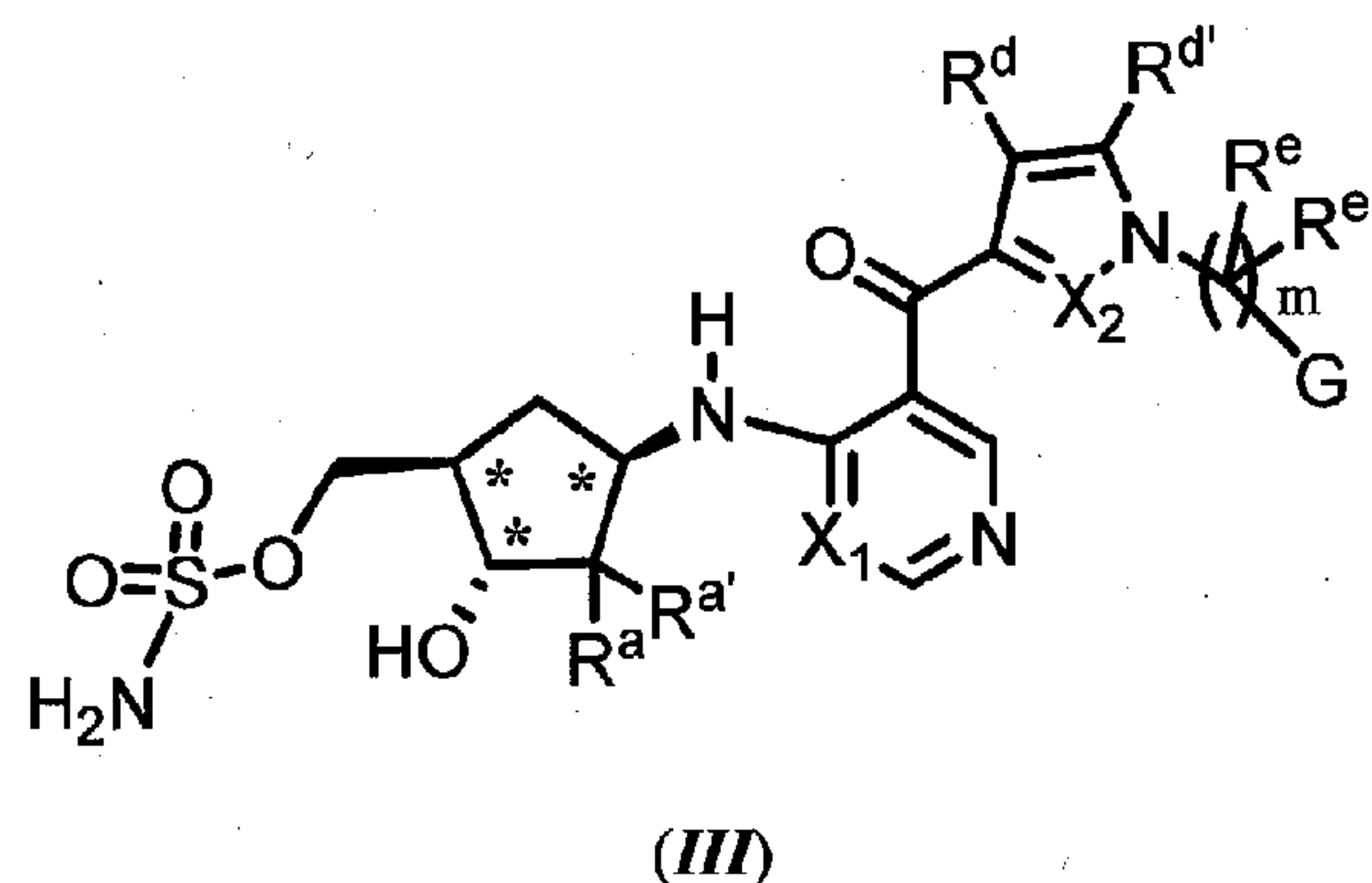


(II-b)

or a pharmaceutically acceptable salt thereof;

wherein R^a , $R^{a'}$, R^c , R^f , X_2 , R^d , $R^{d'}$, R^e , $R^{e'}$, m , and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry. In some embodiments, the compound of formula (I) is represented by formula (II-a) wherein R^a , $R^{a'}$, R^c , R^f , X_2 , R^d , $R^{d'}$, R^e , $R^{e'}$, m , and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry. In some embodiments, the compound of formula (I) is represented by formula (II-b) wherein R^a , $R^{a'}$, R^c , R^f , X_2 , R^d , $R^{d'}$, R^e , $R^{e'}$, m , and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry.

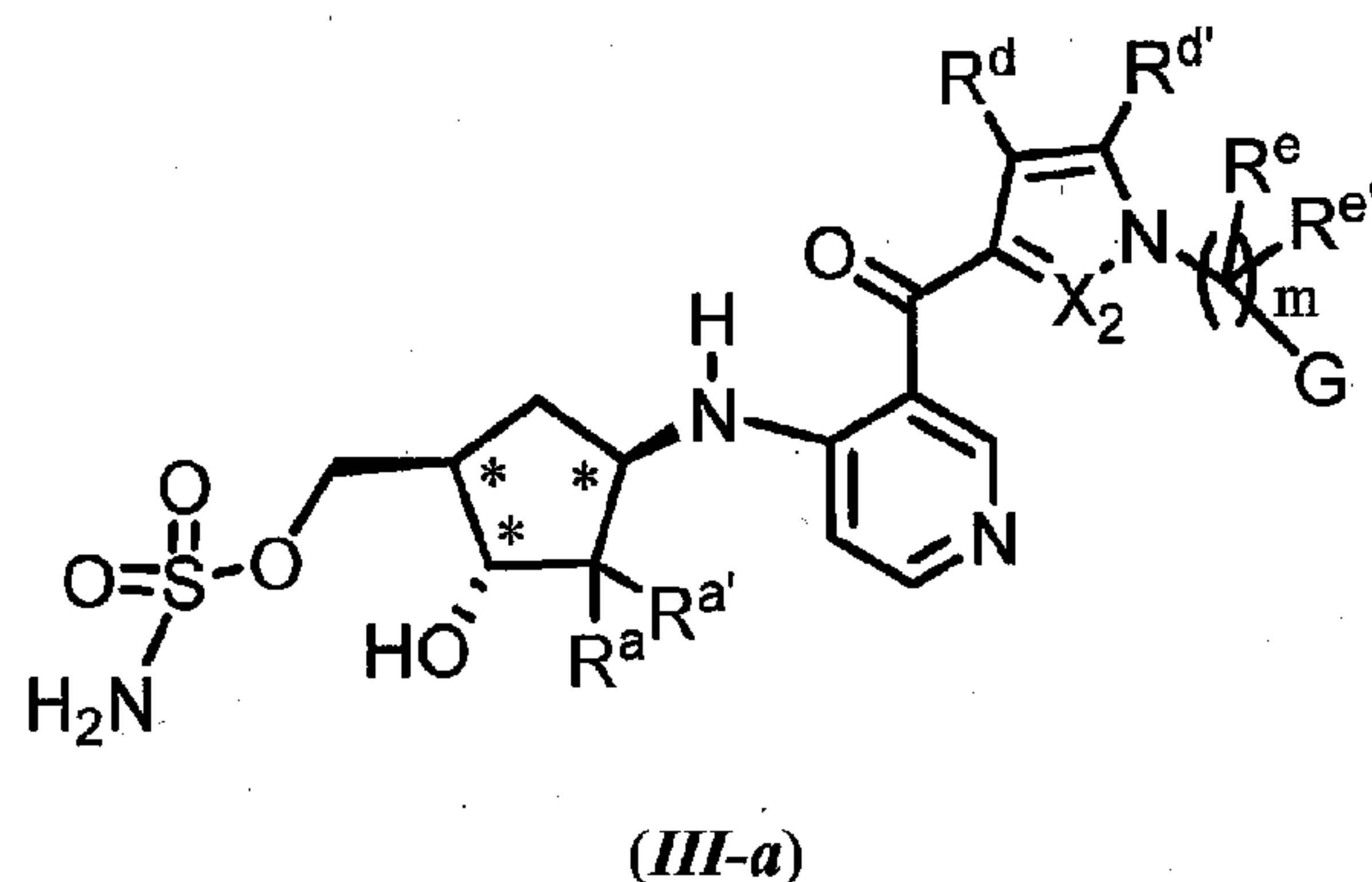
[0045] In some embodiments, the compounds of formula (I) is represented by formula (III):



or a pharmaceutically acceptable salt thereof;

wherein R^a , $R^{a'}$, X_1 , X_2 , R^d , $R^{d'}$, R^e , $R^{e'}$, m , and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry.

[0046] In some embodiments, the compounds of formula (I) is represented by formula (III-a), (III-b), (III-c), or (III-d):

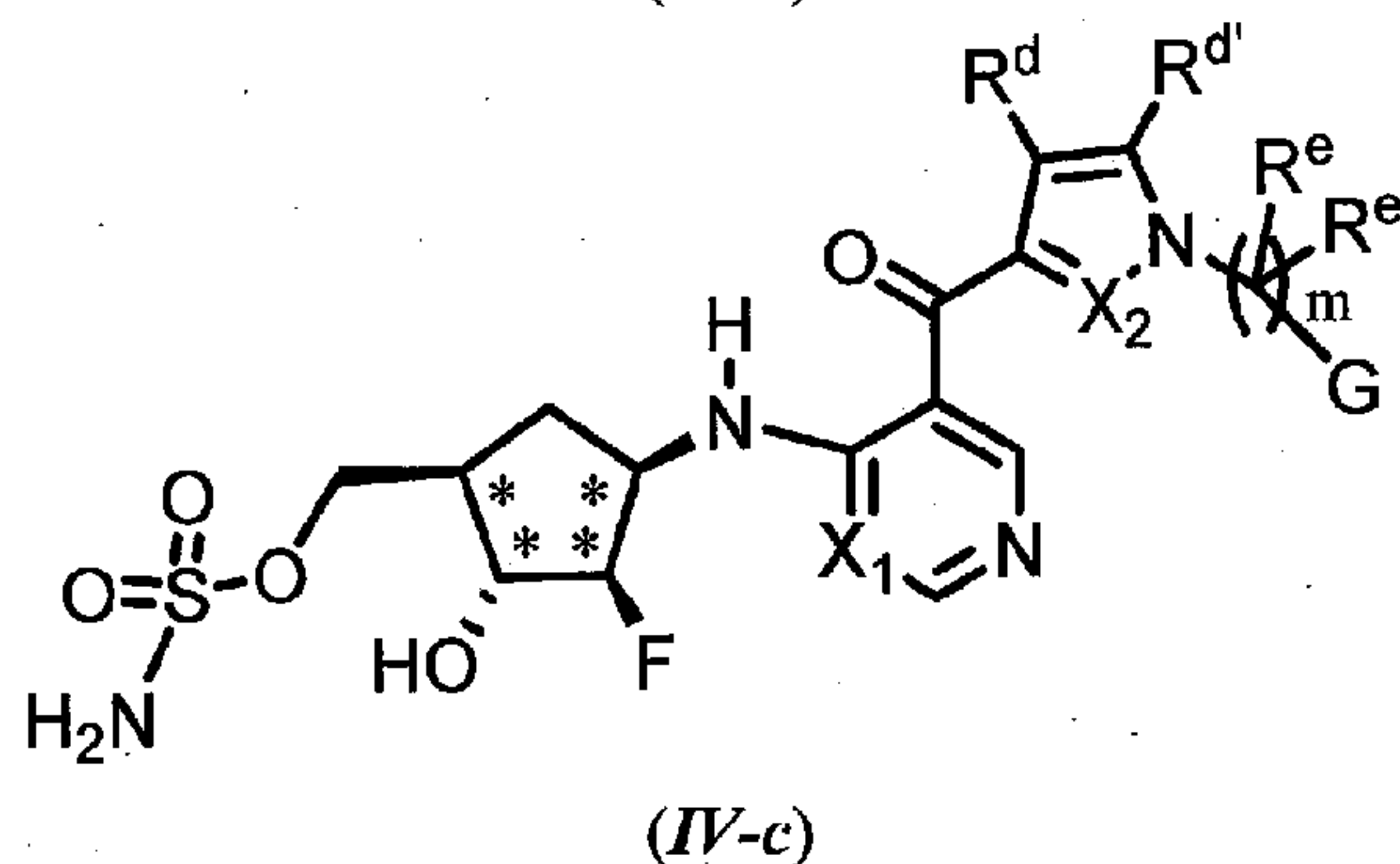
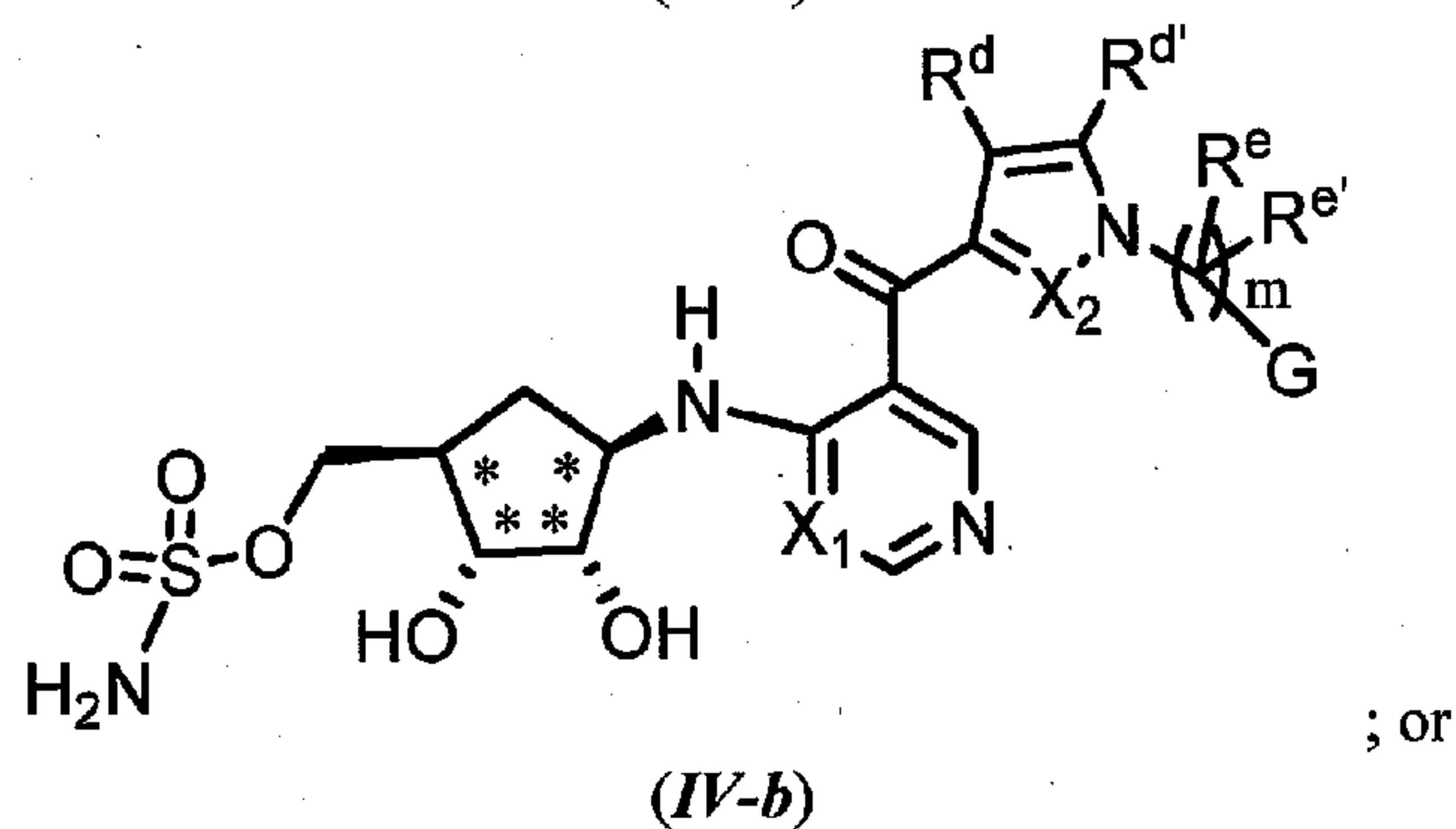
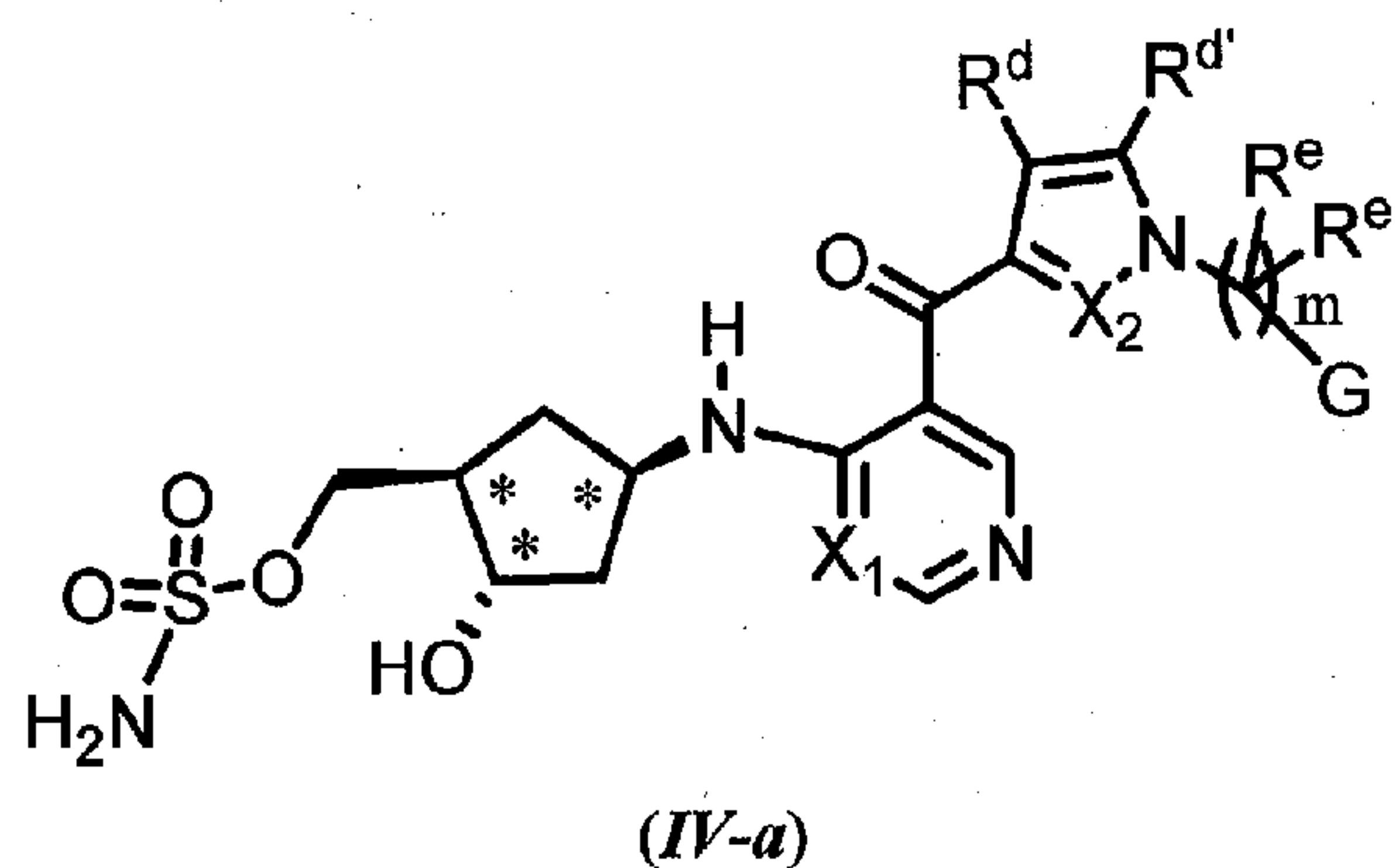




wherein R^a, R^{a'}, X₁, X₂, R^d, R^{d'}, R^e, R^{e'}, m, and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry. In some embodiments, the compound of formula (I) is represented by formula (III-a) wherein R^a, R^{a'}, X₂, R^d, R^{d'}, R^e, R^{e'}, m, and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry. In some embodiments, the compound of formula (I) is represented by formula (III-b) wherein R^a, R^{a'}, X₂, R^d, R^{d'}, R^e, R^{e'}, m, and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry. In some embodiments, the compound of formula (I) is represented by formula (III-c) wherein R^a, R^{a'}, X₁, R^d, R^{d'},

R^e , $R^{e'}$, m , and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry. In some embodiments, the compound of formula (I) is represented by formula (III-d) wherein R^a , $R^{a'}$, X_1 , R^d , $R^{d'}$, R^e , $R^{e'}$, m , and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry.

[0047] In some embodiments, the compounds of formula (I) are represented by formula (IV-a), (IV-b), or (IV-c):



or a pharmaceutically acceptable salt thereof;

wherein X_1 , X_2 , R^d , $R^{d'}$, R^e , $R^{e'}$, m , and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry. In some embodiments,

the compound of formula (I) is represented by formula (IV-a) wherein X_1 , X_2 , R^d , $R^{d'}$, R^e , $R^{e'}$, m , and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry. In some embodiments, the compound of formula (I) is represented by formula (IV-b) wherein X_1 , X_2 , R^d , $R^{d'}$, R^e , $R^{e'}$, m , and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry. In some embodiments, the compound of formula (I) is represented by formula (IV-c) wherein X_1 , X_2 , R^d , $R^{d'}$, R^e , $R^{e'}$, m , and G have the values described herein and stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry.

[0048] The following values are described for any of formulas (I), (II), (II-a), (II-b), (III), (III-a), (III-b), (III-c), (III-d), (IV-a), (IV-b) or (IV-c).

[0049] In some embodiments, Y is $-O-$, $-CH_2-$, or $-N(H)-$. In some embodiments, Y is $-O-$. In some embodiments, Y is $-CH_2-$. In some embodiments, Y is $-N(H)-$.

[0050] In some embodiments, R^a is hydrogen, fluoro, $-NH_2$, or $-OH$. In some embodiments, R^a is hydrogen, fluoro or $-OH$. In some embodiments, R^a is hydrogen or $-OH$. In some embodiments, R^a is hydrogen. In some embodiments, R^a is $-OH$.

[0051] In some embodiments, $R^{a'}$ is hydrogen or fluoro; provided that when R^a is $-NH_2$ or $-OH$, $R^{a'}$ is hydrogen. In some embodiments, $R^{a'}$ is fluoro. In some embodiments, $R^{a'}$ is hydrogen.

[0052] In some embodiments, R^a is hydrogen and $R^{a'}$ is hydrogen. In some embodiments, R^a is fluoro and $R^{a'}$ is fluoro. In some embodiments, R^a is $-NH_2$ and $R^{a'}$ is hydrogen. In some embodiments, R^a is hydrogen and $R^{a'}$ is fluoro. In some embodiments, R^a is $-OH$ and $R^{a'}$ is hydrogen.

[0053] In some embodiments, R^c is hydrogen or C_{1-4} alkyl. In some embodiments, R^c is hydrogen or methyl. In some embodiments, R^c is hydrogen.

[0054] In some embodiments, X_1 is $C(H)$, $C(F)$ or N . In some embodiments, X_1 is $C(H)$, or N . In some embodiments, X_1 is $C(H)$. In some embodiments, X_1 is N .

[0055] In some embodiments, X_2 is $C(R^d)$ or N , wherein R^d has the values described herein. In some embodiments, X_2 is N . In some embodiments, X_2 is $C(R^d)$, wherein R^d has the values described herein.

[0056] In some embodiments, each occurrence of R^d is independently hydrogen, halogen, cyano, C_{1-4} aliphatic, or C_{1-4} fluoroaliphatic. In some embodiments, each occurrence of R^d is independently hydrogen, chloro, bromo, fluoro, methyl, ethyl, or trifluoromethyl. In some embodiments, R^d is hydrogen.

[0057] In some embodiments, $R^{d'}$ is hydrogen, halogen, cyano, C_{1-4} aliphatic, C_{1-4} fluoroaliphatic, or $-T_2-R^3$, wherein T_2 and R^3 have the values described herein. In some embodiments, $R^{d'}$ is hydrogen, chloro, bromo, fluoro, methyl, ethyl, trifluoromethyl, $-CH_2-OR^{3a}$, $CH_2-N(H)R^{3a}$, or $-CH_2-C(O)-R^{3b}$, wherein R^{3a} and R^{3b} have the values described herein. In some embodiments, $R^{d'}$ is hydrogen, chloro, bromo, fluoro, methyl, ethyl, trifluoromethyl, $-CH_2-OH$, $-CH_2-OCH_3$, $-CH_2-N(H)CH_3$, or $-CH_2-C(O)-$

CH₃. In some embodiments, R^{d'} is hydrogen, chloro, bromo, fluoro, methyl, ethyl, or trifluoromethyl. In some embodiments, R^{d'} is hydrogen or methyl.

[0058] In some embodiments, T₂ is an optionally substituted C₁-C₂ alkylene chain. In some embodiments, T₂ is a C₁-C₂ alkylene chain optionally substituted with 0-3 independent occurrences of R^{3c}. In some embodiments, T₂ is -CH₂-CH₂-. In some embodiments, T₂ is -C(CH₃)₂-. In some embodiments, T₂ is -CH₂-.

[0059] In some embodiments, R³ is -CN, -NO₂, -N(R^{3a})₂, -OR^{3a}, -C(O)R^{3b}, -C(O)OR^{3a}, -C(O)N(R^{3a})₂, or -S(O)₂N(R^{3a})₂, wherein R^{3a} and R^{3b} have the values described herein. In some embodiments, R³ is -N(R^{3a})₂, -OR^{3a}, or -C(O)R^{3b}, wherein R^{3a} and R^{3b} have the values described herein. In some embodiments, R³ is -N(R^{3a})₂, wherein R^{3a} has the values described herein. In some embodiments, R³ is -OR^{3a}, wherein R^{3a} has the values described herein. In some embodiments, R³ is -C(O)R^{3b}, wherein R^{3b} has the values described herein.

[0060] In some embodiments, each occurrence of R^{3a} is independently hydrogen or C₁₋₄ alkyl. In some embodiments, each occurrence of R^{3a} is independently hydrogen or methyl. In some embodiments, R^{3a} is hydrogen. In some embodiments, R^{3a} is methyl.

[0061] In some embodiments, R^{3b} is C₁₋₄ alkyl. In some embodiments, R^{3b} is methyl or ethyl. In some embodiments, R^{3b} is methyl.

[0062] In some embodiments, each occurrence of R^{3c} is independently C₁₋₄ alkyl. In some embodiments, each occurrence of R^{3c} is independently methyl or ethyl. In some embodiments, R^{3c} is methyl.

[0063] In some embodiments, R^e is hydrogen or C₁₋₄ alkyl. In some embodiments, R^e is hydrogen, methyl, or ethyl. In some embodiments, R^e is hydrogen.

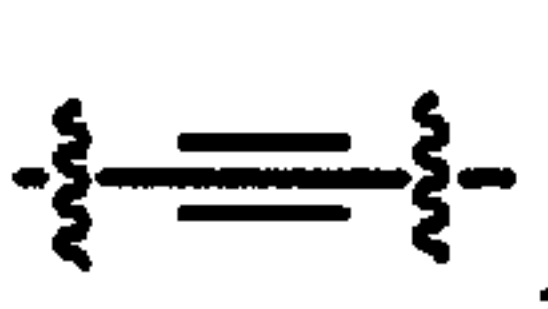
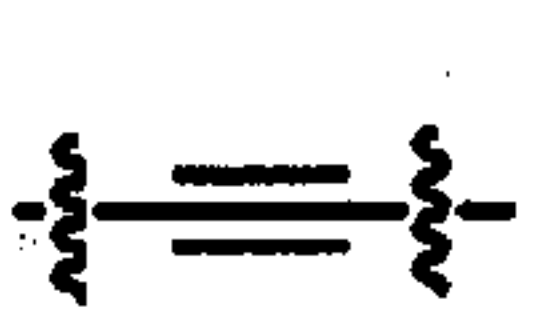
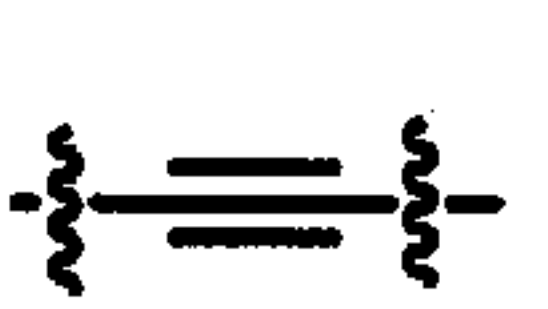
[0064] In some embodiments, R^{e'} is hydrogen or C₁₋₄ alkyl. In some embodiments, R^{e'} is hydrogen, methyl or ethyl. In some embodiments, R^{e'} is hydrogen.

[0065] In some embodiments, R^e is taken together with R^{e'} to form a 3-6 membered cycloaliphatic ring. In some embodiments, R^e is taken together with R^{e'} to form a cyclopropyl, cyclobutyl, cyclopentyl, or cyclohexyl ring. In some embodiments, R^e is taken together with R^{e'} to form a cyclopropyl ring.

[0066] In some embodiments, m is 0-2. In some embodiments, m is 1-2. In some embodiments, m is 0. In some embodiments, m is 1. In some embodiments, m is 2.

[0067] In some embodiments, R^f is hydrogen, chloro or C₁₋₄ alkyl. In some embodiments, R^f is hydrogen, chloro, methyl, or ethyl. In some embodiments, R^f is hydrogen.

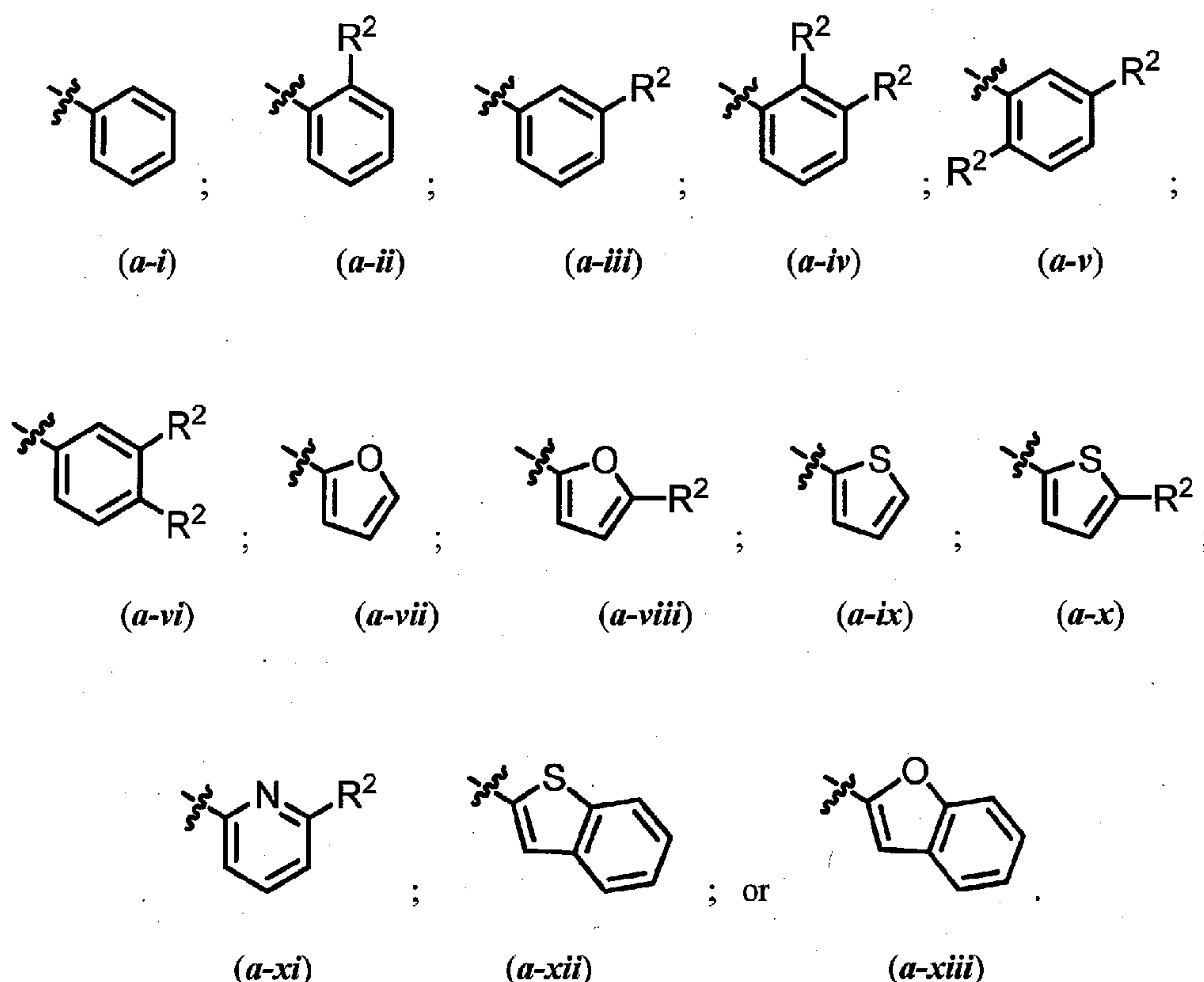
[0068] In some embodiments, G is R¹ or -L₁-R¹. In some embodiments, G is R¹. In some embodiments, G is -L₁-R¹.

[0069] In some embodiments, L_1 is , , , $-C(O)-$, or $-SO_2-$;
provided that when L_1 is $-SO_2-$, m is zero. In some embodiments, L_1 is , , or $-C(O)-$.
In some embodiments, L_1 is , or .

[0070] In some embodiments, R^1 is C_{1-6} aliphatic, 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^1 is unsubstituted or substituted with n occurrences of R^2 , wherein n and R^2 have the values described herein. In some embodiments, R^1 is 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^1 is optionally substituted with n occurrences of R^2 , wherein n and R^2 have the values described herein.

[0071] In some embodiments, R^1 is furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indoliziny, imidazopyridyl, indolyl, isoindolyl, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzodioxolyl, benzthiadiazolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, pyrazolopyrimidinyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolyl, tetrahydronaphthyridinyl, tetrahydroisoquinolyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalinyl, naphthyridinyl, pteridinyl, tetrahydrofuranyl, tetrahydropyranyl, dihydropyranyl, tetrahydrothienyl, indanyl, tetrahydroindazolyl, pyrrolidinyl, pyrrolidonyl, piperidinyl, pyrrolinyl, decahydroquinolyl, oxazolidinyl, piperazinyl, dioxanyl, diazepinyl, oxazepinyl, thiazepinyl, morpholinyl, thiomorpholinyl, quinuclidinyl, phenanthridinyl, tetrahydronaphthyl, oxodihydropyridyl, indolyl, benzodioxanyl, chromanyl, oxetanyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclopentenyl, cyclohexenyl, cycloheptenyl, cyclooctenyl, bicycloheptanyl, azabicyclooctanyl, oxabicyclooctanyl, bicyclononyl, bicyclooctanyl, or adamantyl, wherein R^1 is unsubstituted or substituted with n occurrences of R^2 , wherein n and R^2 have the values described herein. In some embodiments, R^1 is furanyl, thienyl, phenyl, naphthyl, pyridyl, benzothienyl, benzofuranyl, cyclohexyl, or cyclohexenyl, wherein R^1 is unsubstituted or substituted with n occurrences of R^2 , wherein n and R^2 have the values described herein.

[0072] In some embodiments, R^1 is:



wherein R^2 has the values described herein.

[0073] In some embodiments, R^1 is (a-i), (a-iii), (a-iv), (a-v), (a-viii), or (a-xi), wherein R^2 has the values described herein.

[0074] In some embodiments, n is 1-5. In some embodiments, n is 1-4. In some embodiments, n is 1-3. In some embodiments, n is 1-2. In some embodiments, n is 1.

[0075] In some embodiments, each occurrence of R^2 is independently $-R^{2a}$, $-T_1-R^{2d}$, $-T_1-R^{2a}$, or $-V_1-T_1-R^{2d}$, wherein R^{2a} , T_1 , R^{2d} , V_1 and T_1 have the values described herein. In some embodiments, each occurrence of R^2 is independently $-R^{2a}$ or $-T_1-R^{2a}$, wherein R^{2a} and T_1 have the values described herein. In some embodiments, each occurrence of R^2 is independently $-R^{2a}$, wherein R^{2a} has the values described herein. In some embodiments, each occurrence of R^2 is independently halogen, $-R^{2c}$, $-N(R^{2b})_2$, $-OR^{2b}$, $-SR^{2c}$, C_{1-6} aliphatic or C_{1-6} fluoroaliphatic, wherein R^{2b} and R^{2c} have the values described herein.

[0076] In some embodiments, each occurrence of R^2 is independently chloro, bromo, fluoro, iodo, methyl, ethyl, propyl, tert-butyl, methoxy, ethoxy, isopropoxy, tert-butoxy, difluoromethyl, trifluoromethyl, difluoromethoxy, trifluoromethoxy, trifluoromethylthio, dimethylamino, diethylamino, ethyne, cyclopropyl, or phenyl. In some embodiments, each occurrence of R^2 is independently chloro,

bromo, fluoro, iodo, methyl, ethyl, difluoromethoxy, trifluoromethoxy, ethyne, cyclopropyl, or phenyl. In some embodiments, each occurrence of R^2 is independently chloro, bromo, iodo, or methyl.

[0077] In some embodiments, each occurrence of R^{2a} is independently halogen, $-CN$, $-NO_2$, $-R^{2c}$, $-N(R^{2b})_2$, $-OR^{2b}$, $-SR^{2c}$, $-S(O)R^{2c}$, $-S(O)_2R^{2c}$, $-C(O)R^{2b}$, $-C(O)OR^{2b}$, $-C(O)N(R^{2b})_2$, $-S(O)_2N(R^{2b})_2$, $-OC(O)N(R^{2b})_2$, $-N(R^{2e})C(O)R^{2b}$, $-N(R^{2e})SO_2R^{2c}$, $-N(R^{2e})C(O)OR^{2b}$, $-N(R^{2e})C(O)N(R^{2b})_2$, $-N(R^{2e})SO_2N(R^{2b})_2$, or $Si(R^{2c})_3$, or an optionally substituted C_{1-6} aliphatic or C_{1-6} haloaliphatic, wherein R^{2b} , R^{2c} , and R^{2e} have the values described herein. In some embodiments, each occurrence of R^{2a} is independently halogen, $-R^{2c}$, $-N(R^{2b})_2$, $-N(R^{2e})C(O)R^{2b}$, $-OR^{2b}$, $-SR^{2c}$, $-S(O)R^{2c}$, $-S(O)_2R^{2c}$, or an optionally substituted C_{1-6} aliphatic, or C_{1-6} fluoroaliphatic, wherein R^{2b} and R^{2c} have the values described herein. In some embodiments, each occurrence of R^{2a} is independently halogen, $-R^{2c}$, $-N(R^{2b})_2$, $-OR^{2b}$, $-SR^{2c}$, C_{1-6} aliphatic, or C_{1-6} fluoroaliphatic, wherein R^{2b} and R^{2c} have the values described herein. In some embodiments, each occurrence of R^{2a} is independently chloro, bromo, fluoro, iodo, cyano, methyl, ethyl, propyl, isopropyl, tert-butyl, methoxy, ethoxy, isopropoxy, tert-butoxy, difluoromethyl, trifluoromethyl, difluoromethoxy, trifluoromethoxy, trifluoromethylthio, trimethylsilyl, dimethylamino, diethylamino, 2-methoxy 2-methylpropyl, 2-hydroxy 2-methyl propyl, or ethyne. In some embodiments, each occurrence of R^{2a} is independently chloro, bromo, fluoro, iodo, methyl, ethyl, propyl, tert-butyl, methoxy, ethoxy, isopropoxy, tert-butoxy, difluoromethyl, trifluoromethyl, difluoromethoxy, trifluoromethoxy, trifluoromethylthio, dimethylamino, diethylamino, or ethyne. In some embodiments, each occurrence of R^{2a} is independently chloro, bromo, fluoro, iodo, methyl, ethyl, difluoromethyl, trifluoromethyl, difluoromethoxy, trifluoromethoxy, or ethyne.

[0078] In some embodiments, each occurrence of R^{2b} is independently hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, C_{1-6} haloaliphatic, 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, or two occurrences of R^{2b} , taken together with a nitrogen atom to which they are bound, form an optionally substituted 4- to 7-membered heterocyclyl ring having 0-1 additional heteroatoms selected from nitrogen, oxygen, and sulfur. In some embodiments, each occurrence of R^{2b} is independently hydrogen, C_{1-6} aliphatic or C_{1-6} fluoroaliphatic. In some embodiments, each occurrence of R^{2b} is independently C_{1-6} aliphatic or C_{1-6} fluoroaliphatic. In some embodiments, each occurrence of R^{2b} is independently optionally substituted phenyl. In some embodiments, each occurrence of R^{2b} is independently methyl, ethyl, vinyl, phenyl, 4-fluorophenyl, $-CH_2Cl$, difluoromethyl, or trifluoromethyl.

[0079] In some embodiments, each occurrence of R^{2c} is independently an optionally substituted group selected from C_{1-6} aliphatic, C_{1-6} haloaliphatic, 3- to 10-membered cycloaliphatic, 4- to 10-

membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur. In some embodiments, each occurrence of R^{2c} is independently methyl, ethyl, propyl, isopropyl, tert-butyl, vinyl, difluoromethyl, trifluoromethyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, phenyl, morpholinyl or piperazinyl. In some embodiments, each occurrence of R^{2c} is independently cyclopropyl or phenyl.

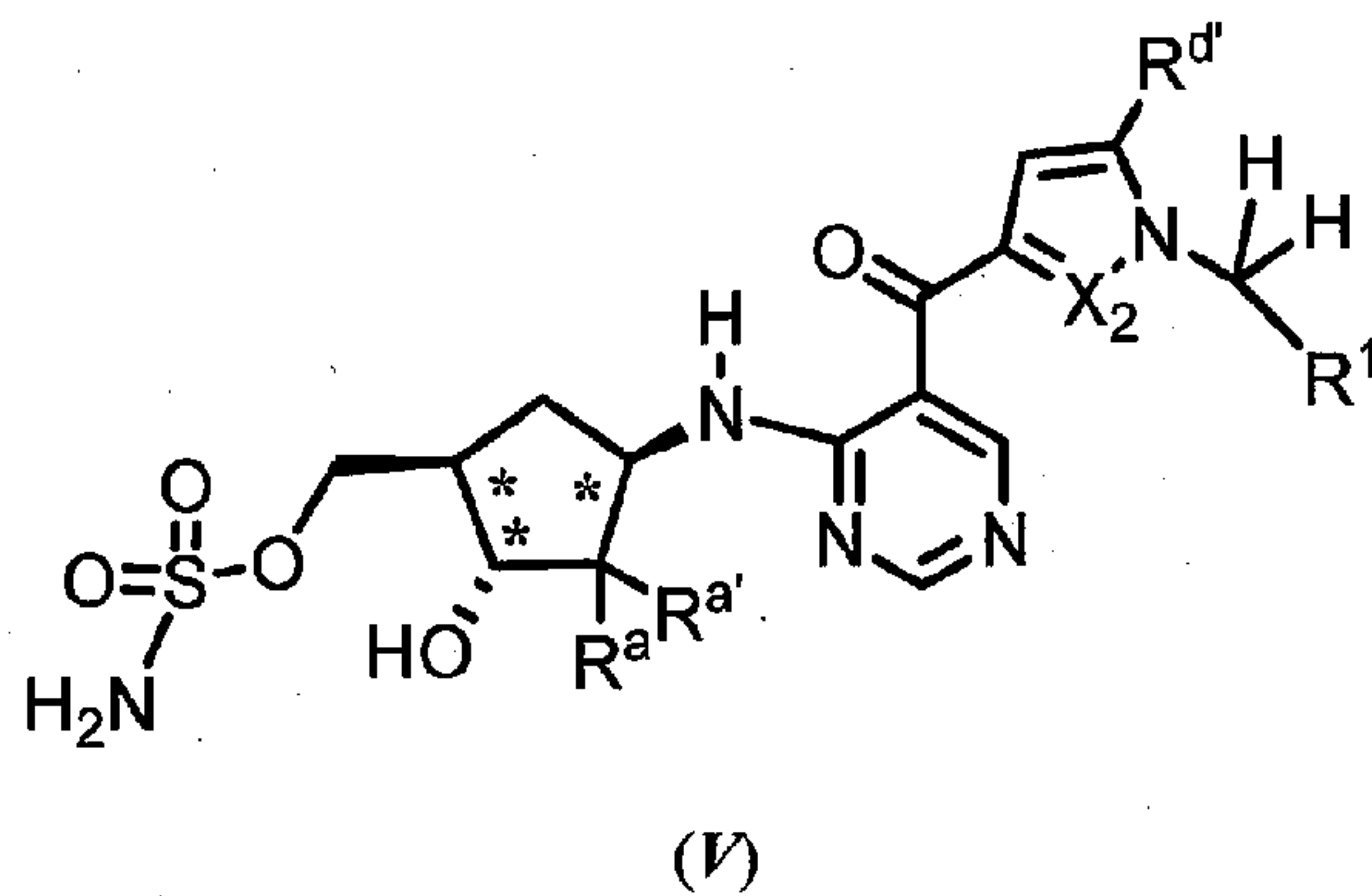
[0080] In some embodiment, each occurrence of R^{2d} is independently hydrogen or an optionally substituted group selected from 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur.

[0081] In some embodiments, each occurrence of R^{2e} is independently hydrogen or an optionally substituted C_{1-6} aliphatic group. In some embodiments, each occurrence of R^{2e} is independently hydrogen or methyl.

[0082] In some embodiments, each occurrence of V_1 is independently $-N(R^{2e})-$, $-O-$, $-S-$, $-S(O)-$, $-S(O)_2-$, $-C(O)-$, $-C(O)O-$, $-C(O)N(R^{2e})-$, $-S(O)_2N(R^{2e})-$, $-OC(O)N(R^{2e})-$, $-N(R^{2e})C(O)-$, $-N(R^{2e})SO_2-$, $-N(R^{2e})C(O)O-$, $-N(R^{2e})C(O)N(R^{2e})-$, $-N(R^{2e})SO_2N(R^{2e})-$, $-OC(O)-$, or $-C(O)N(R^{2e})O-$, wherein R^{2e} has the values described herein.

[0083] In some embodiments, each occurrence of T_1 is an optionally substituted C_{1-6} alkylene chain wherein the alkylene chain optionally is interrupted by $-N(R^4)-$, $-O-$, $-S-$, $-S(O)-$, $-S(O)_2-$, $-C(O)-$, $-C(O)O-$, $-C(O)N(R^4)-$, $-S(O)_2N(R^4)-$, $-OC(O)N(R^4)-$, $-N(R^4)C(O)-$, $-N(R^4)SO_2-$, $-N(R^4)C(O)O-$, $-N(R^4)C(O)N(R^4)-$, $-N(R^4)S(O)_2N(R^4)-$, $-OC(O)-$, or $-C(O)N(R^4)O-$ or wherein T_1 or a portion thereof optionally forms part of an optionally substituted 3- to 7 membered cycloaliphatic or heterocyclyl ring, wherein R^4 is hydrogen or an optionally substituted C_{1-4} aliphatic group.

[0084] In some embodiments, the compounds of formula (I) are represented by formula (V):



or a pharmaceutically acceptable salt thereof;

wherein:

stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry;

R^a is hydrogen and $R^{a'}$ is hydrogen; or R^a is hydrogen and $R^{a'}$ is fluoro; or R^a is OH and $R^{a'}$ is hydrogen;

X_2 is $C(R^d)$ or N;

R^d is hydrogen, chloro, bromo, fluoro, methyl, ethyl, or trifluoromethyl;

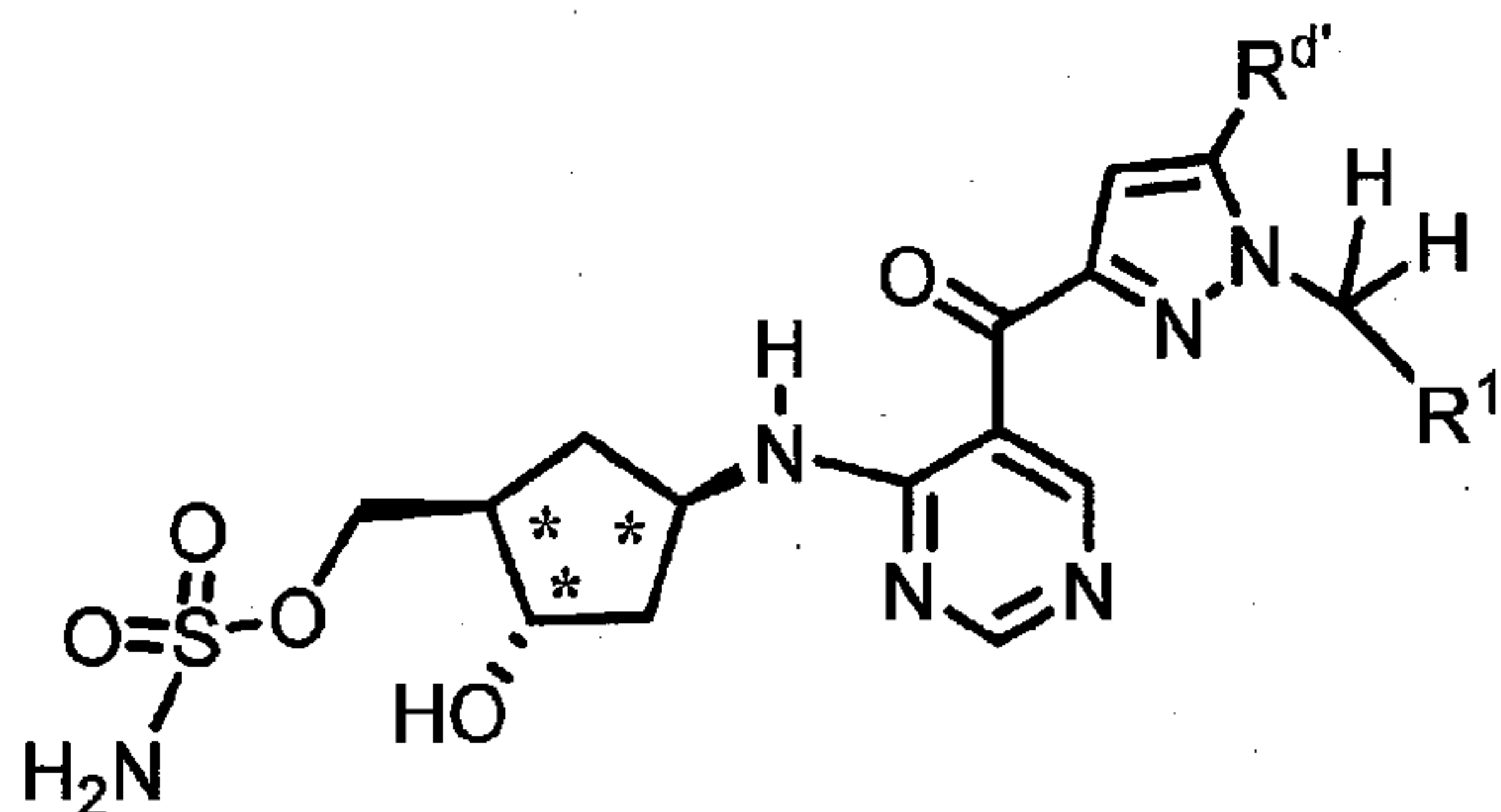
R^1 is furanyl, thienyl, phenyl, naphthyl, pyridyl, benzothienyl, benzofuranyl, cyclohexyl, or cyclohexenyl, wherein R^1 is unsubstituted or substituted with n occurrences of R^2 ;

n is 1-2; and

each occurrence of R^2 is independently halogen, $-R^{2c}$, $-N(R^{2b})_2$, $-OR^{2b}$, $-SR^{2c}$, C_{1-6} aliphatic or C_{1-6} fluoroaliphatic;

wherein R^{2b} and R^{2c} have the values described herein.

[0085] In some embodiments, the compounds of formula (I) are represented by formula (VI-a):



(VI-a)

or a pharmaceutically acceptable salt thereof;

wherein:

stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry;

R^d is hydrogen, chloro, bromo, fluoro, methyl, ethyl, or trifluoromethyl;

R^1 is furanyl, thienyl, phenyl, naphthyl, pyridyl, benzothienyl, benzofuranyl, cyclohexyl, or cyclohexenyl, wherein R^1 is unsubstituted or substituted with n occurrences of R^2 ;

n is 1-2; and

each occurrence of R^2 is independently halogen, $-R^{2c}$, $-N(R^{2b})_2$, $-OR^{2b}$, $-SR^{2c}$, C_{1-6} aliphatic or C_{1-6} fluoroaliphatic;

wherein R^{2b} and R^{2c} have the values described herein.

[0086] In some such embodiments described directly above:

each occurrence of R^2 is independently chloro, bromo, fluoro, iodo, methyl, ethyl, difluoromethoxy, trifluoromethoxy, ethyne, cyclopropyl, or phenyl.

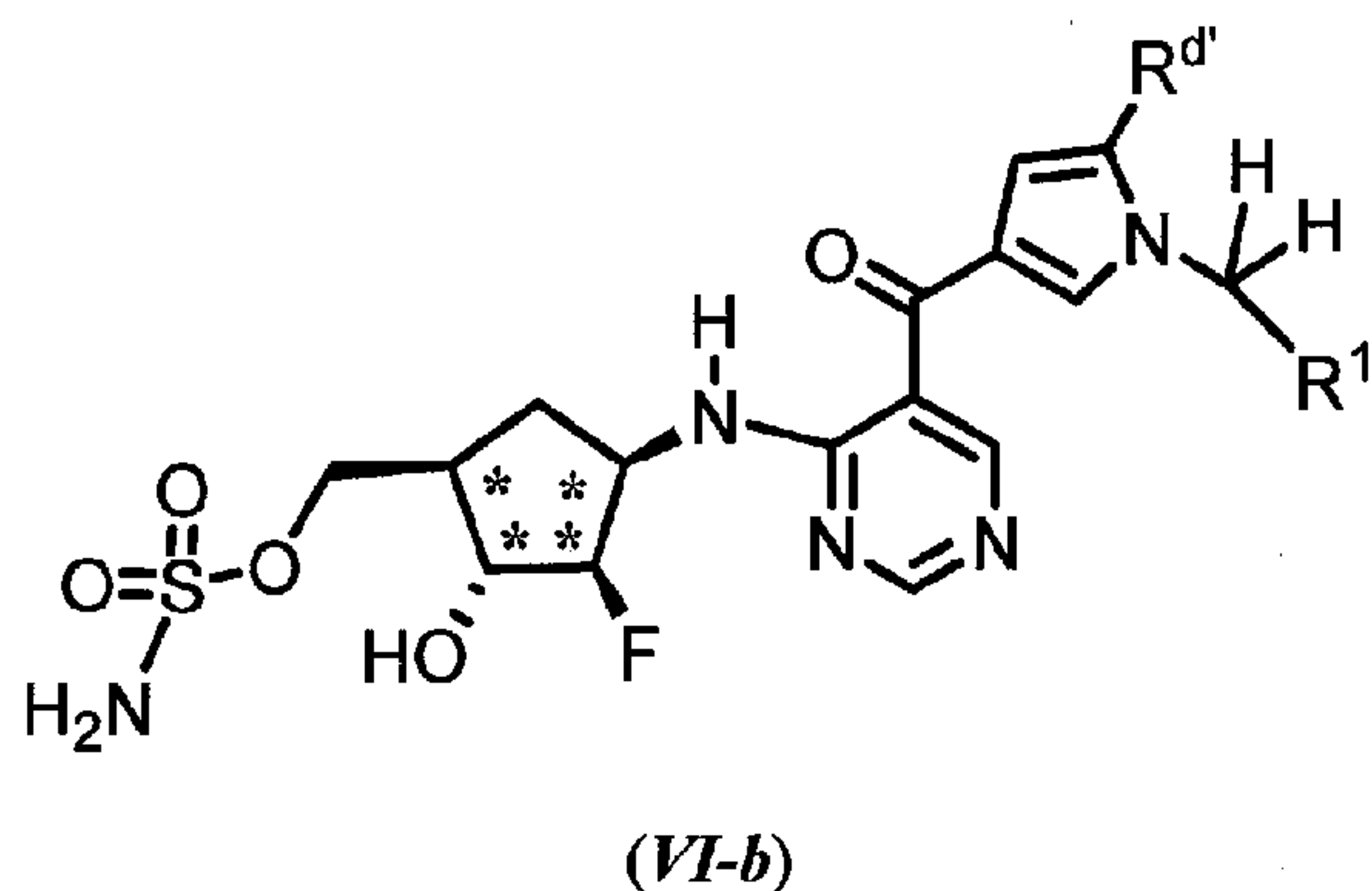
[0087] In some such embodiments described directly above:

$R^{d'}$ is hydrogen or methyl;

R^1 is (a-i), (a-iii), (a-iv), (a-v), (a-viii), or (a-xi); and

each occurrence of R^2 is independently chloro, bromo, iodo, or methyl.

[0088] In some embodiments, the compounds of formula (I) are represented by formula (VI-b):



or a pharmaceutically acceptable salt thereof;

wherein:

stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry;

$R^{d'}$ is hydrogen, chloro, bromo, fluoro, methyl, ethyl, or trifluoromethyl;

R^1 is furanyl, thienyl, phenyl, naphthyl, pyridyl, benzothienyl, benzofuranyl, cyclohexyl, or cyclohexenyl, wherein R^1 is unsubstituted or substituted with n occurrences of R^2 ;

n is 1-2; and

each occurrence of R^2 is independently halogen, $-R^{2c}$, $-N(R^{2b})_2$, $-OR^{2b}$, $-SR^{2c}$, C_{1-6} aliphatic or C_{1-6} fluoroaliphatic;

wherein R^{2b} and R^{2c} have the values described herein.

[0089] In some such embodiments described directly above:

each occurrence of R^2 is independently chloro, bromo, fluoro, iodo, methyl, ethyl, difluoromethoxy, trifluoromethoxy, ethyne, cyclopropyl, or phenyl.

[0090] In some such embodiments described directly above:

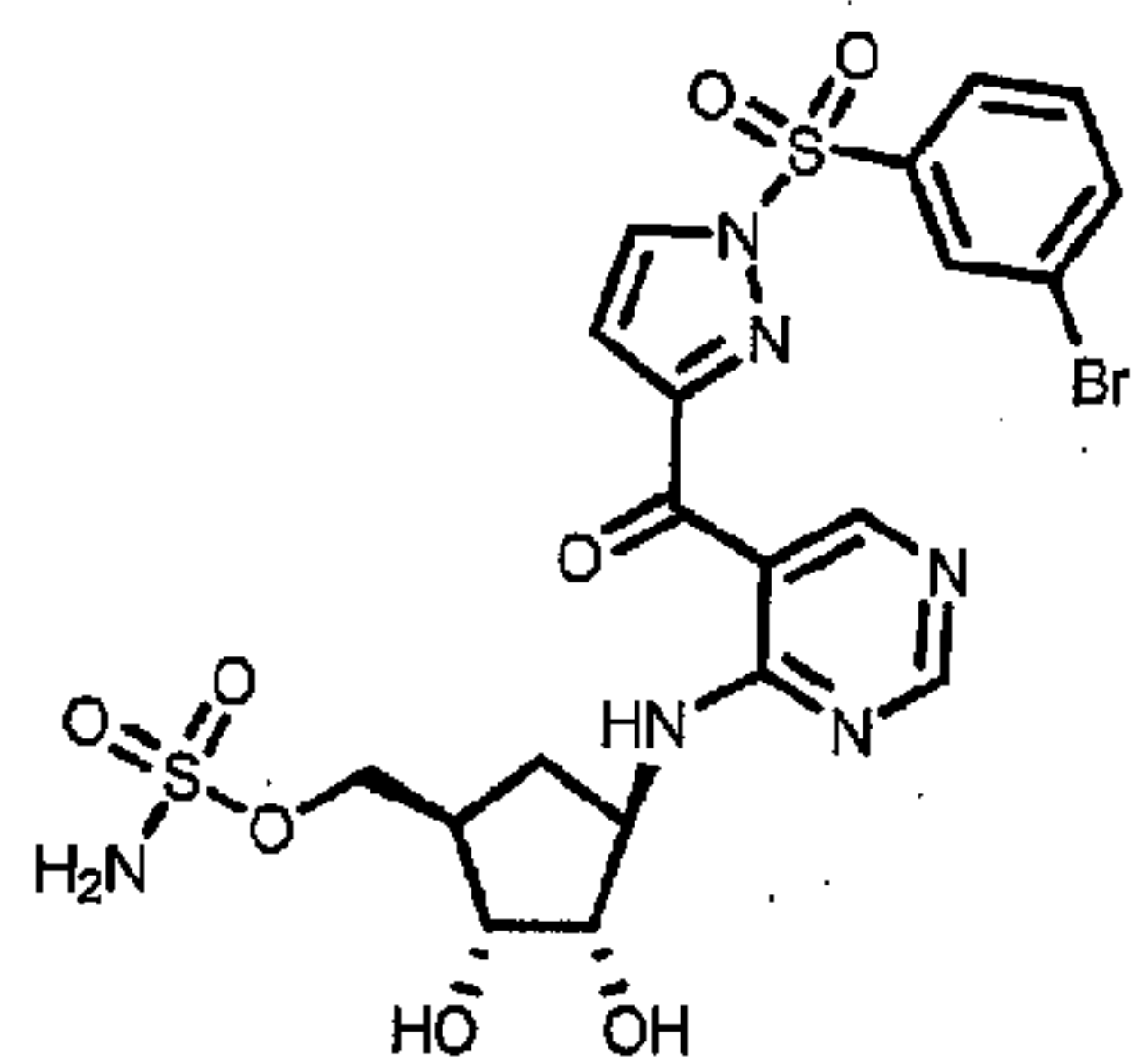
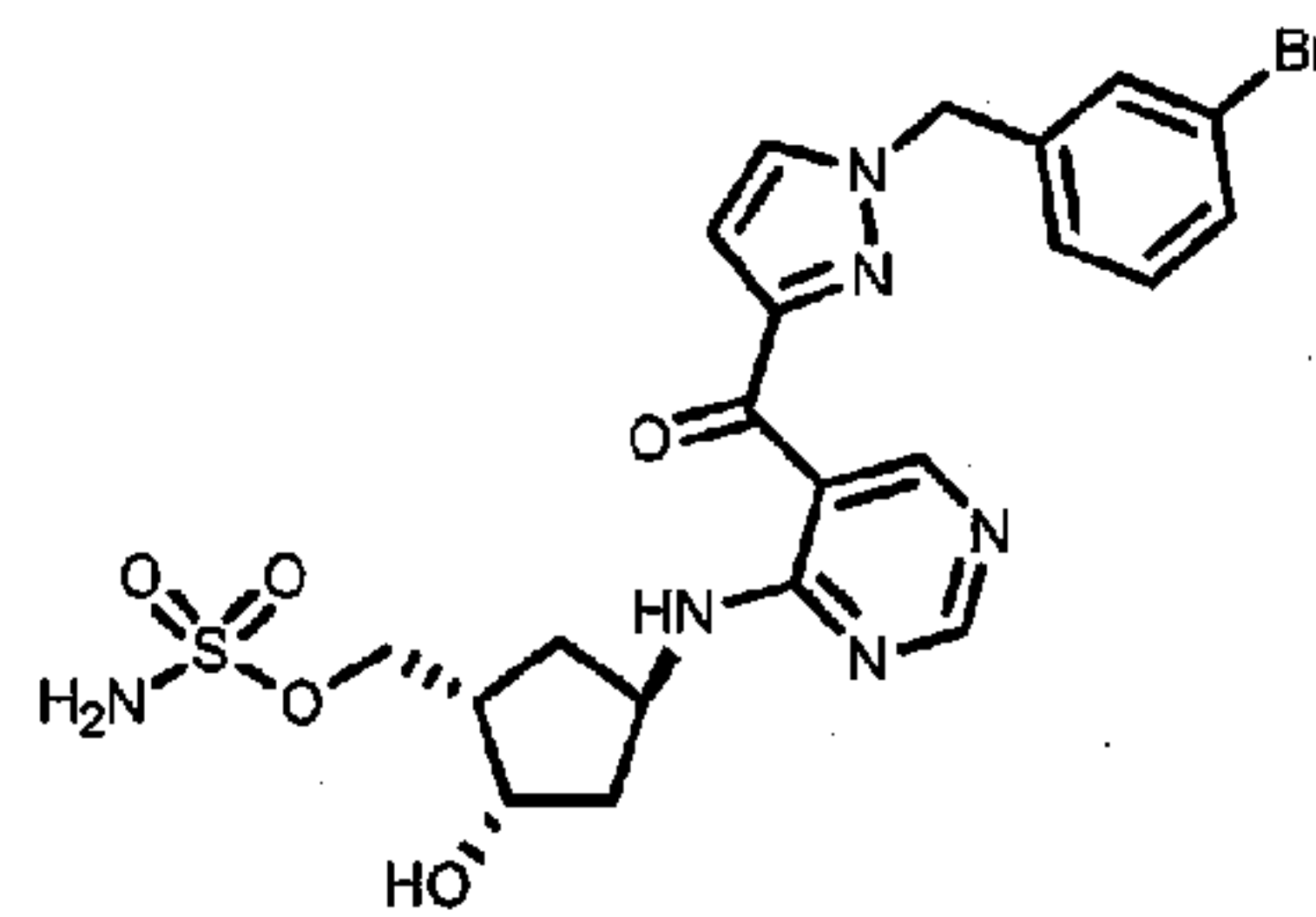
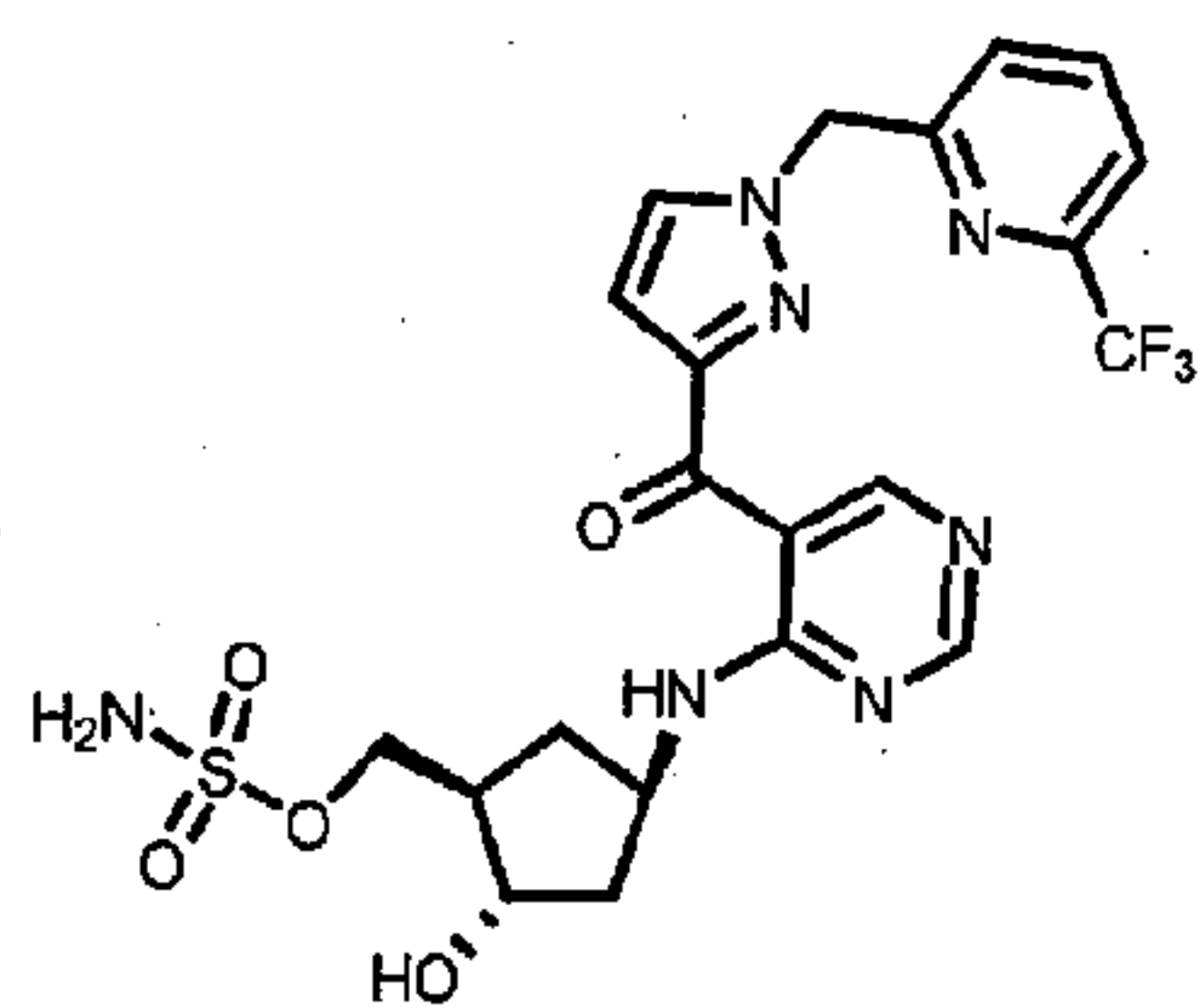
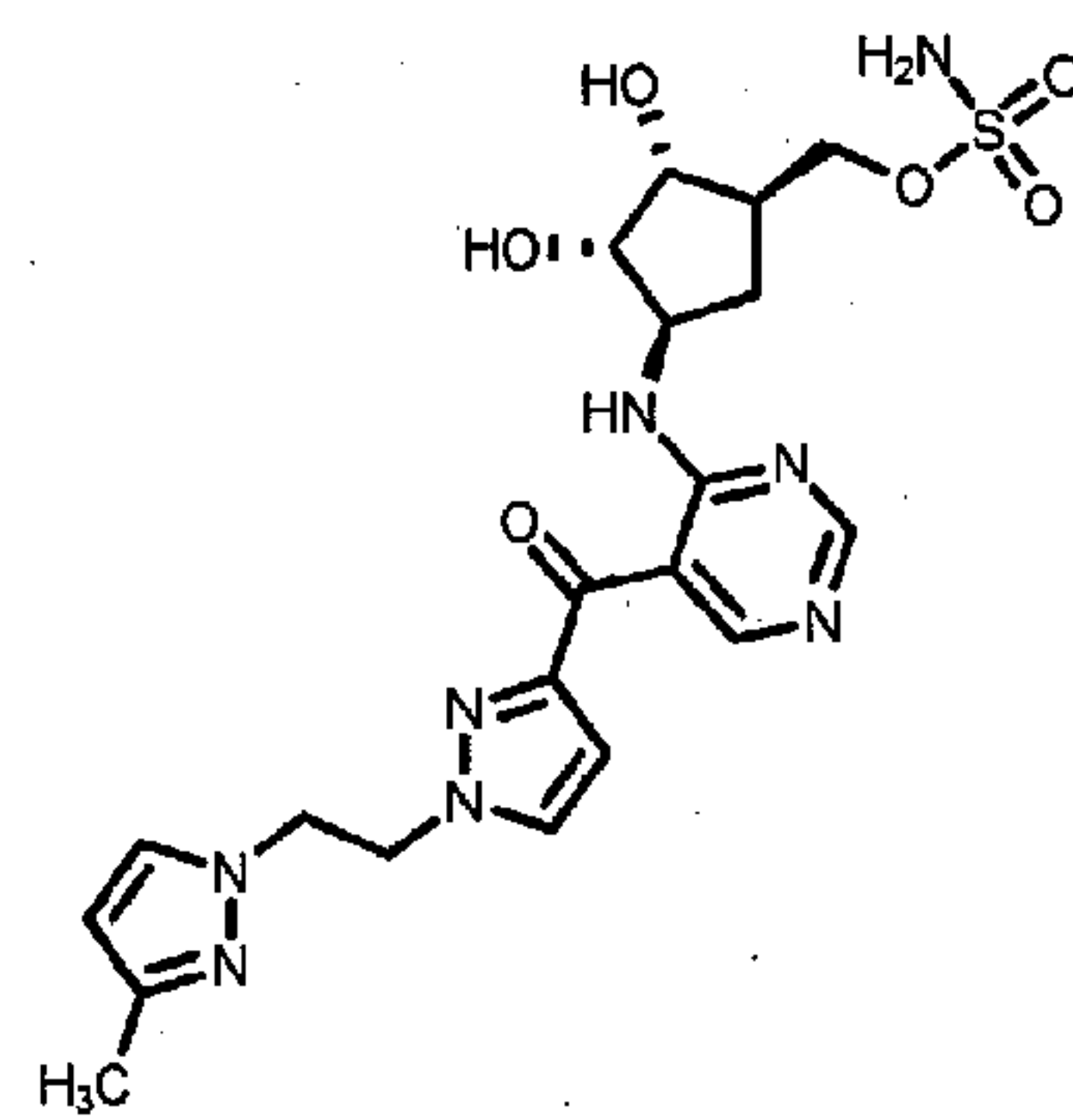
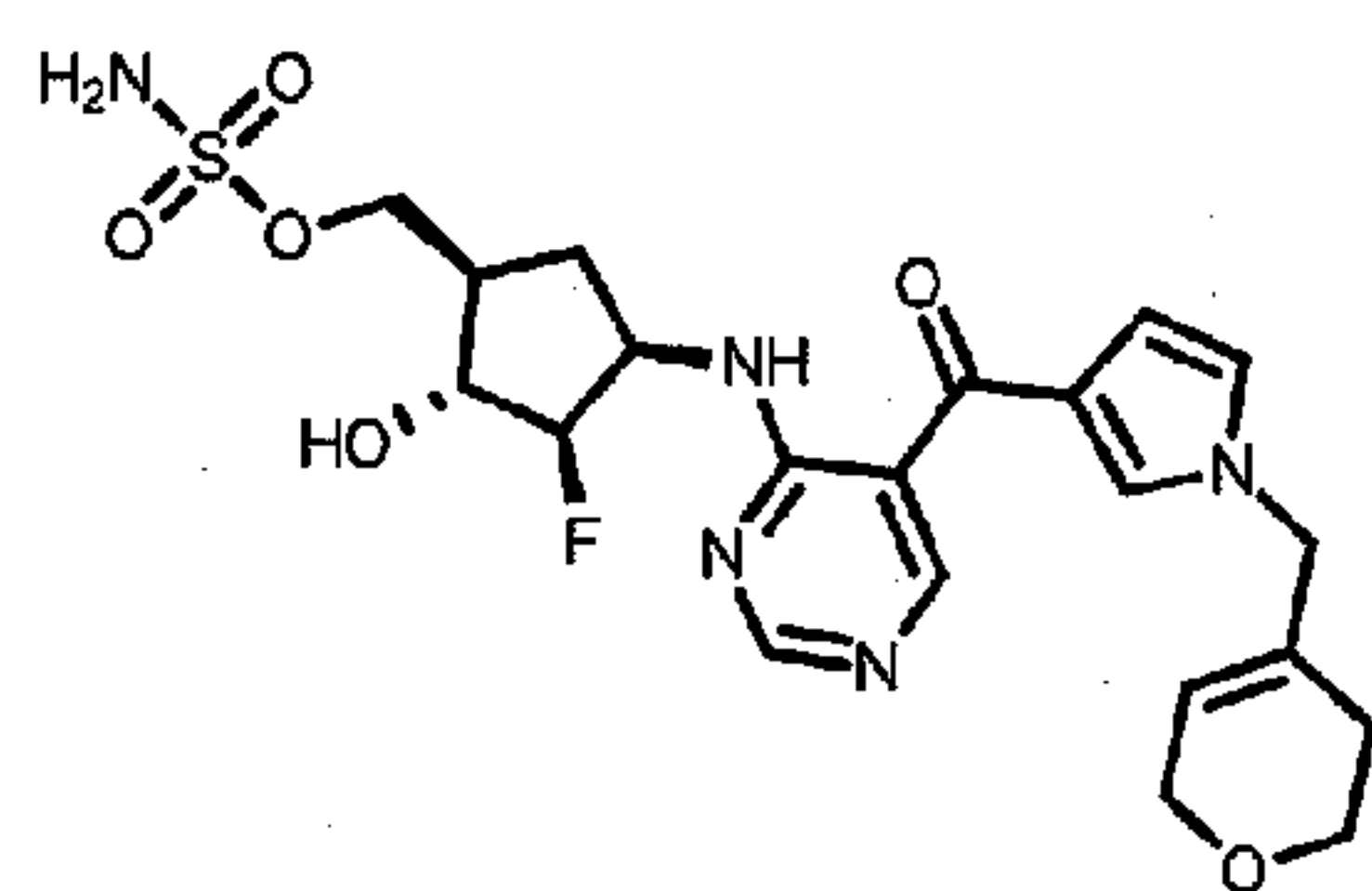
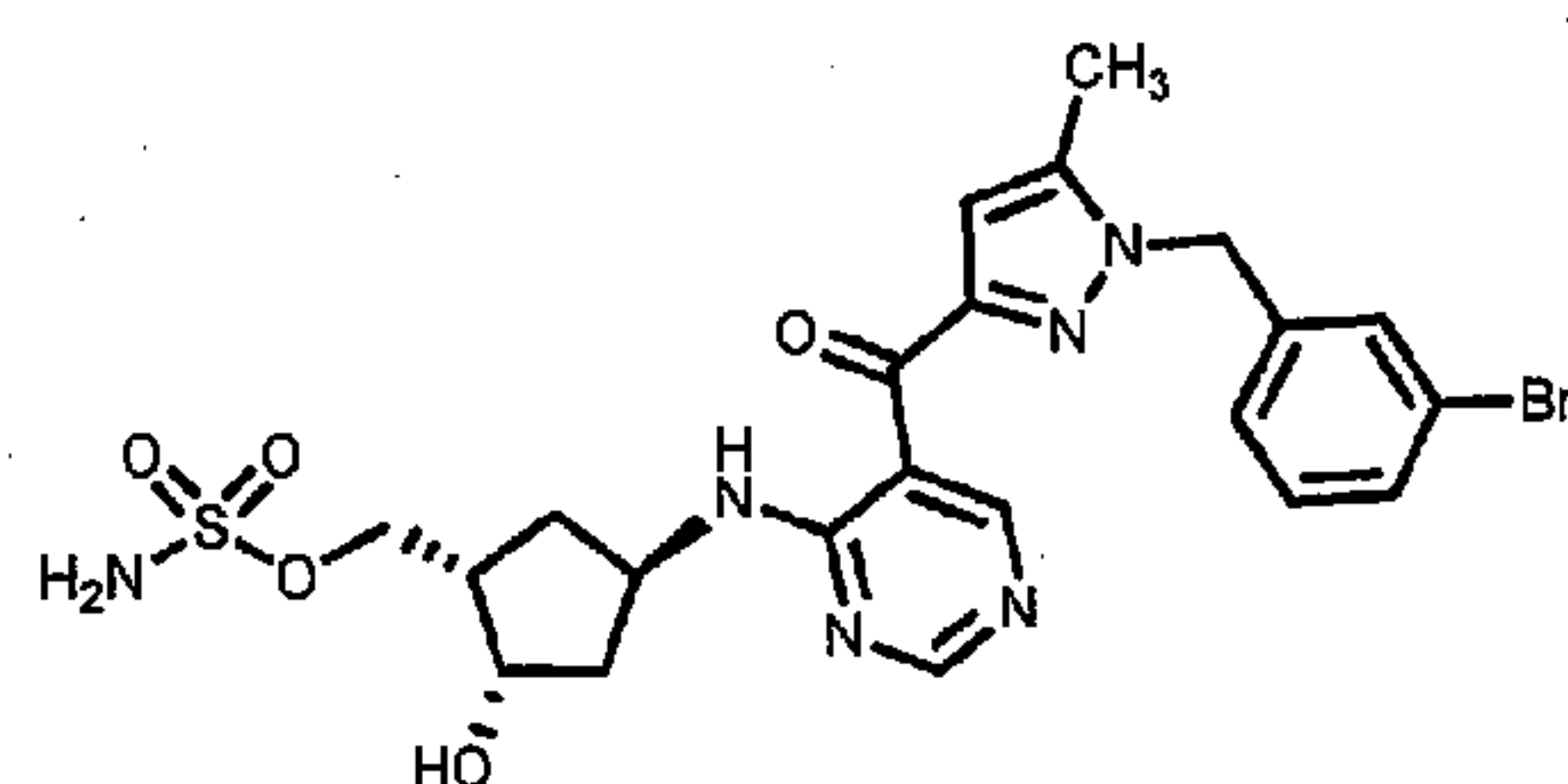
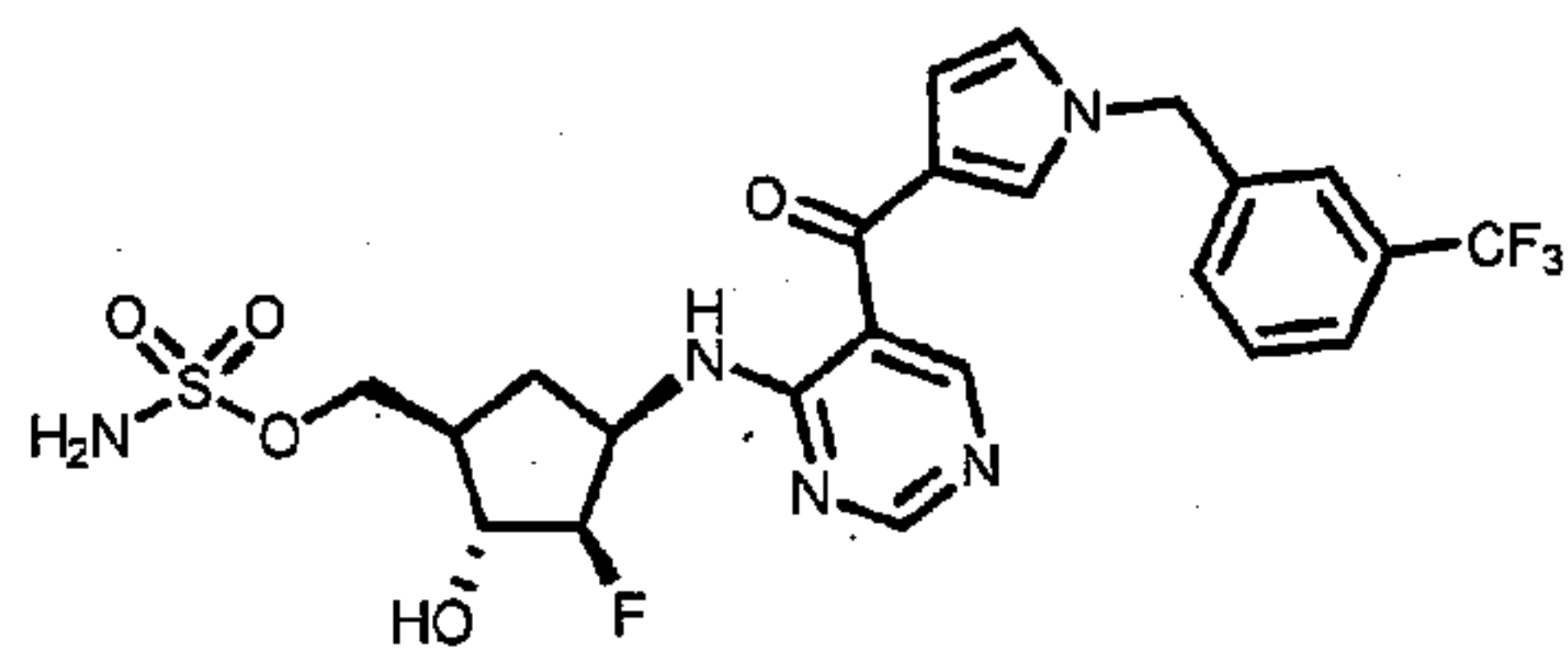
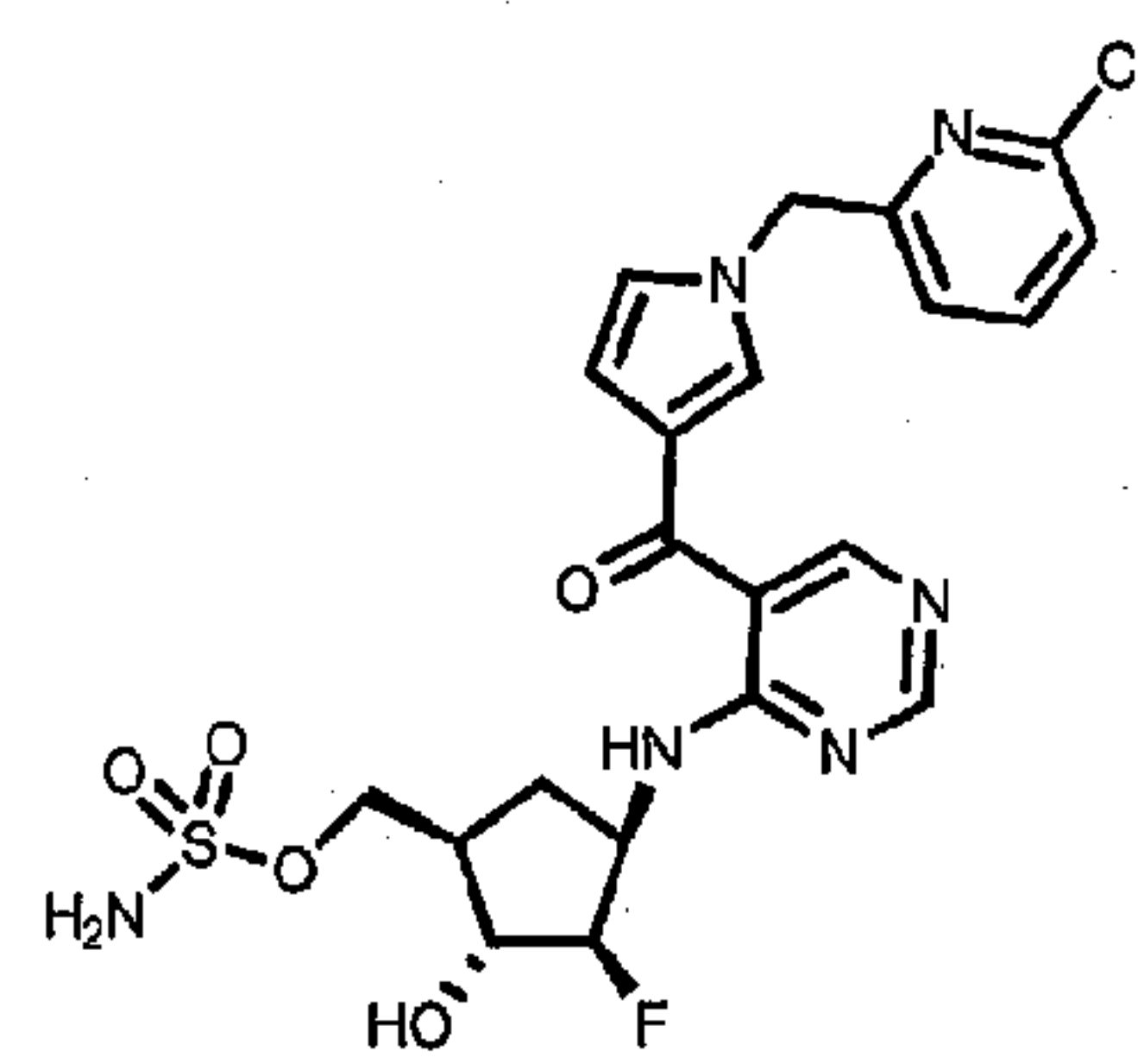
$R^{d'}$ is hydrogen or methyl;

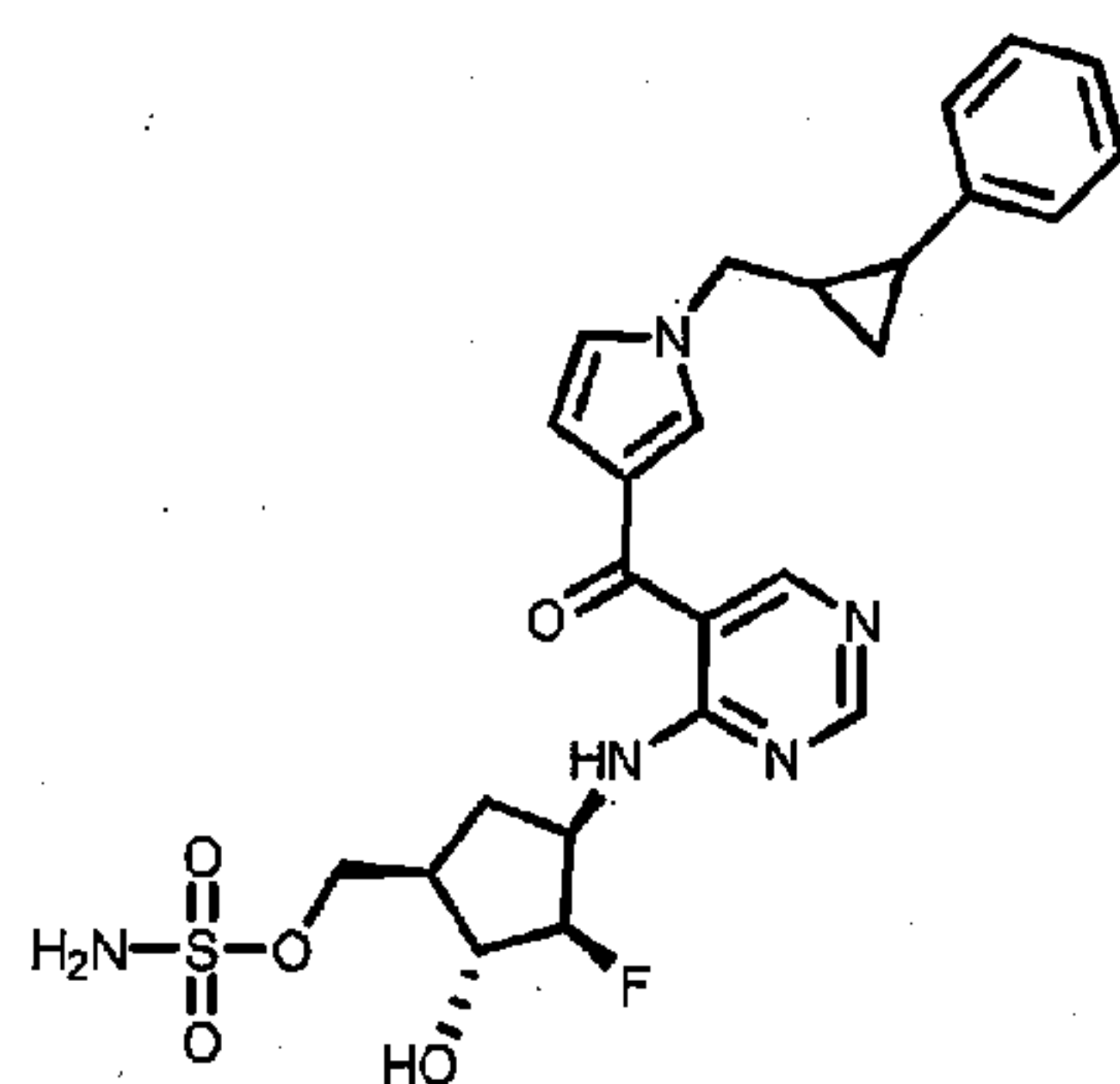
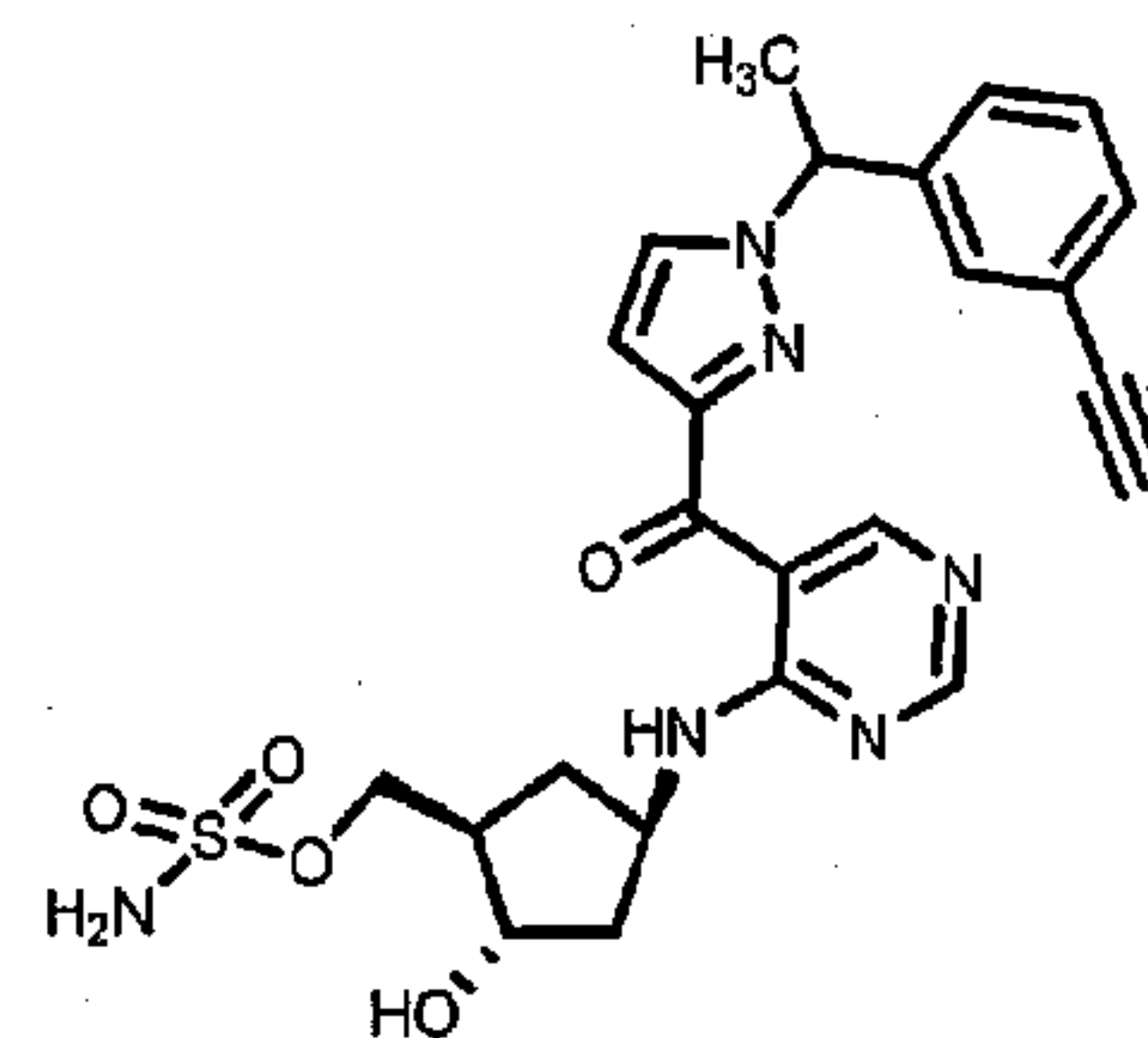
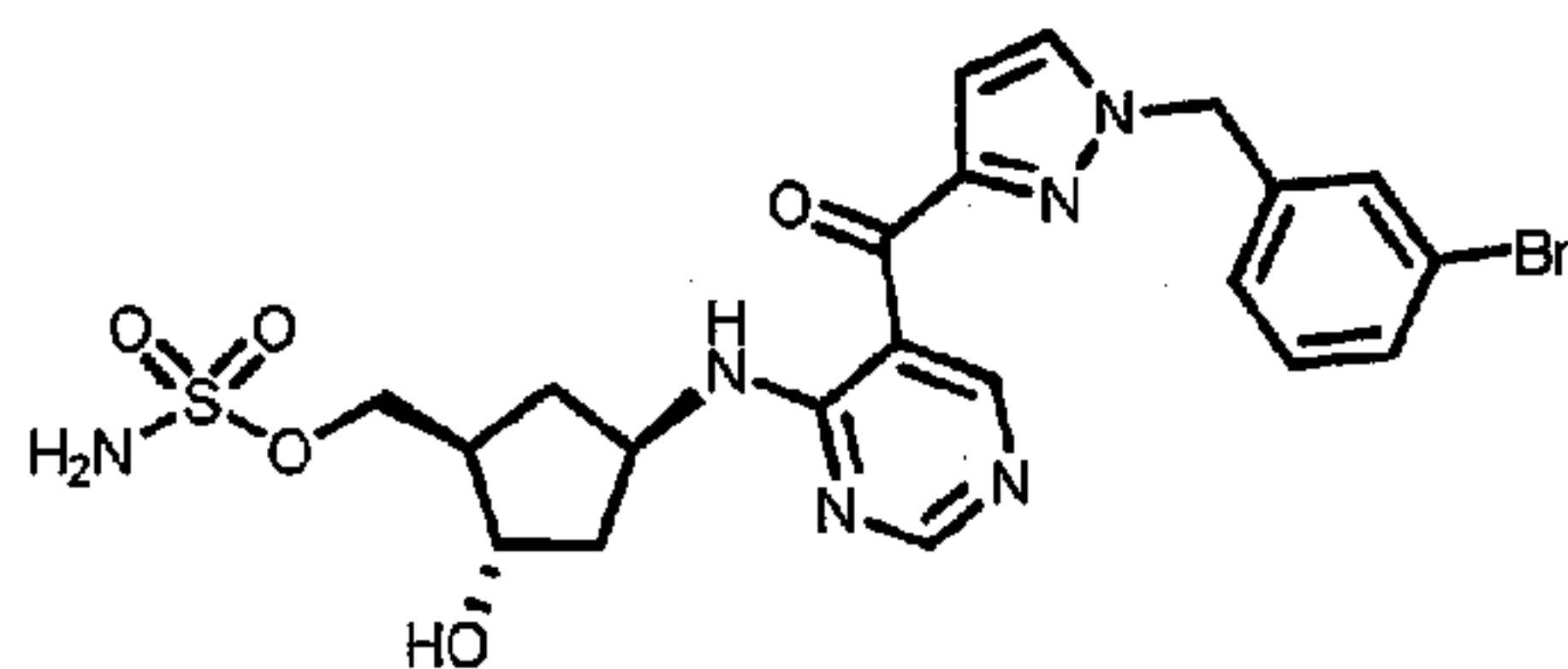
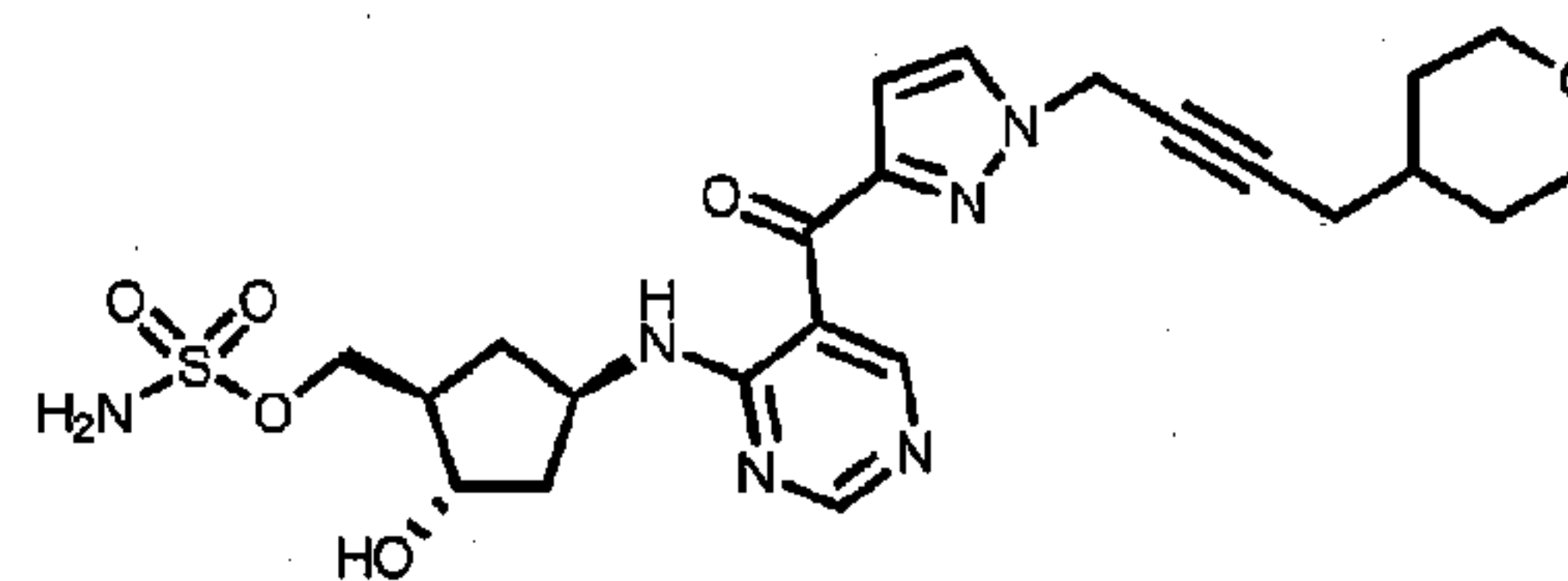
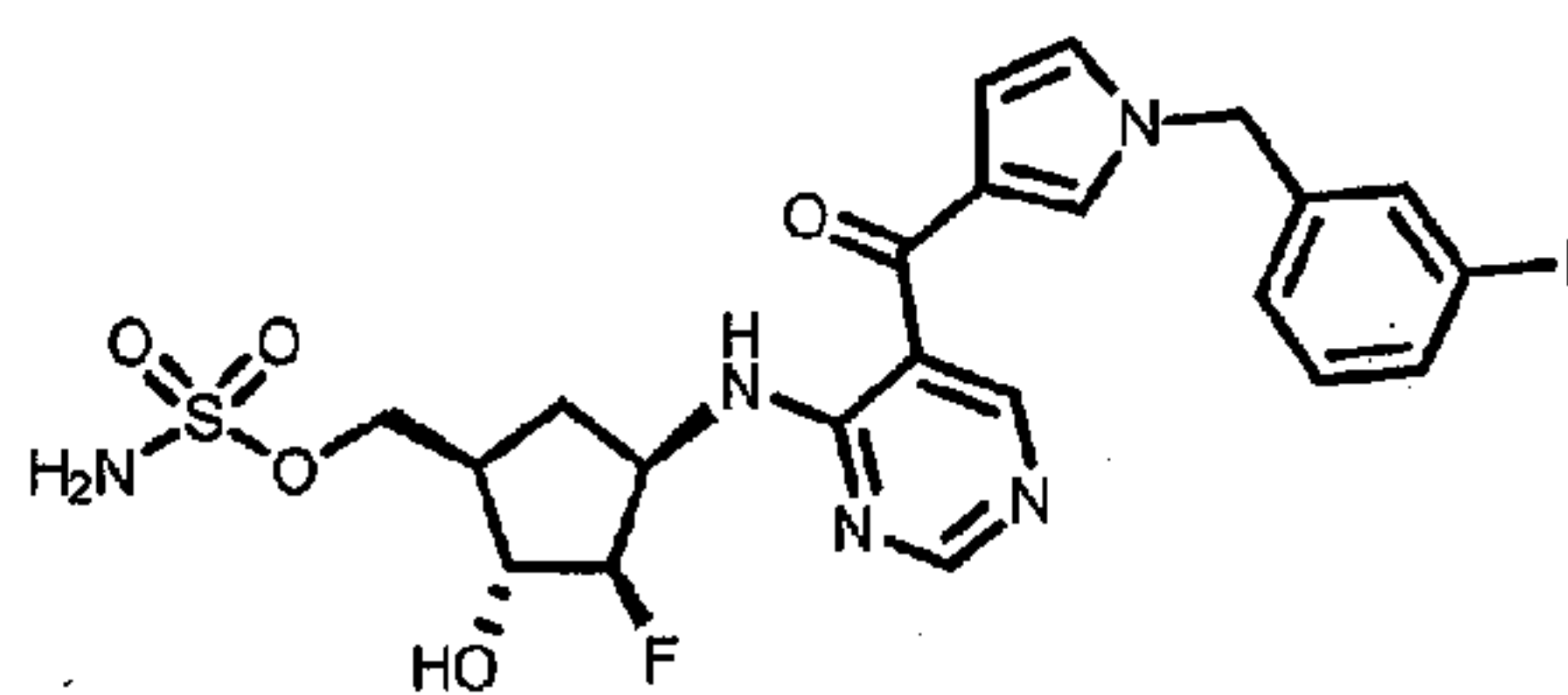
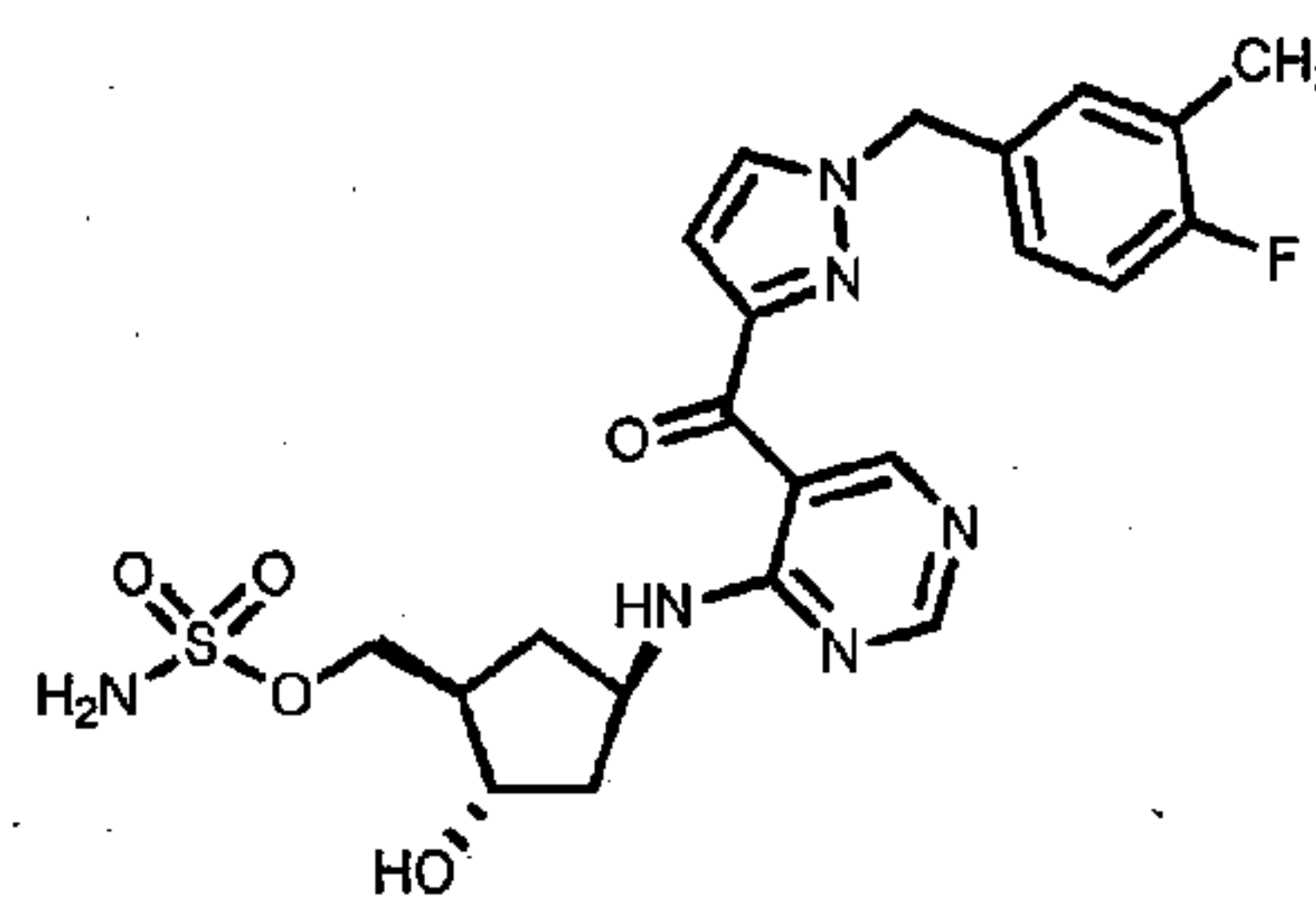
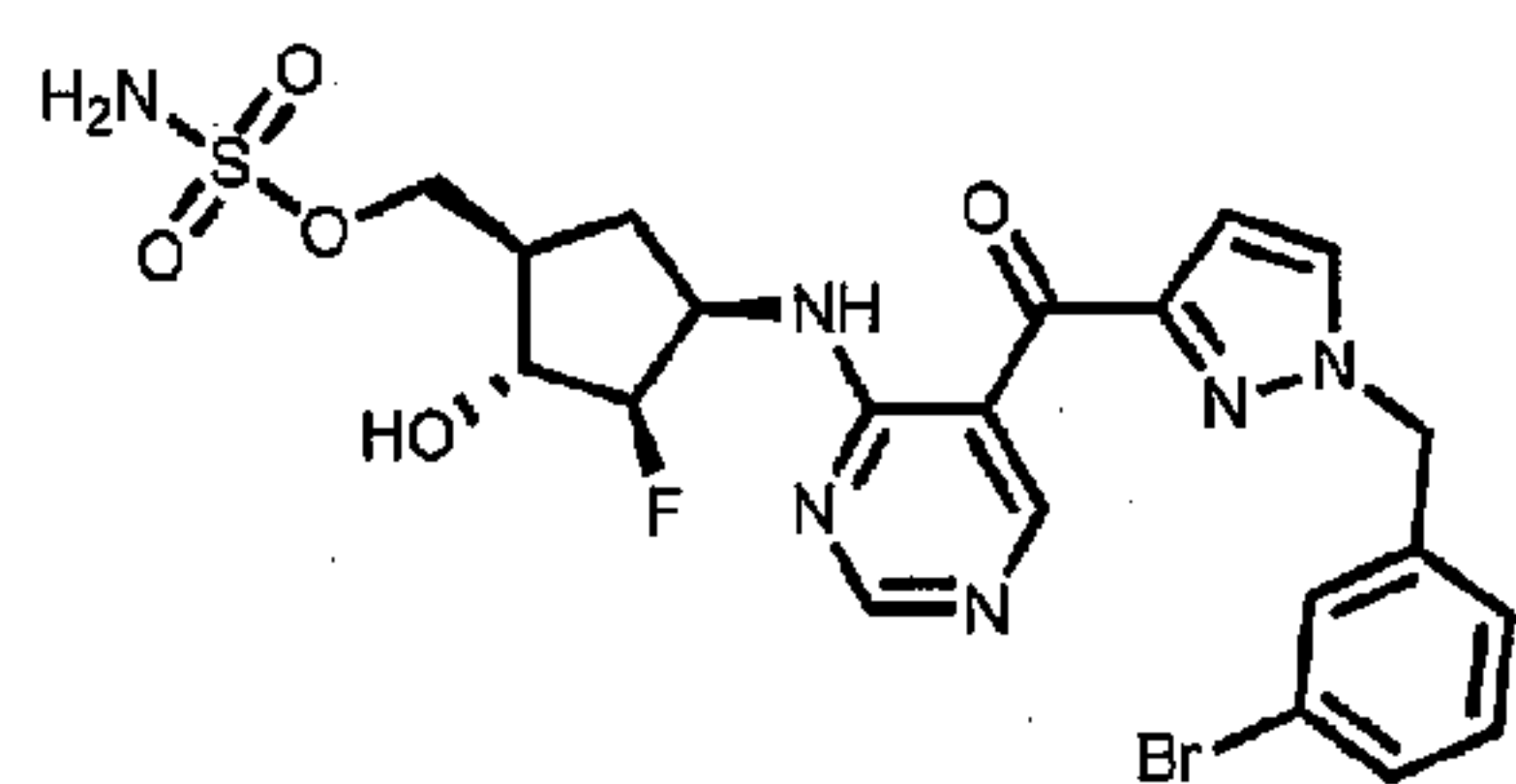
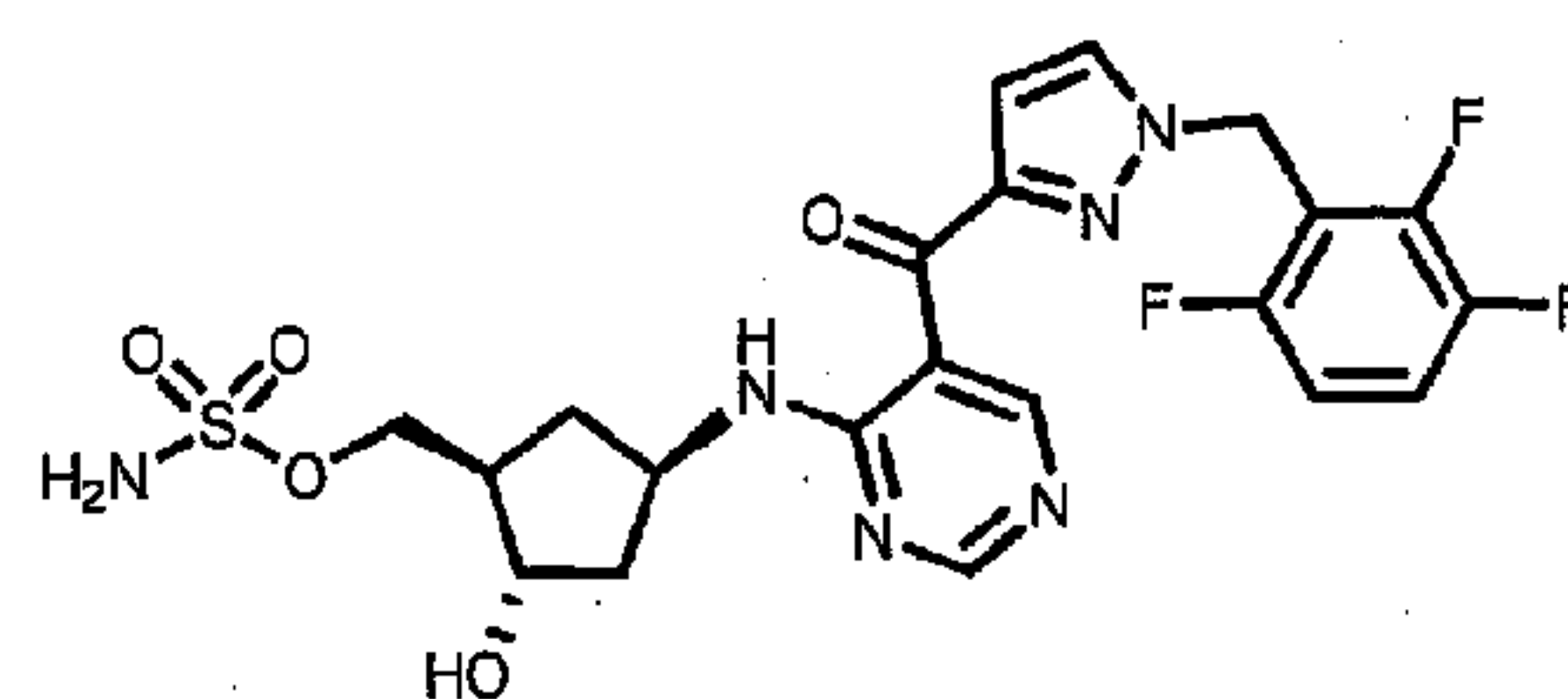
R^1 is (a-i), (a-iii), (a-iv), (a-v), (a-viii), or (a-xi); and

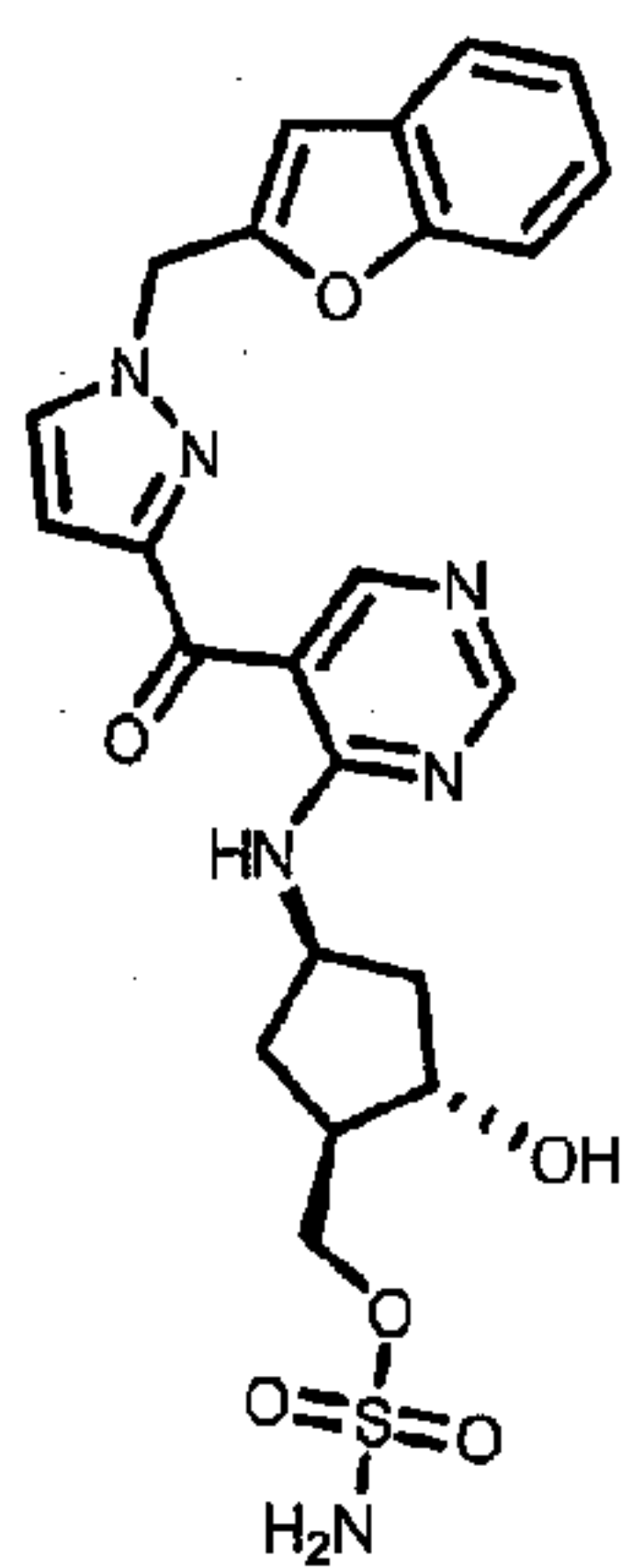
each occurrence of R^2 is independently chloro, bromo, iodo, or methyl.

wherein R^{2b} and R^{2c} have the values described herein.

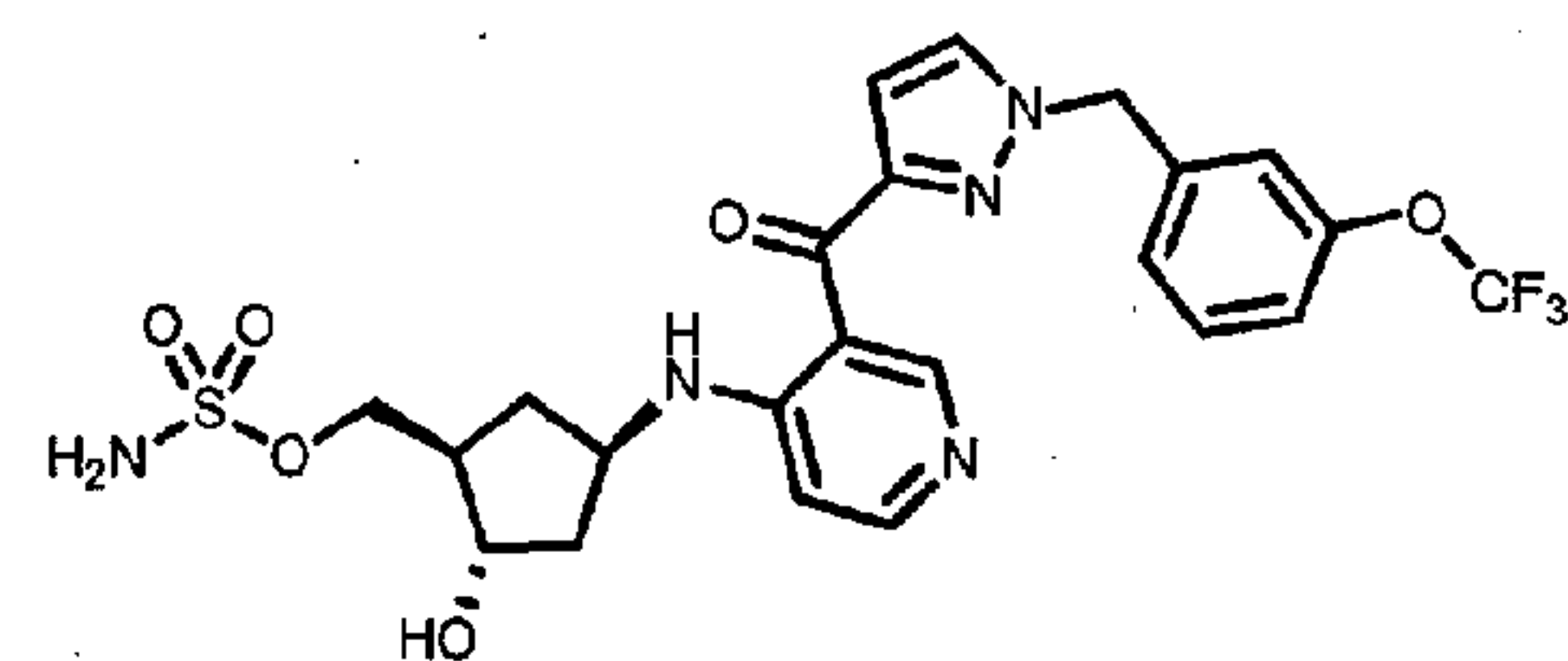
[0091] Representative examples of the compounds of formula (I) are shown below in Table 1.

**I-1****I-2****I-3****I-4****I-5****I-6****I-7****I-8**

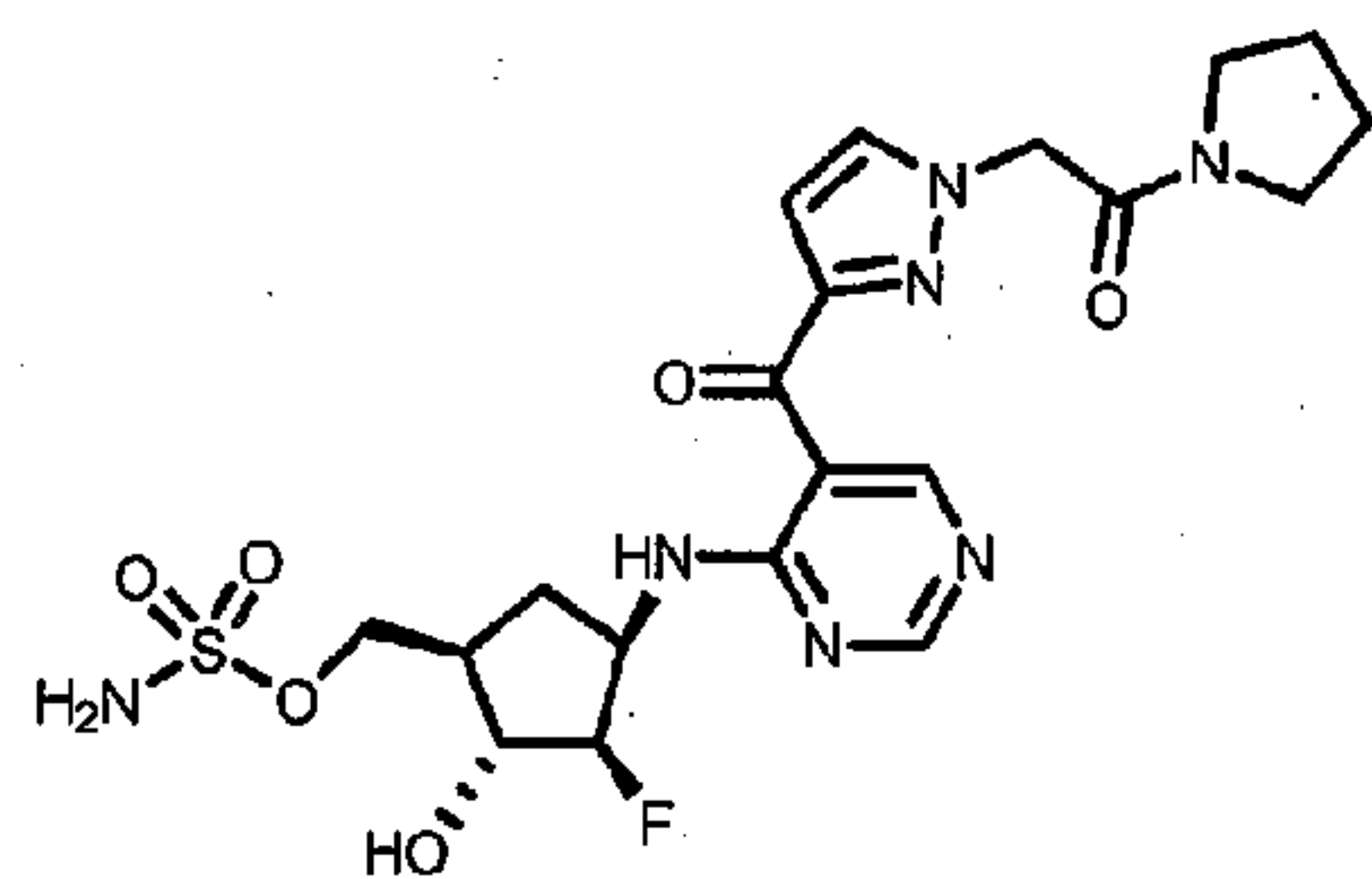
**I-9****I-10****I-11****I-12****I-13****I-14****I-15****I-16**



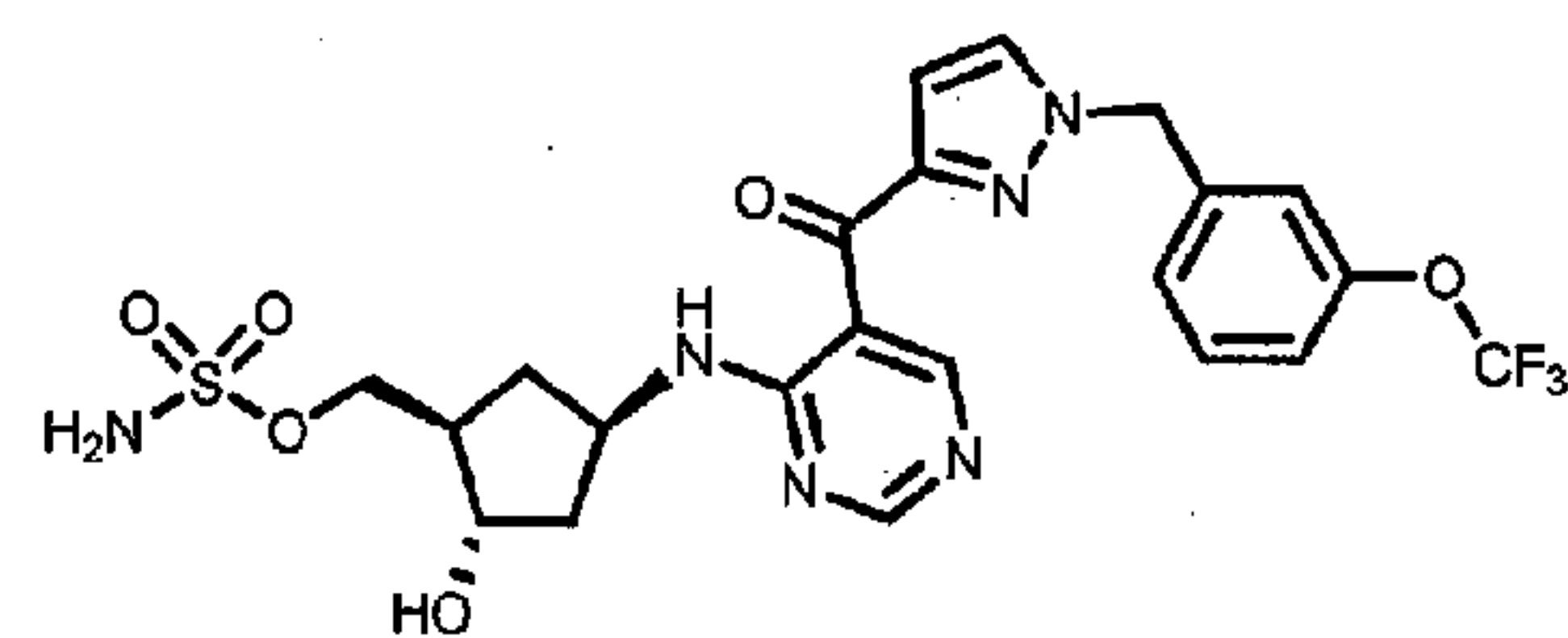
I-17



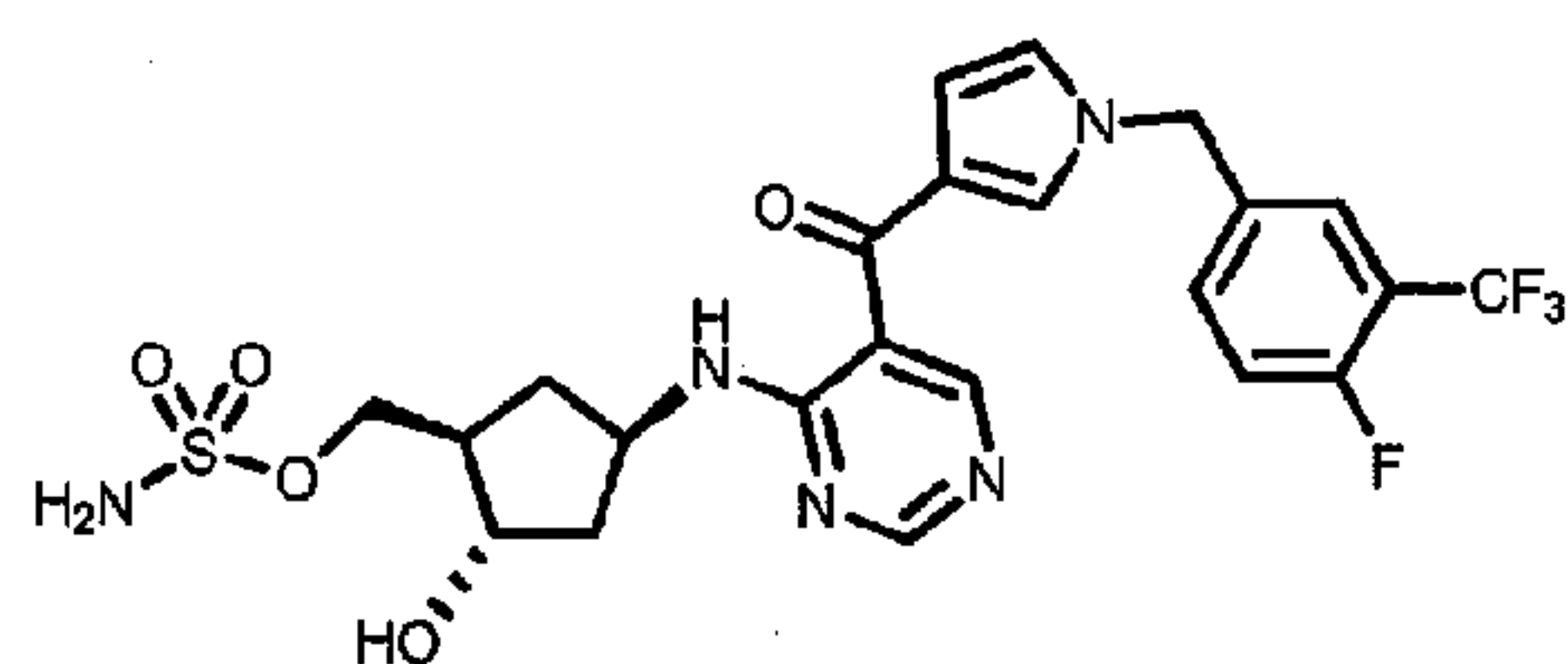
I-18



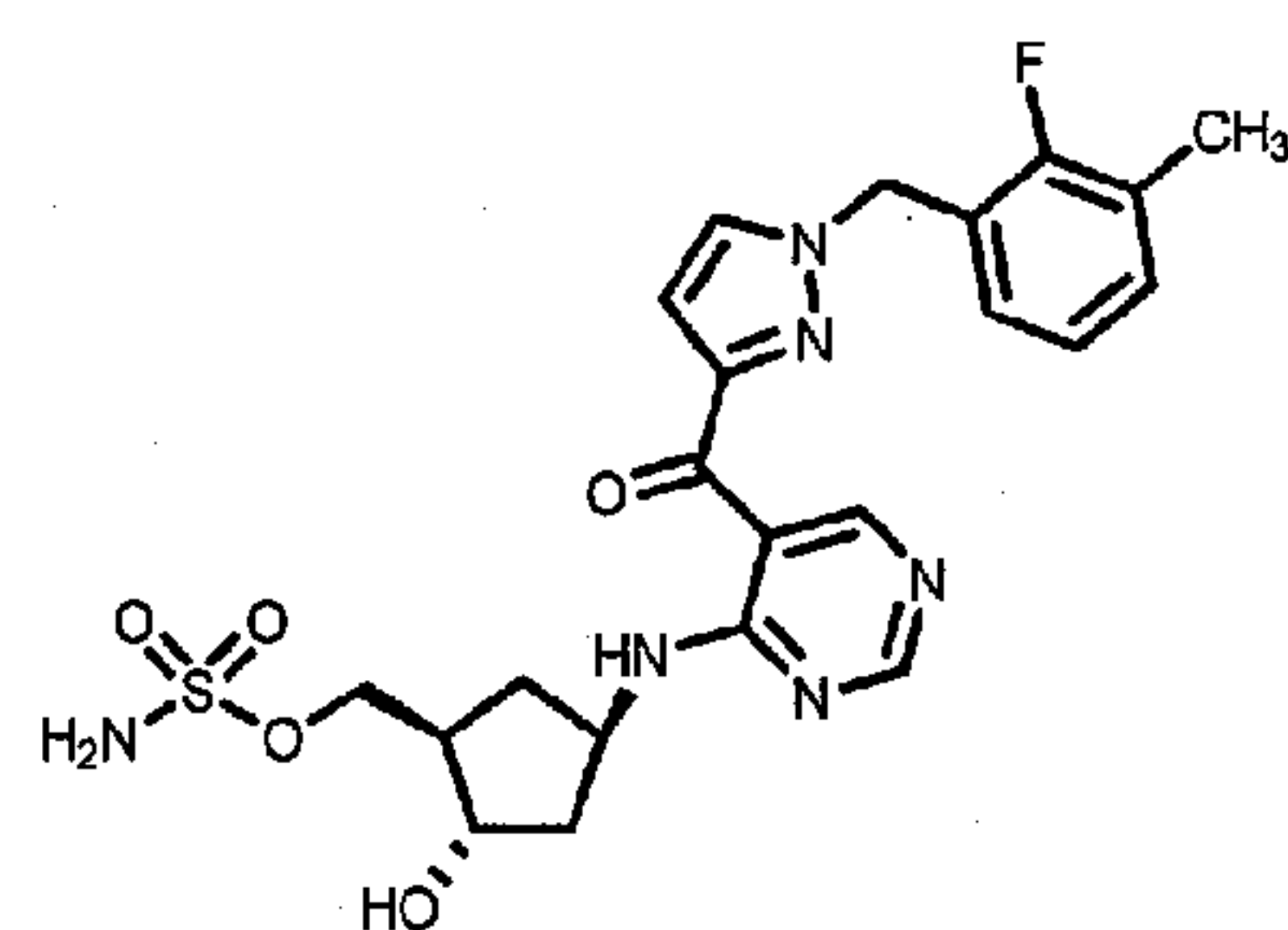
I-19



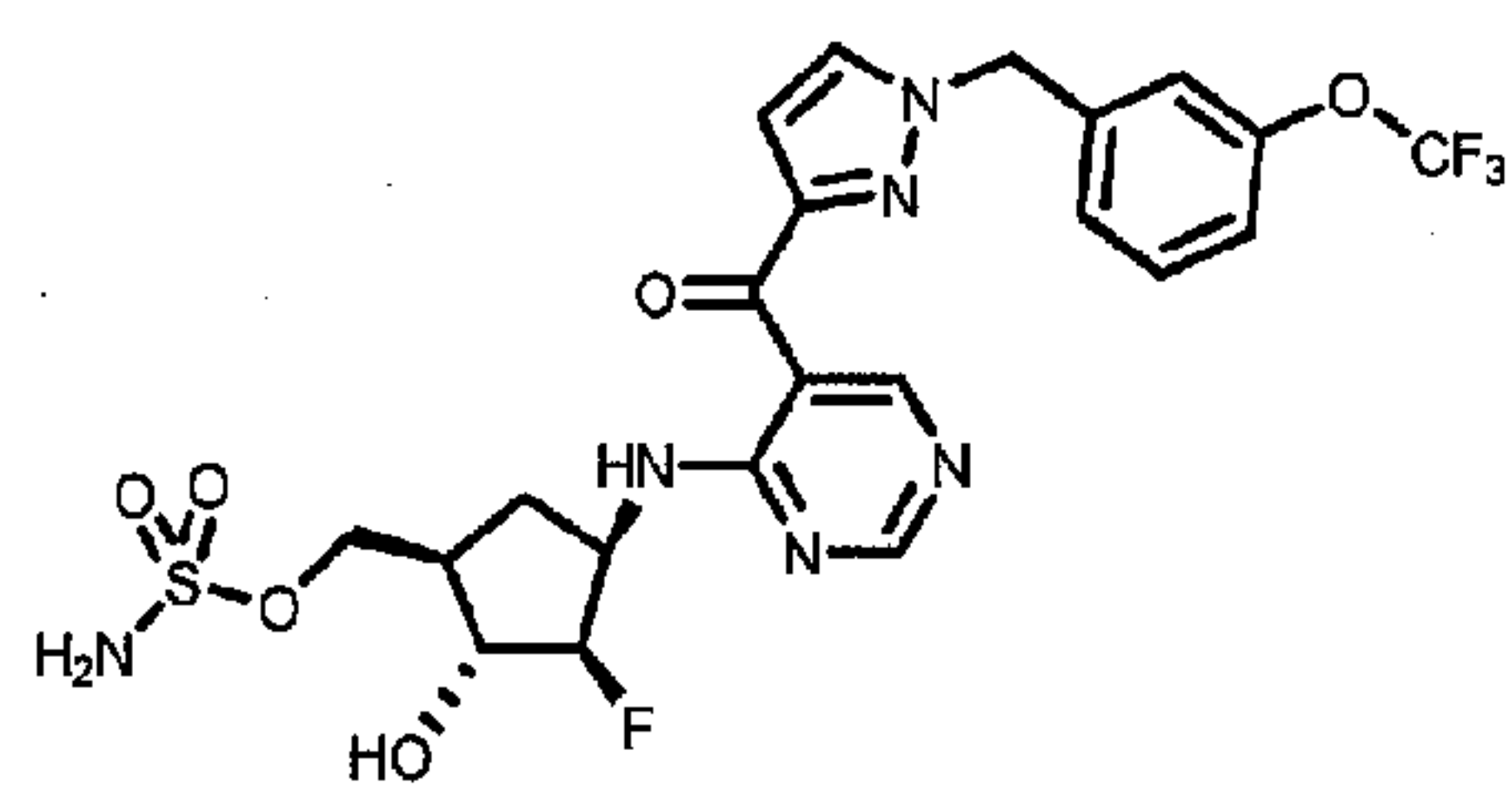
I-20



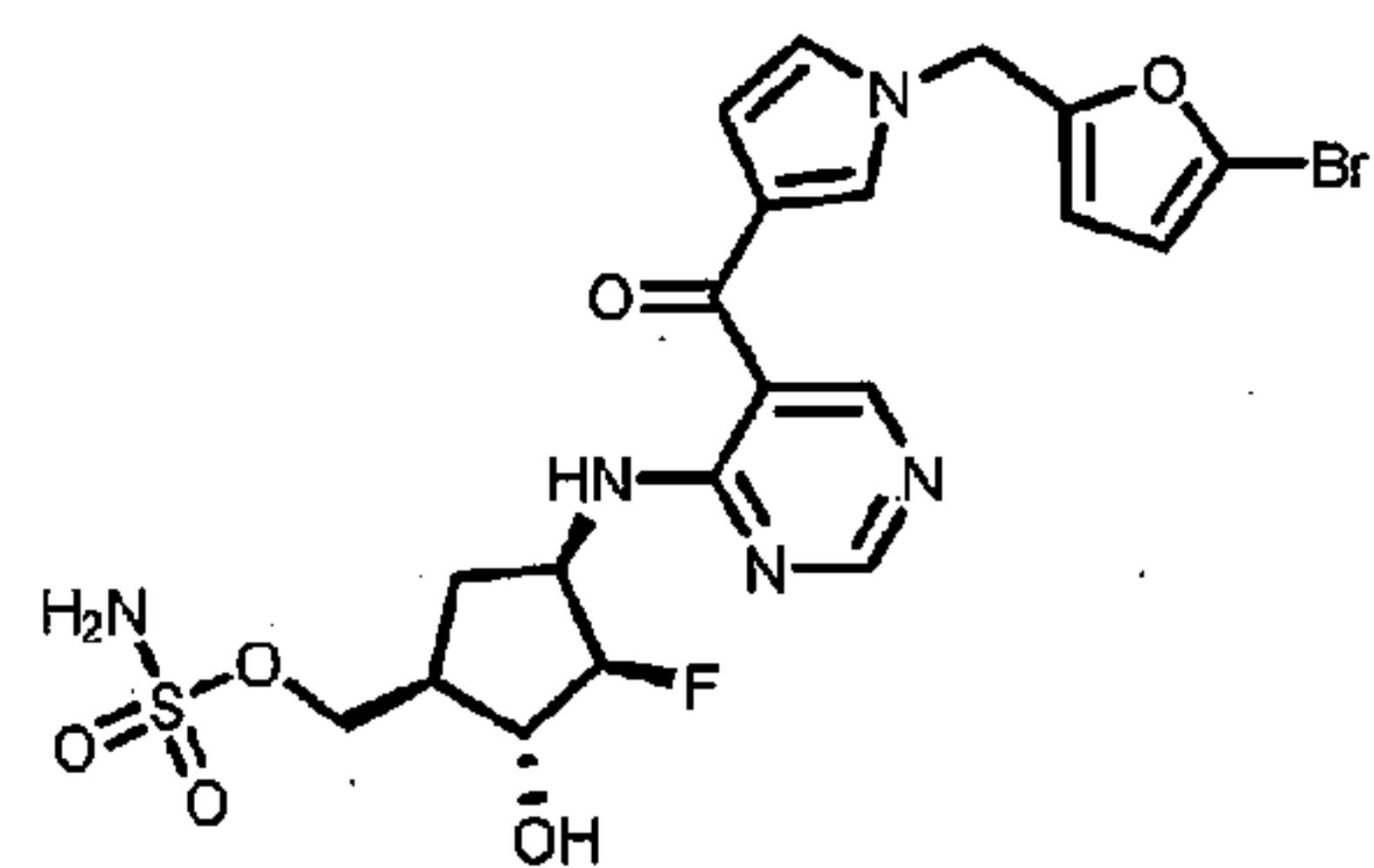
I-21



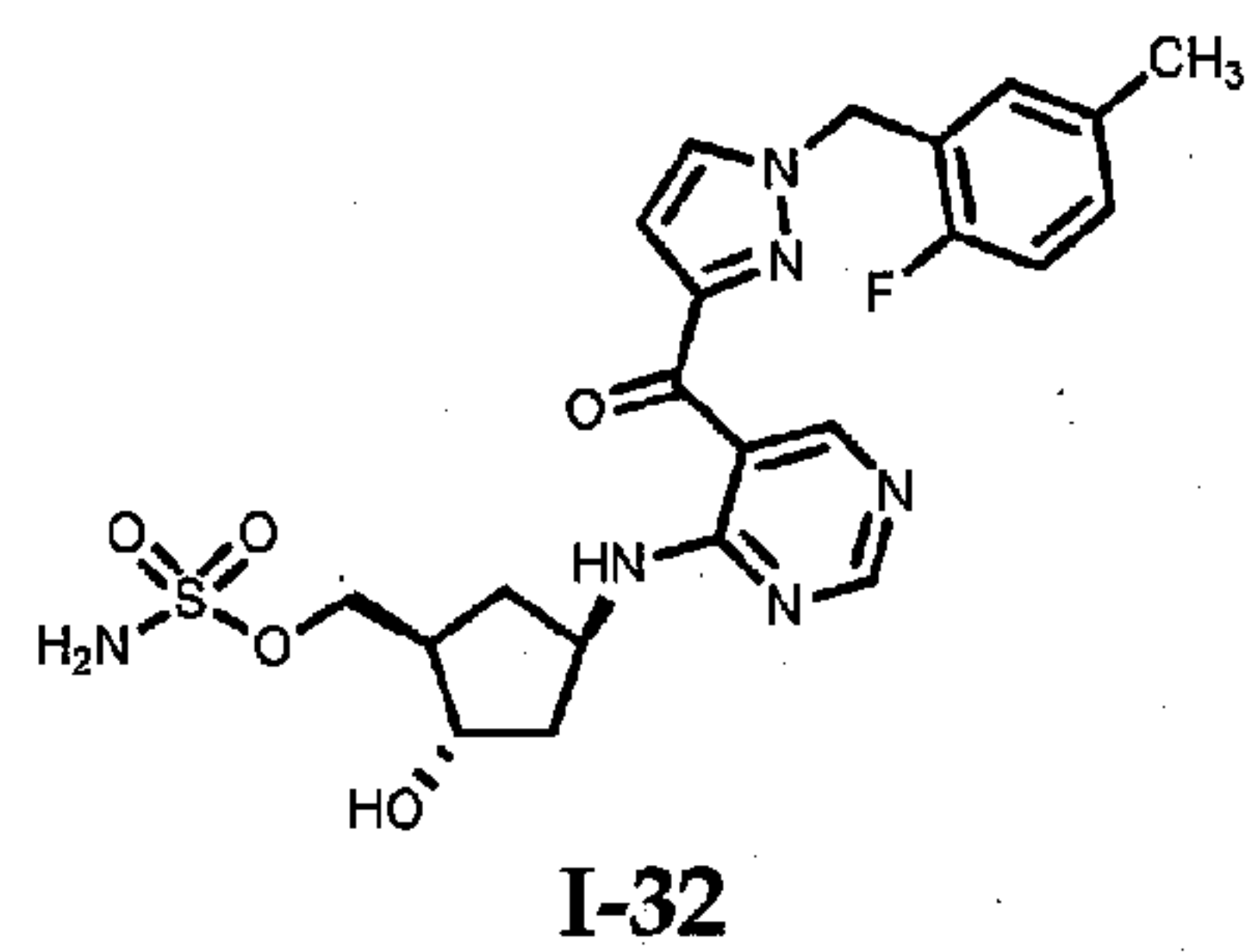
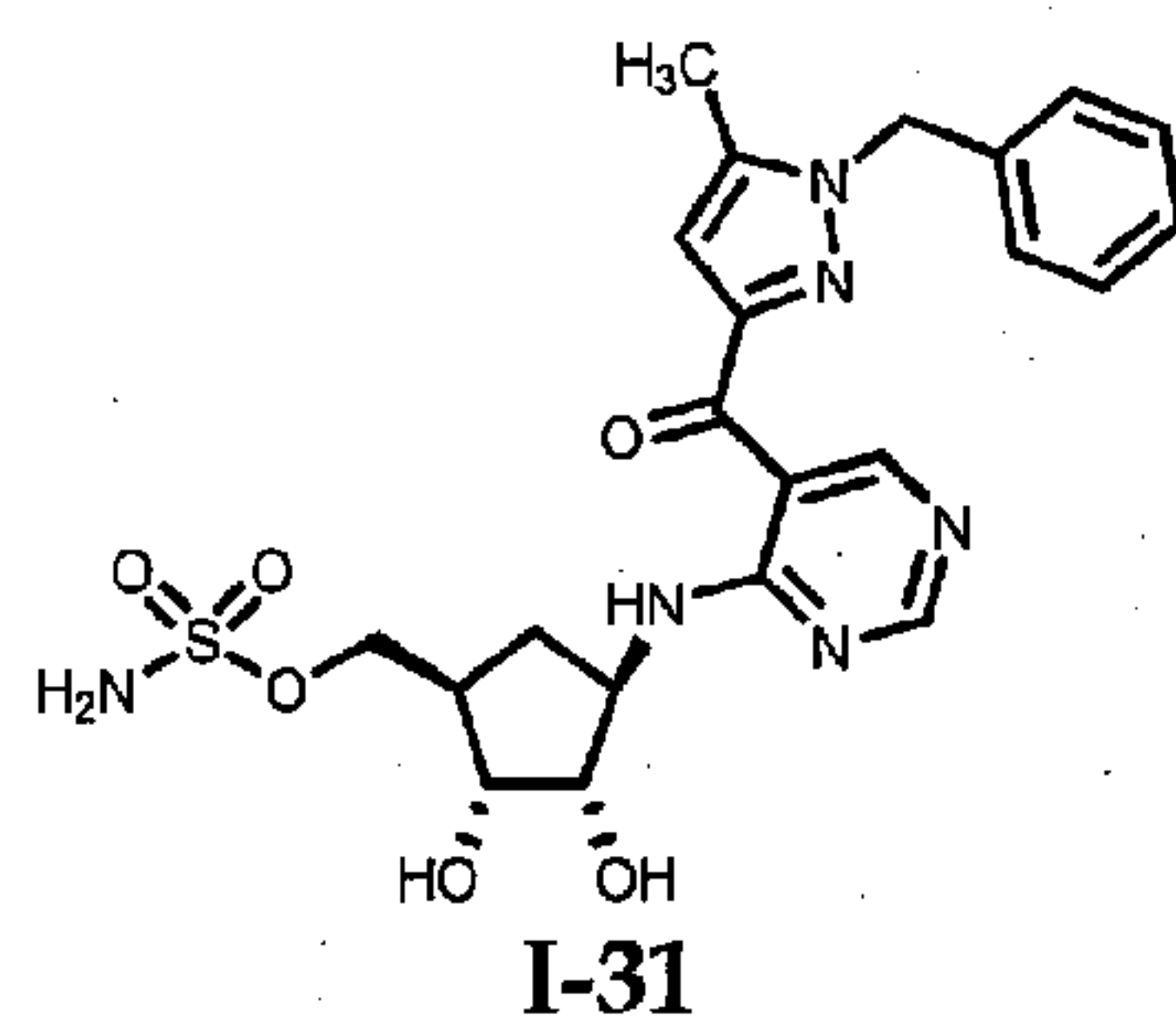
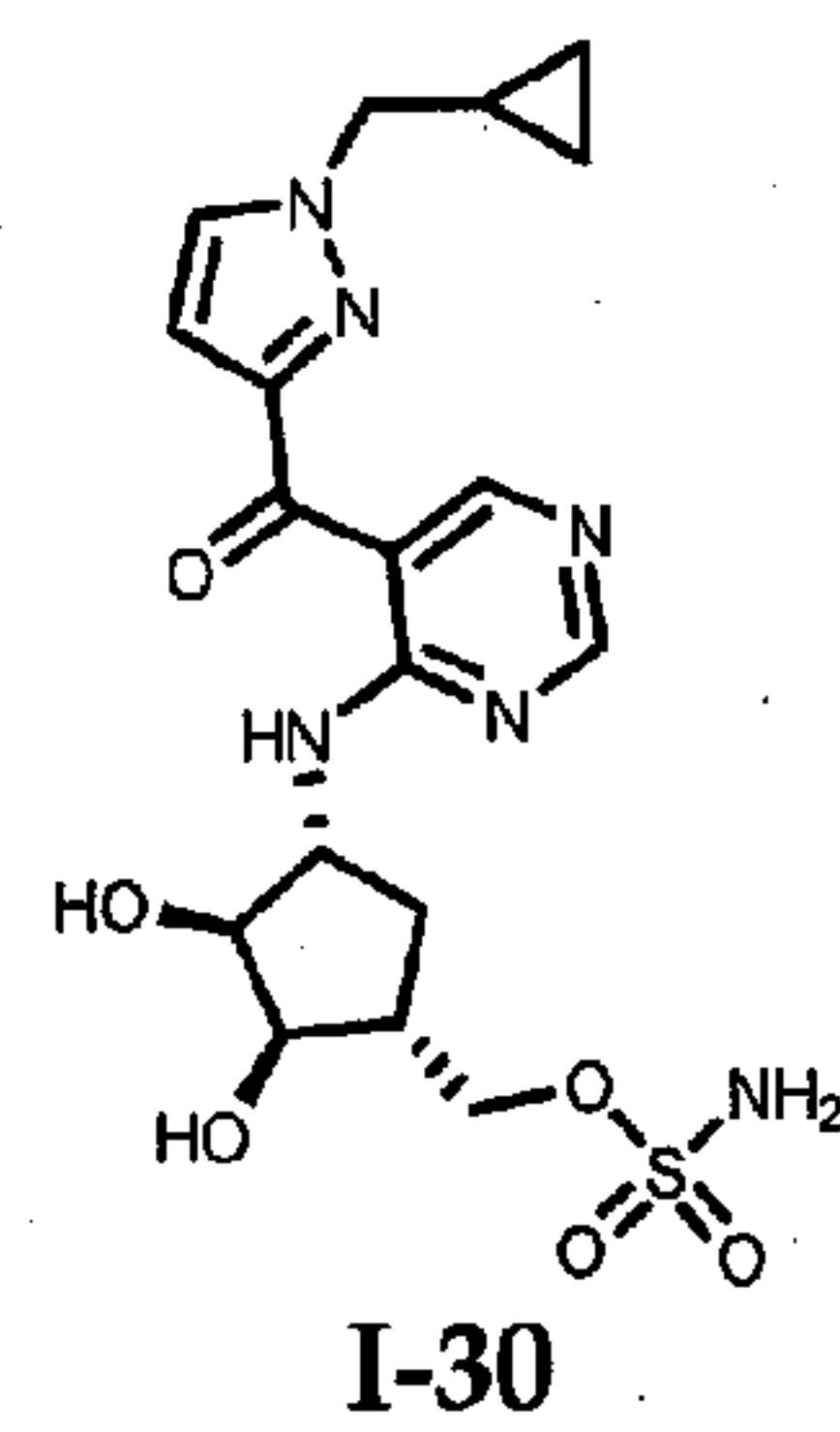
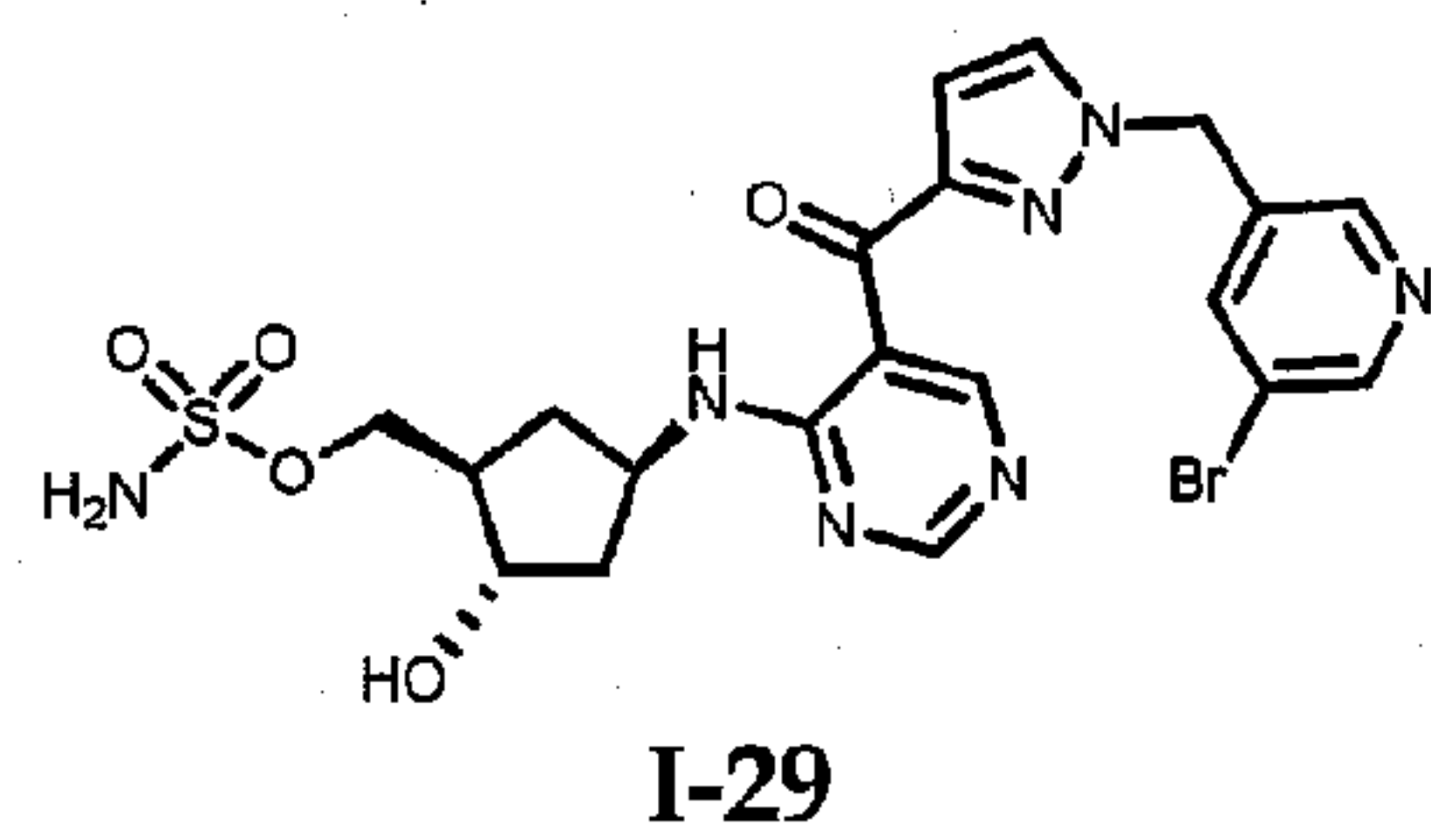
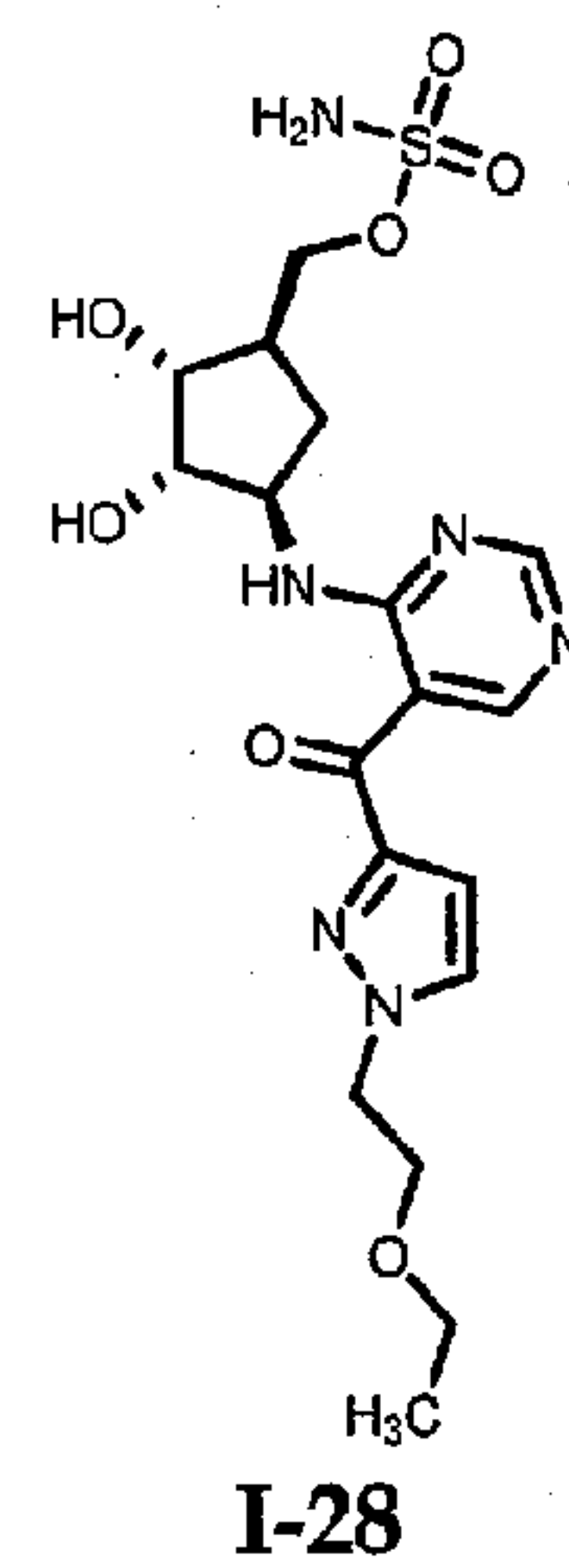
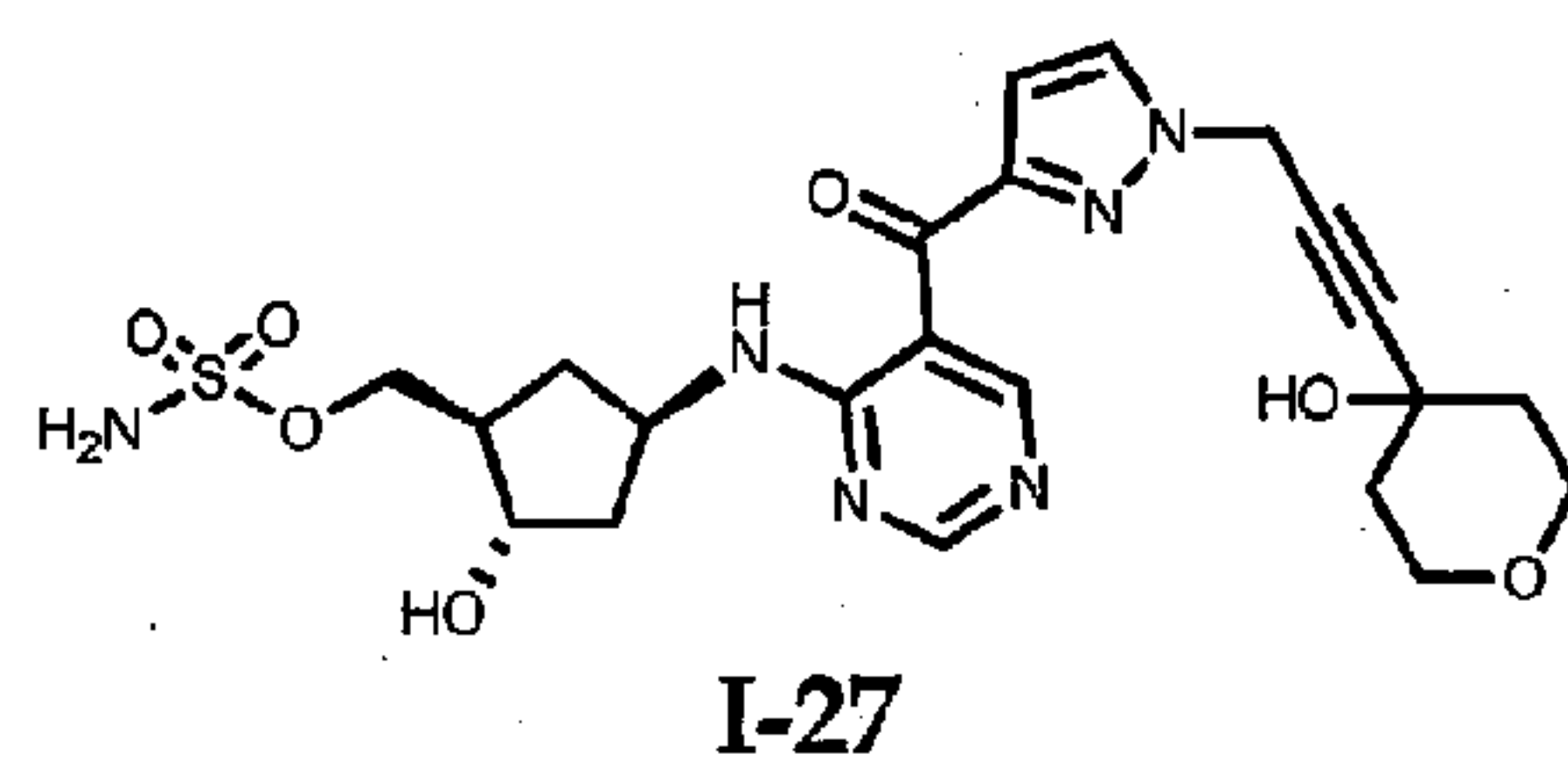
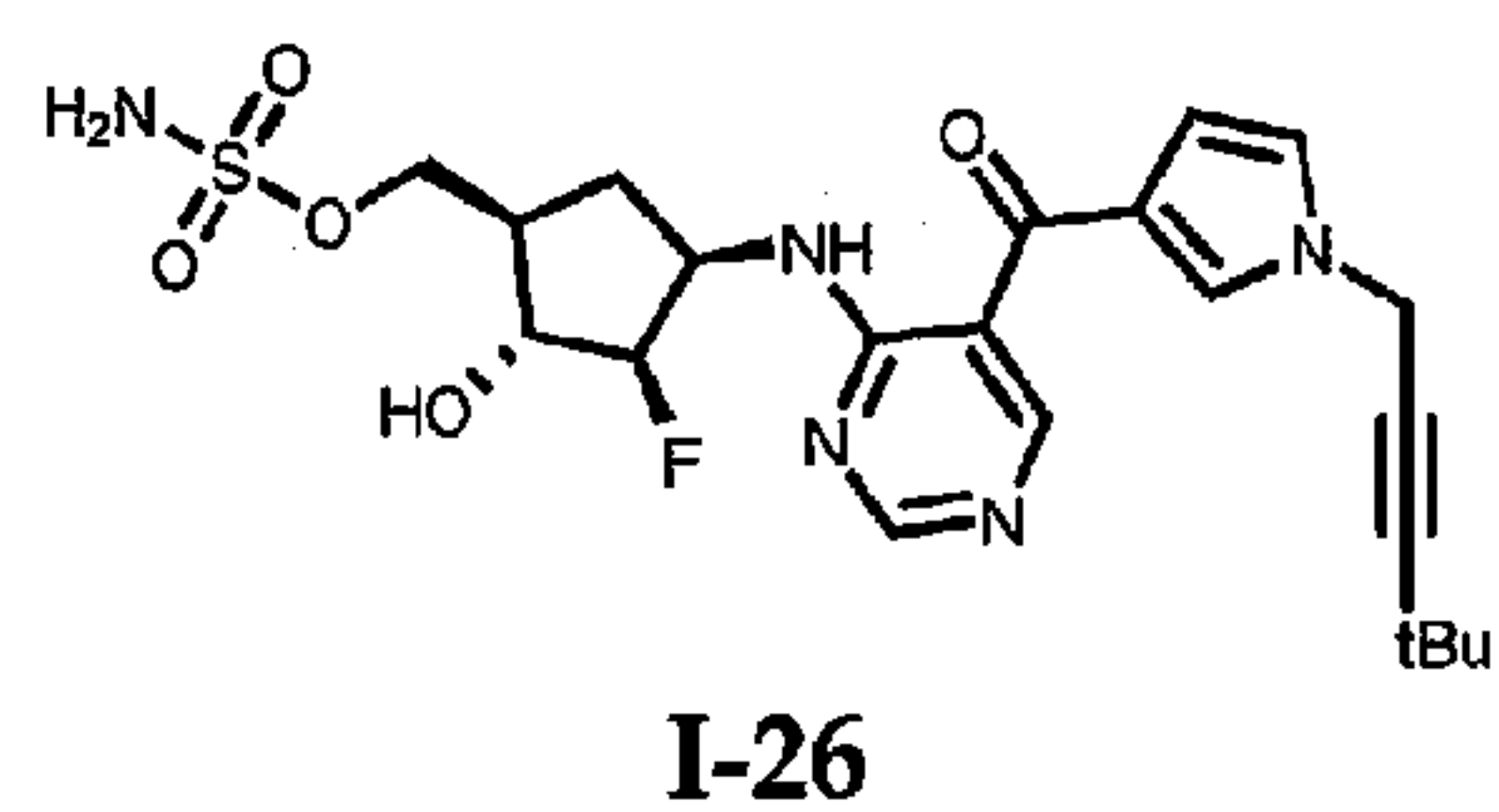
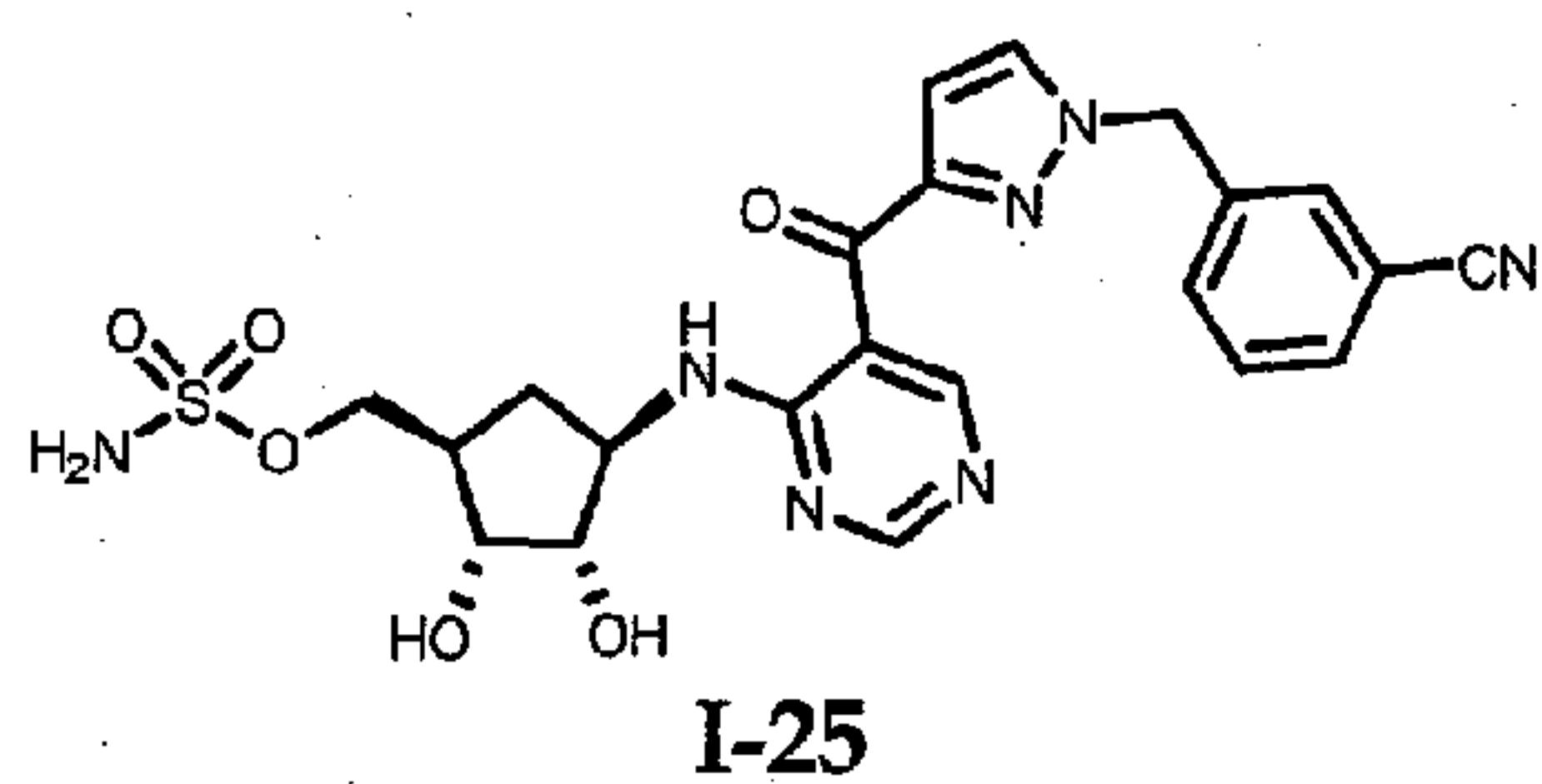
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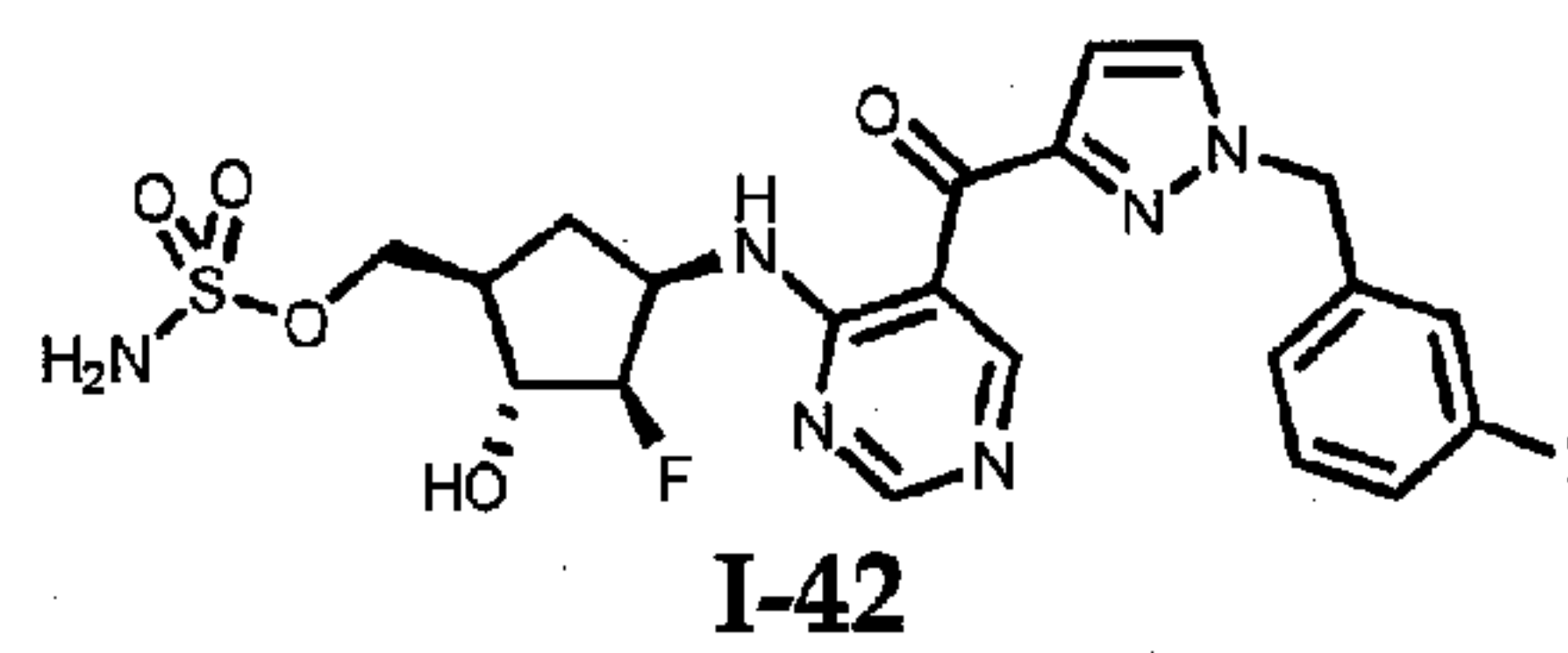
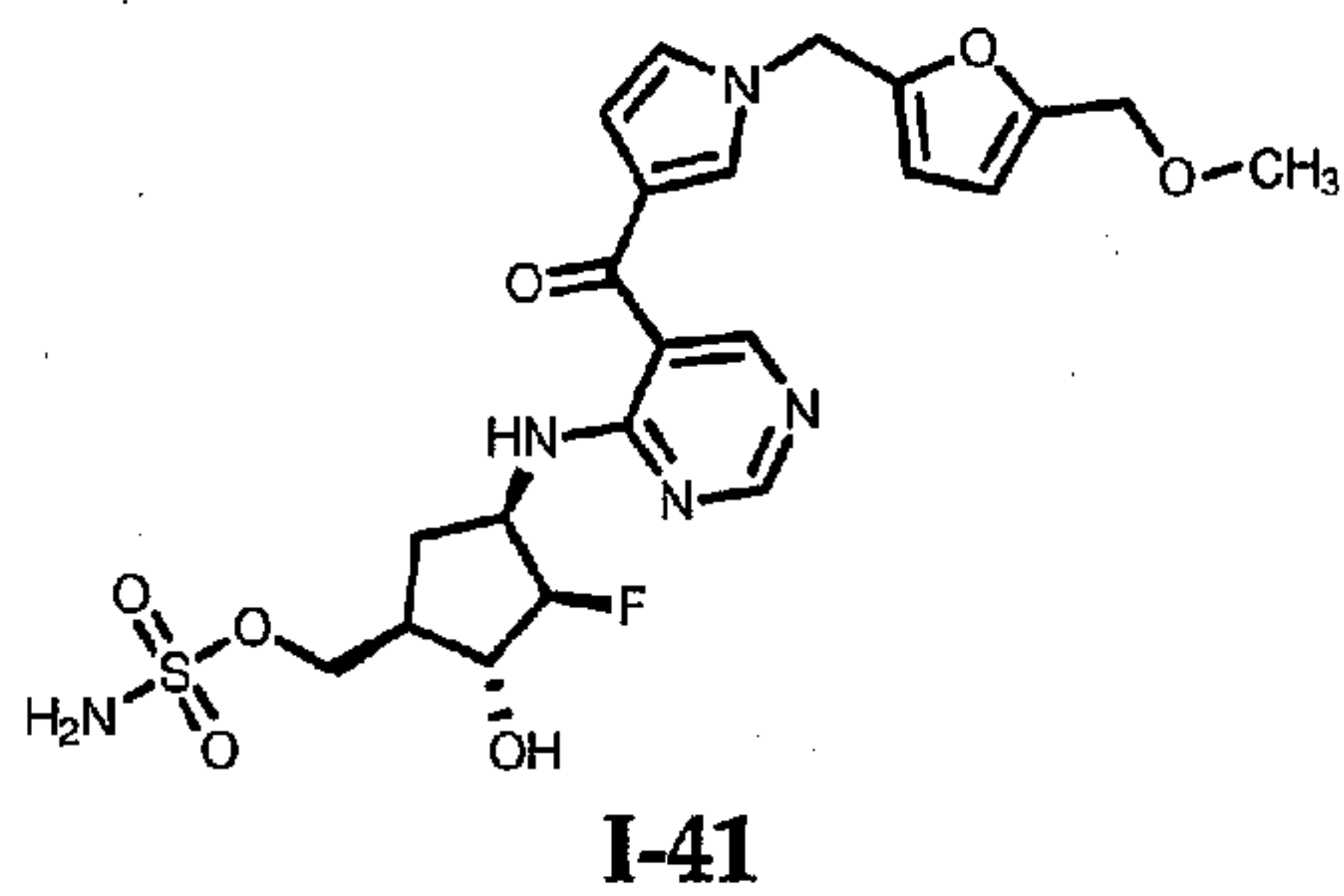
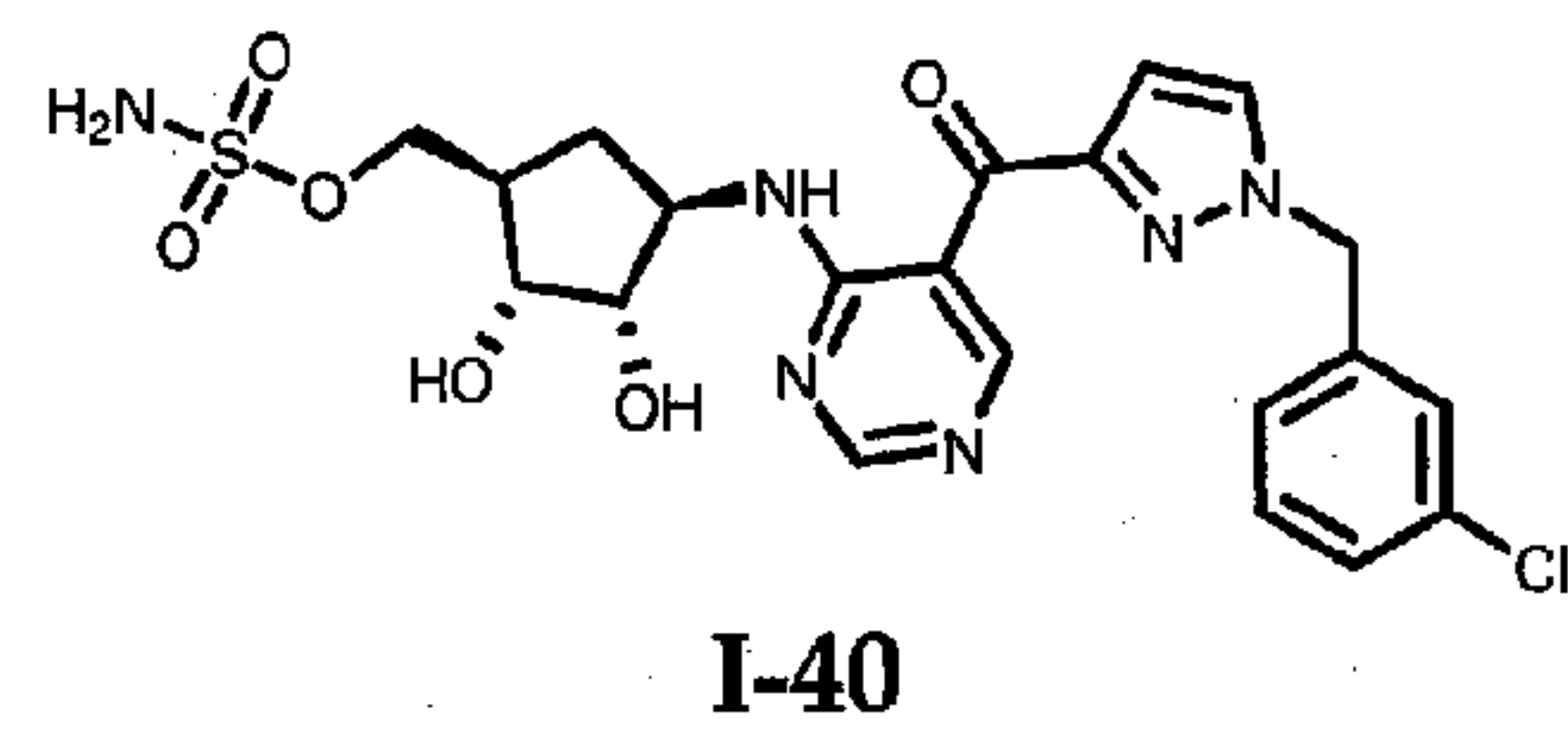
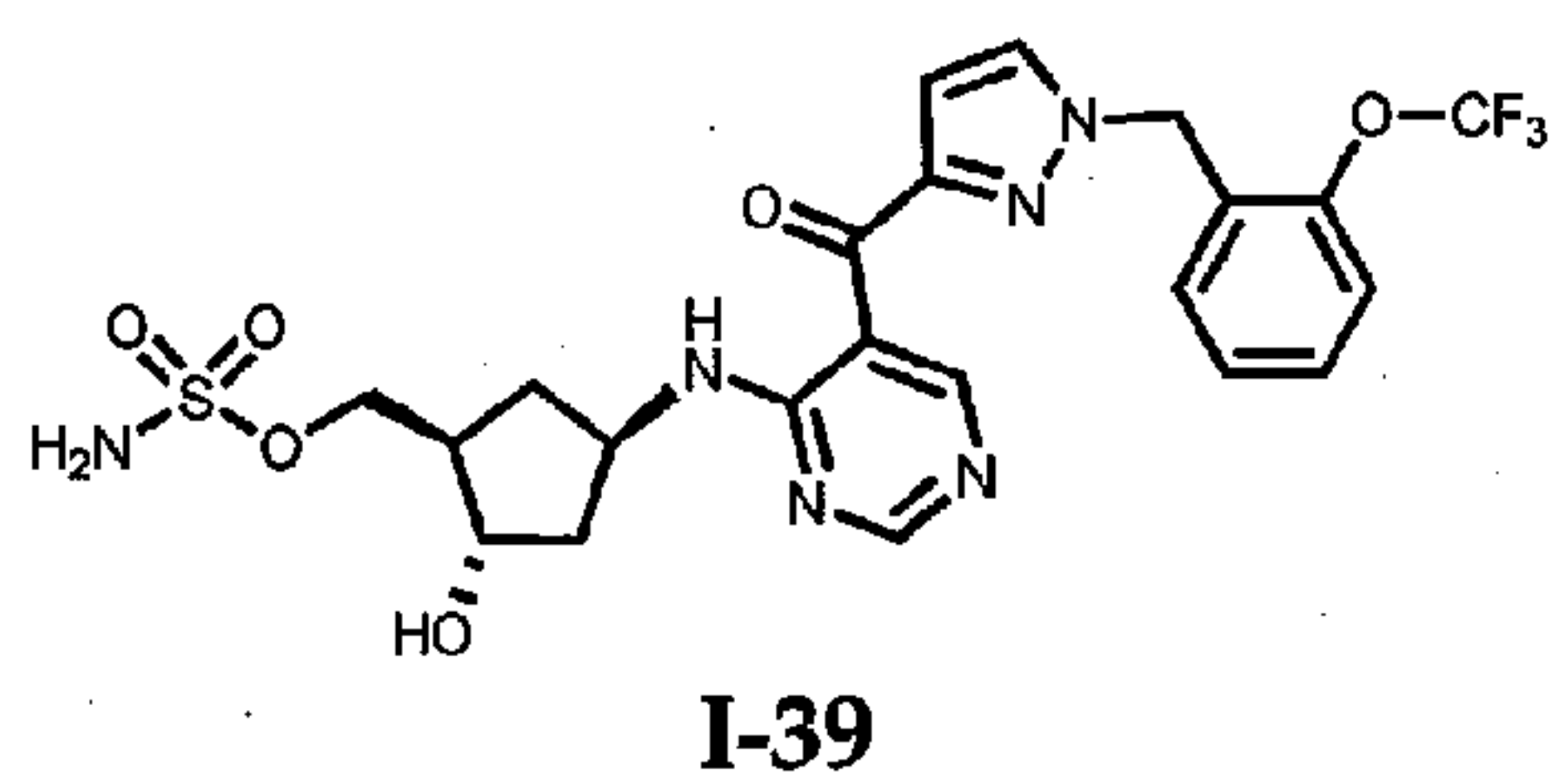
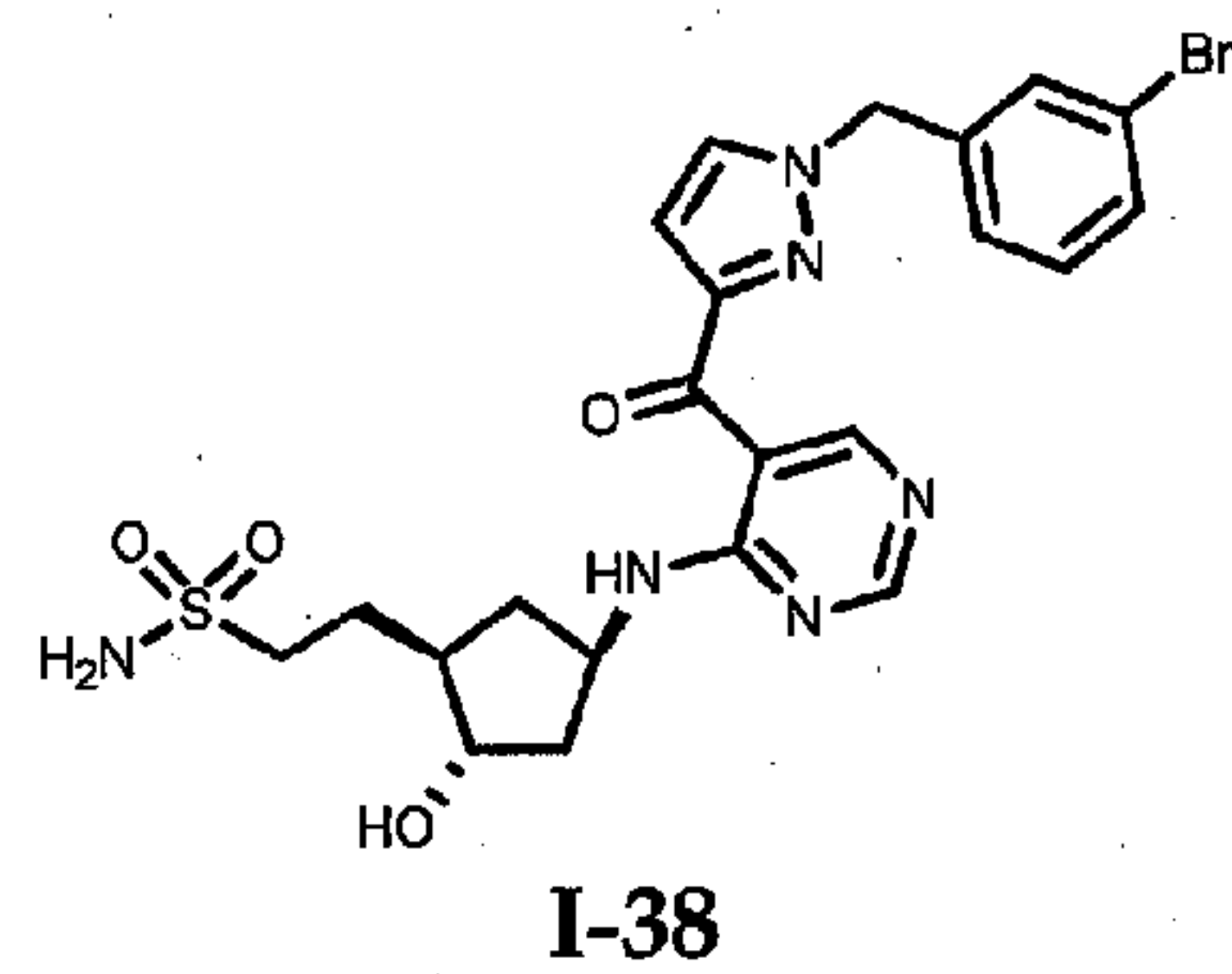
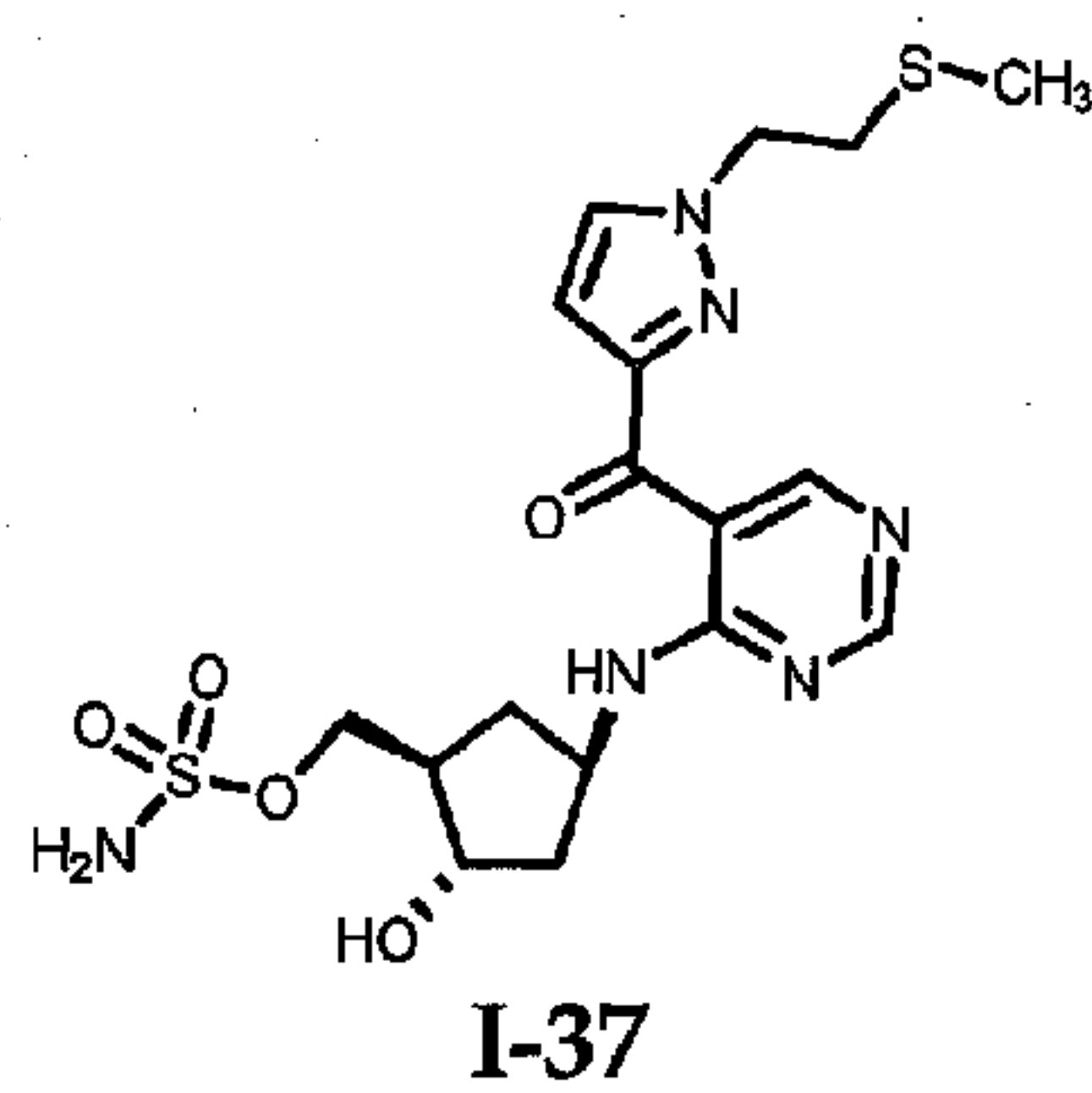
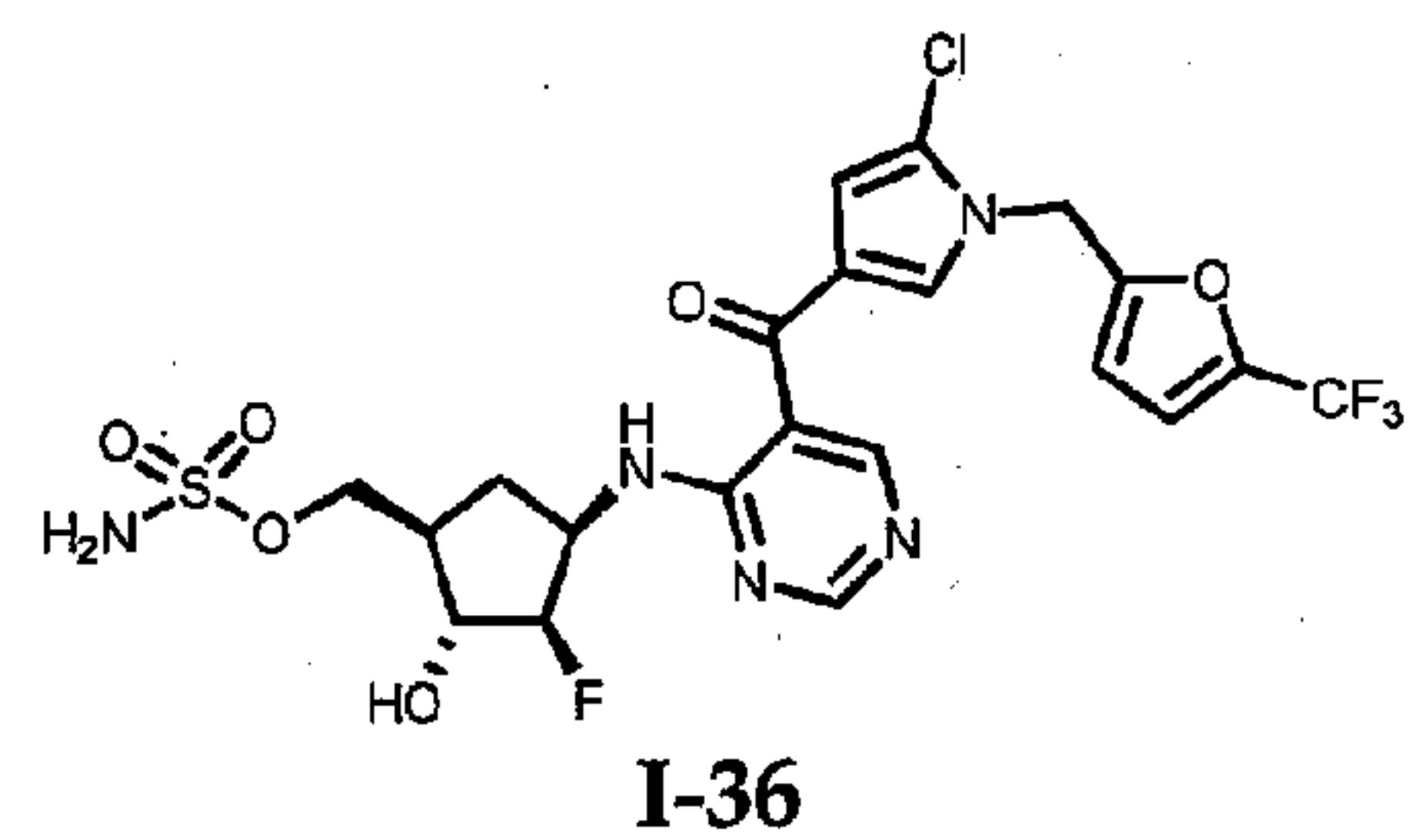
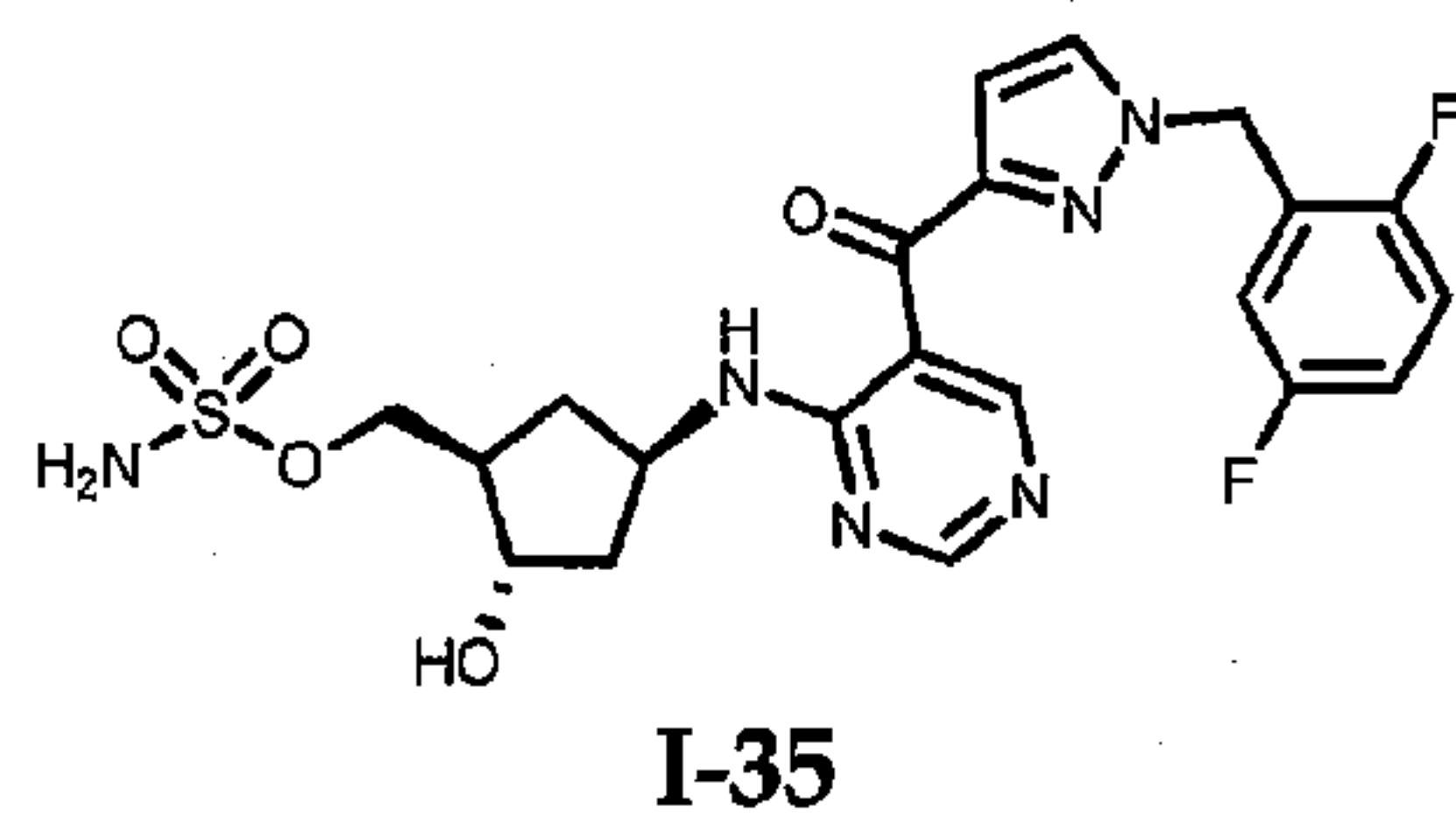
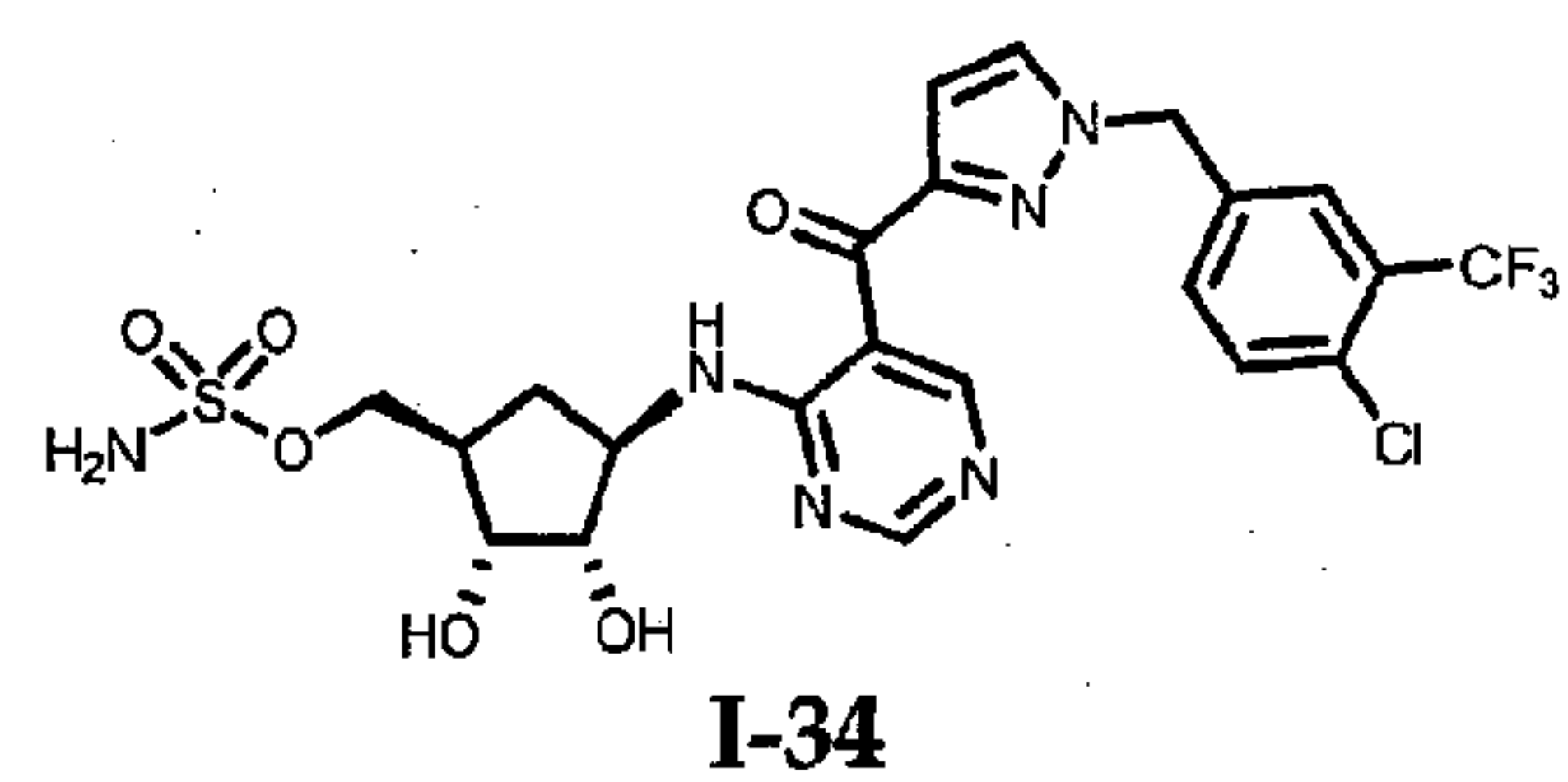
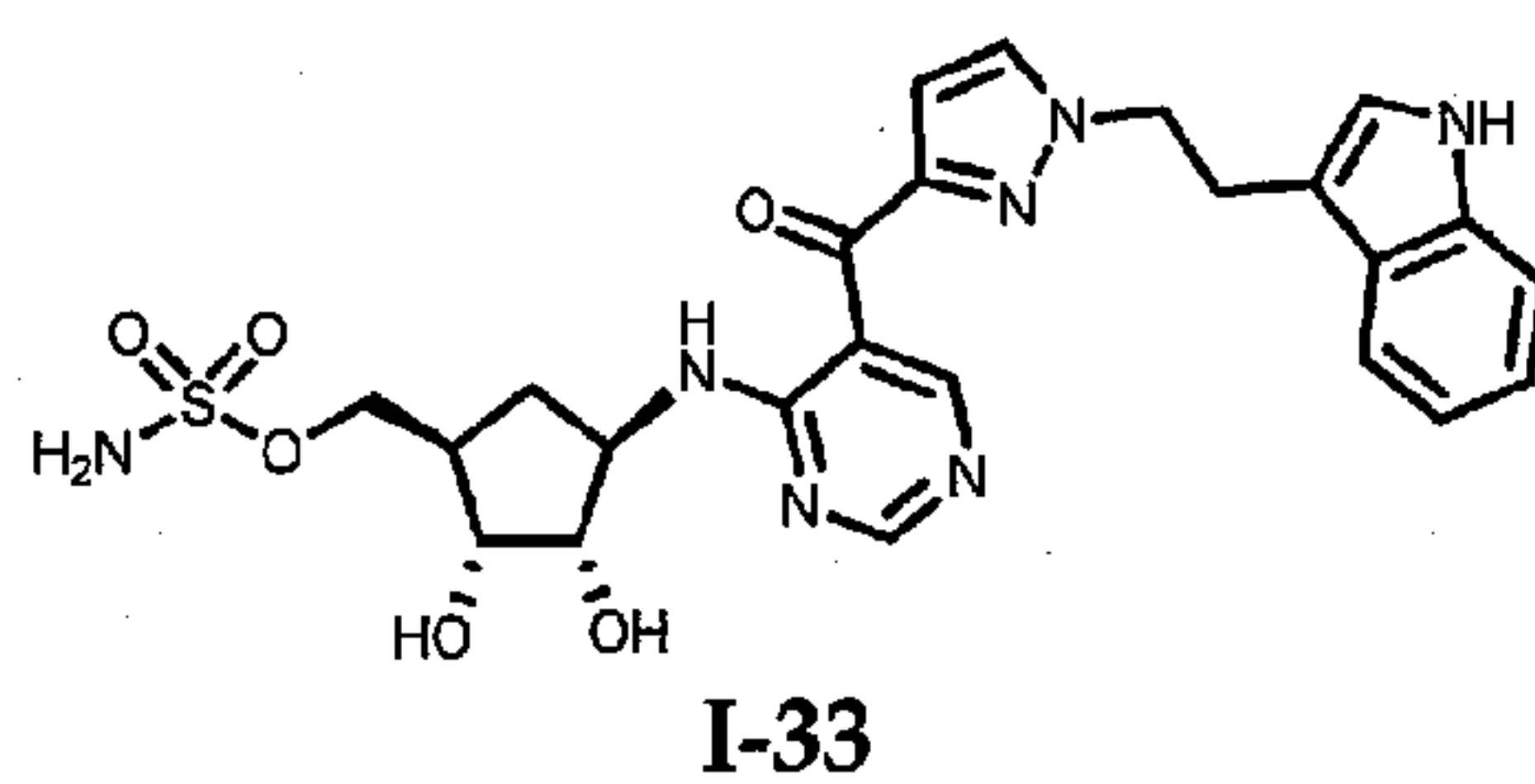


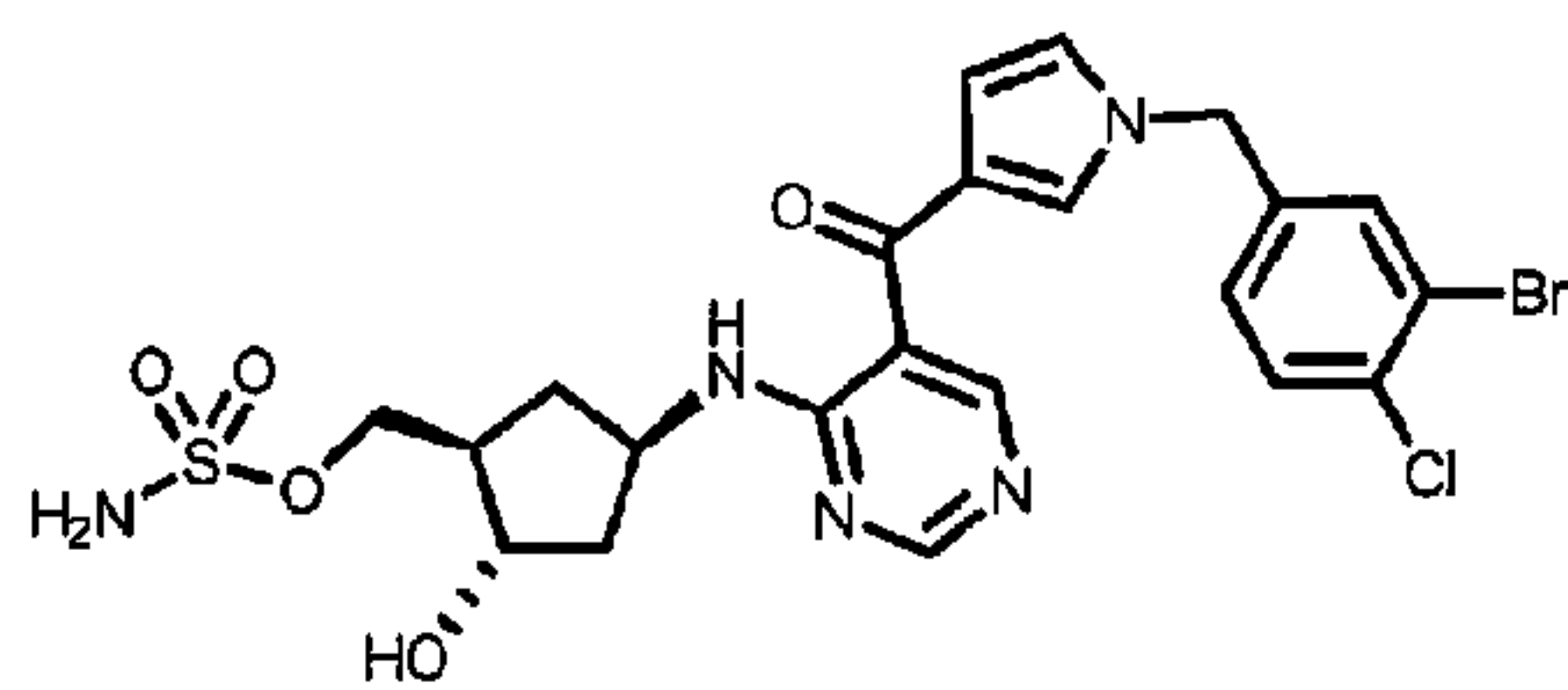
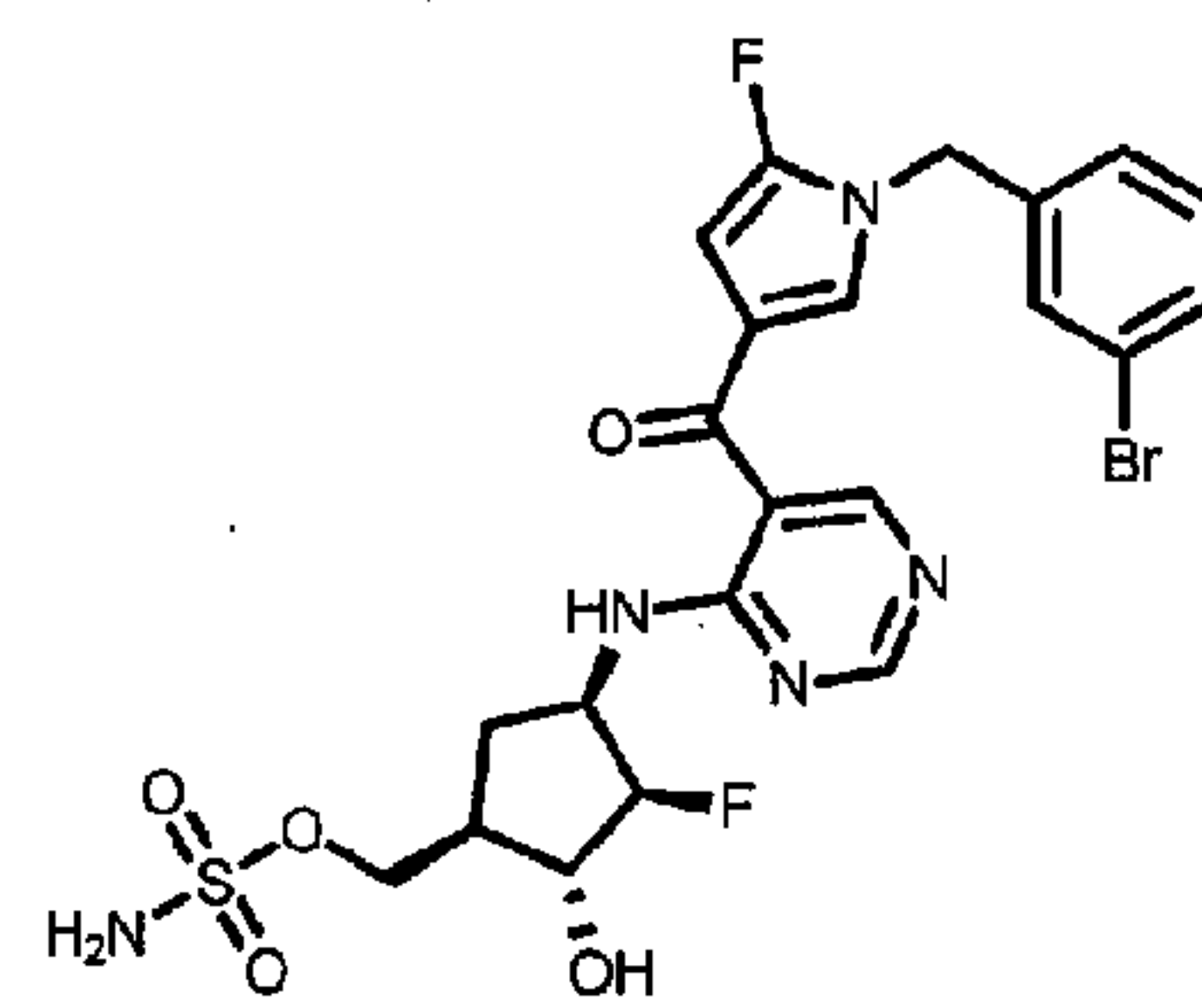
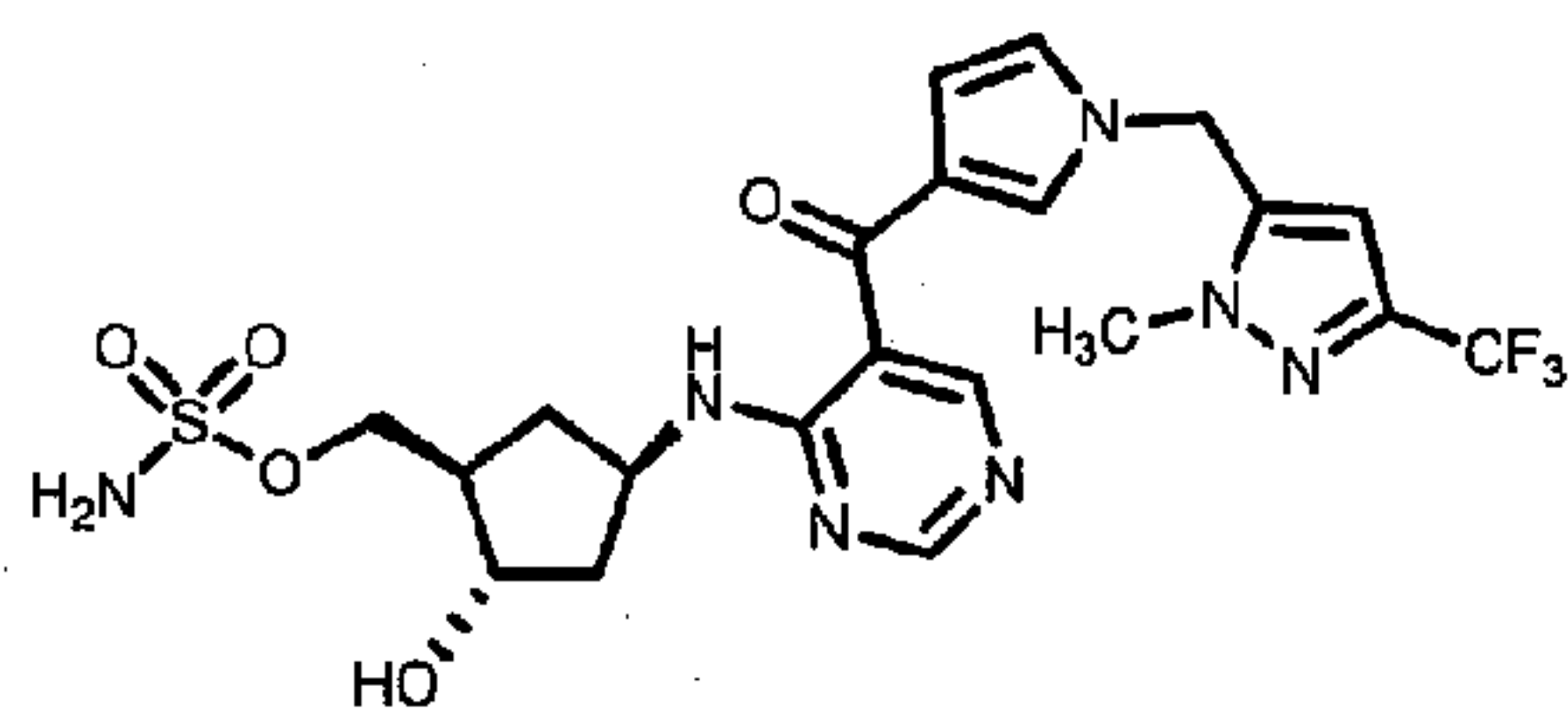
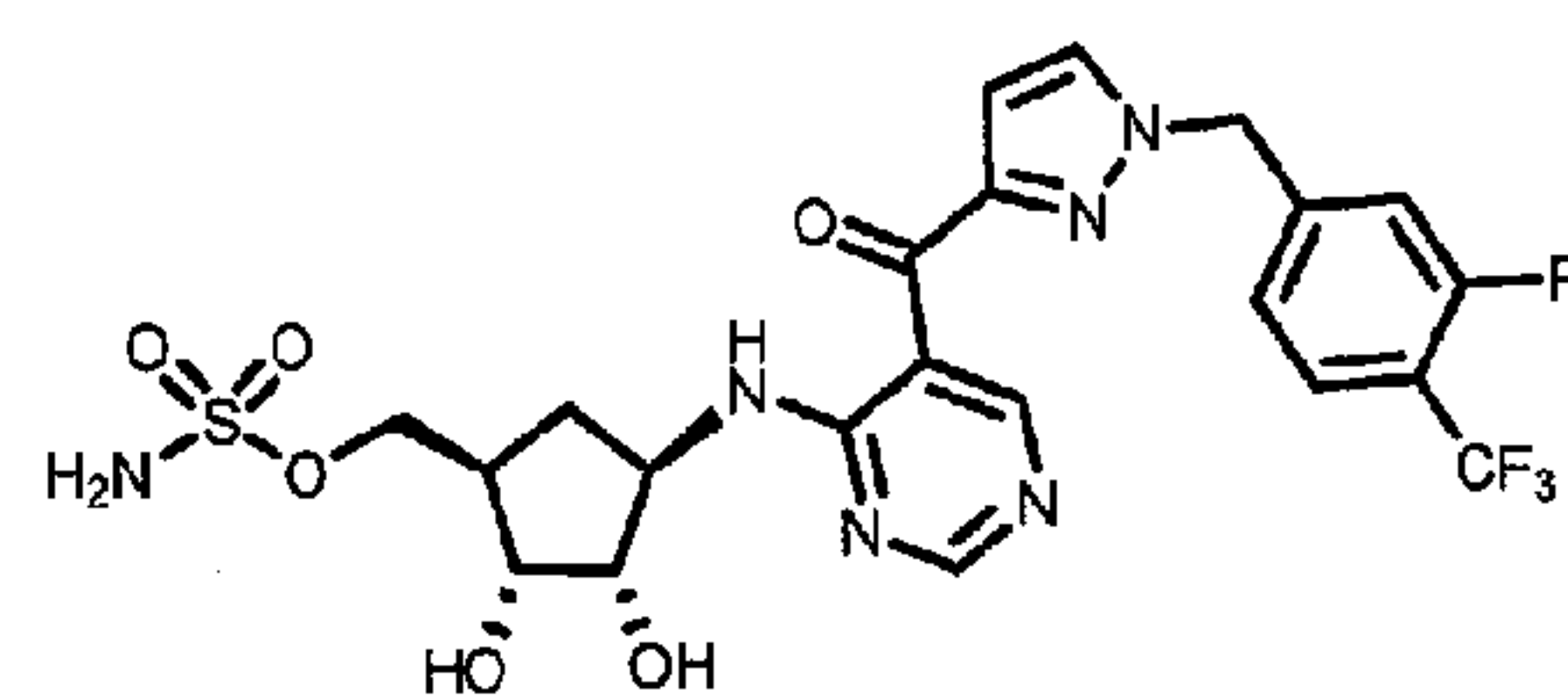
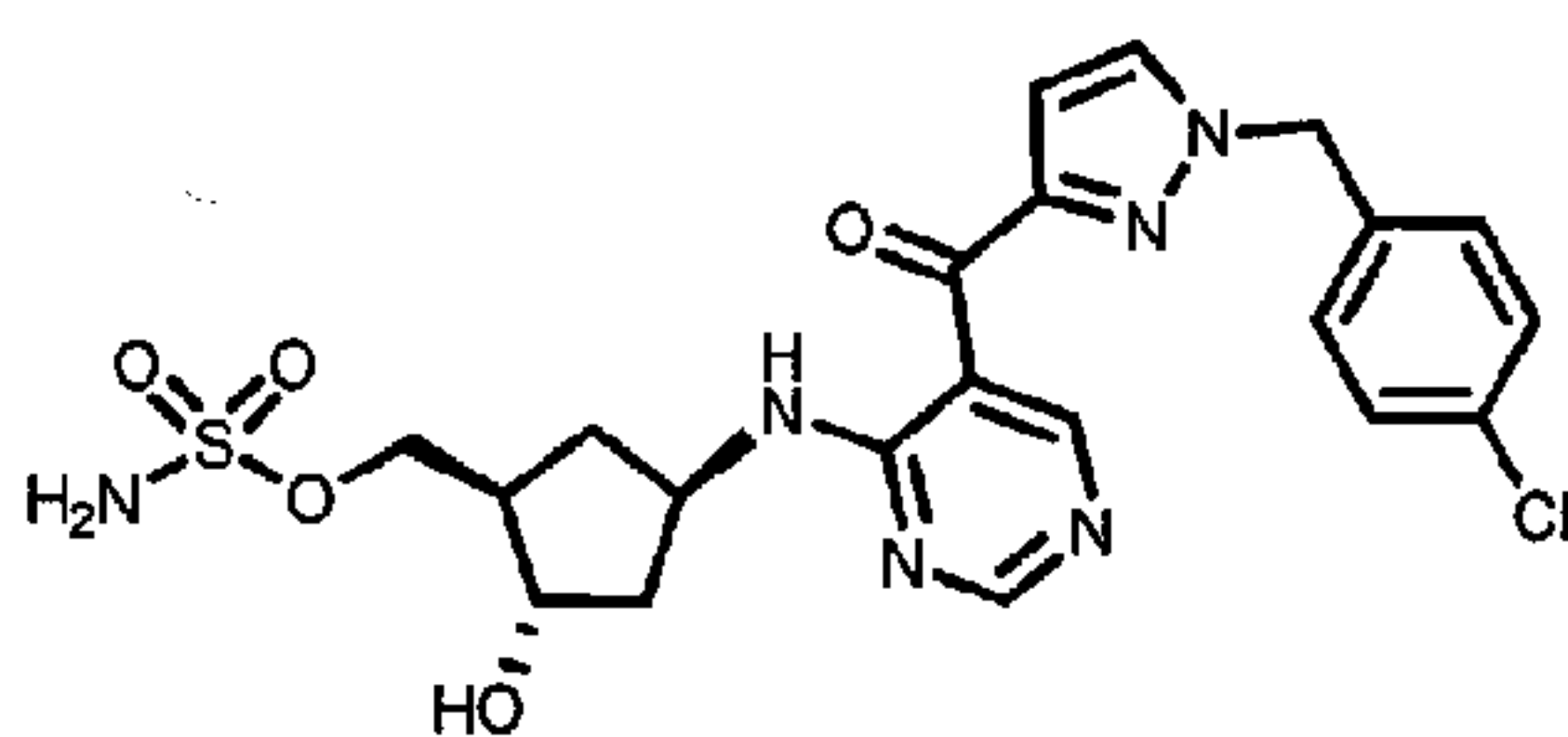
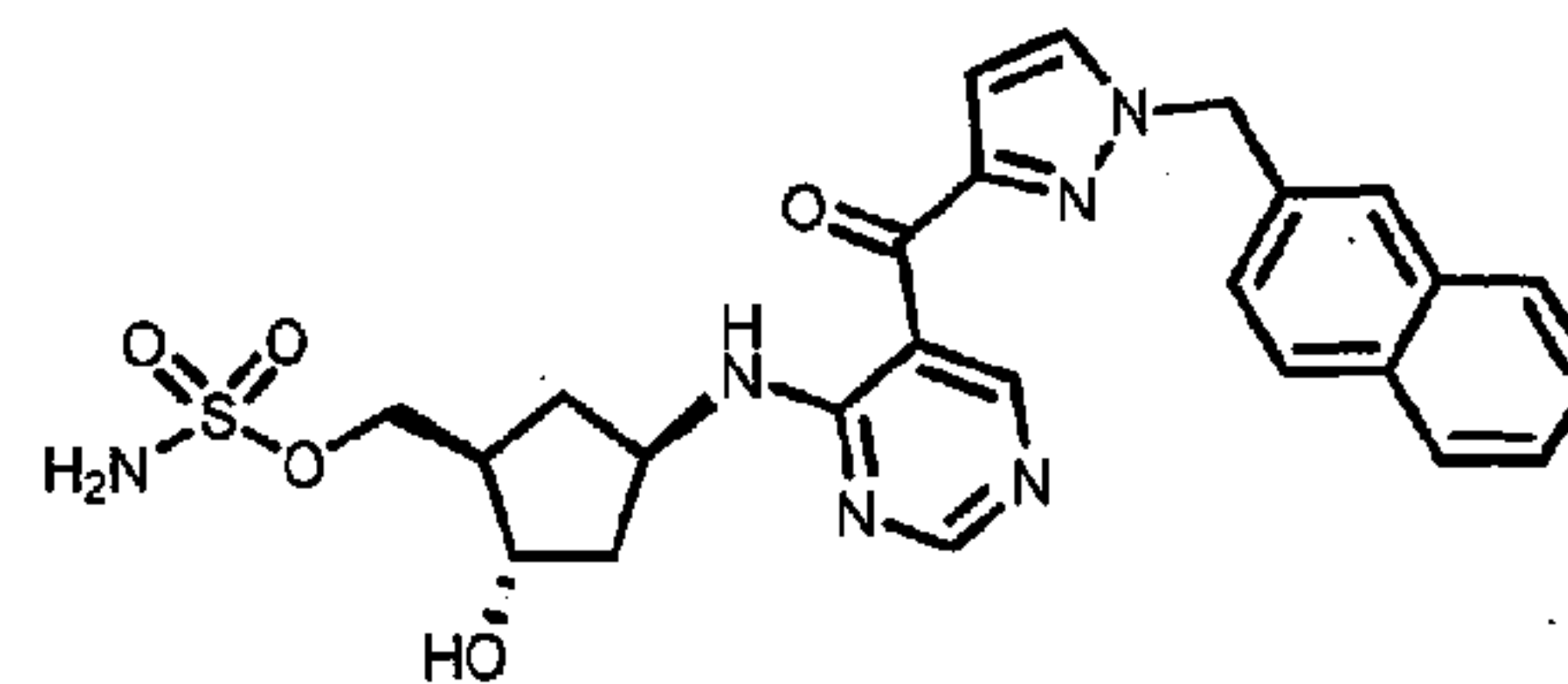
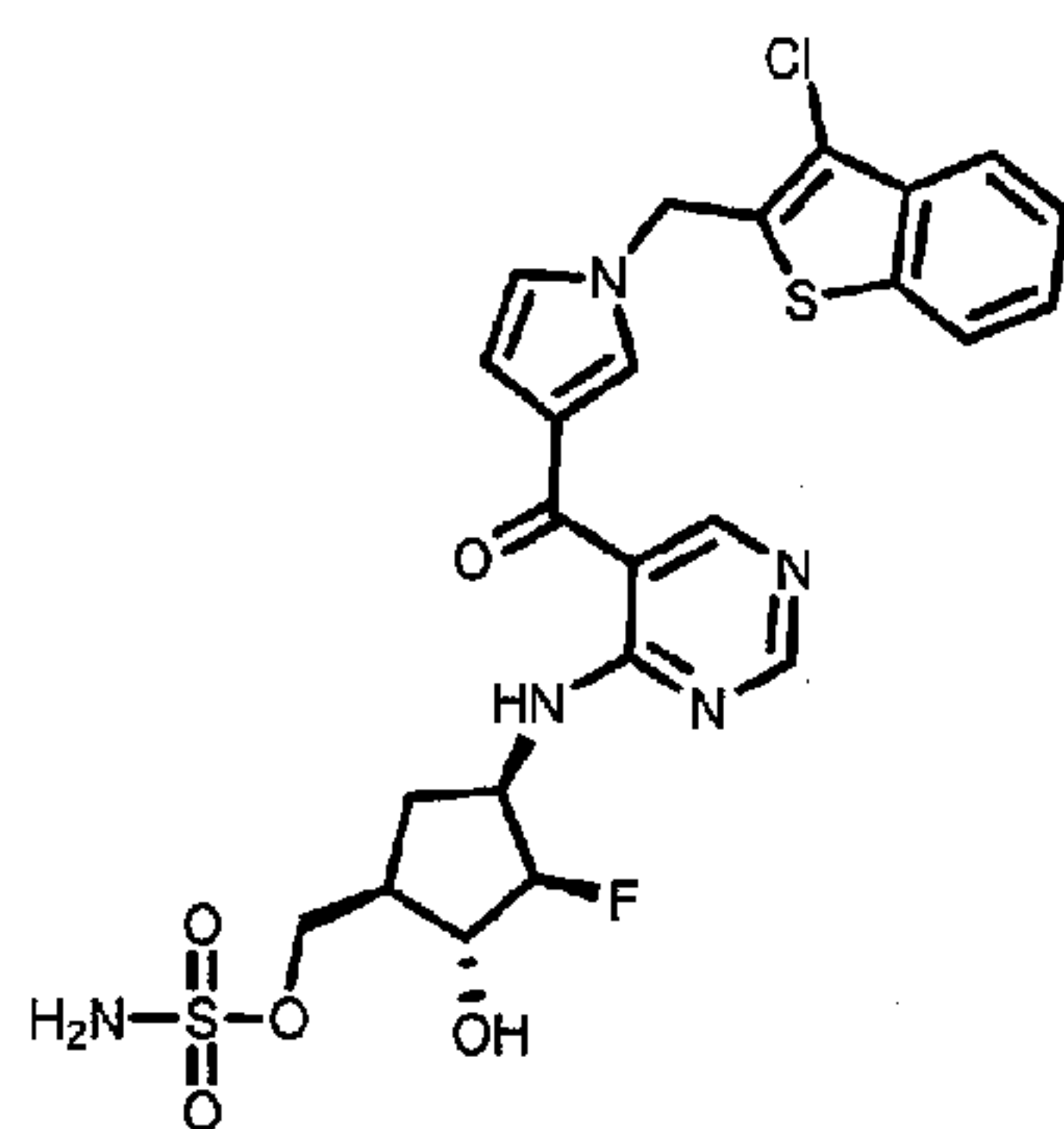
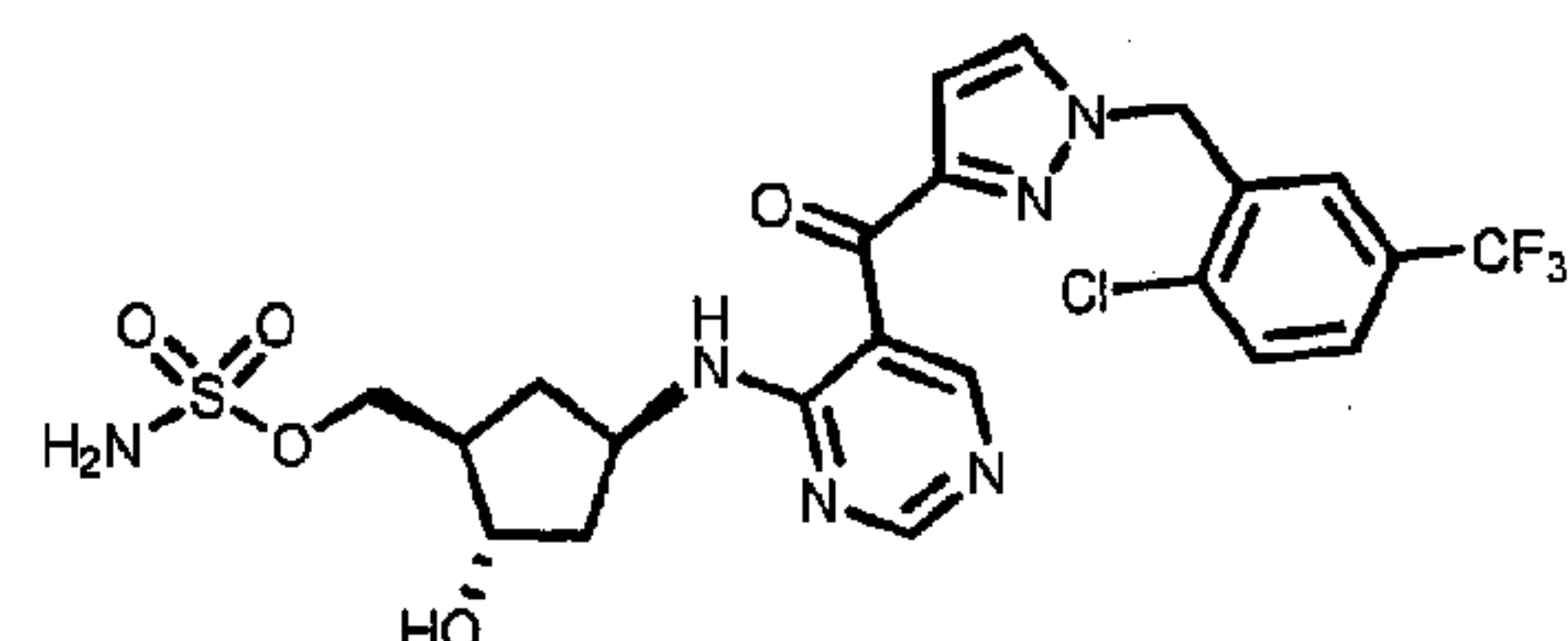
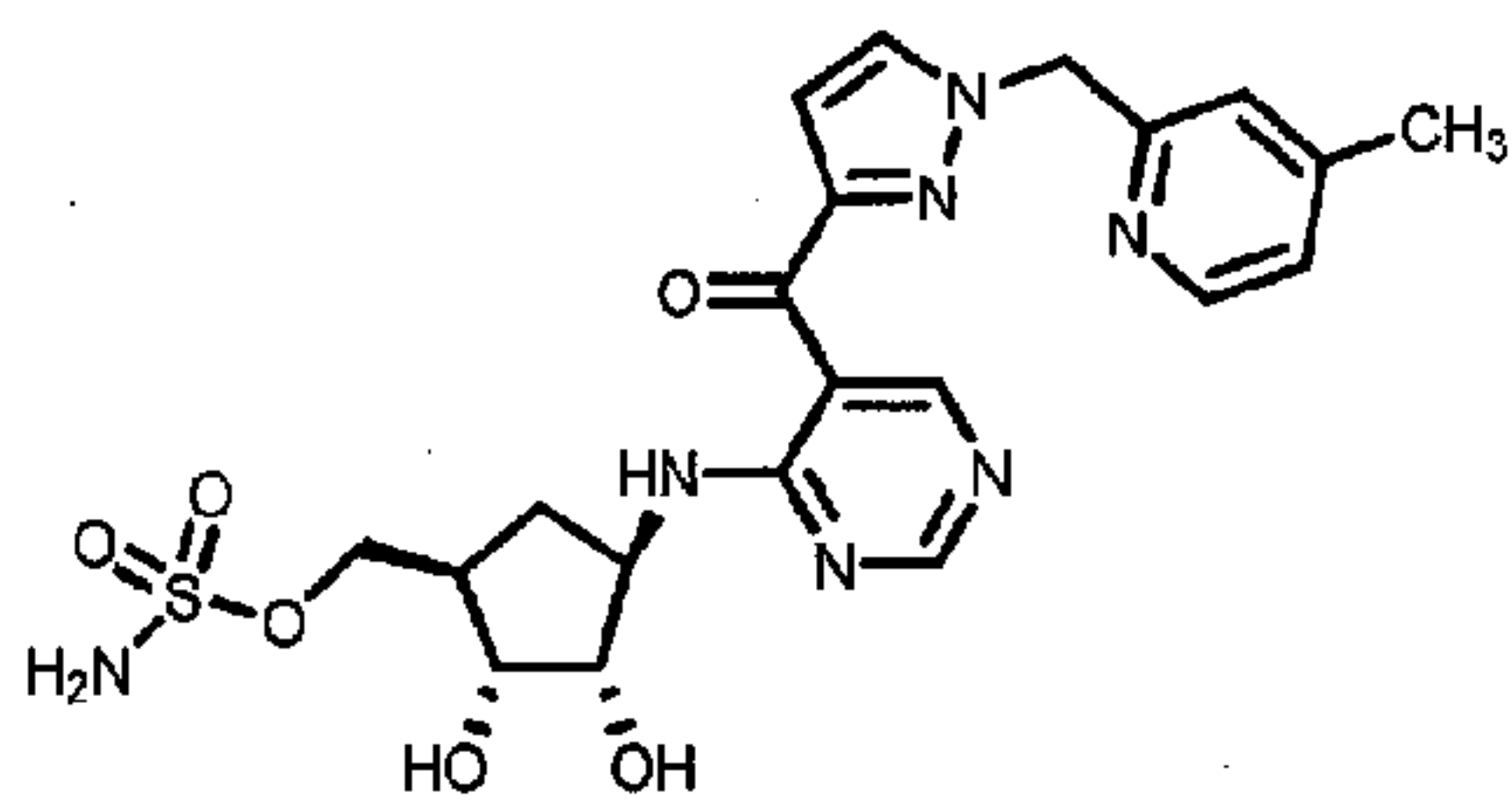
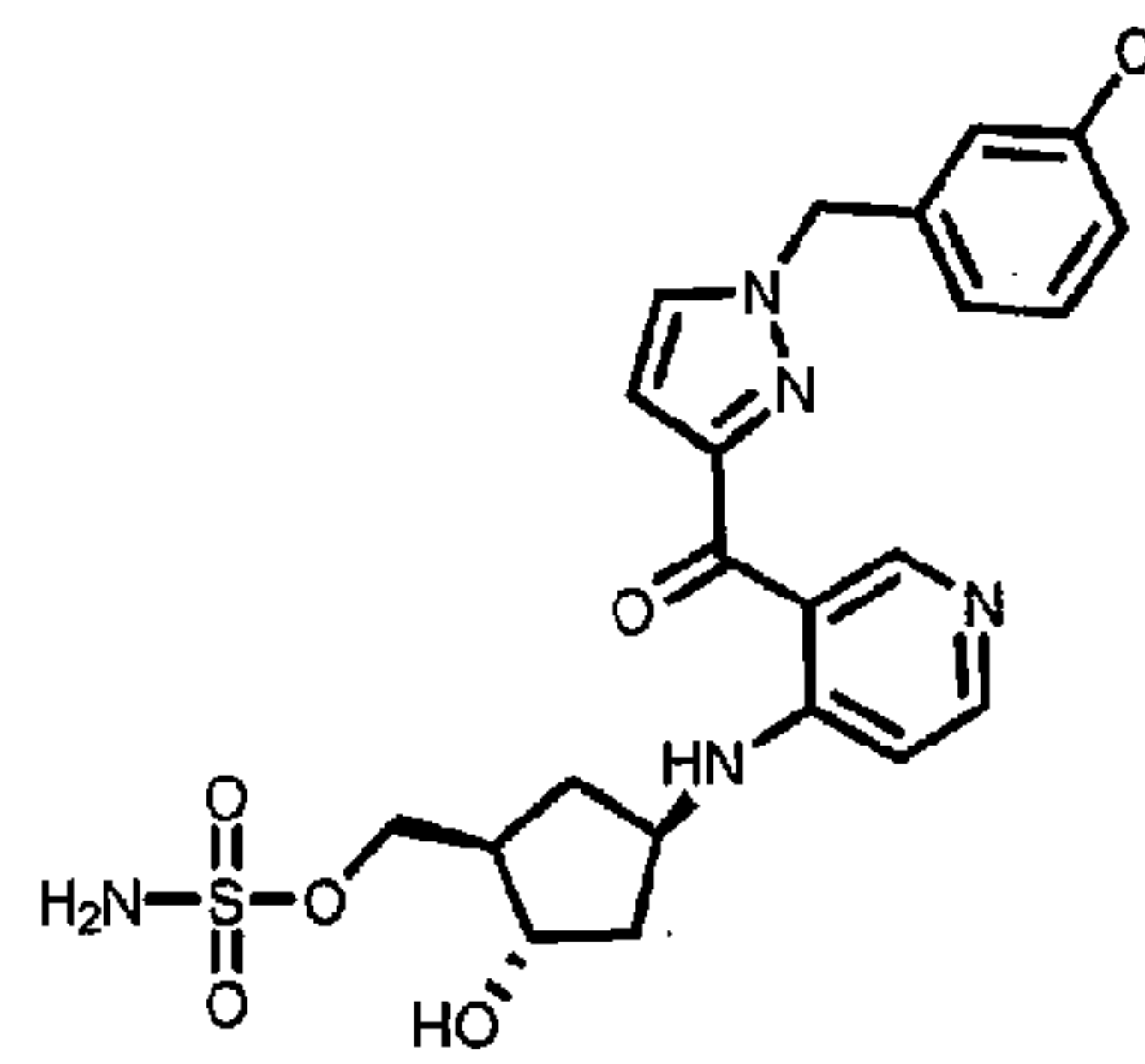
I-23

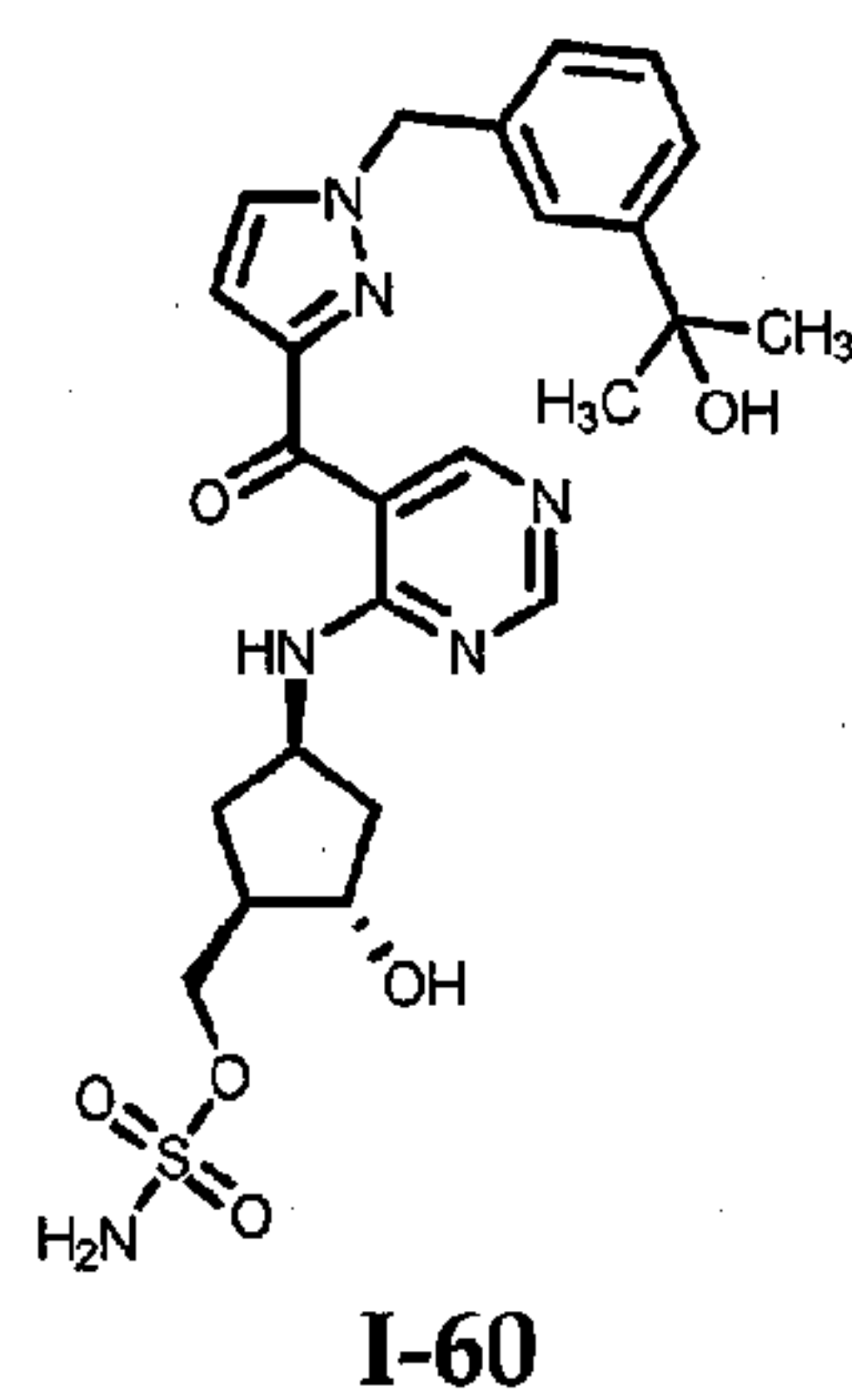
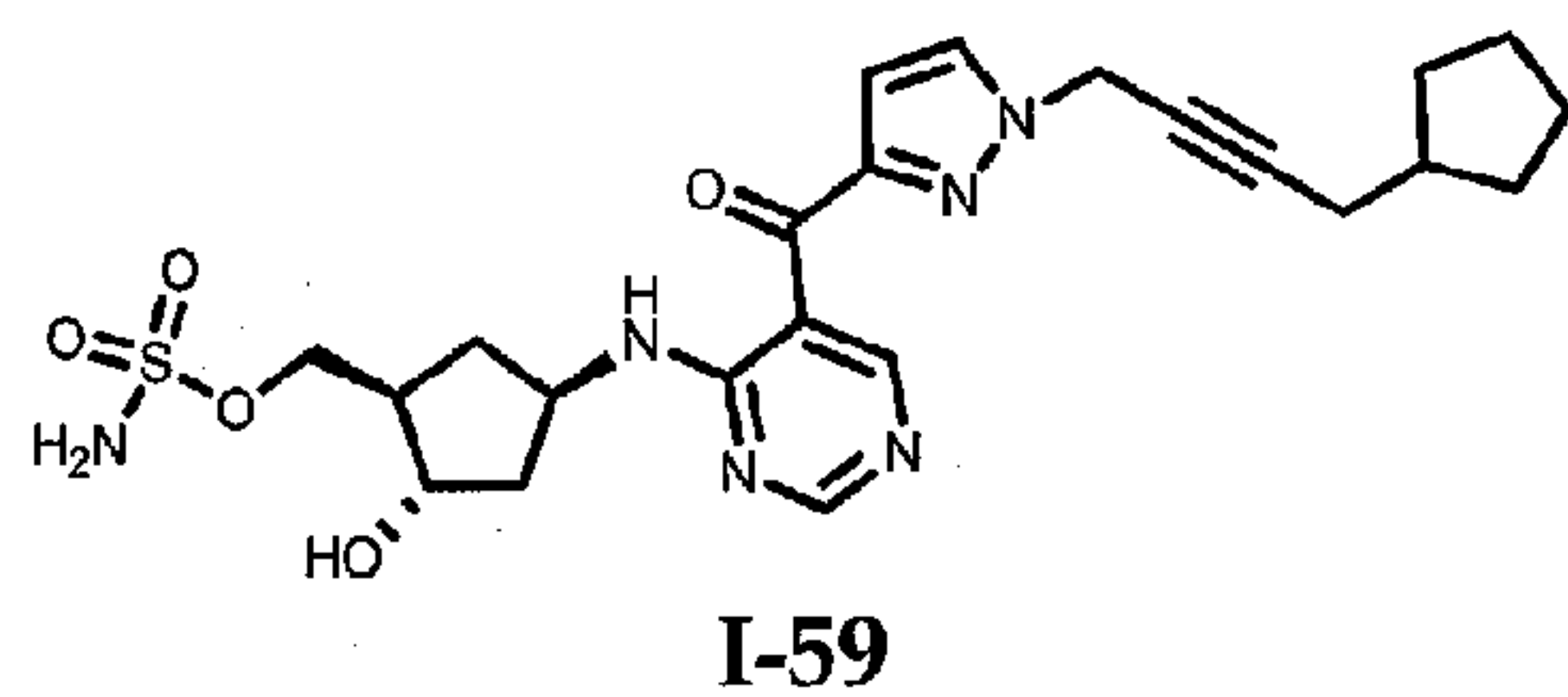
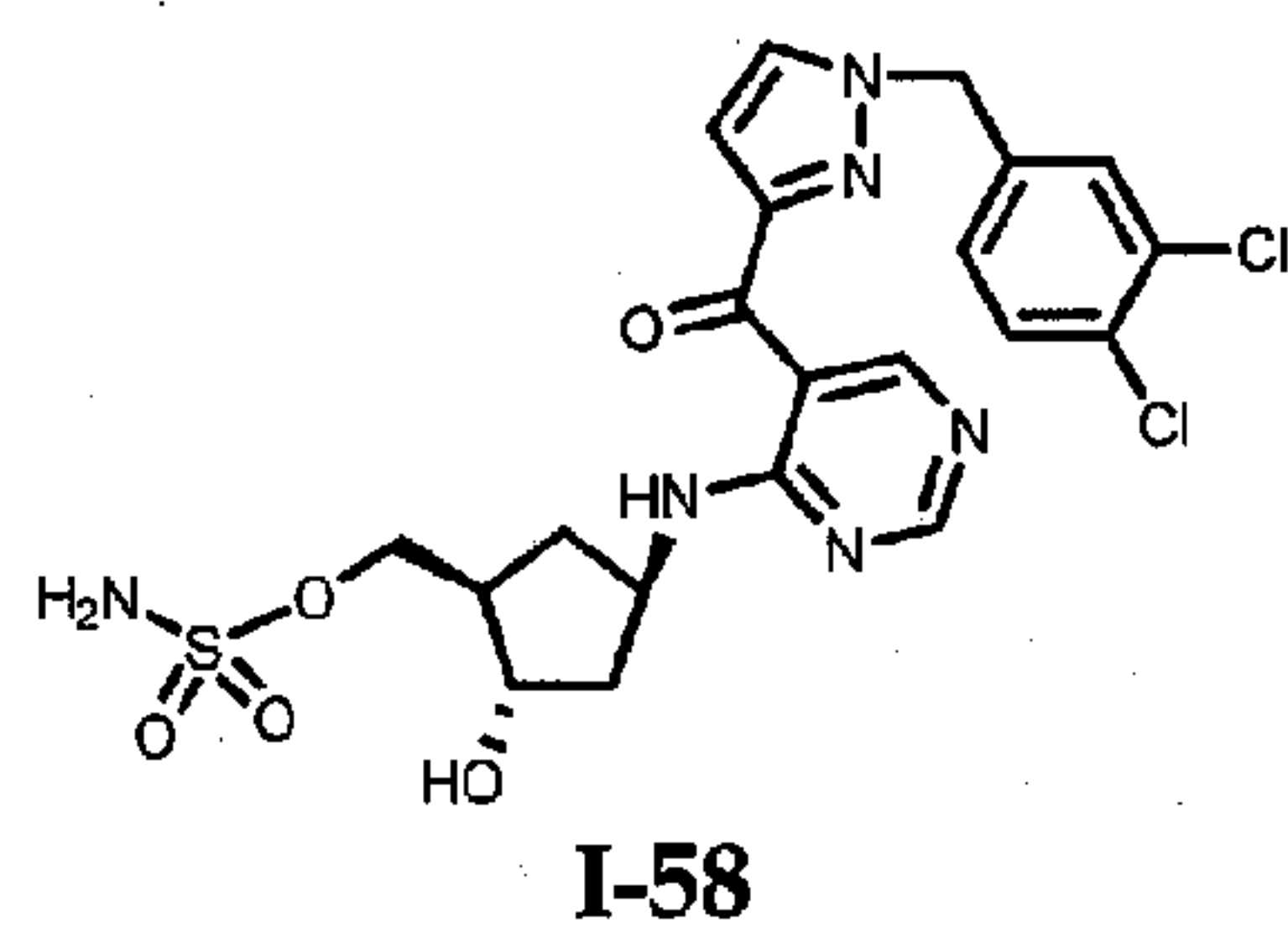
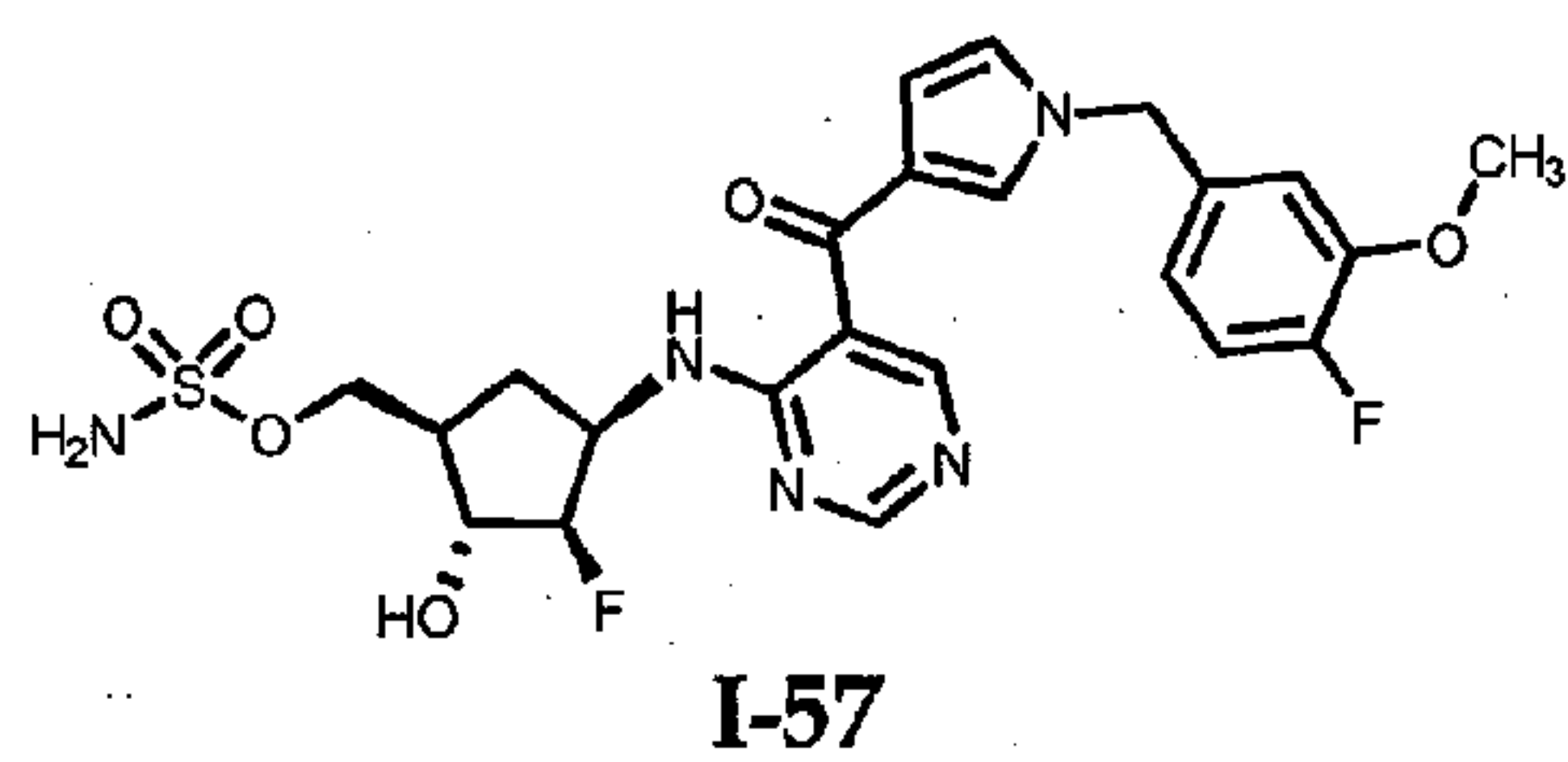
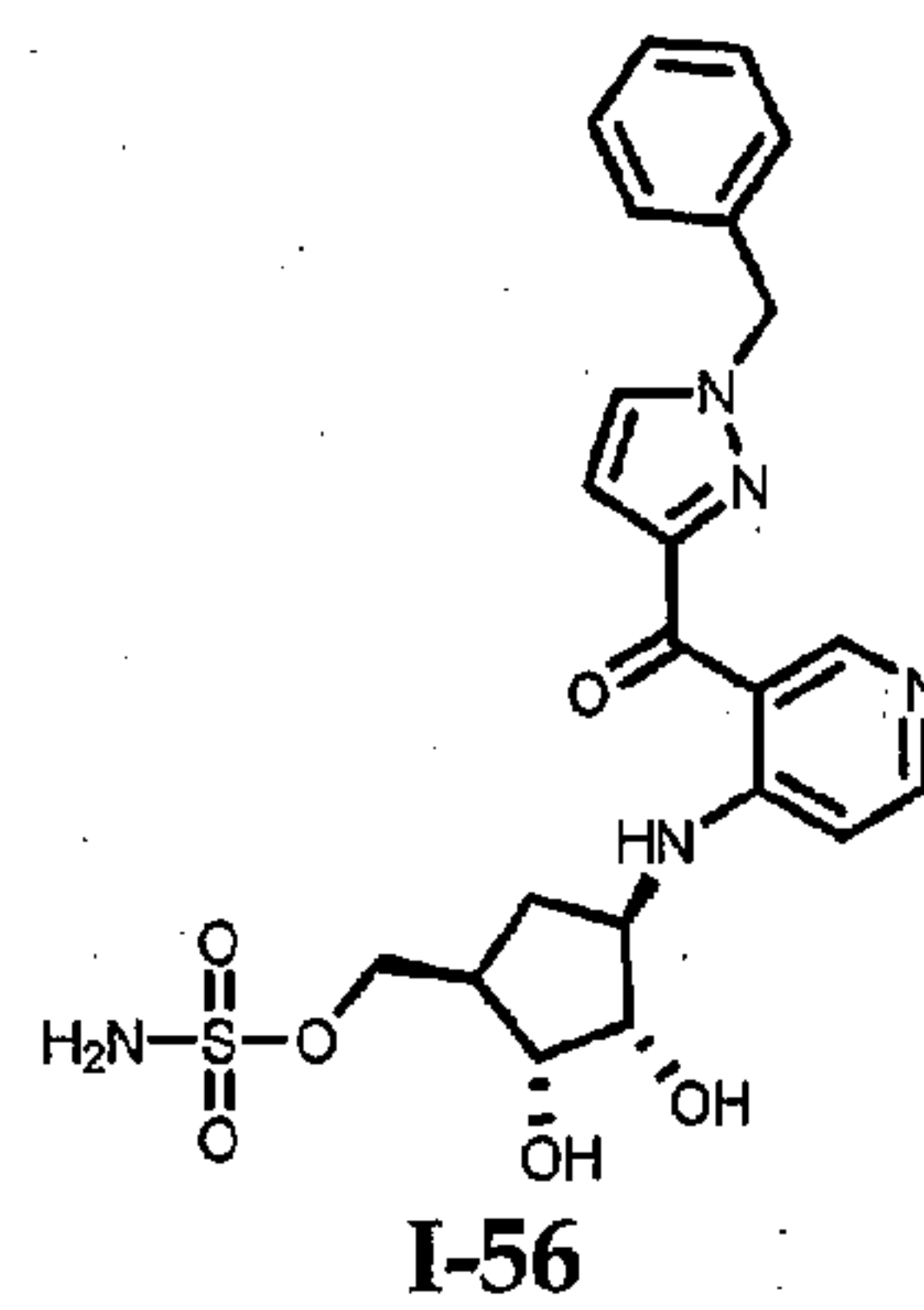
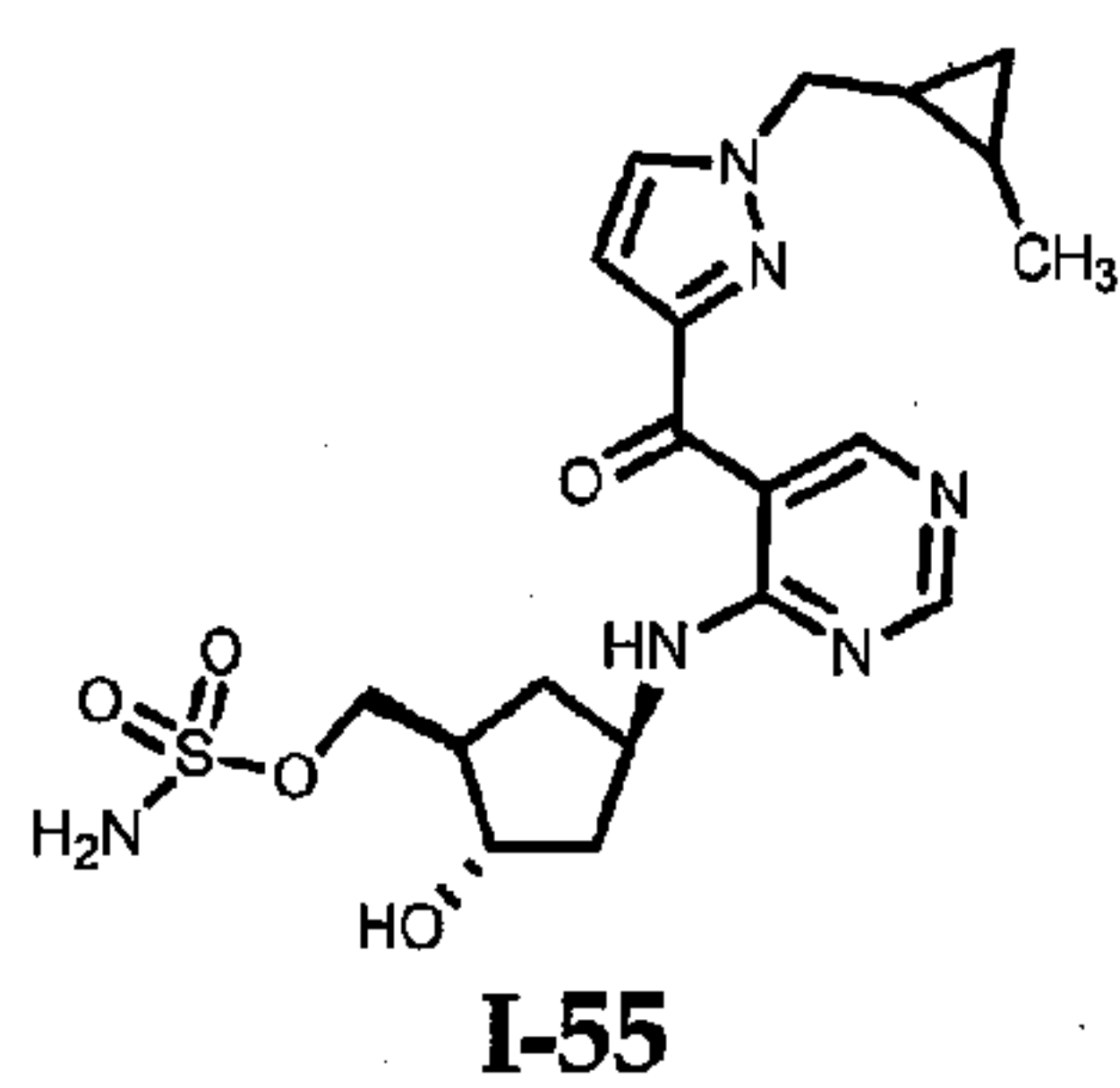
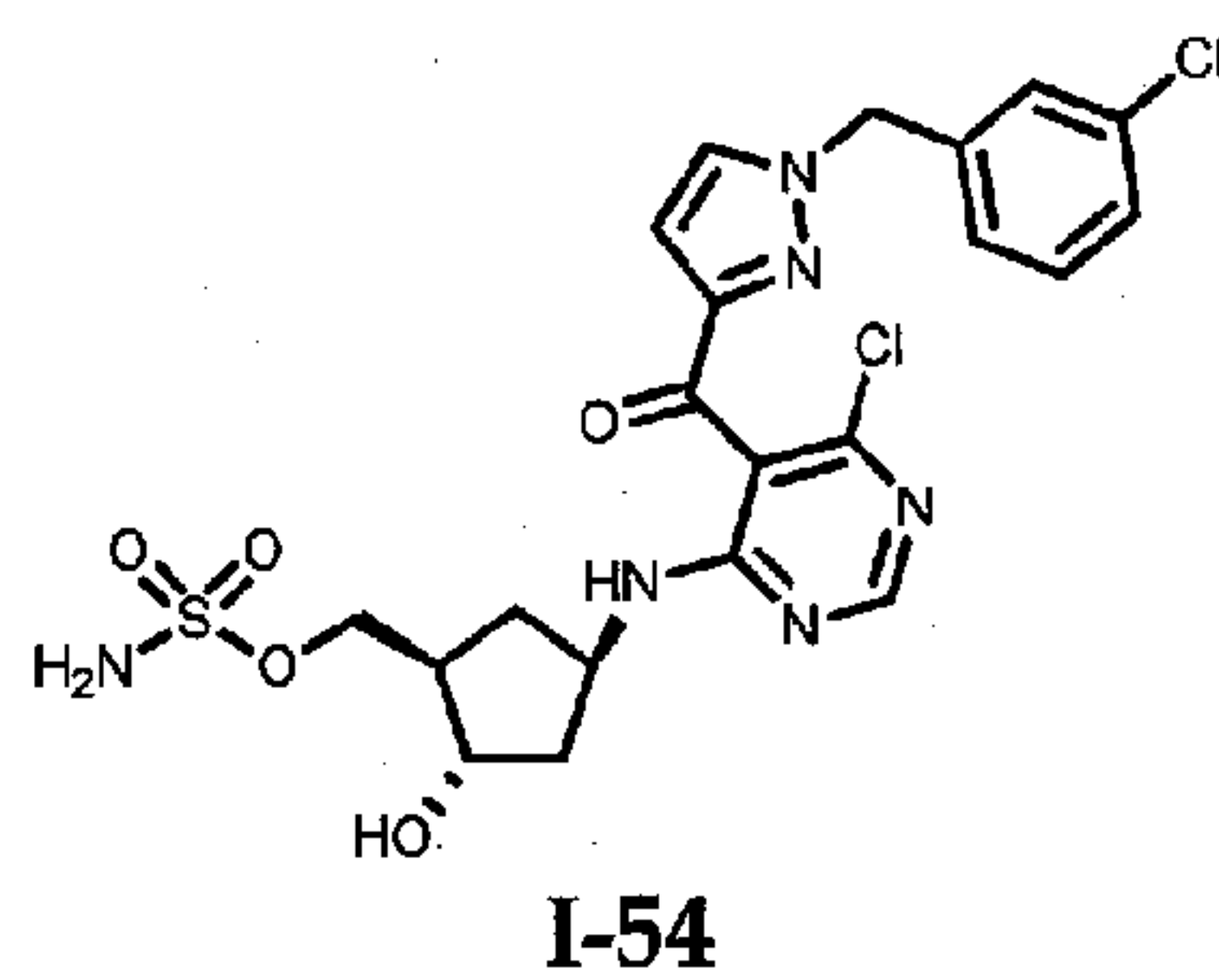
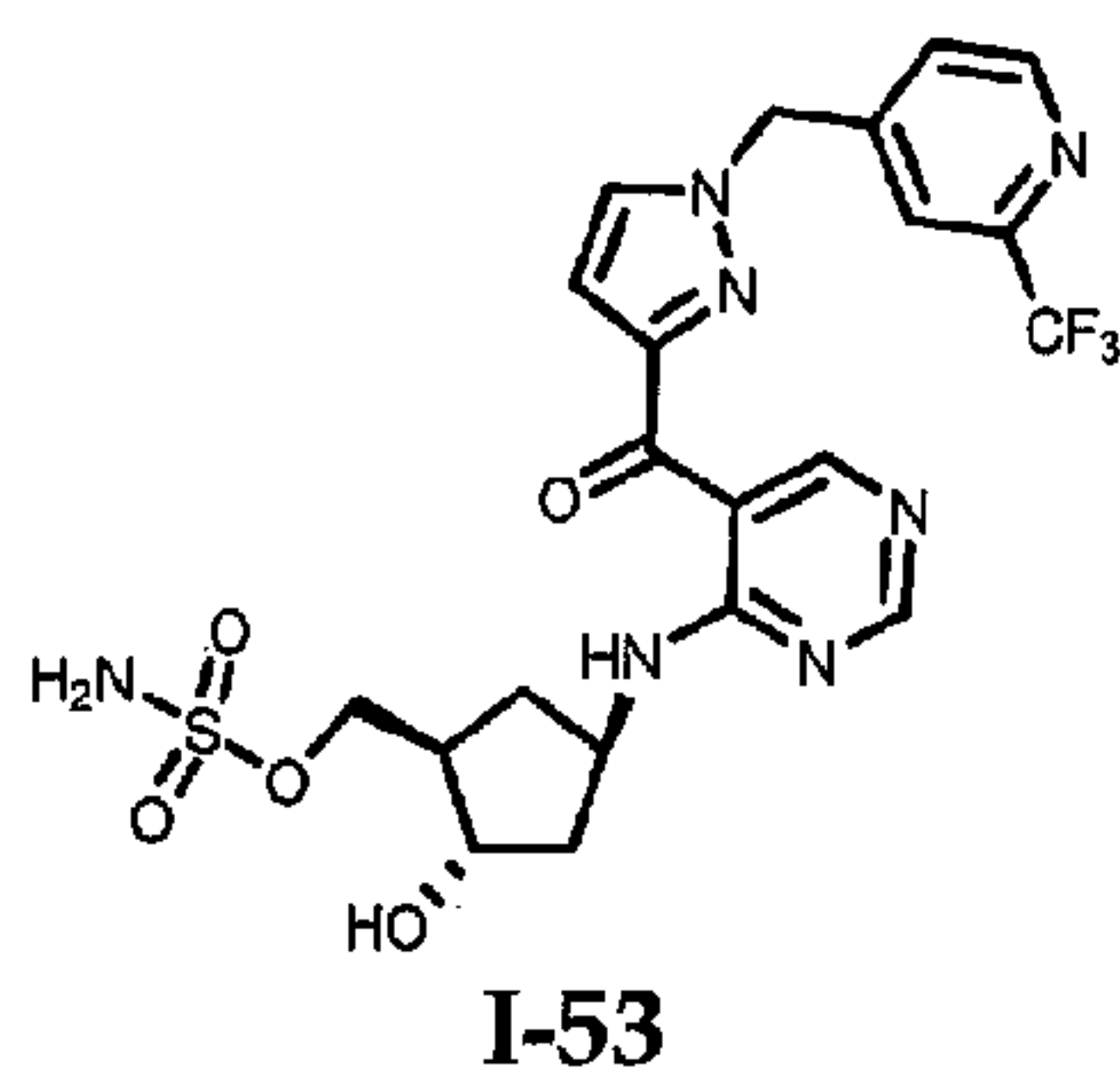


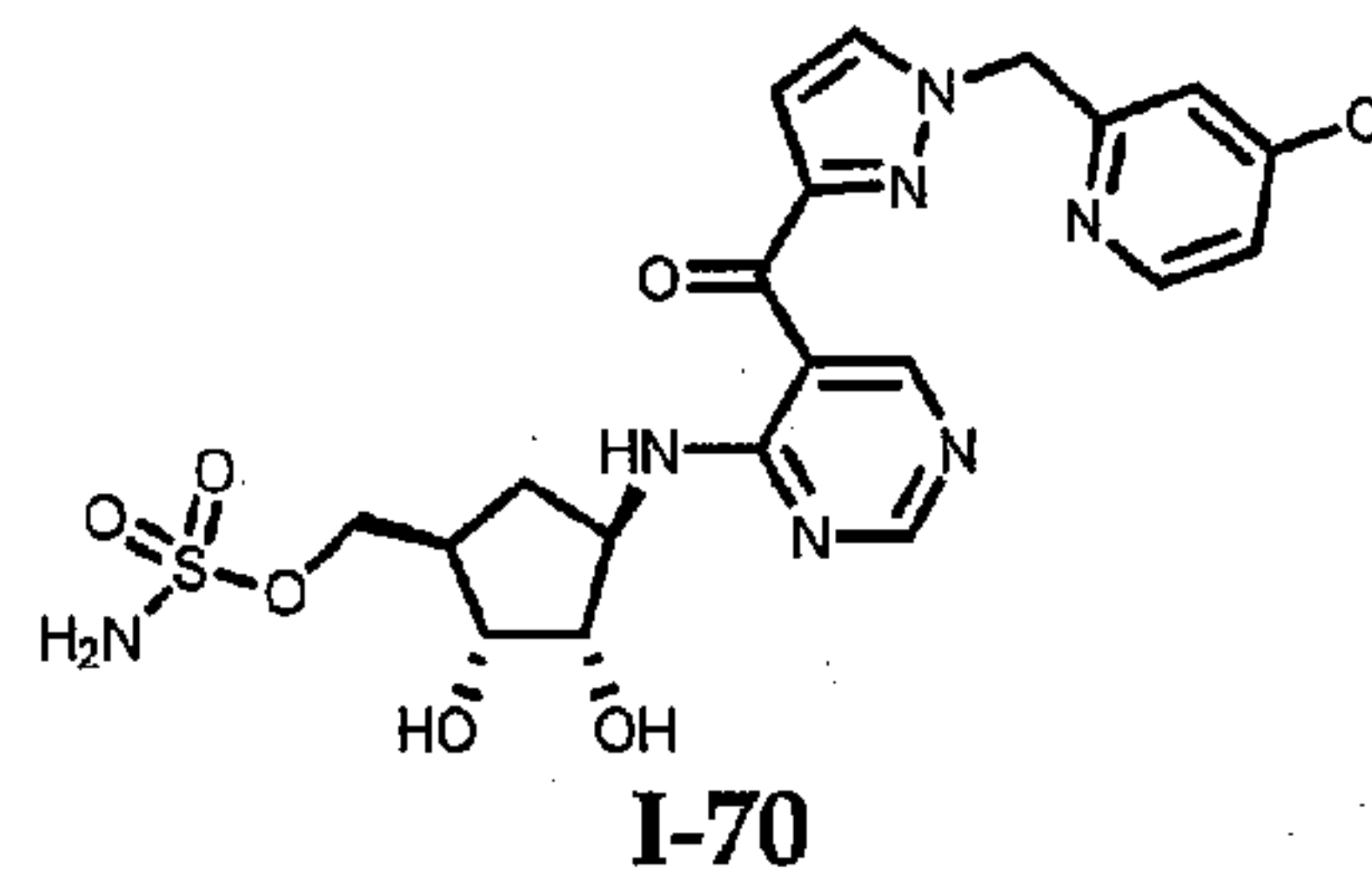
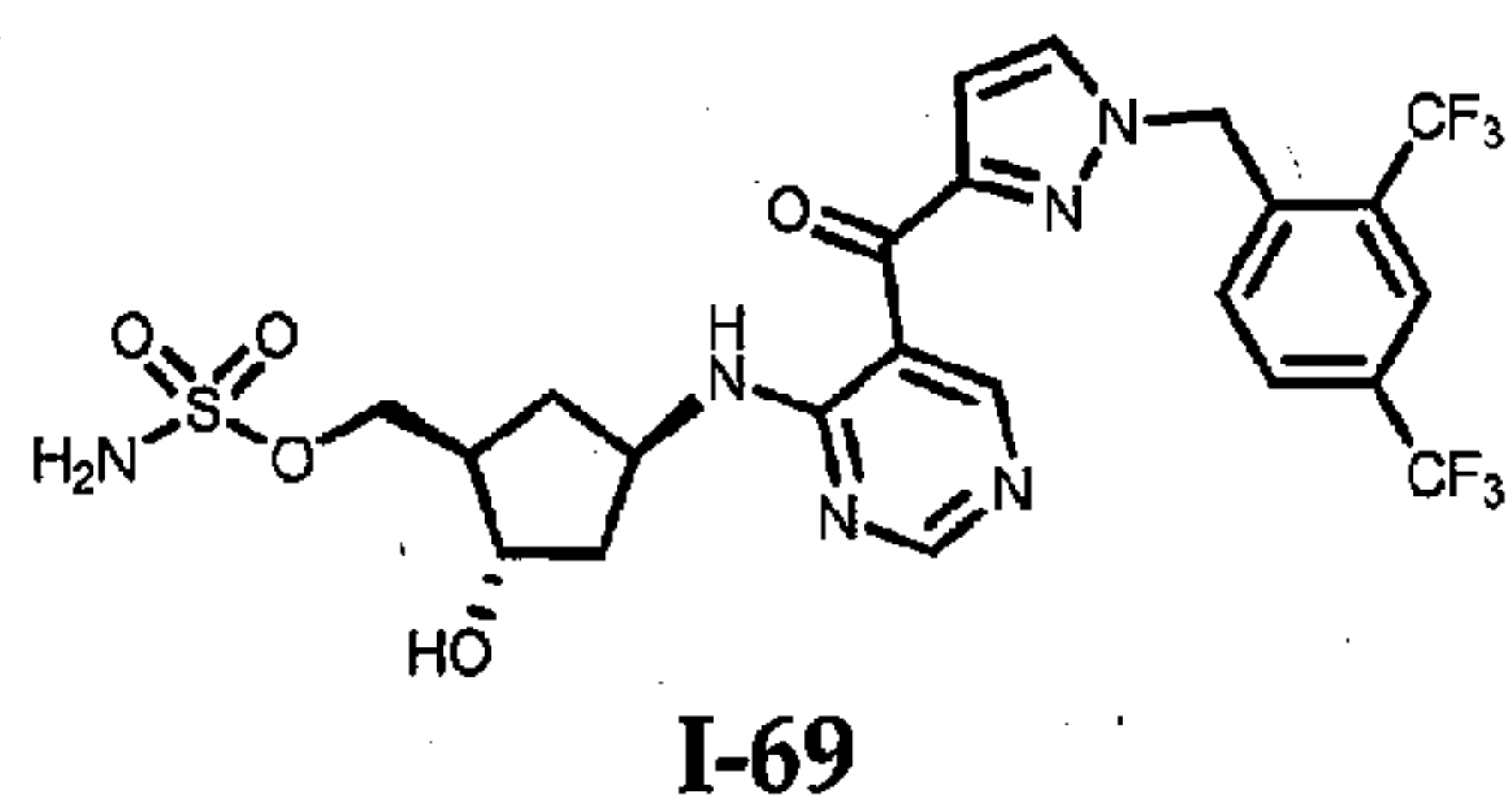
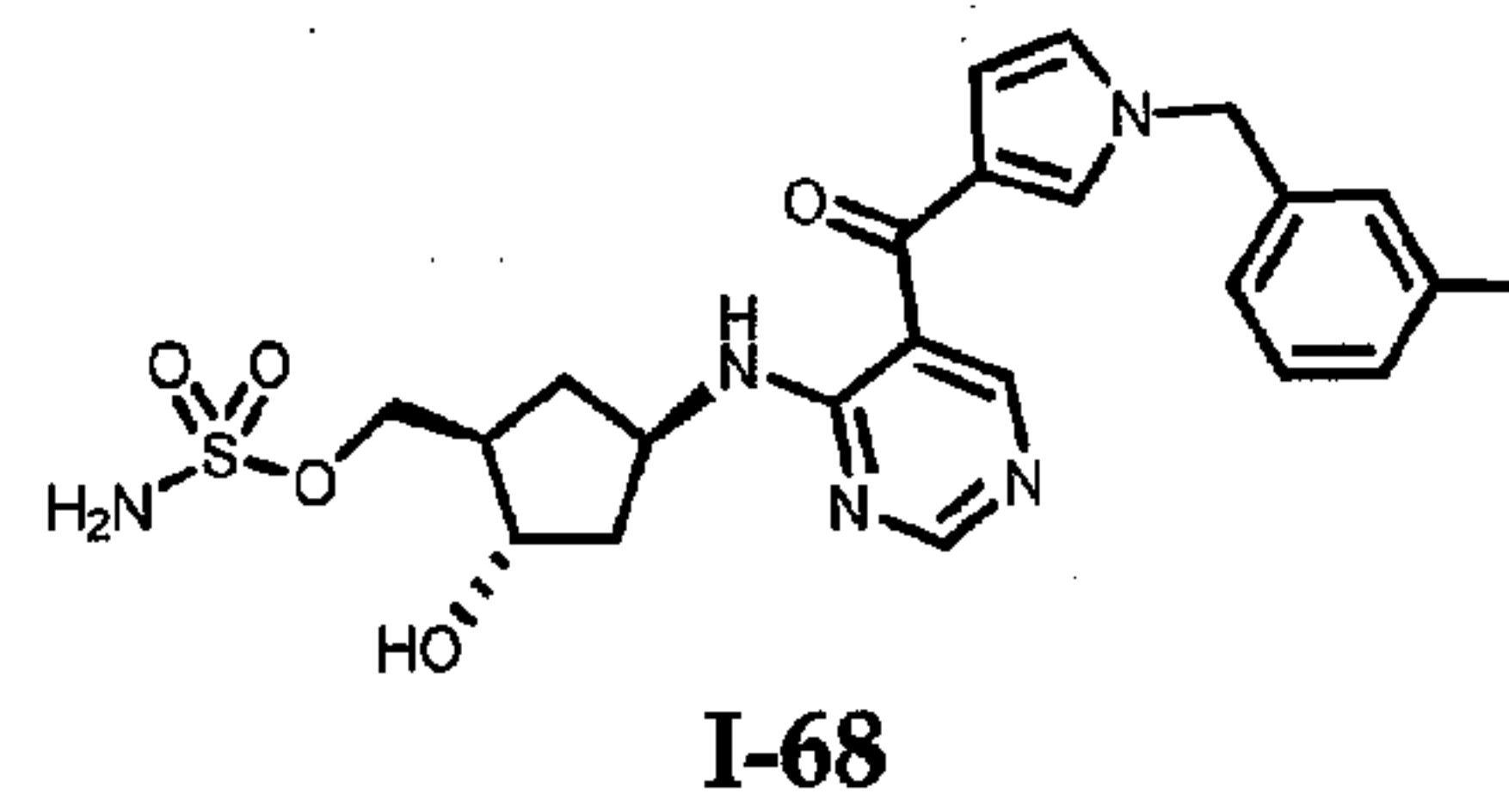
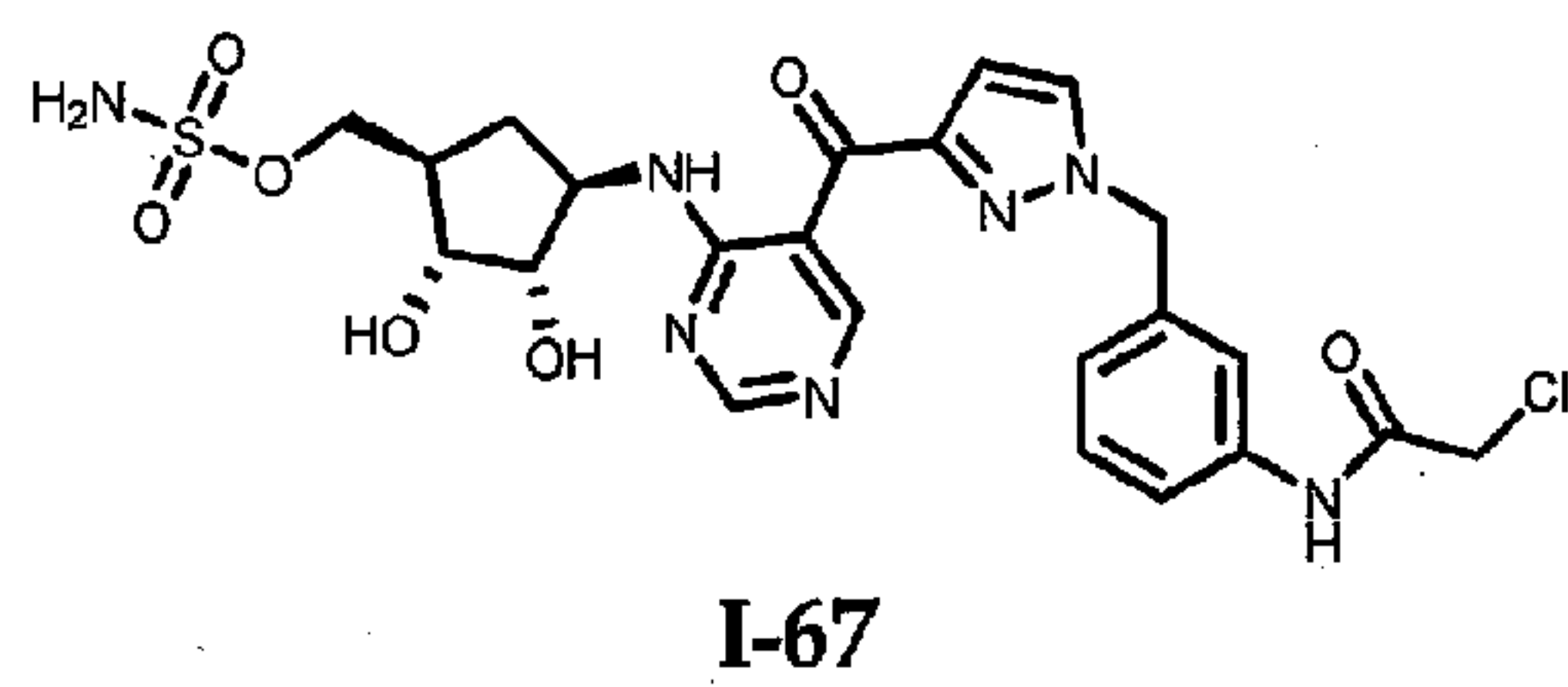
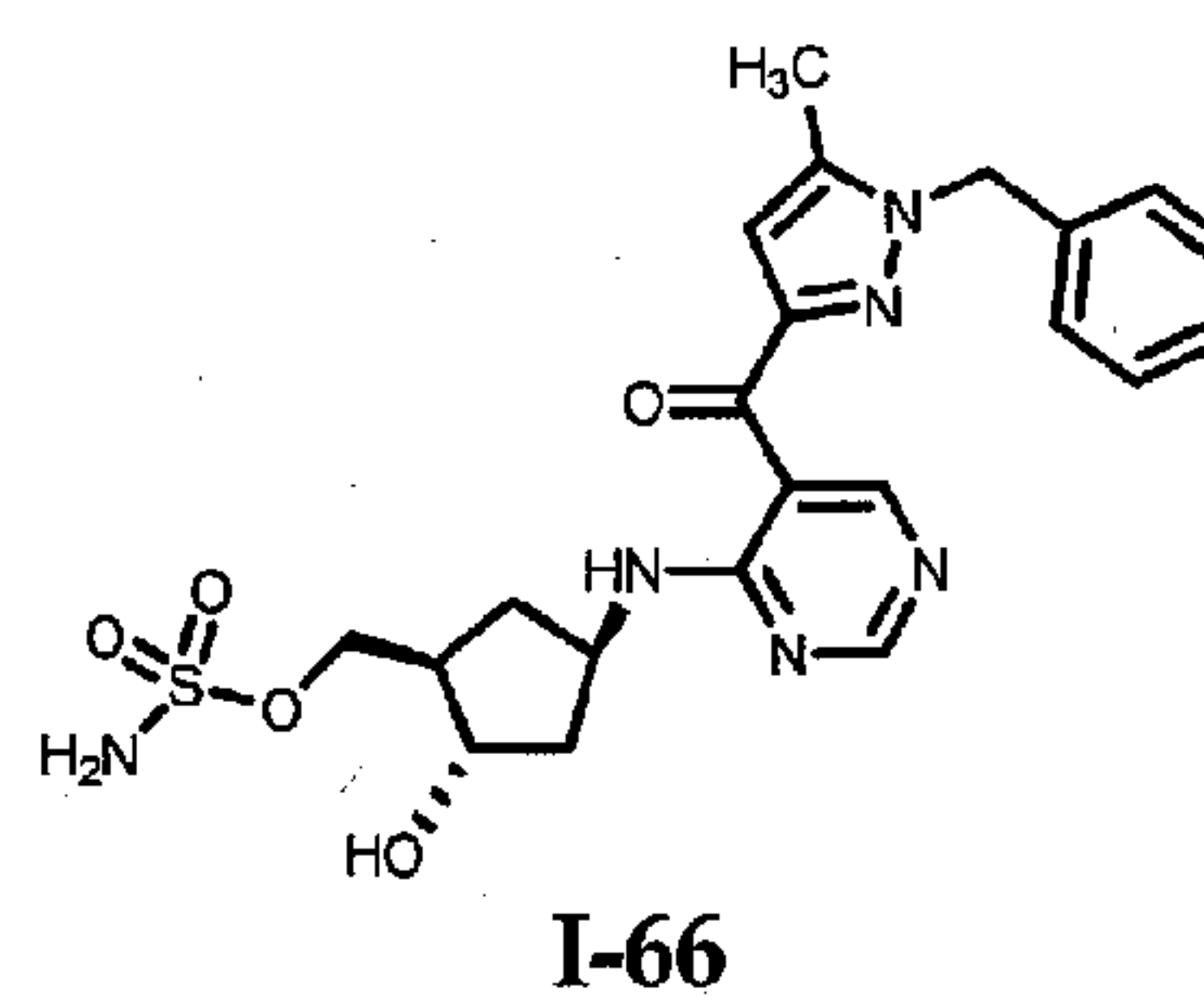
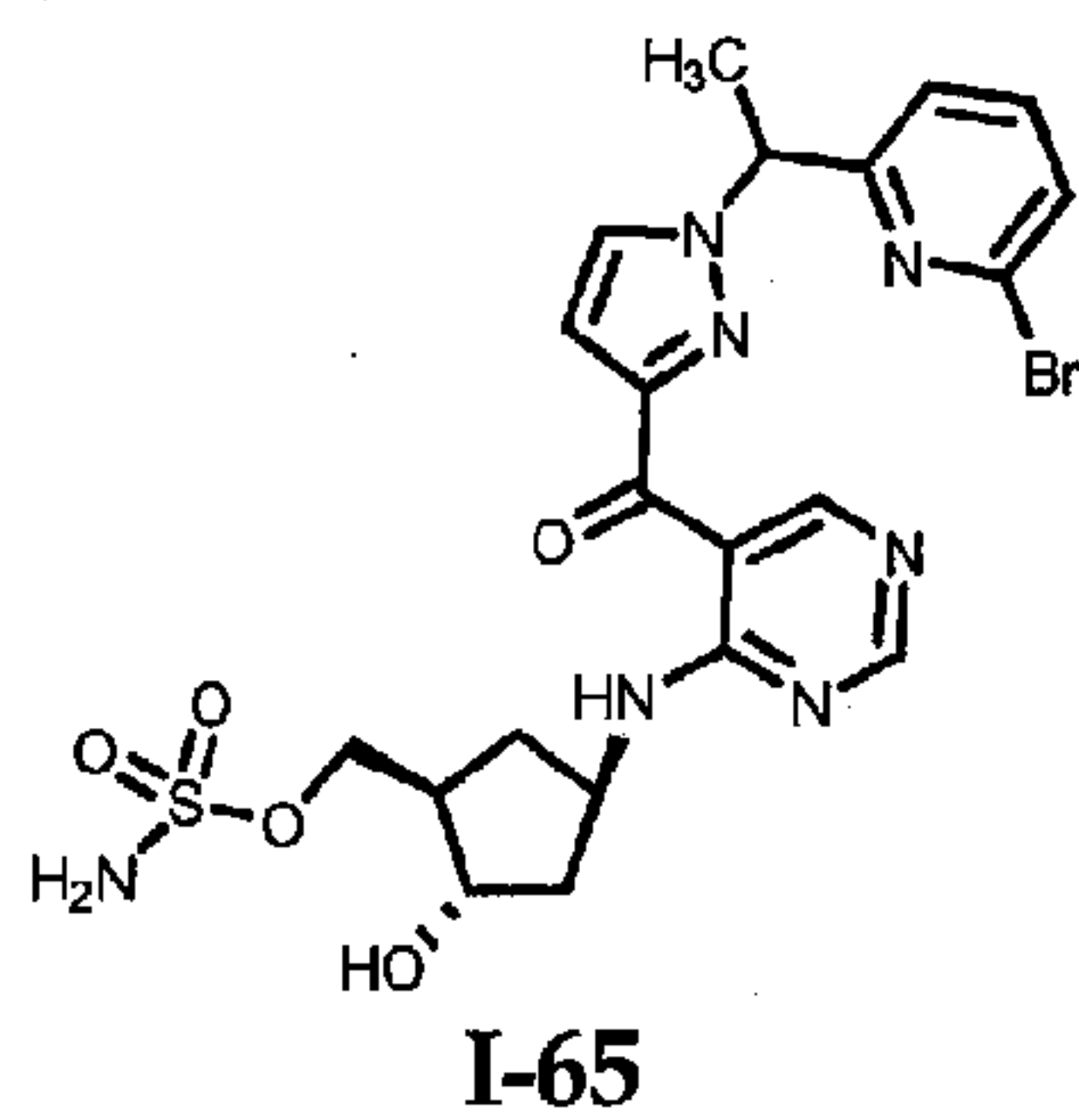
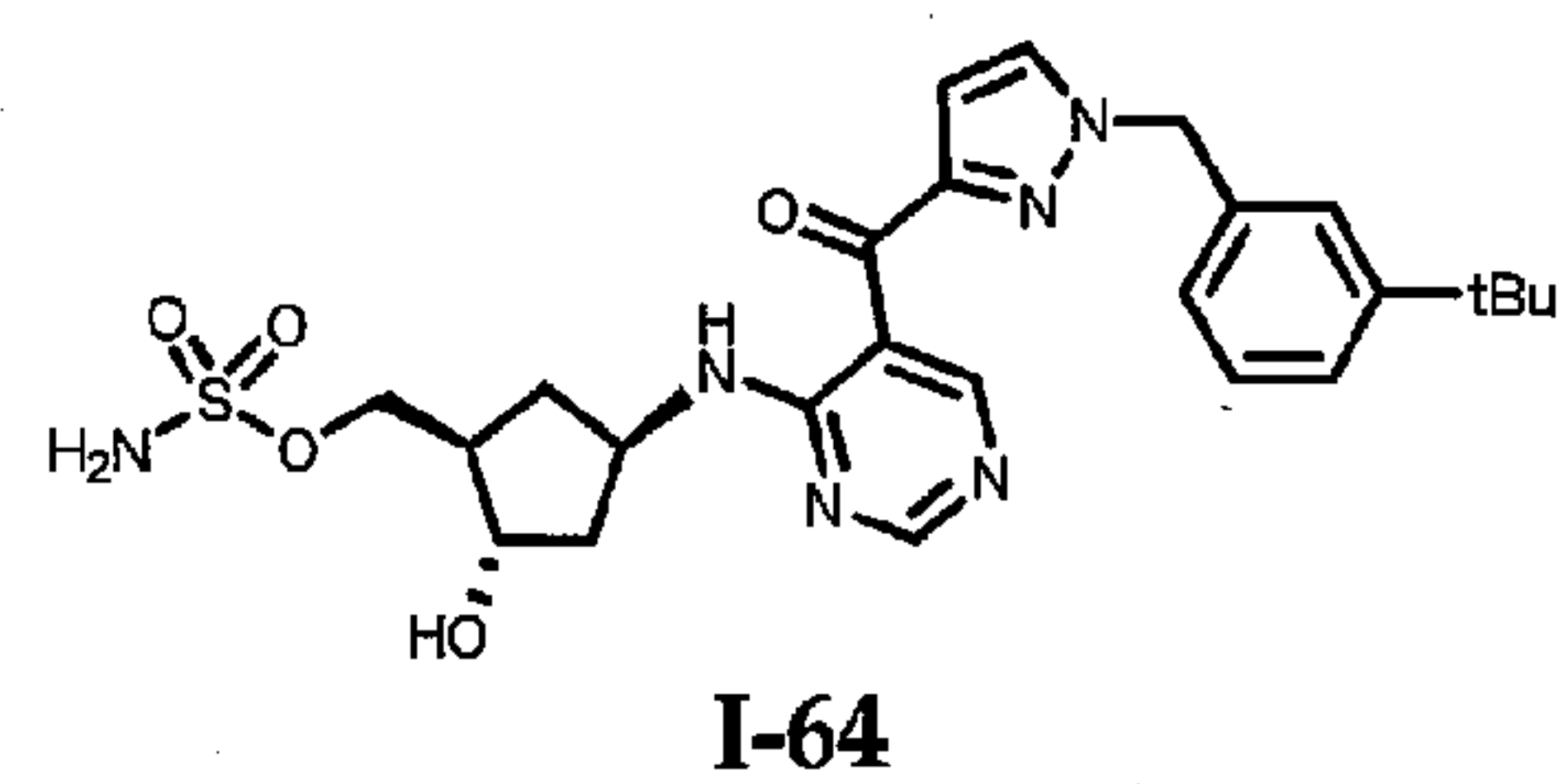
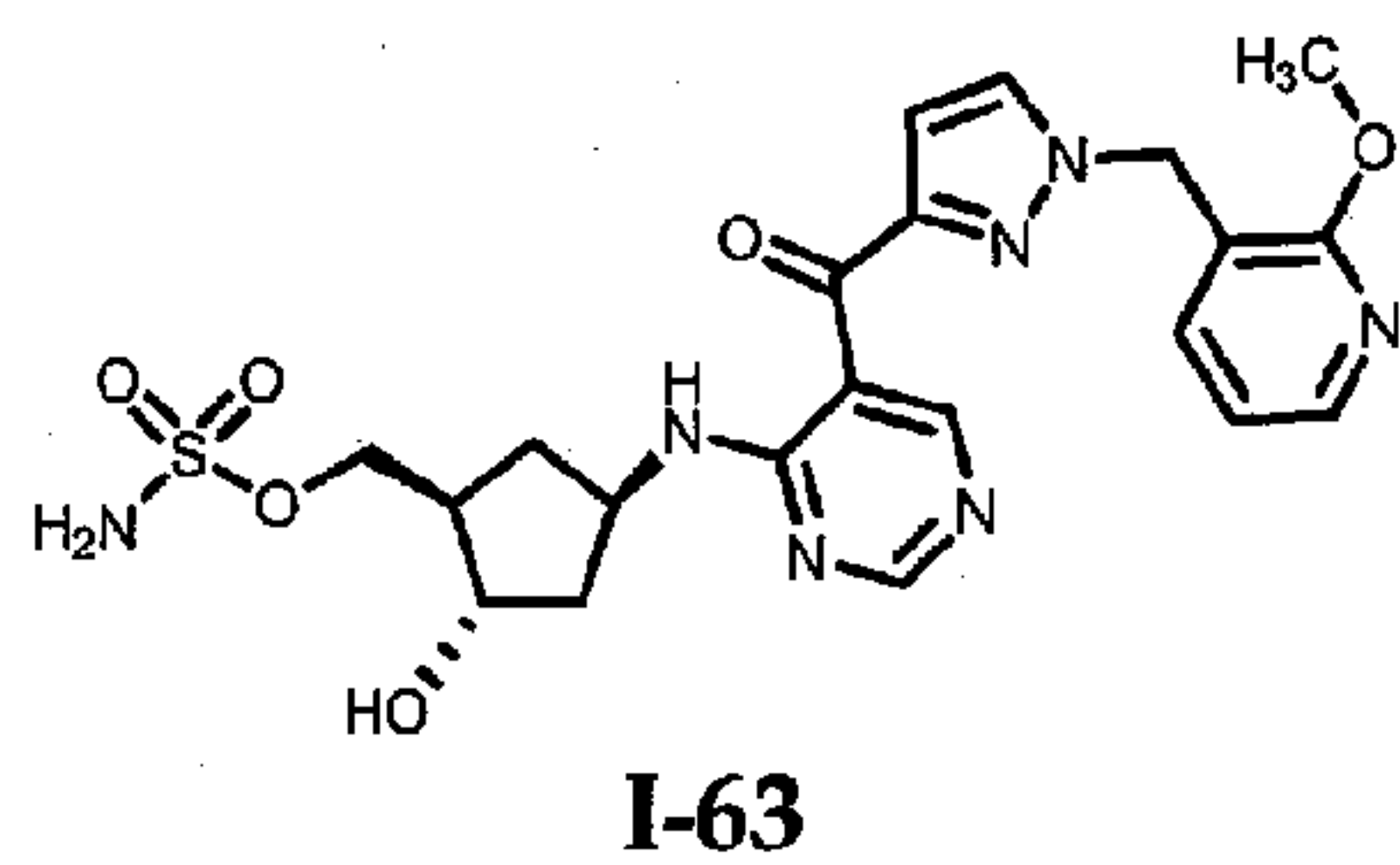
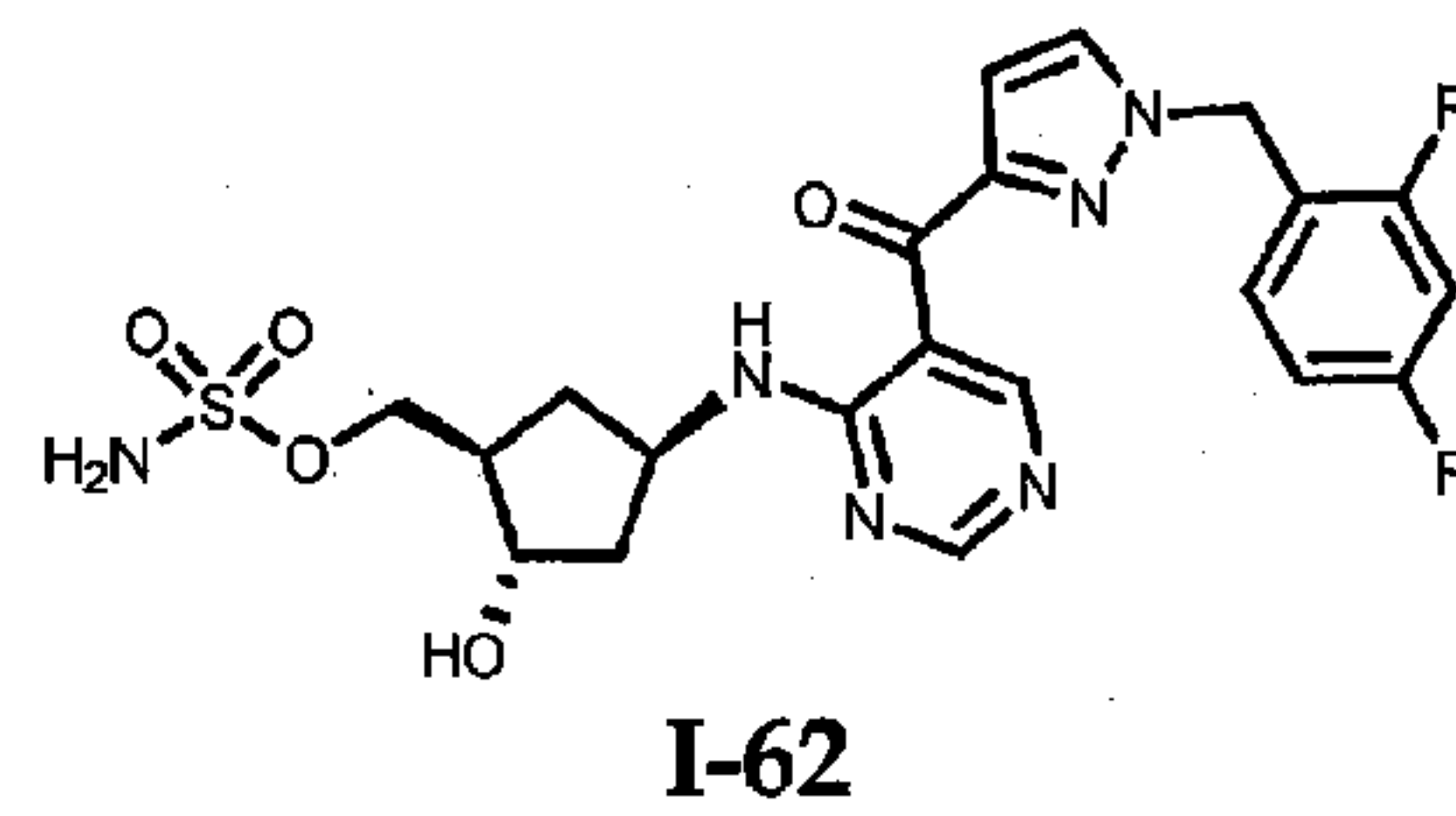
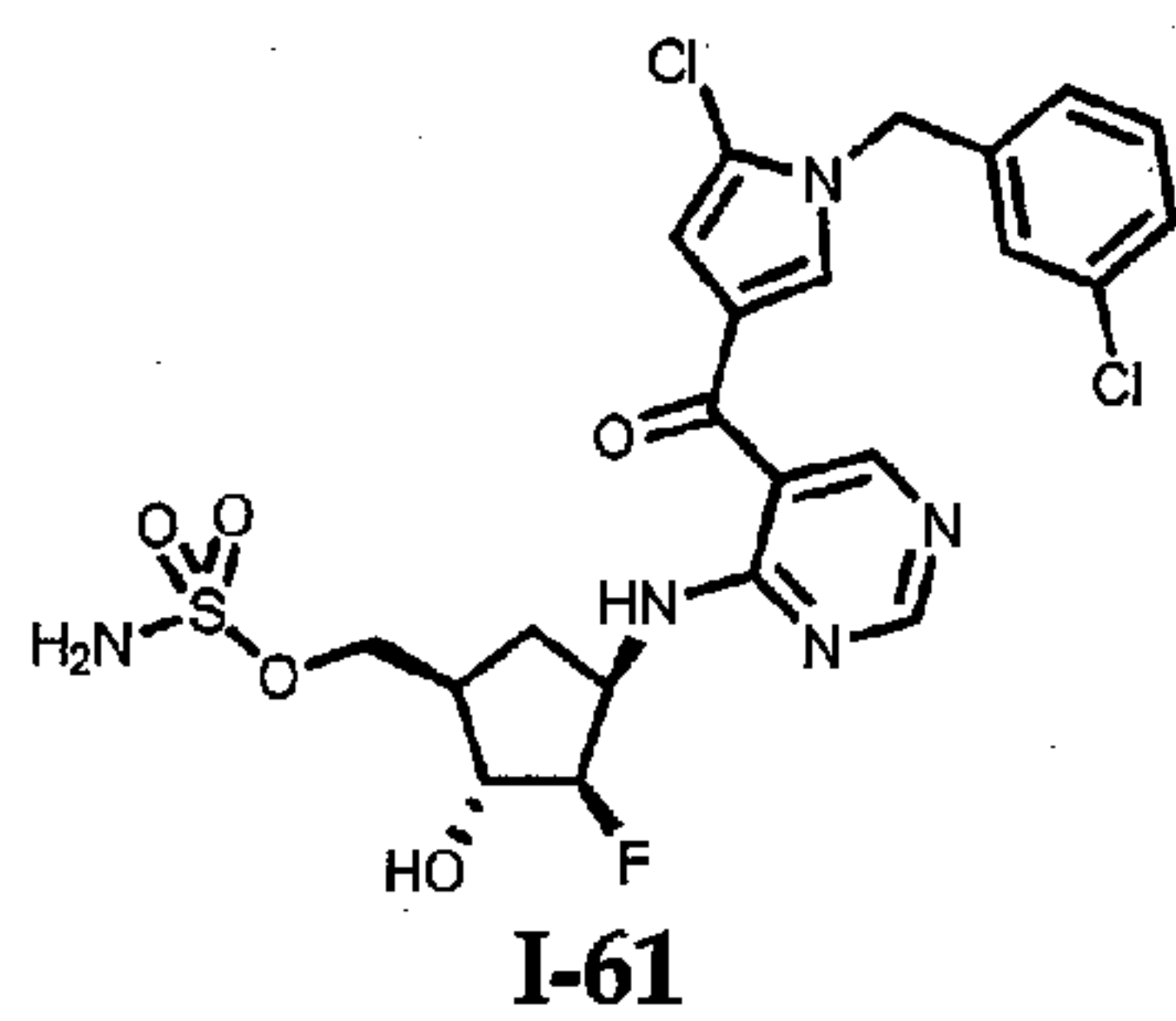
I-24

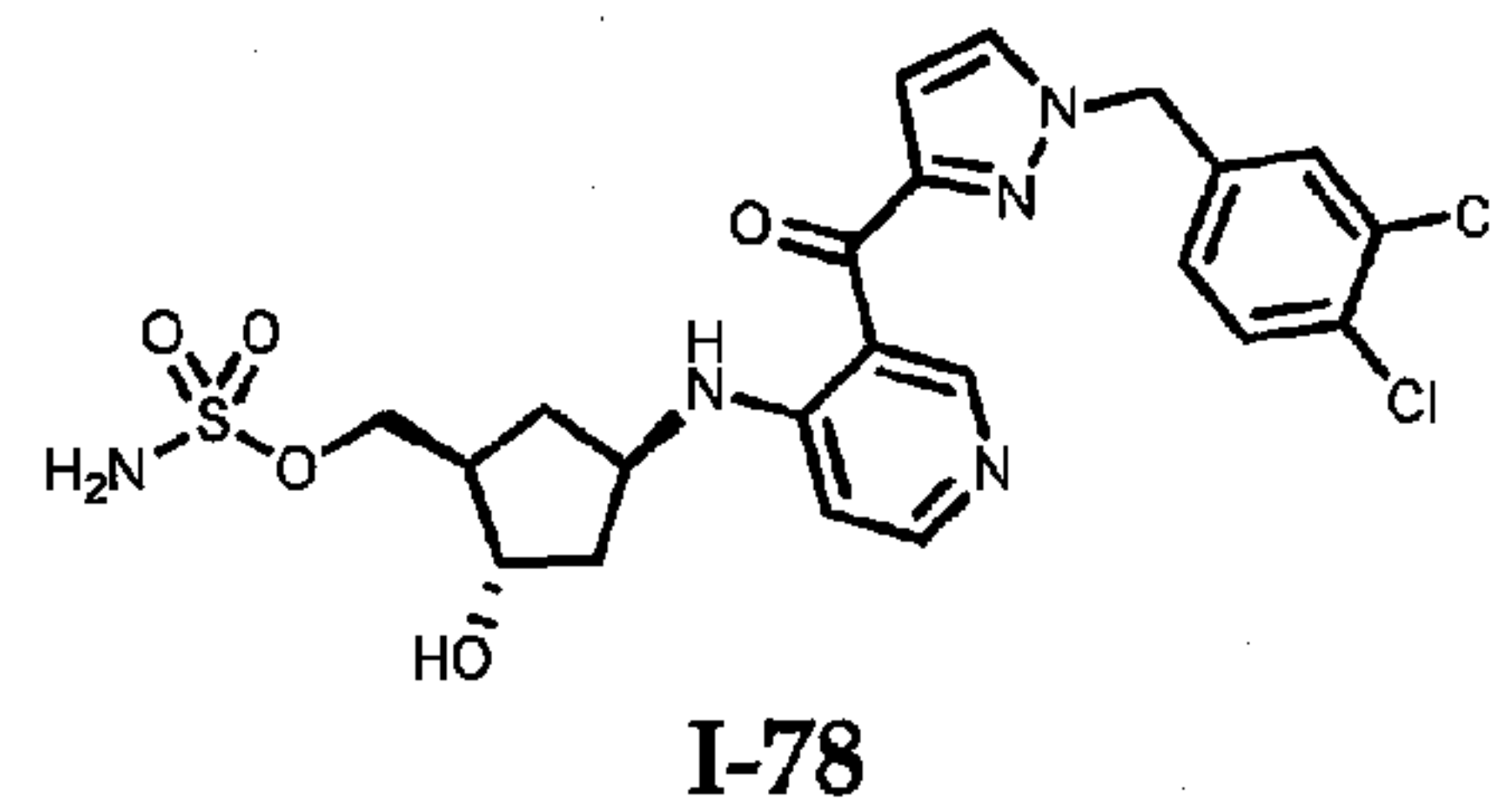
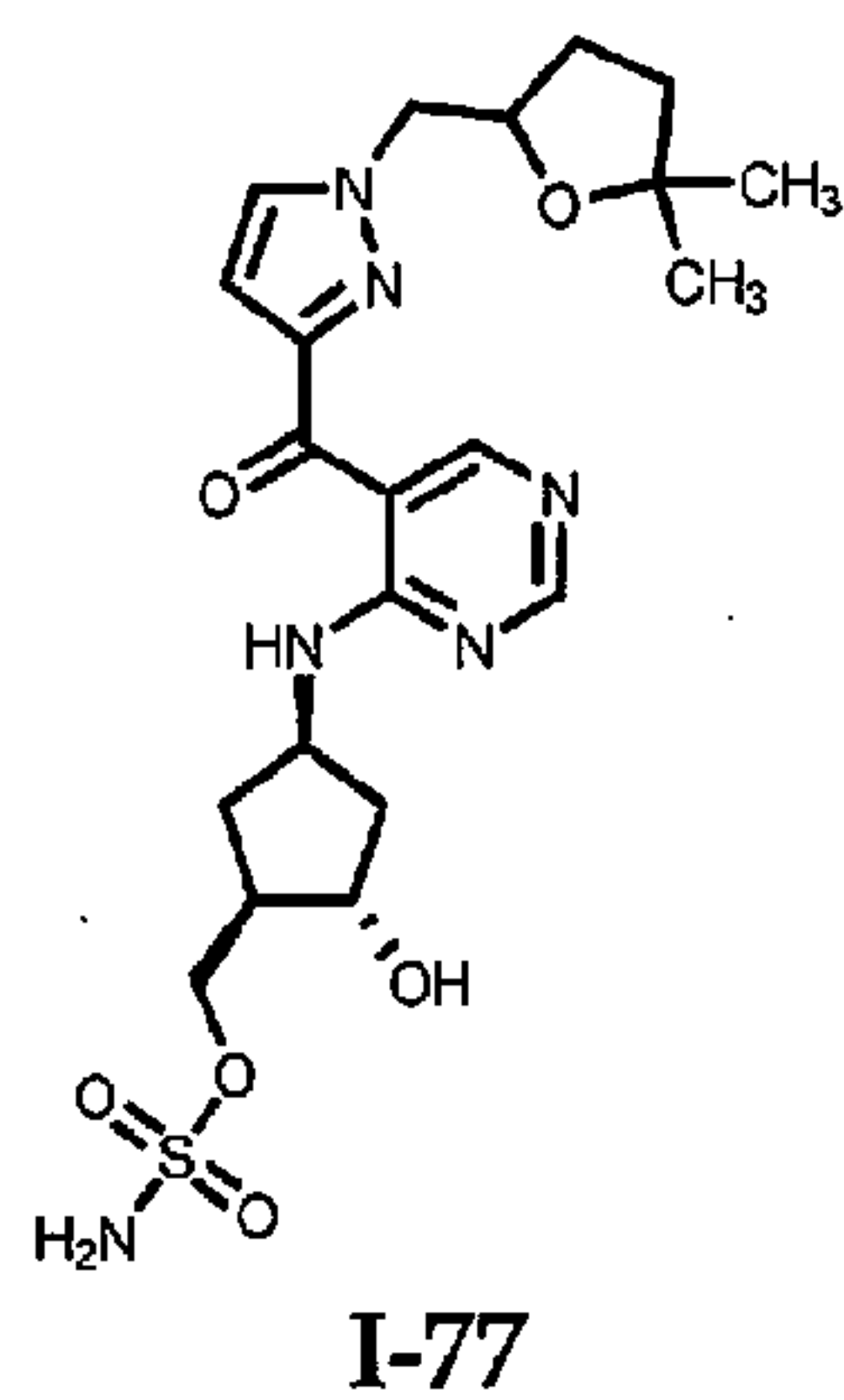
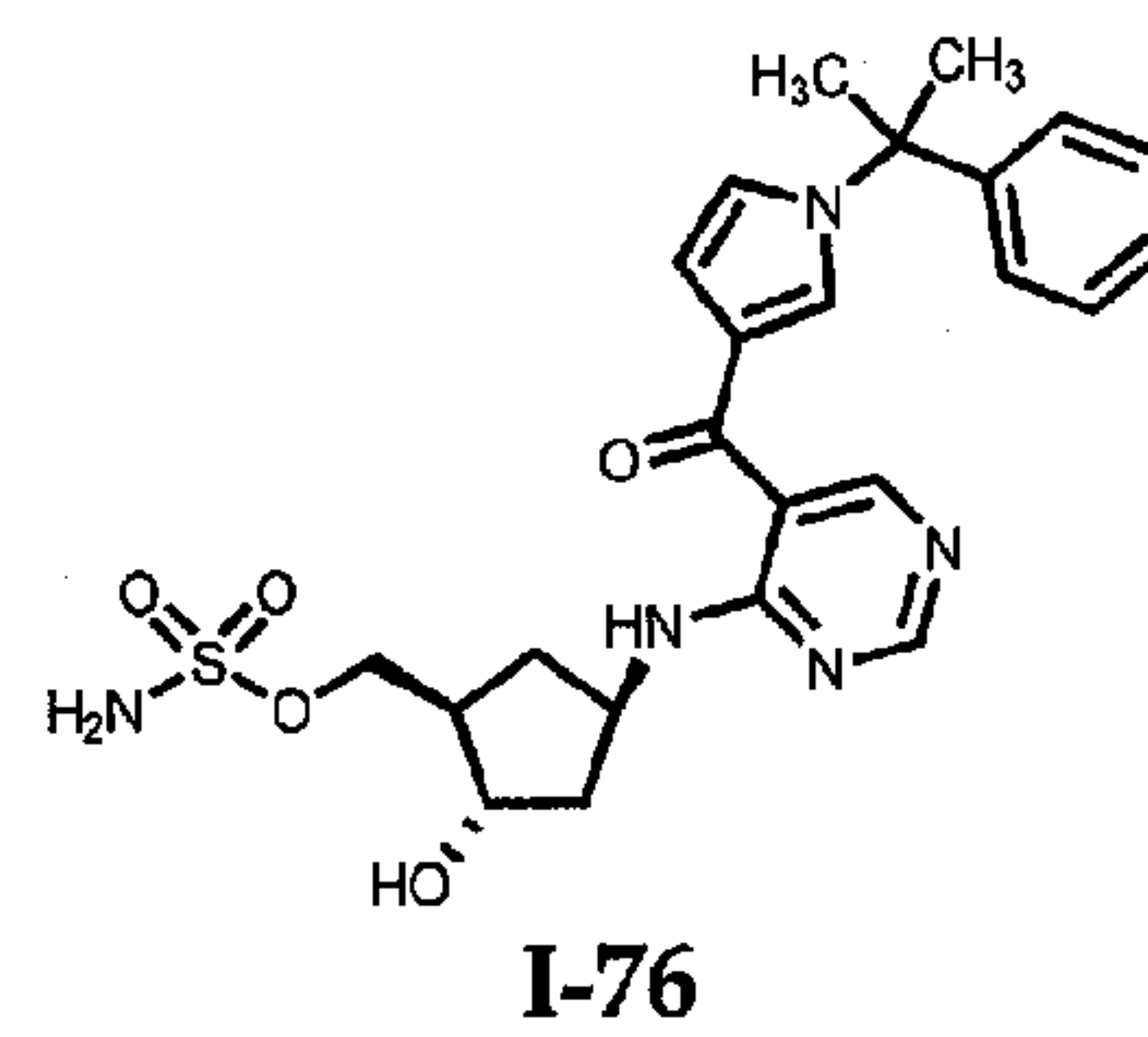
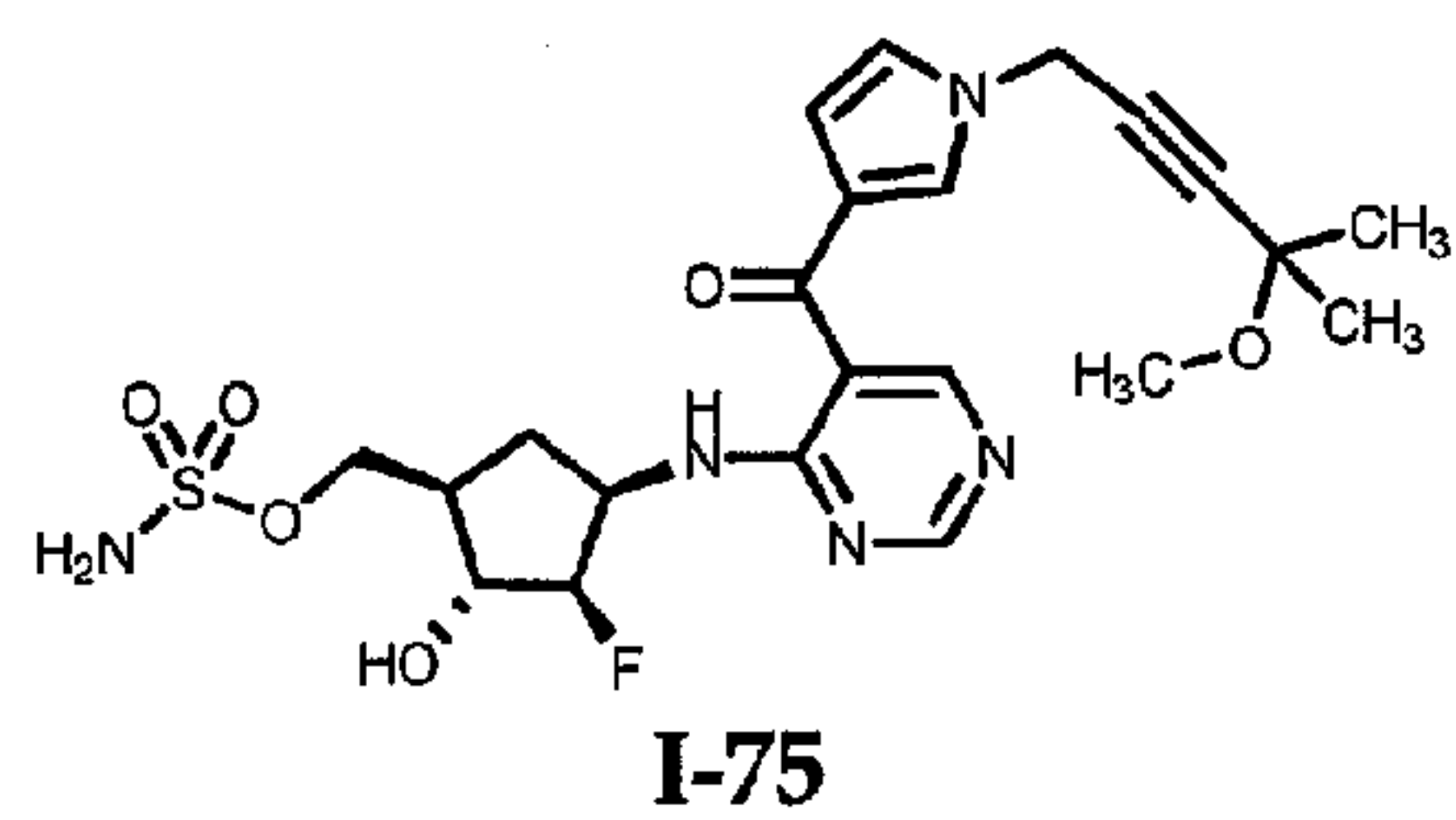
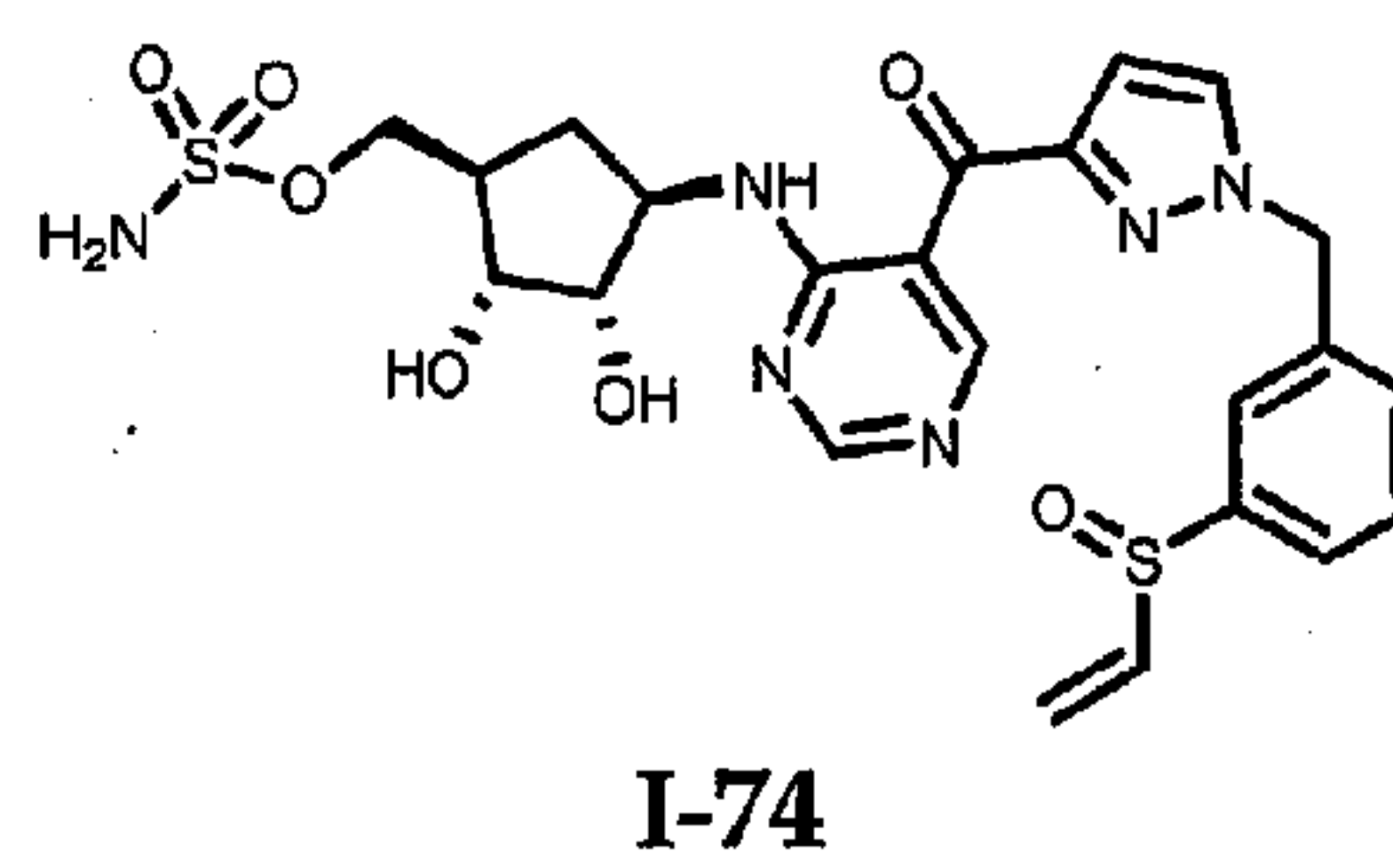
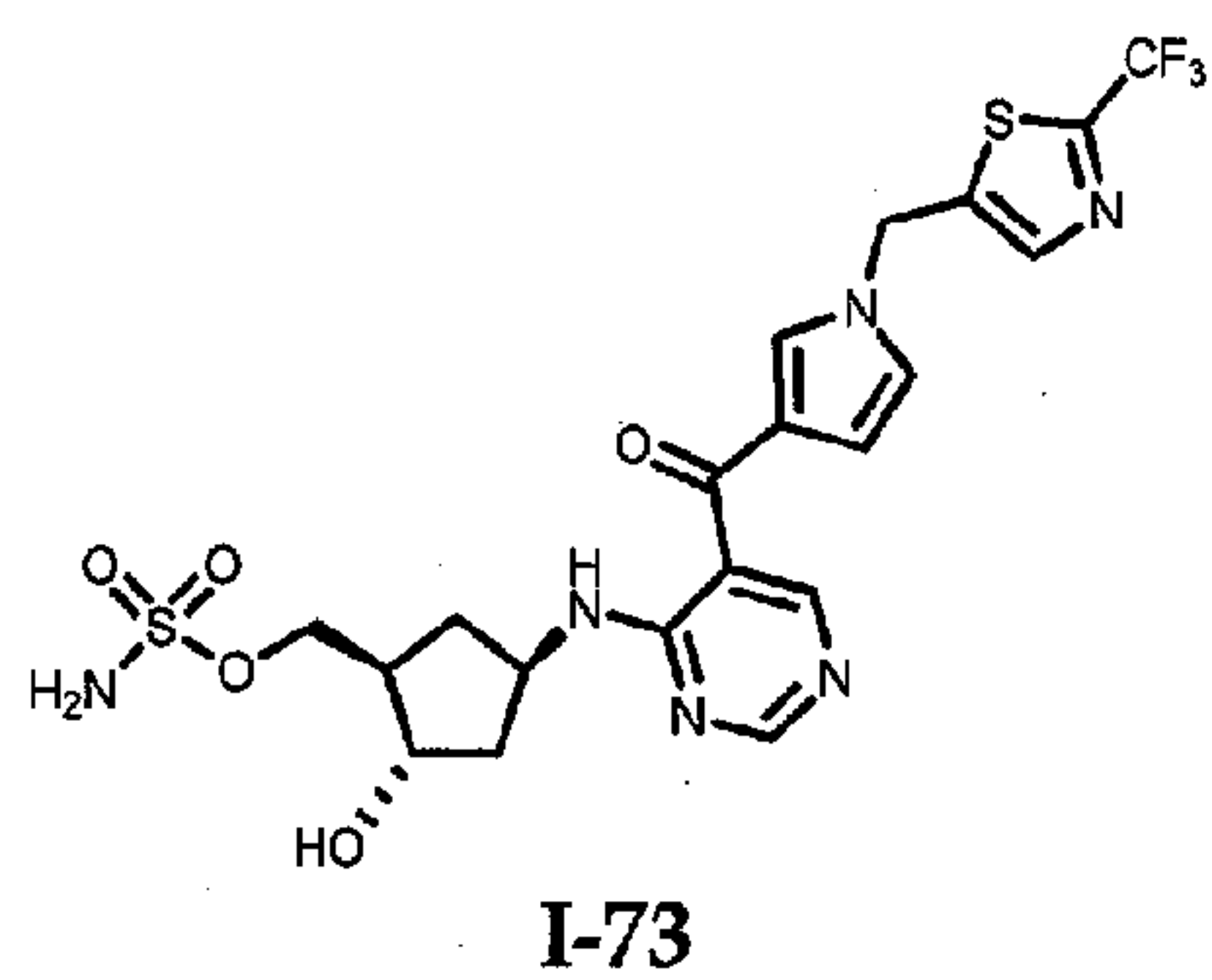
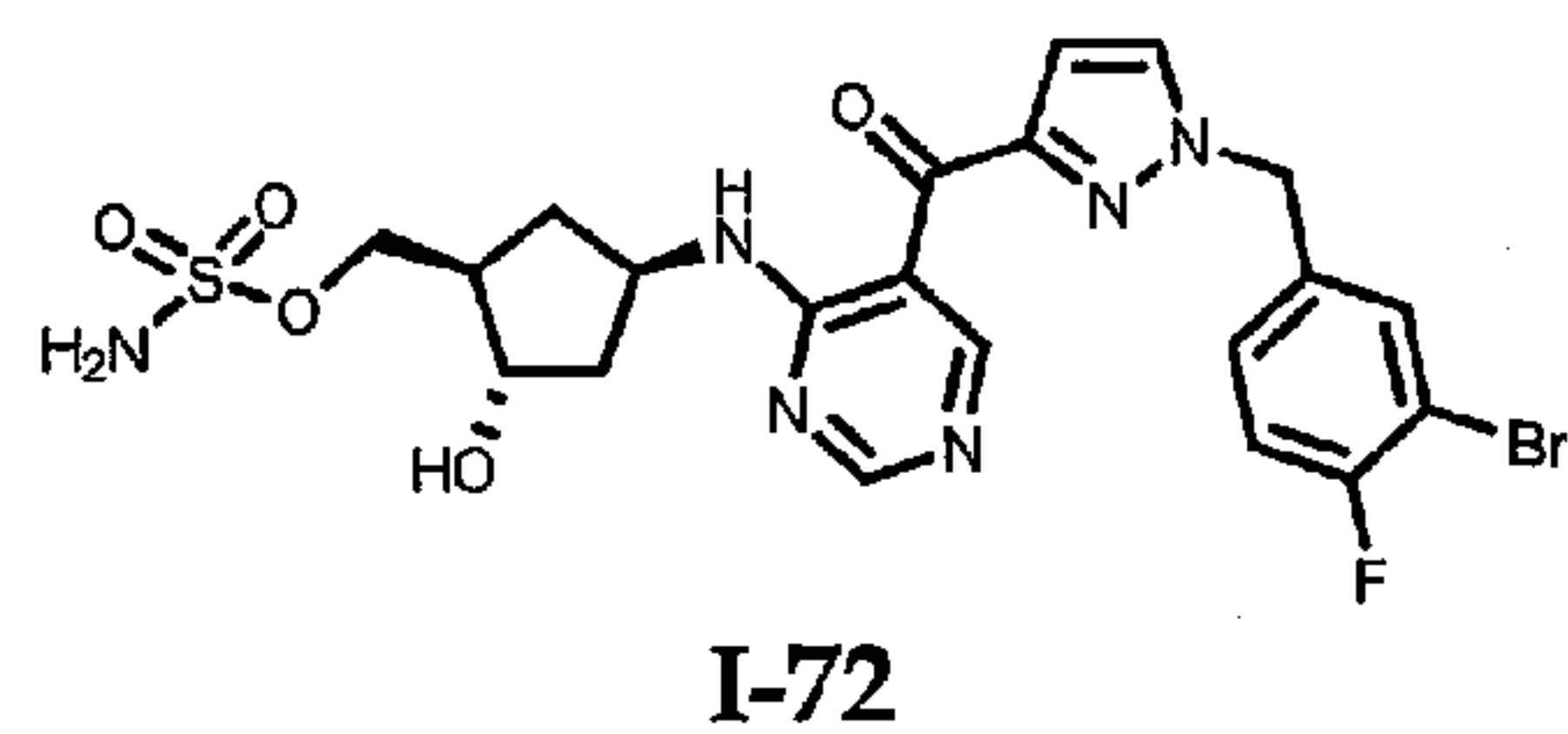
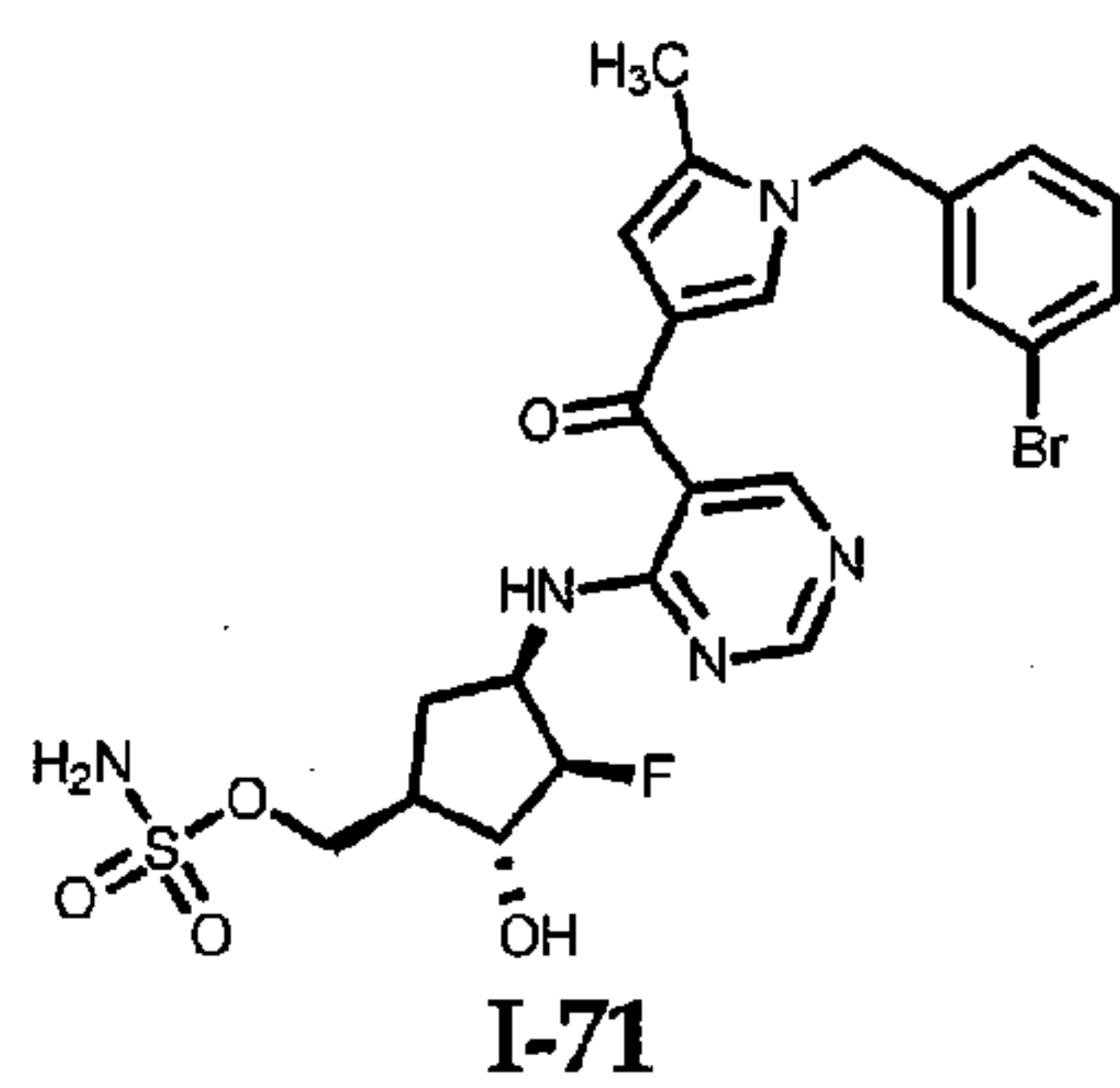


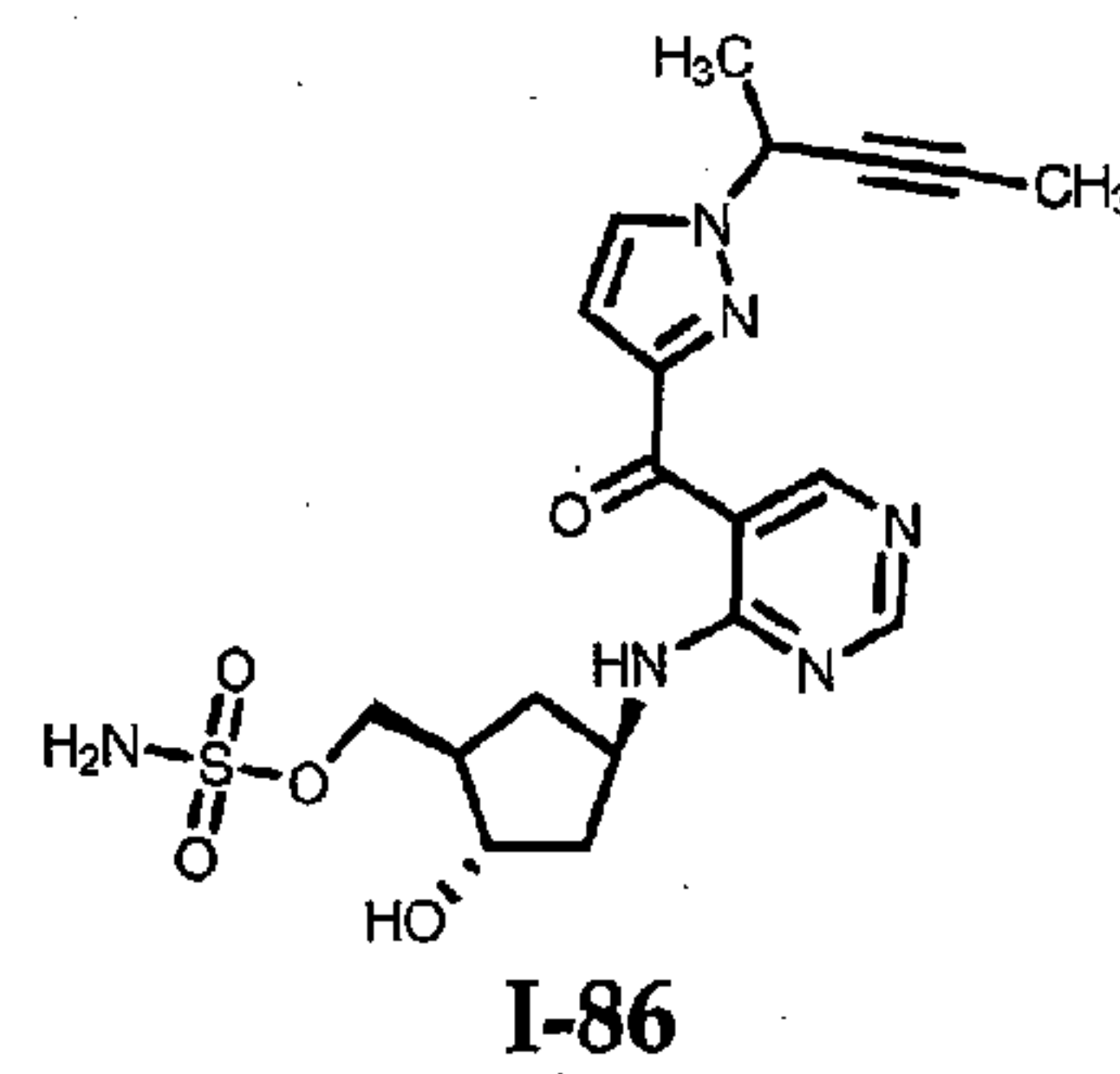
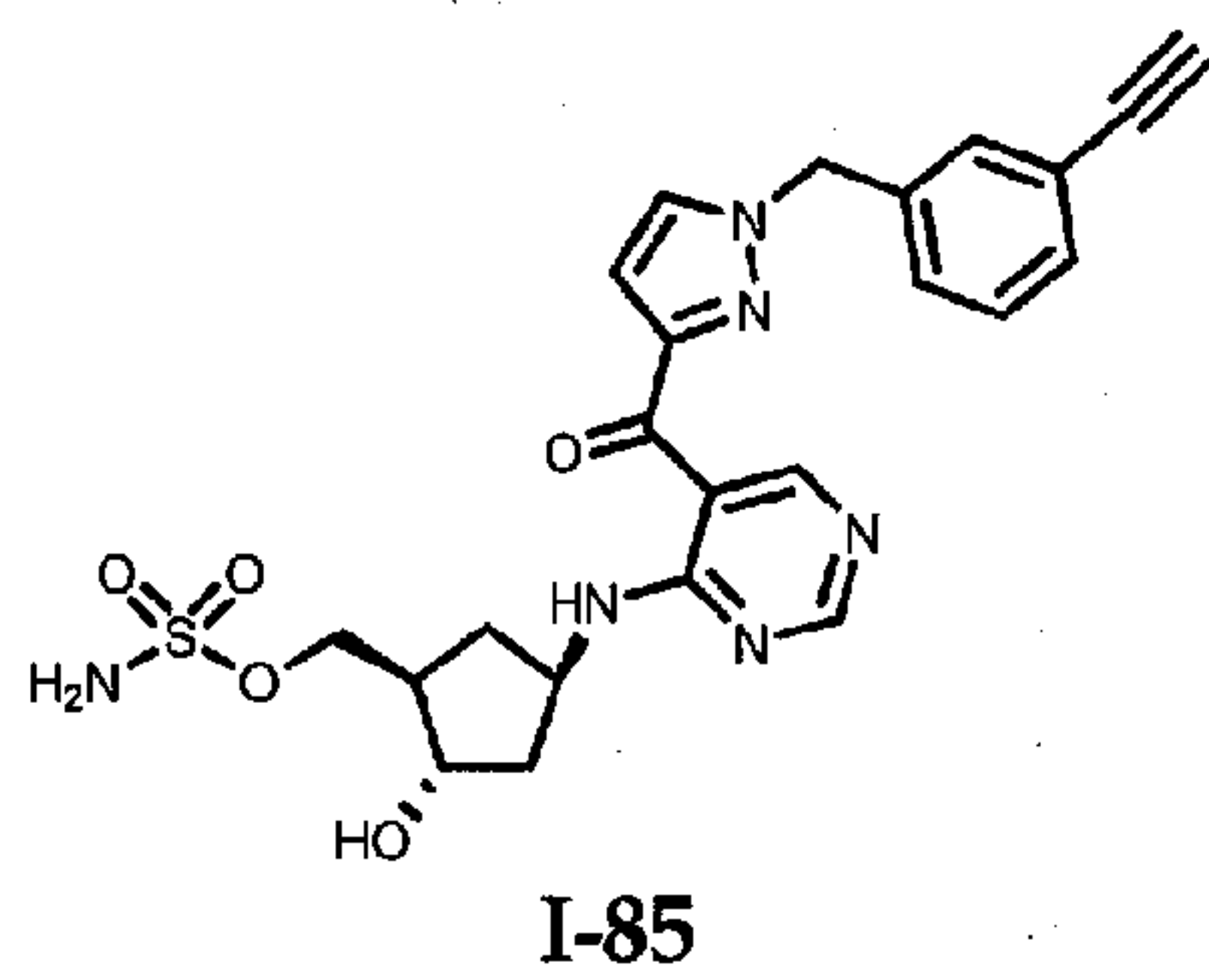
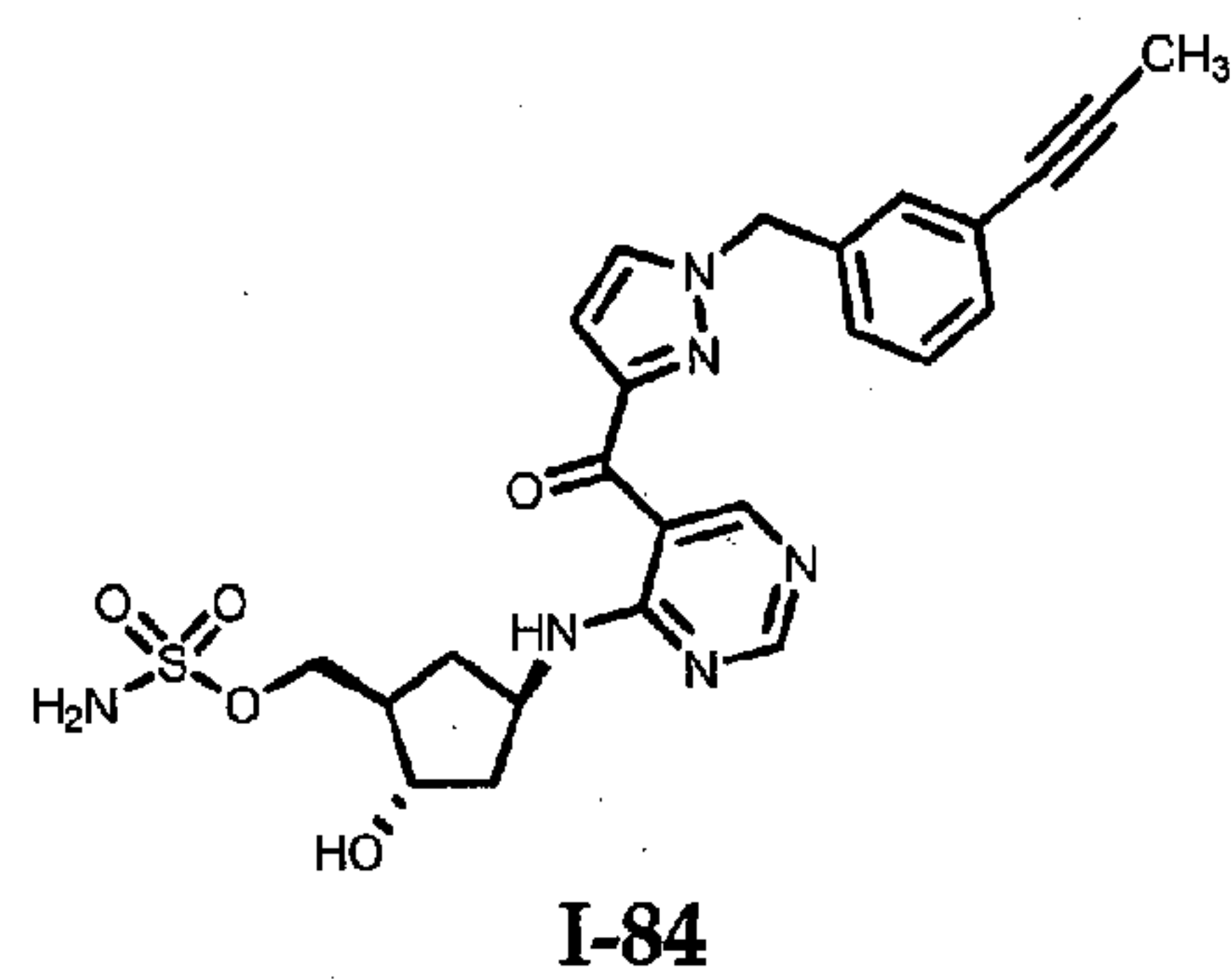
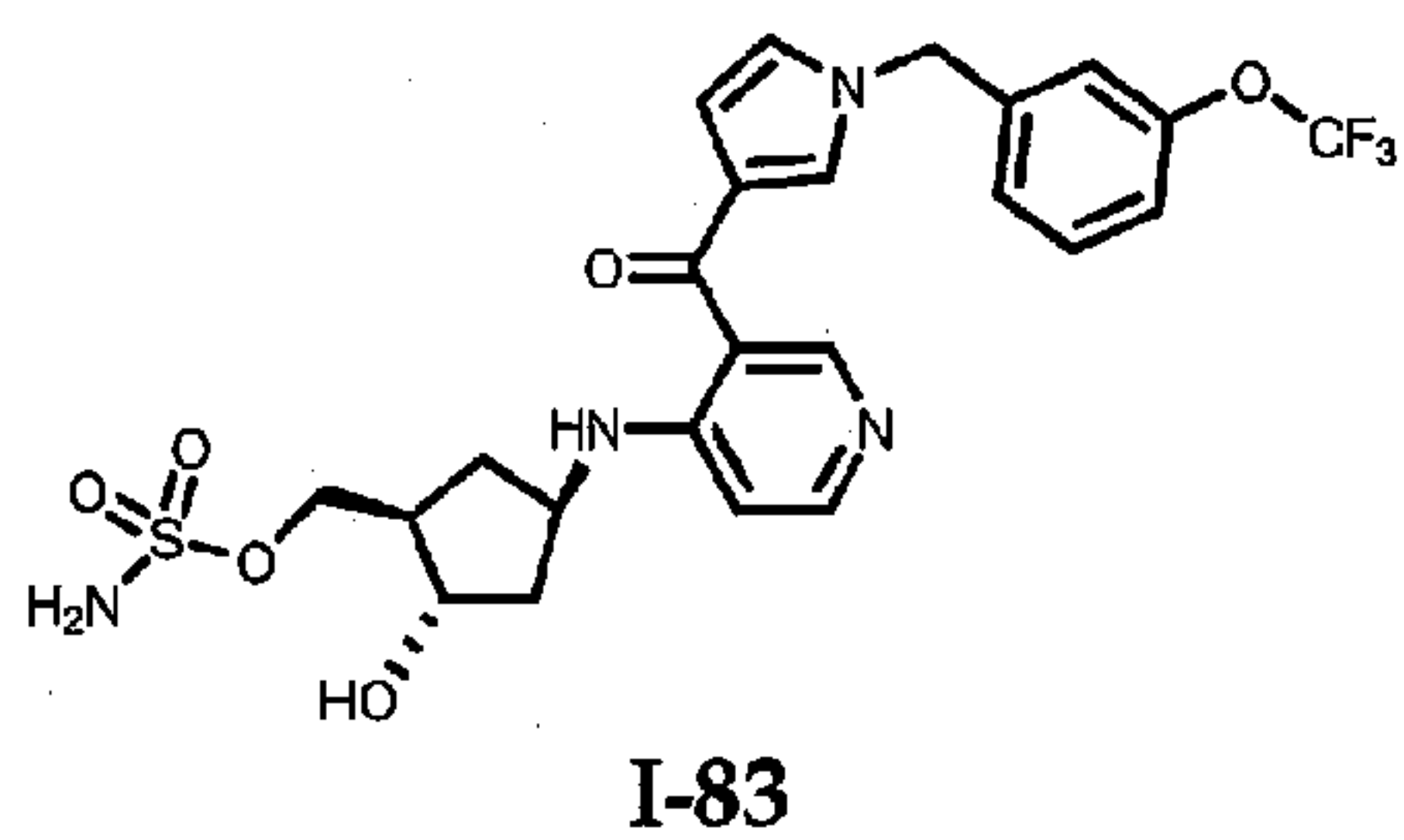
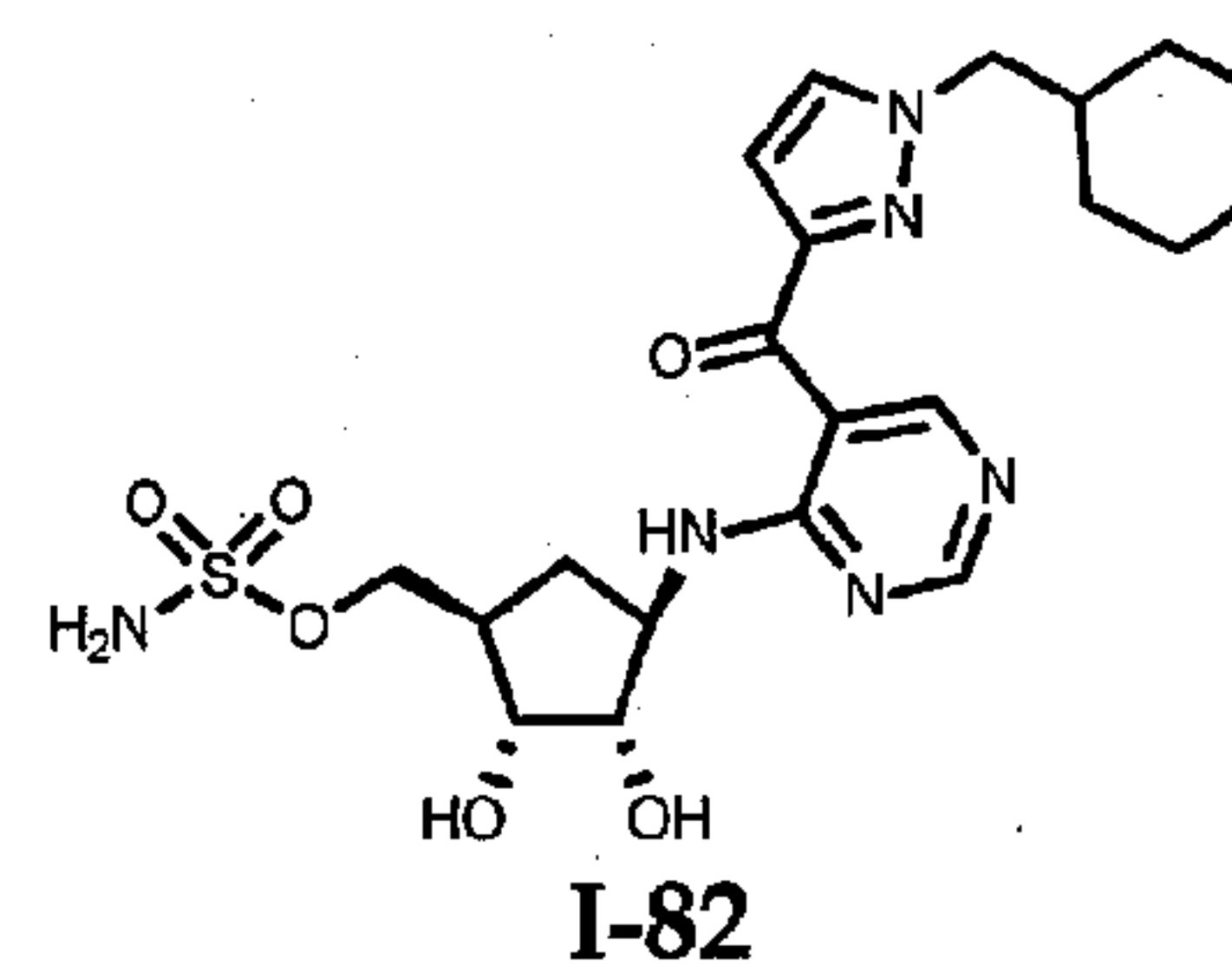
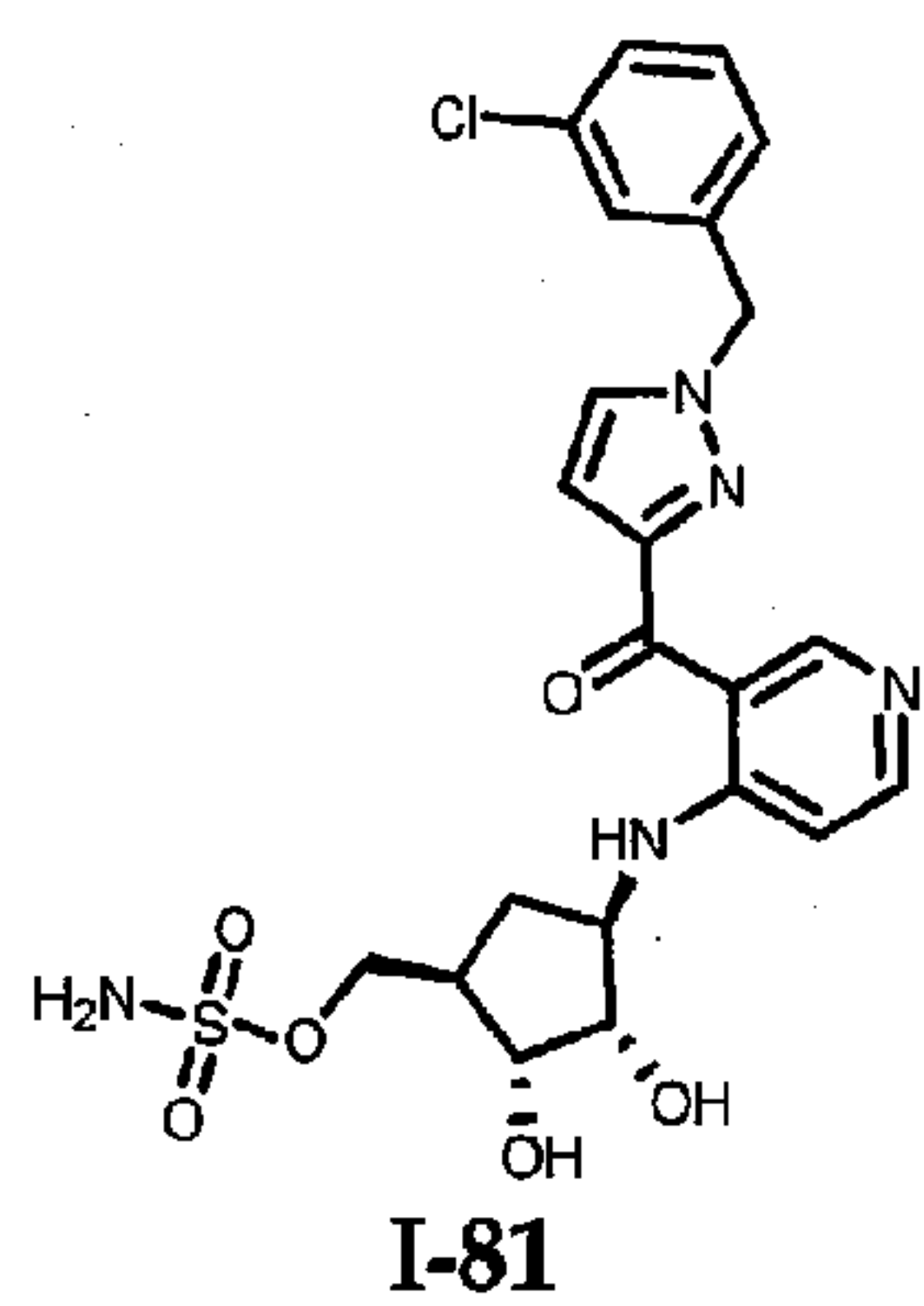
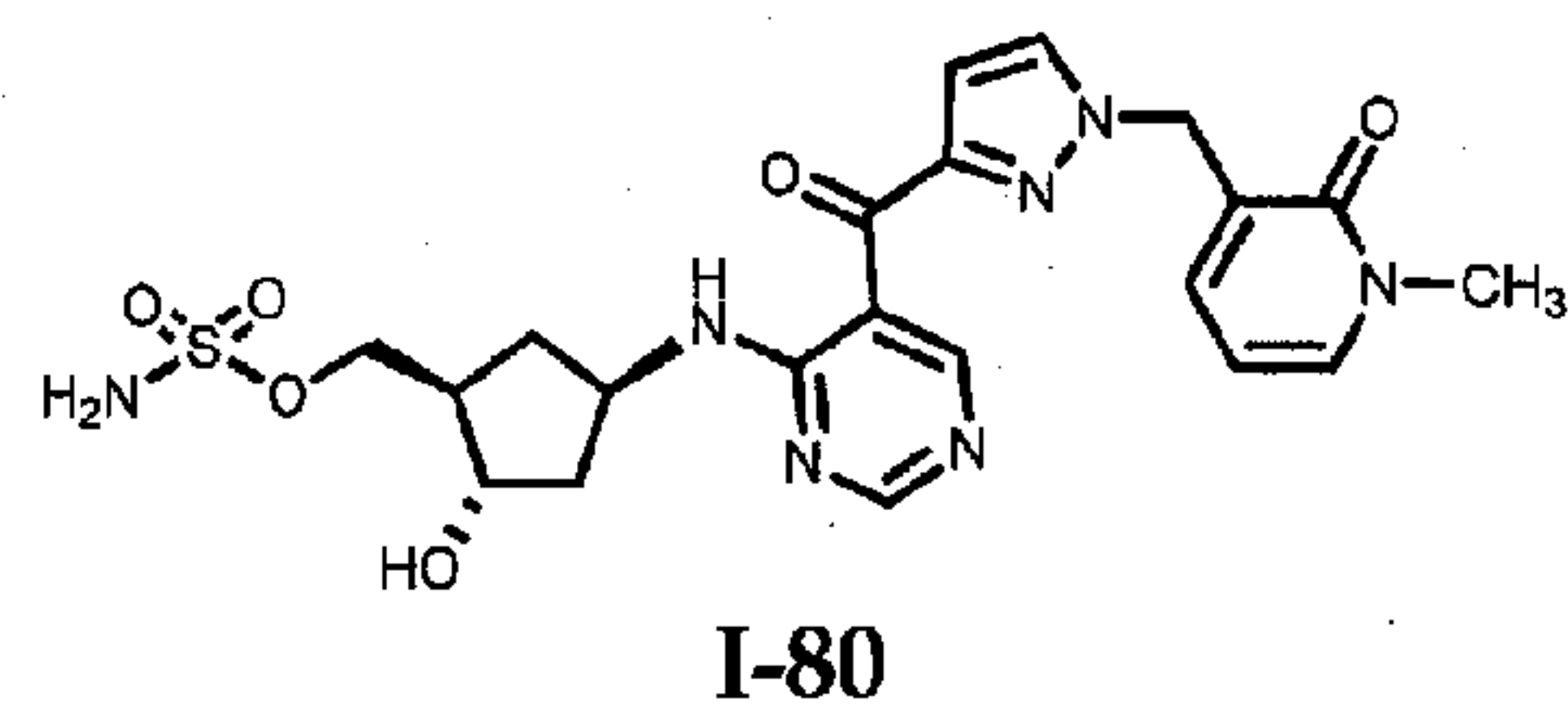
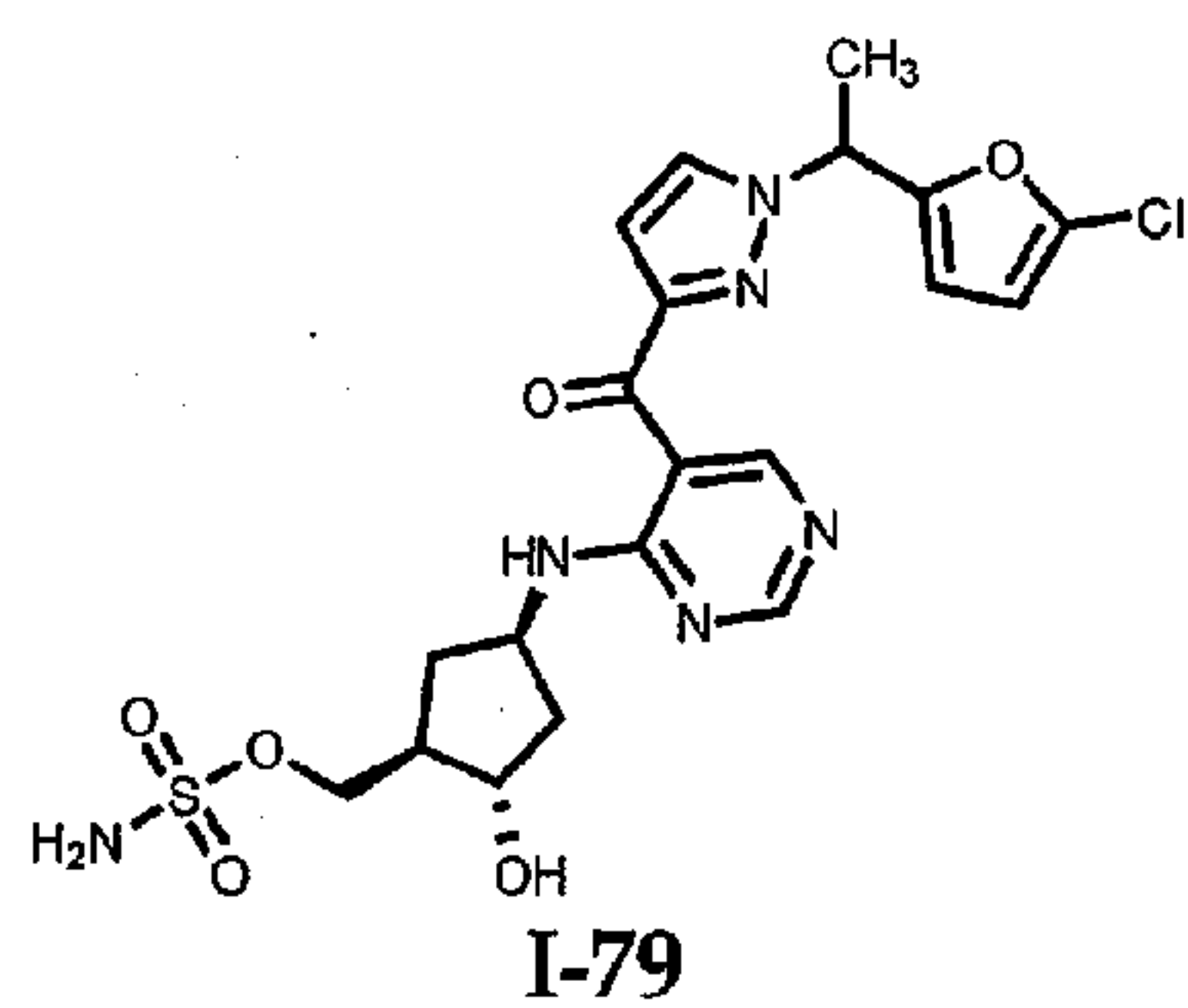


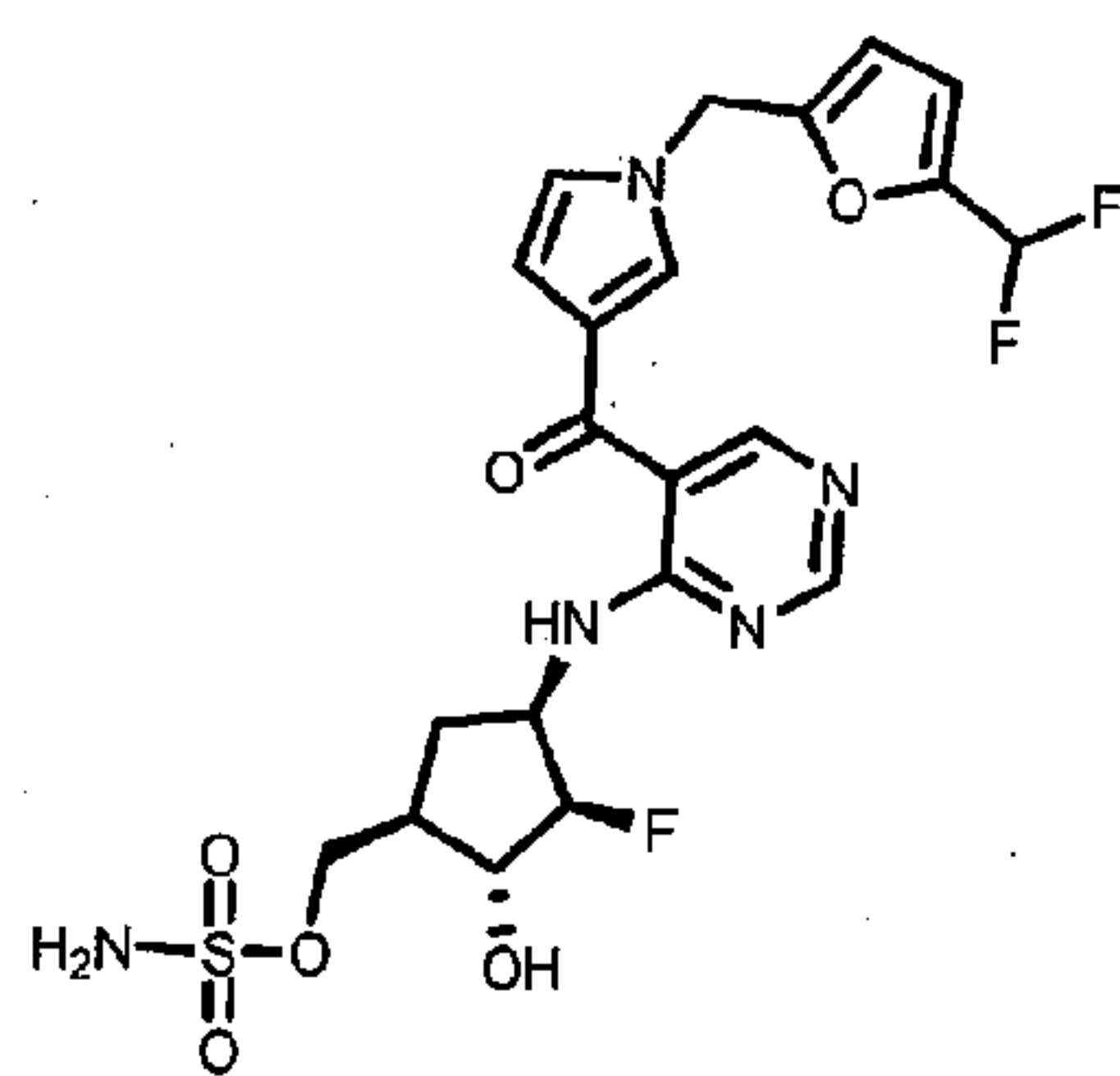
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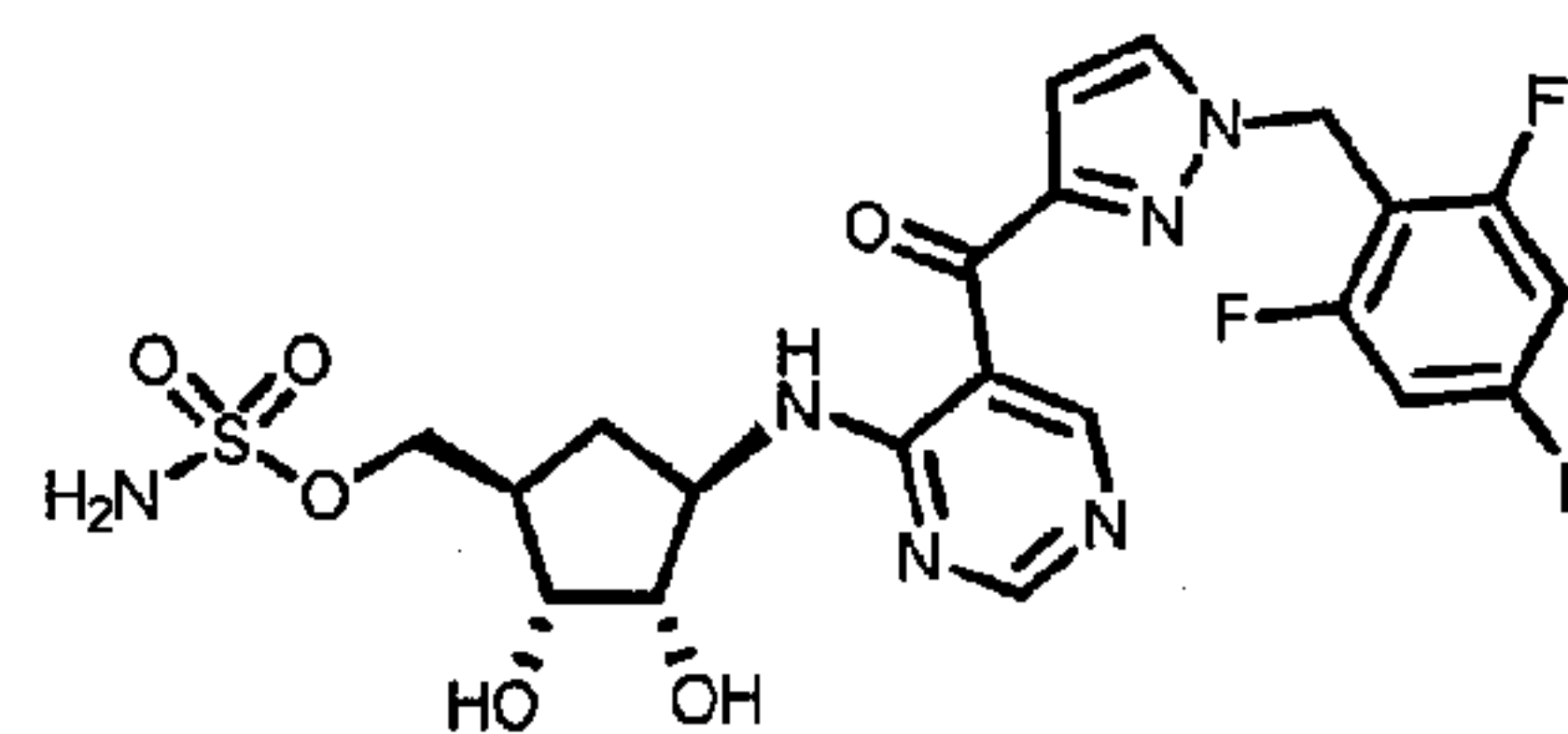




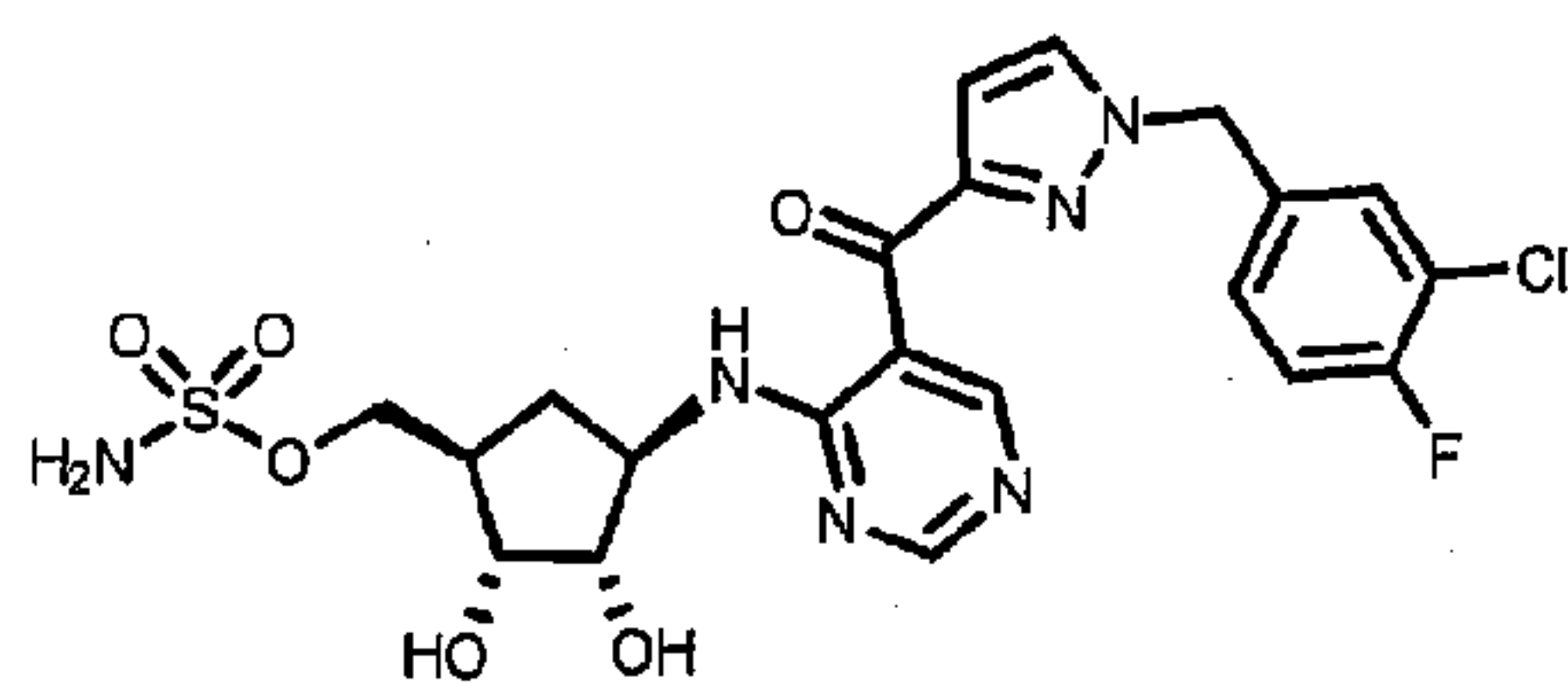




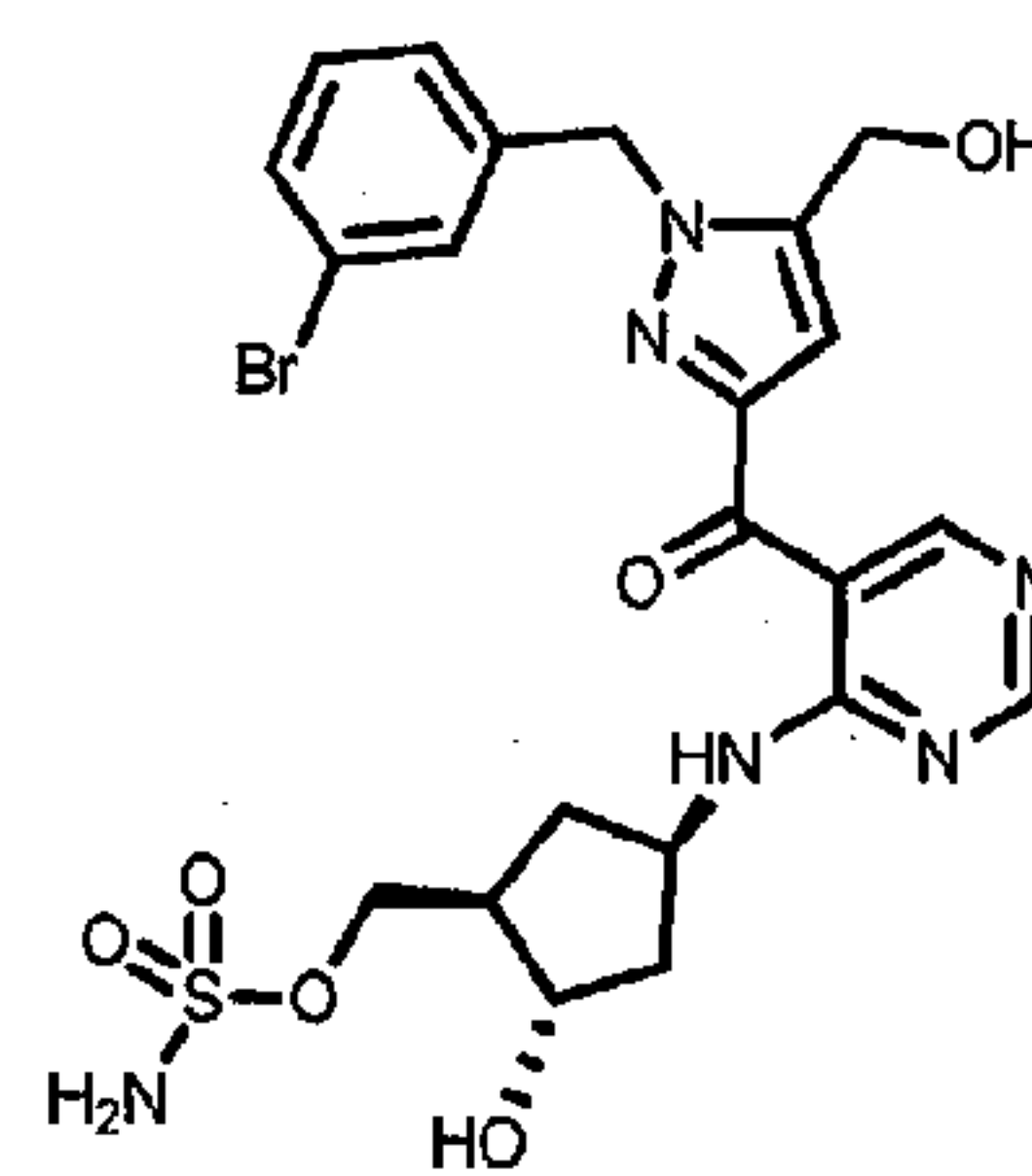
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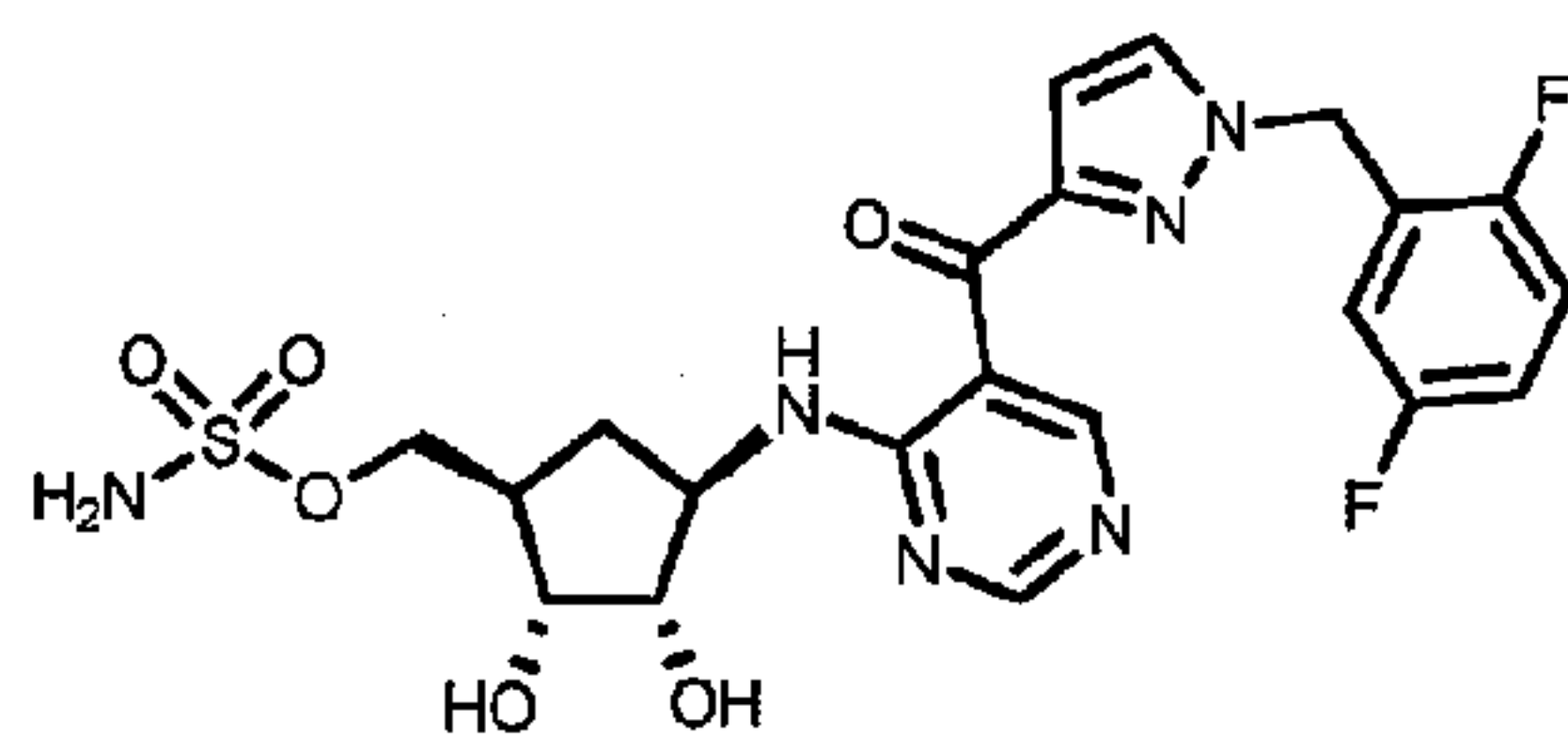
I-88



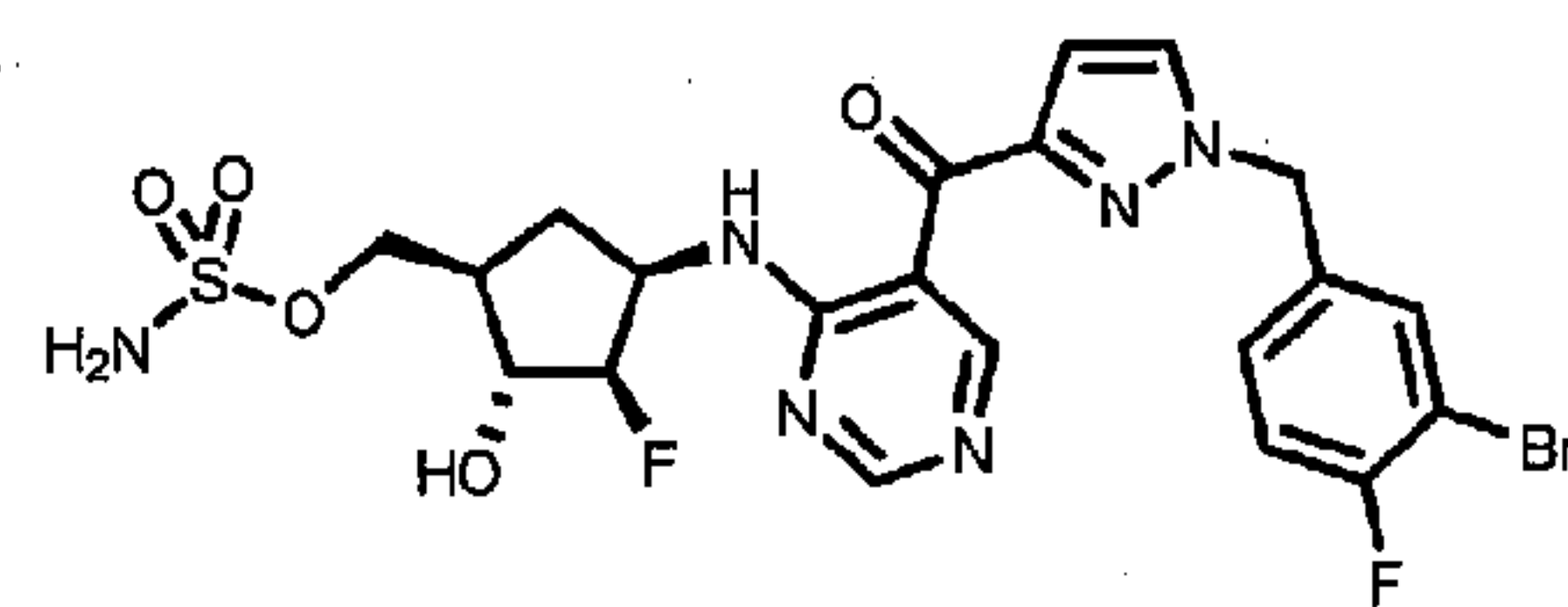
I-89



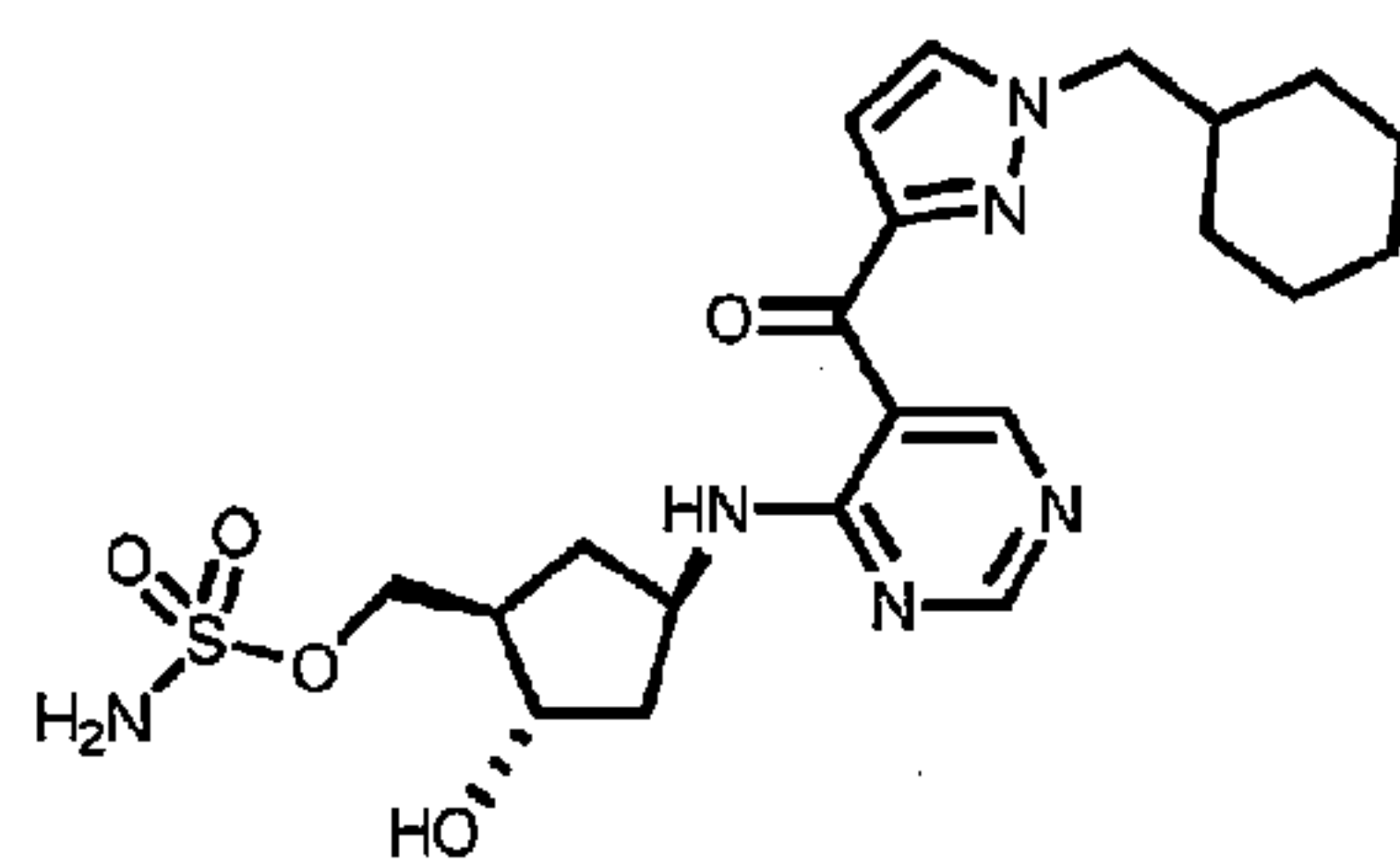
I-90



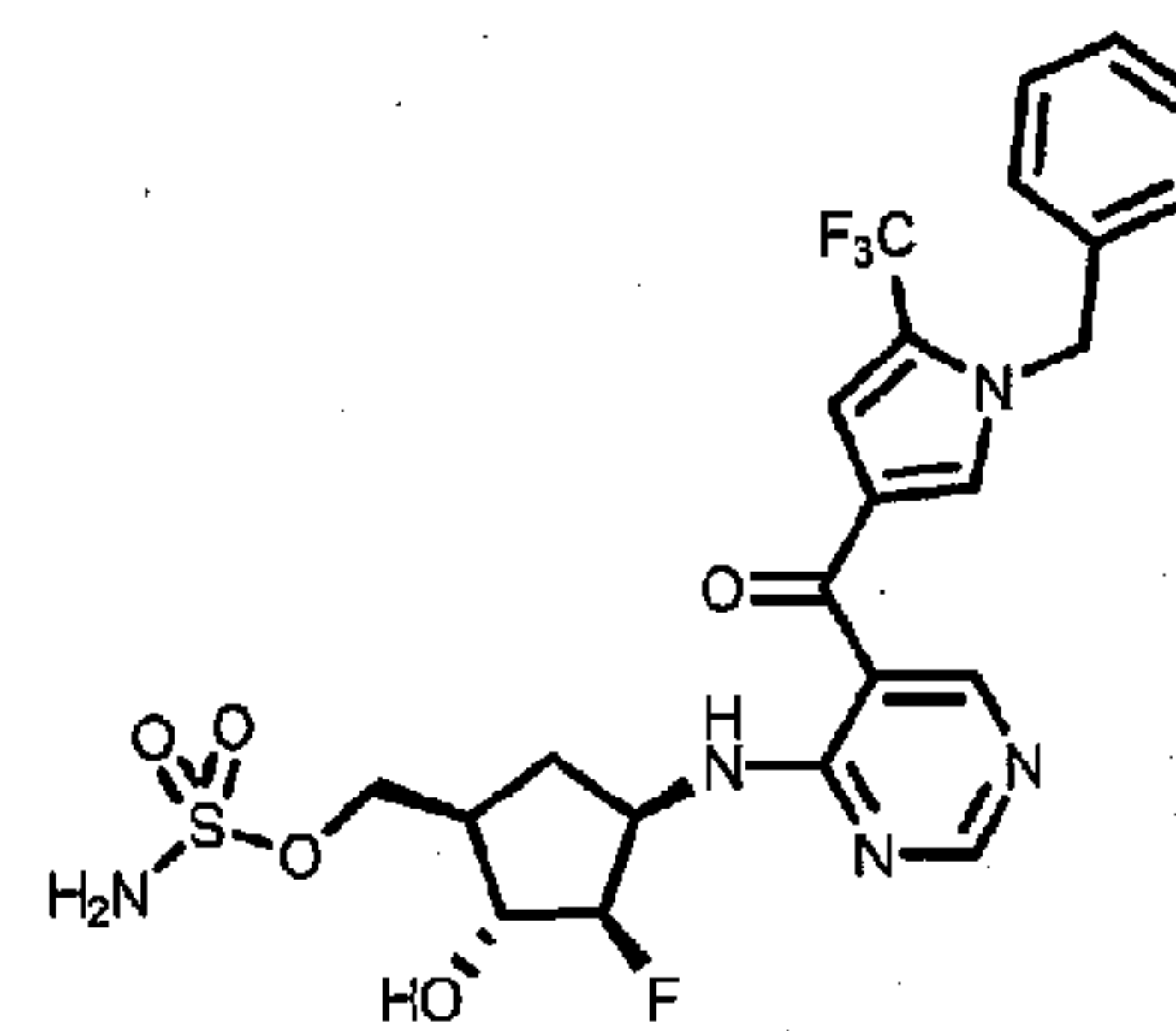
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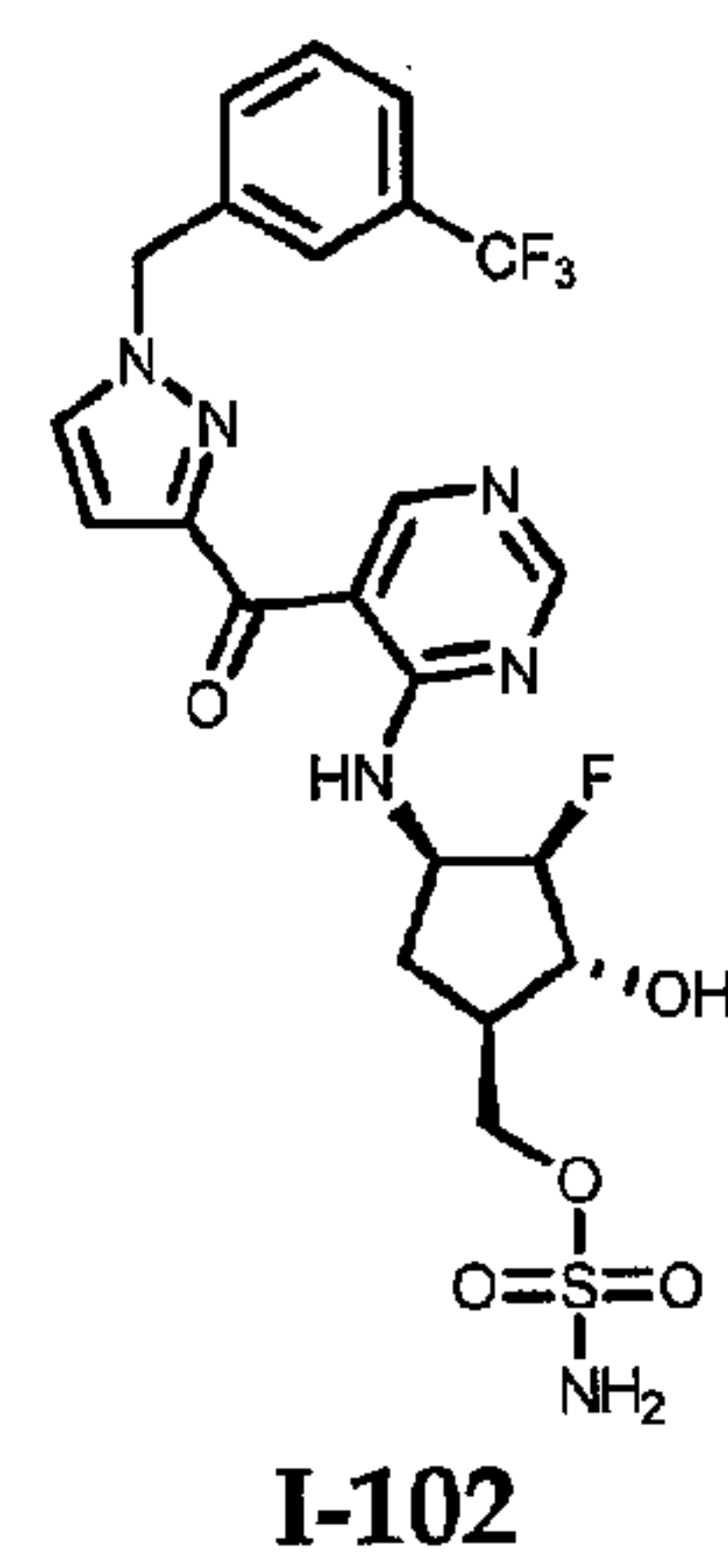
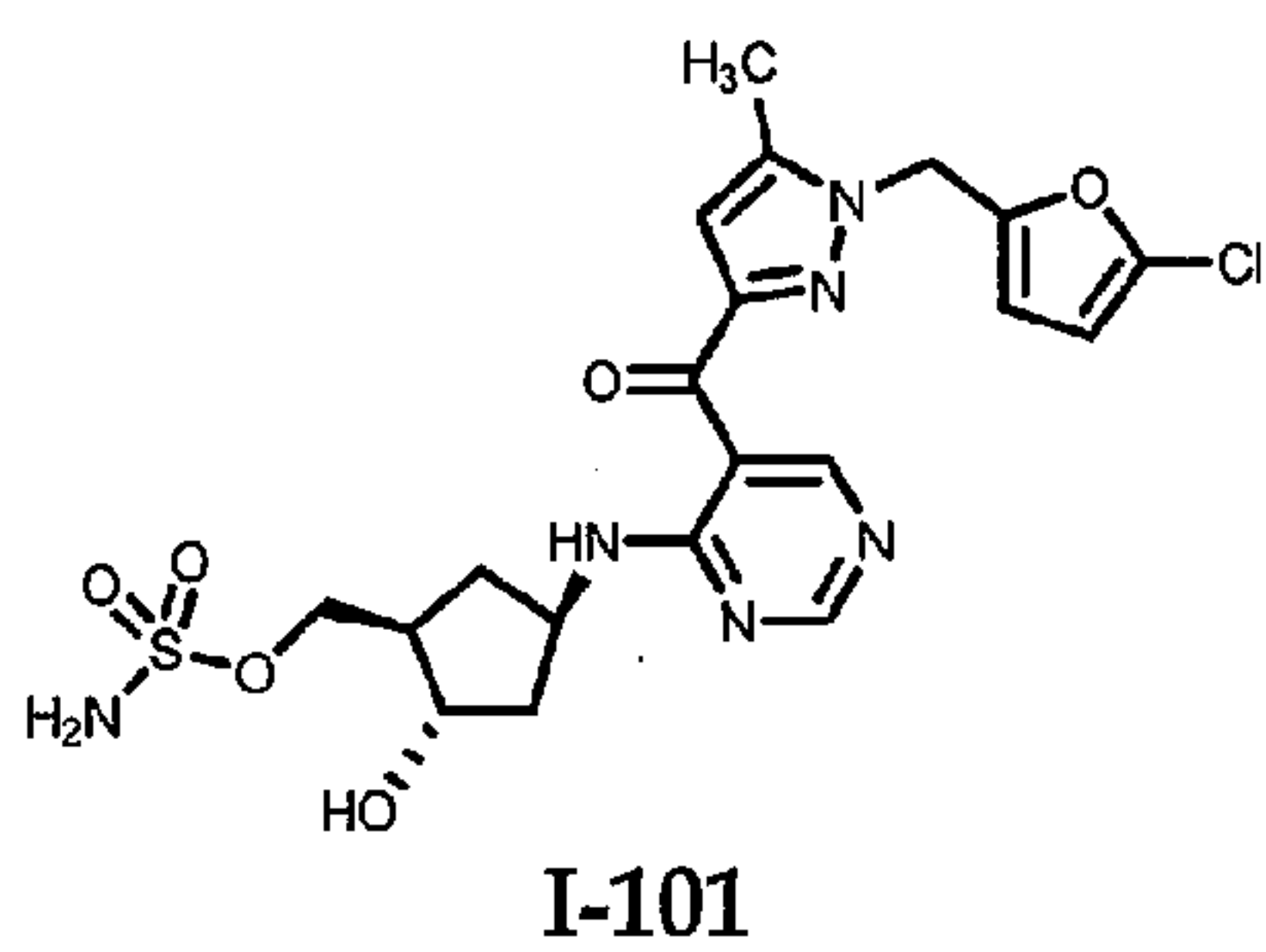
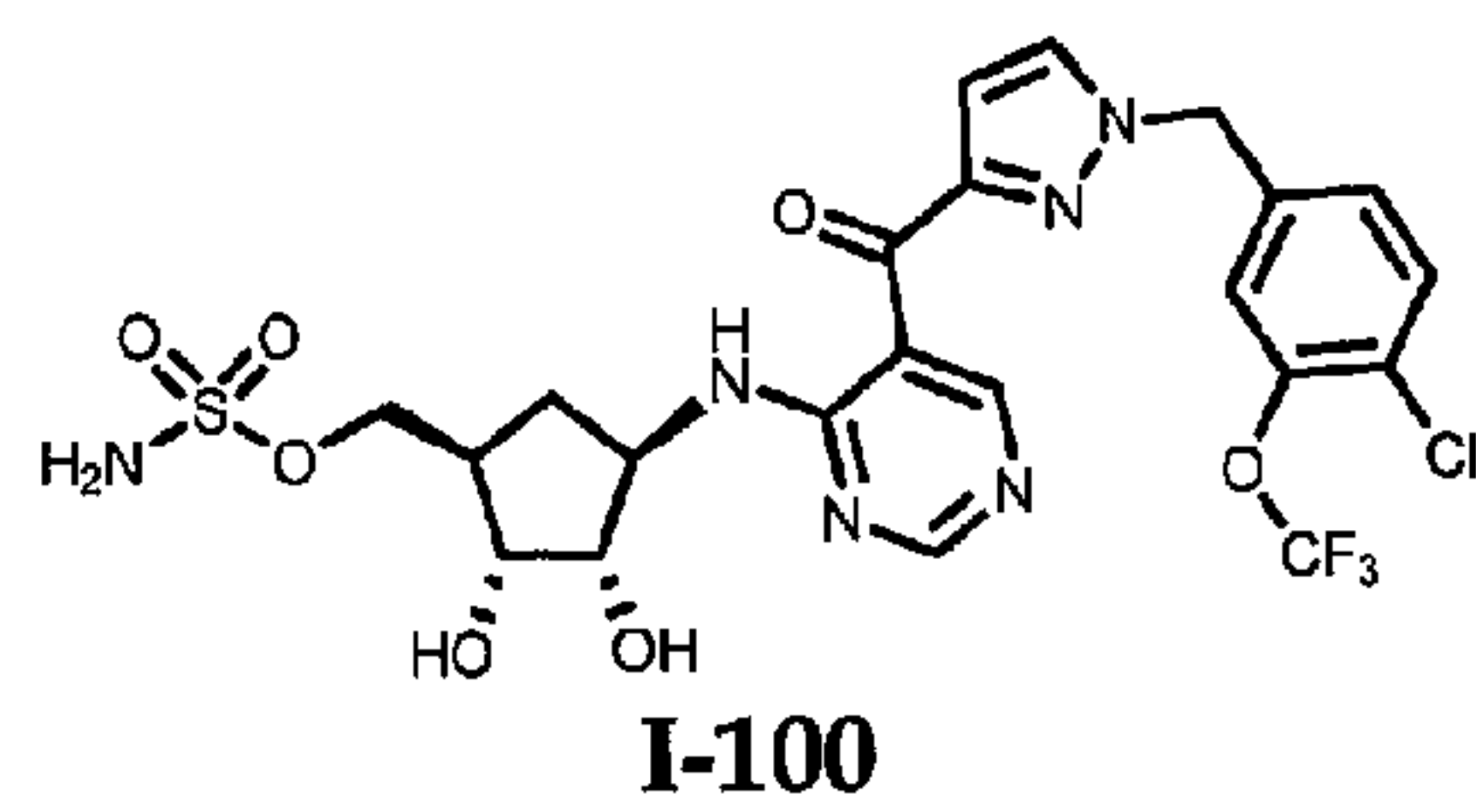
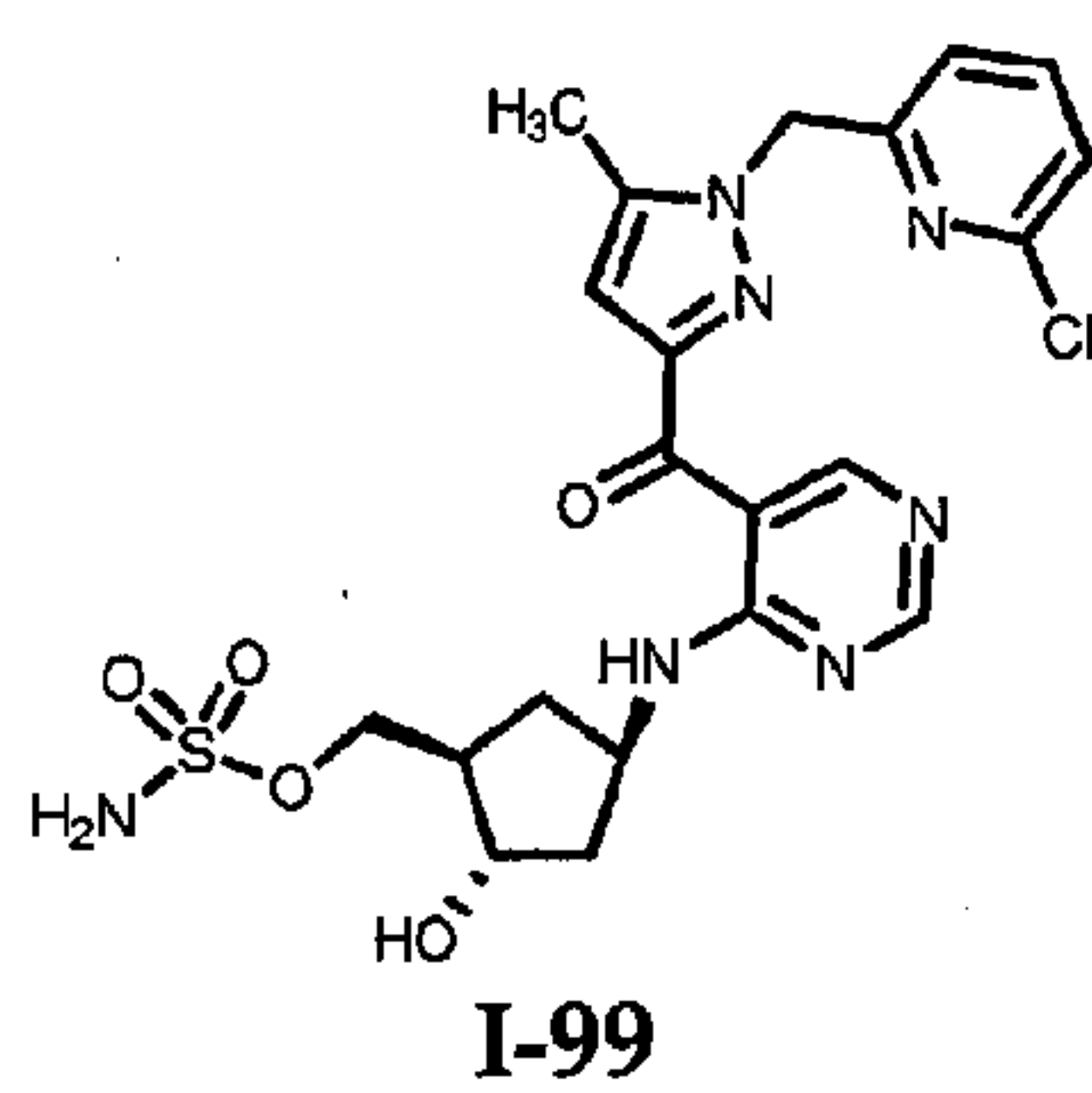
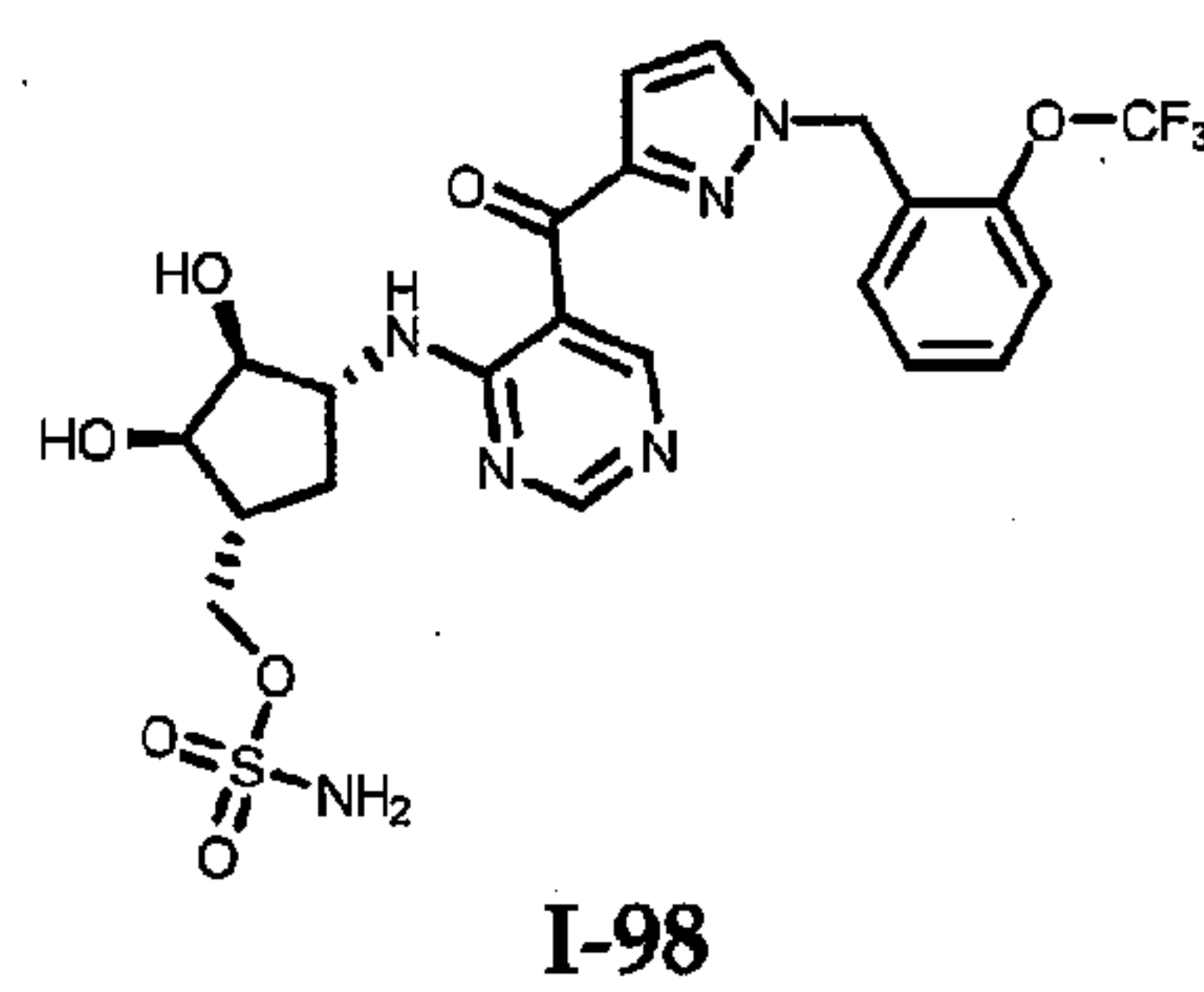
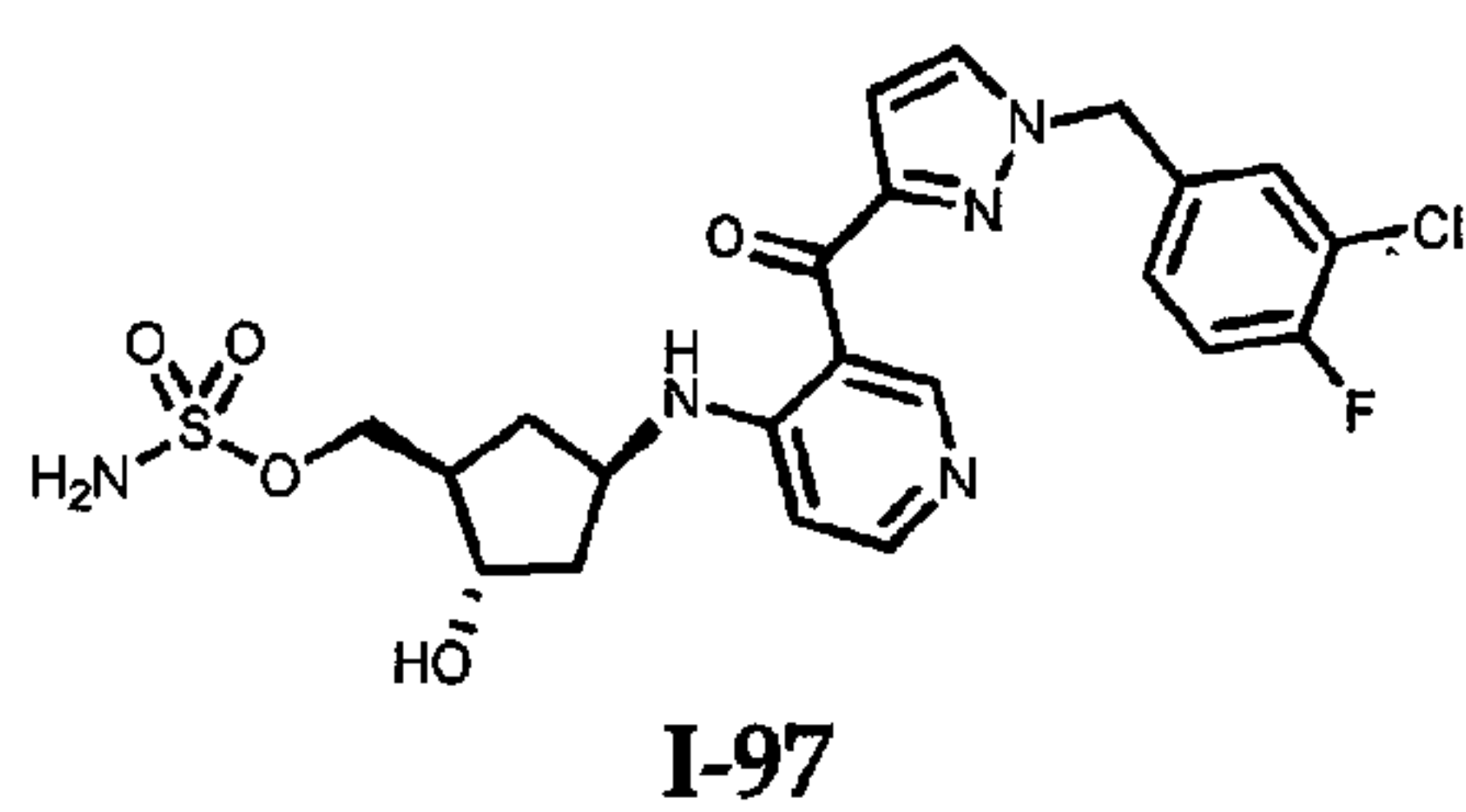
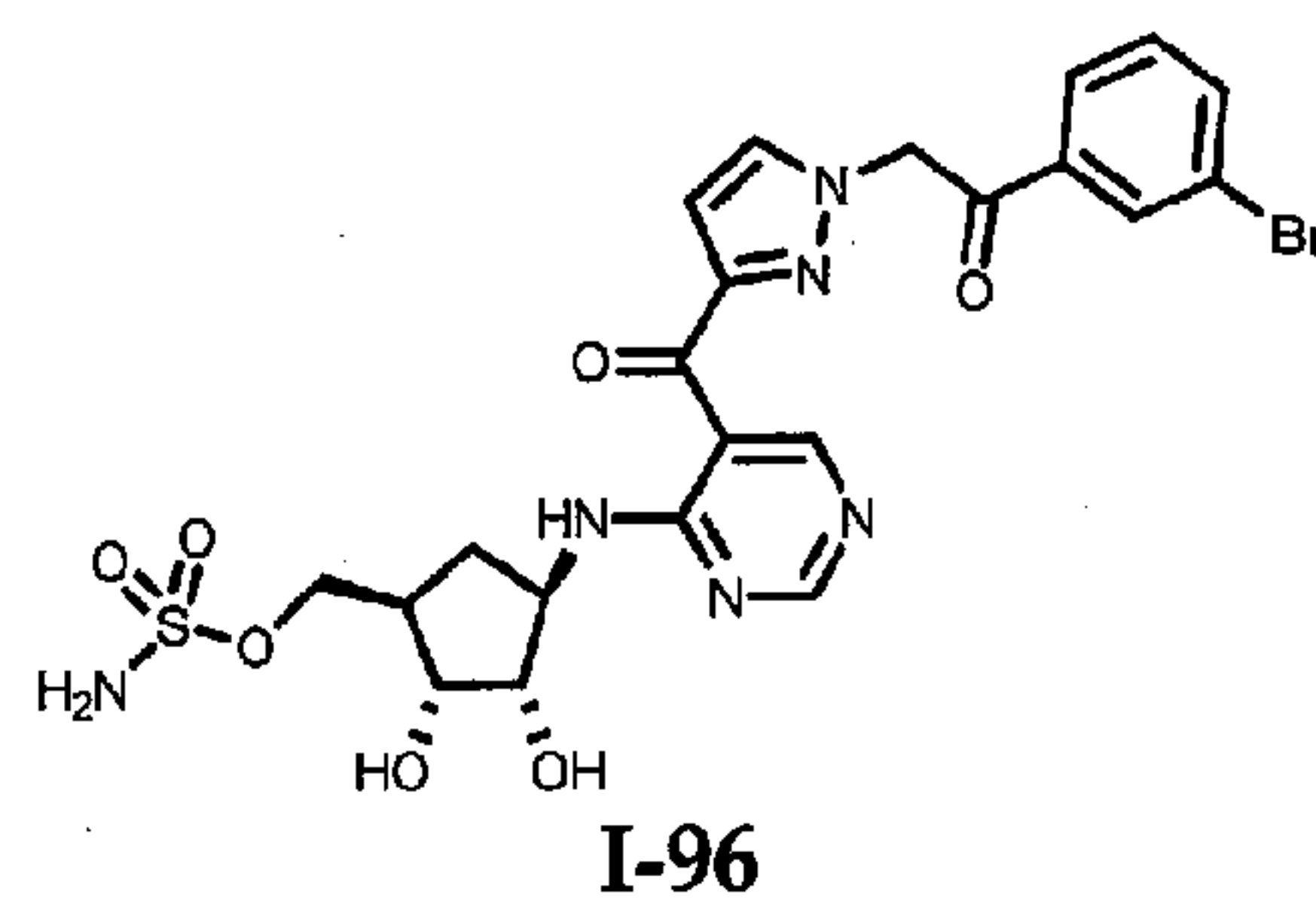
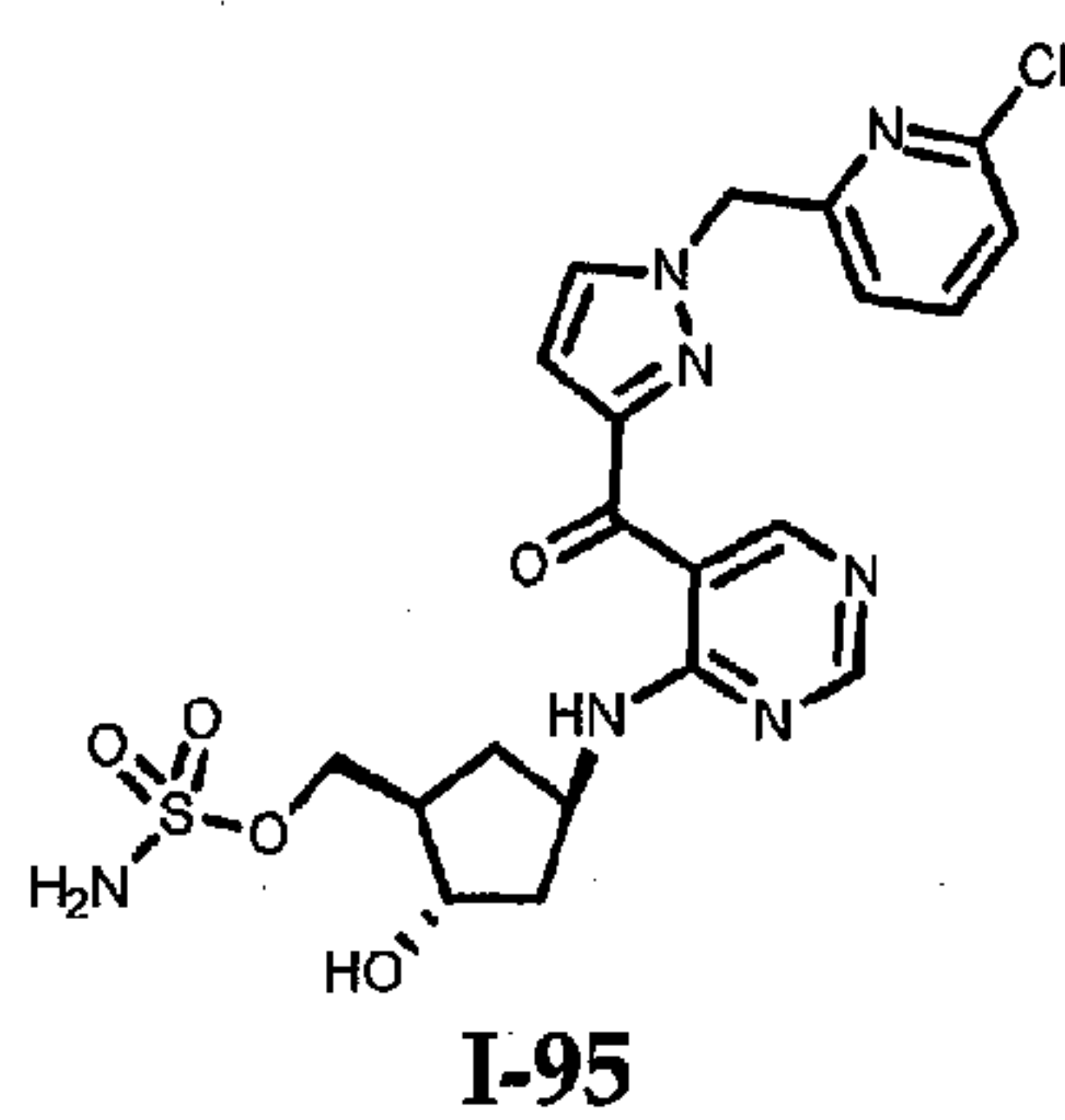
I-92

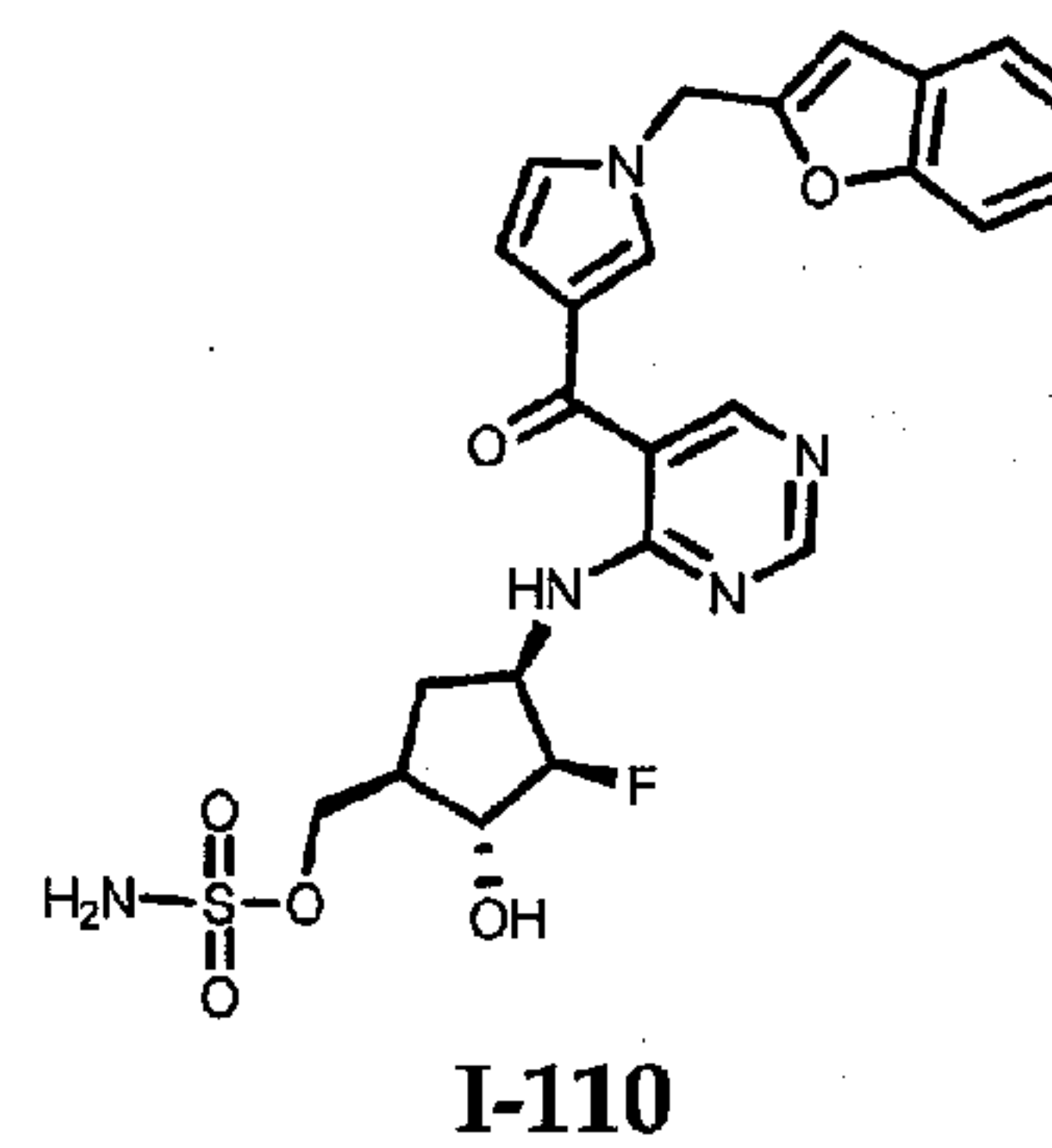
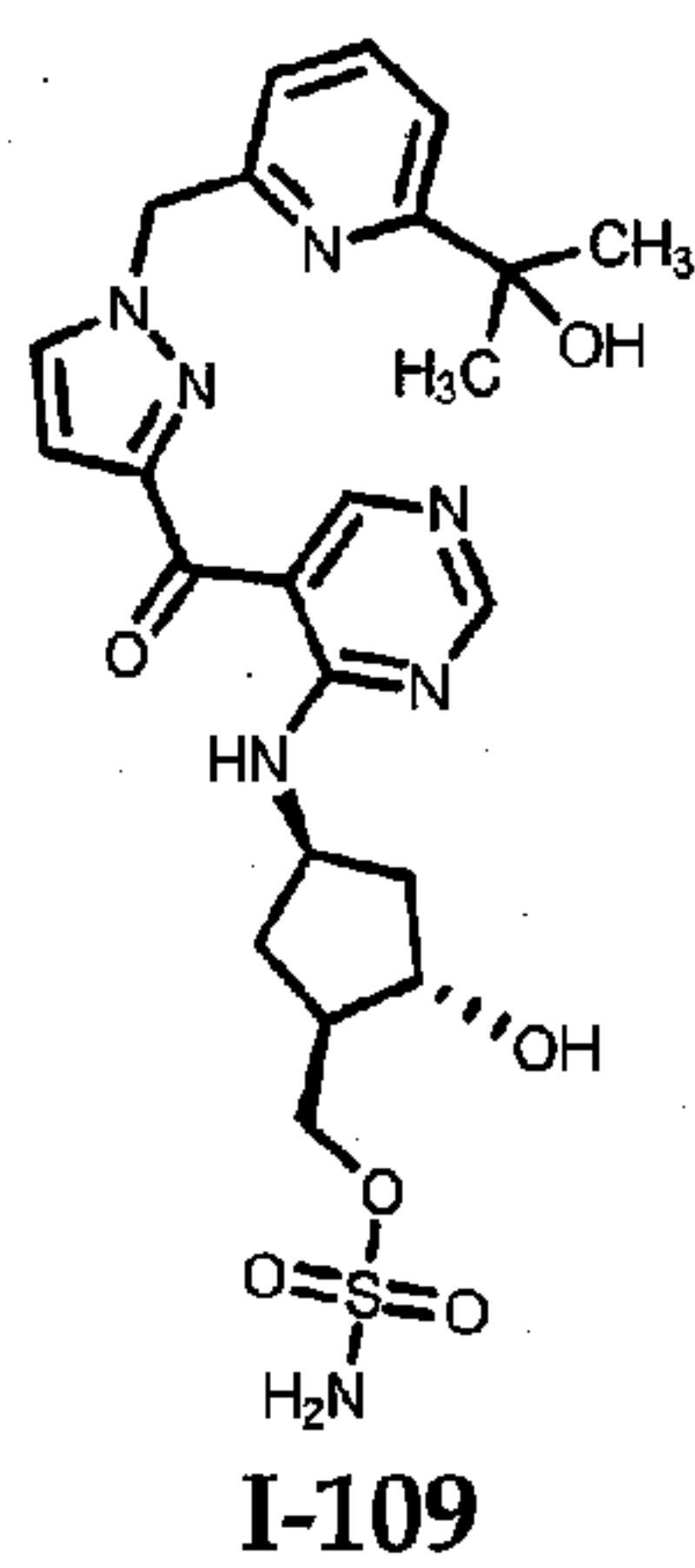
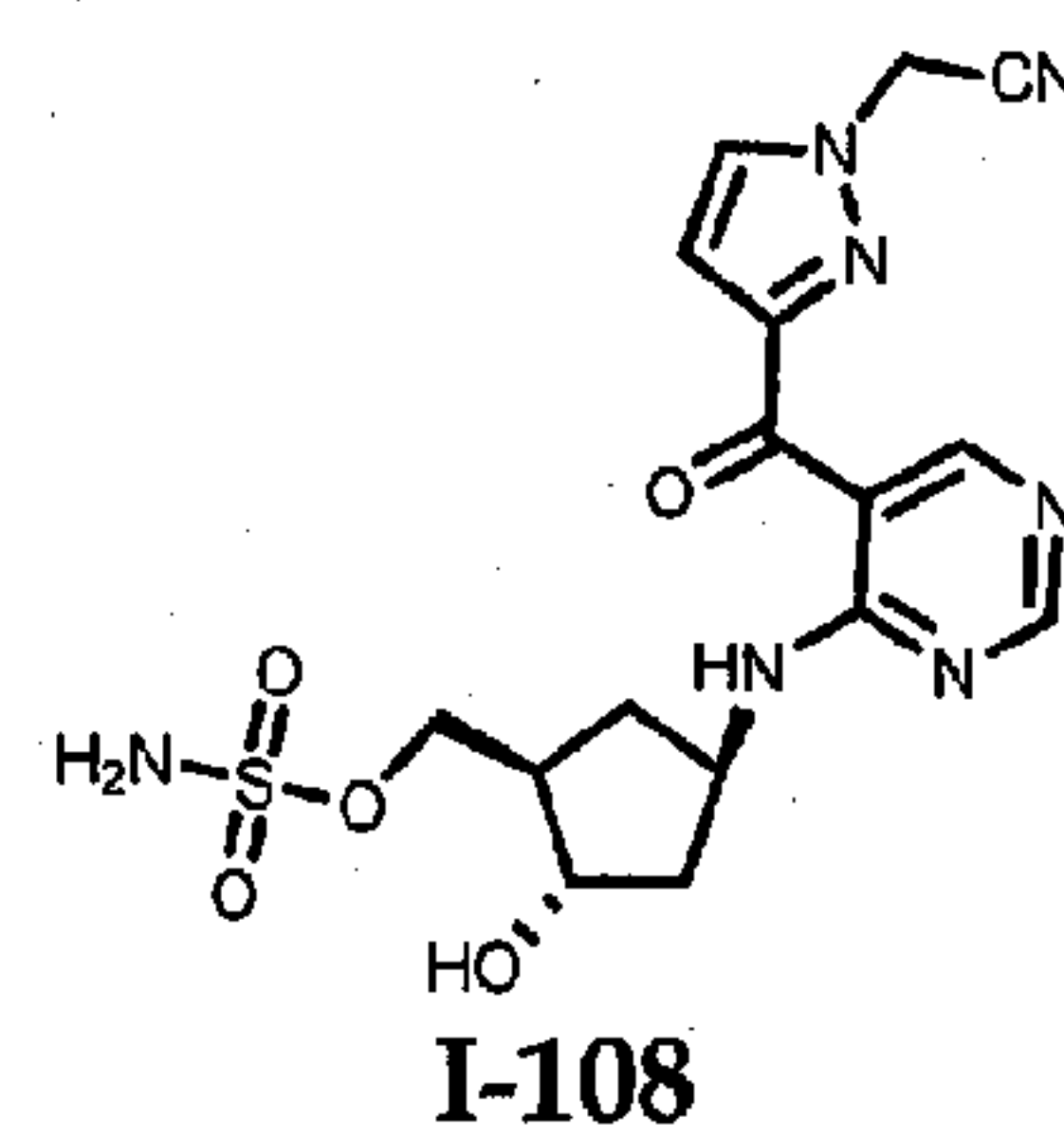
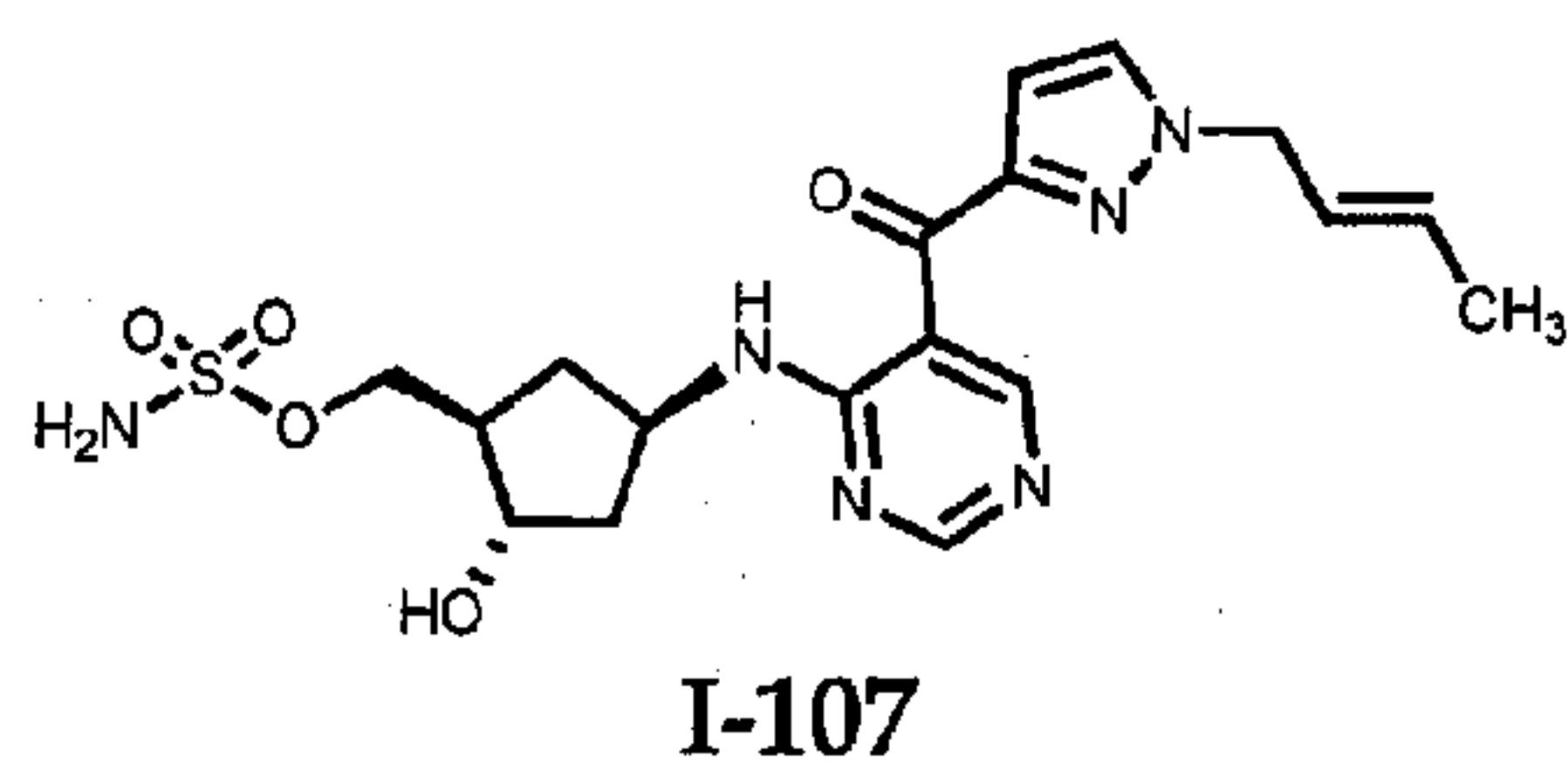
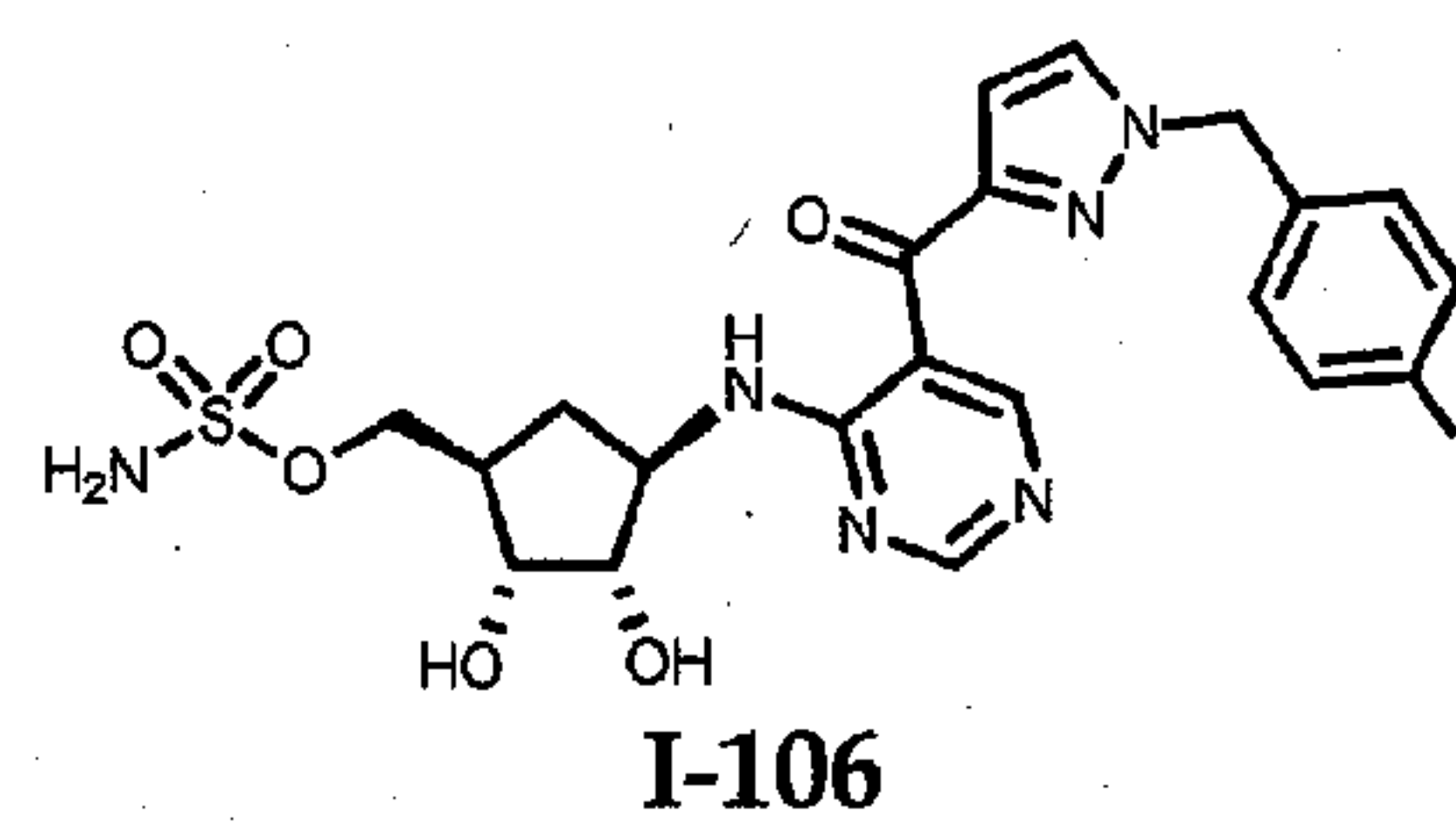
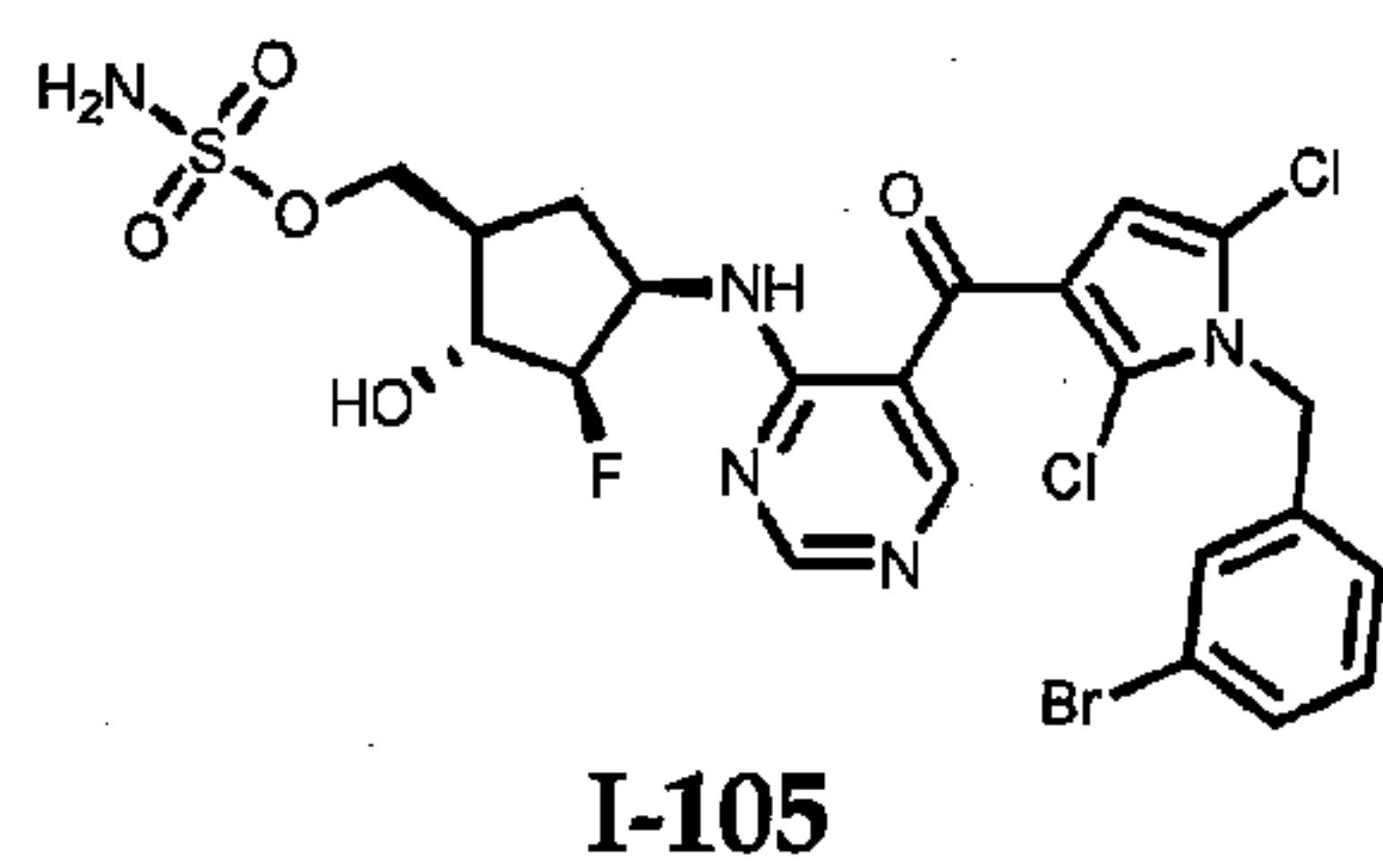
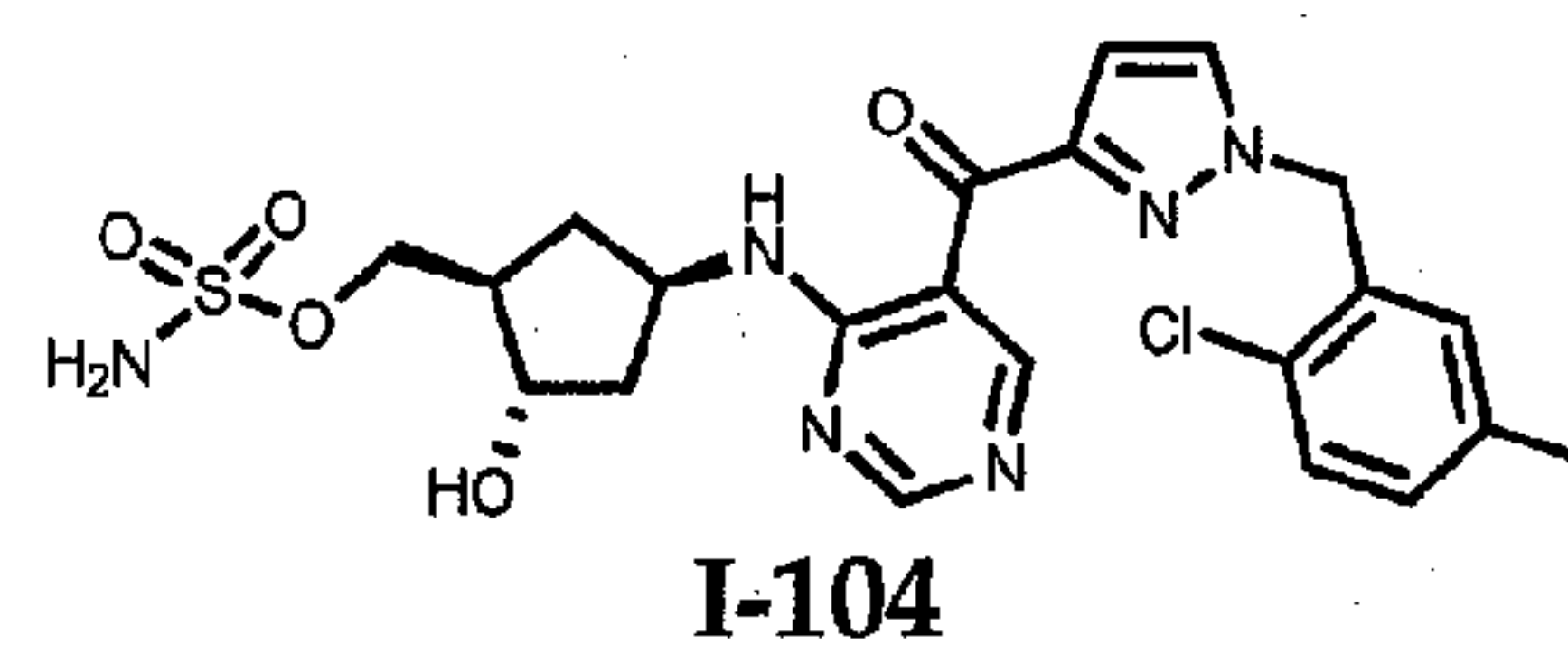
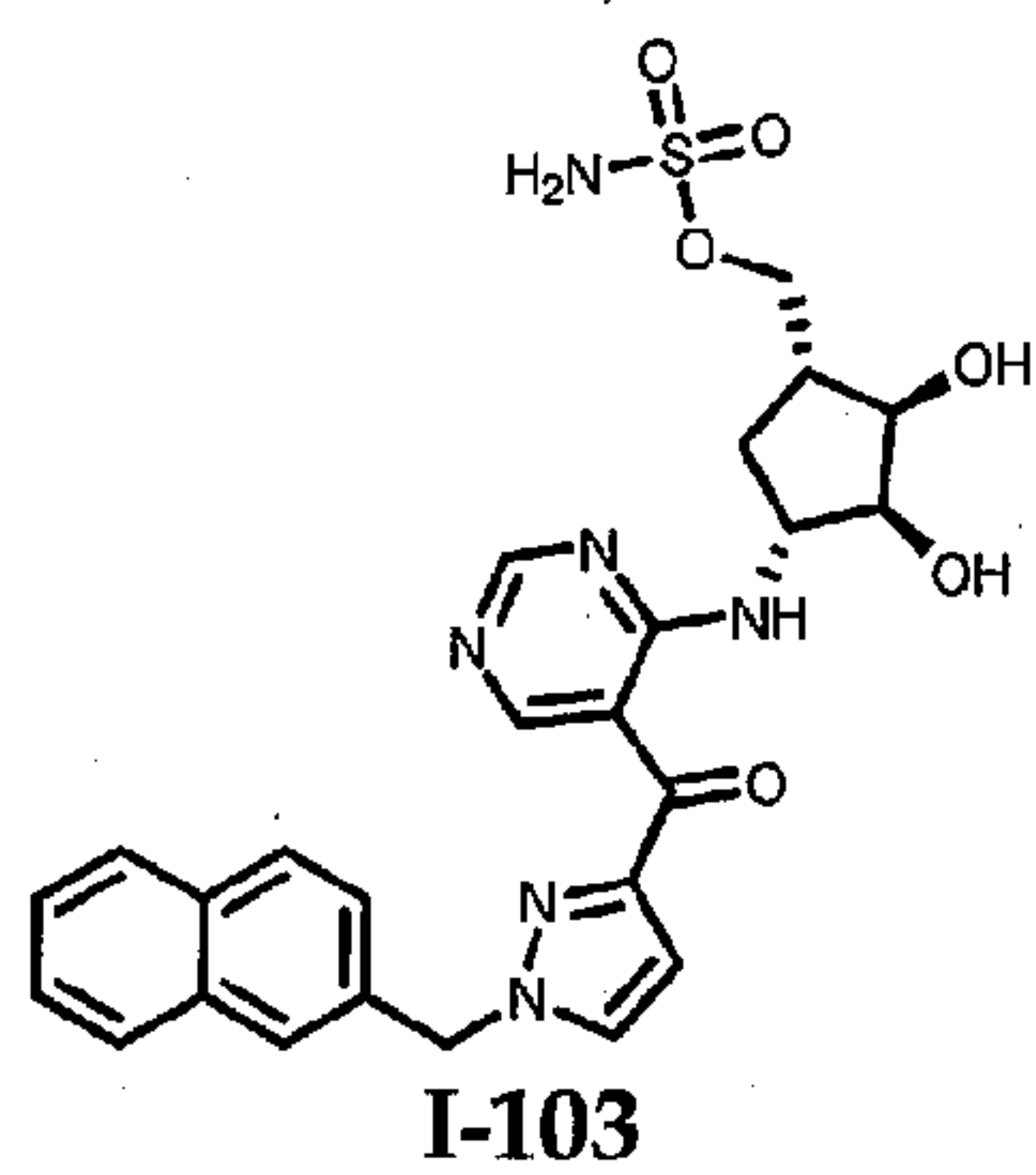


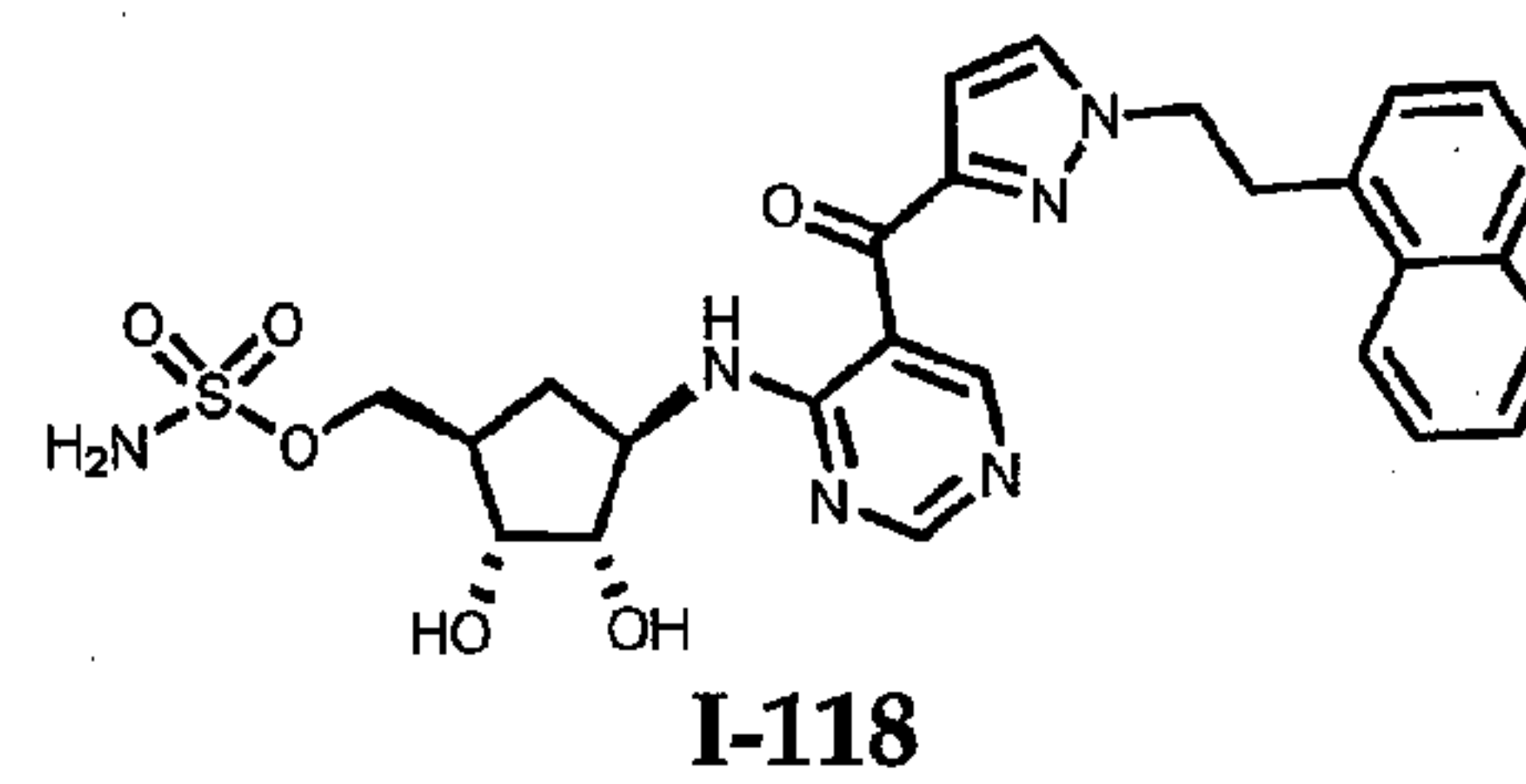
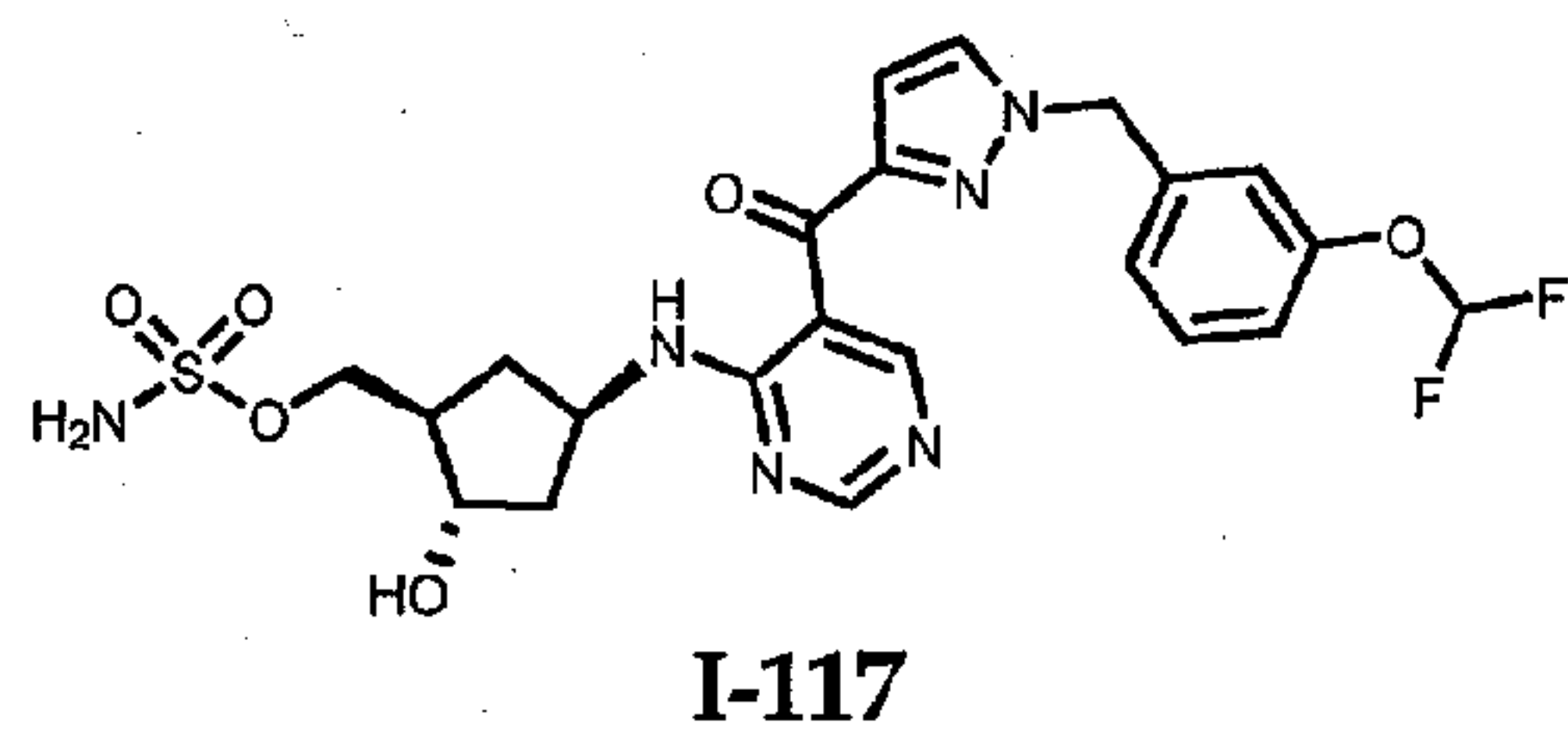
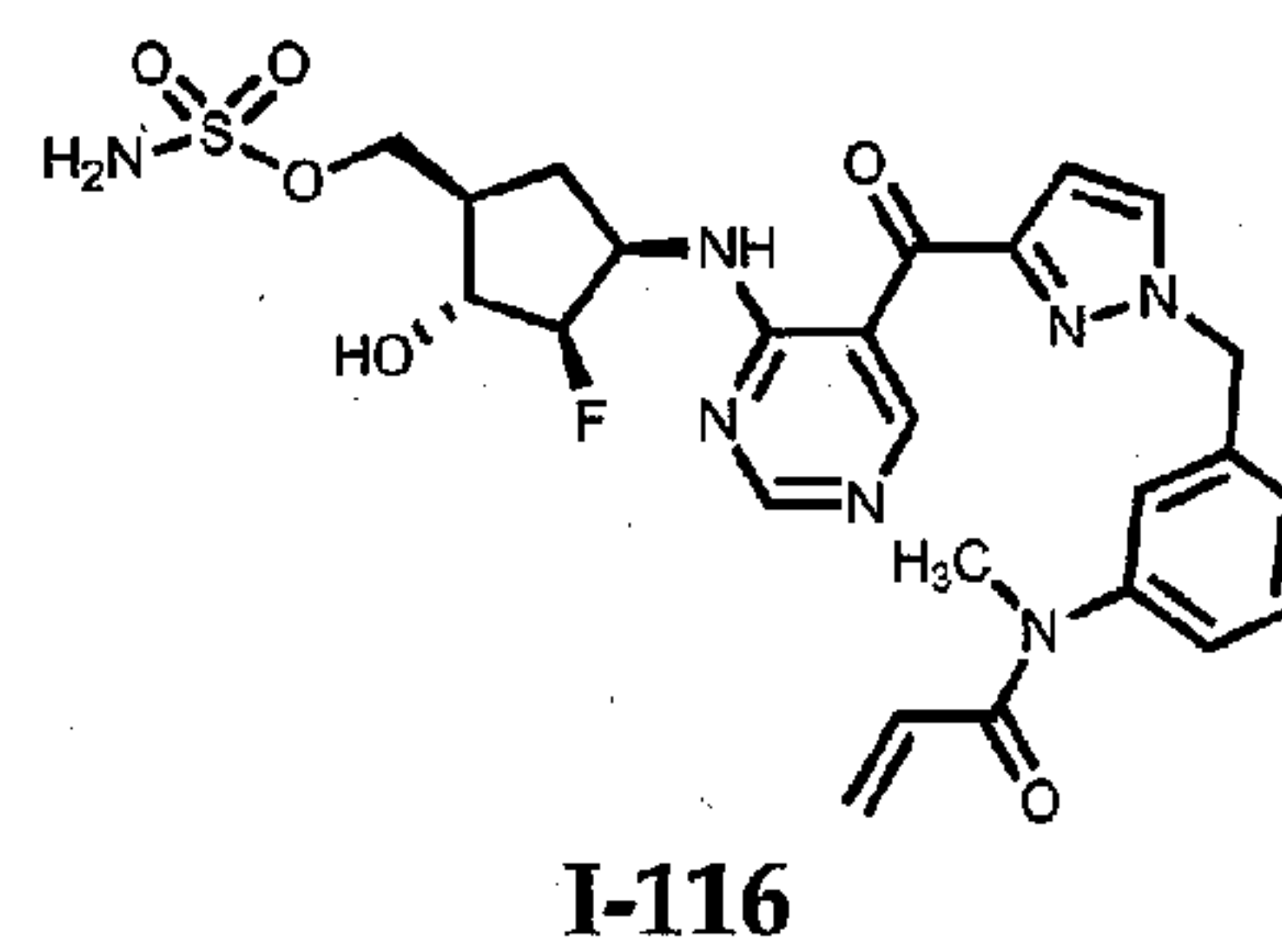
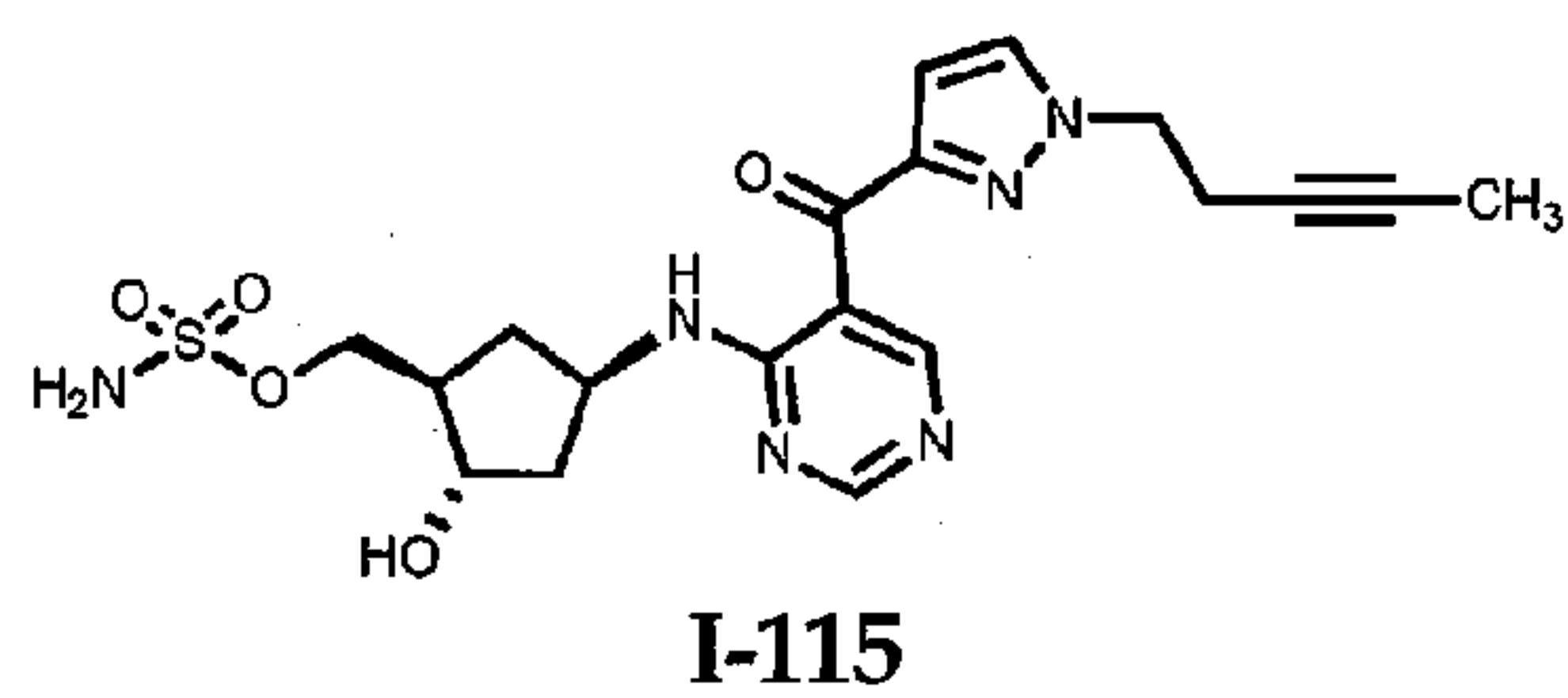
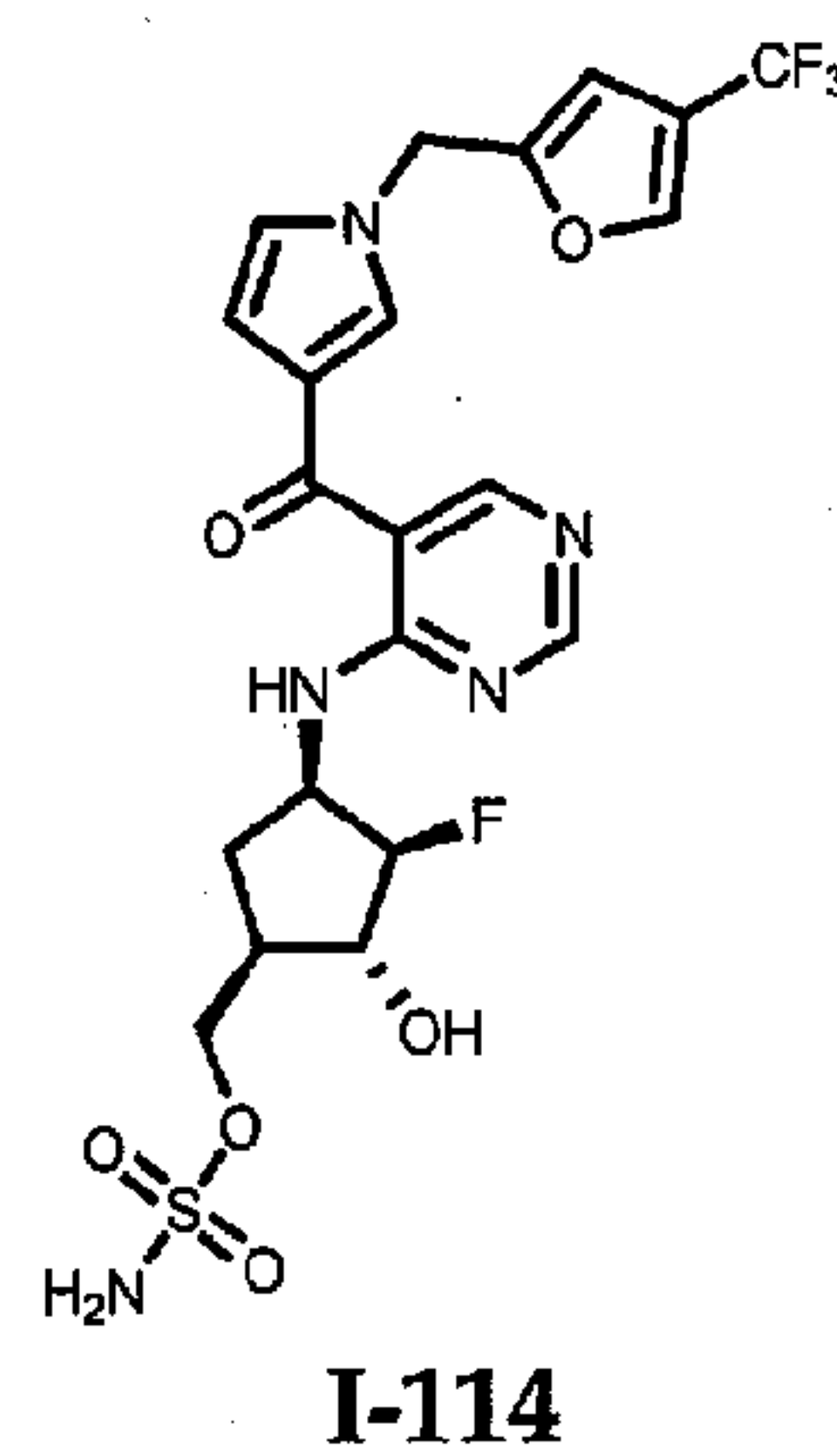
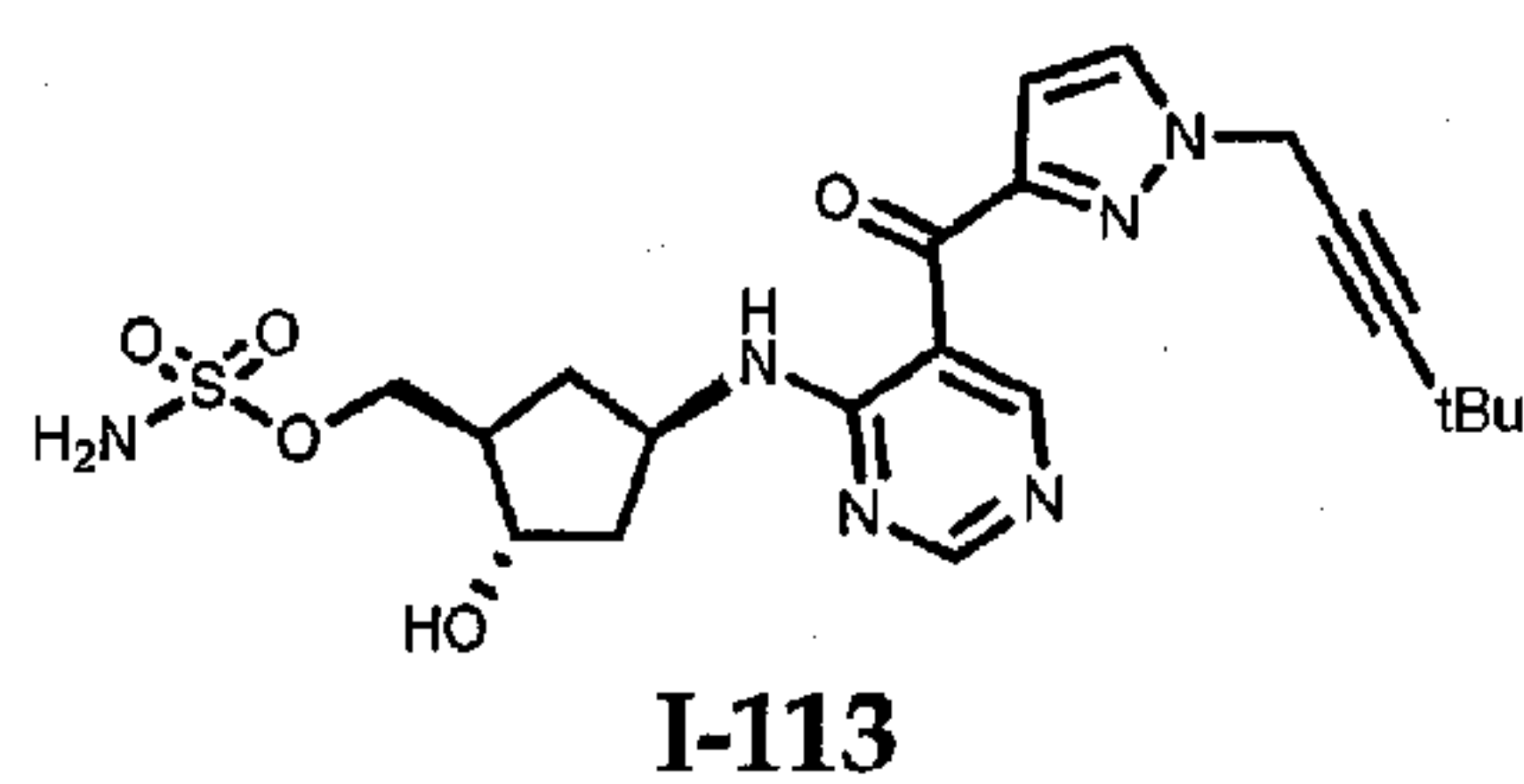
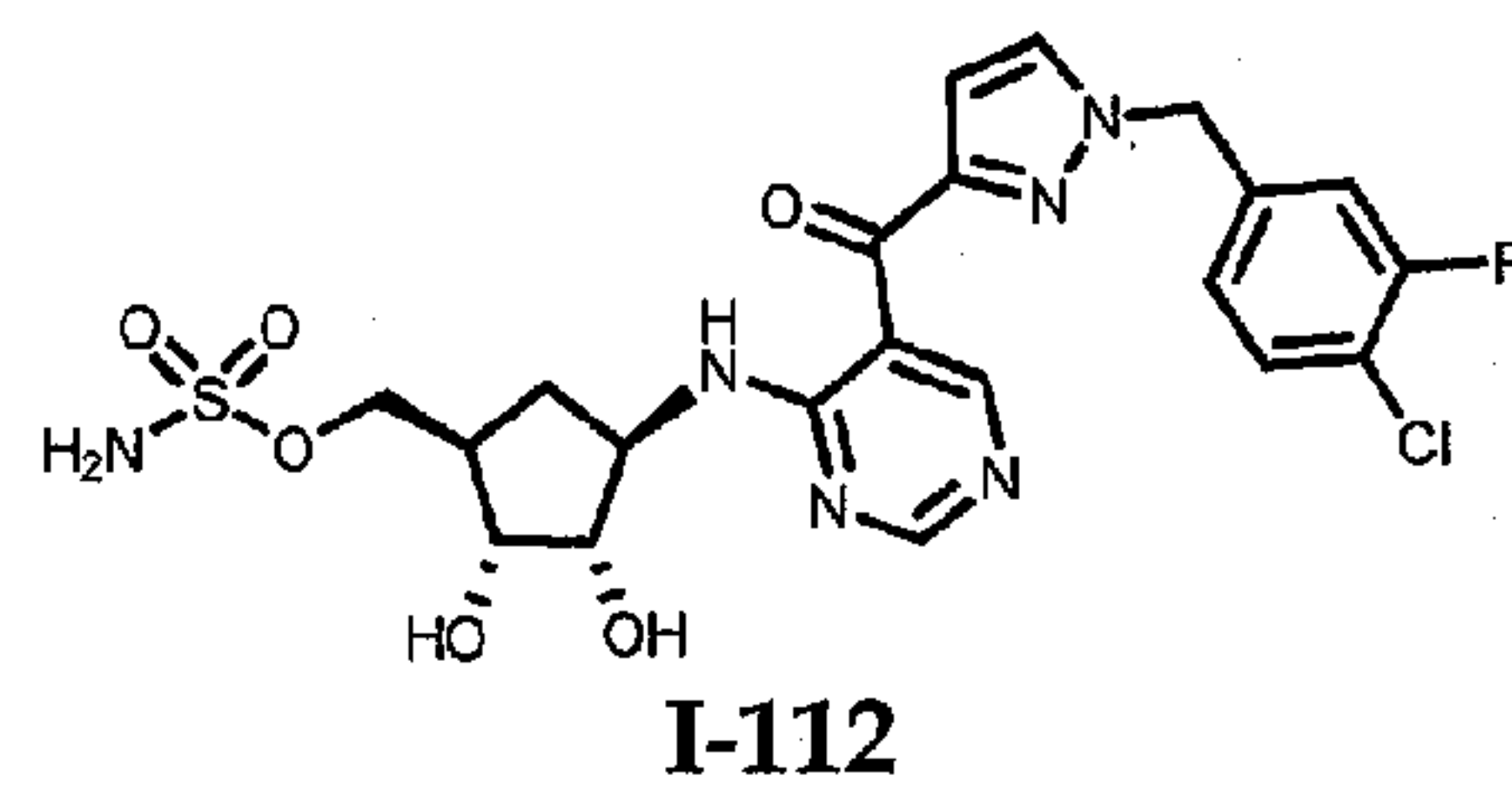
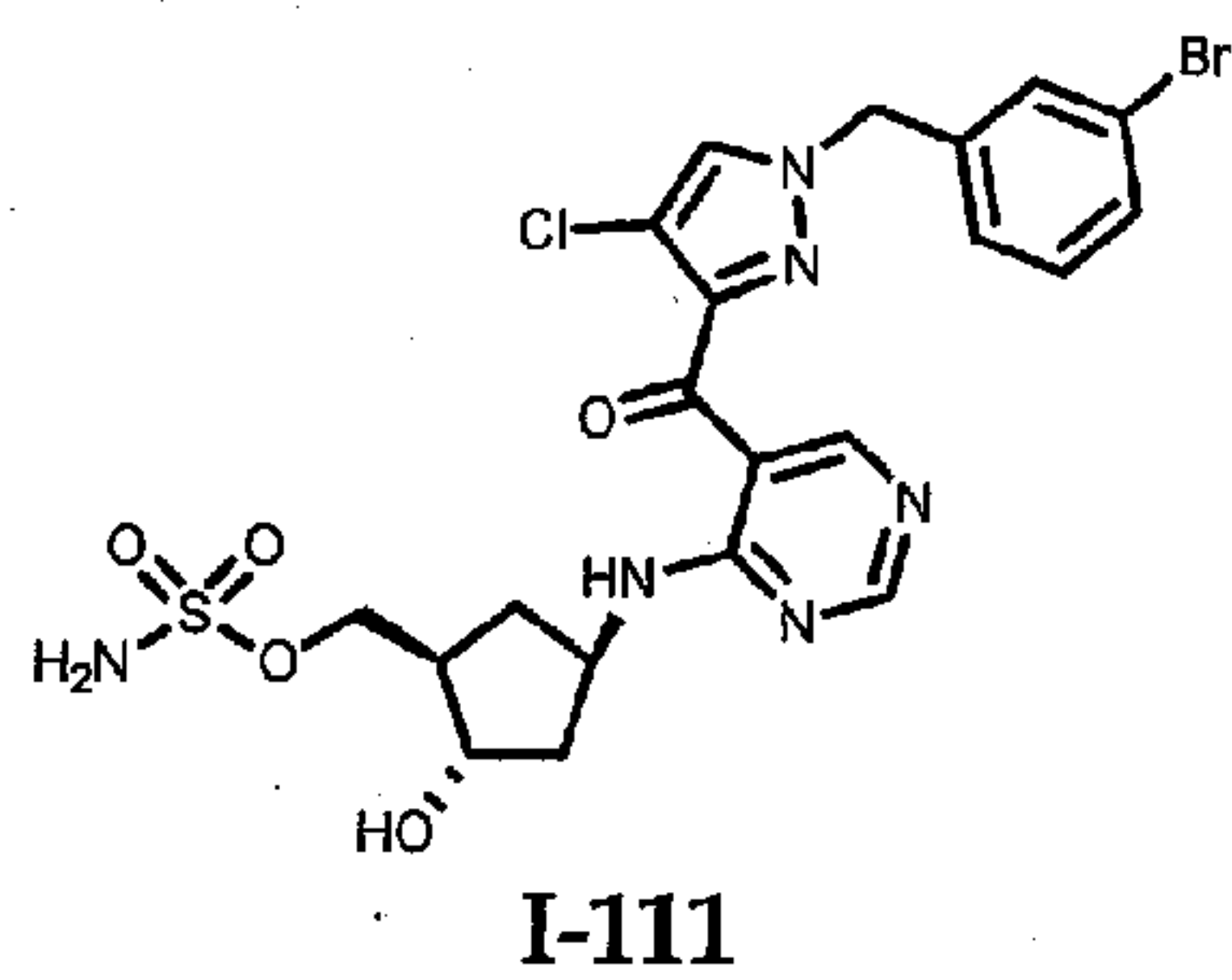
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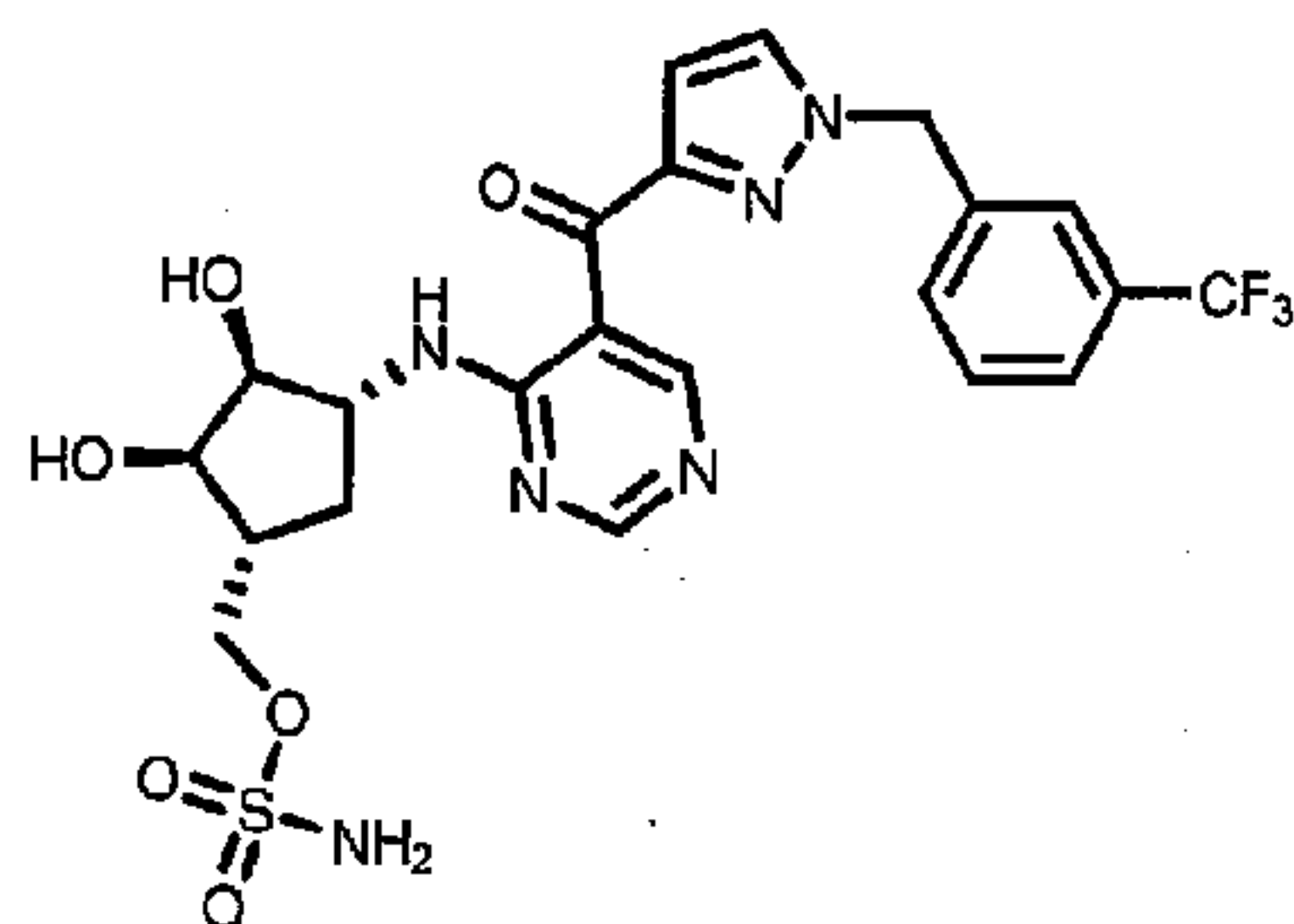
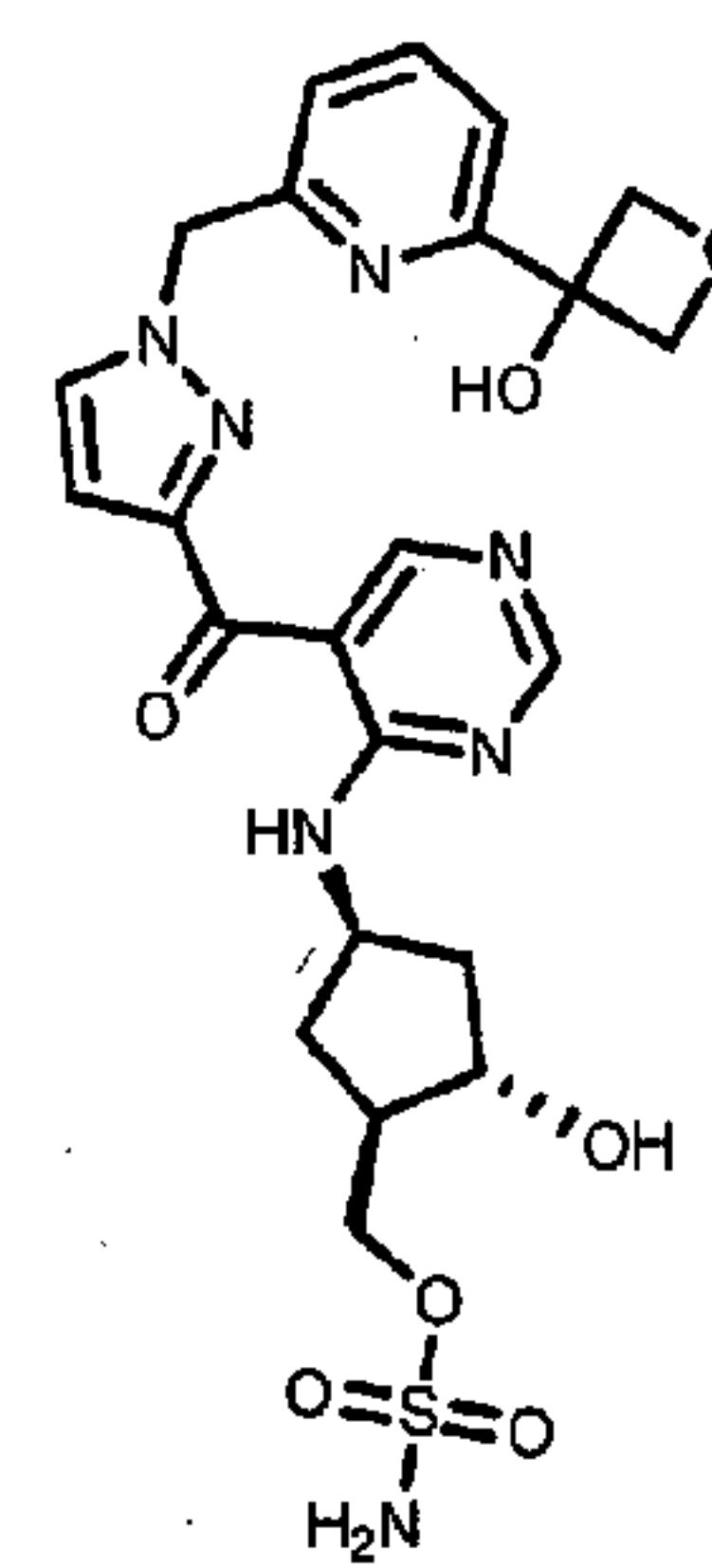
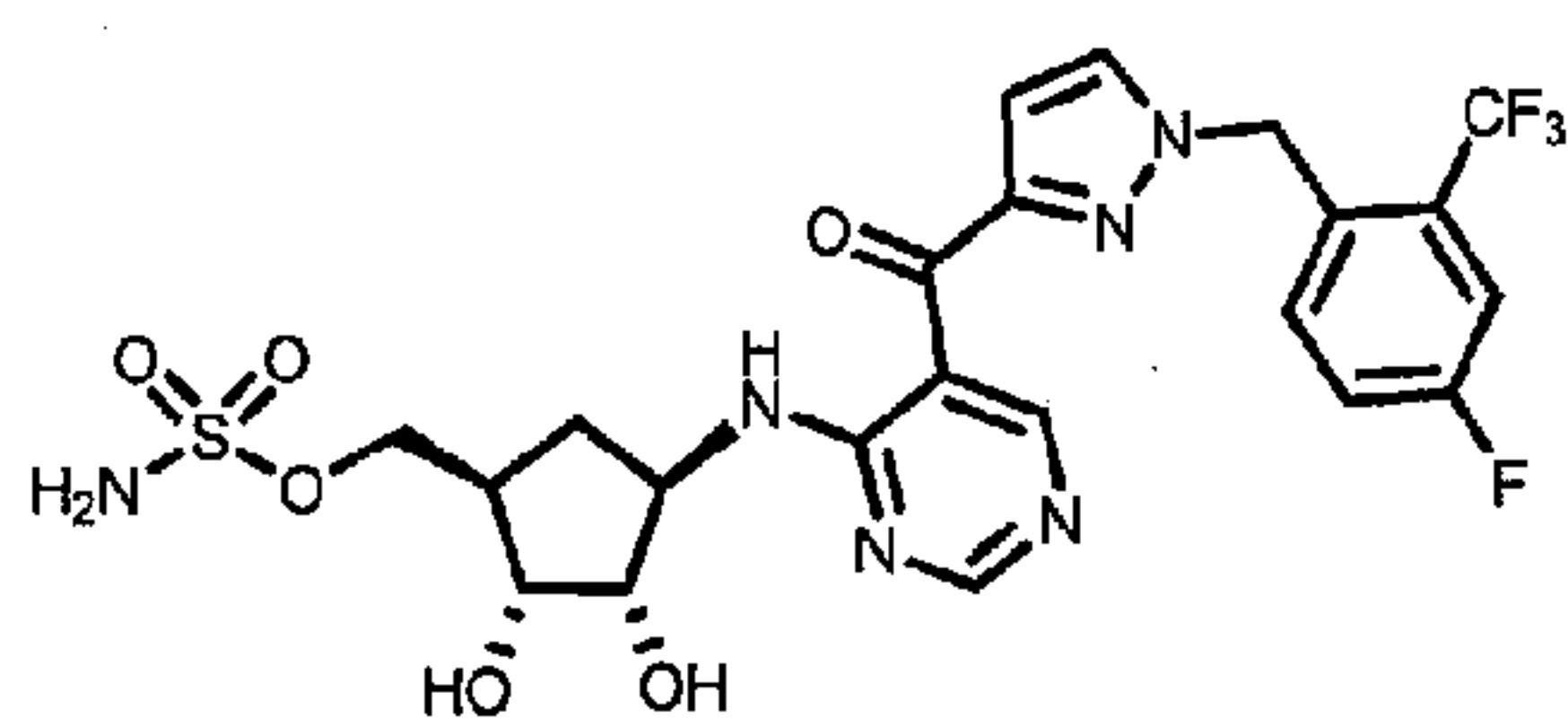
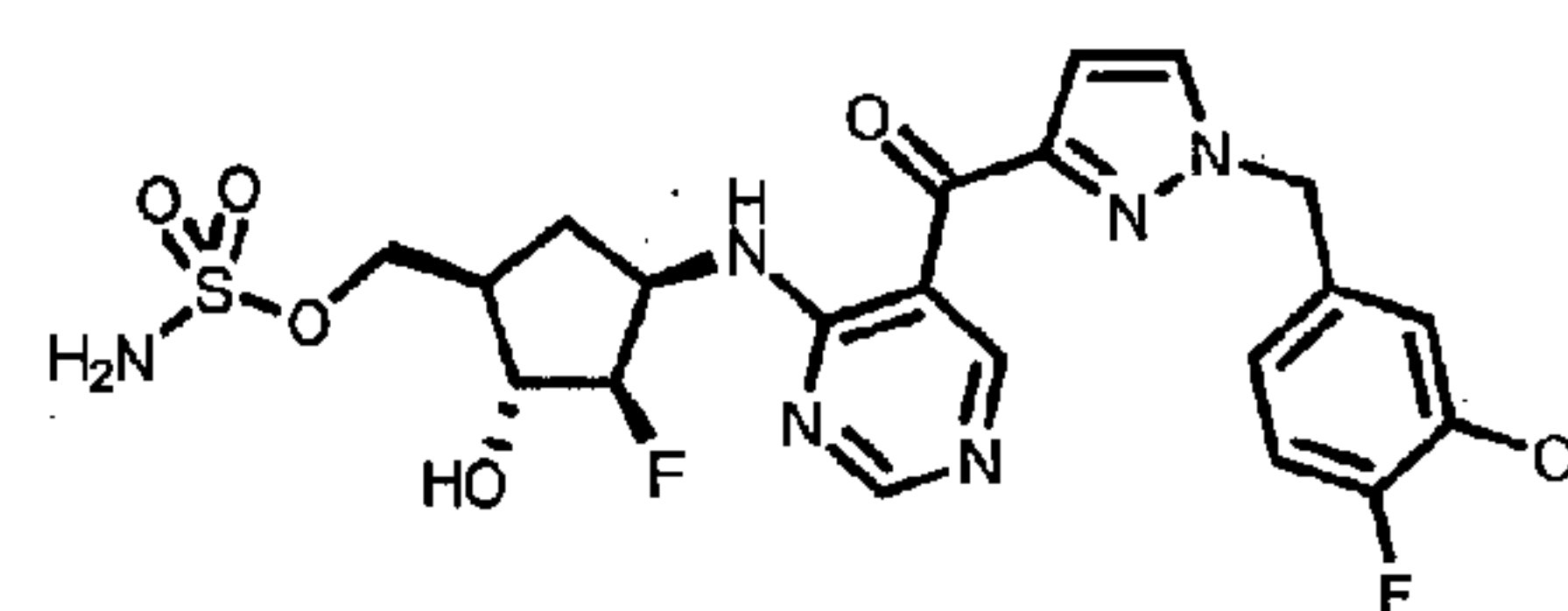
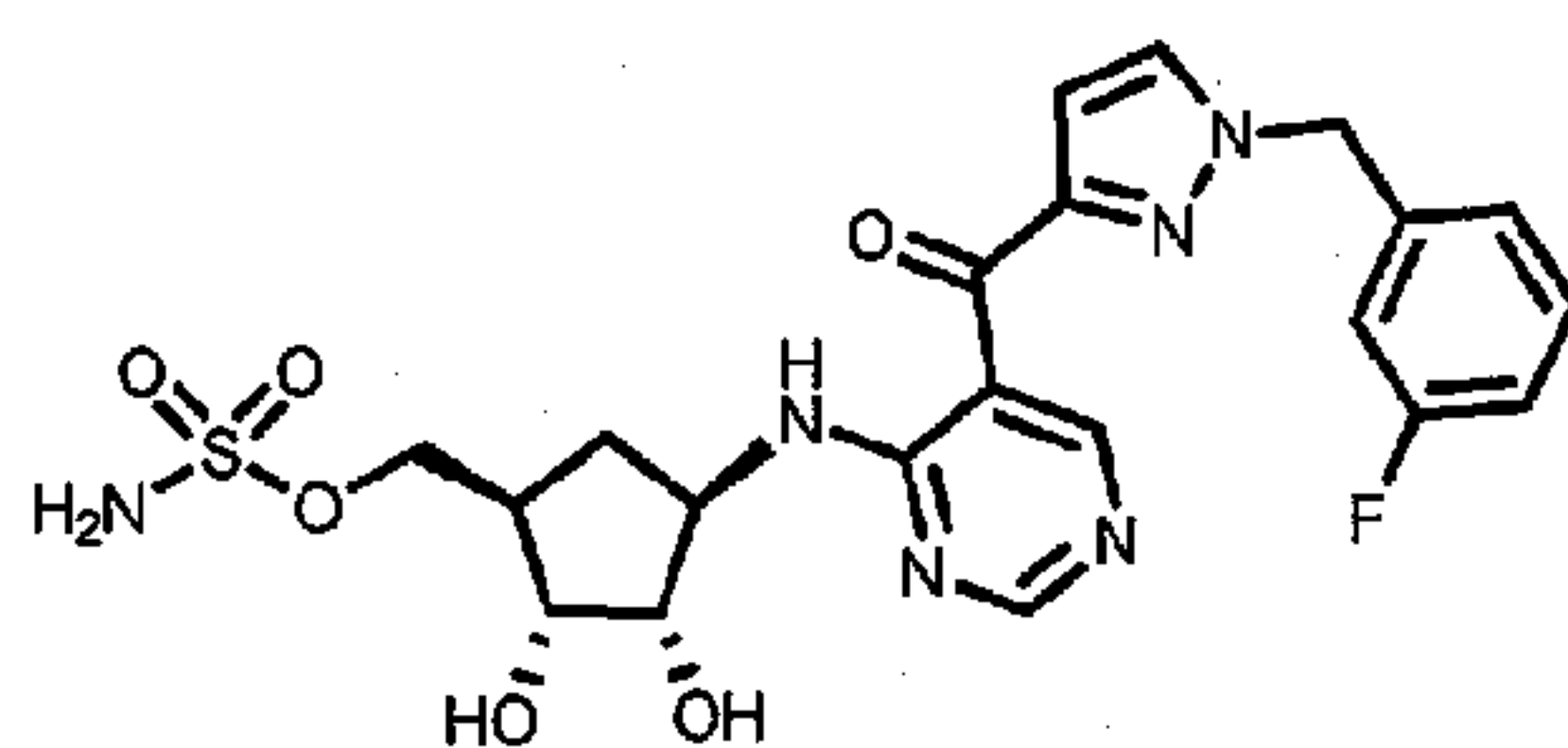
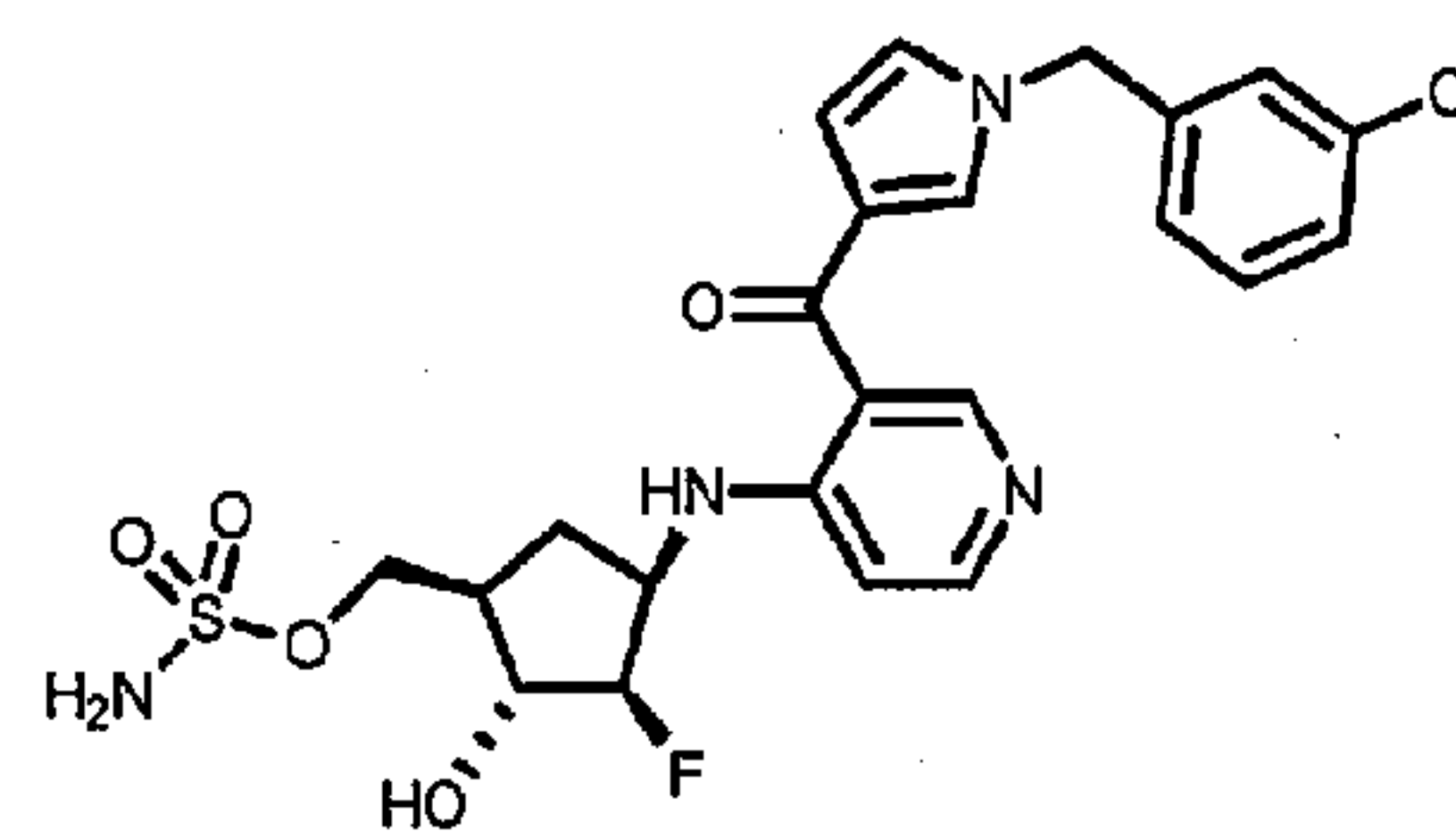
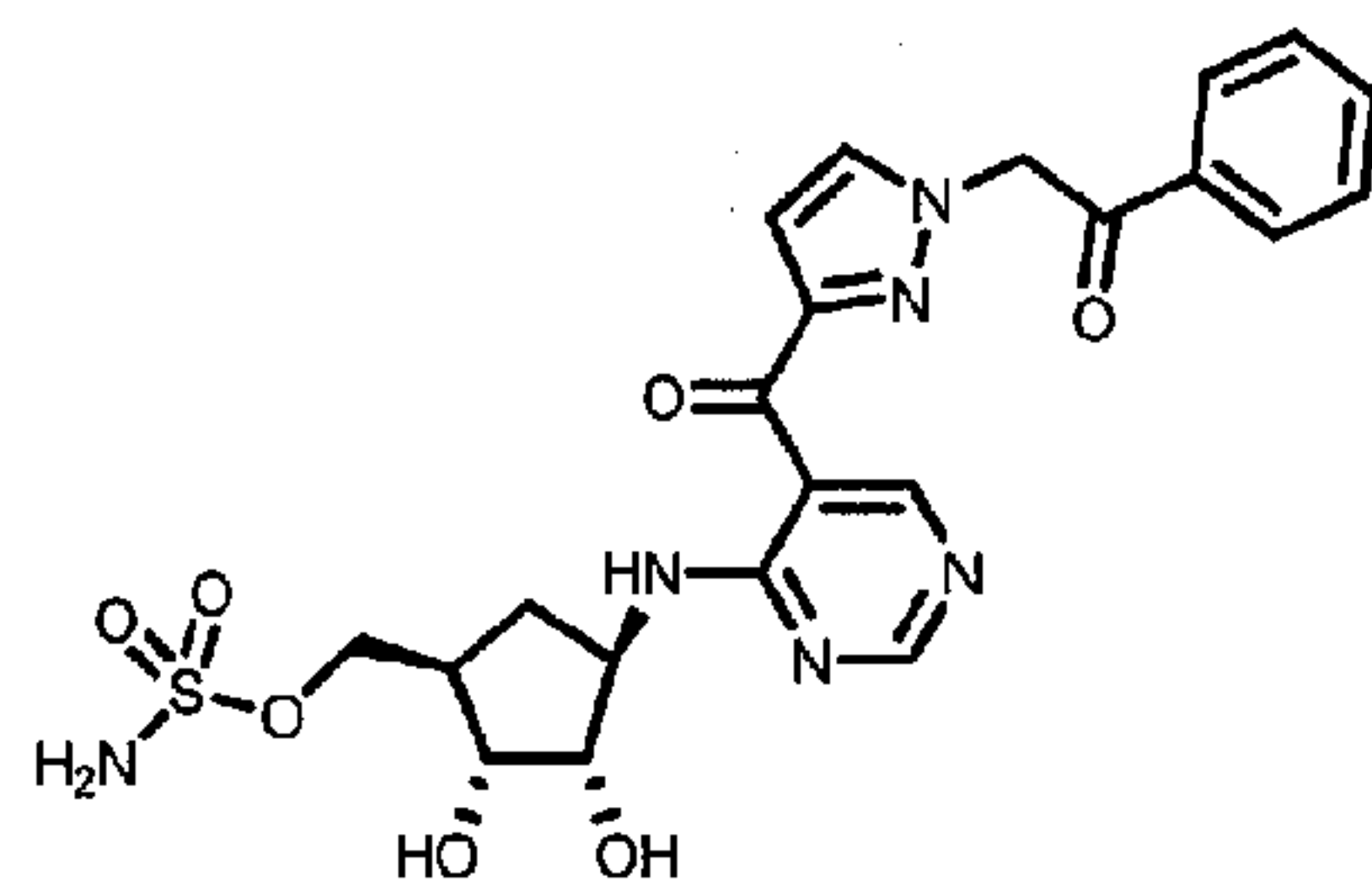
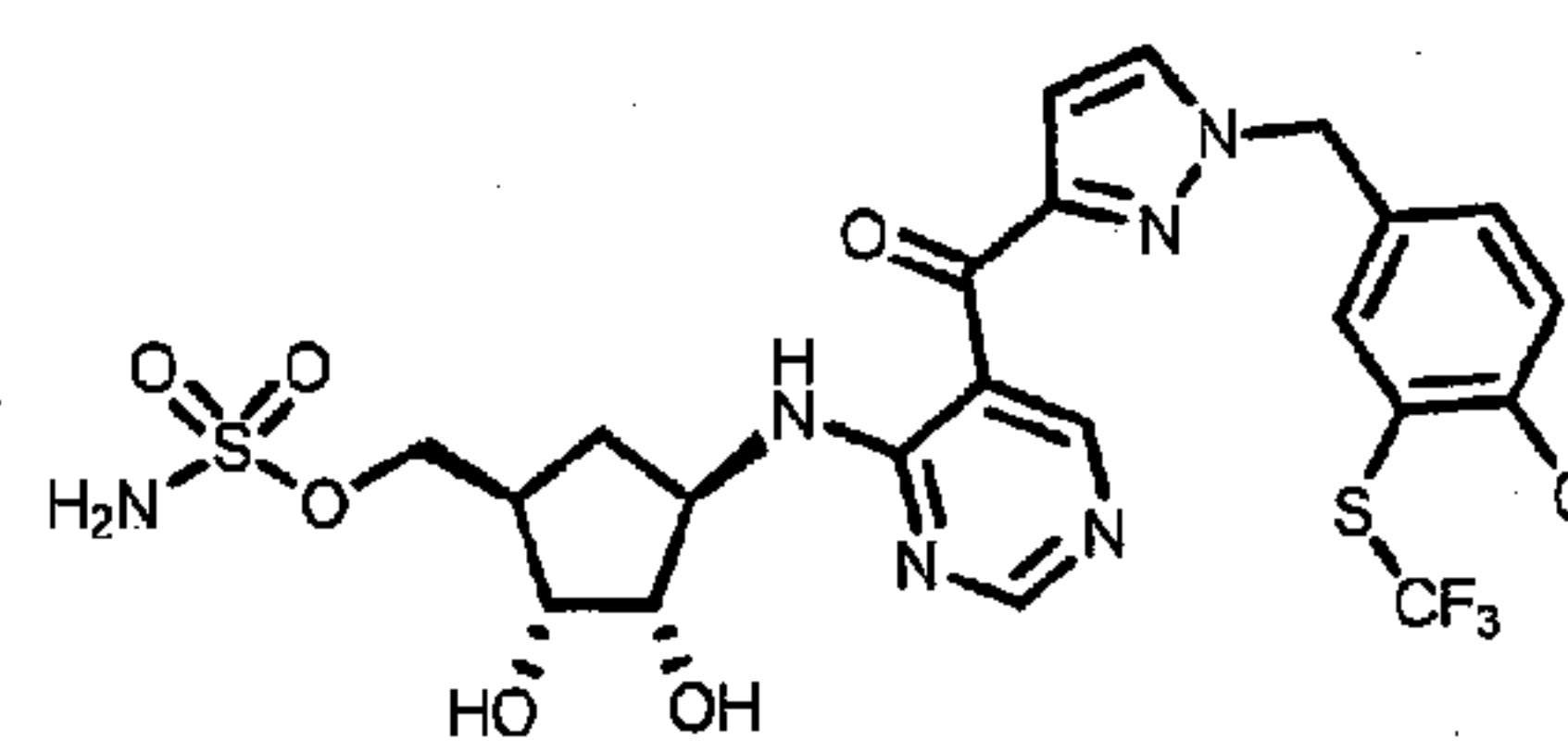
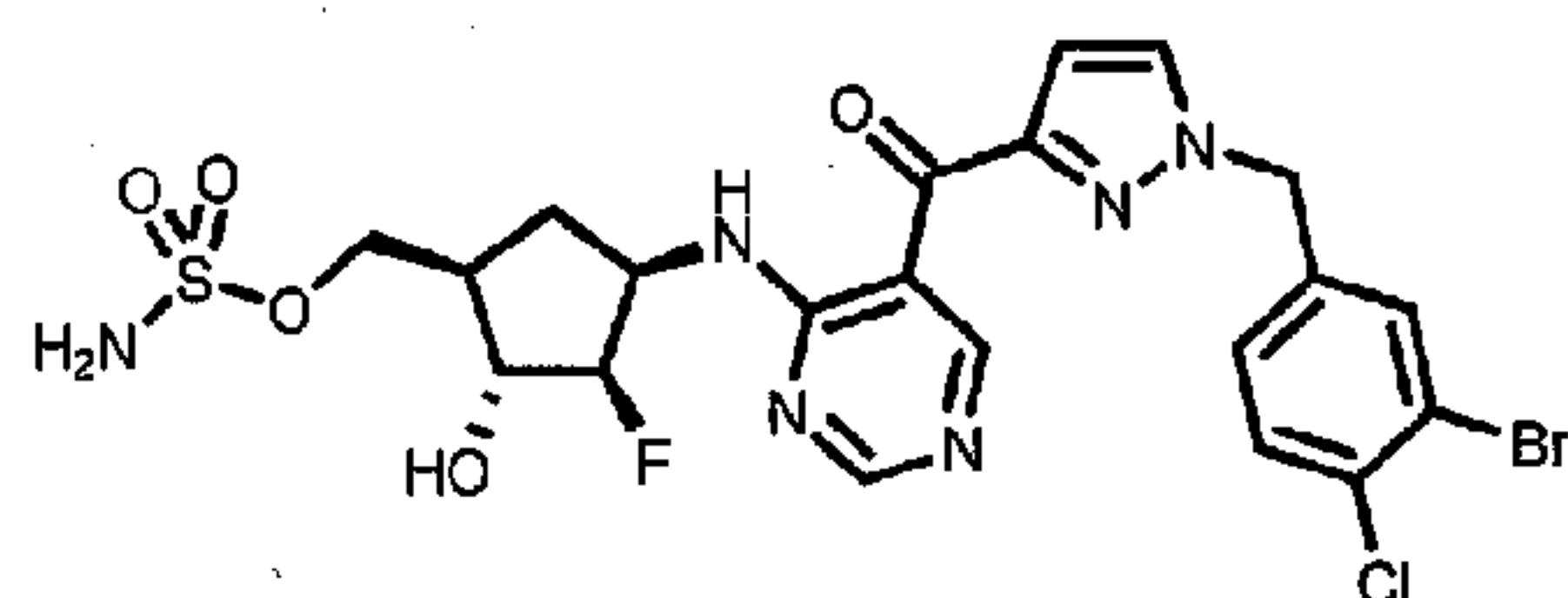
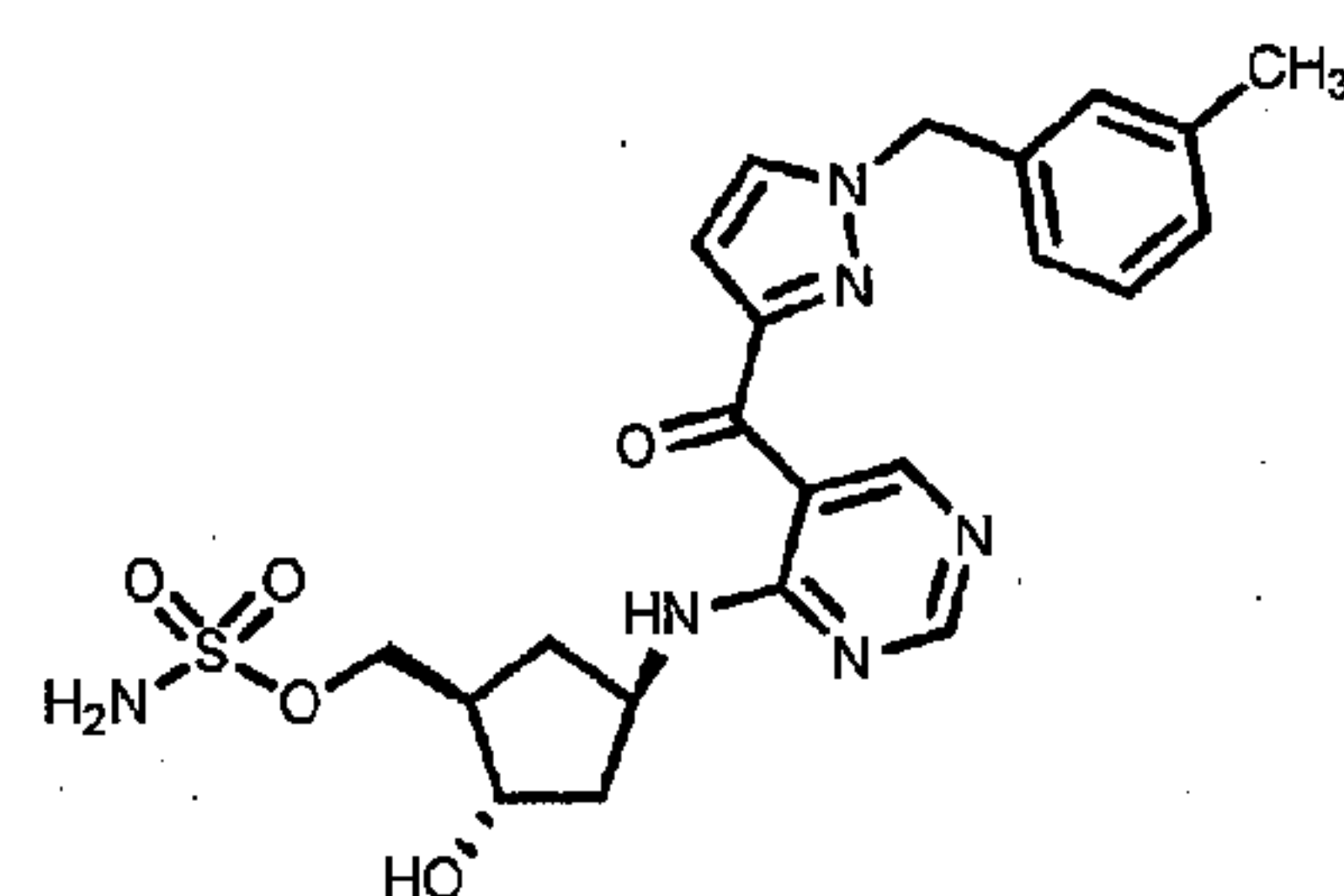


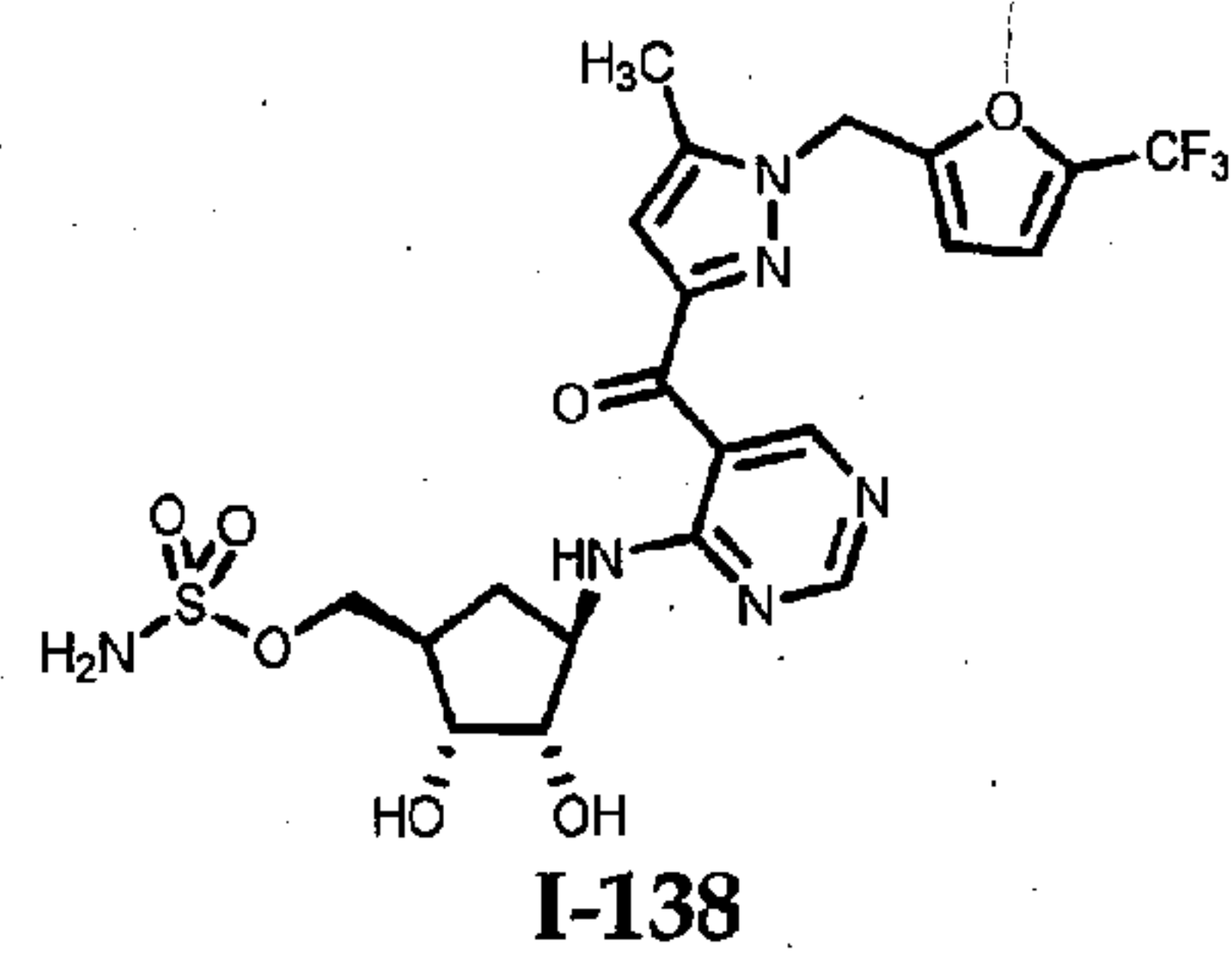
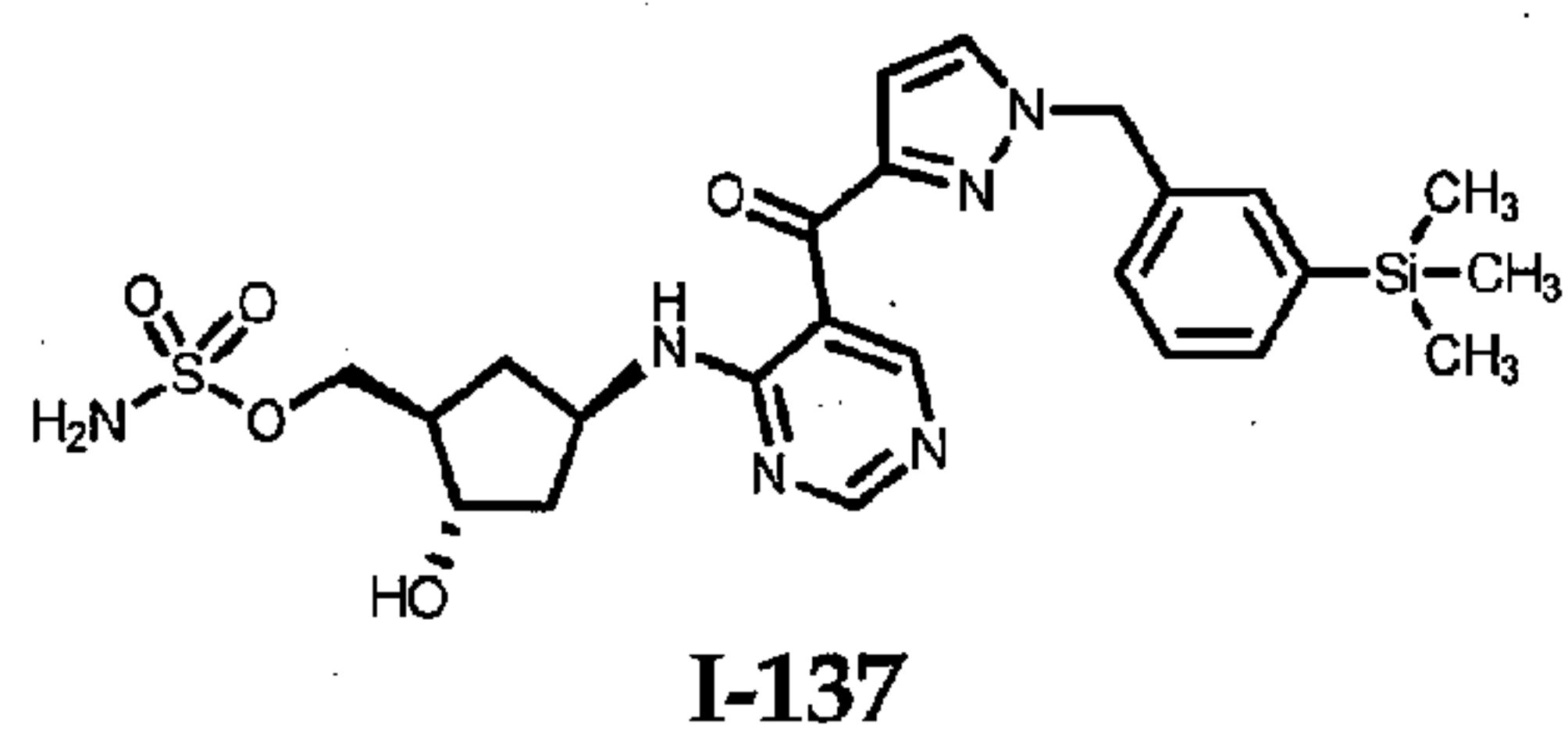
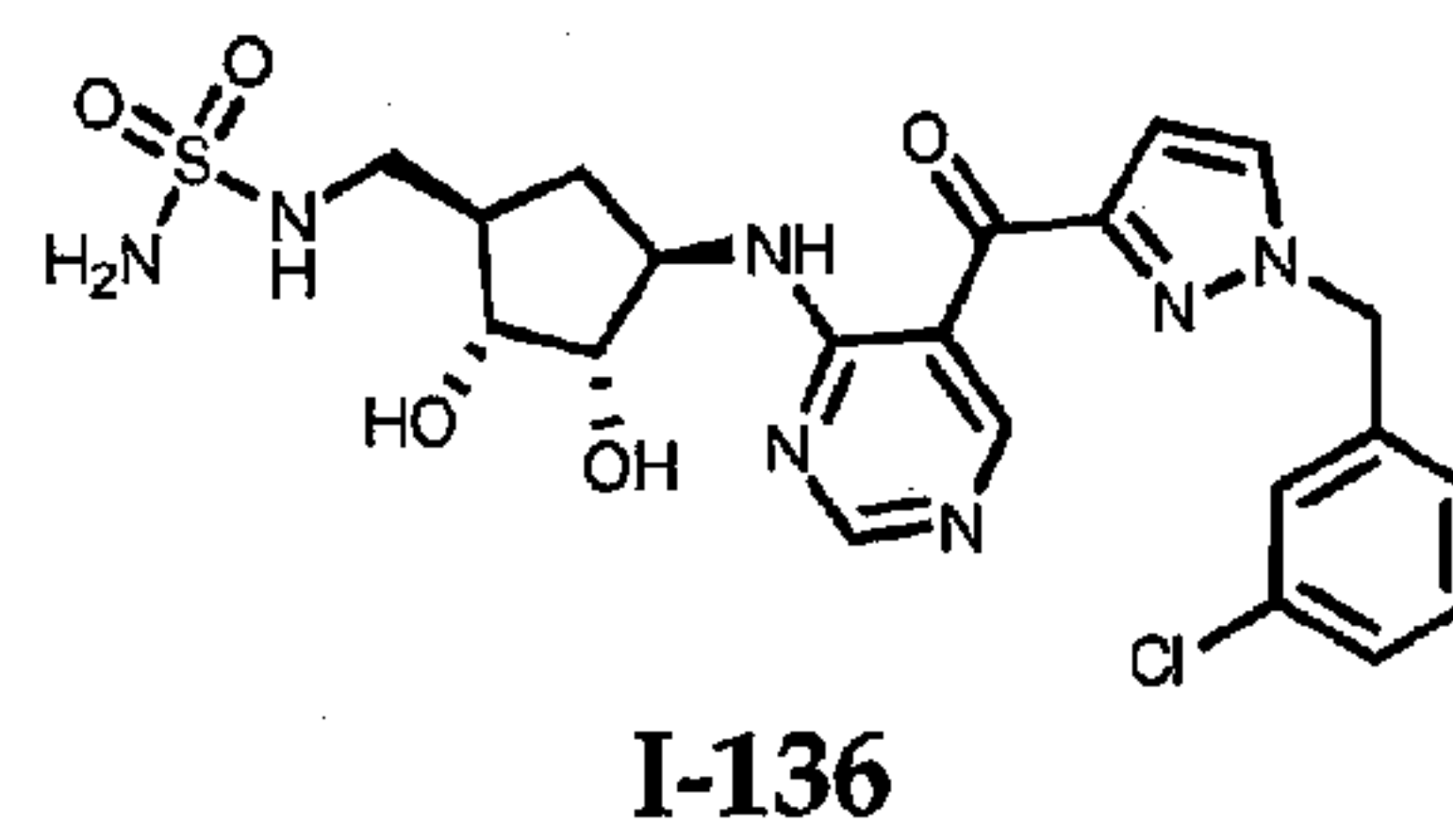
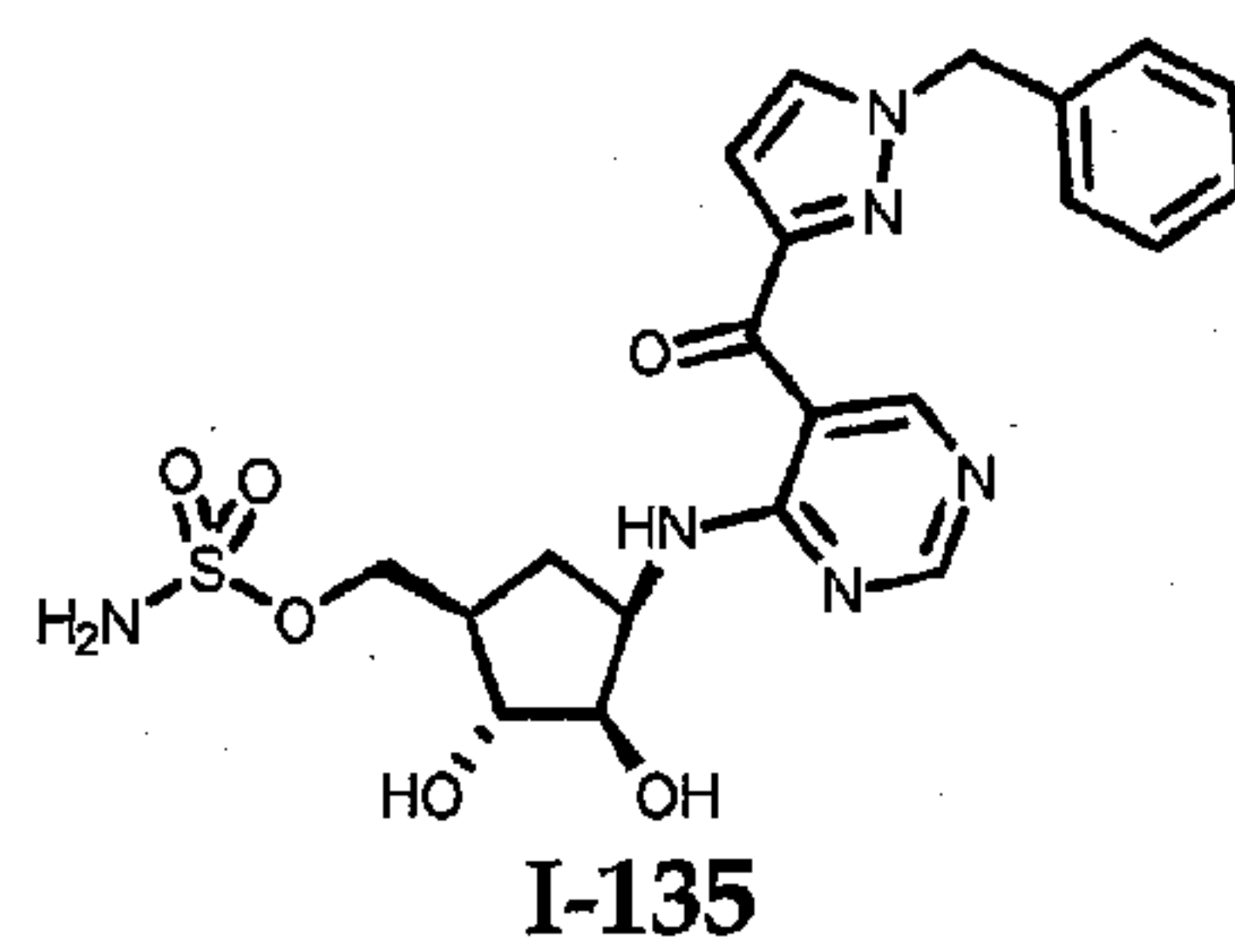
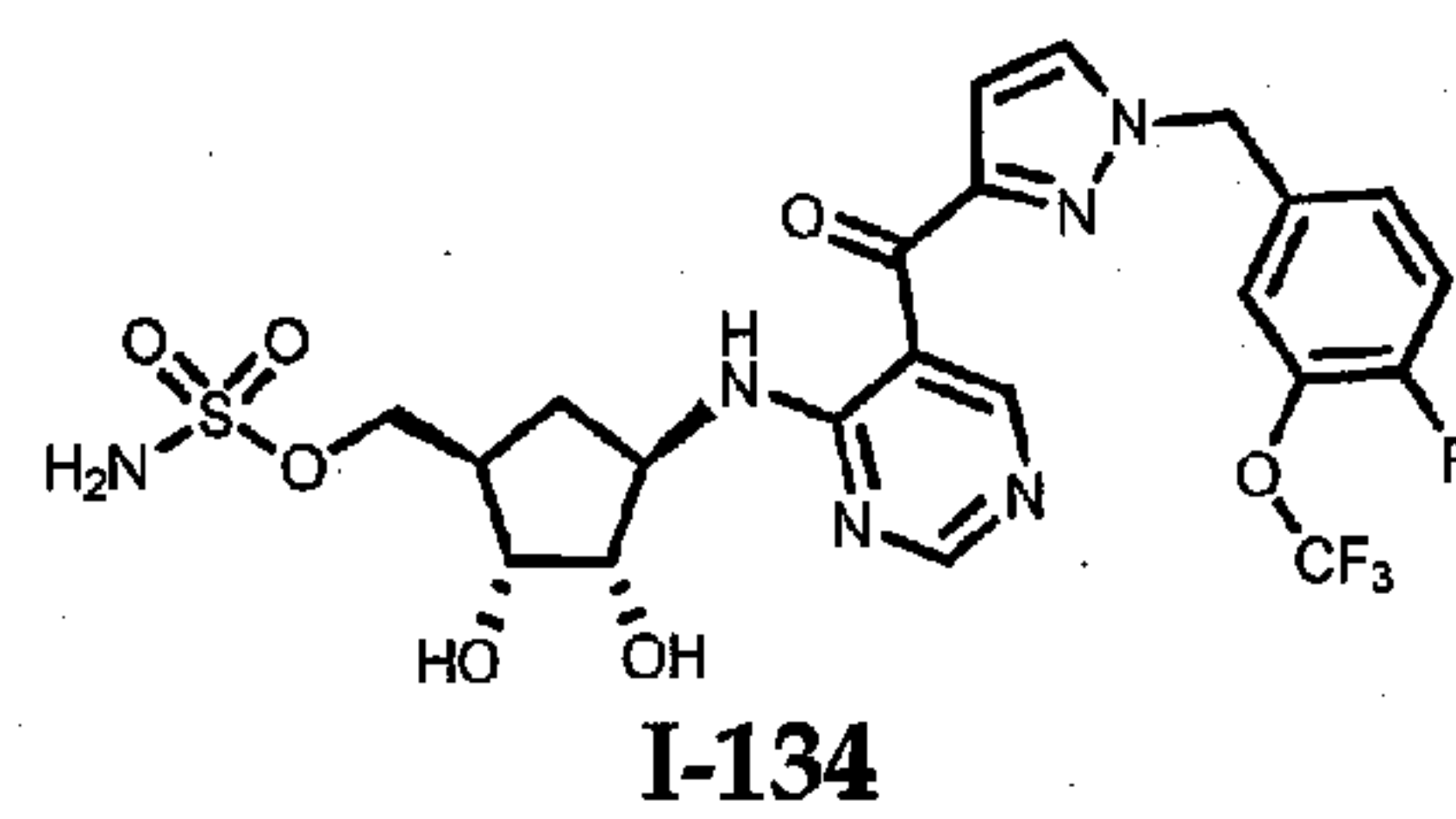
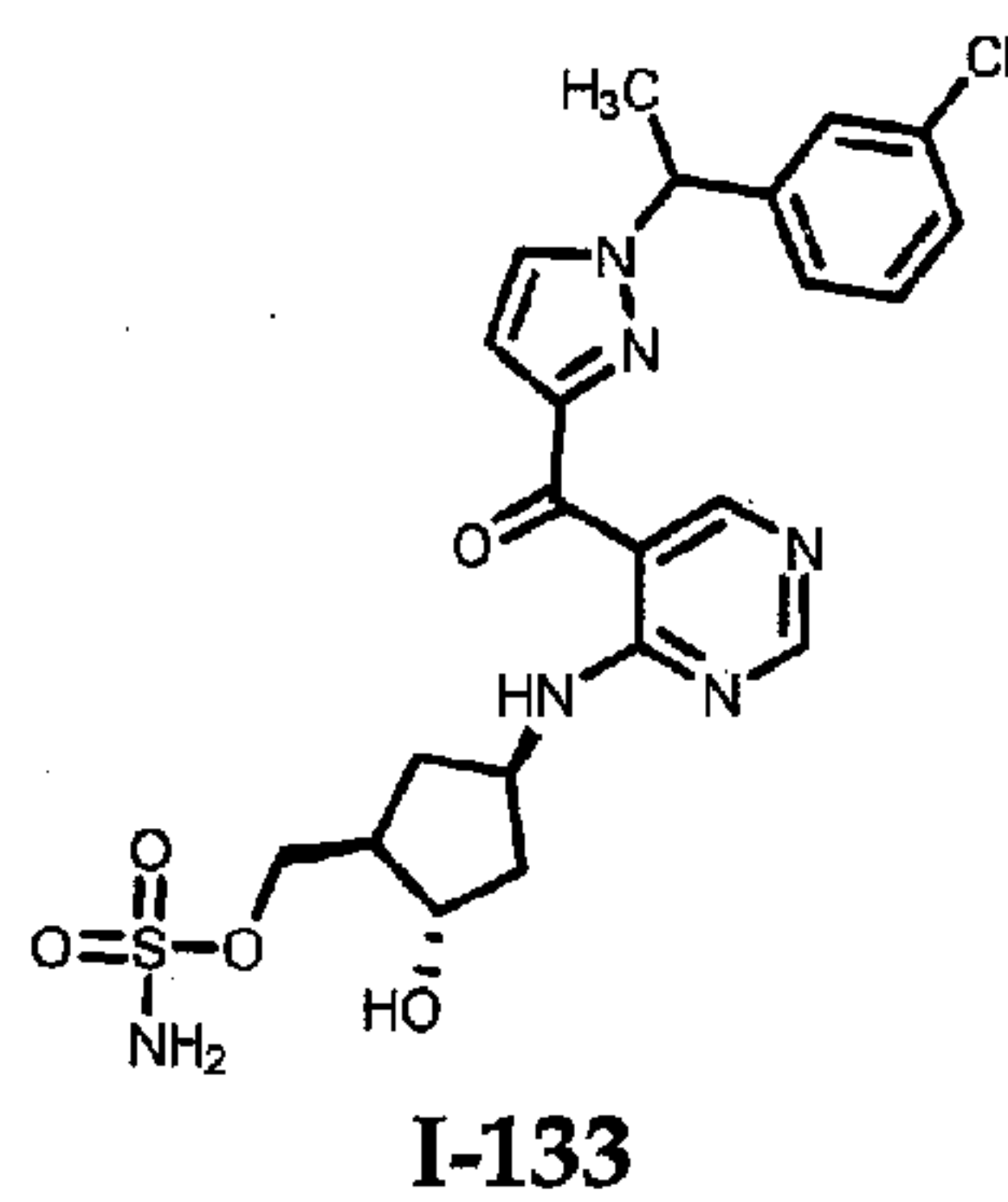
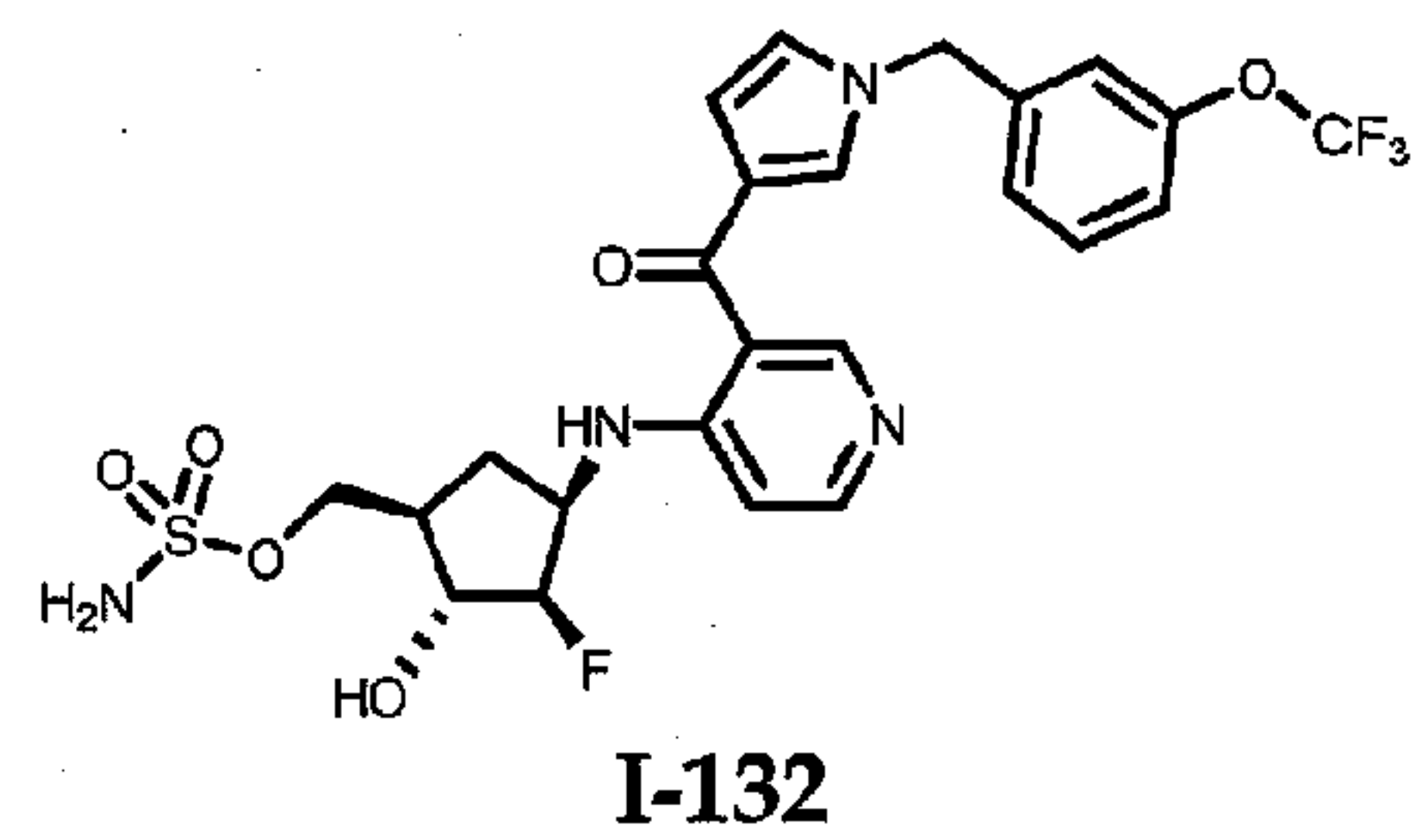
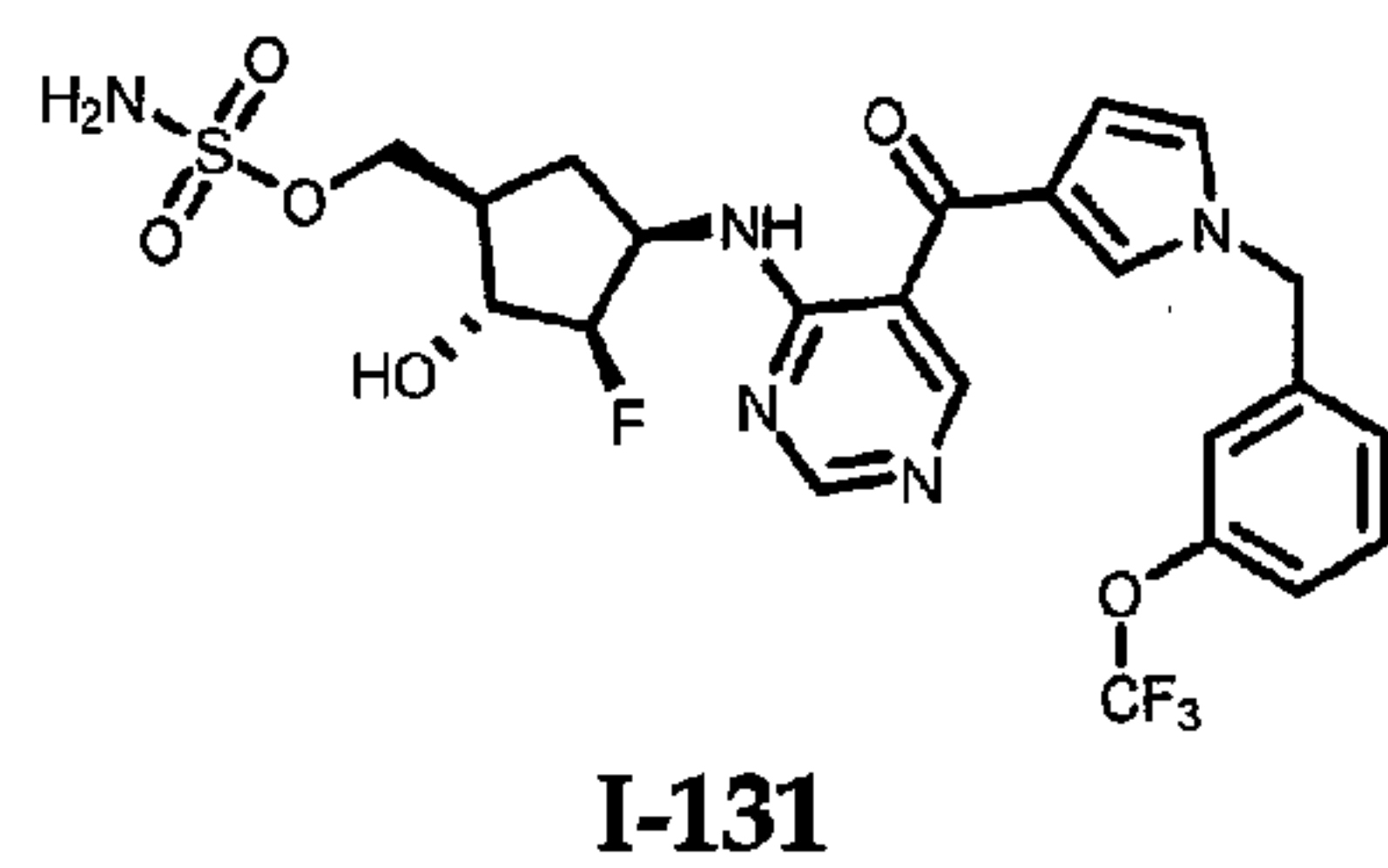
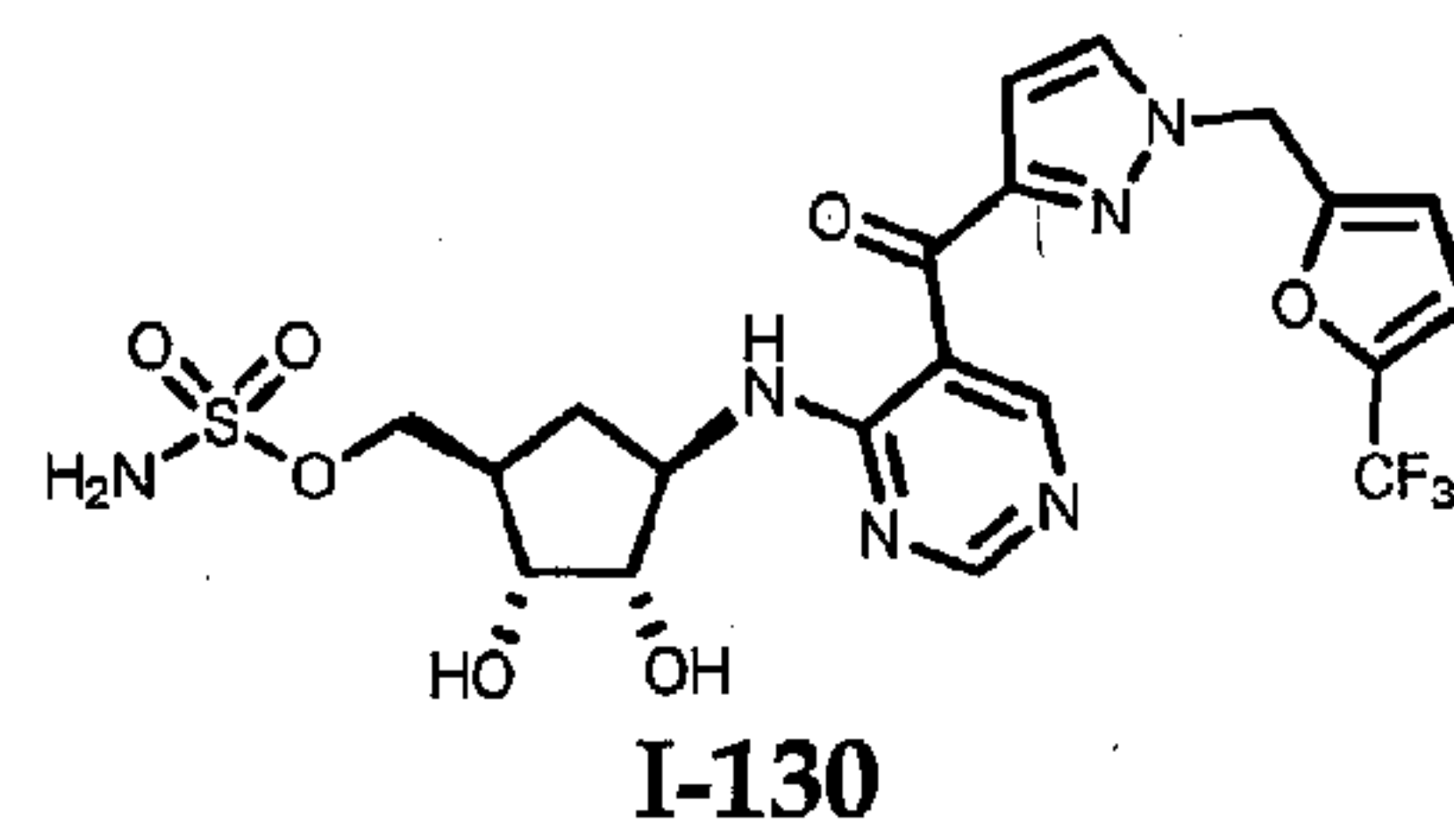
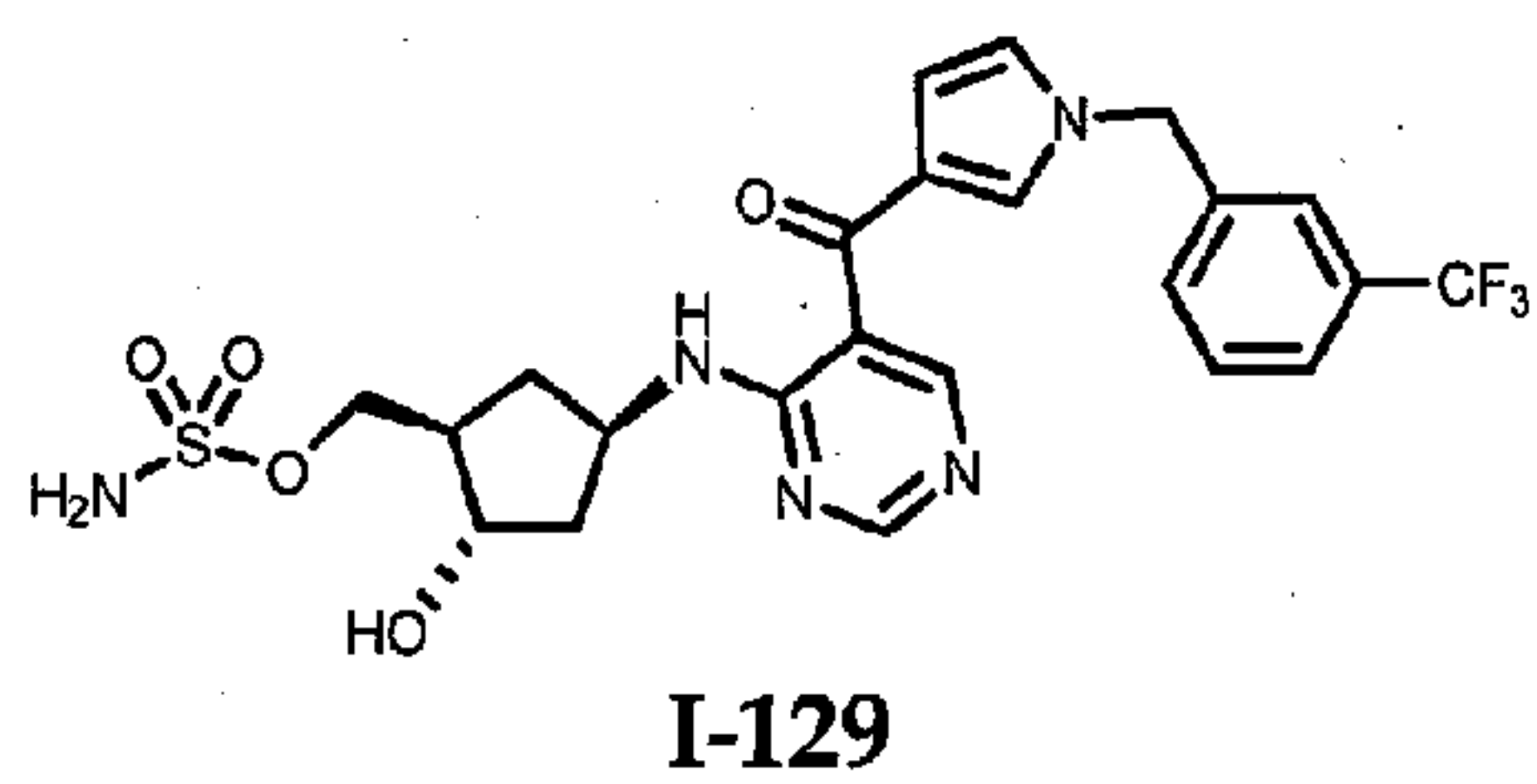
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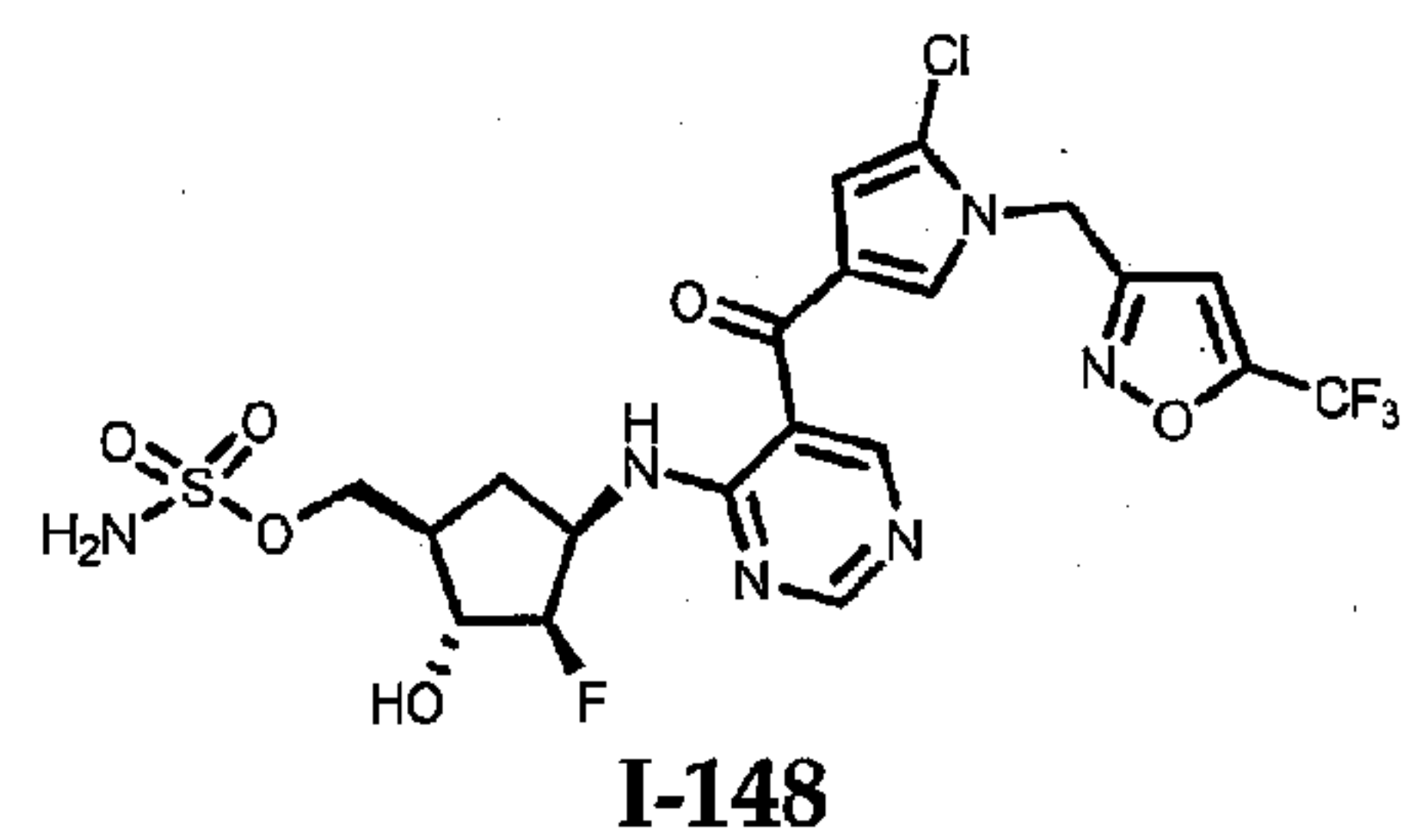
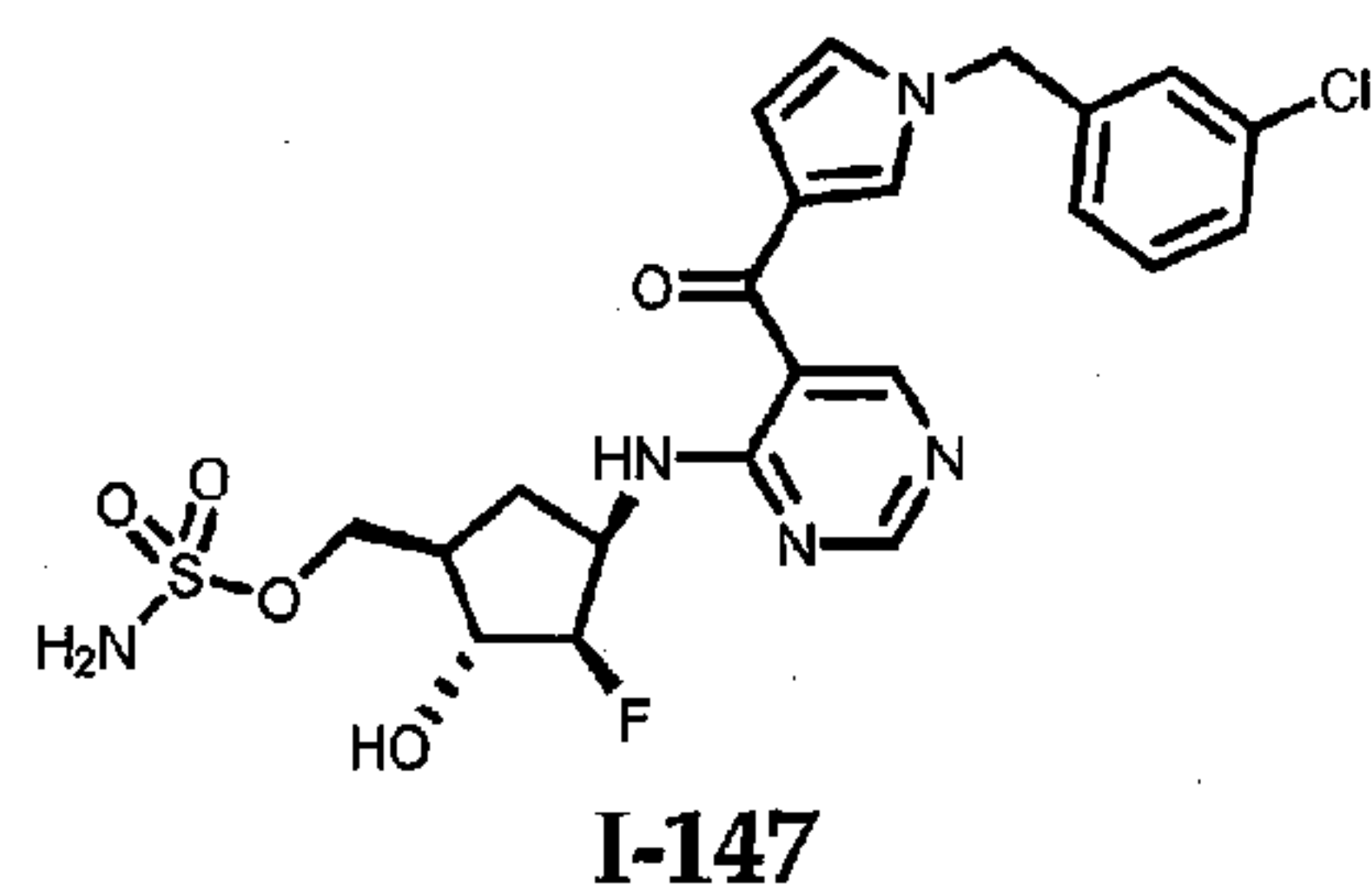
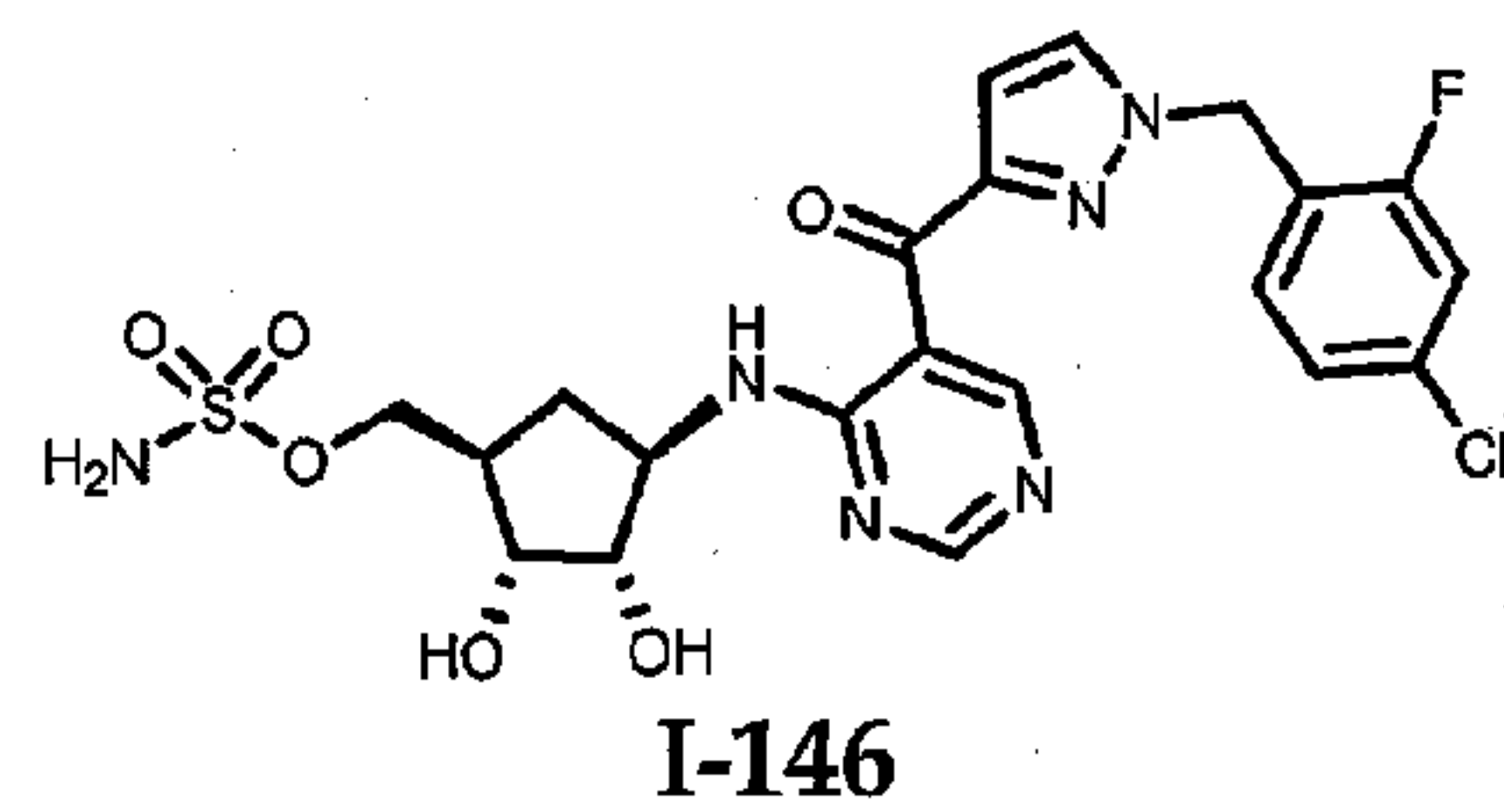
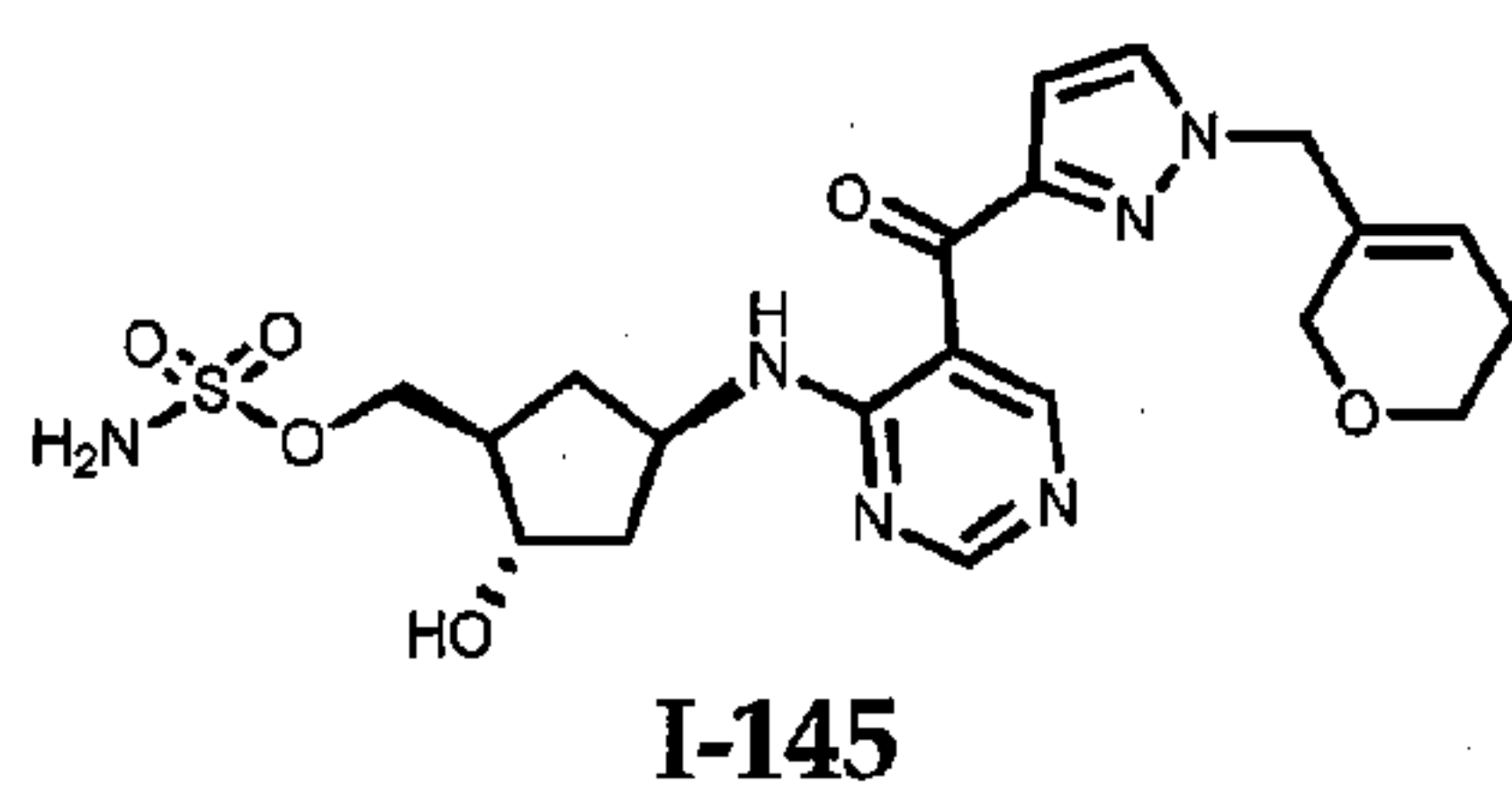
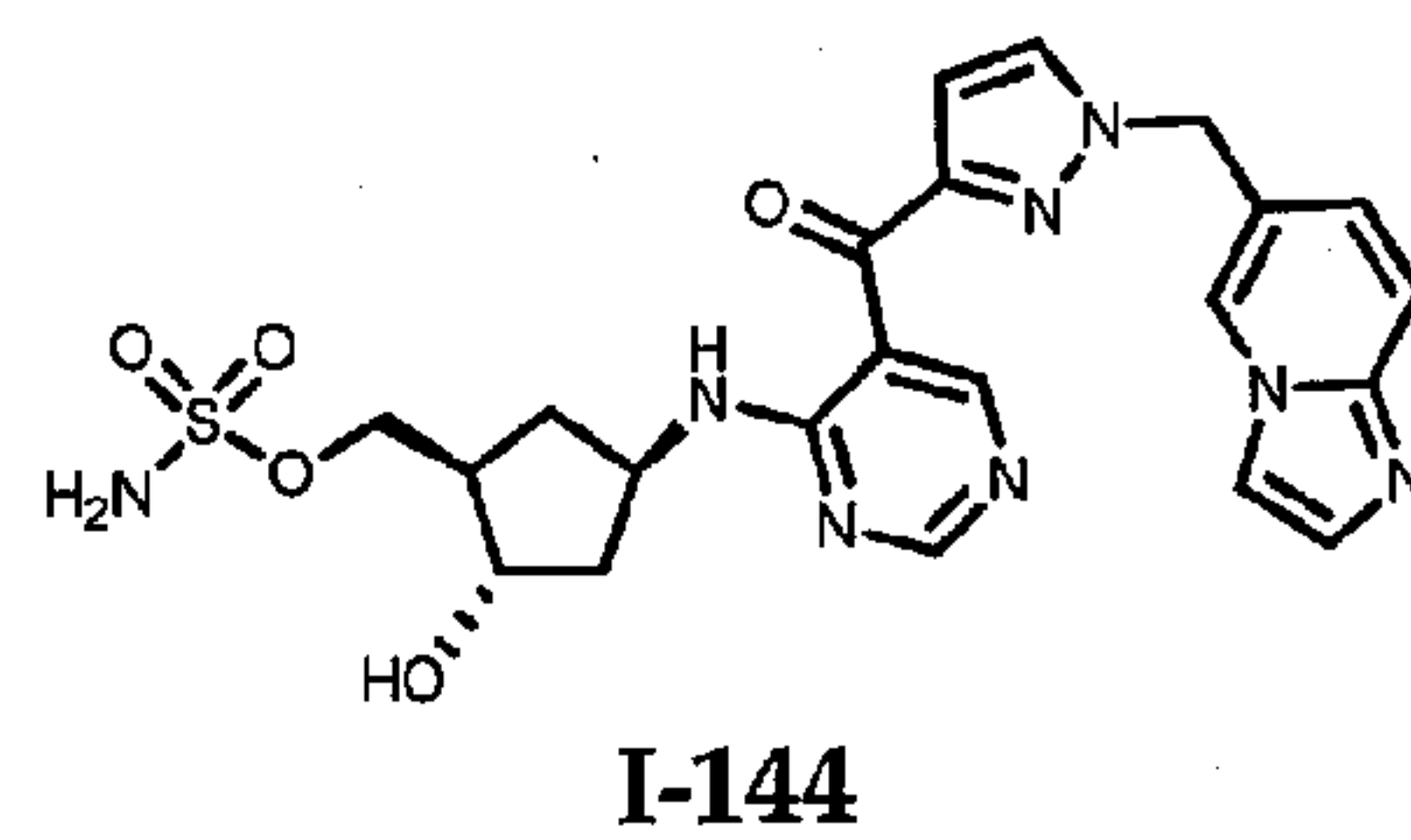
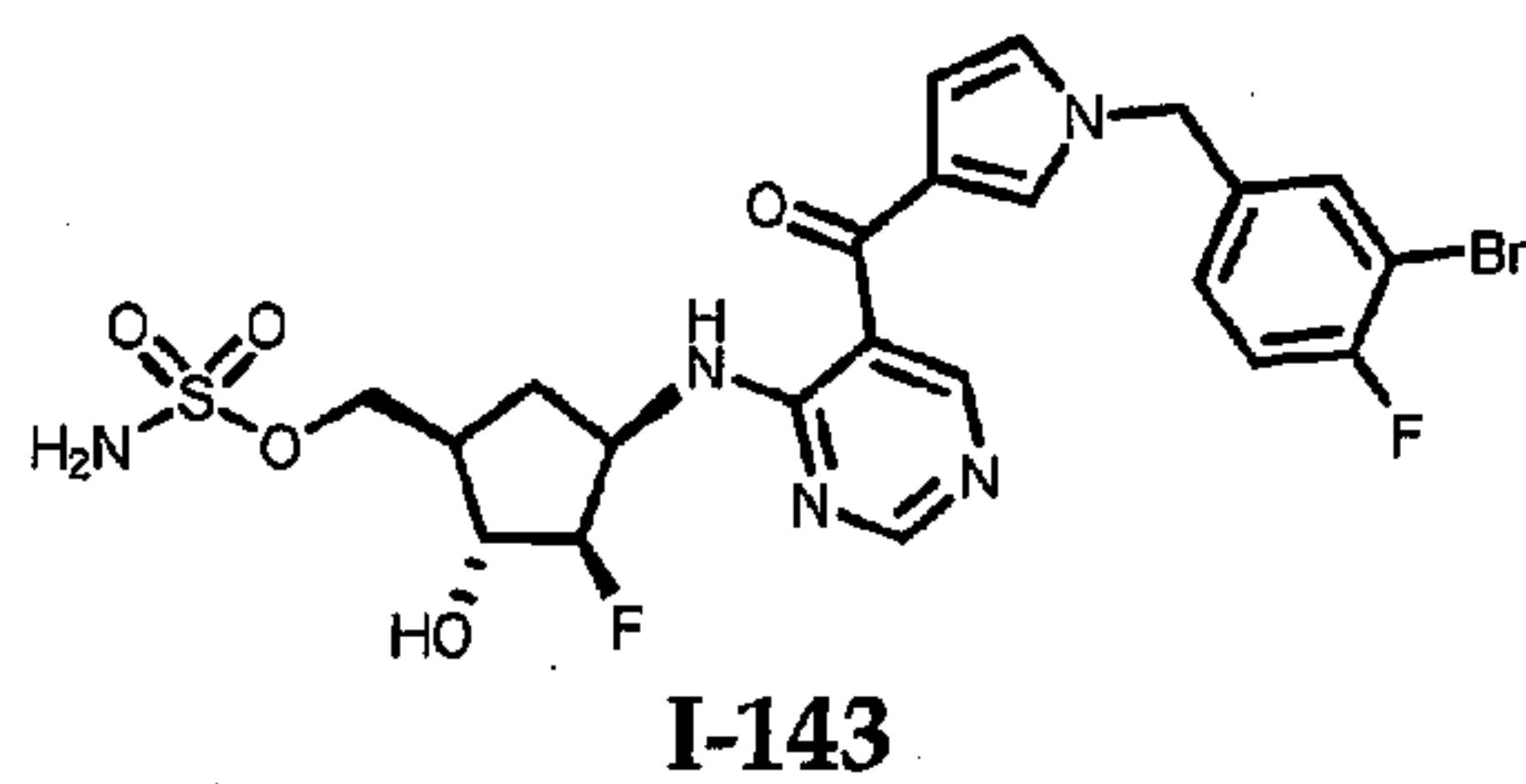
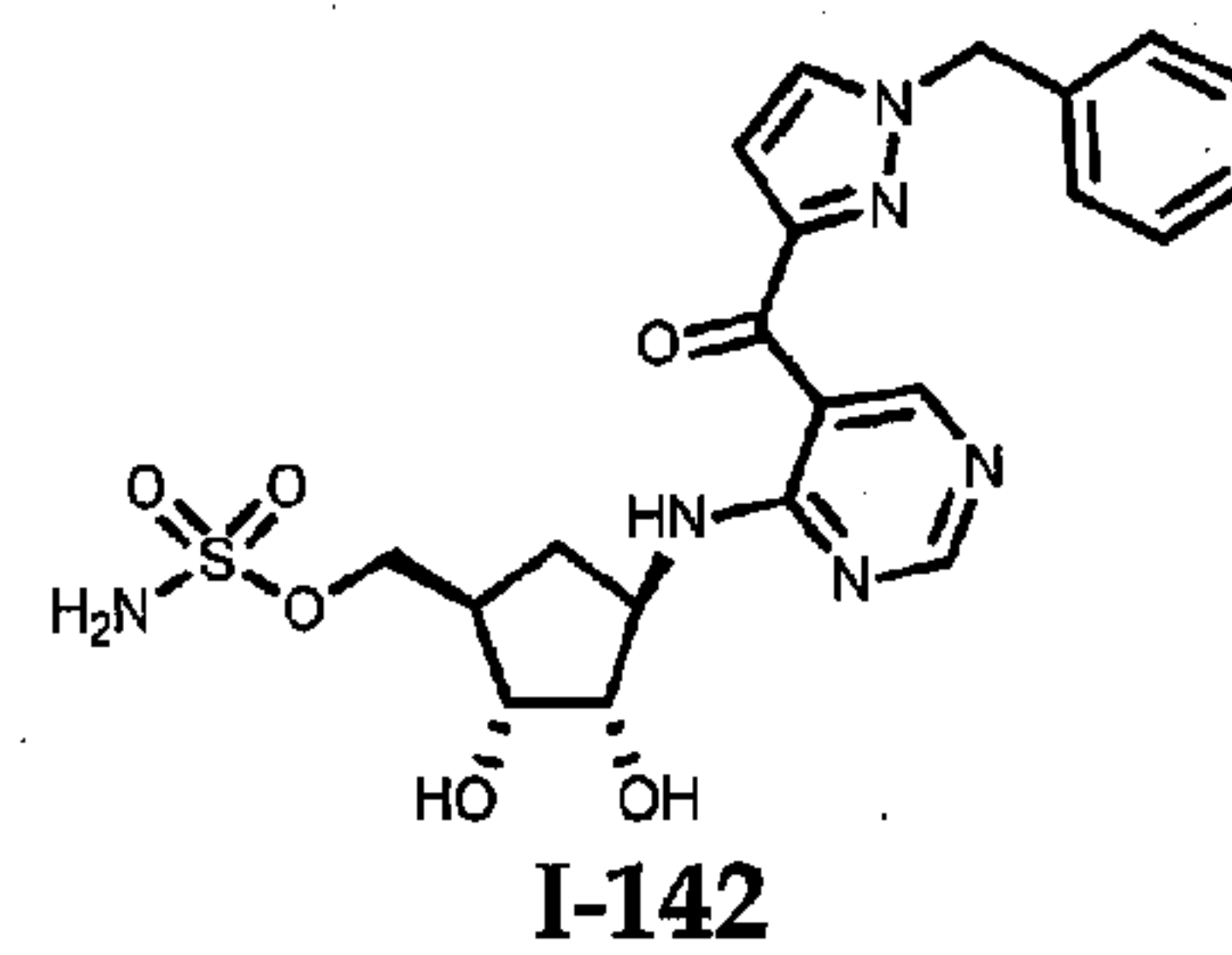
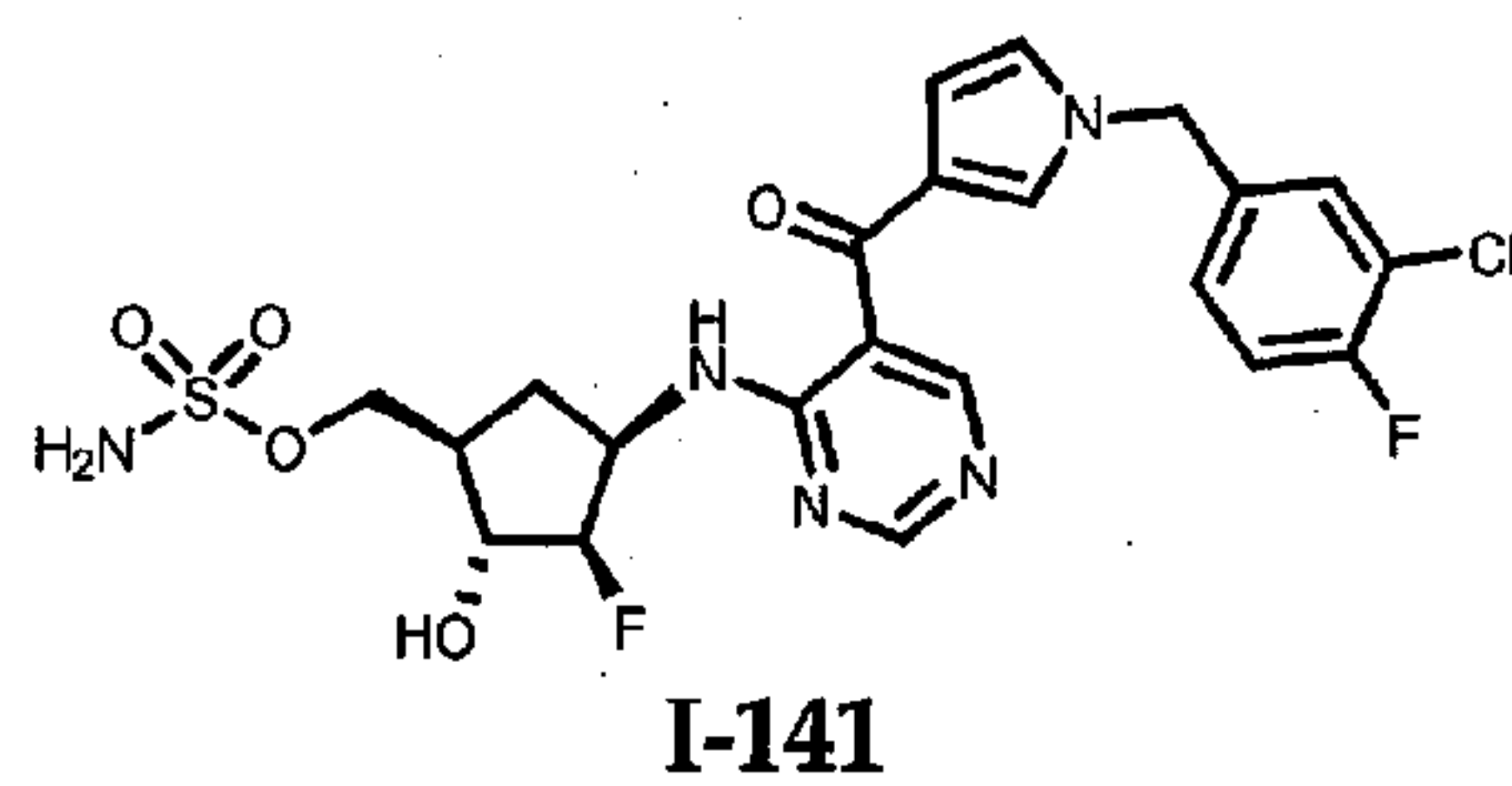
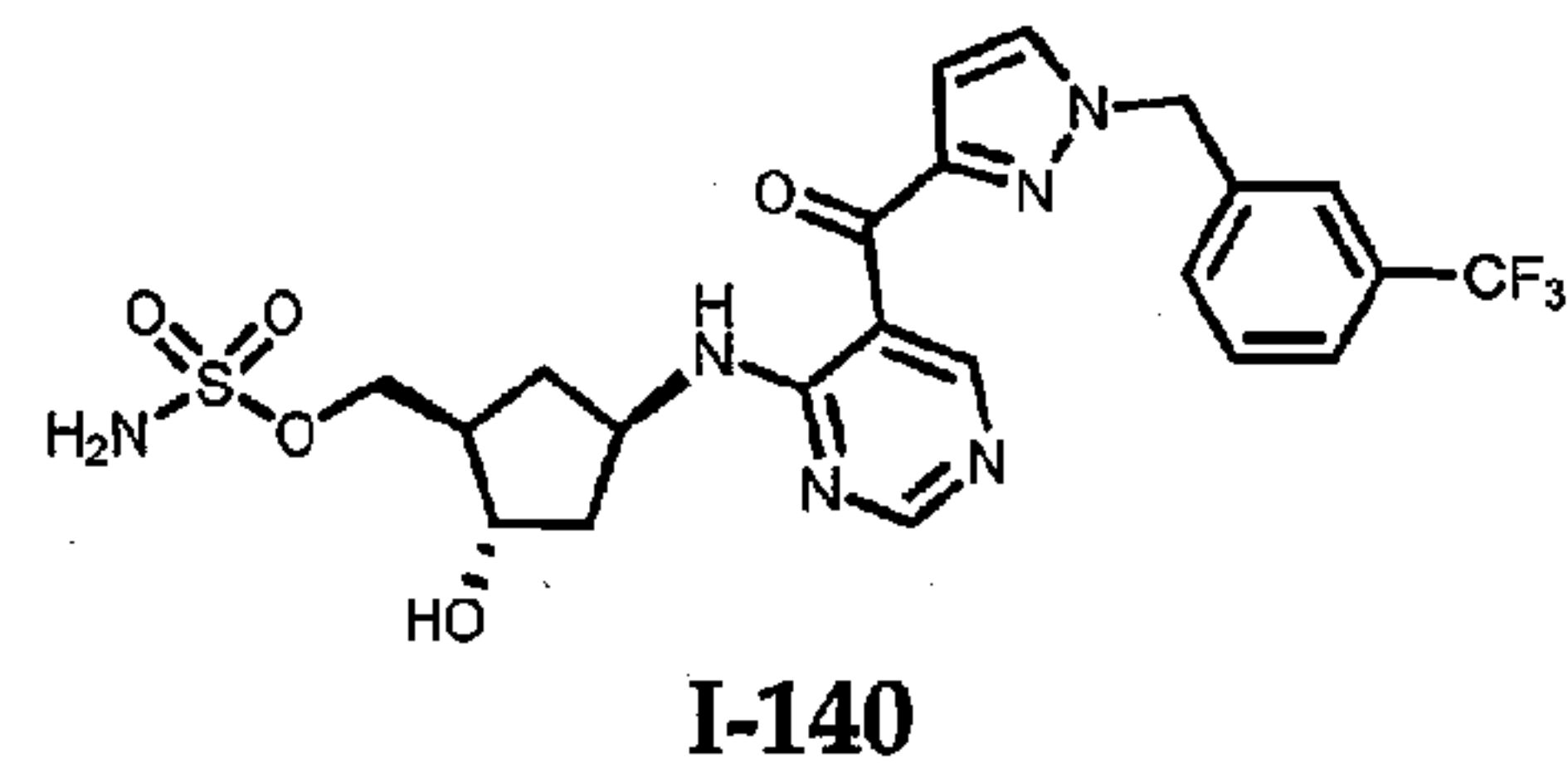
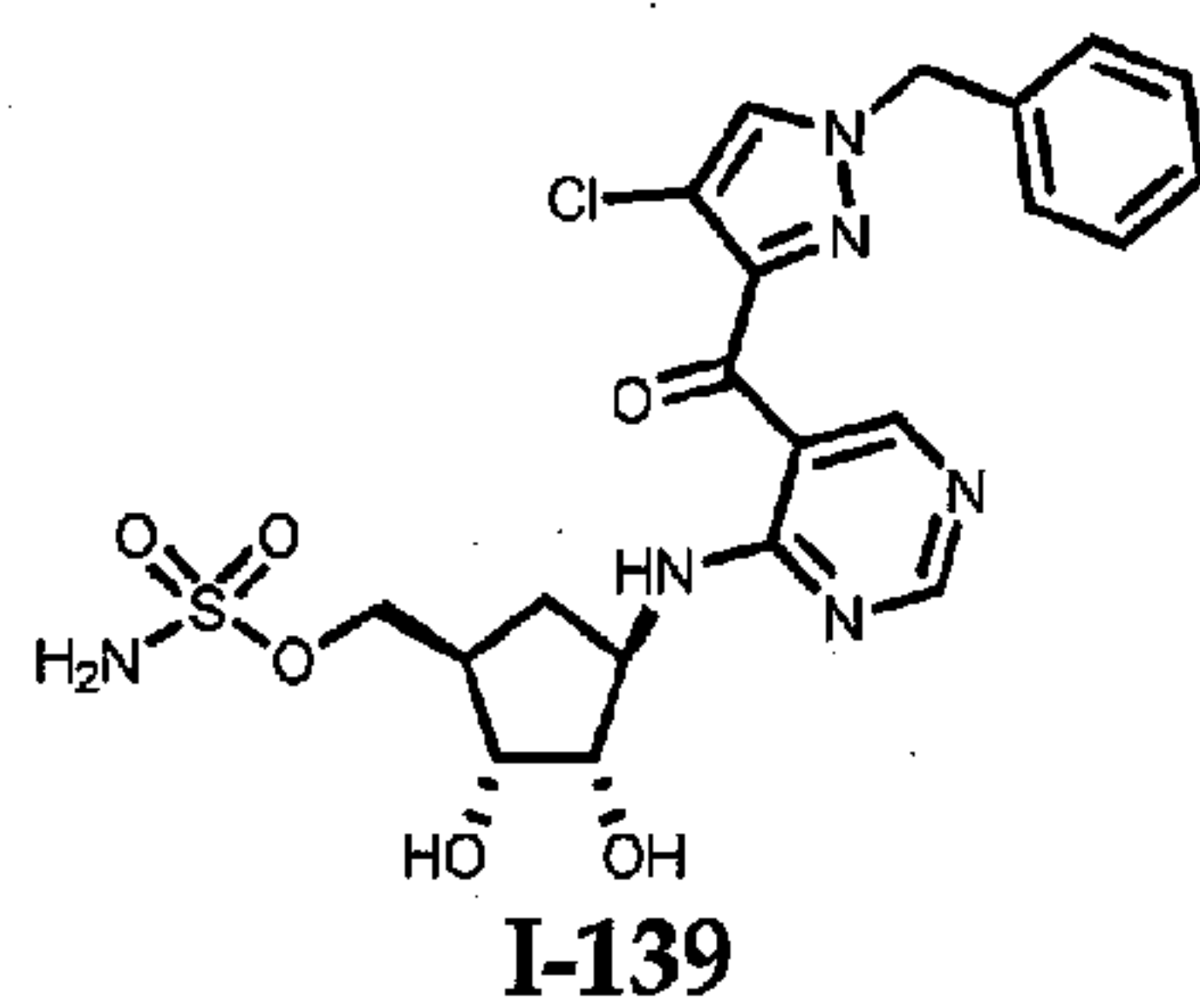


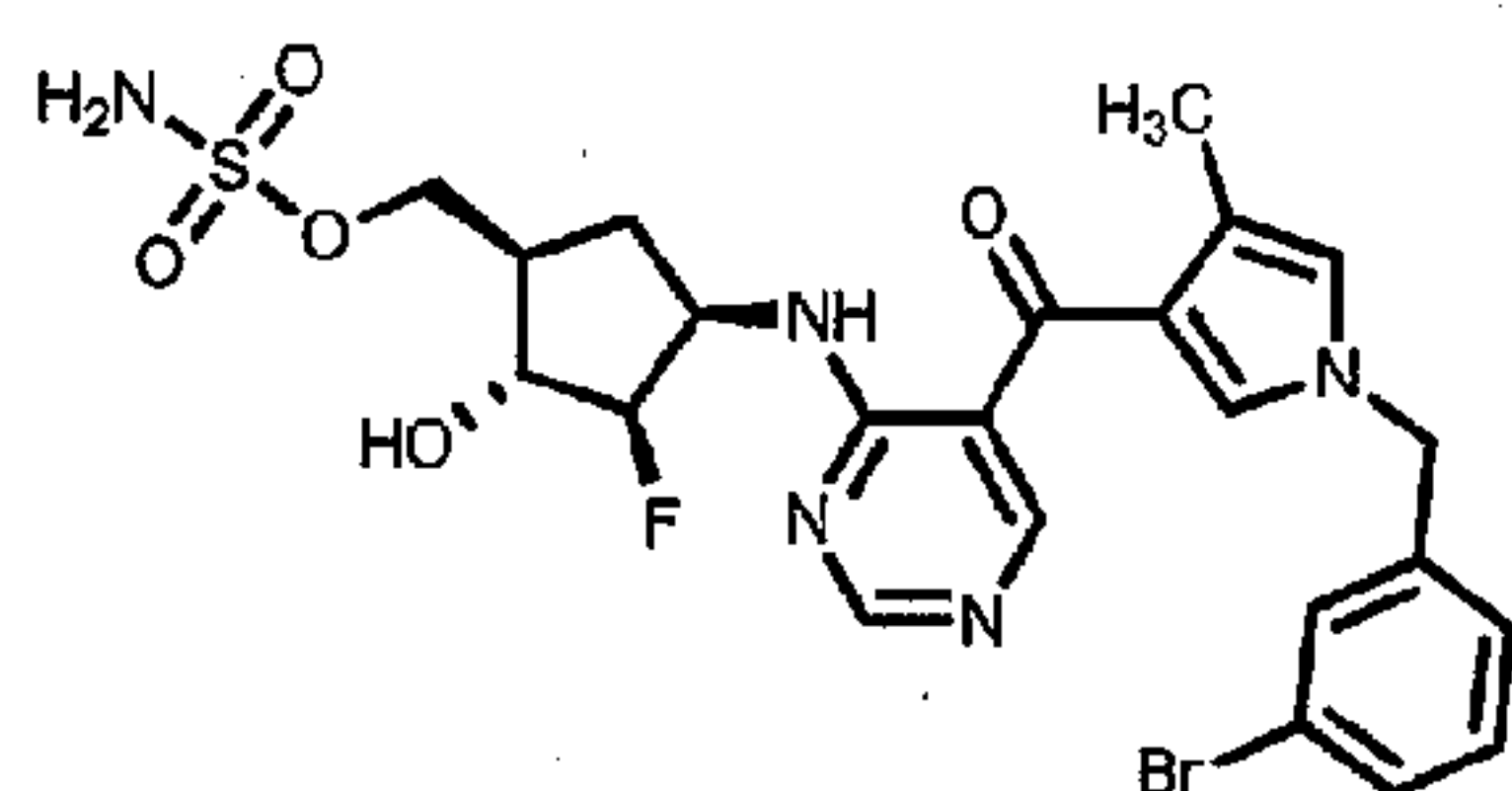
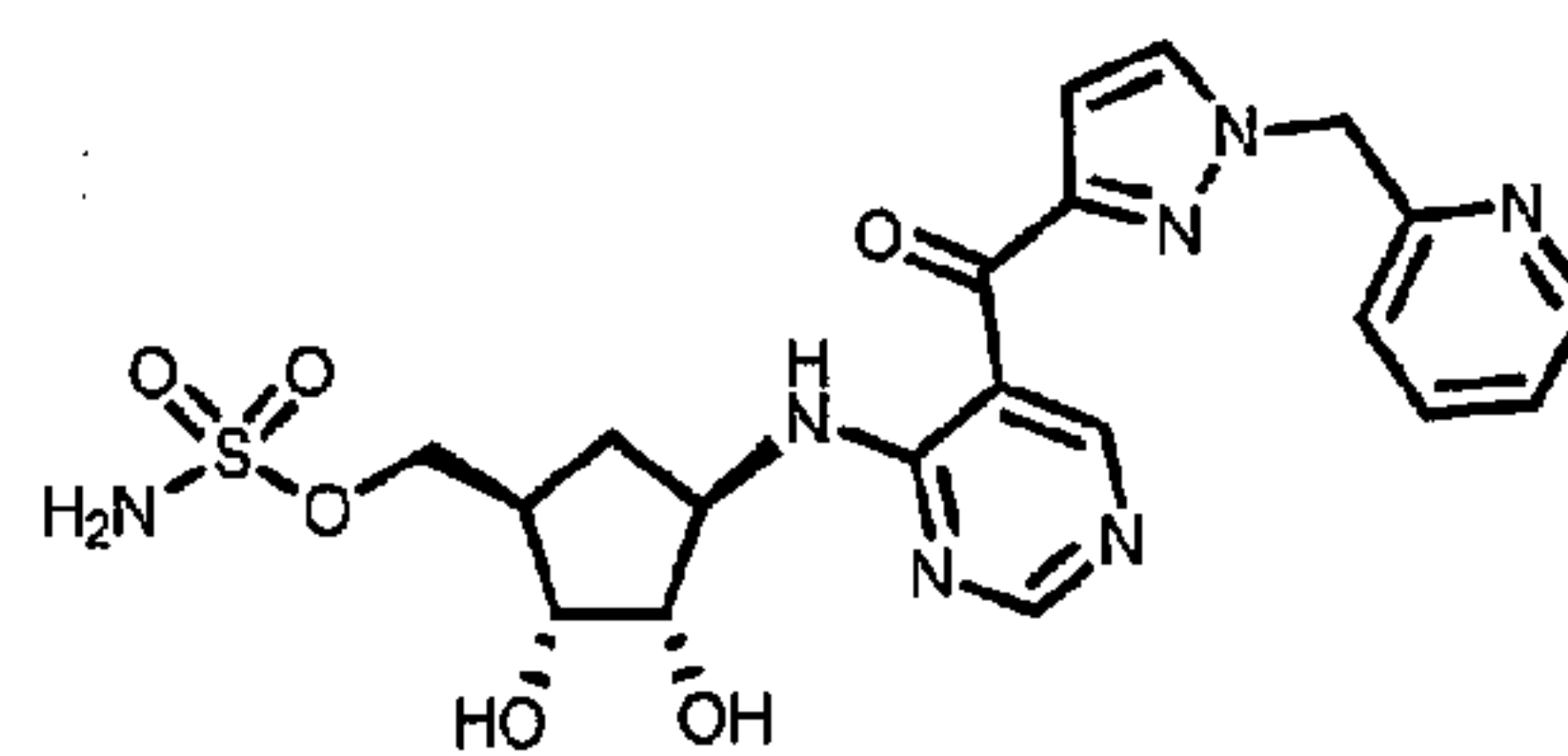
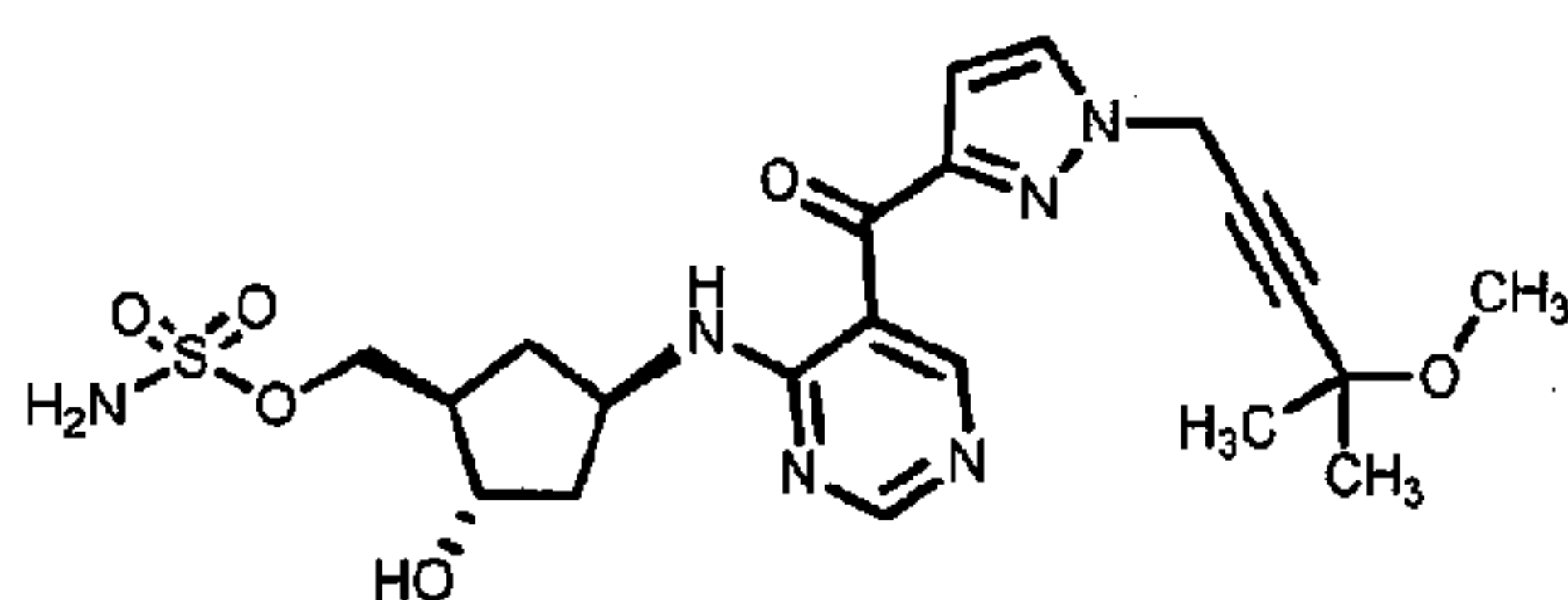
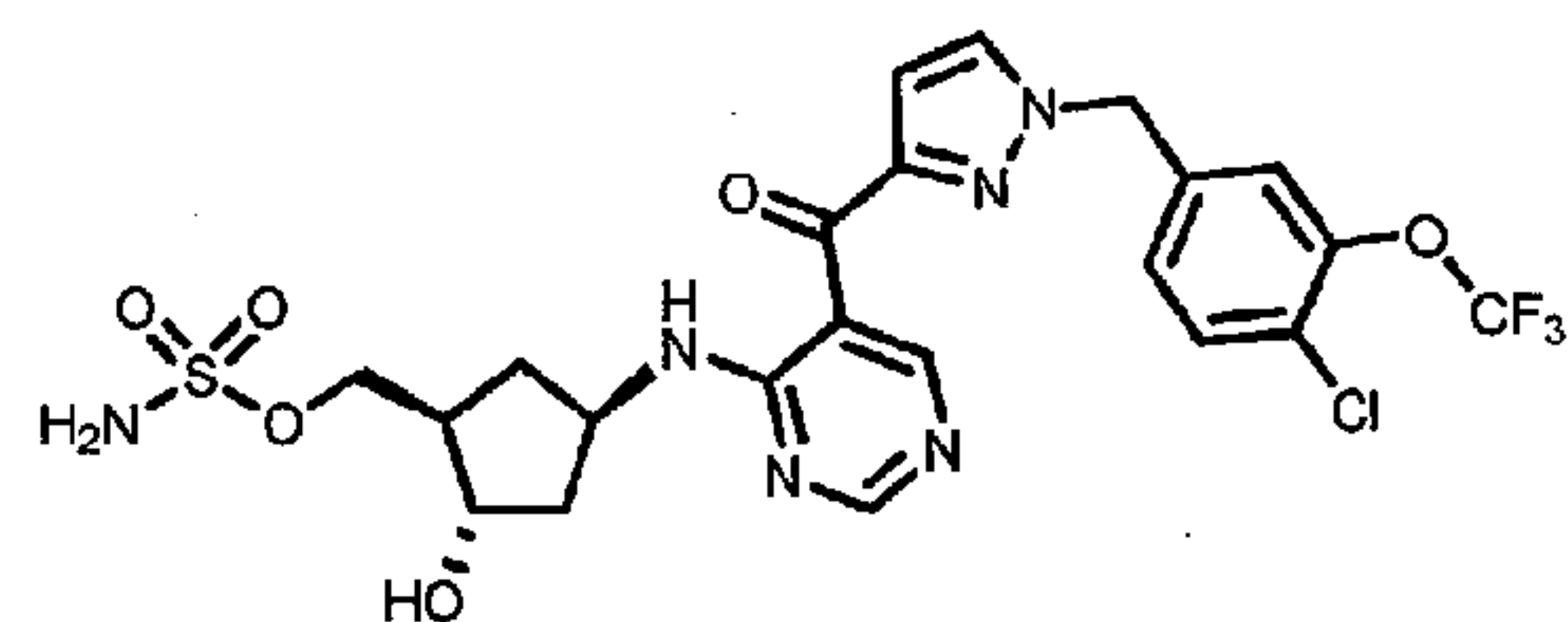
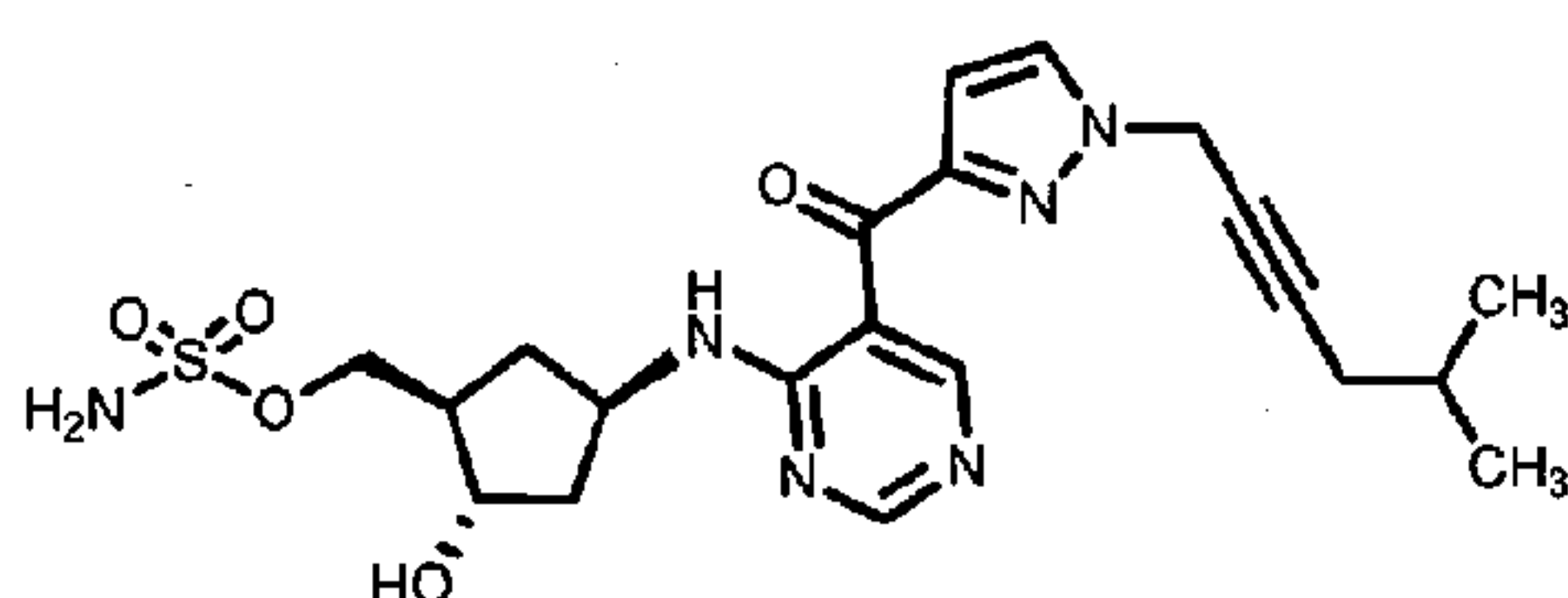
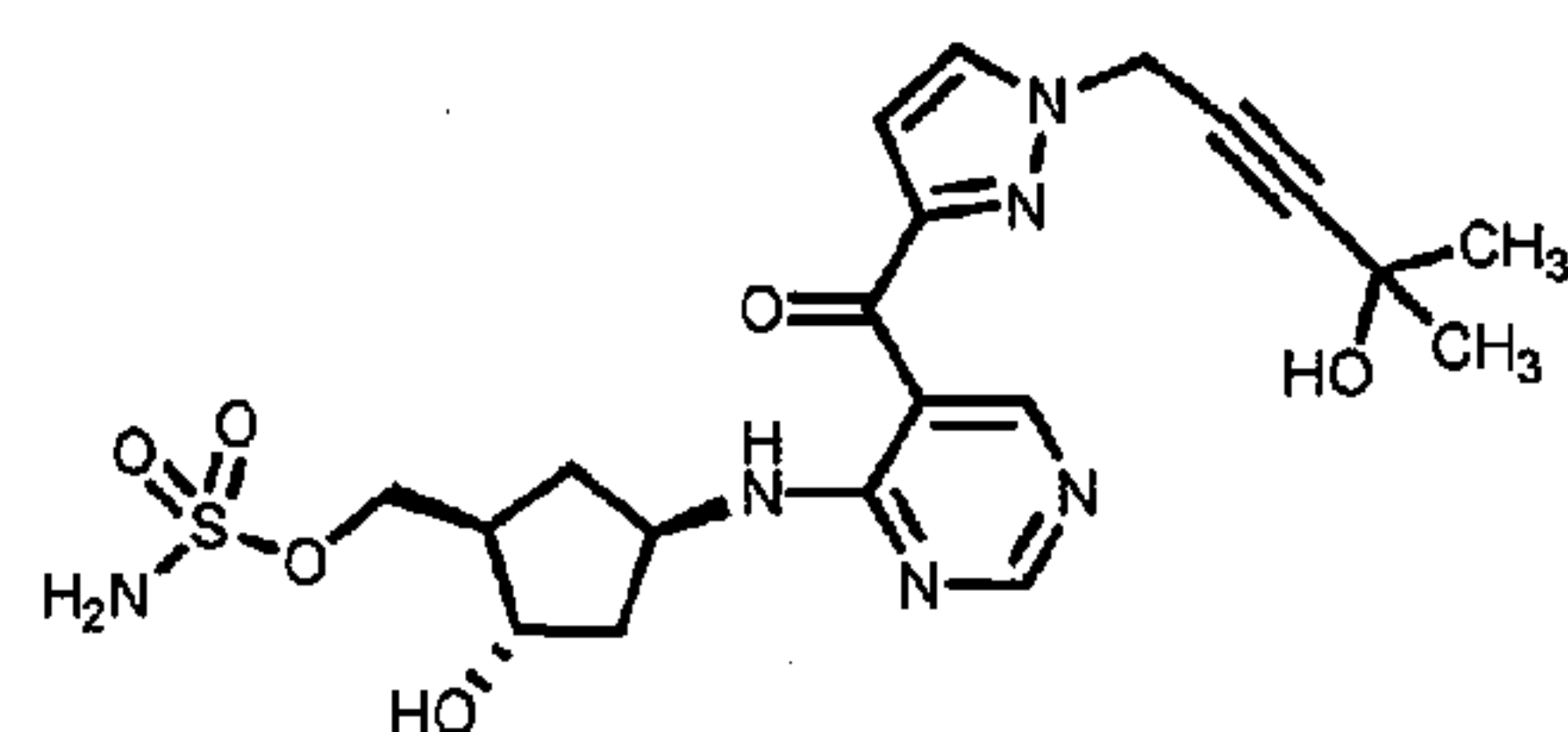
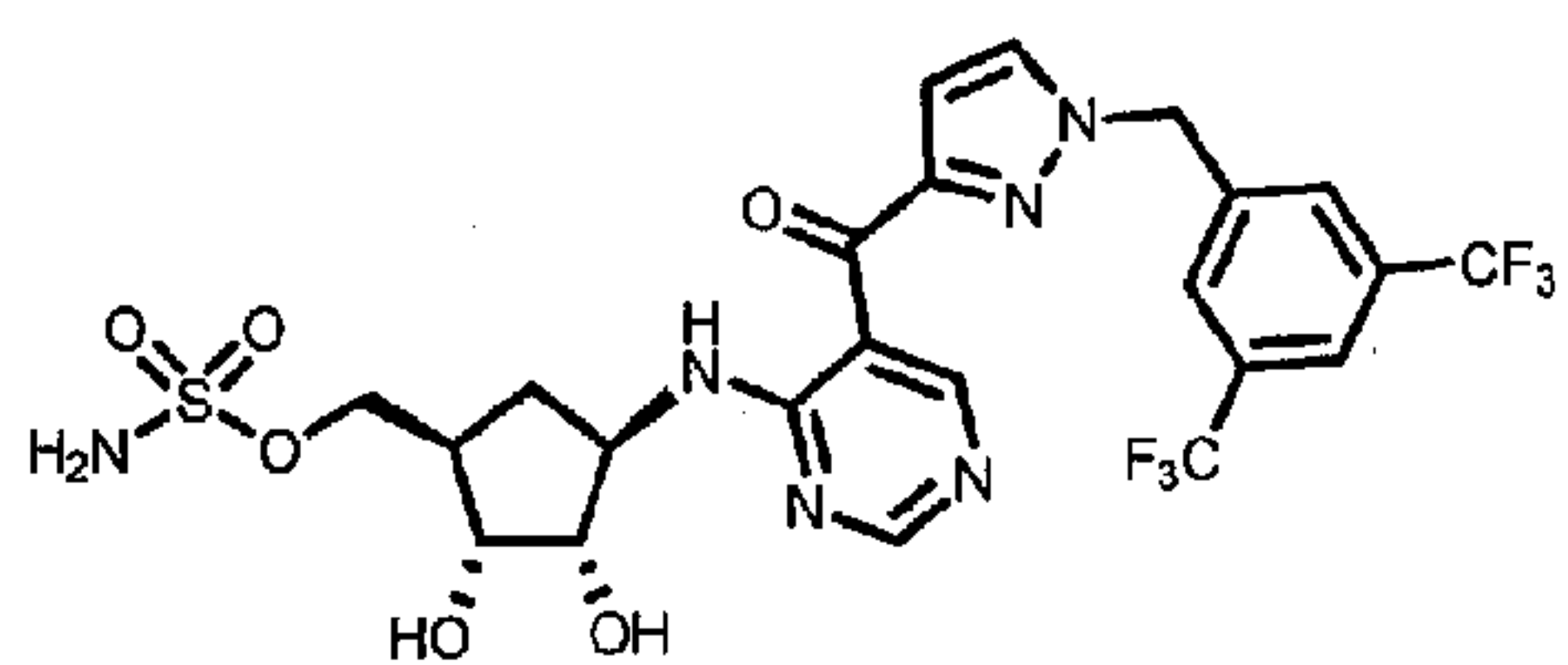
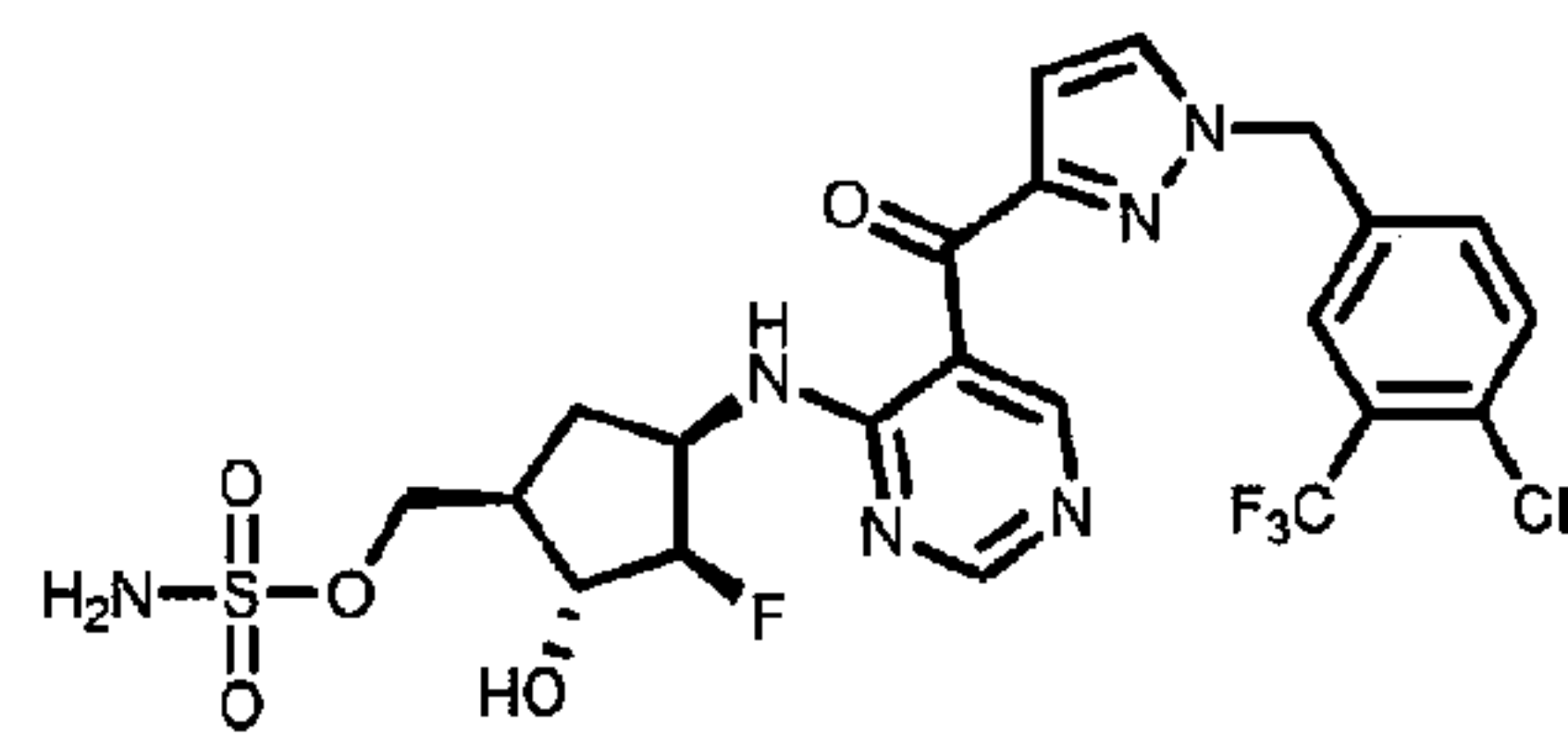
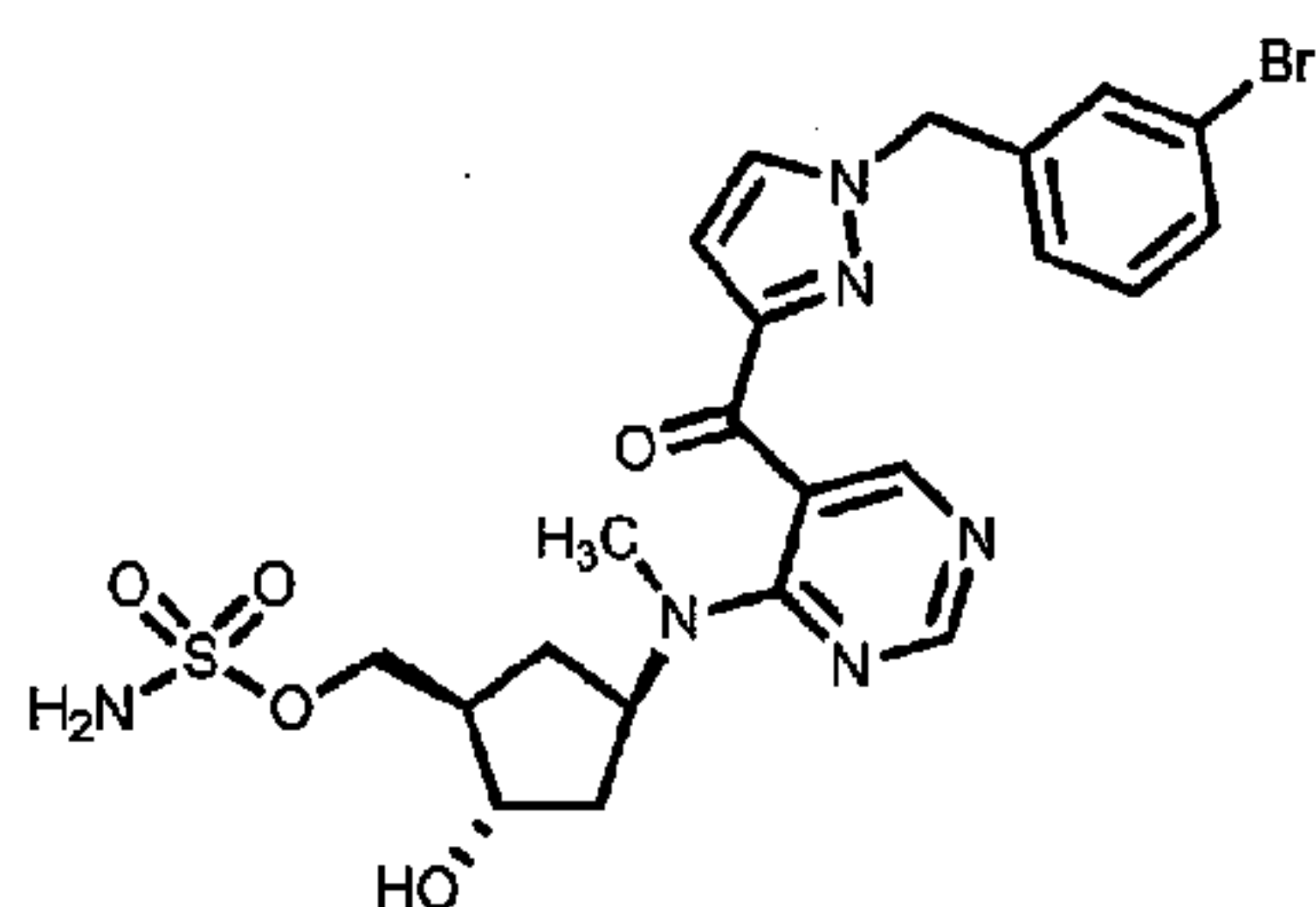
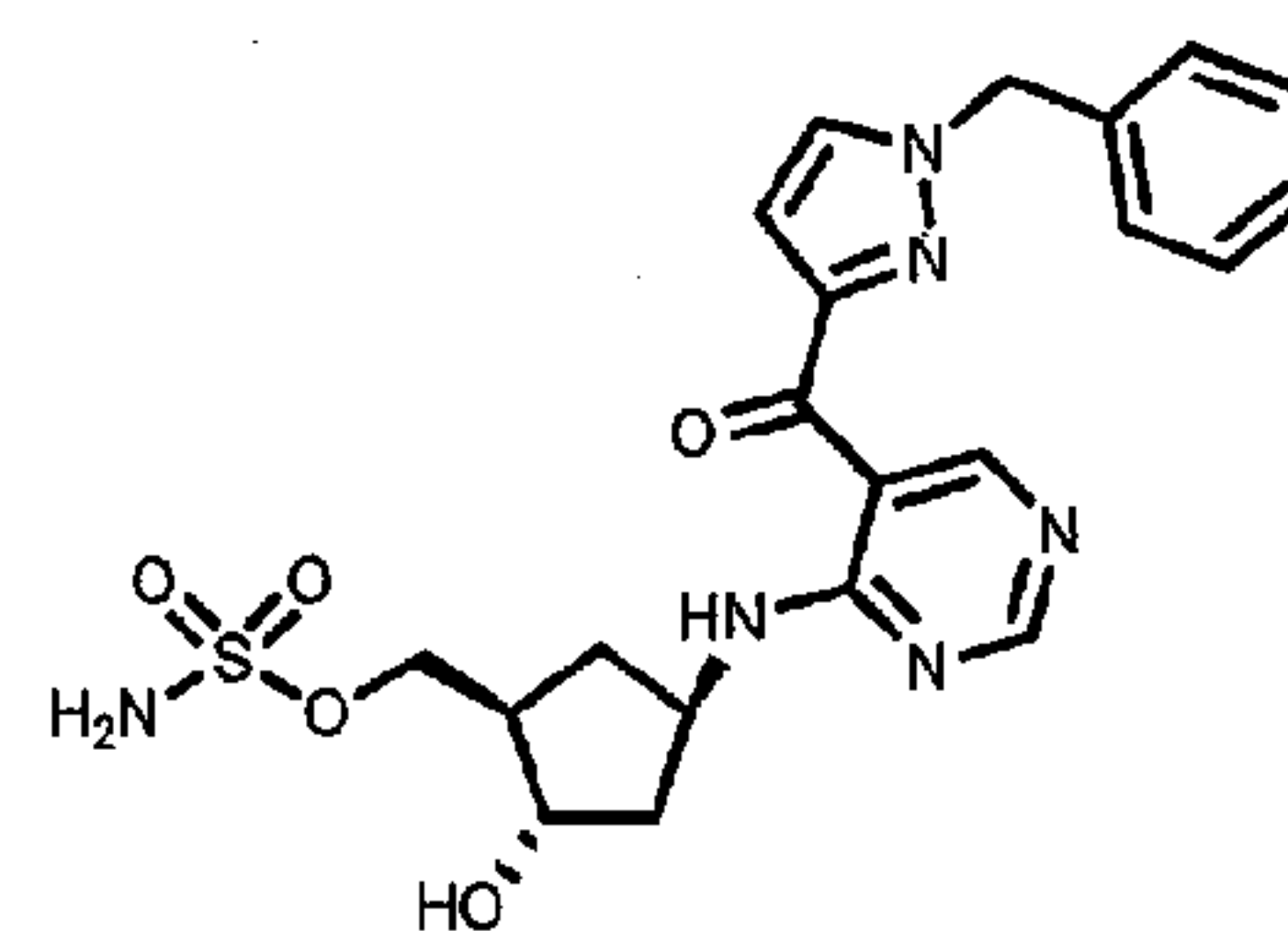
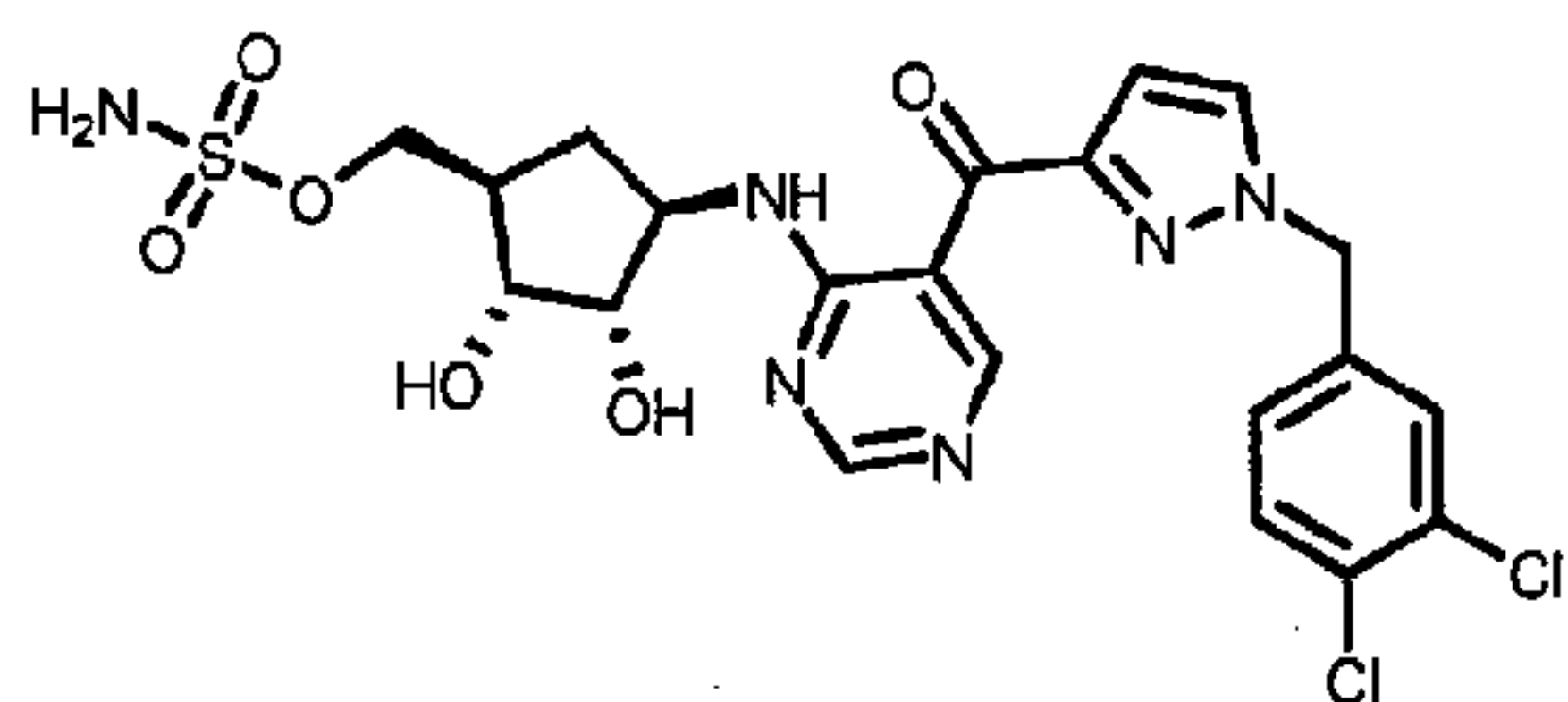
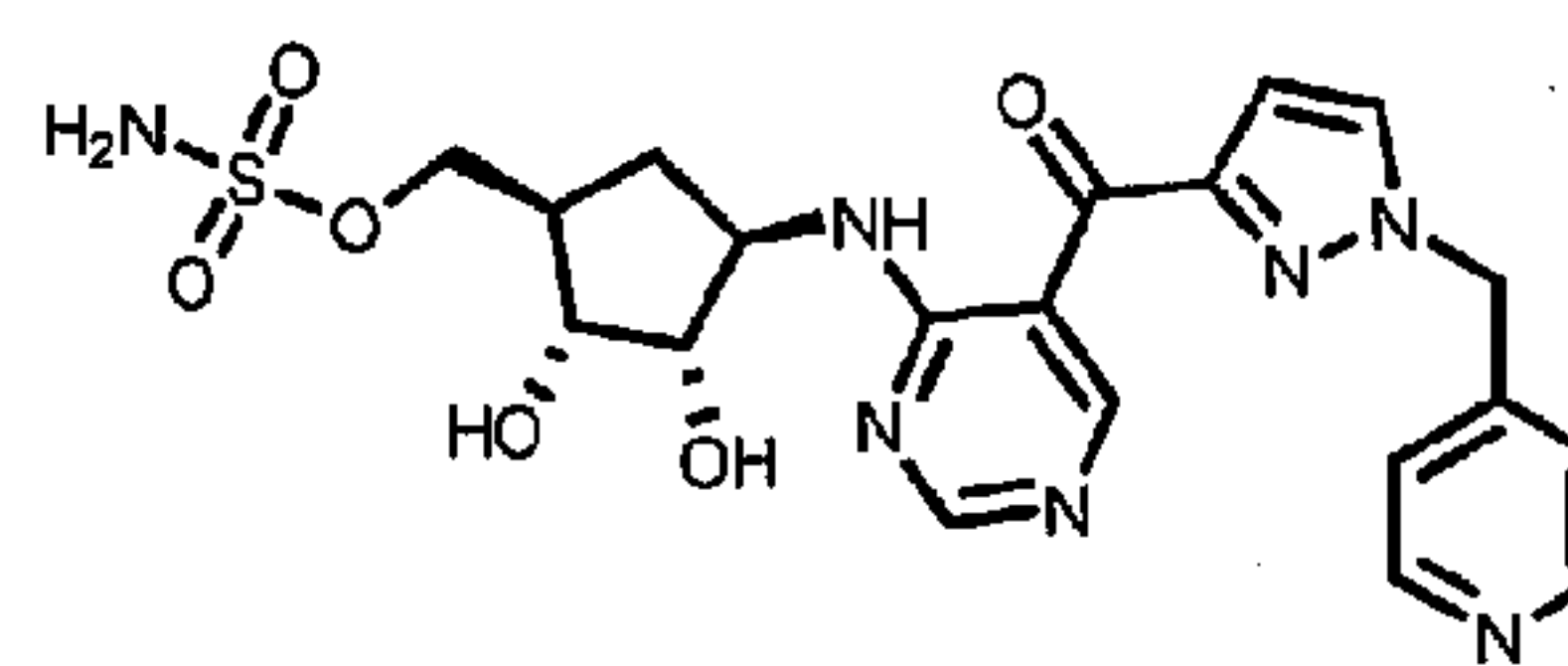


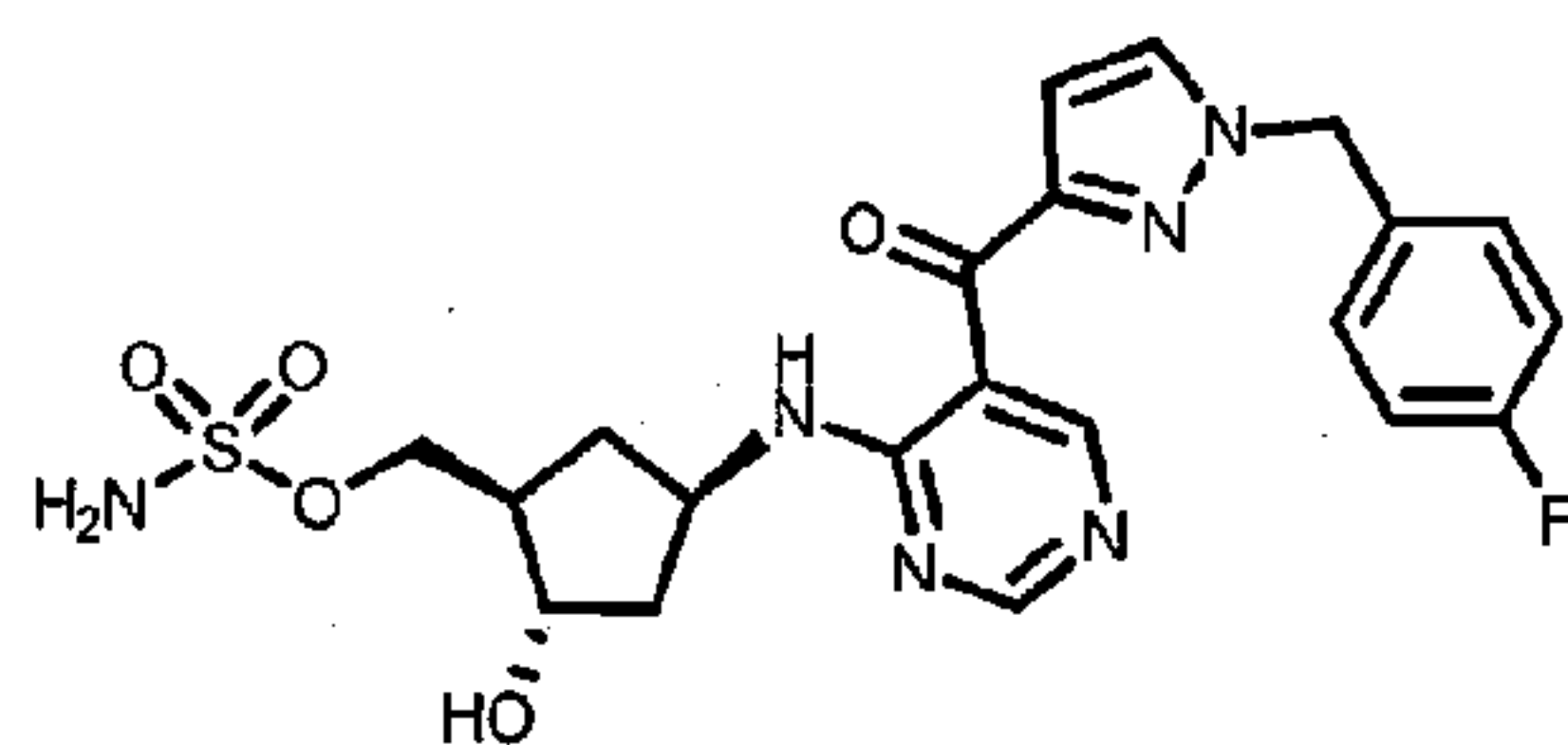
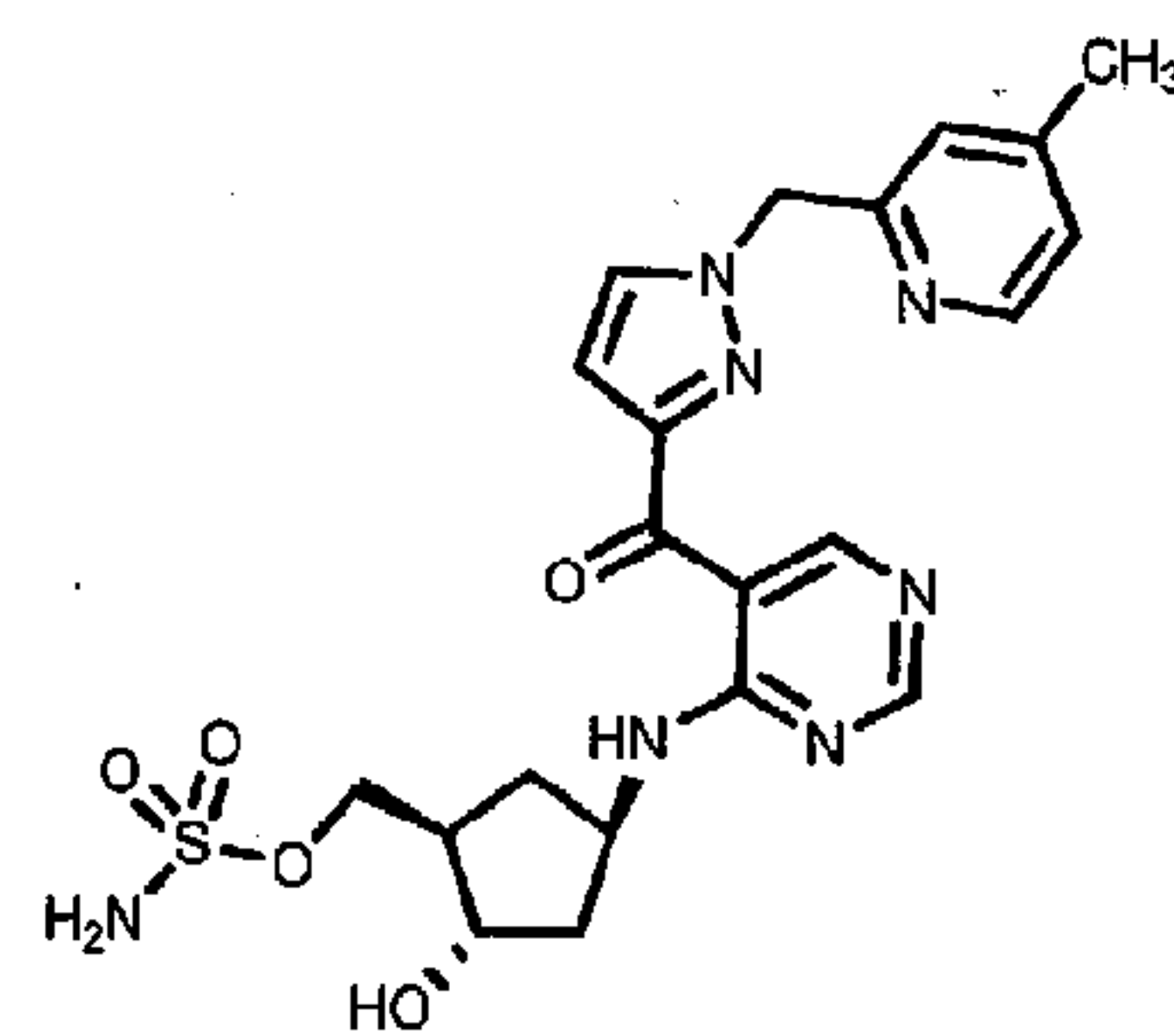
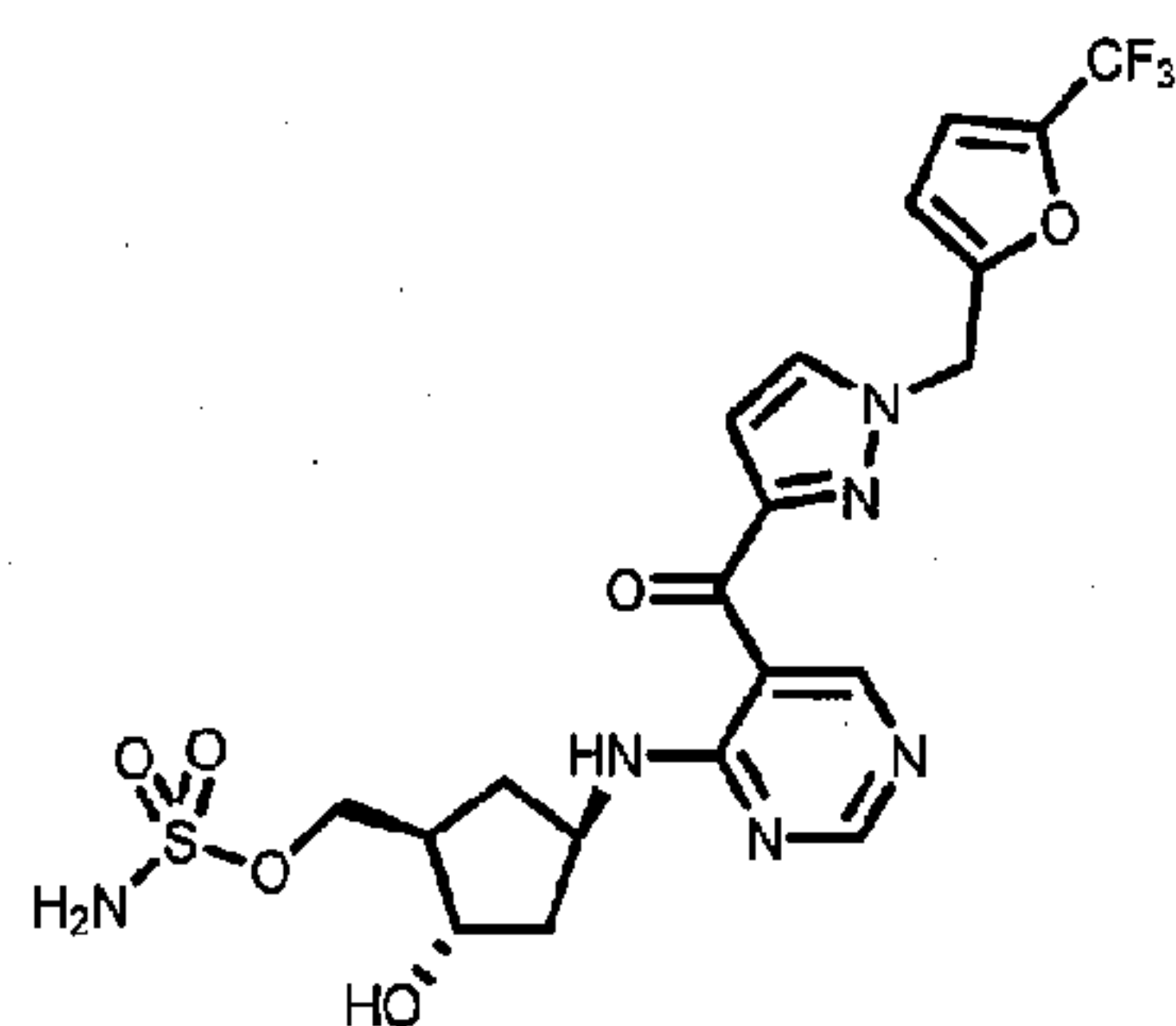
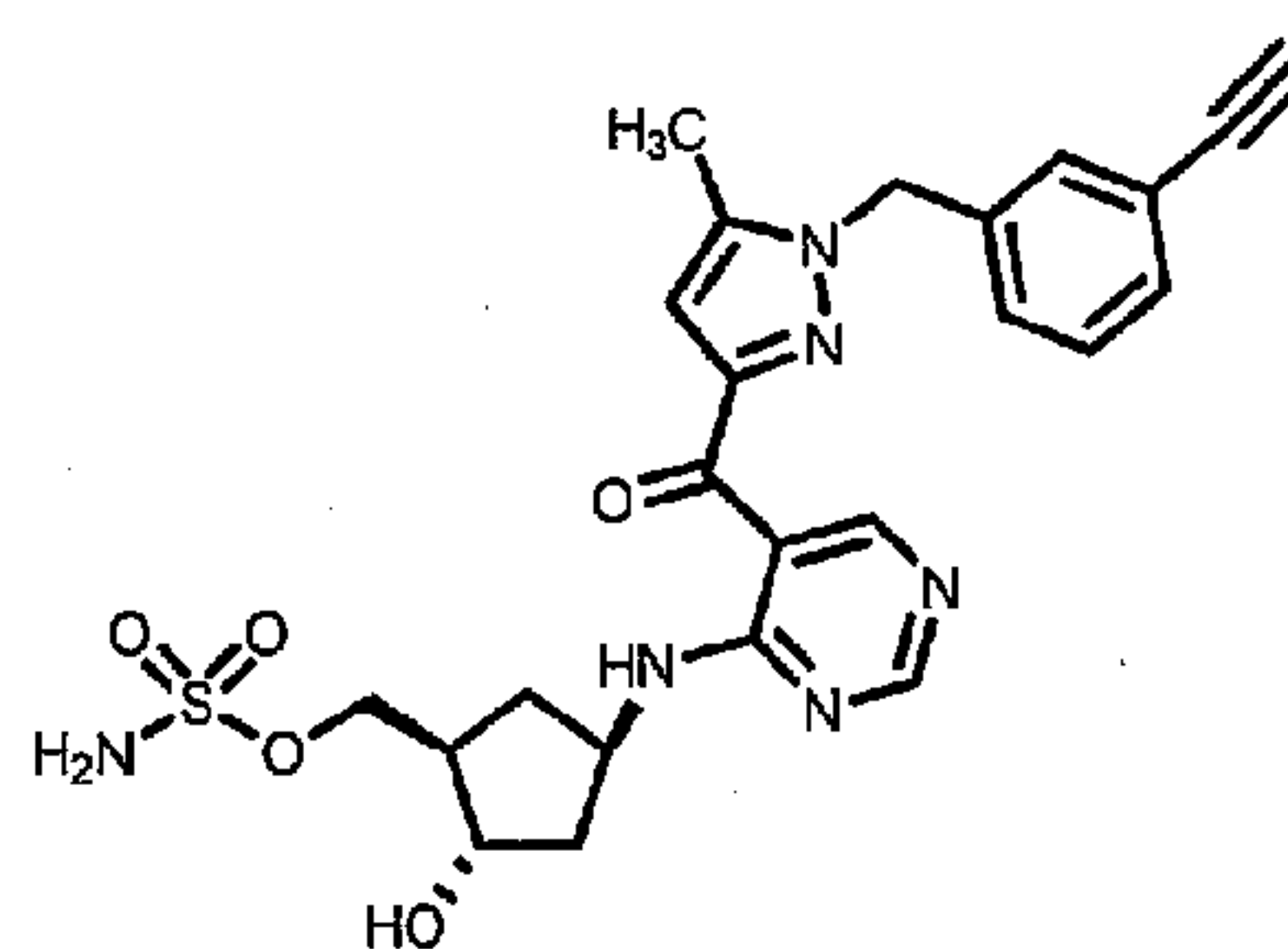
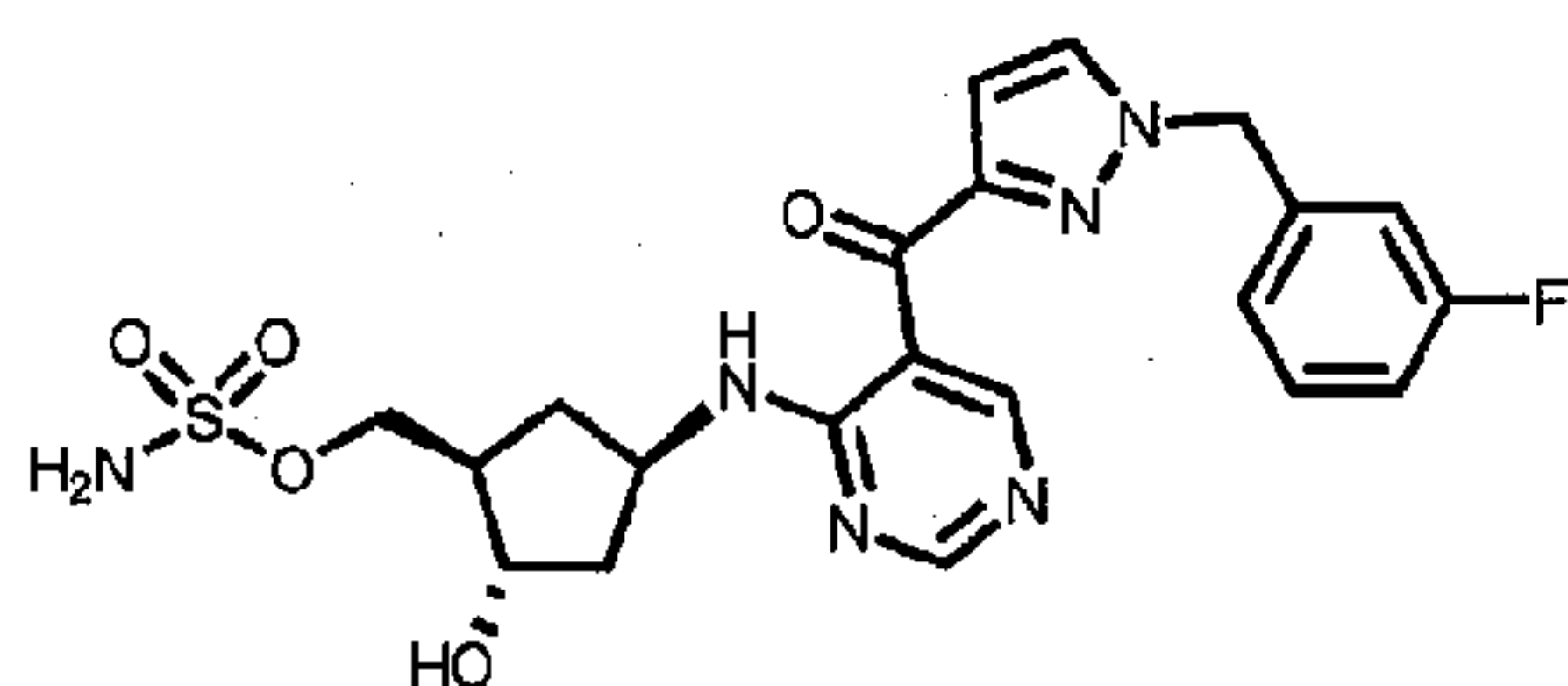
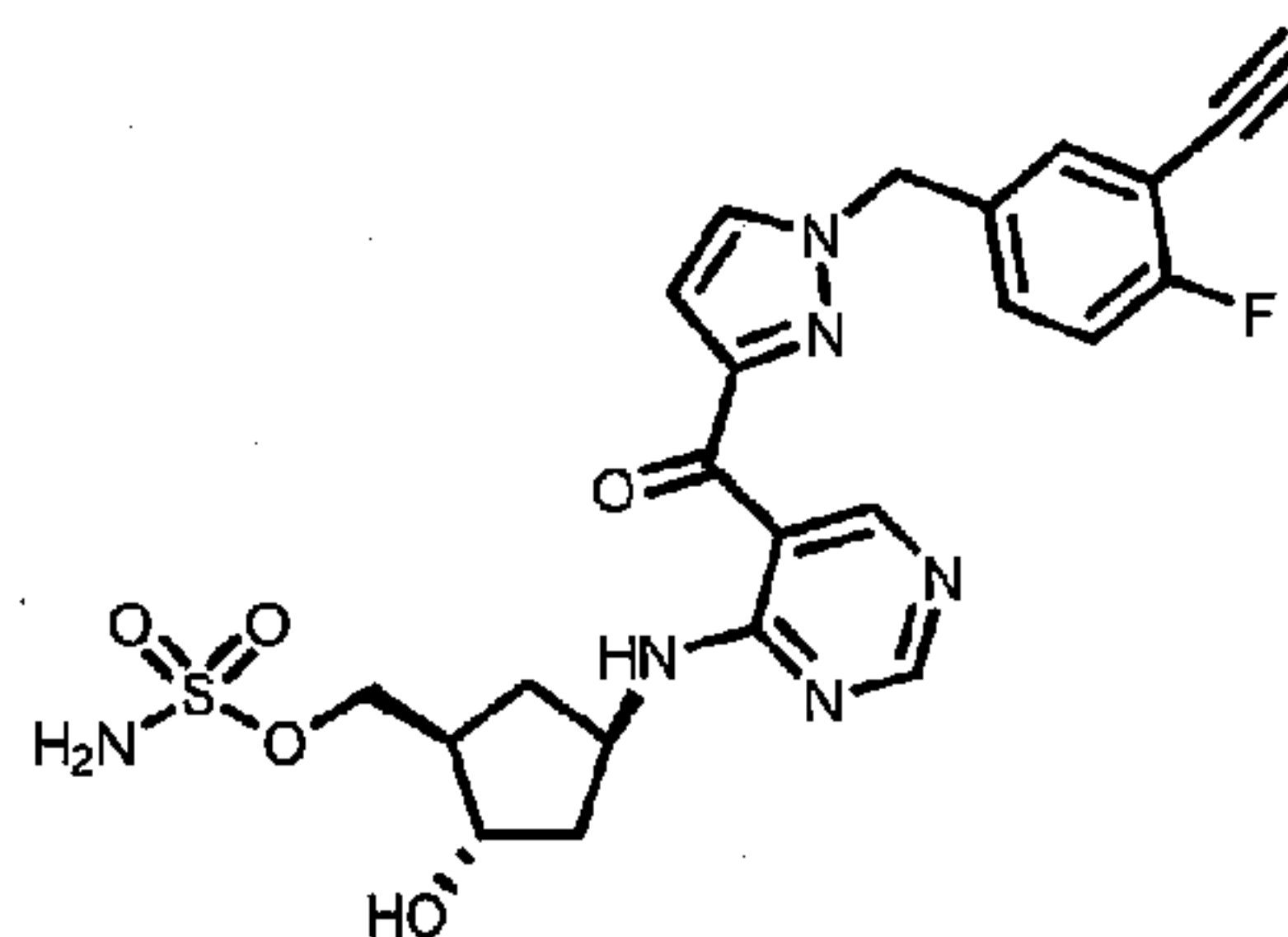
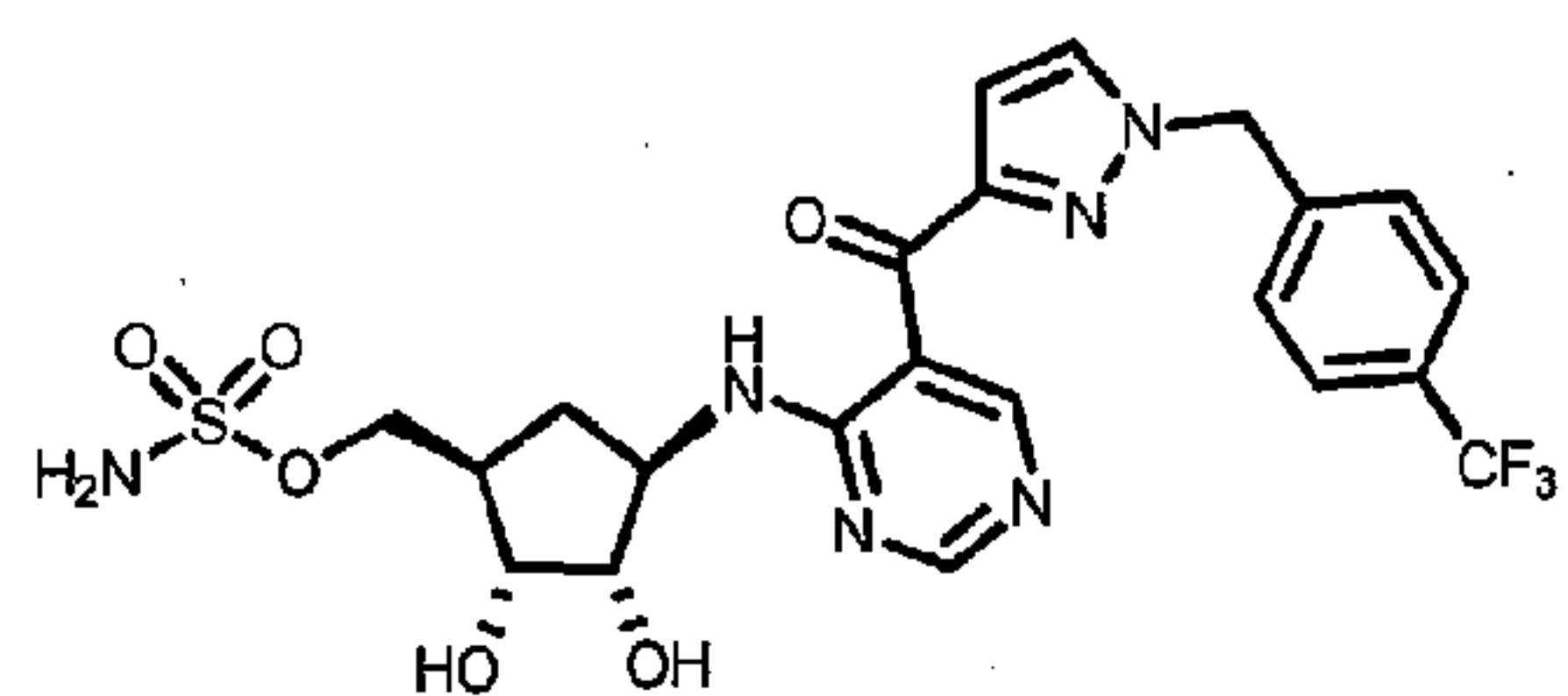
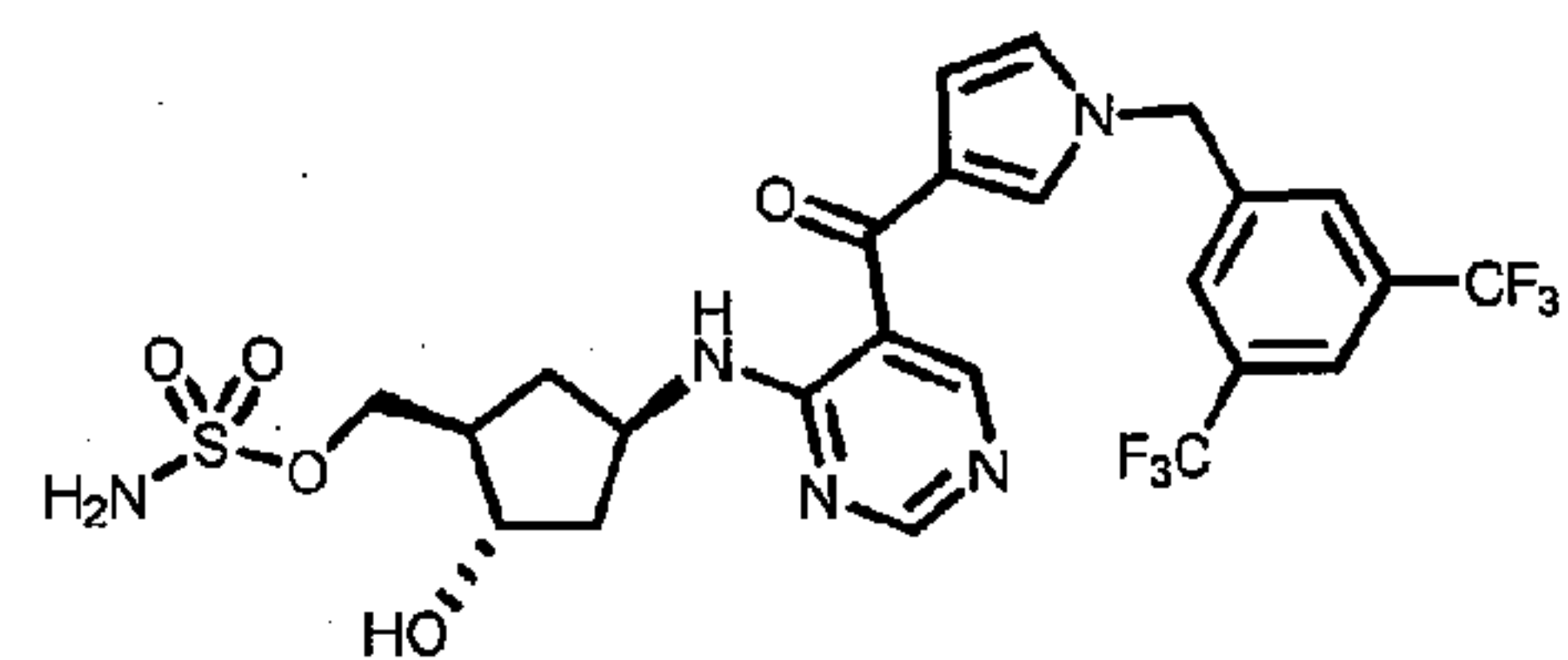


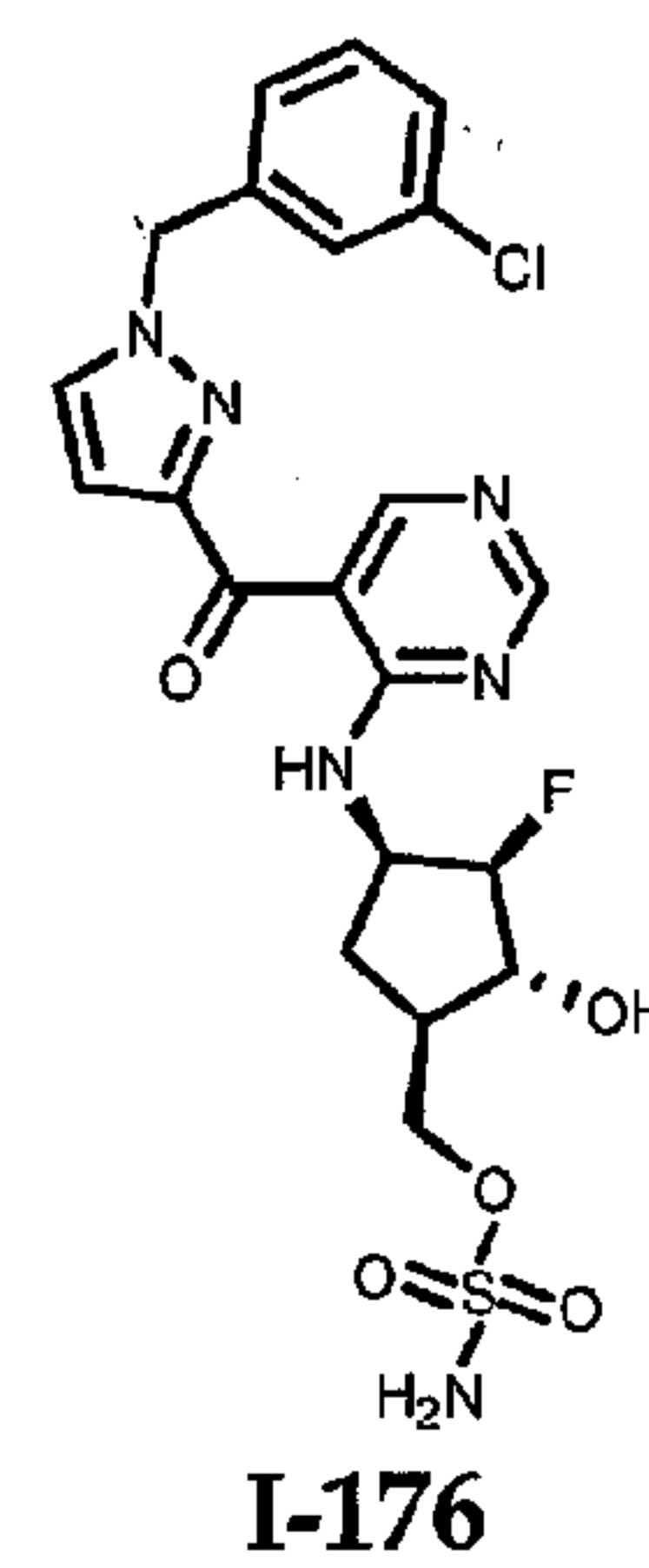
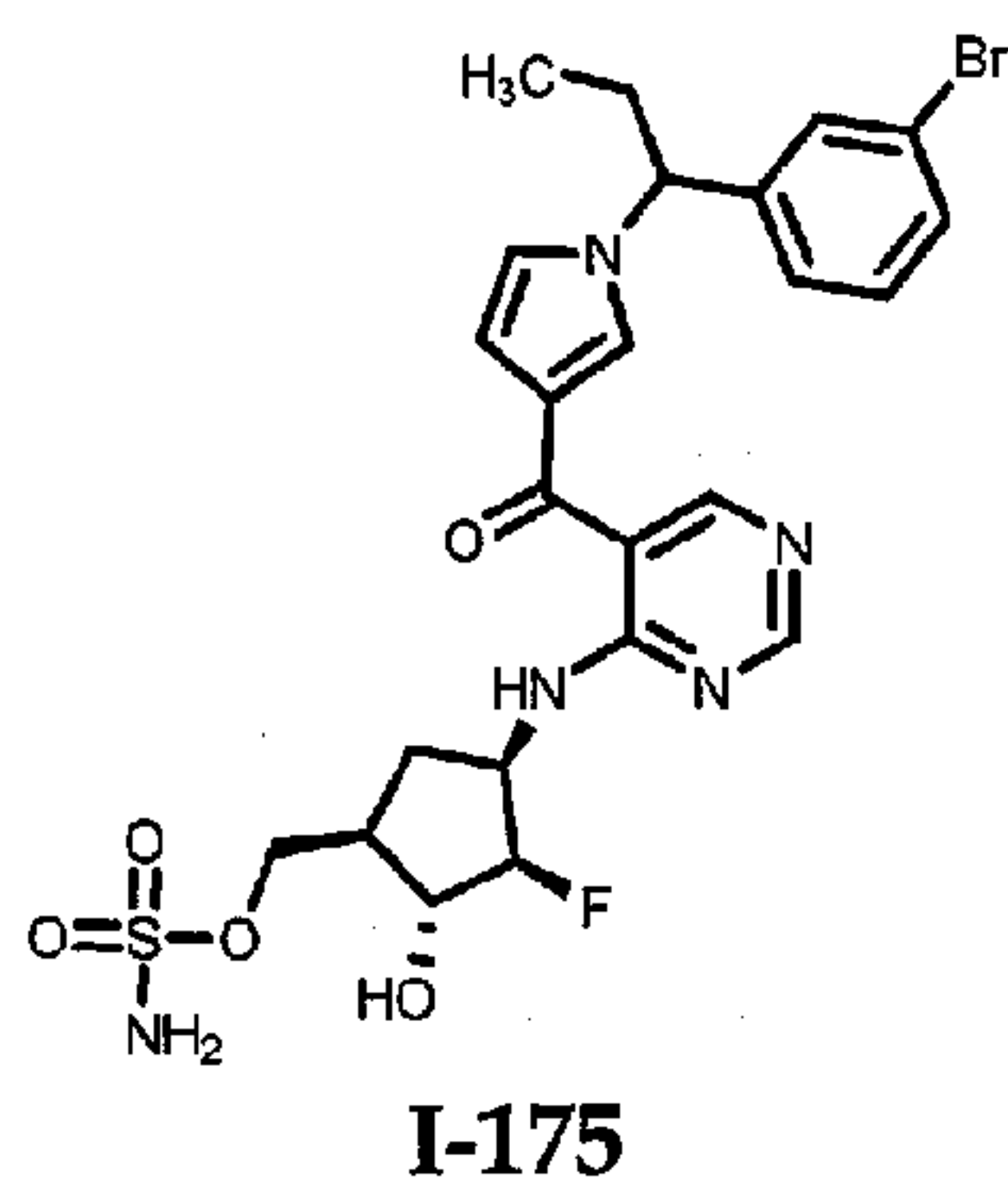
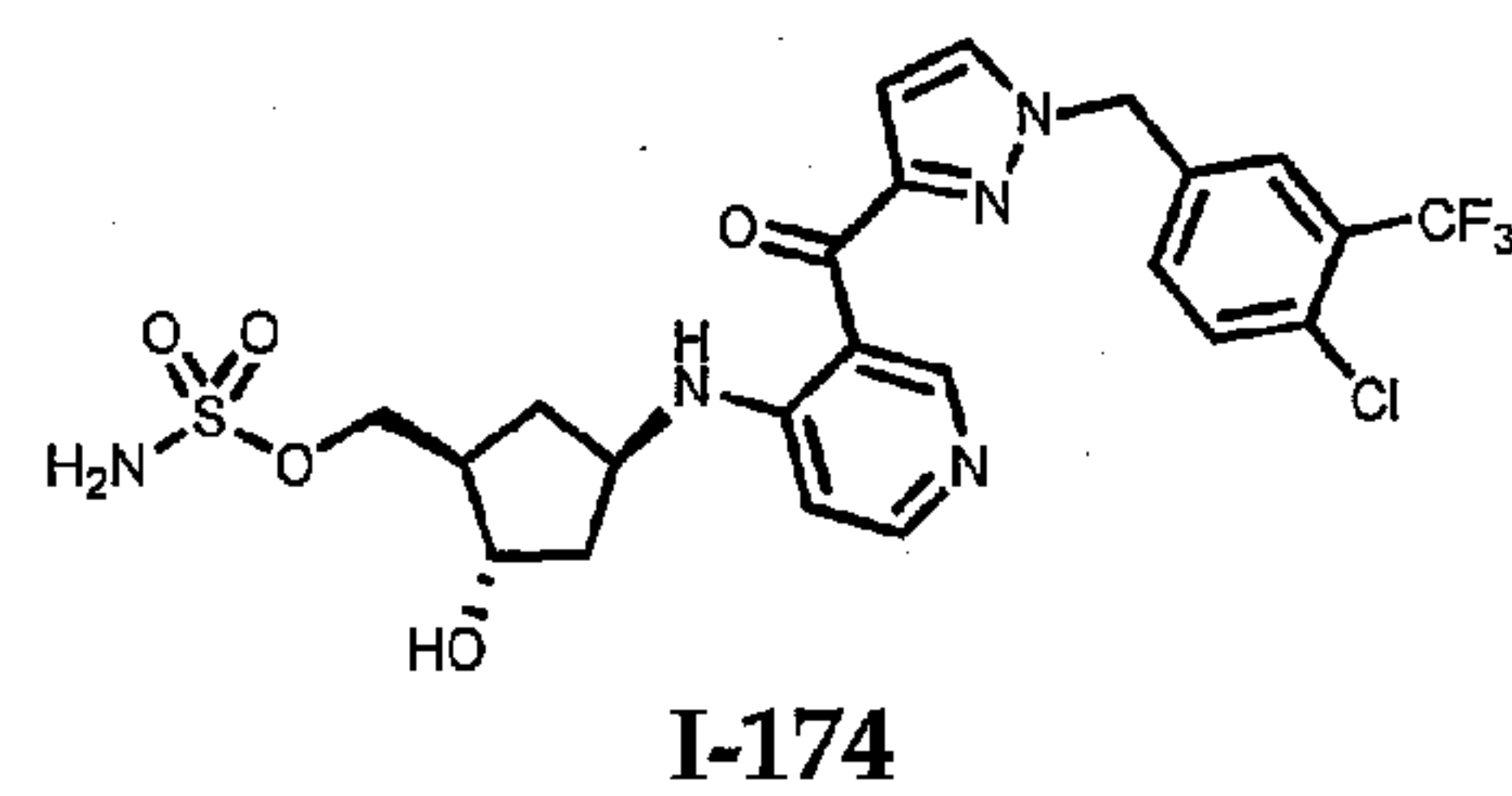
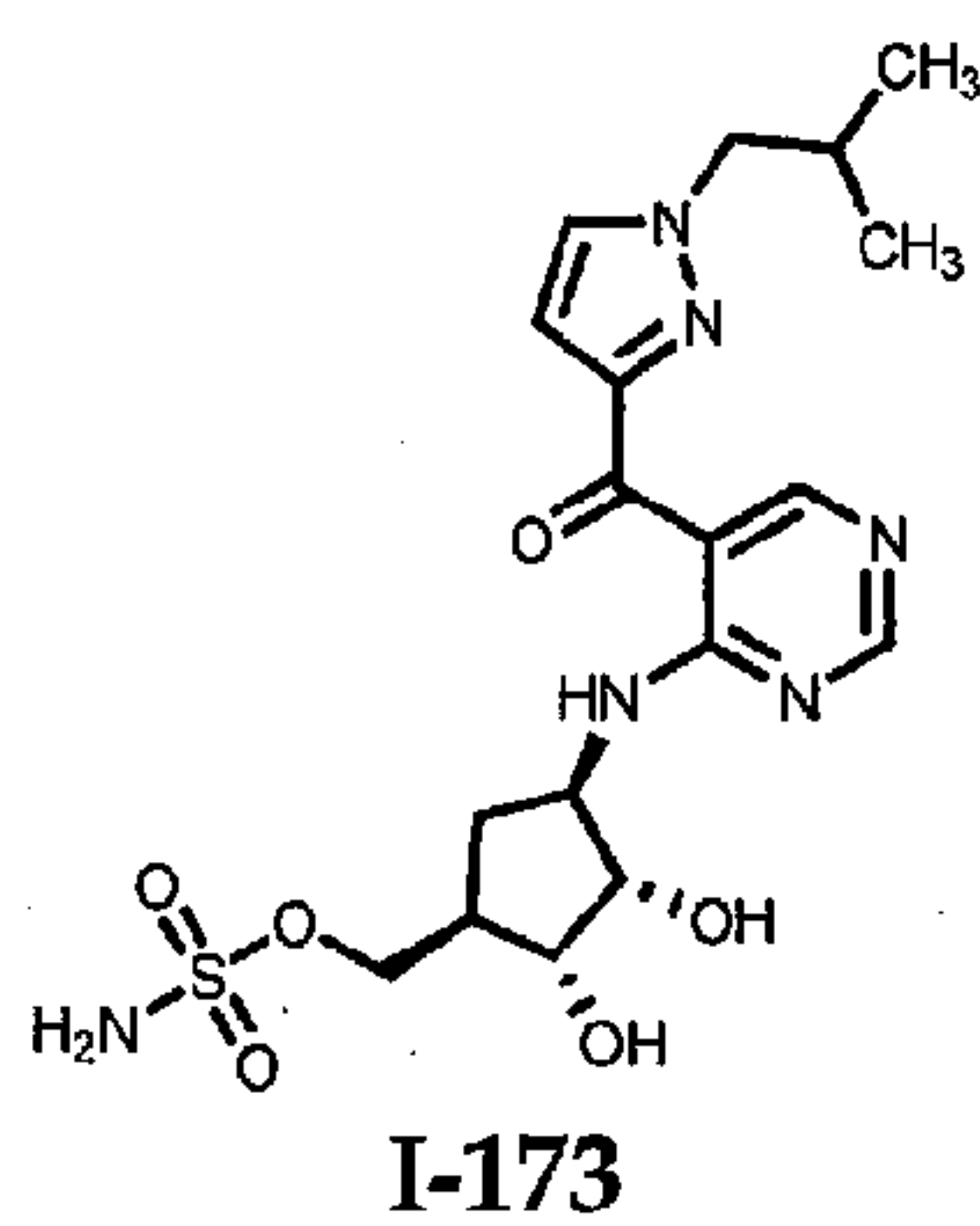
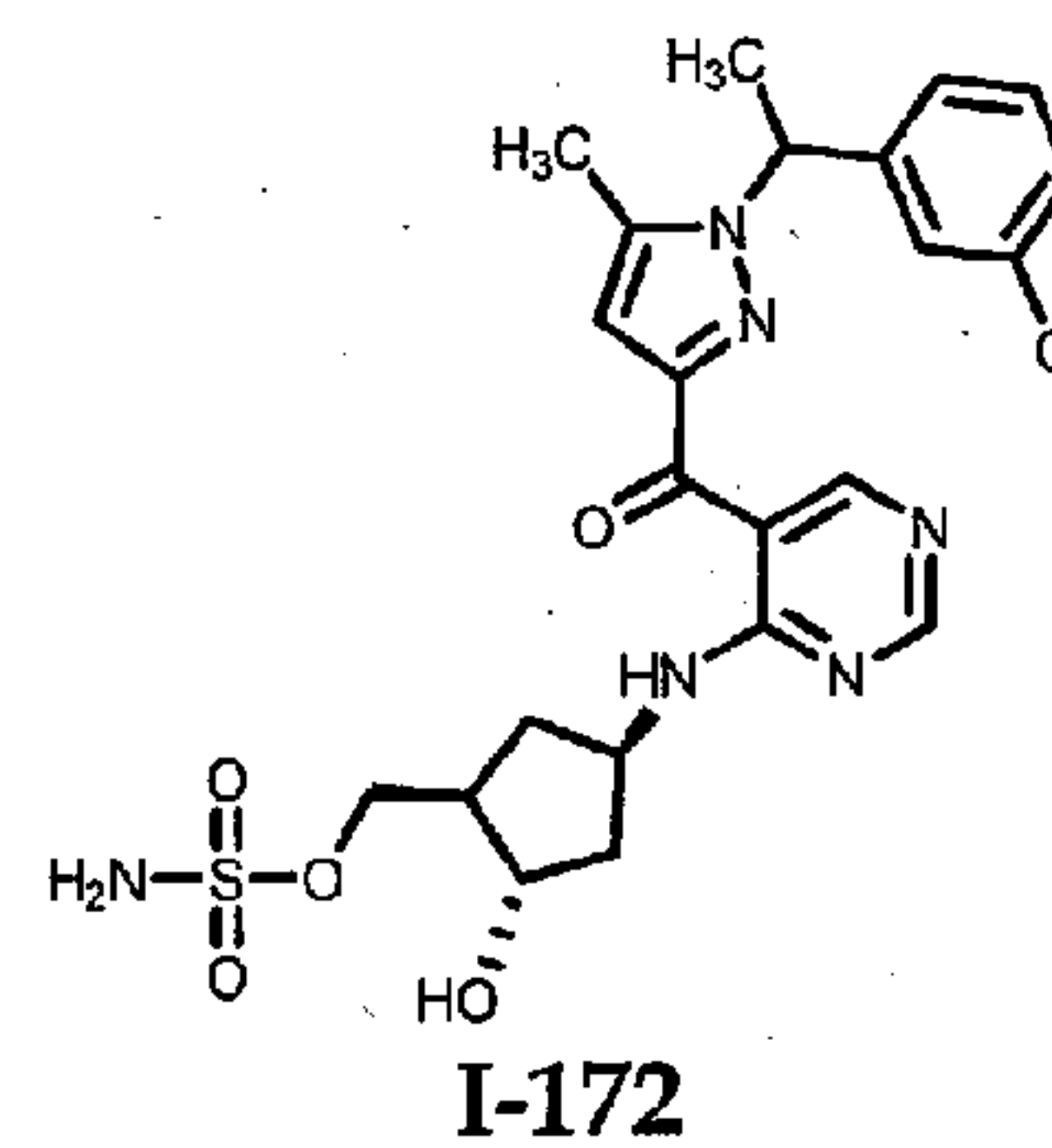
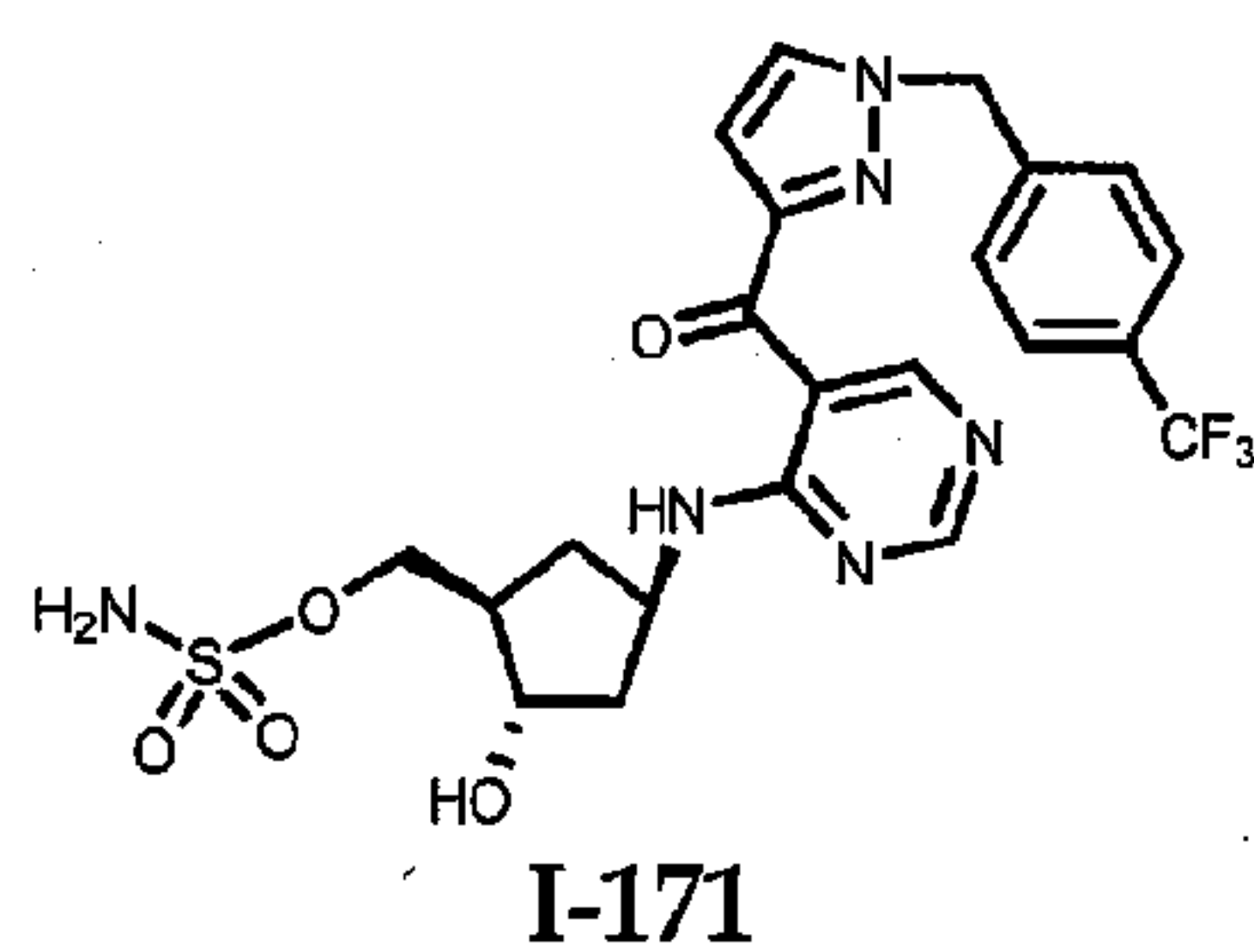
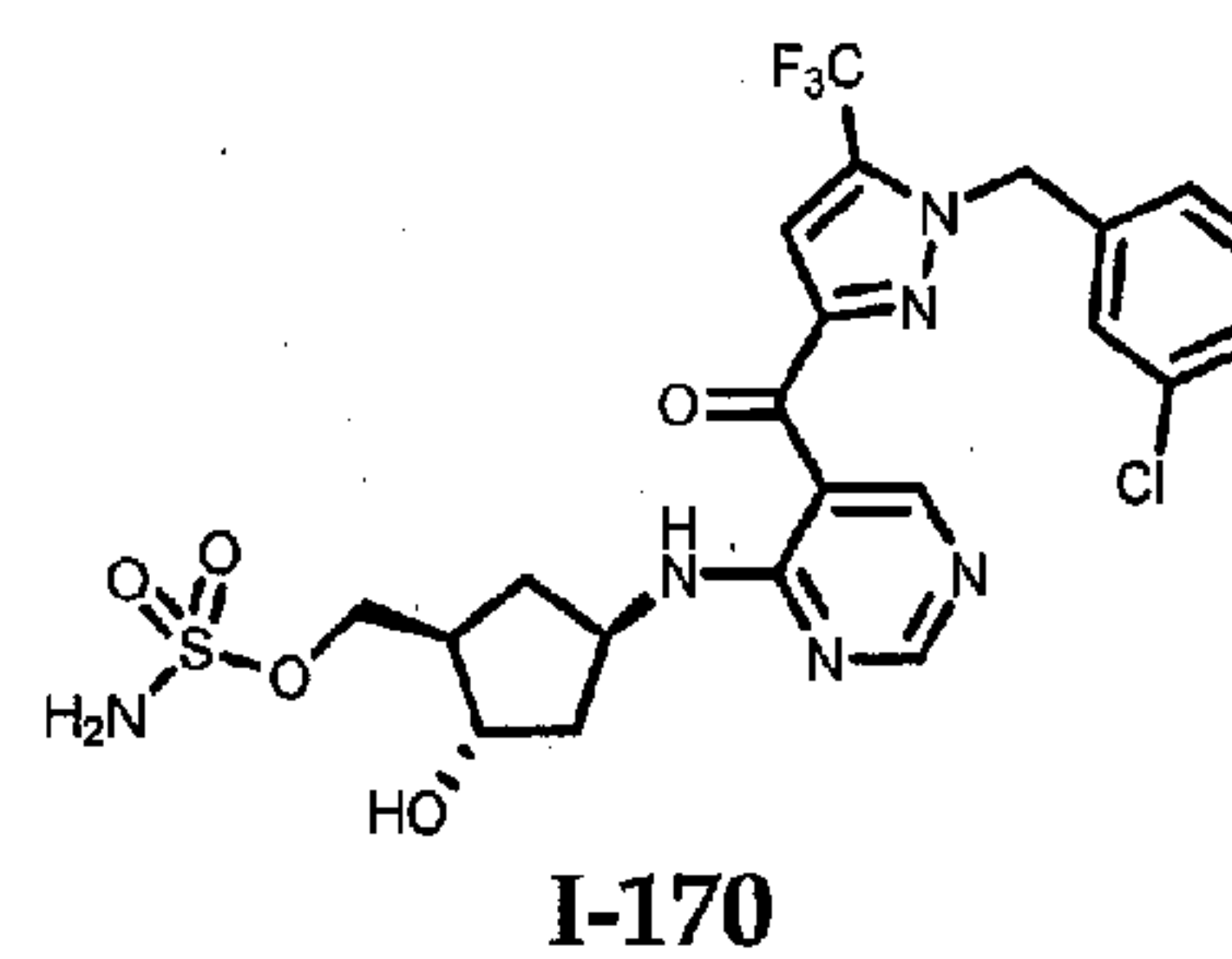
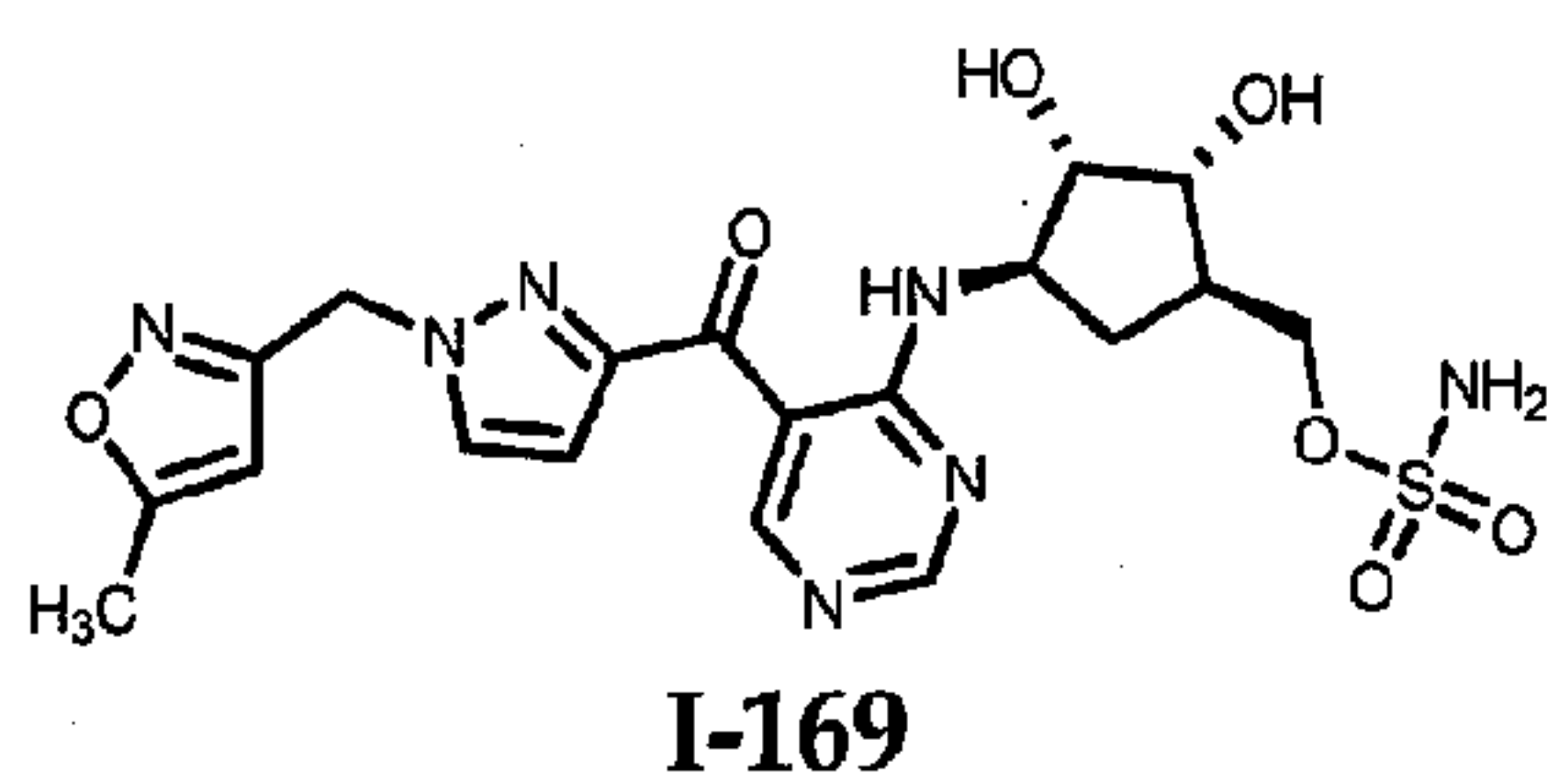
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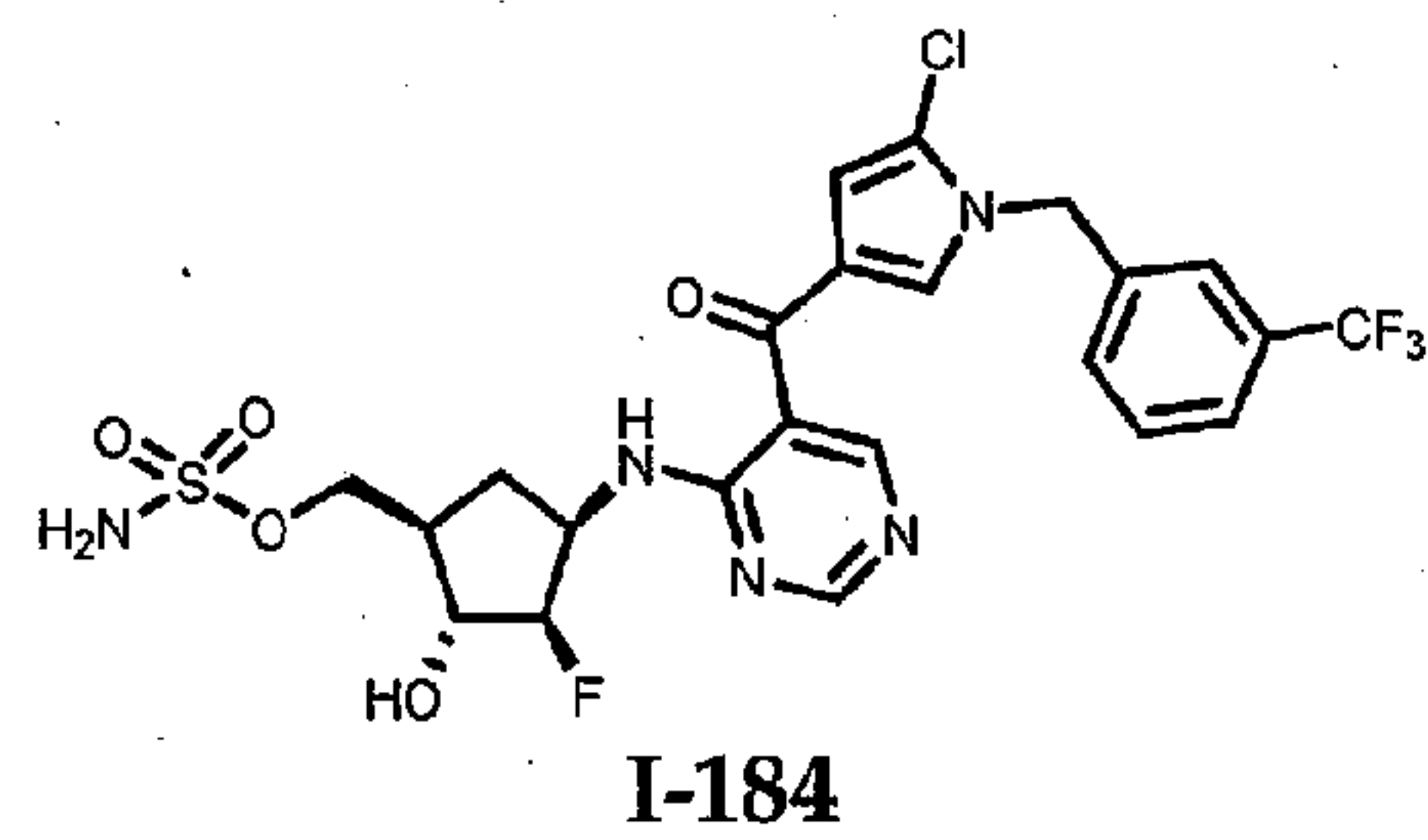
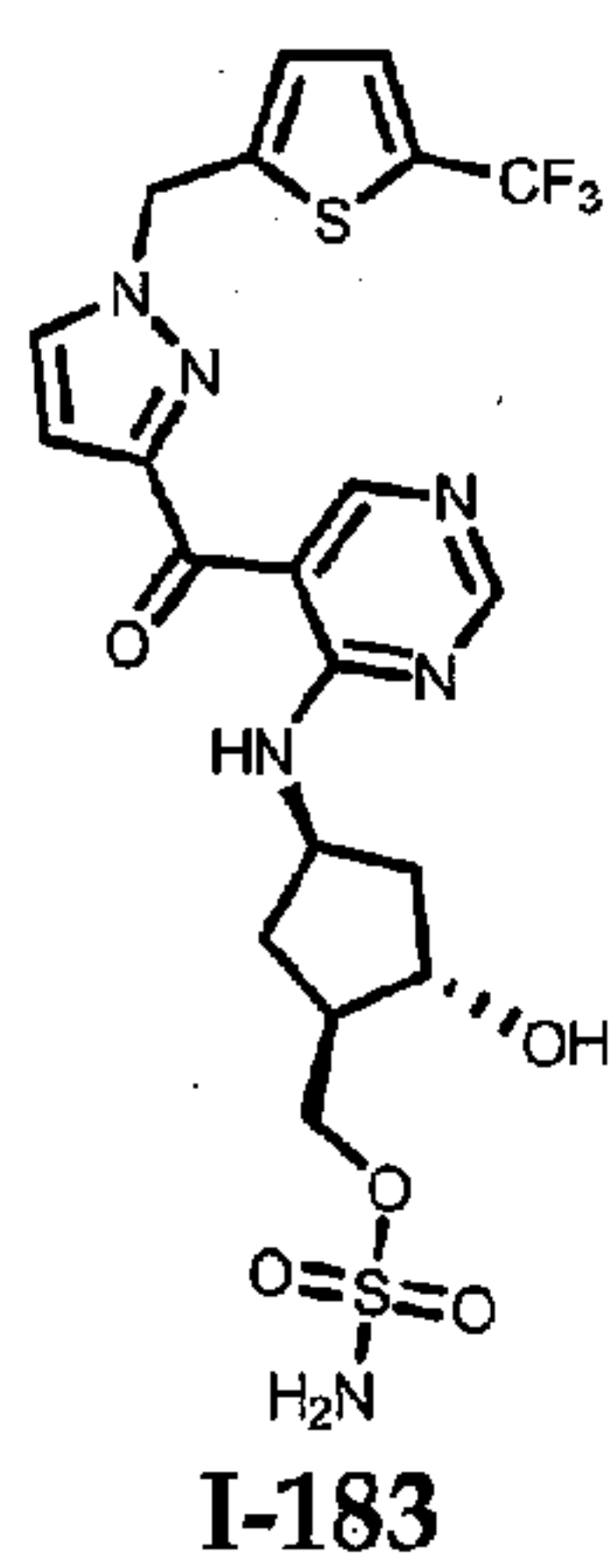
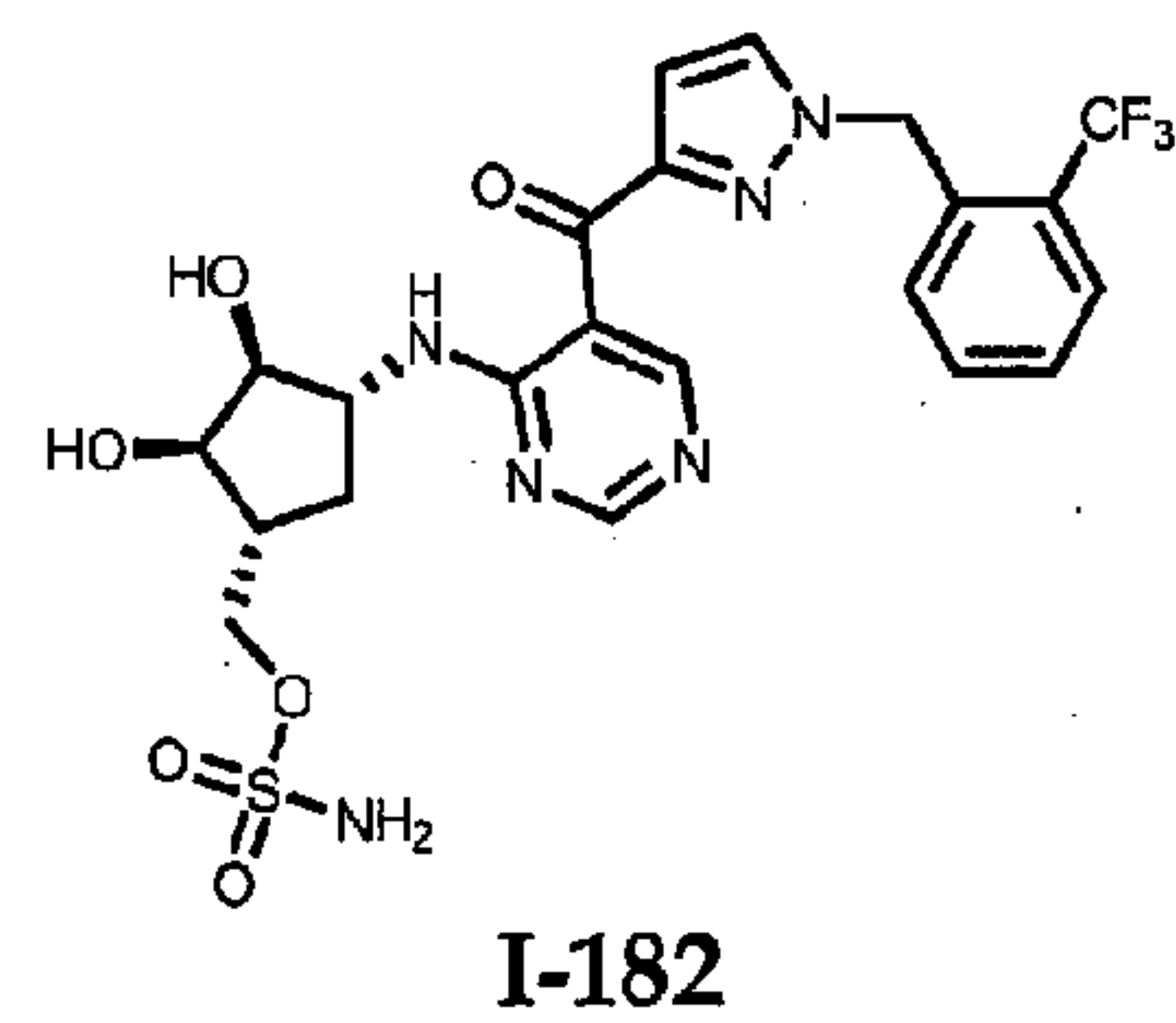
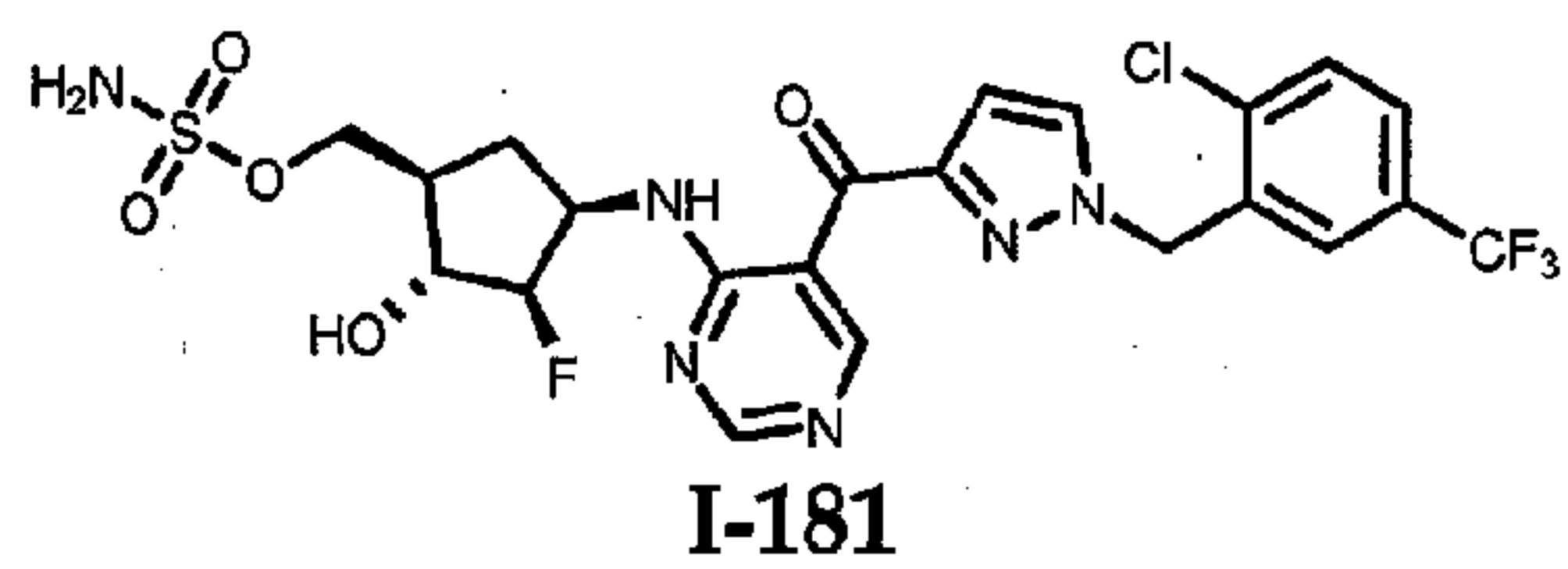
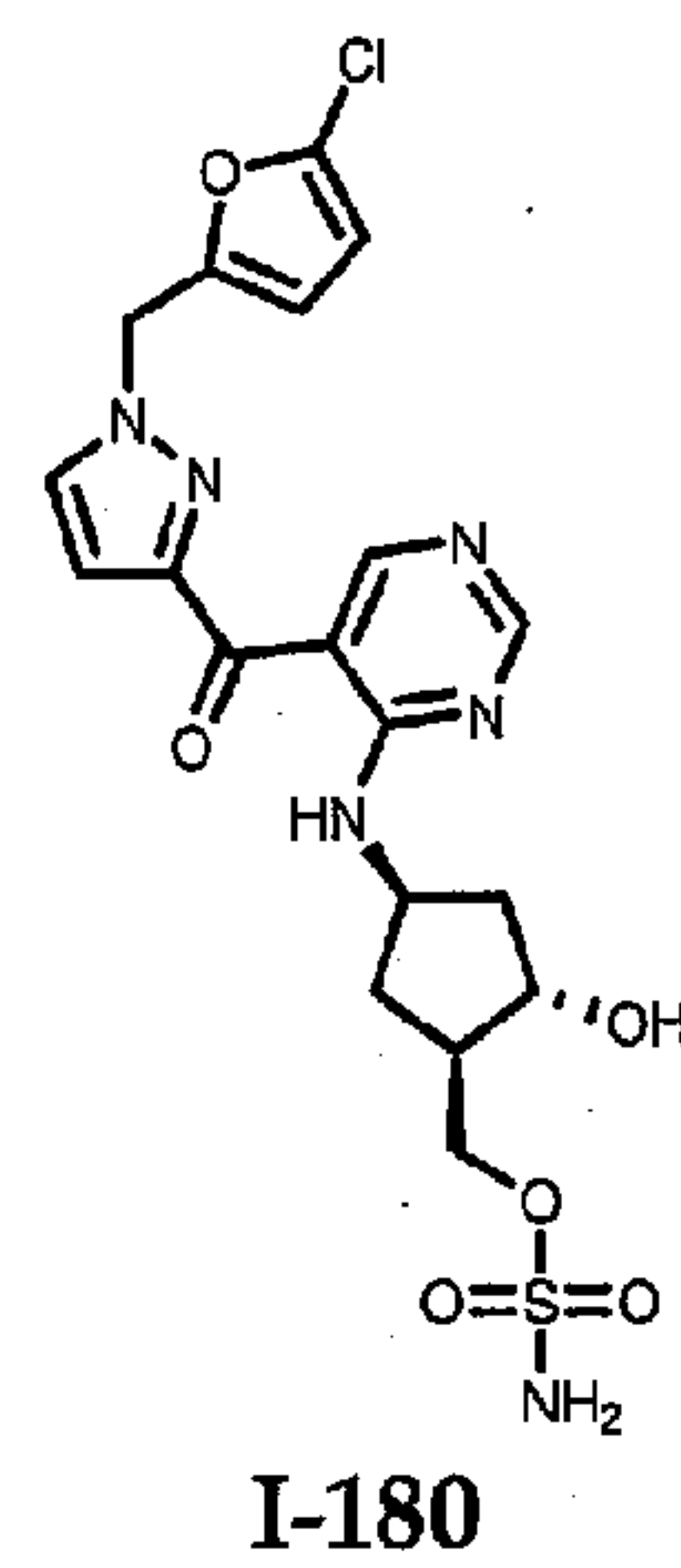
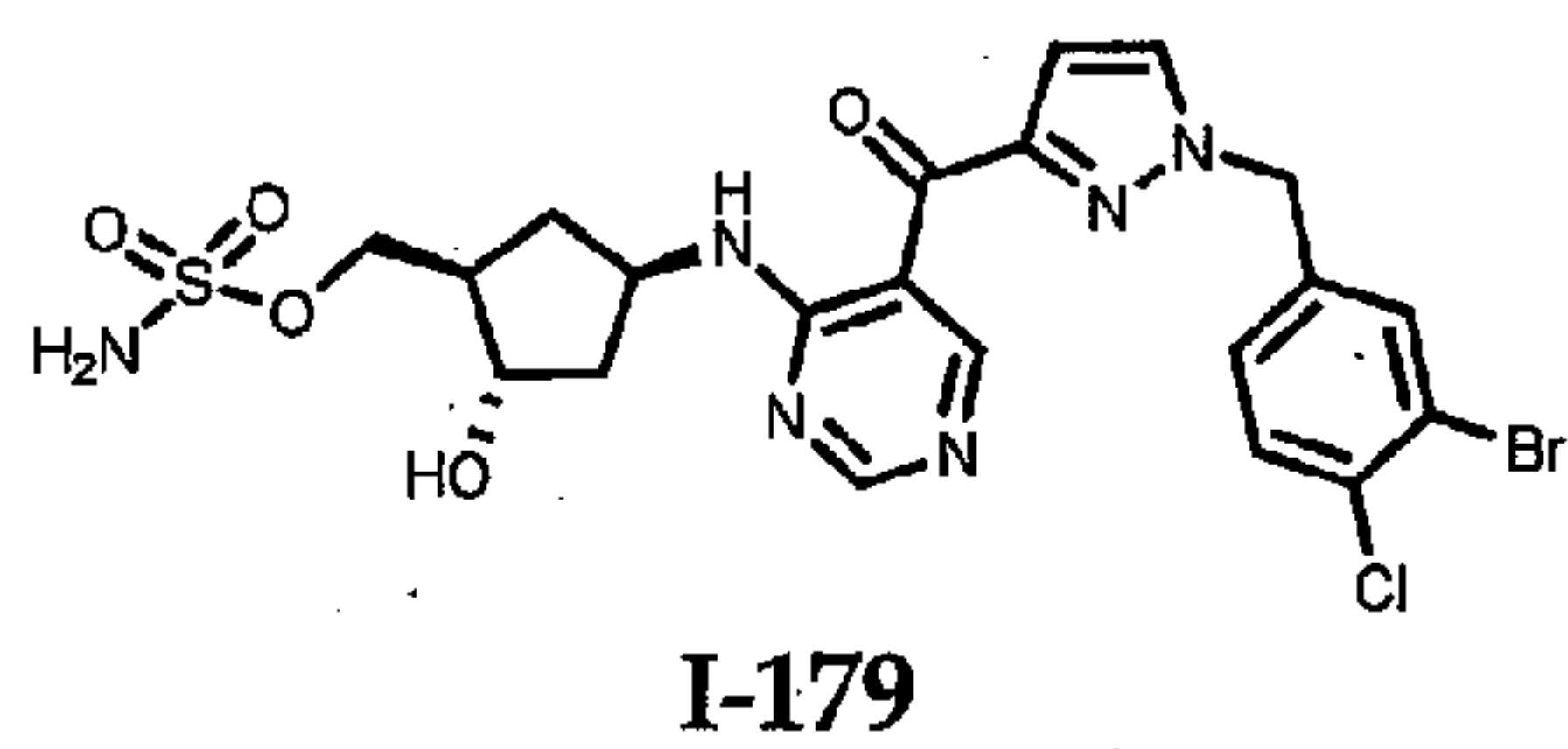
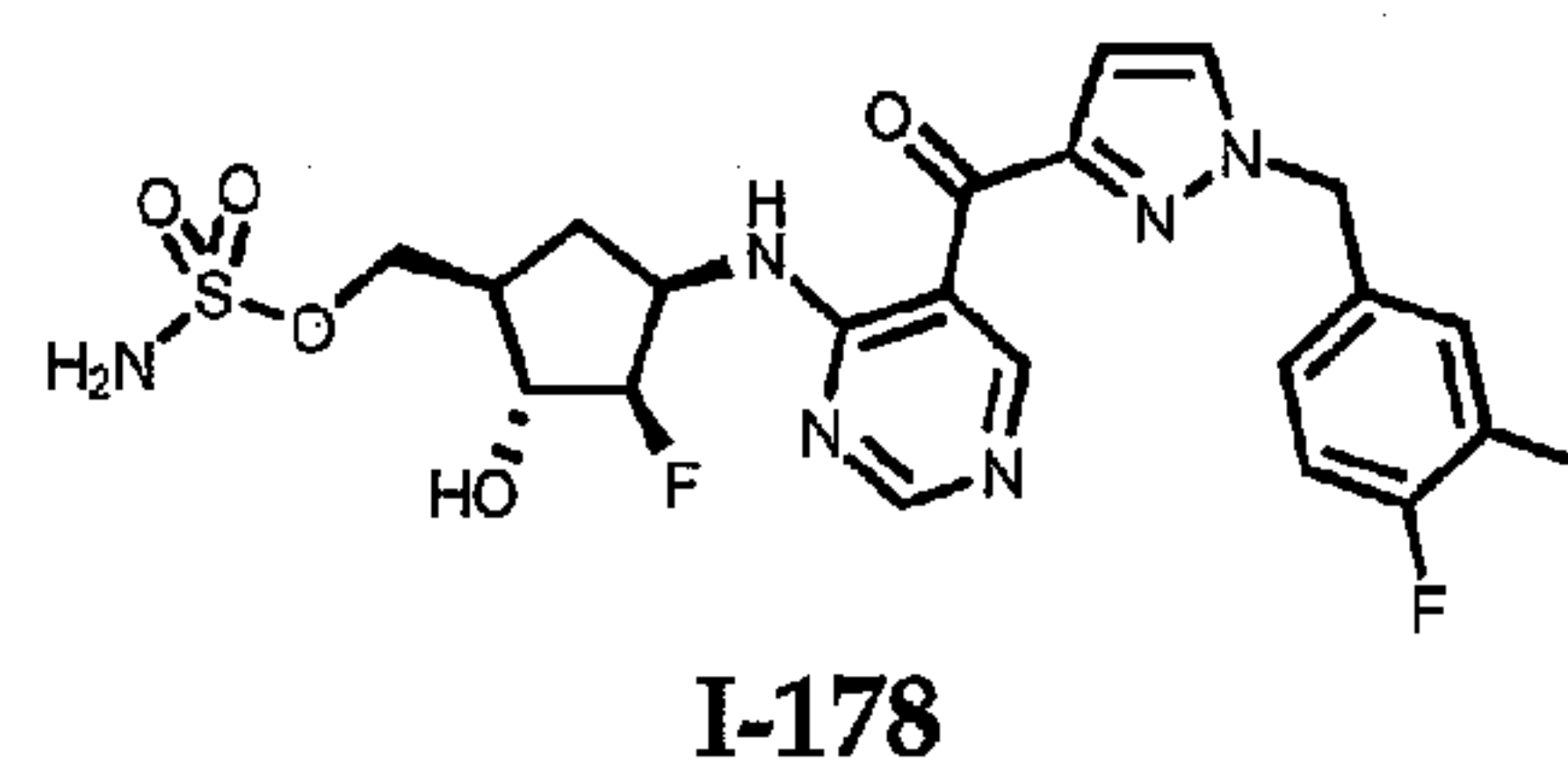
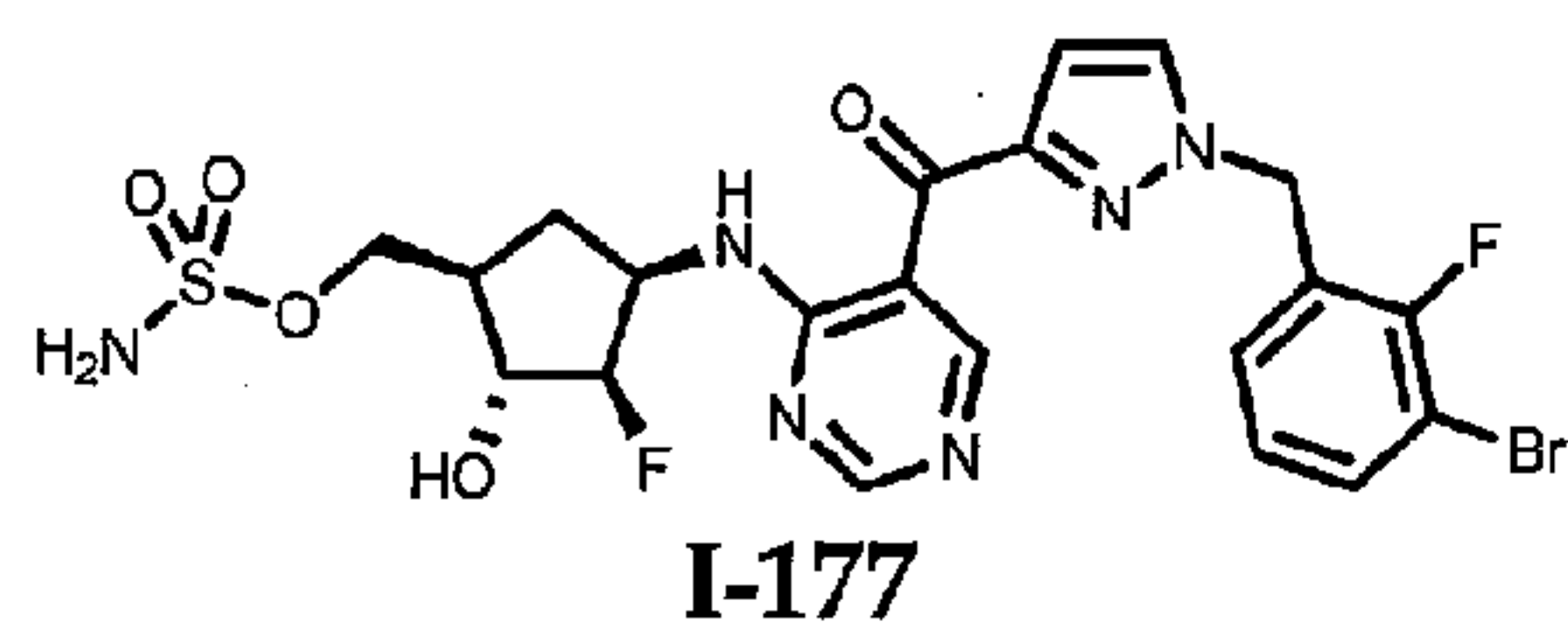


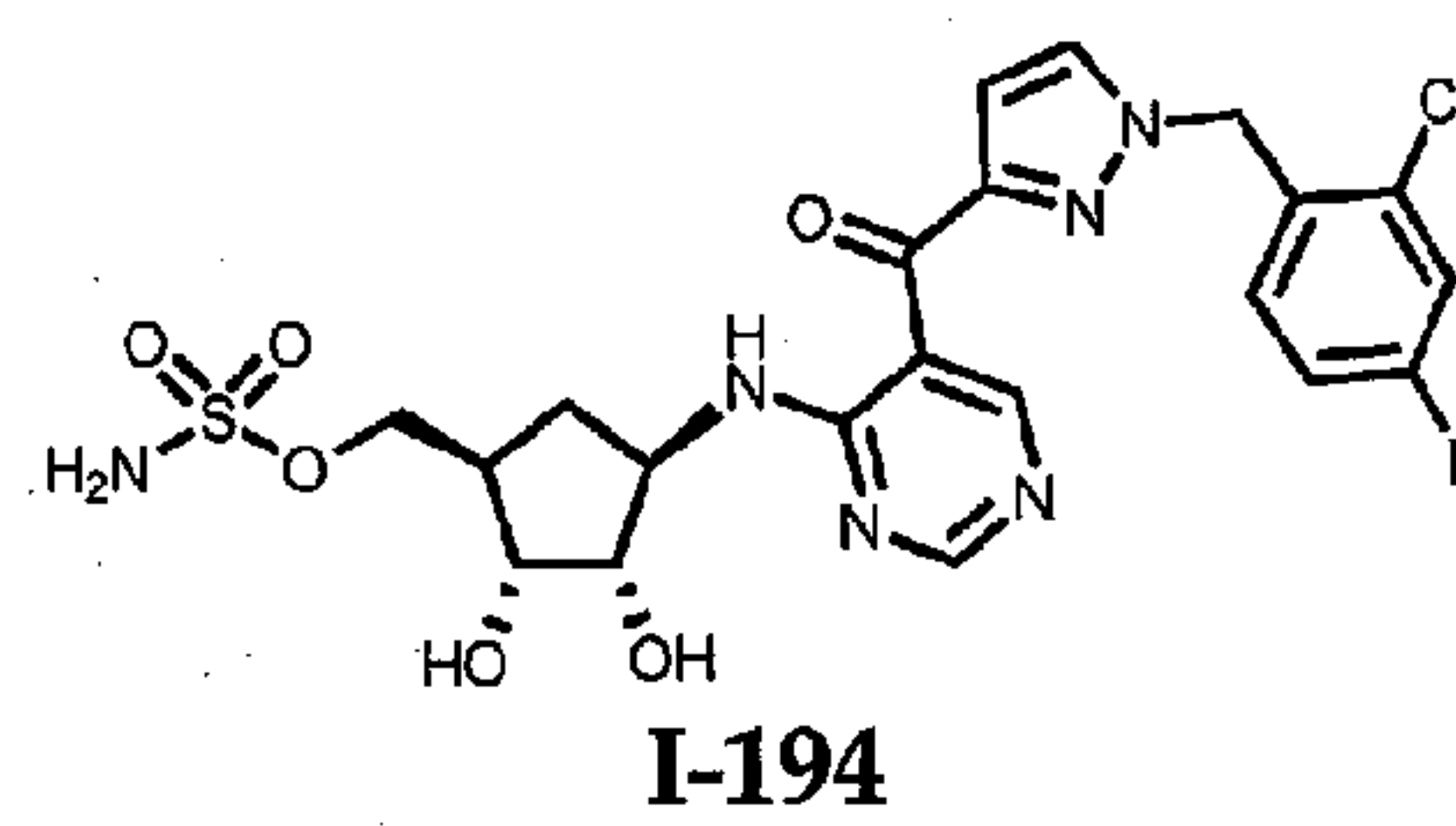
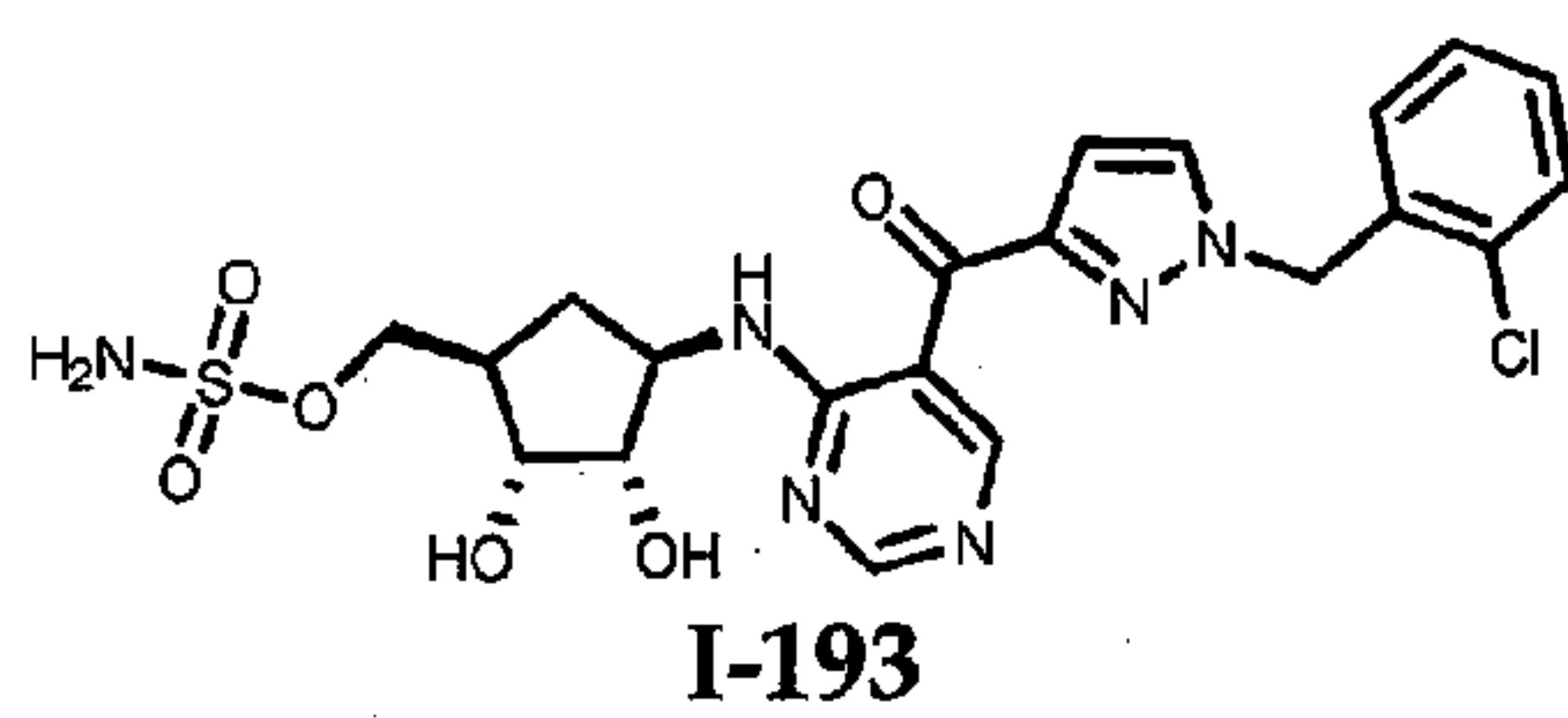
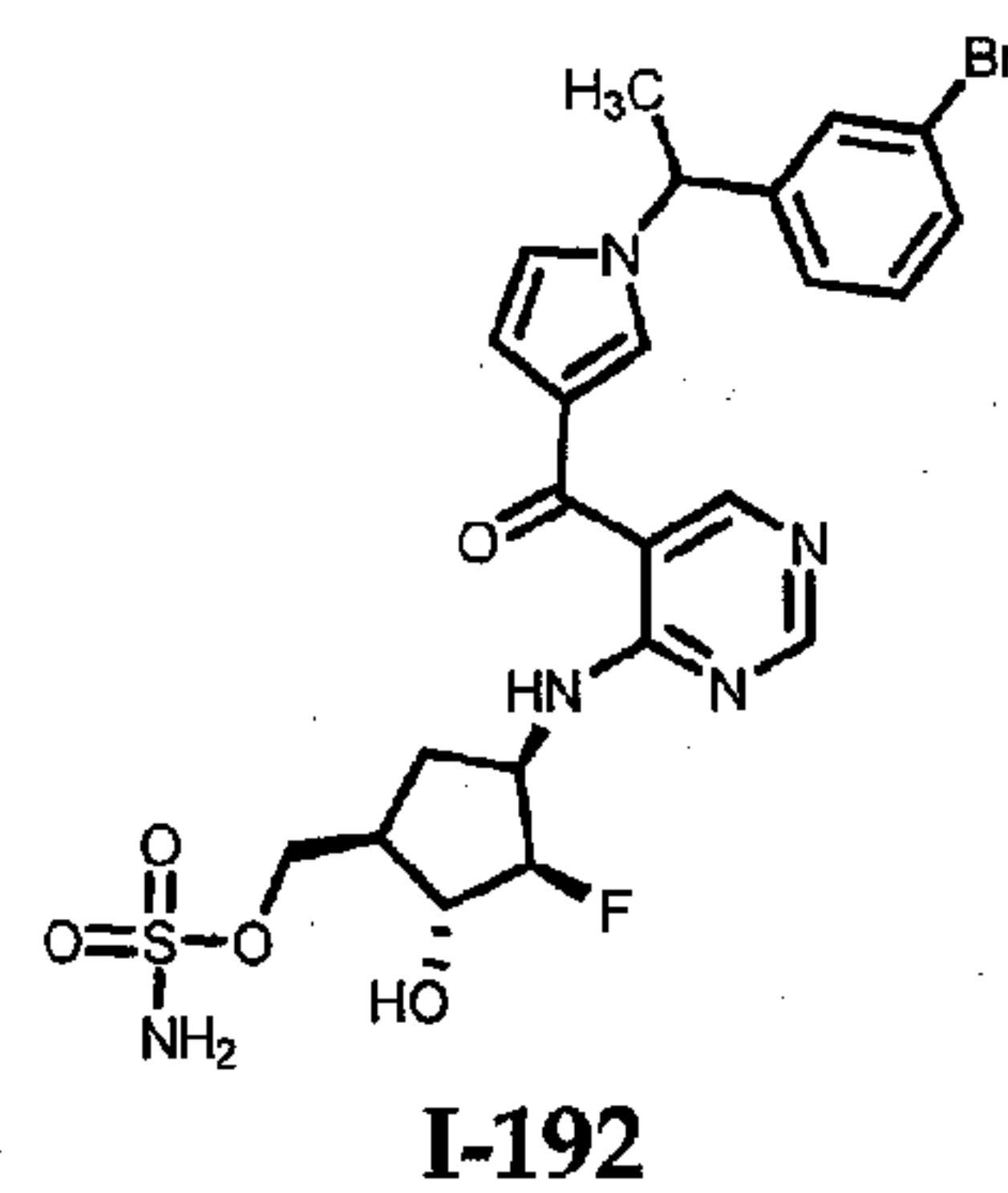
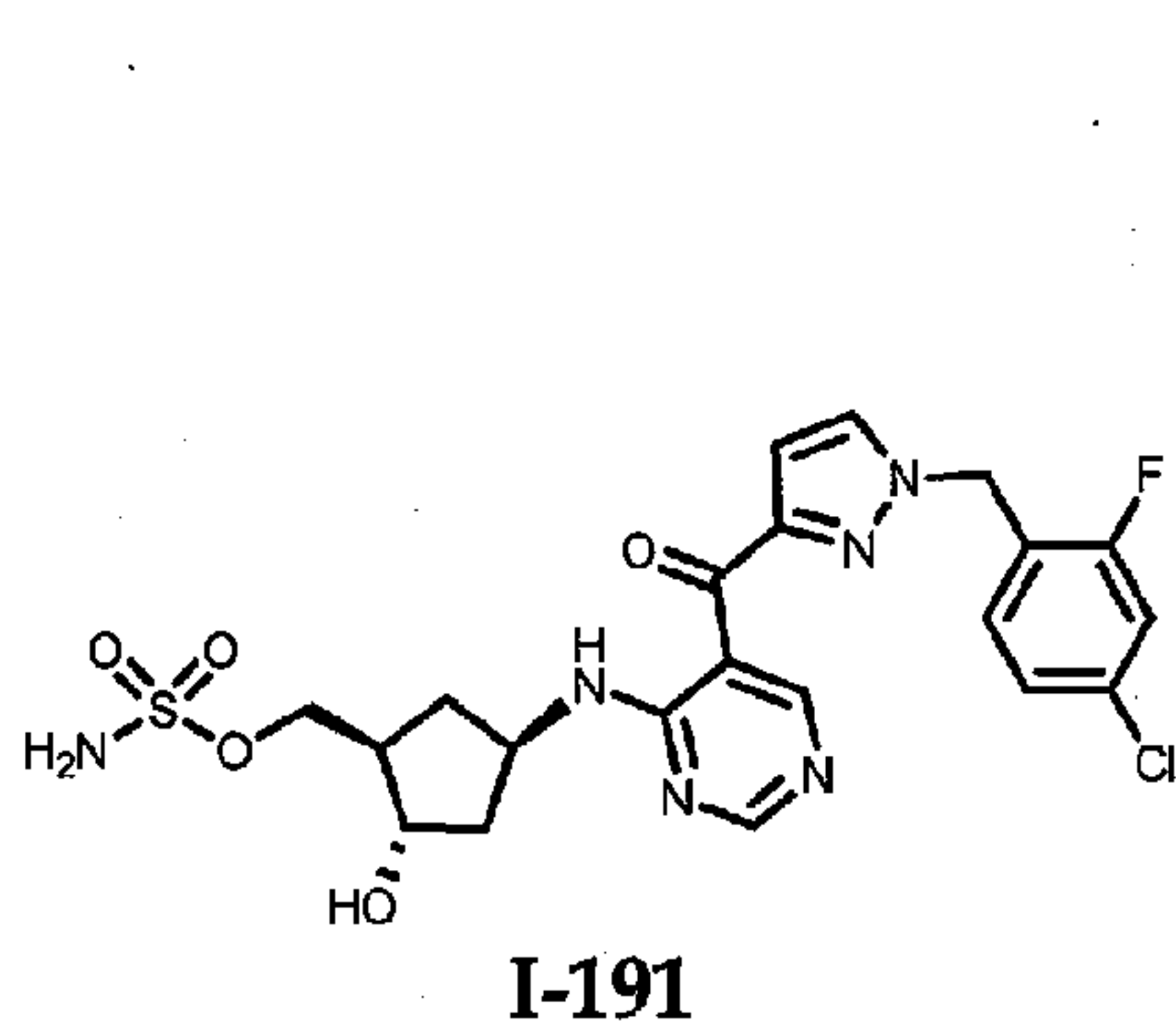
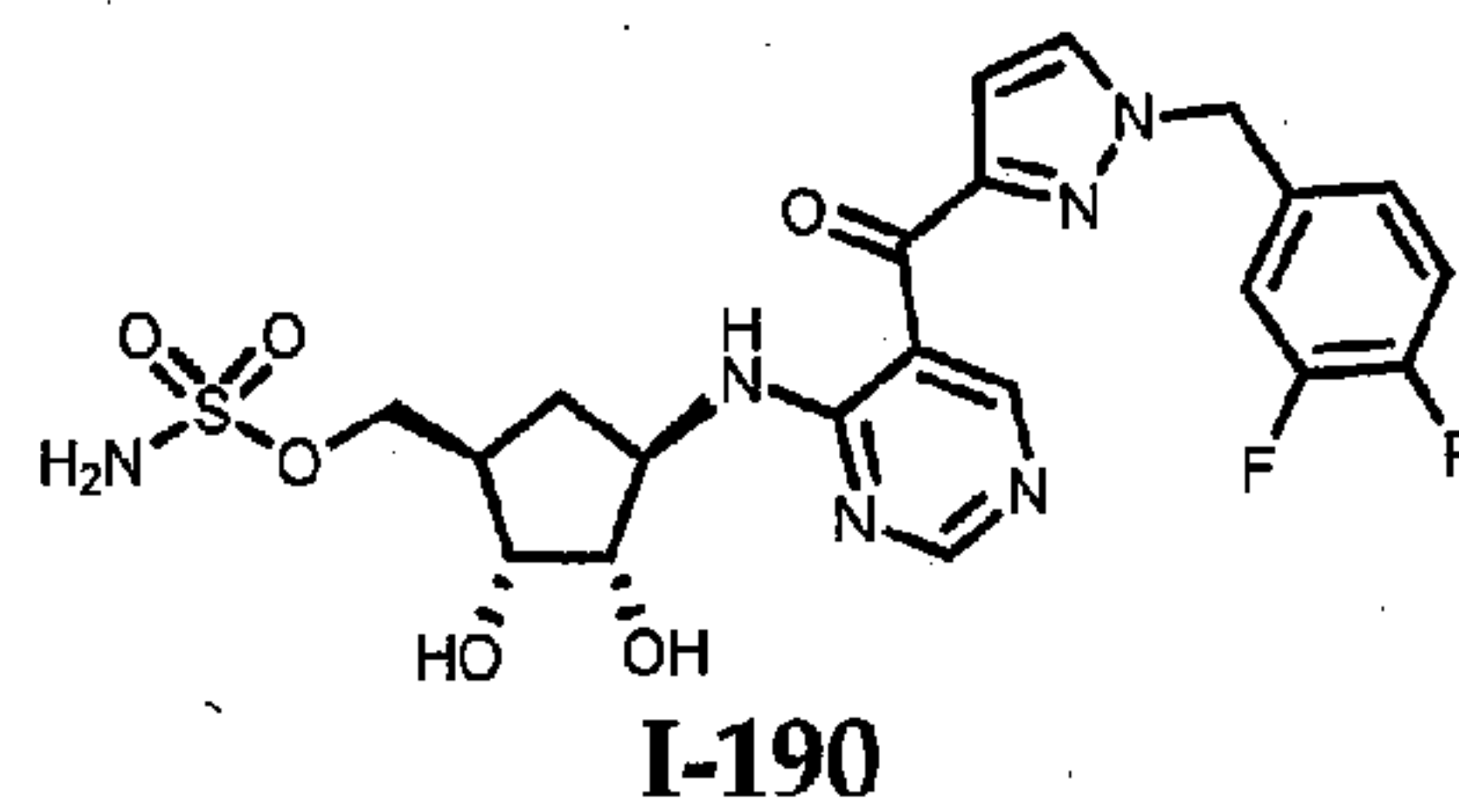
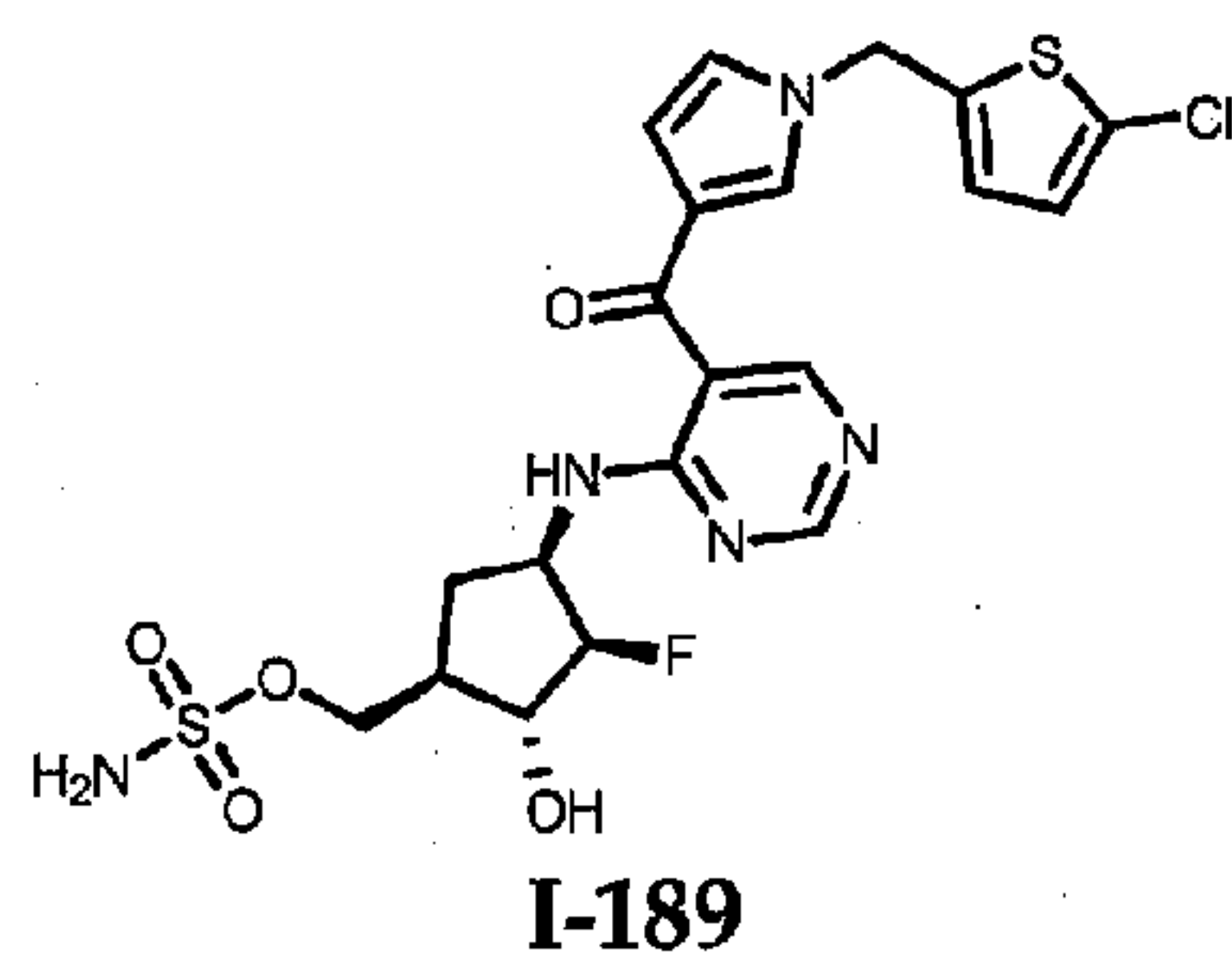
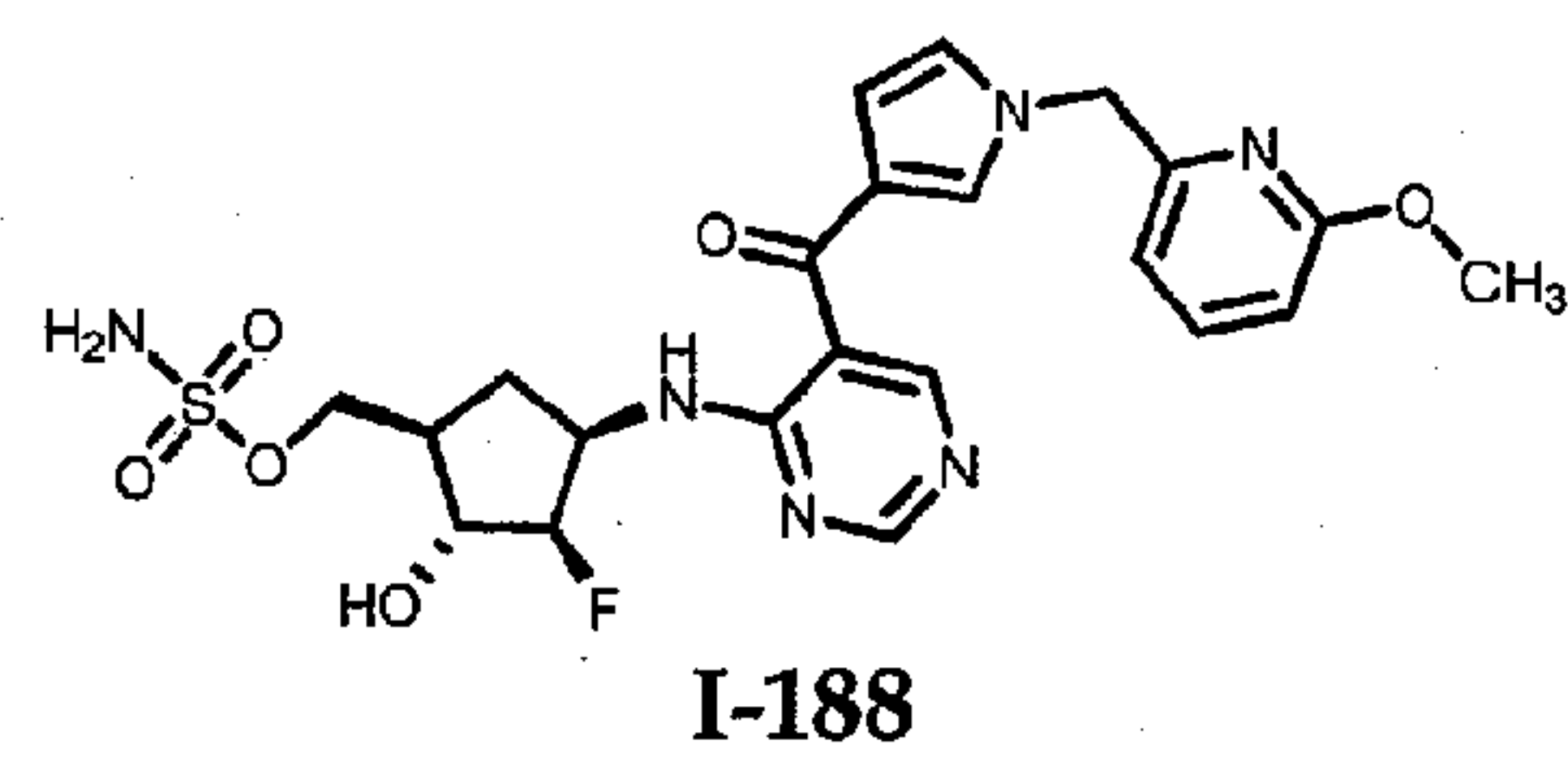
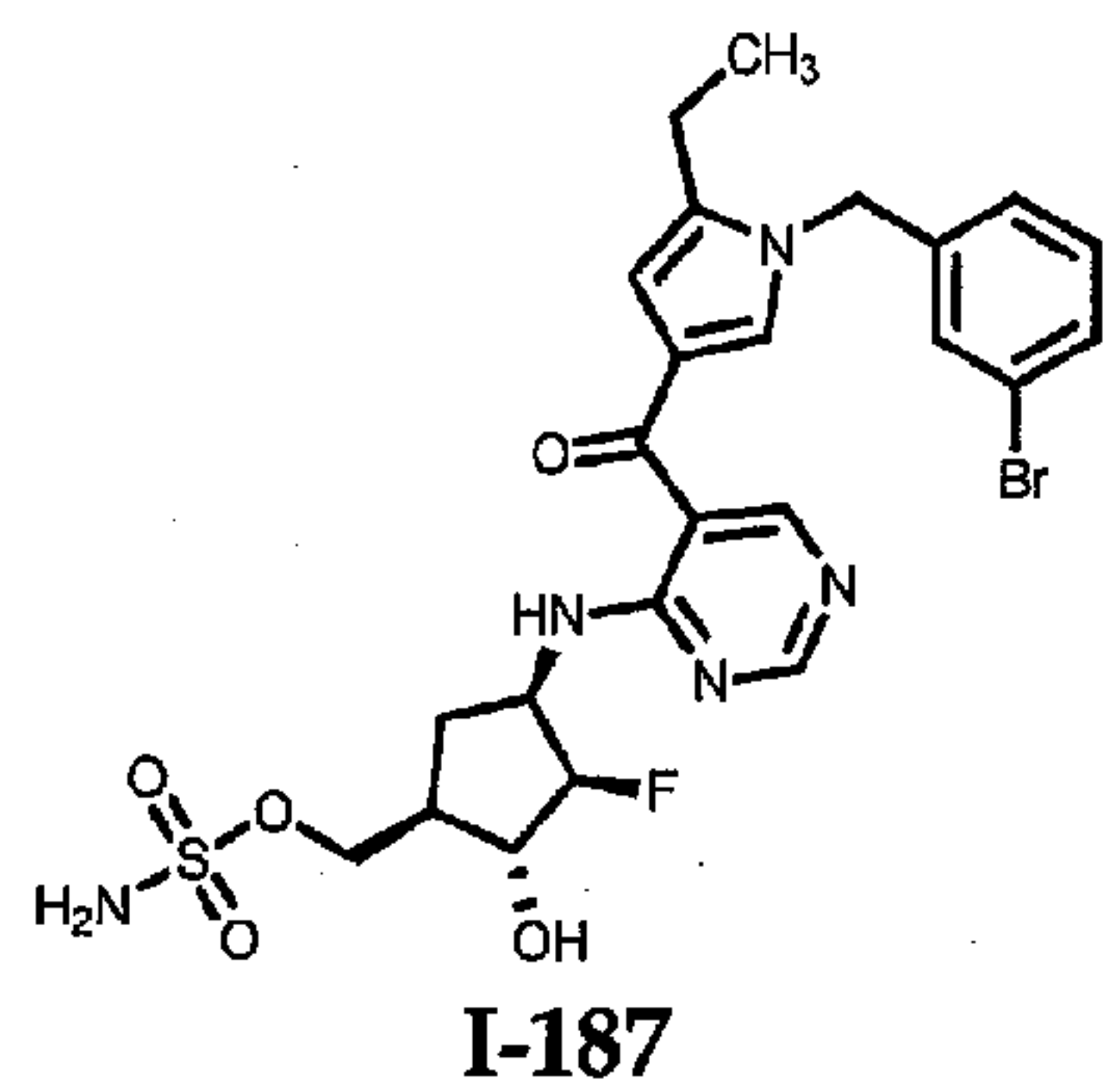
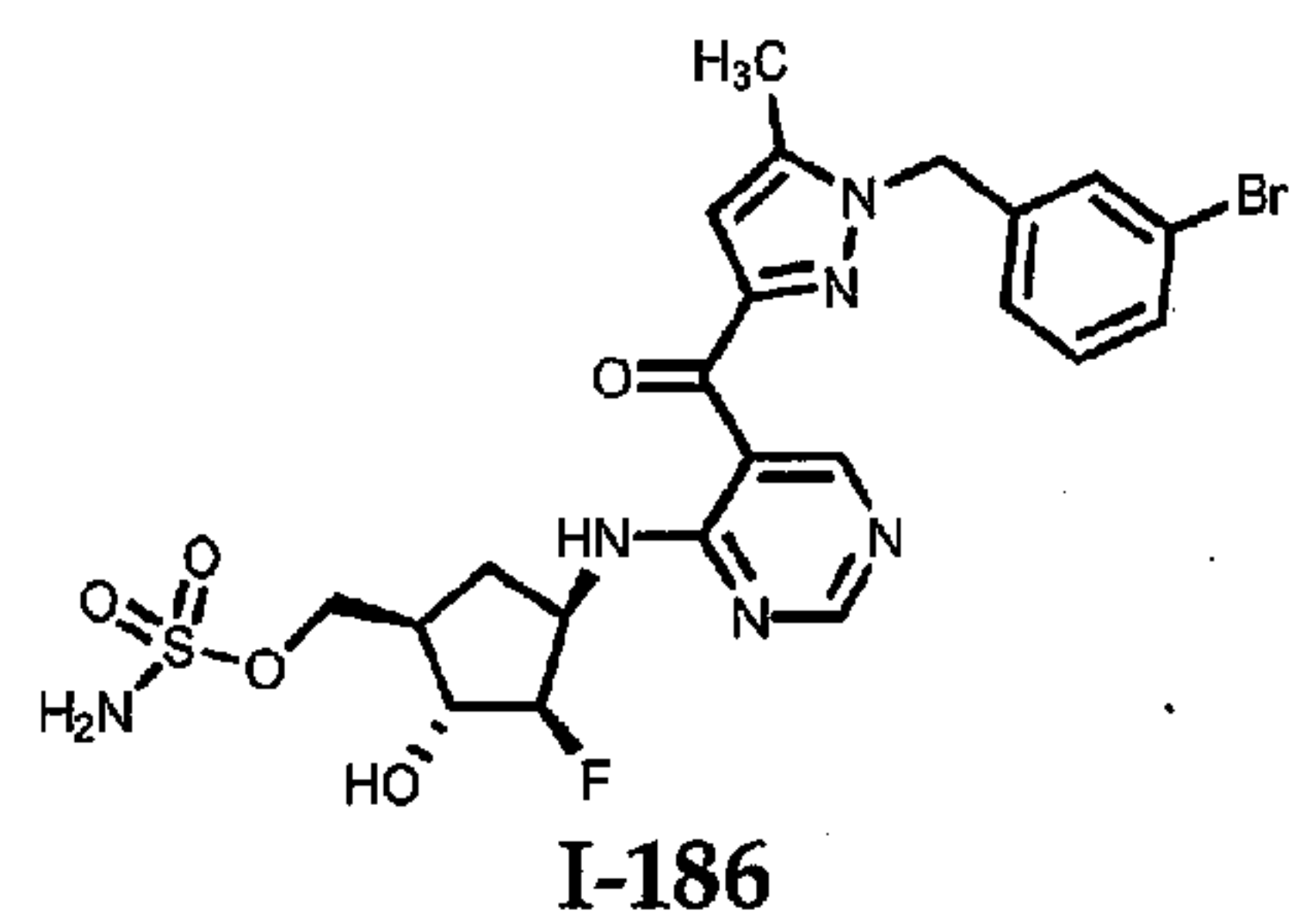
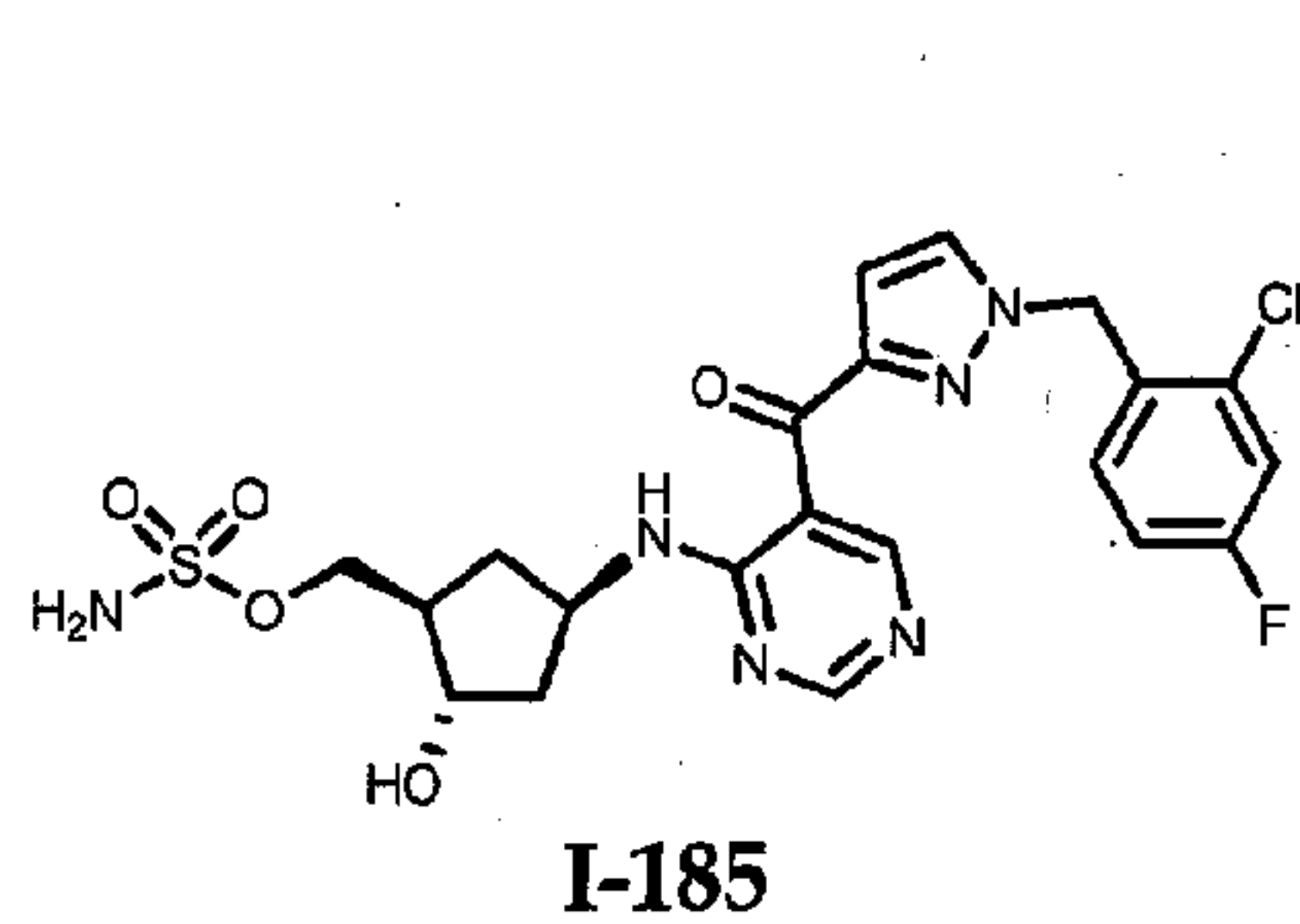


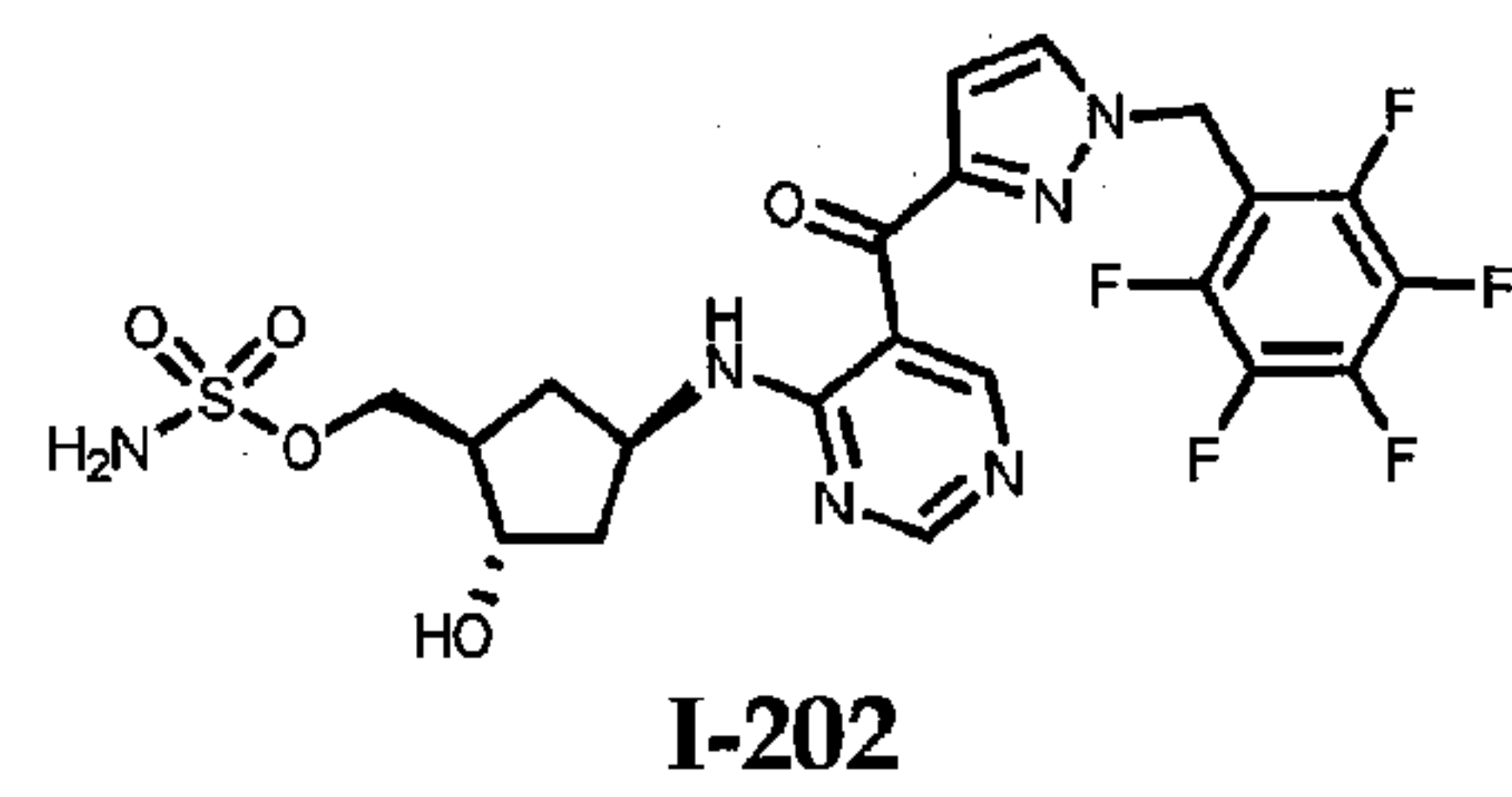
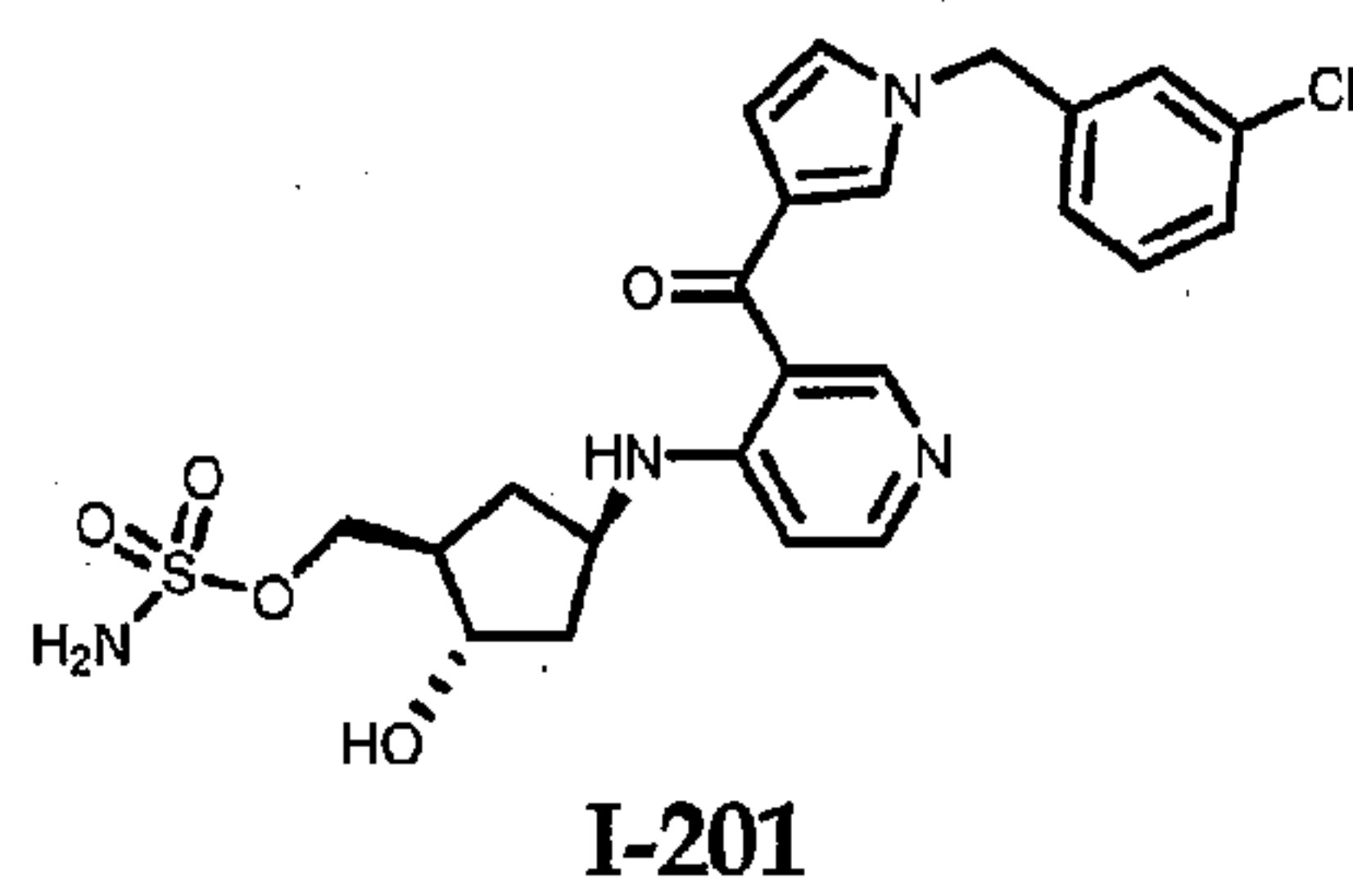
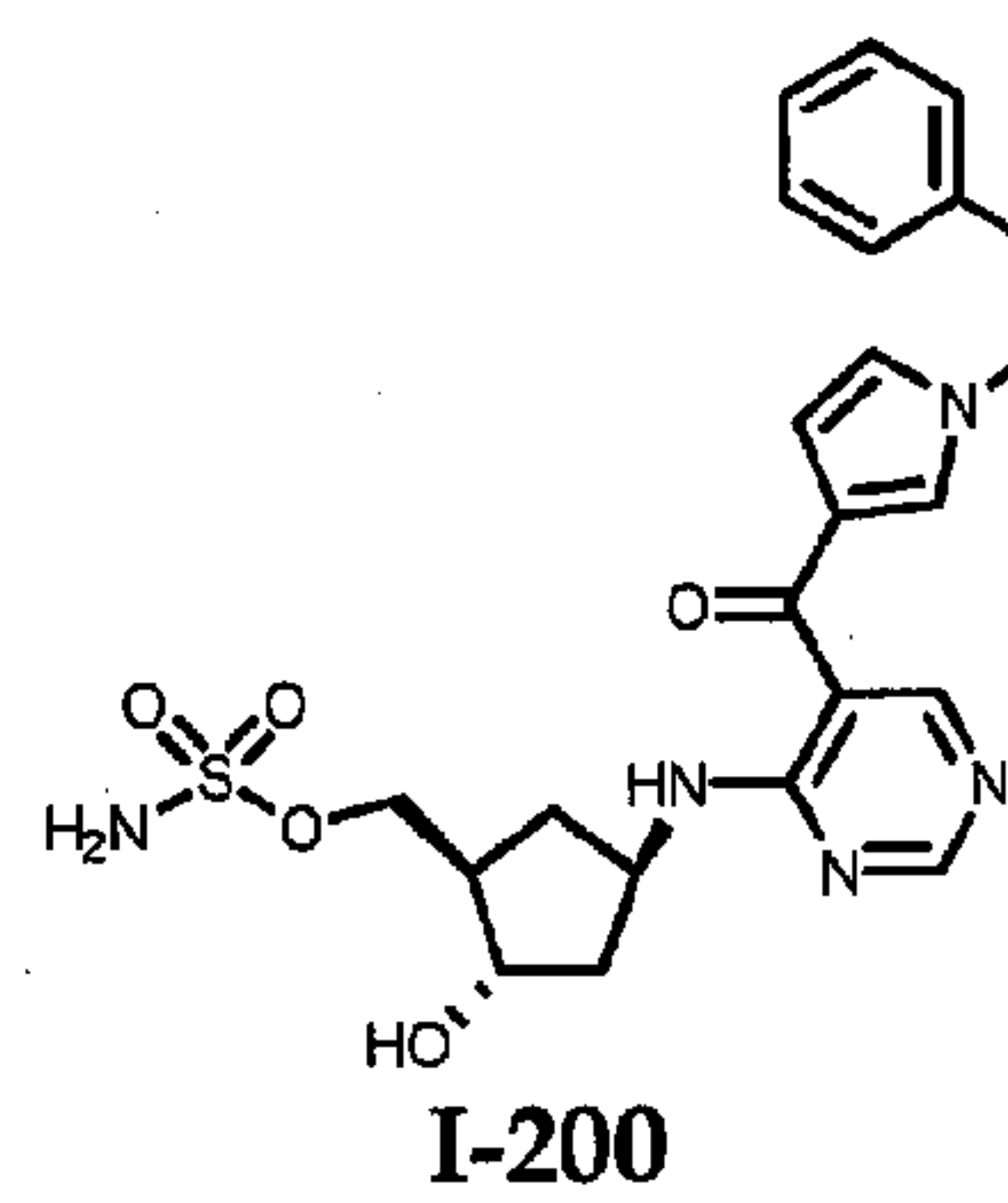
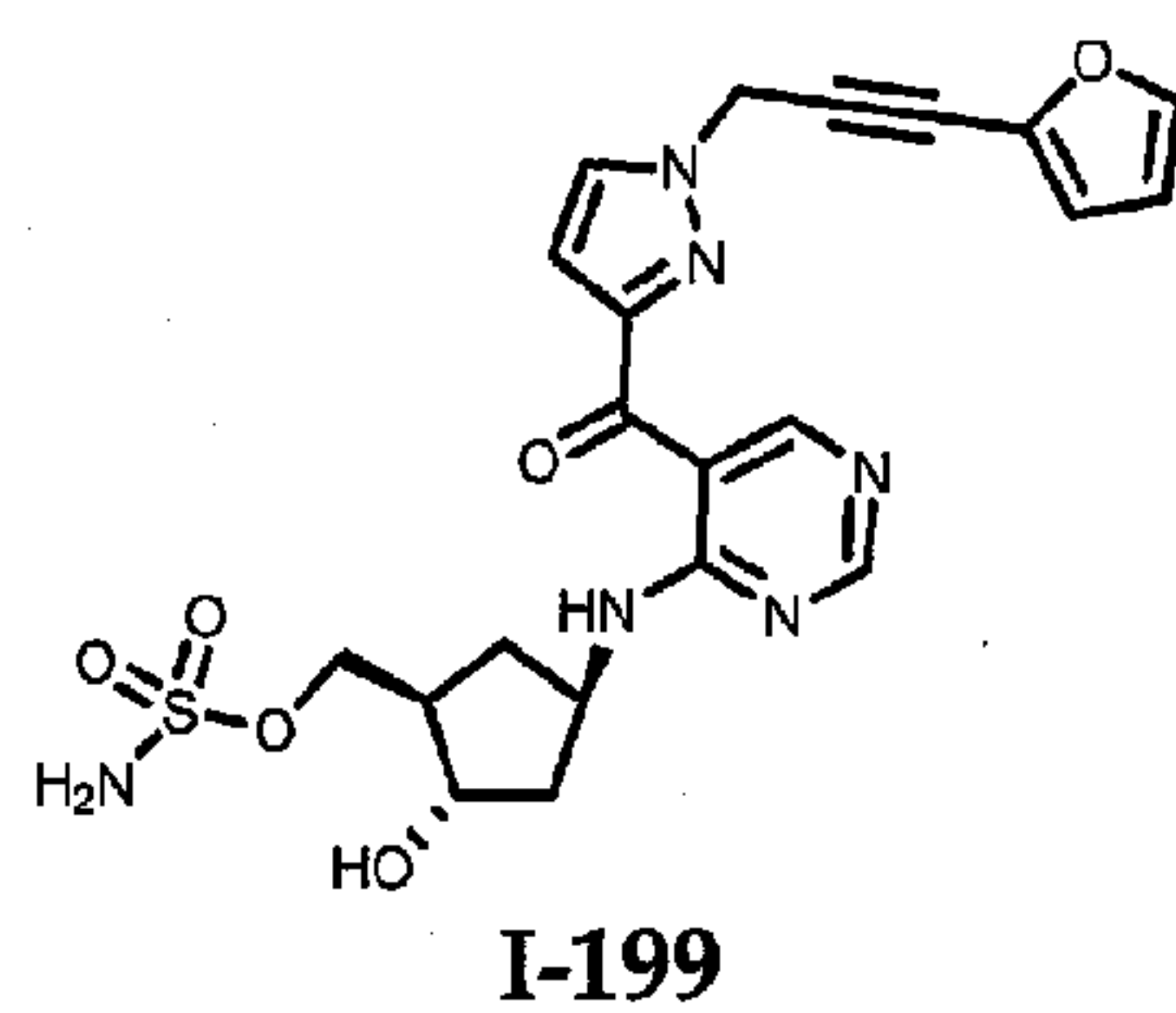
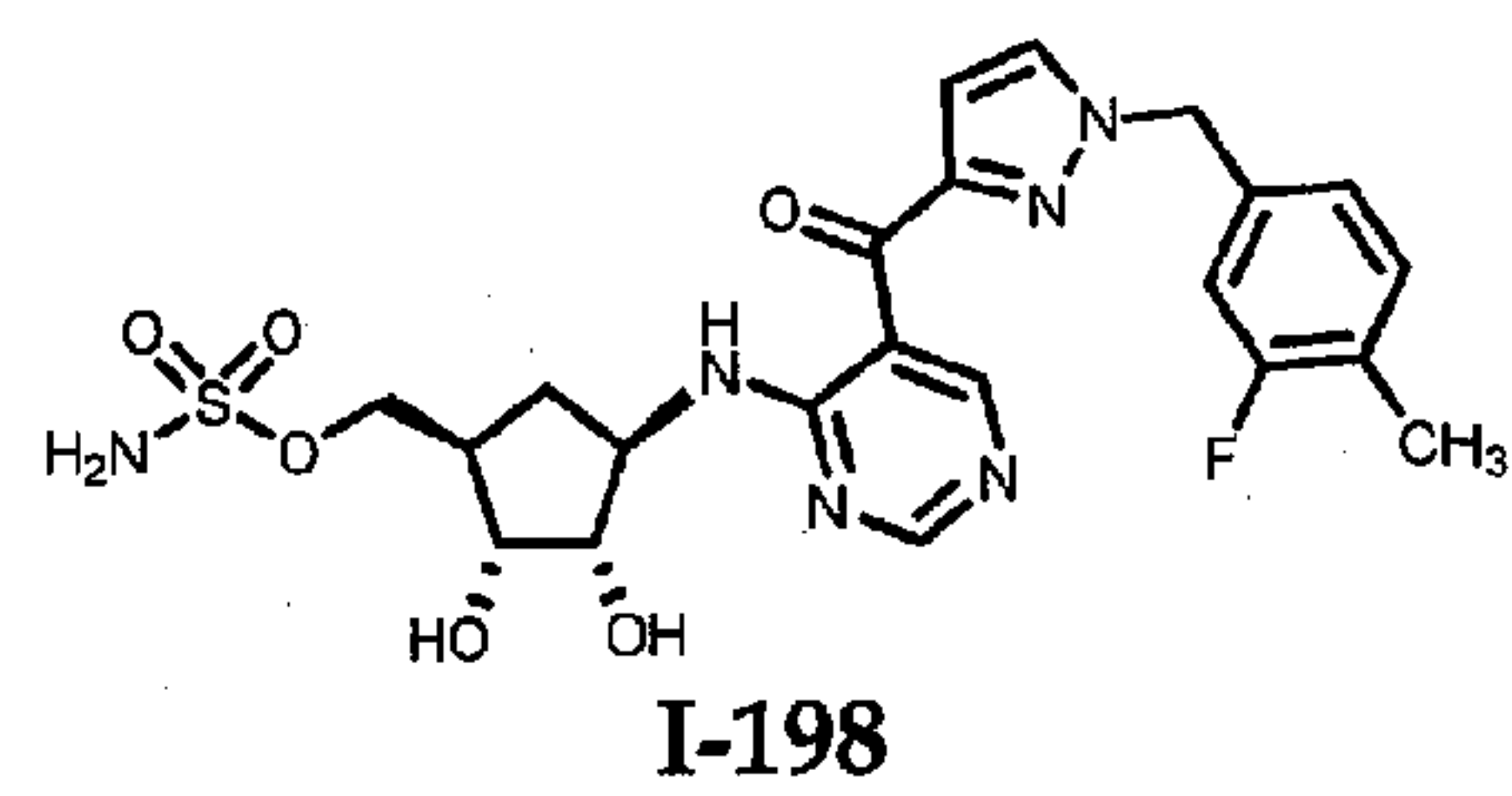
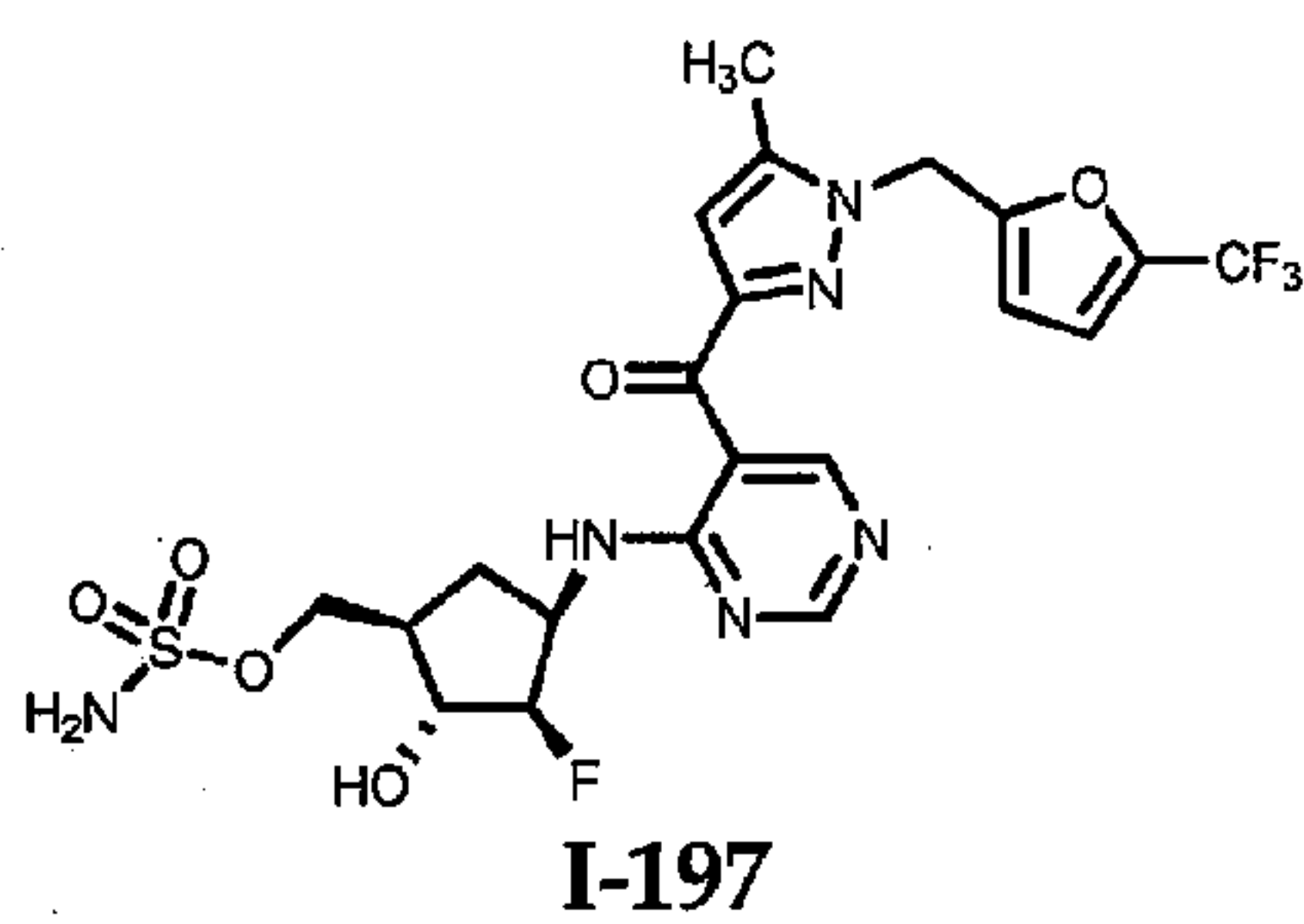
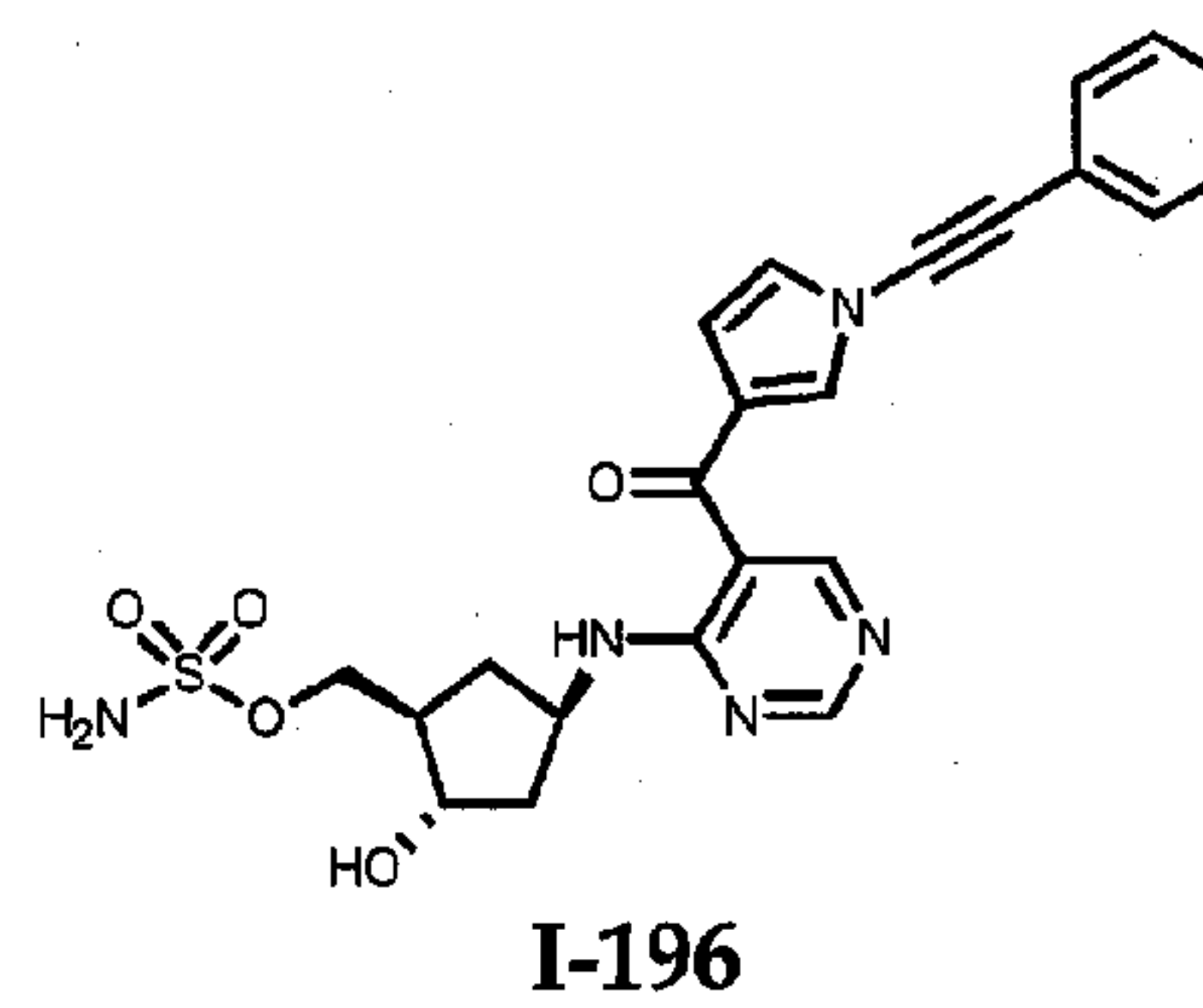
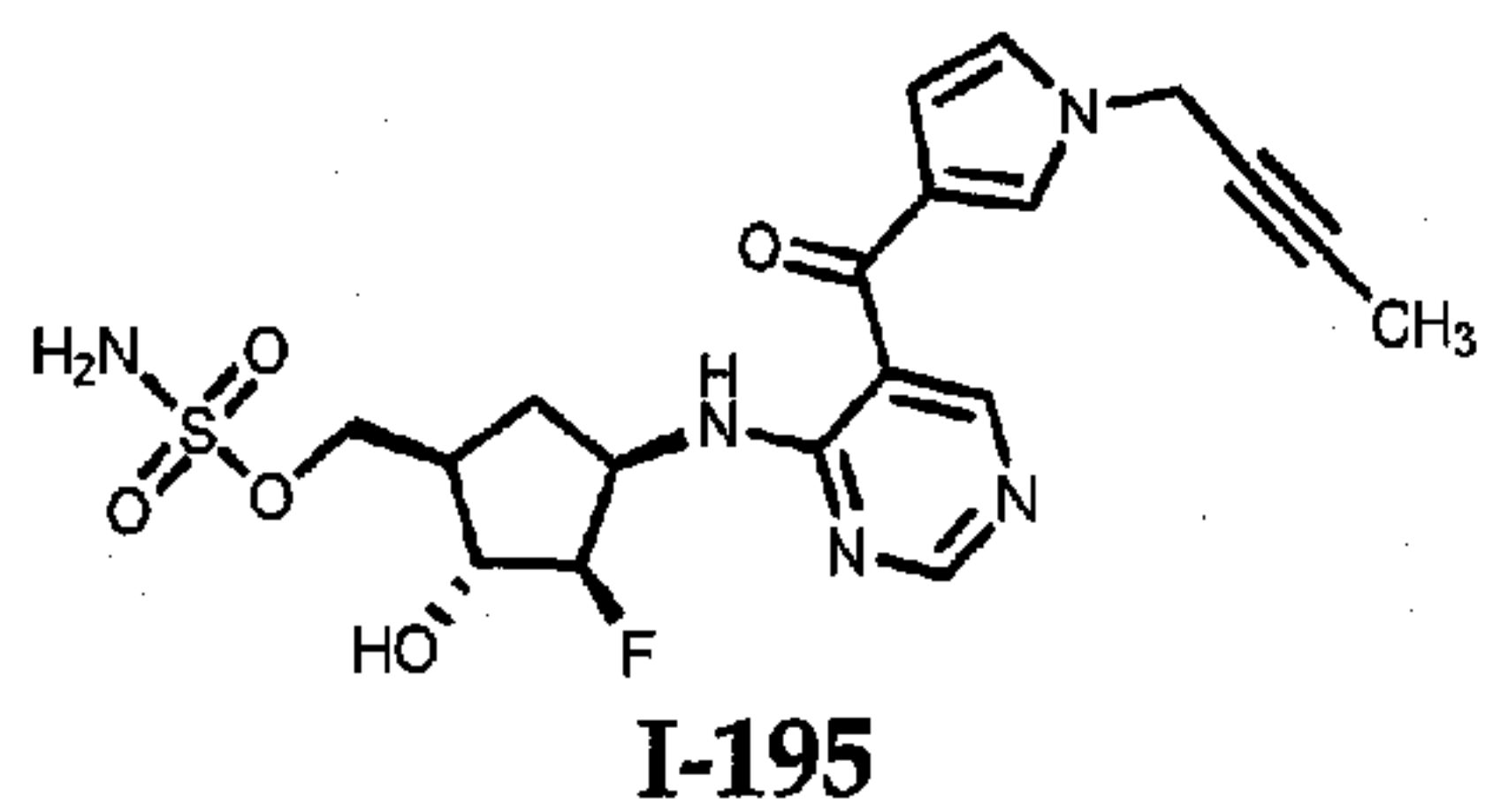
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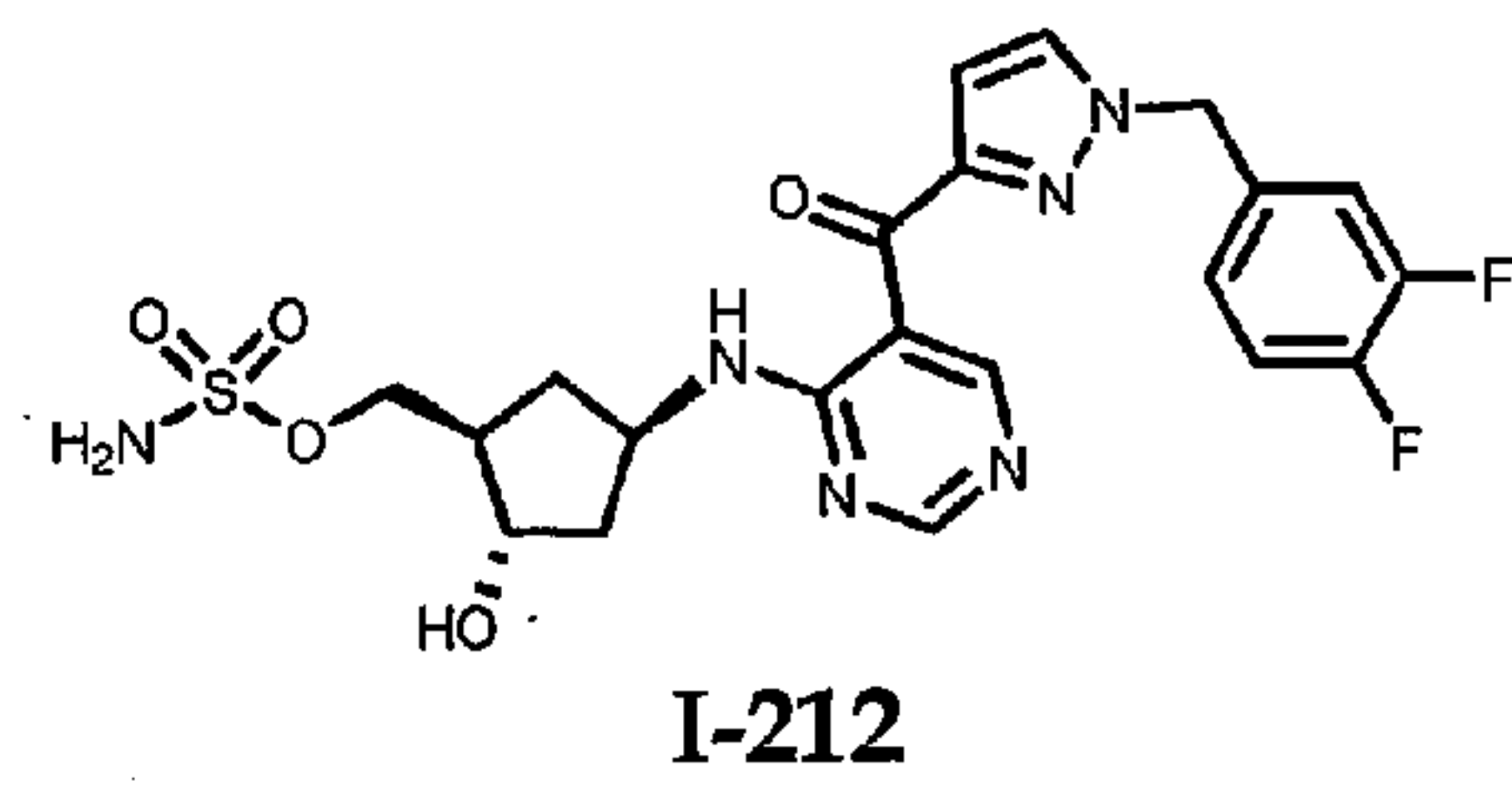
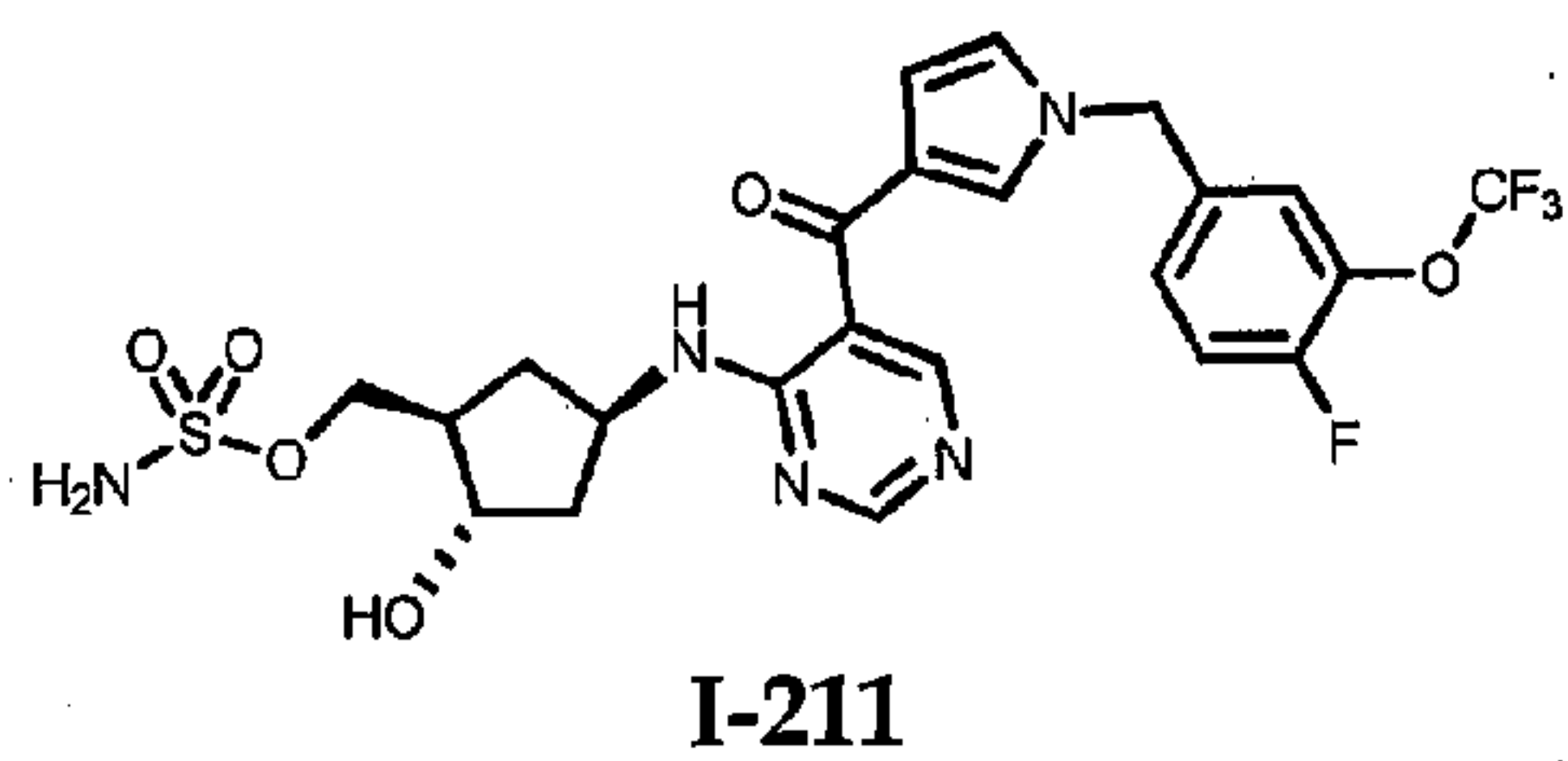
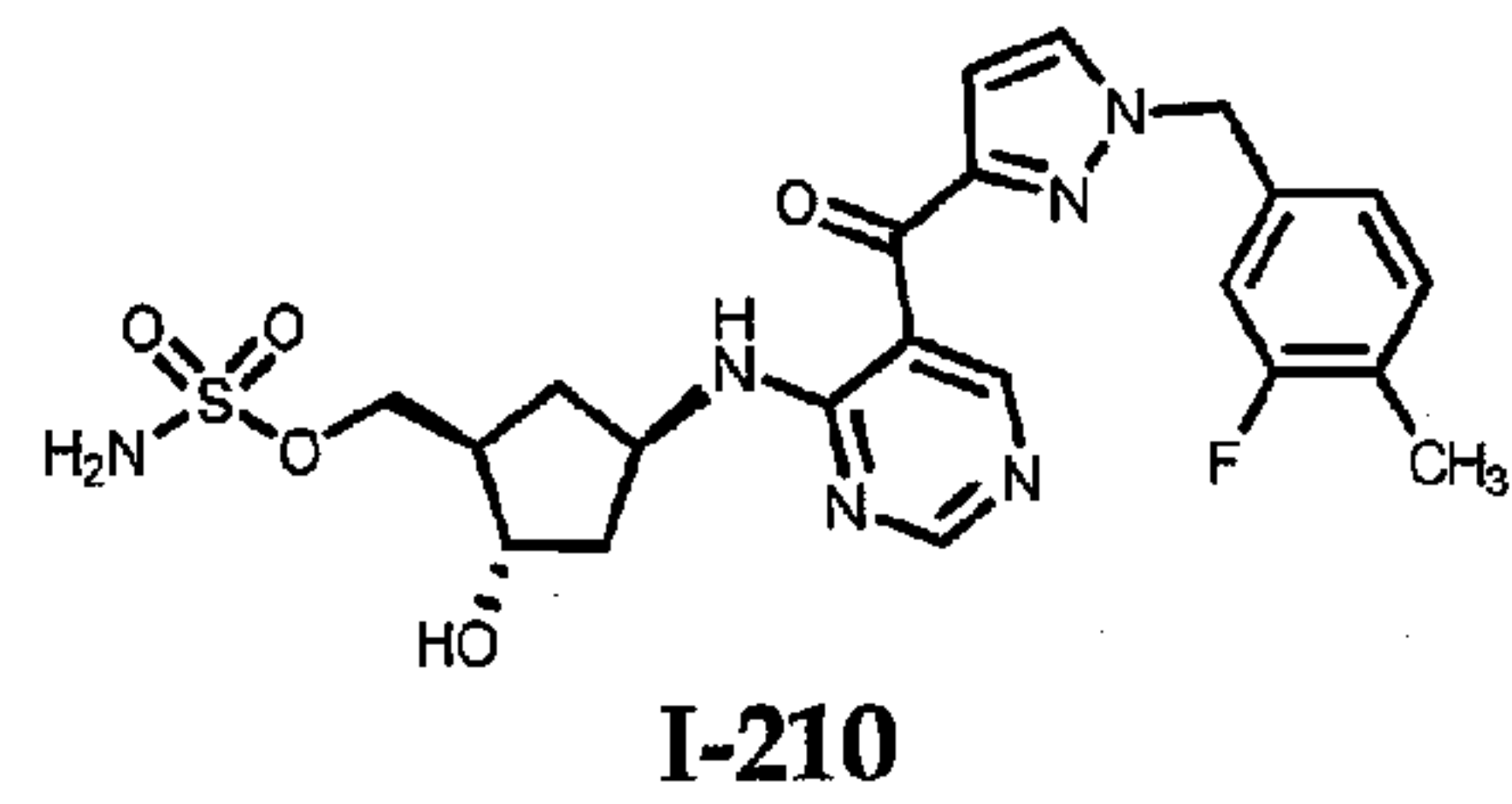
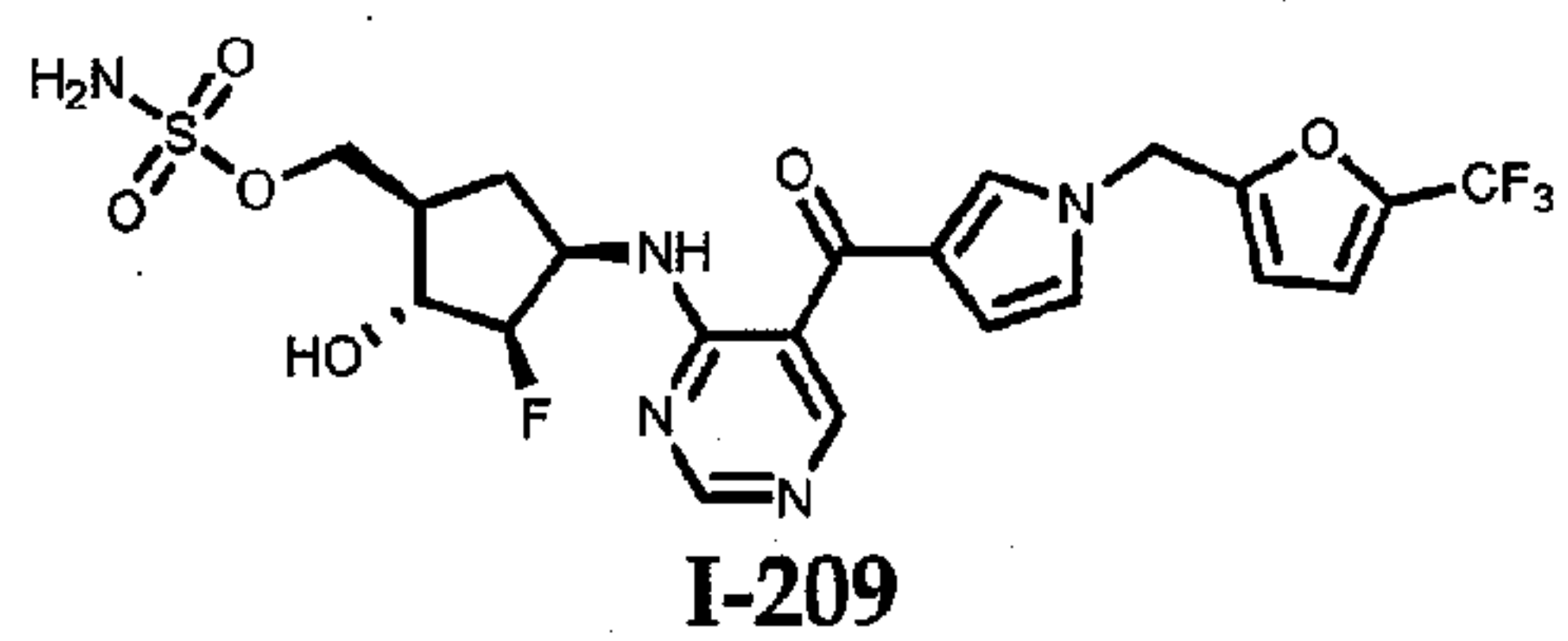
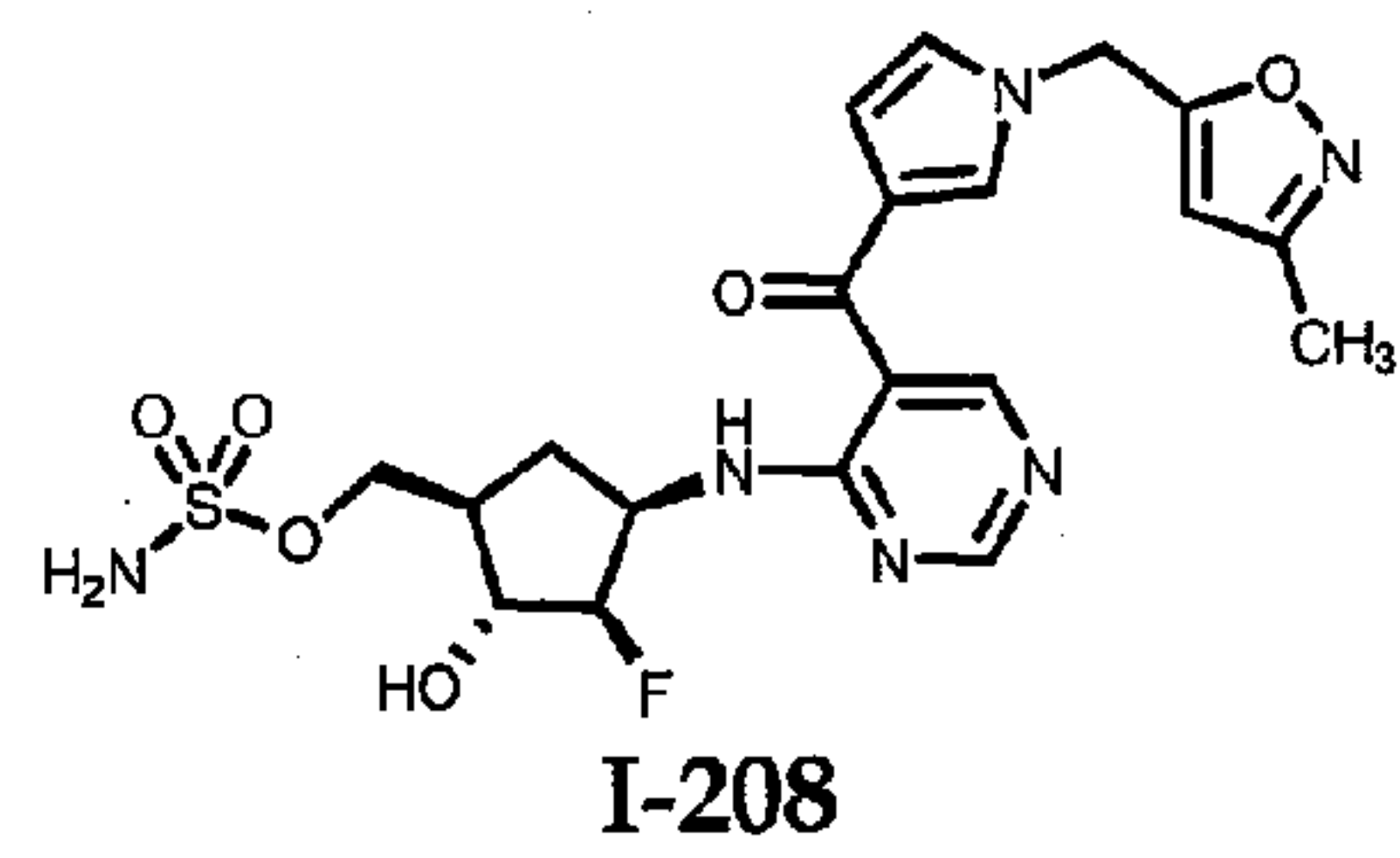
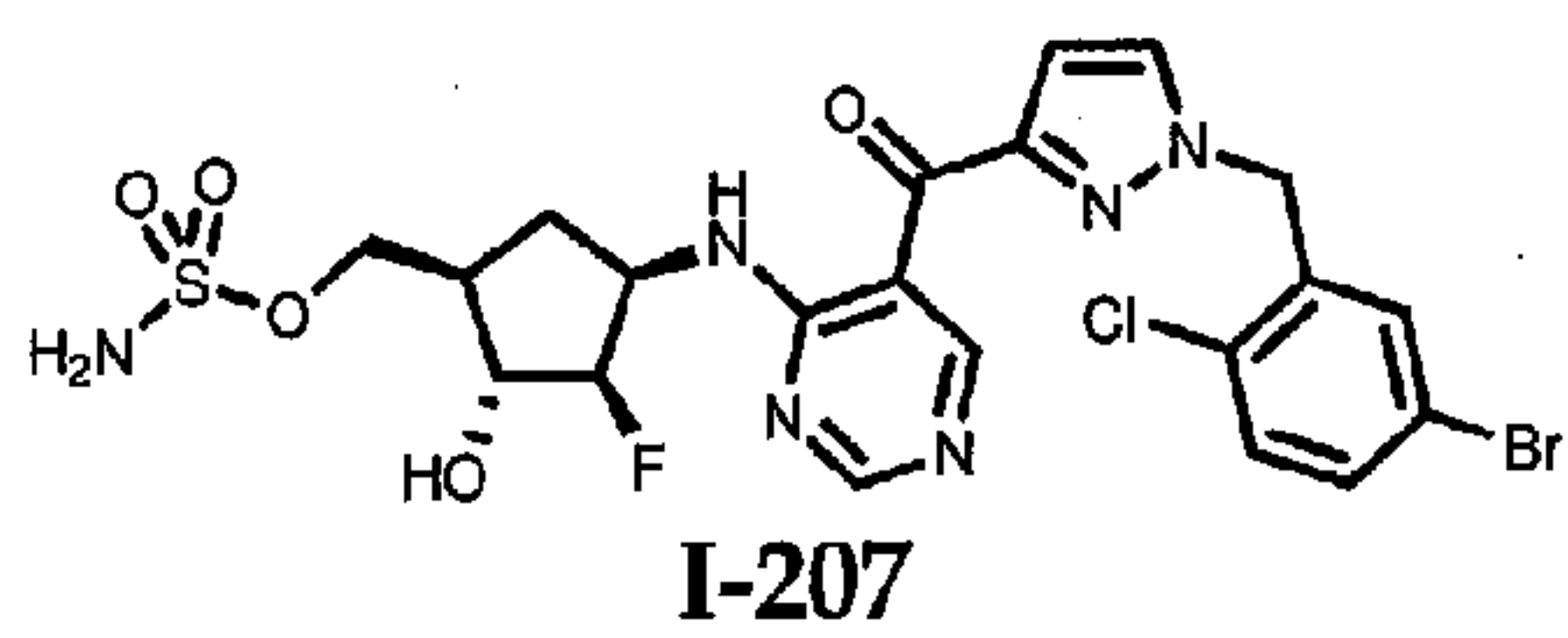
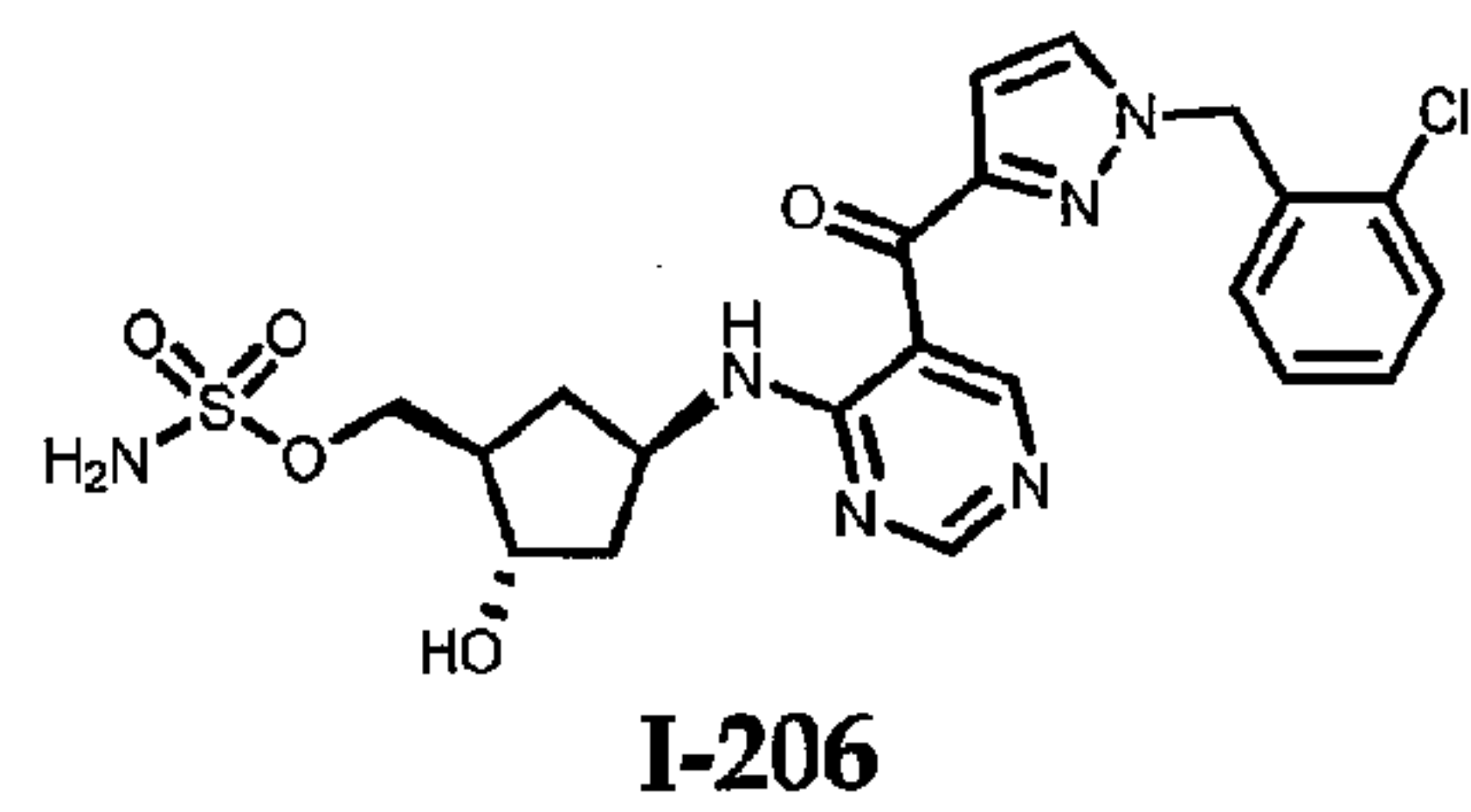
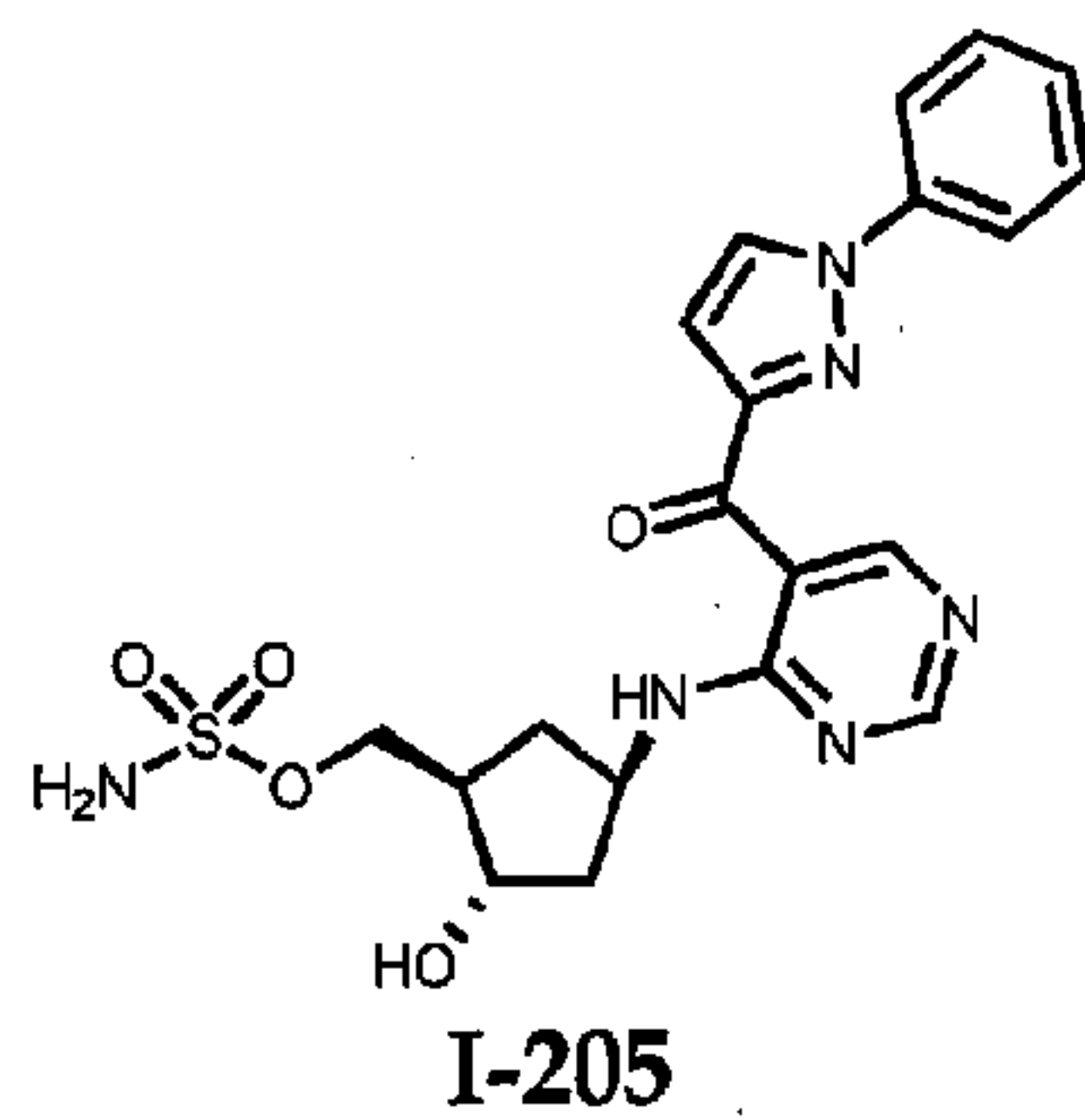
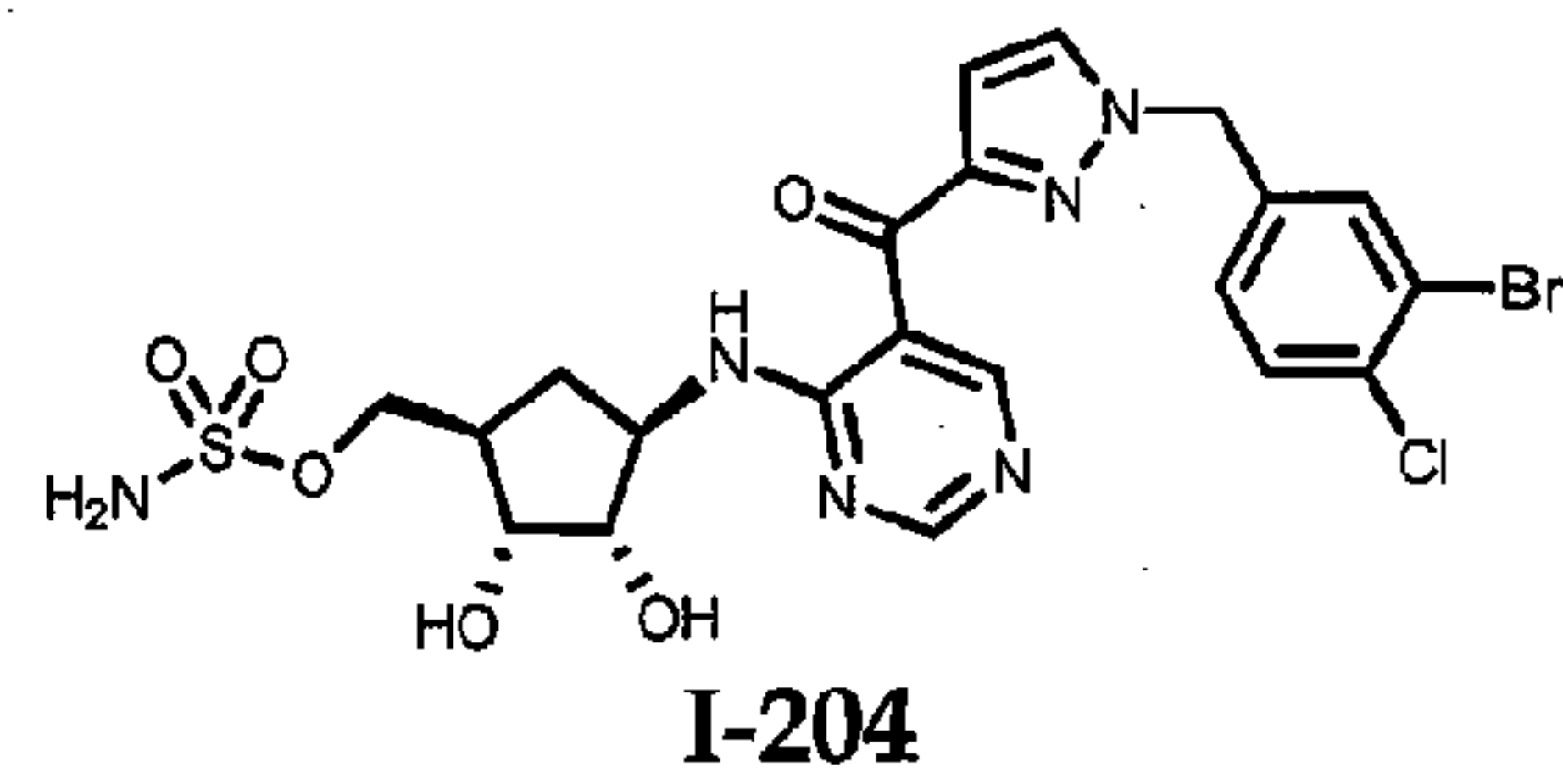
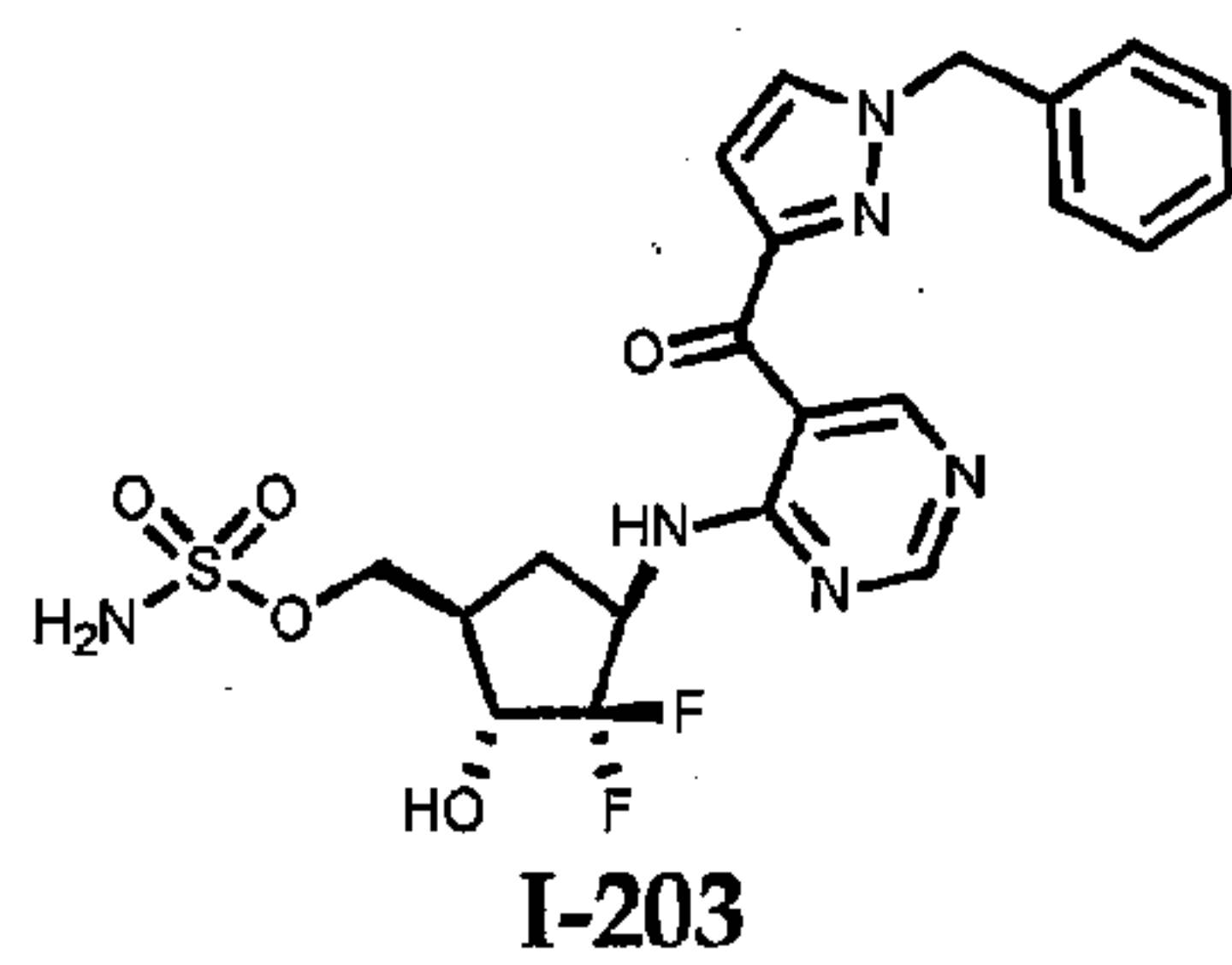
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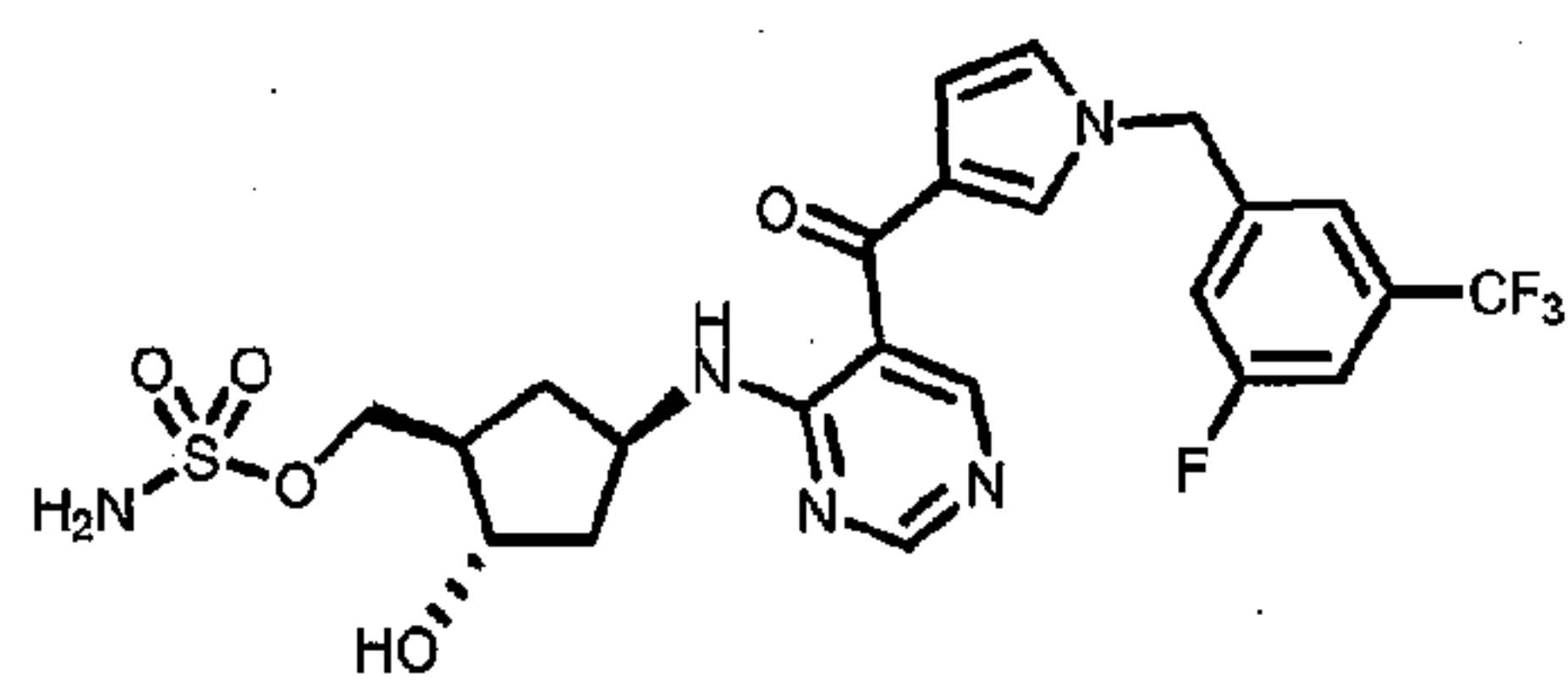
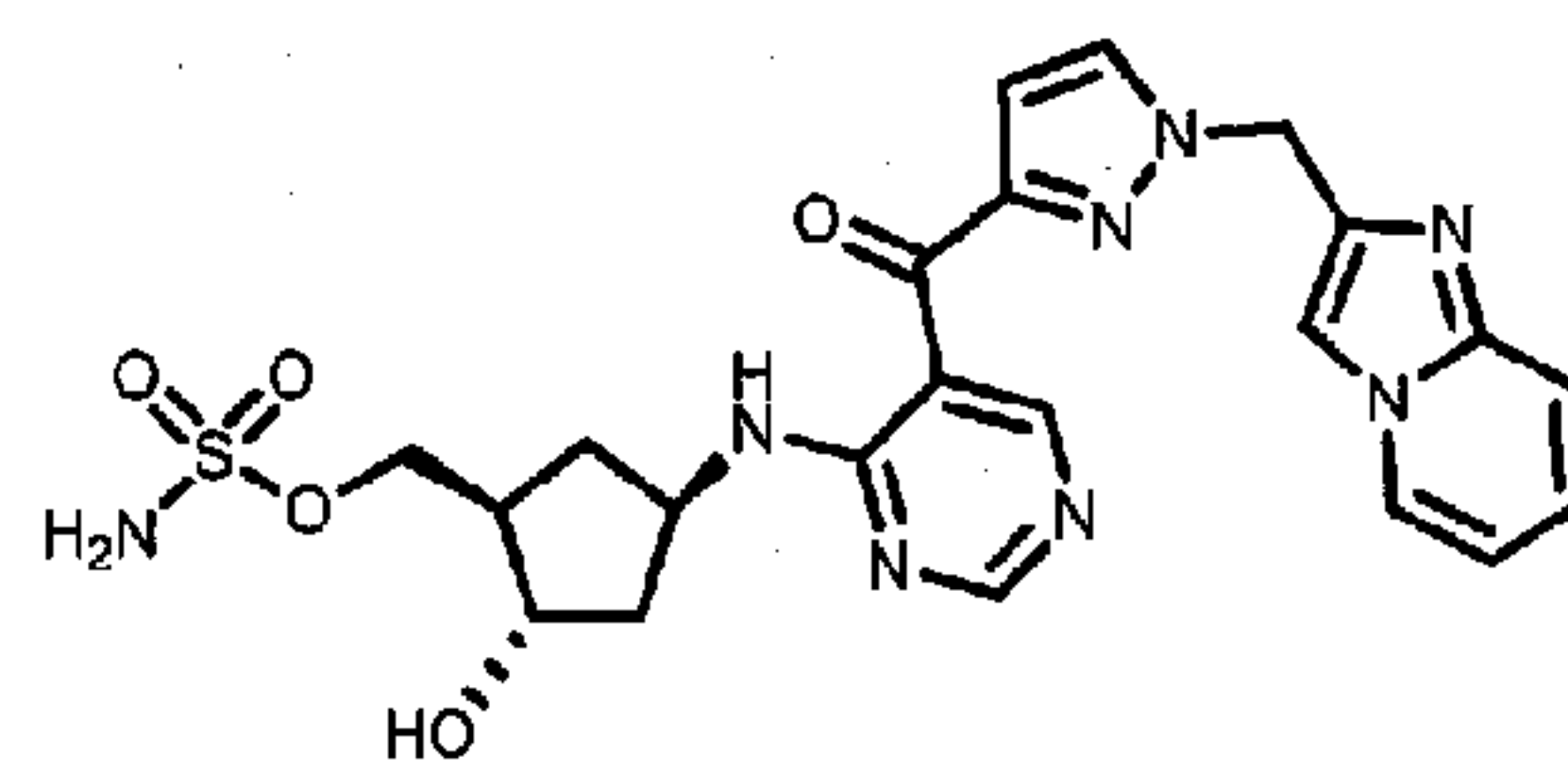
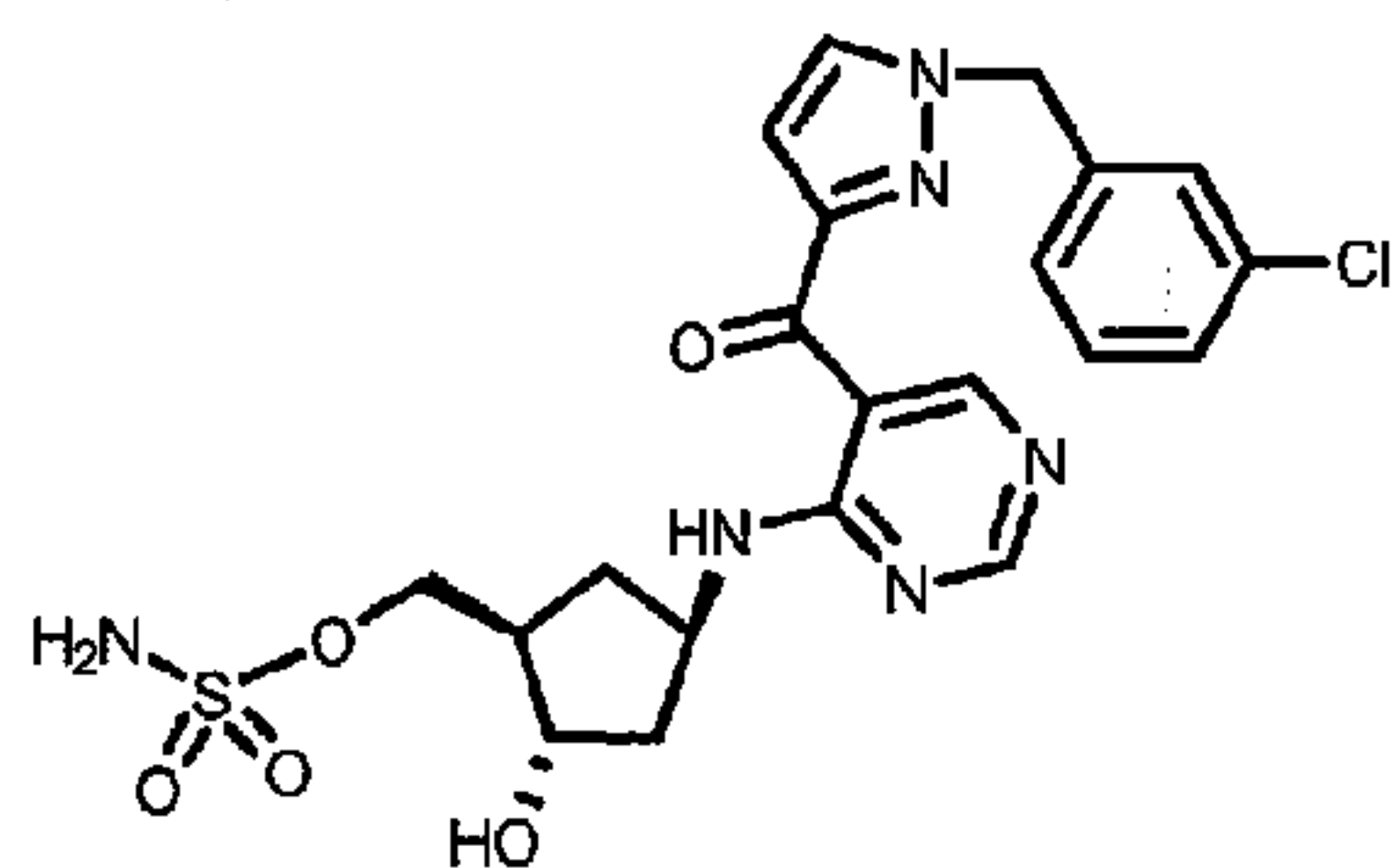
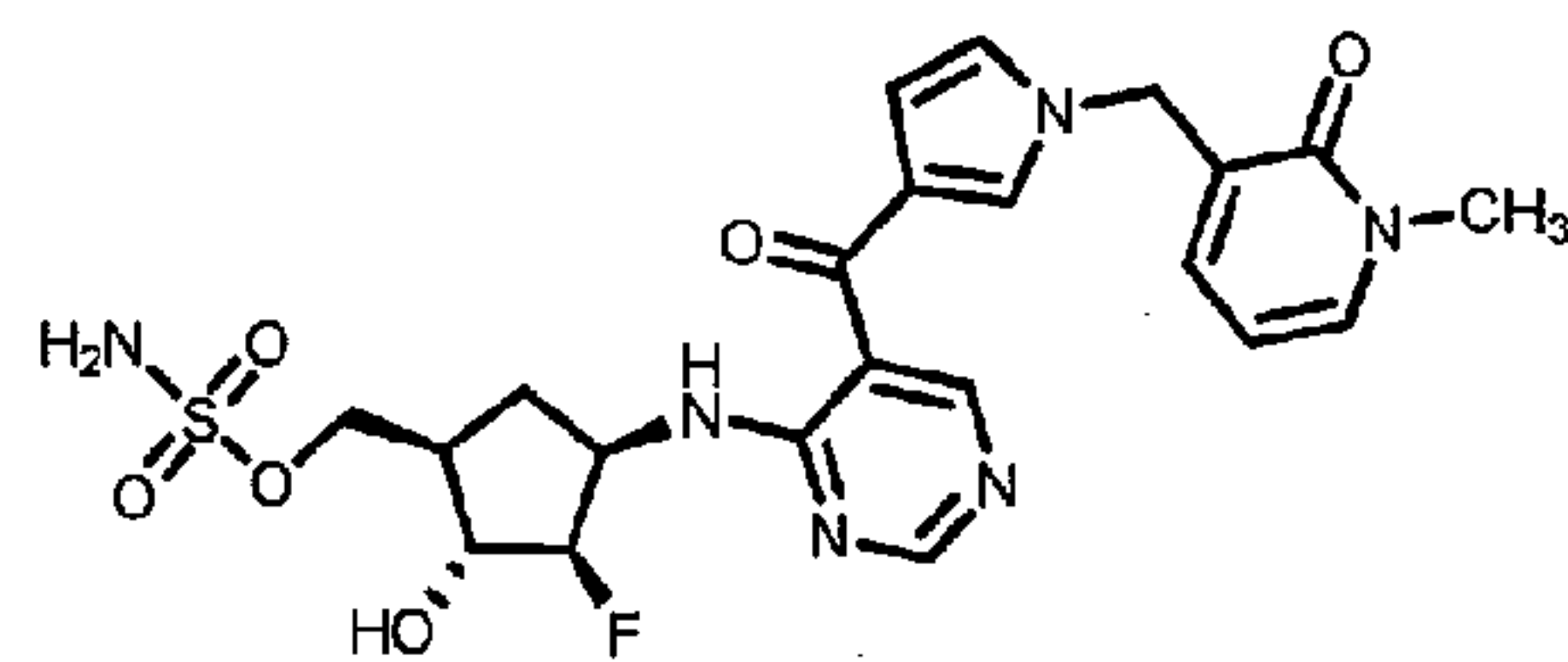
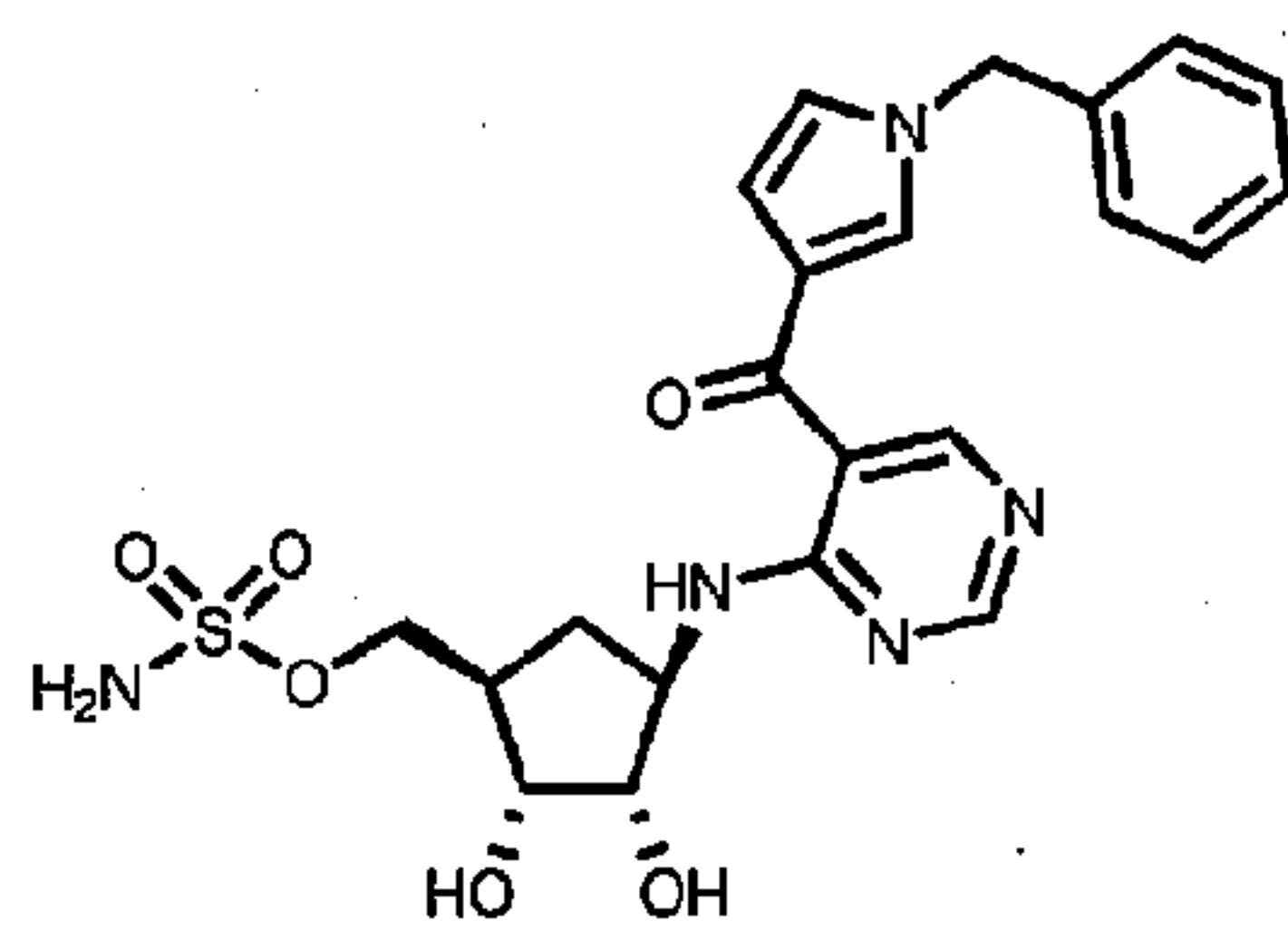
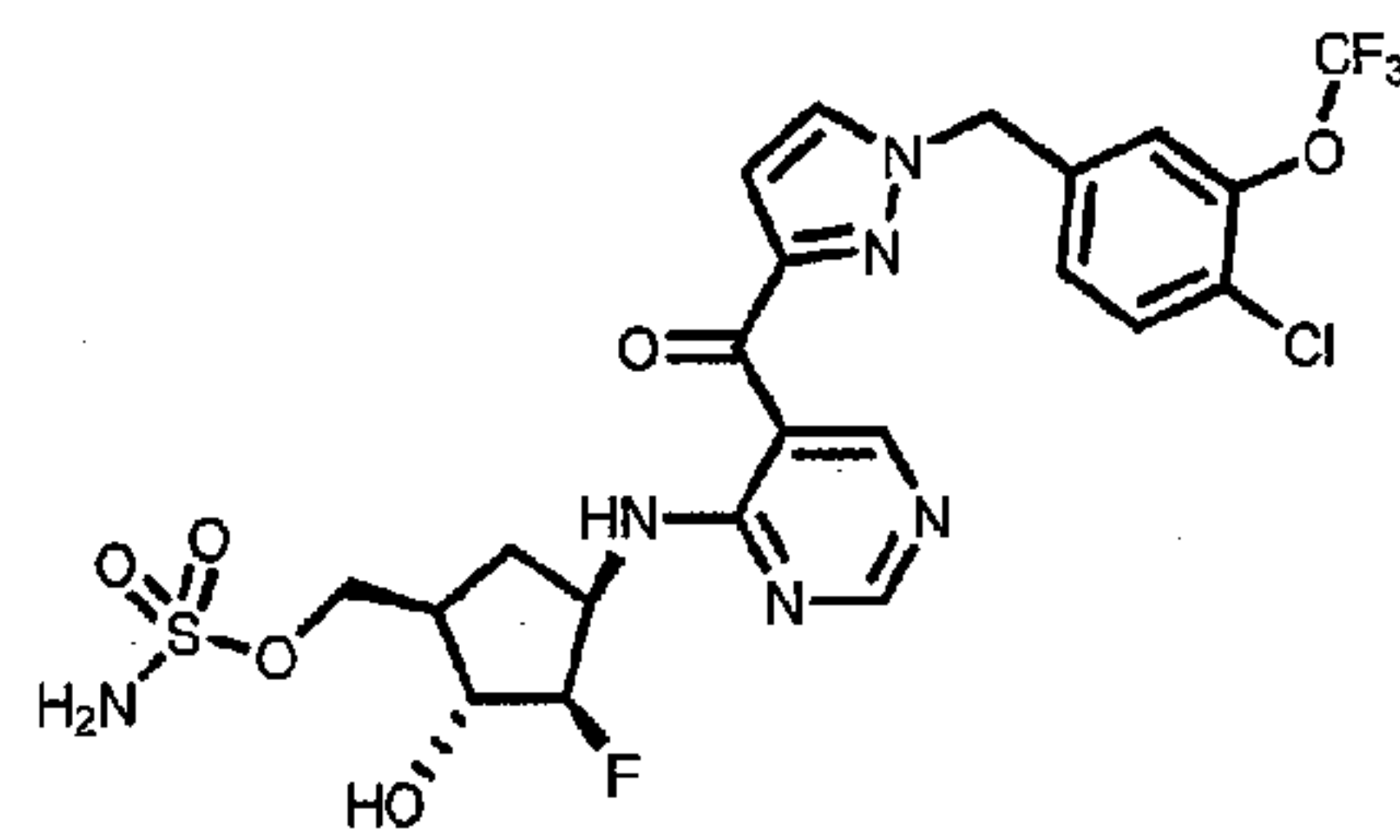
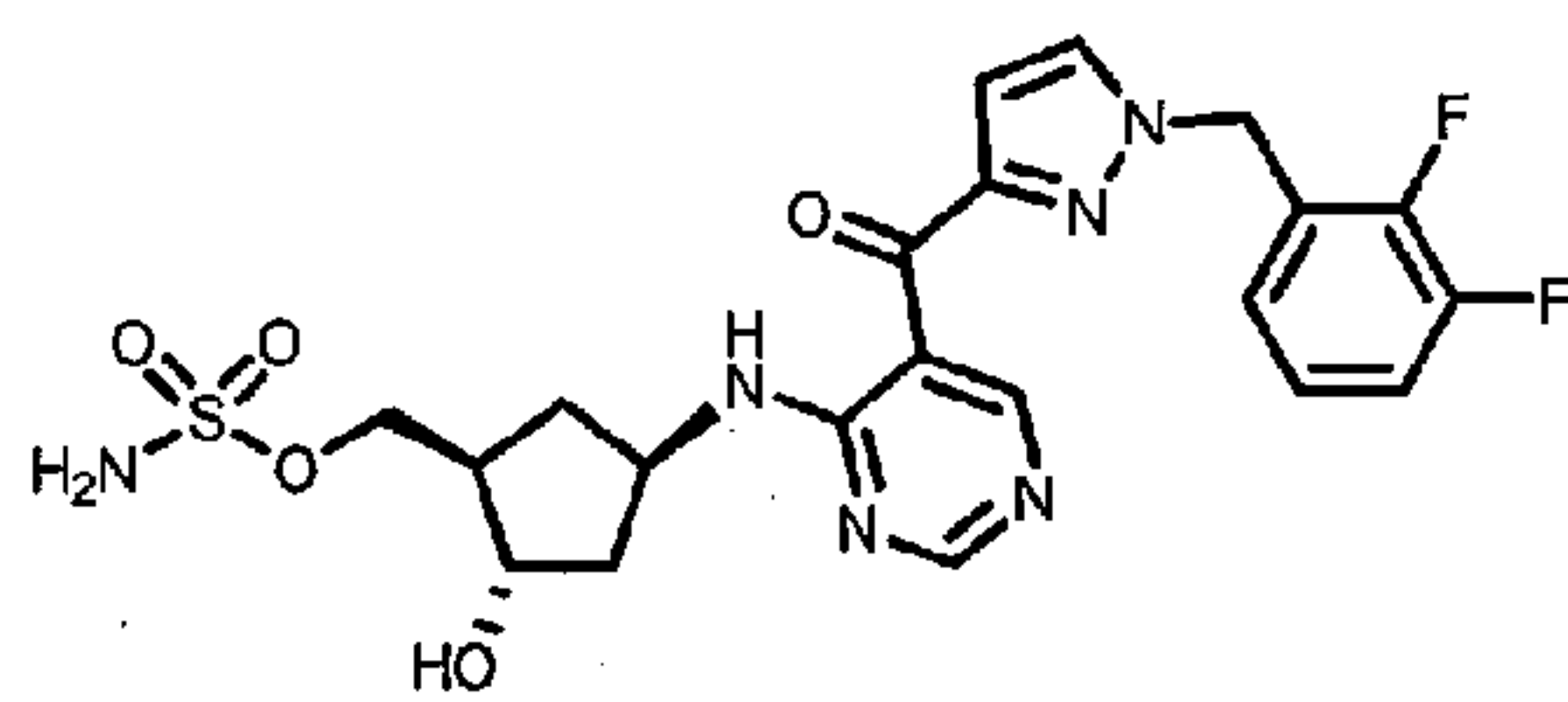
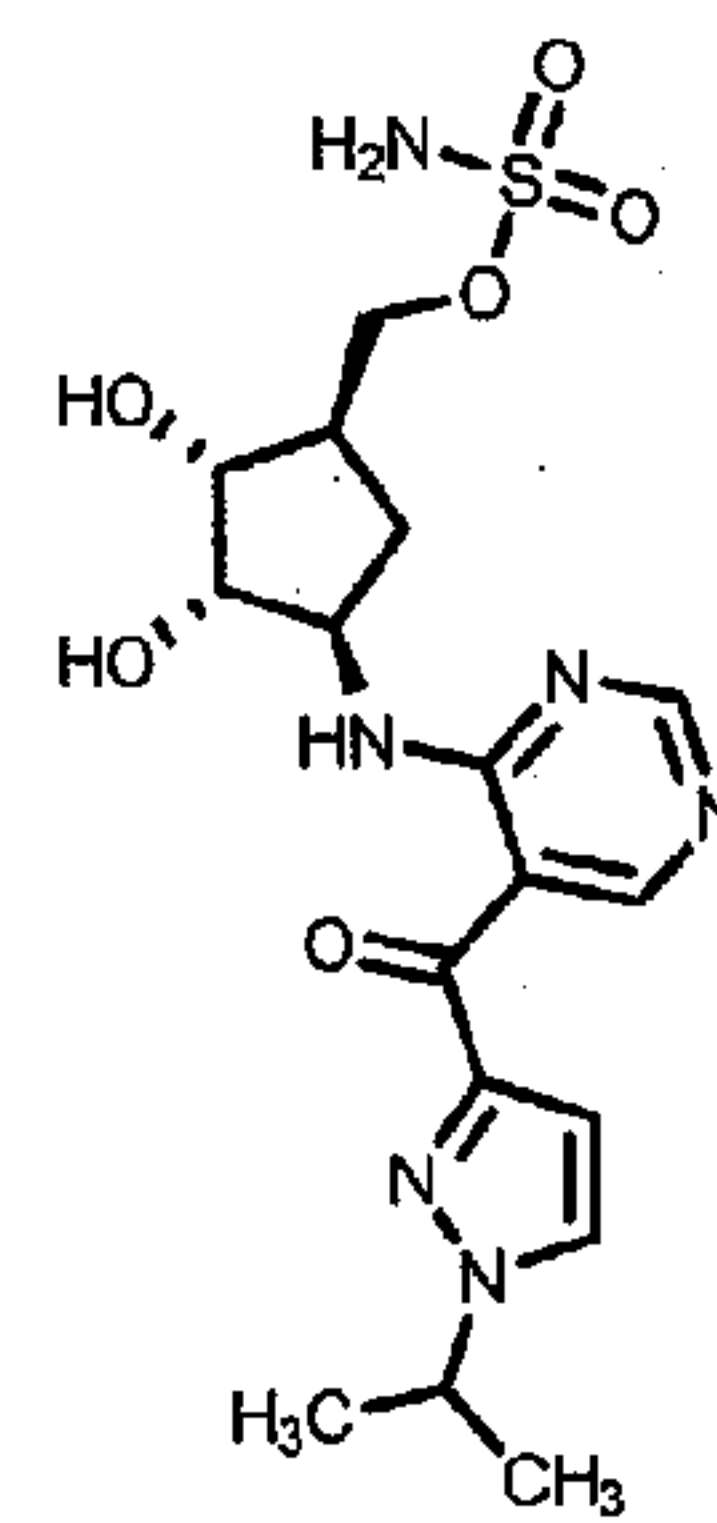
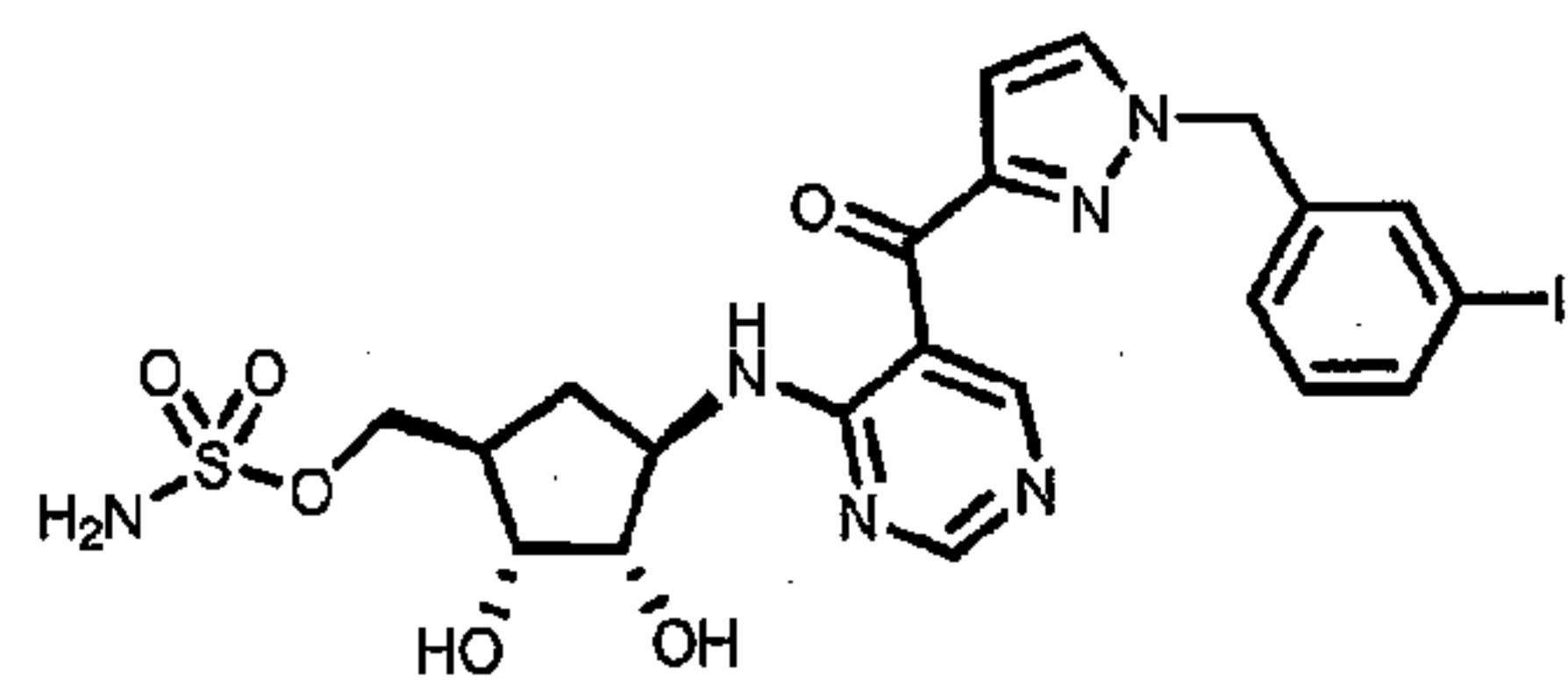
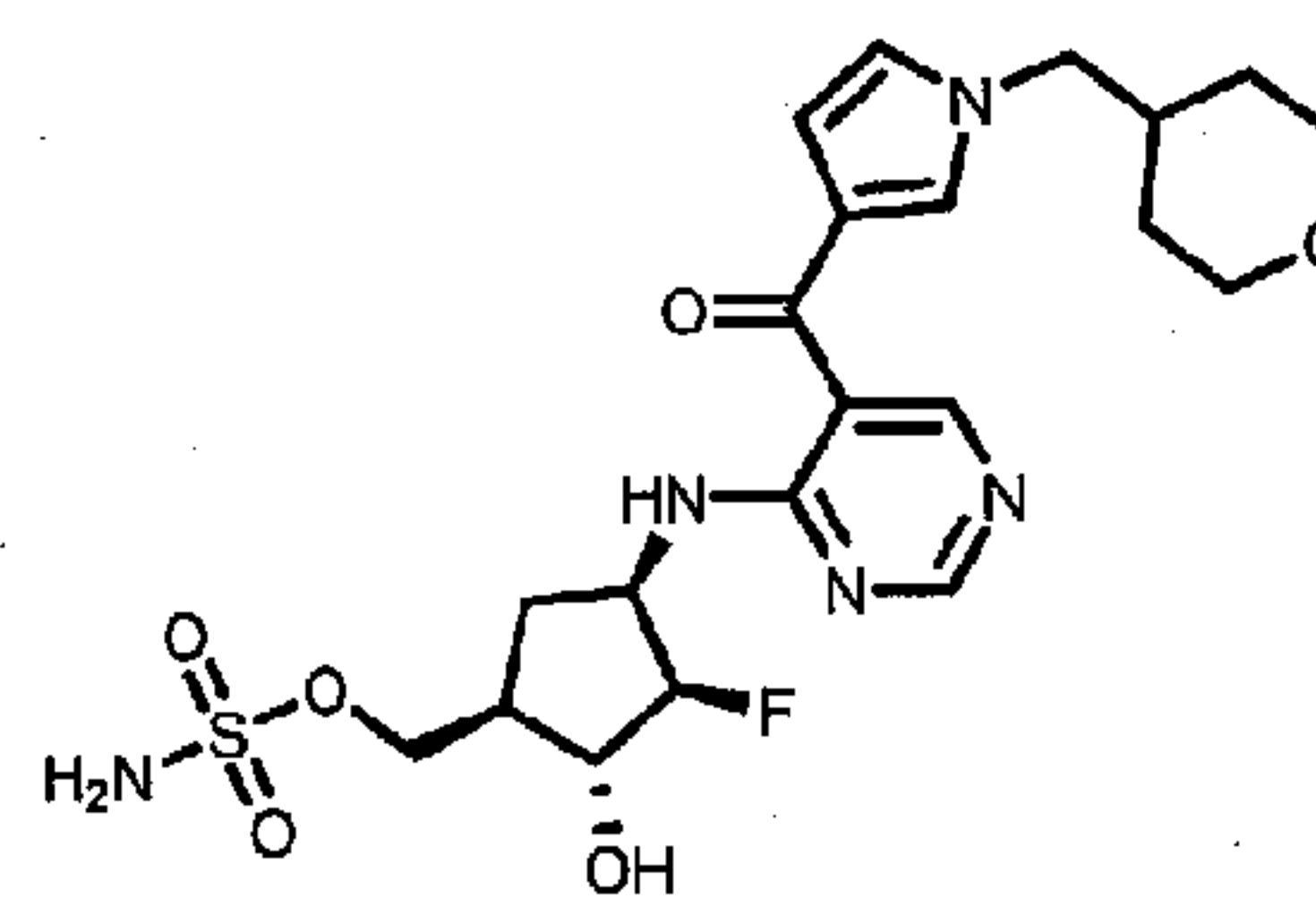


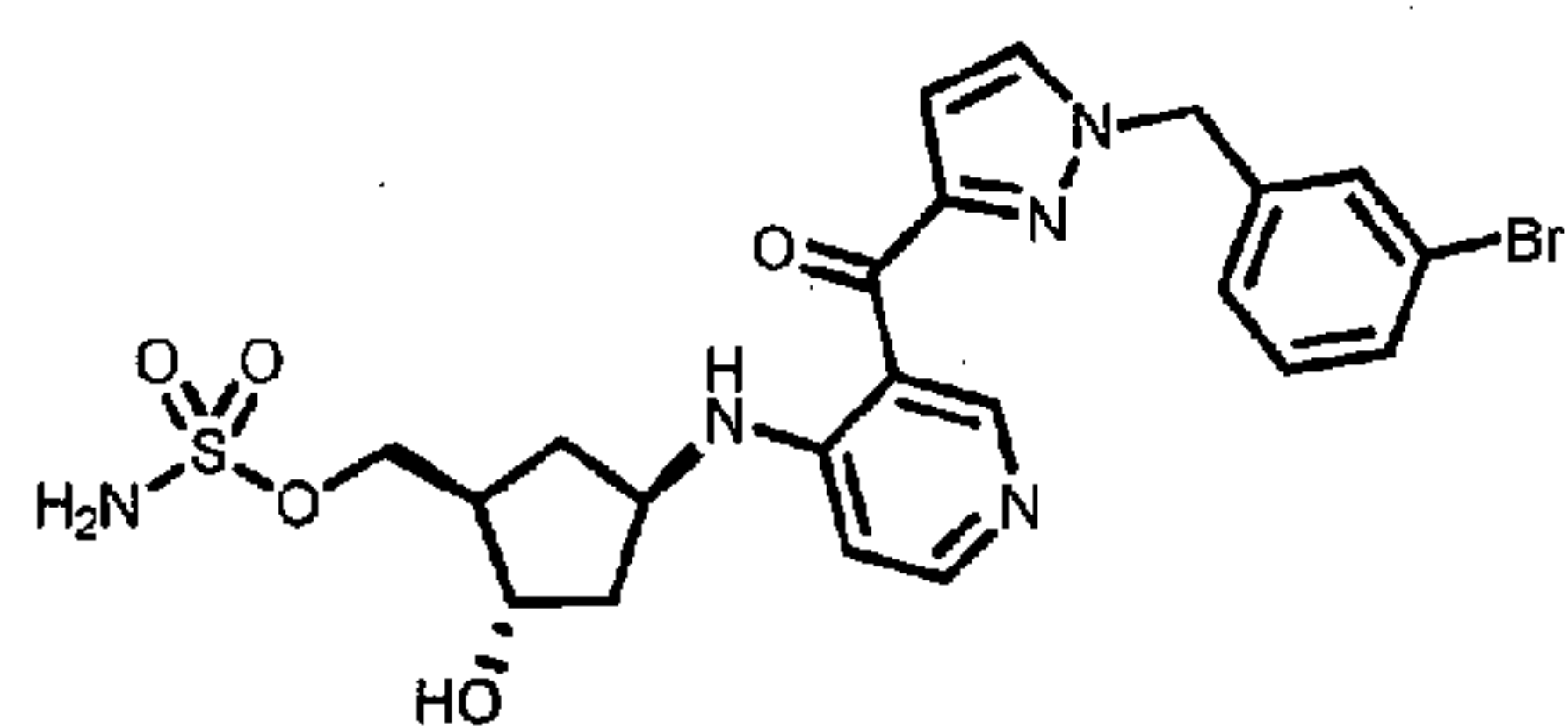
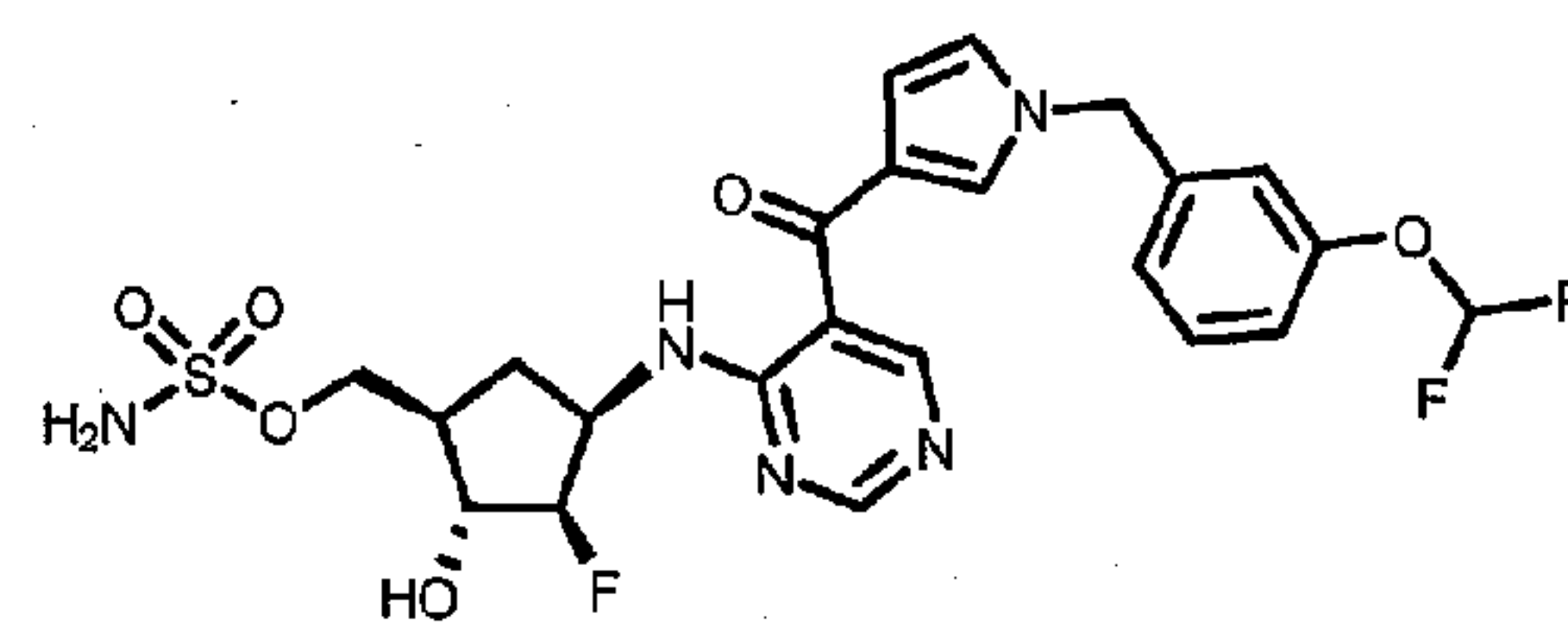
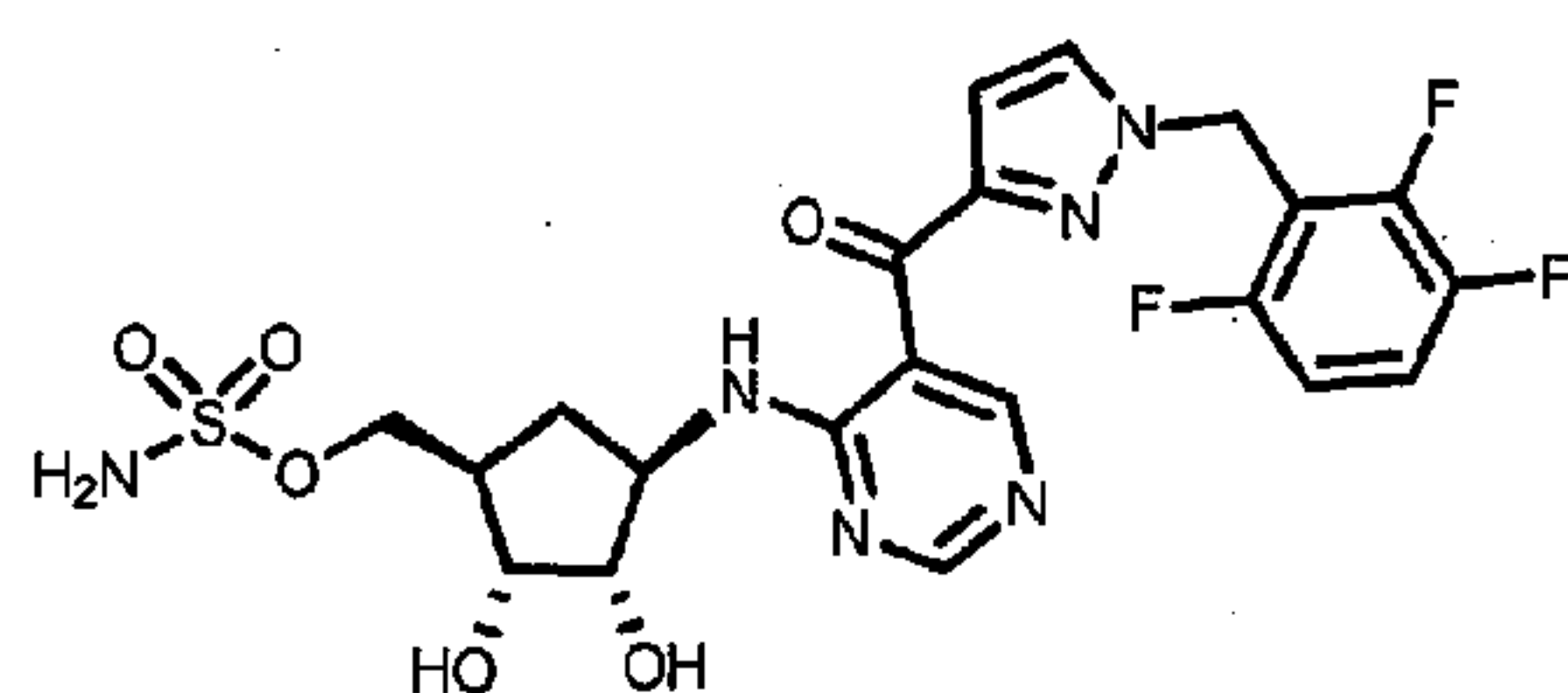
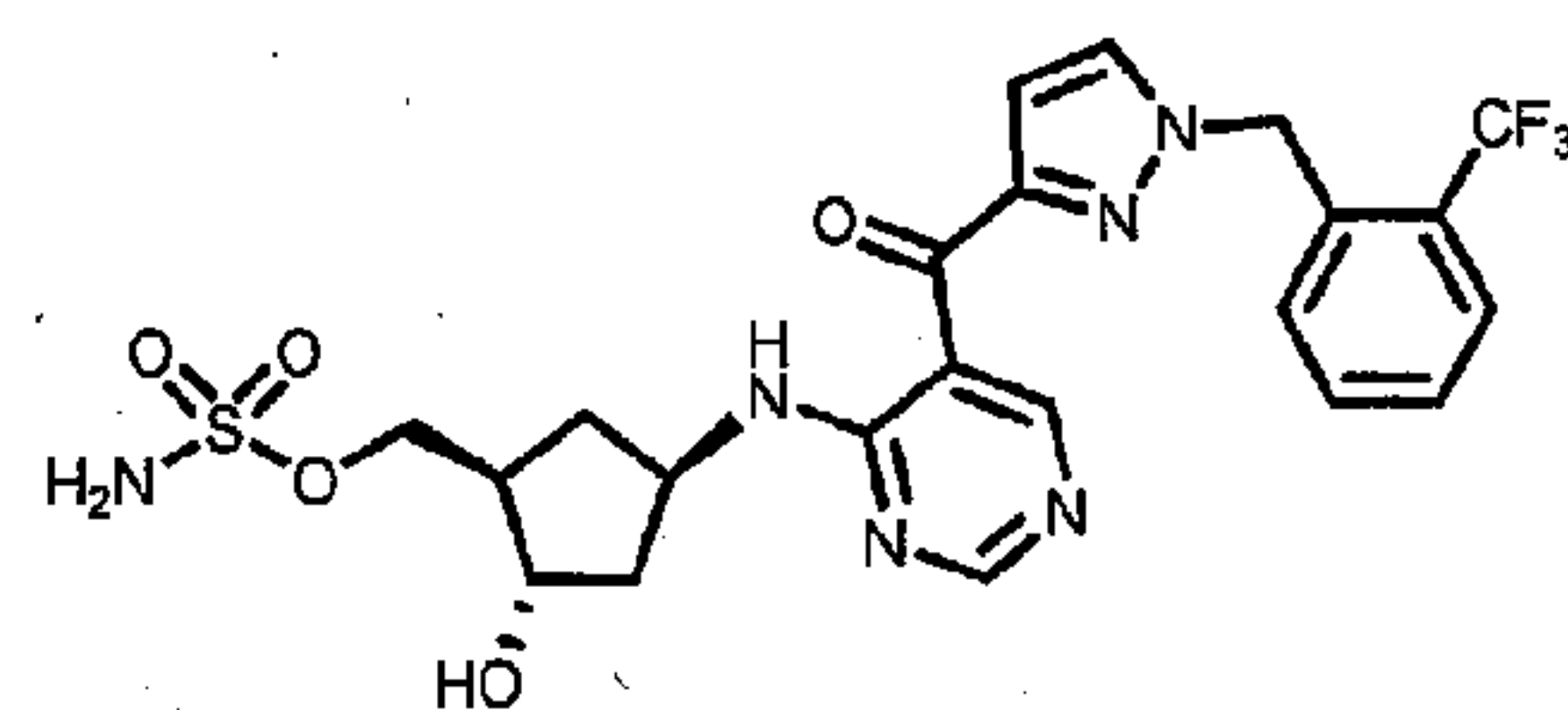
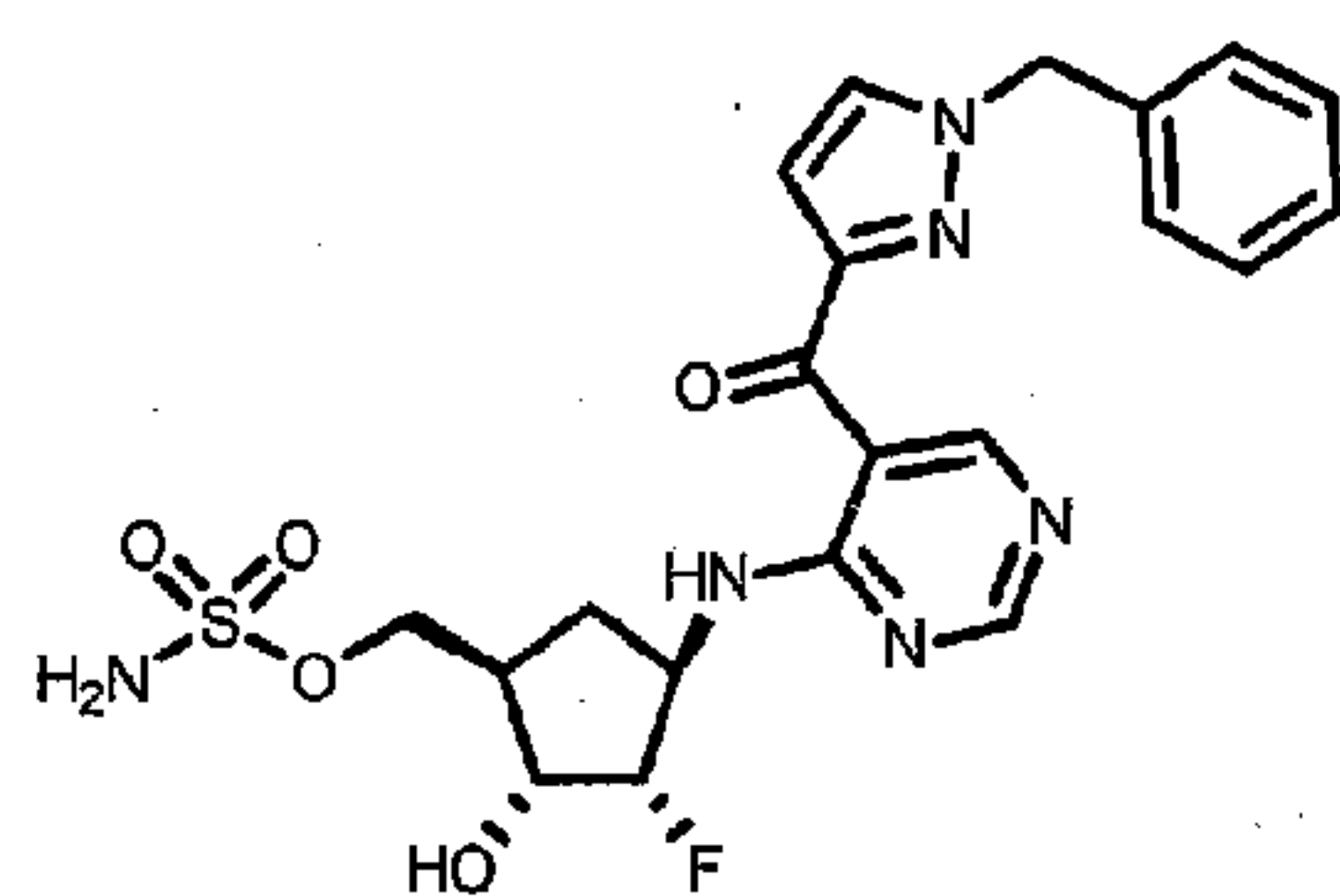
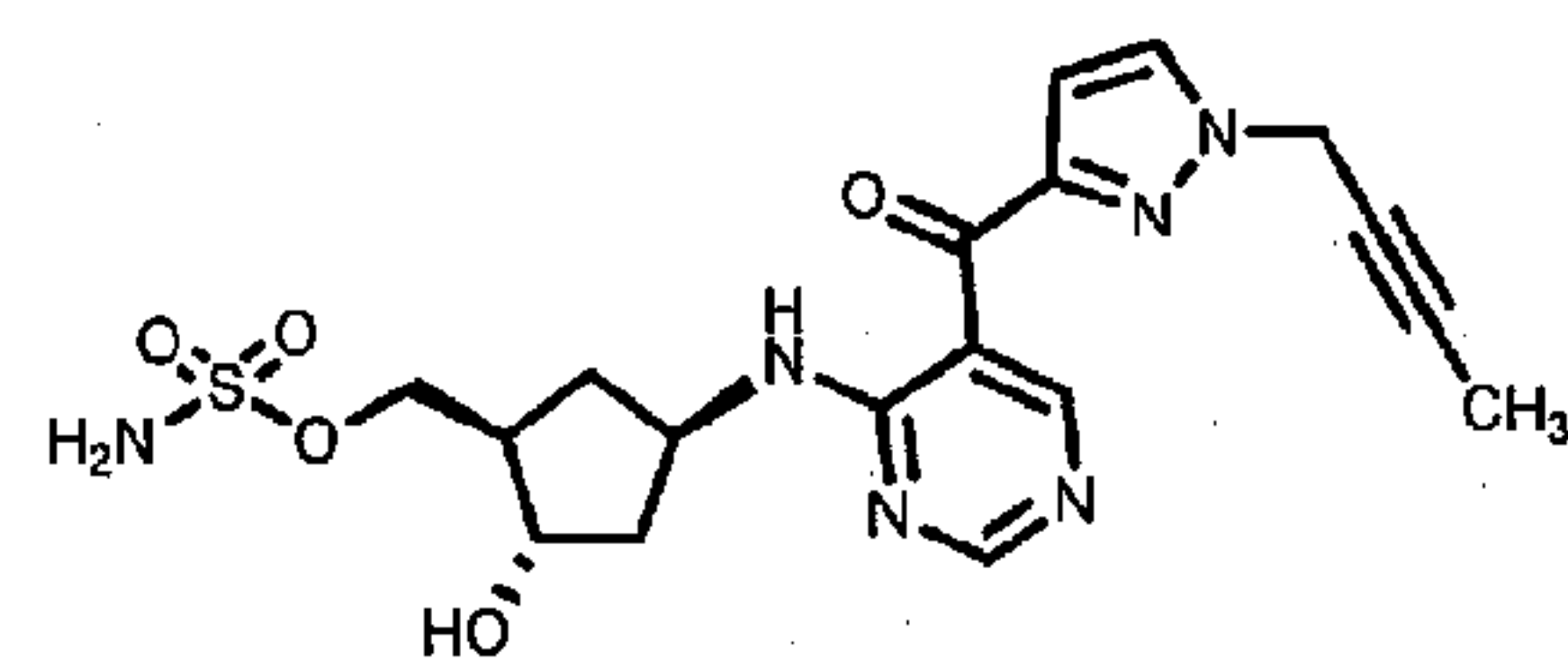
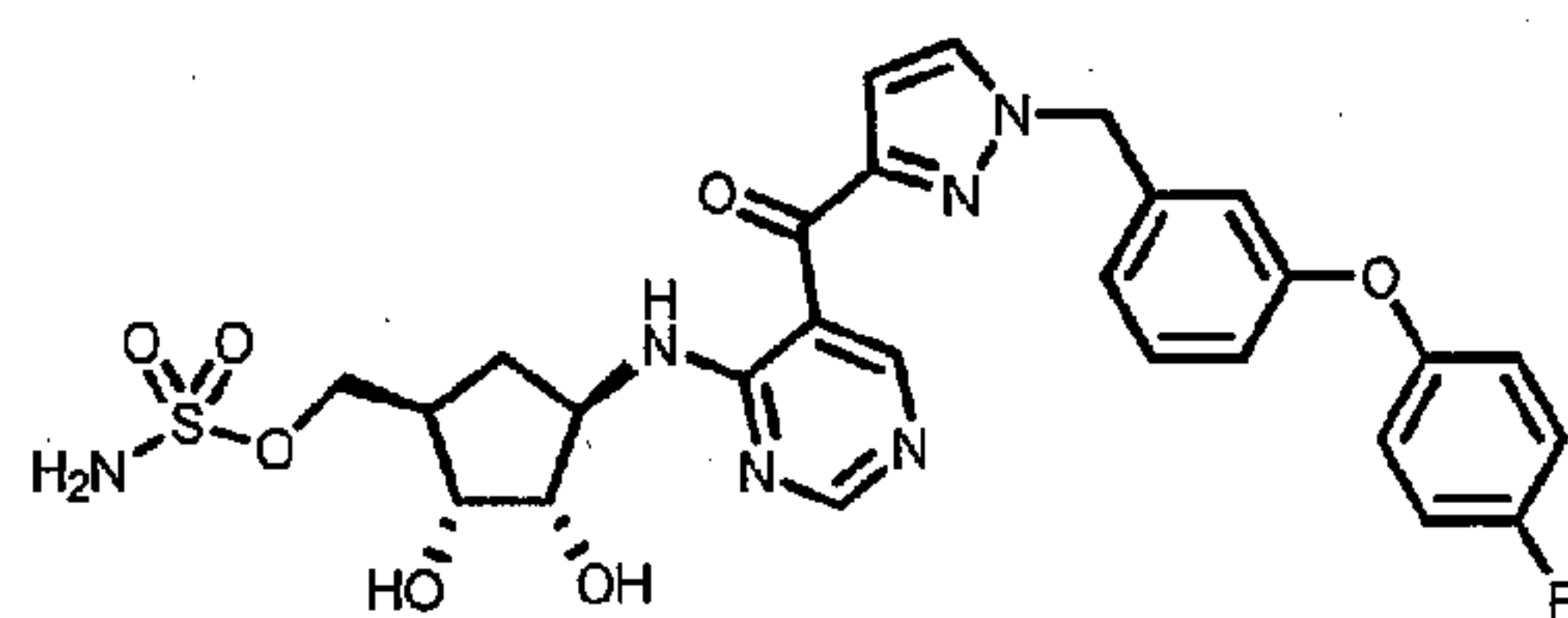
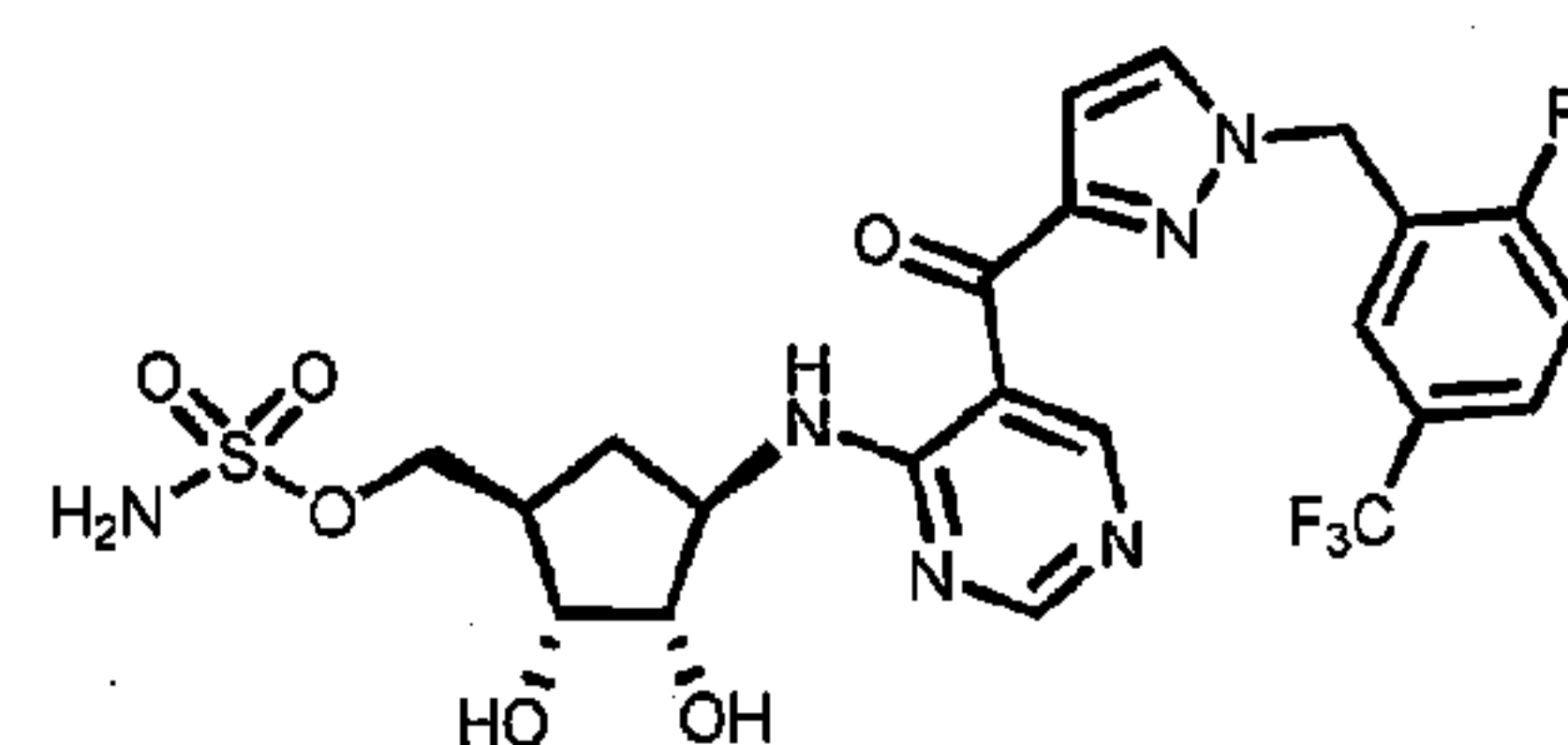
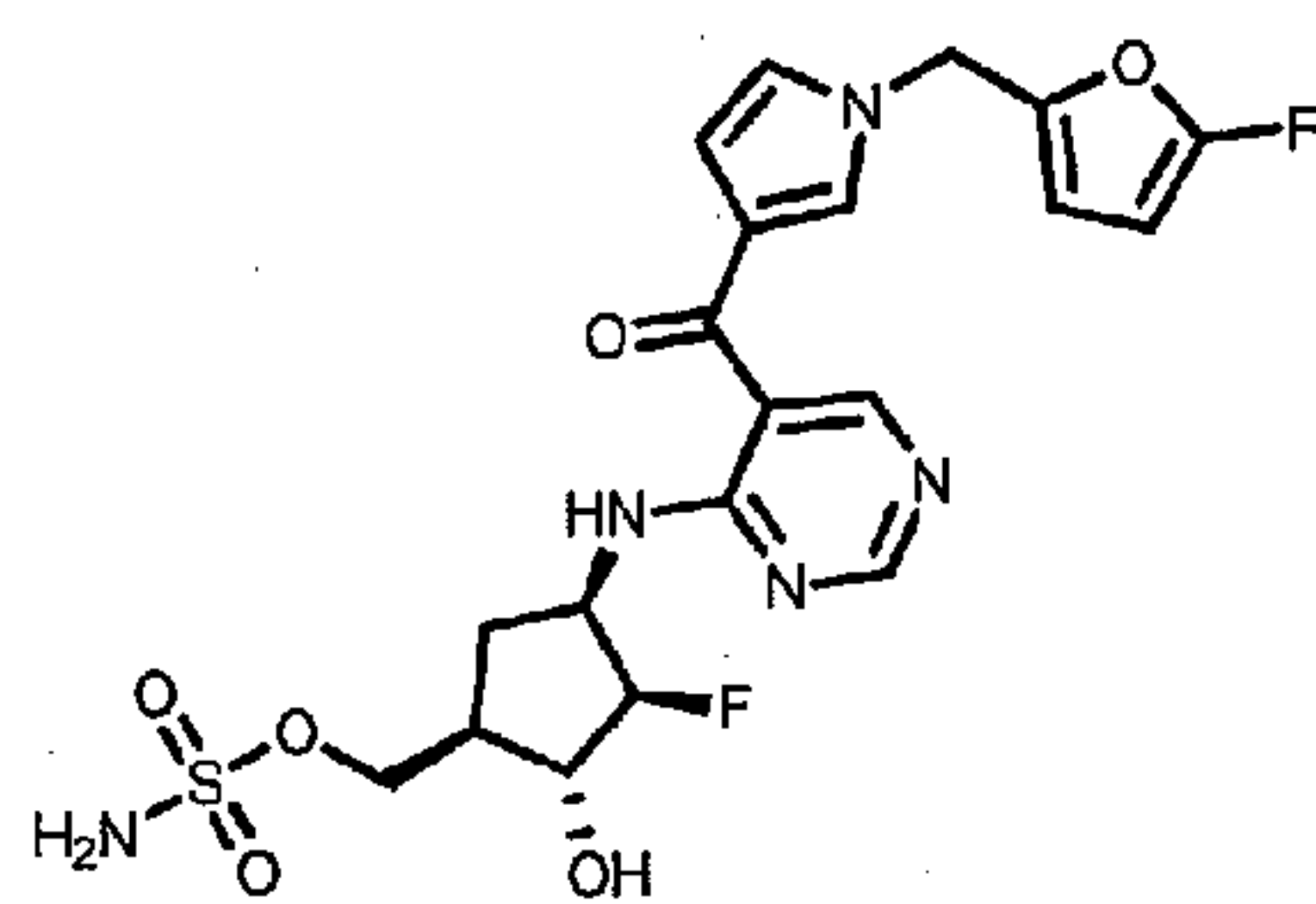
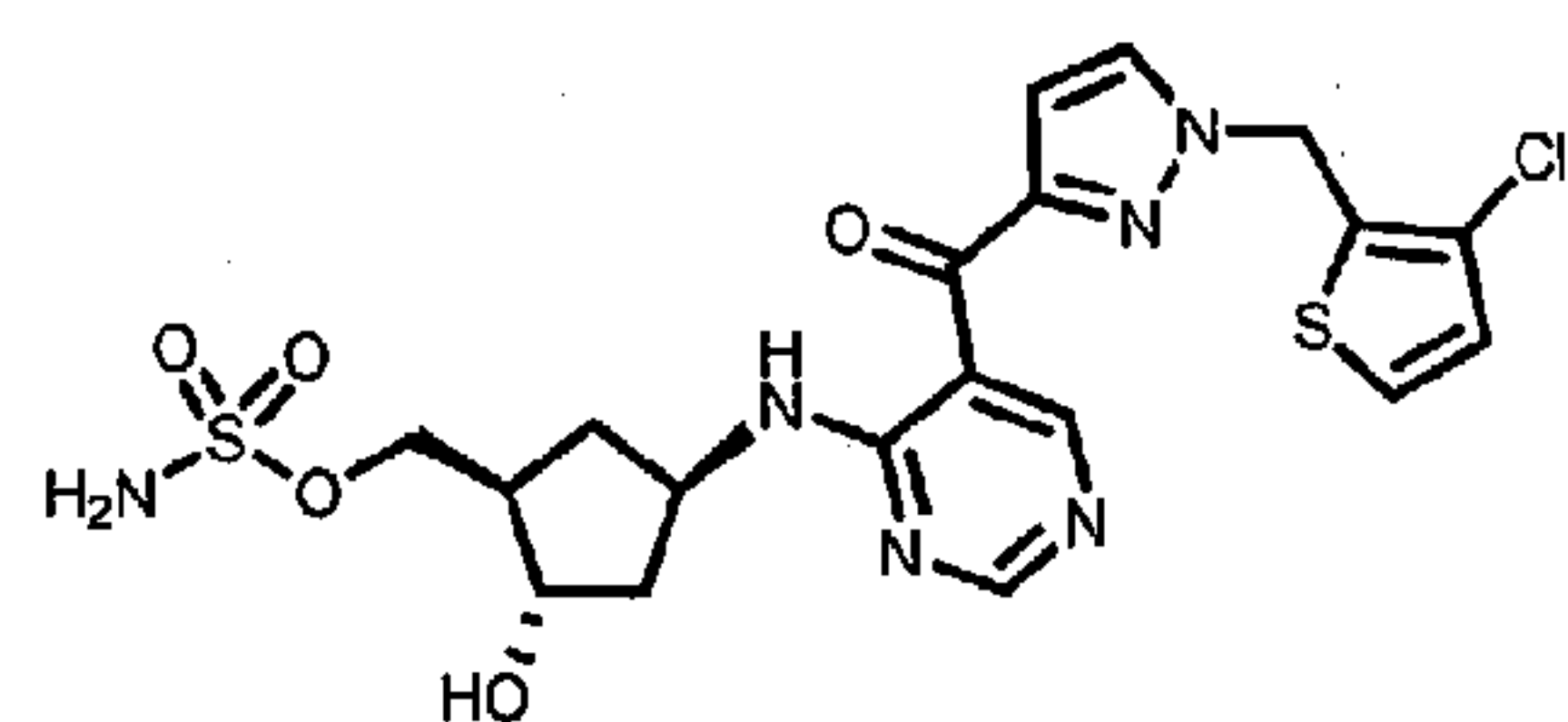


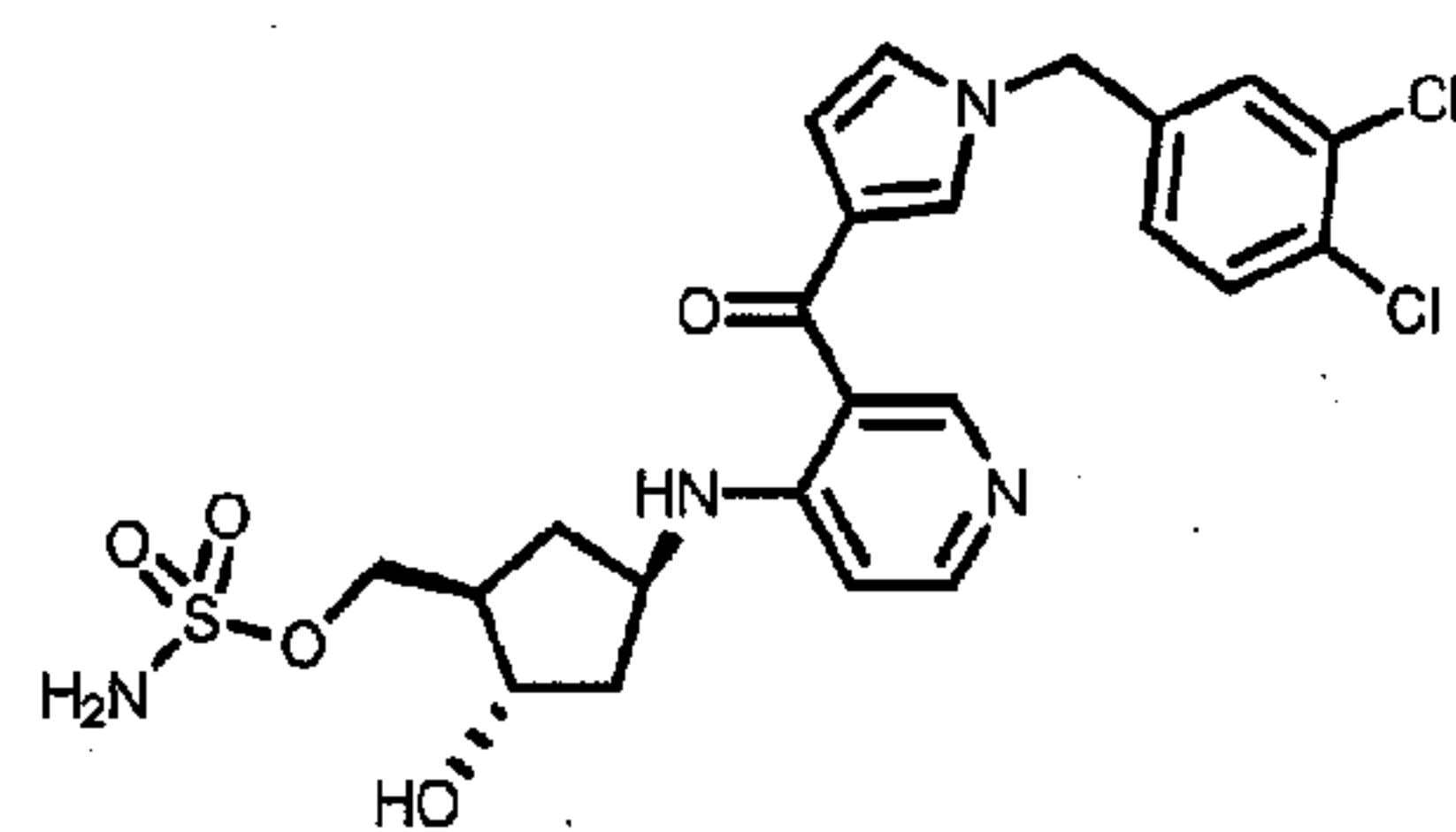
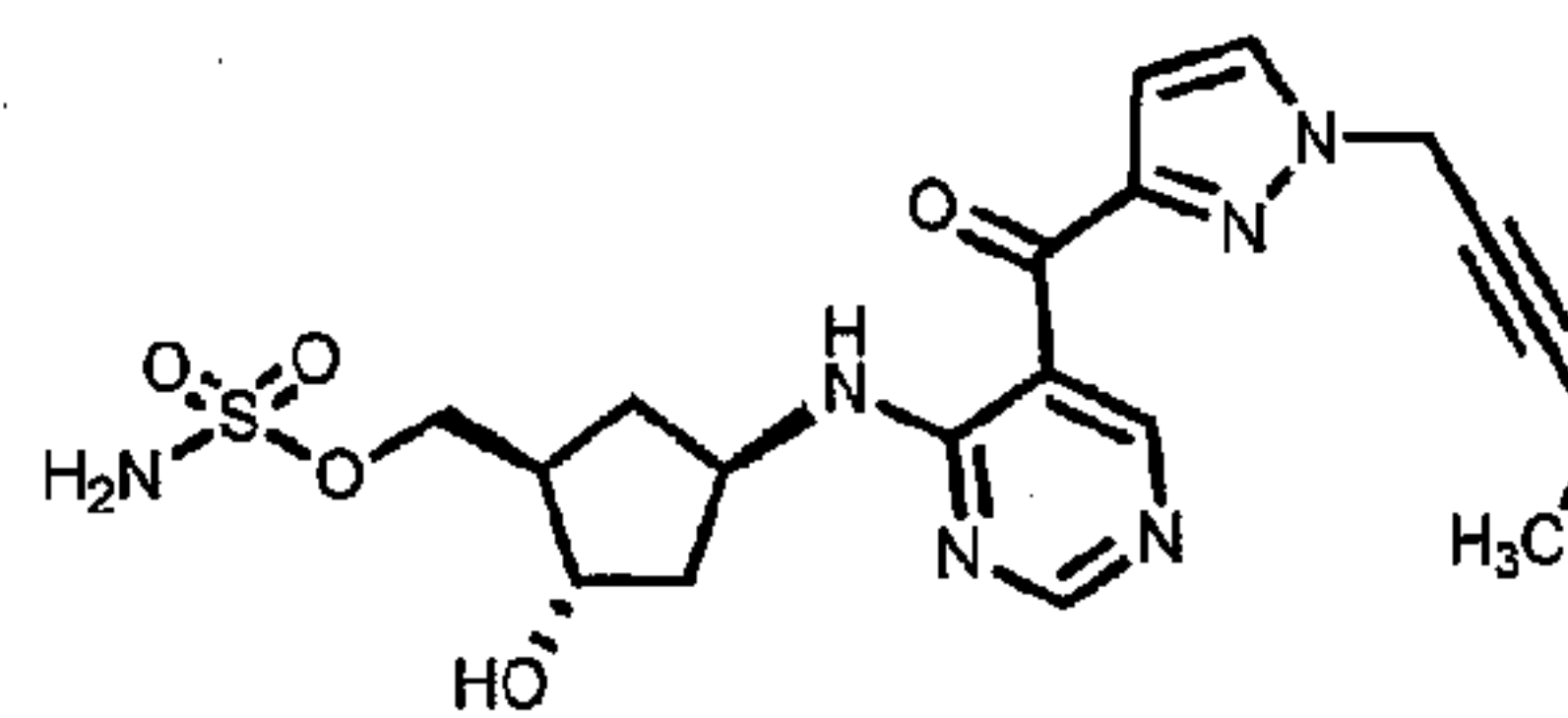
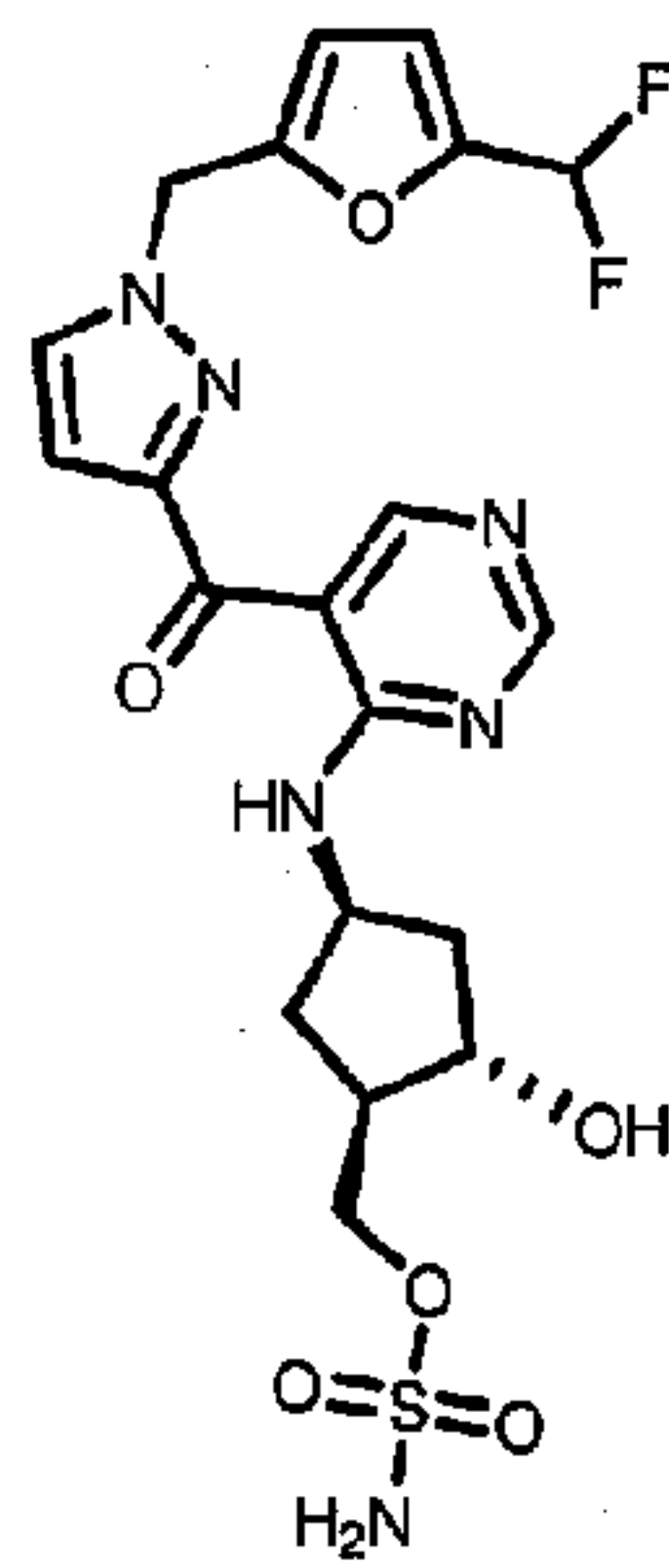
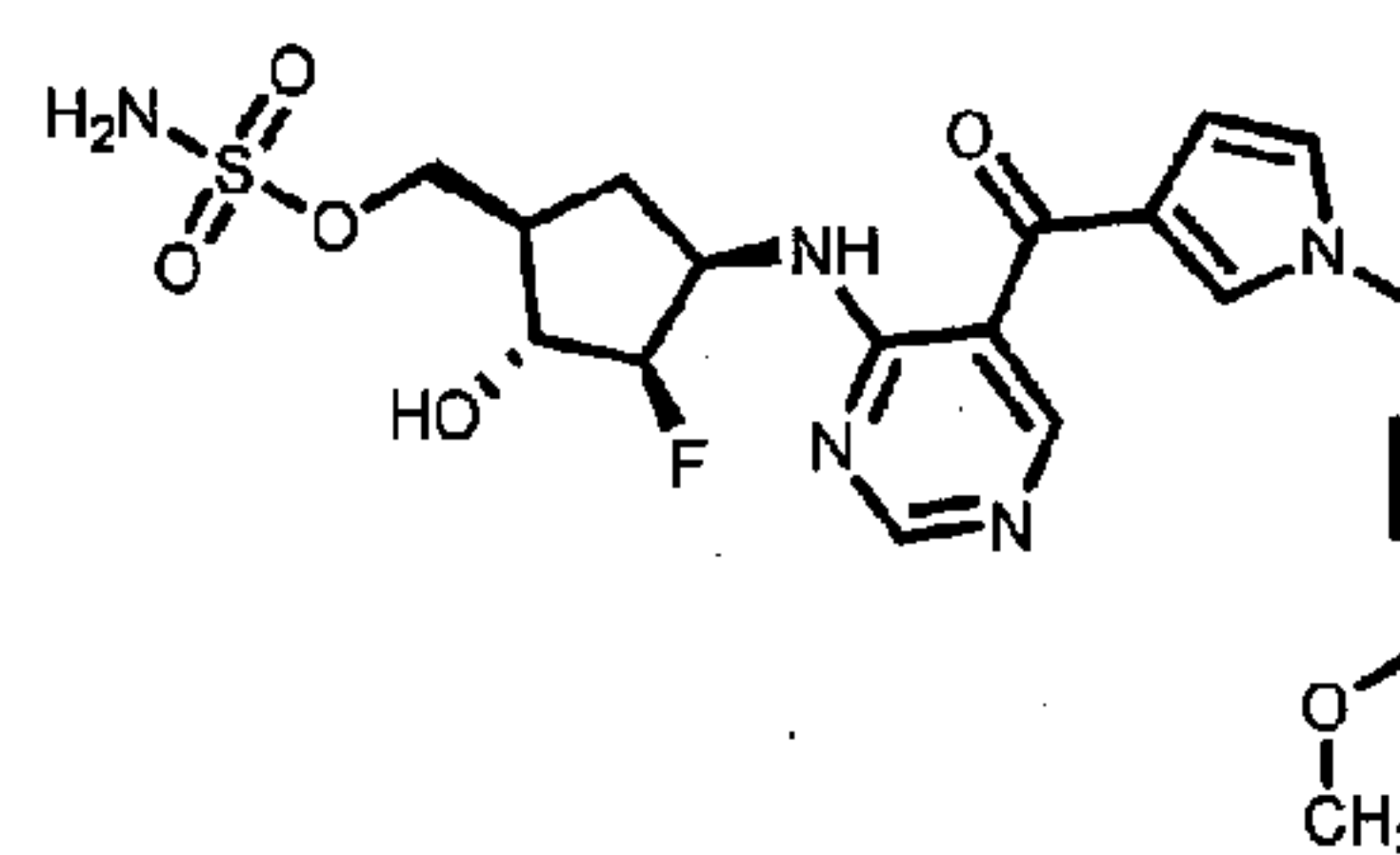
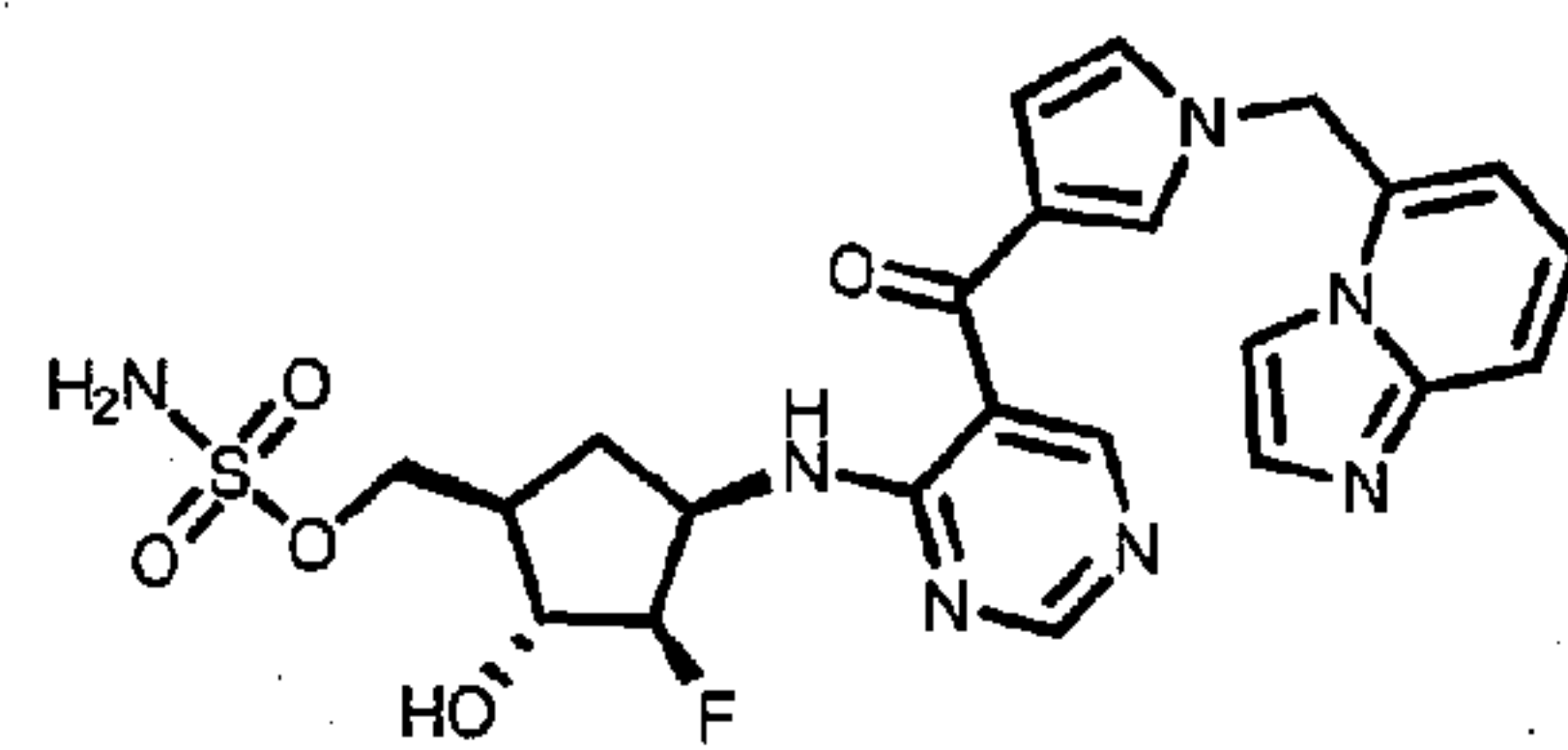
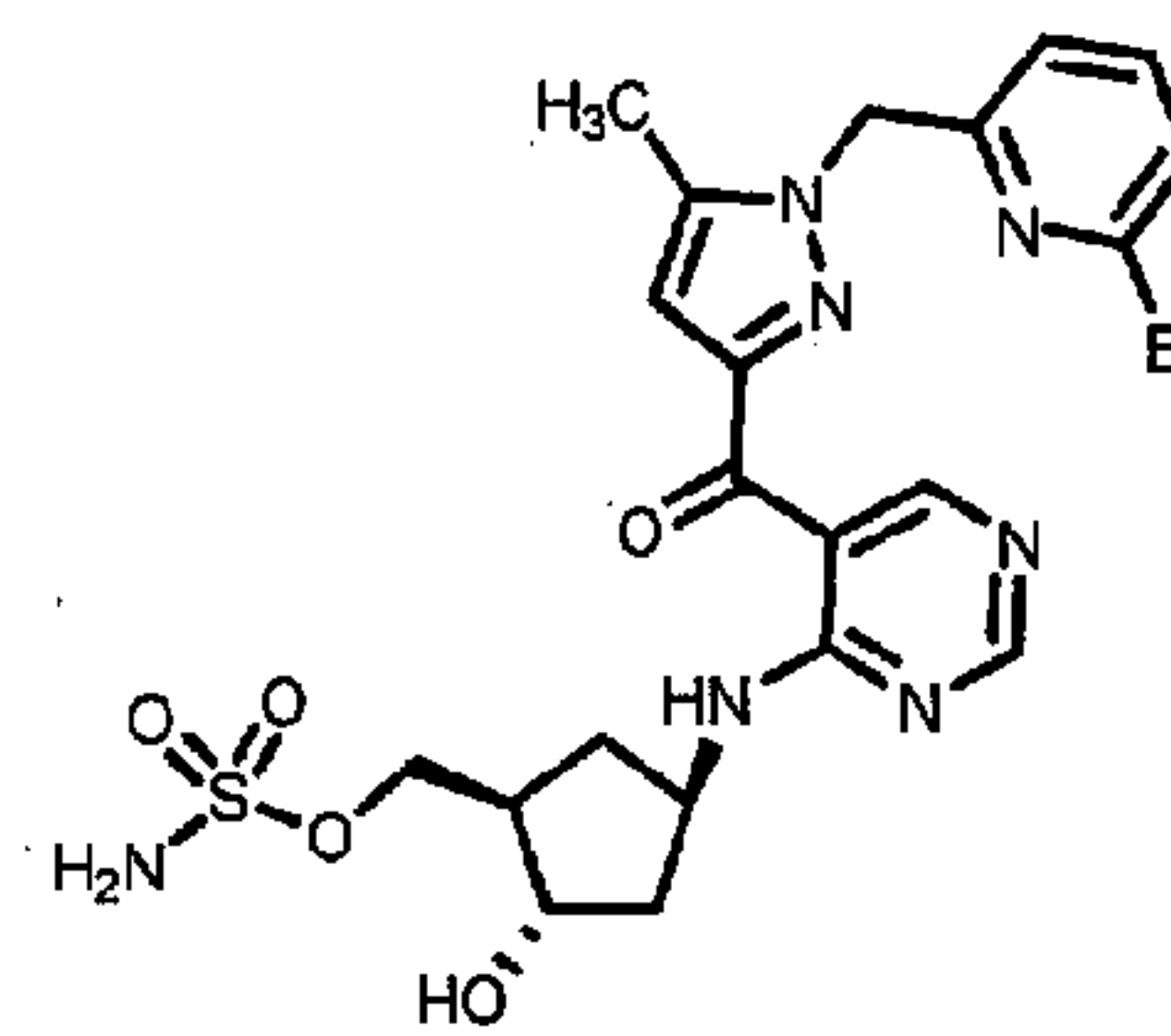
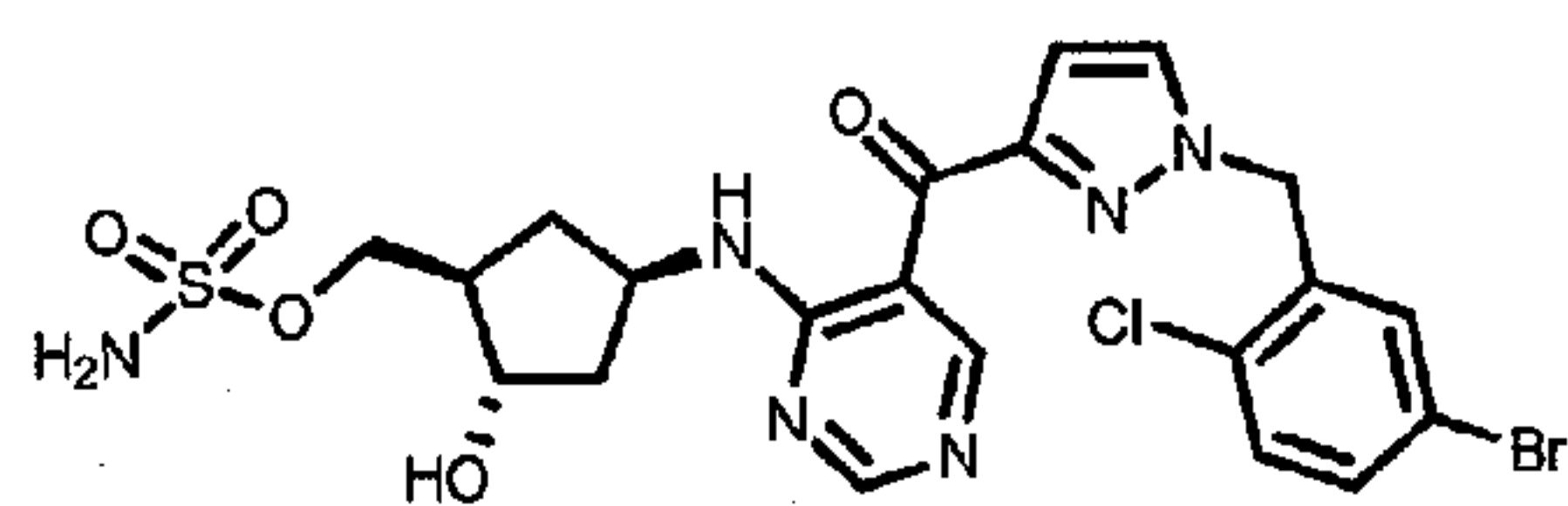
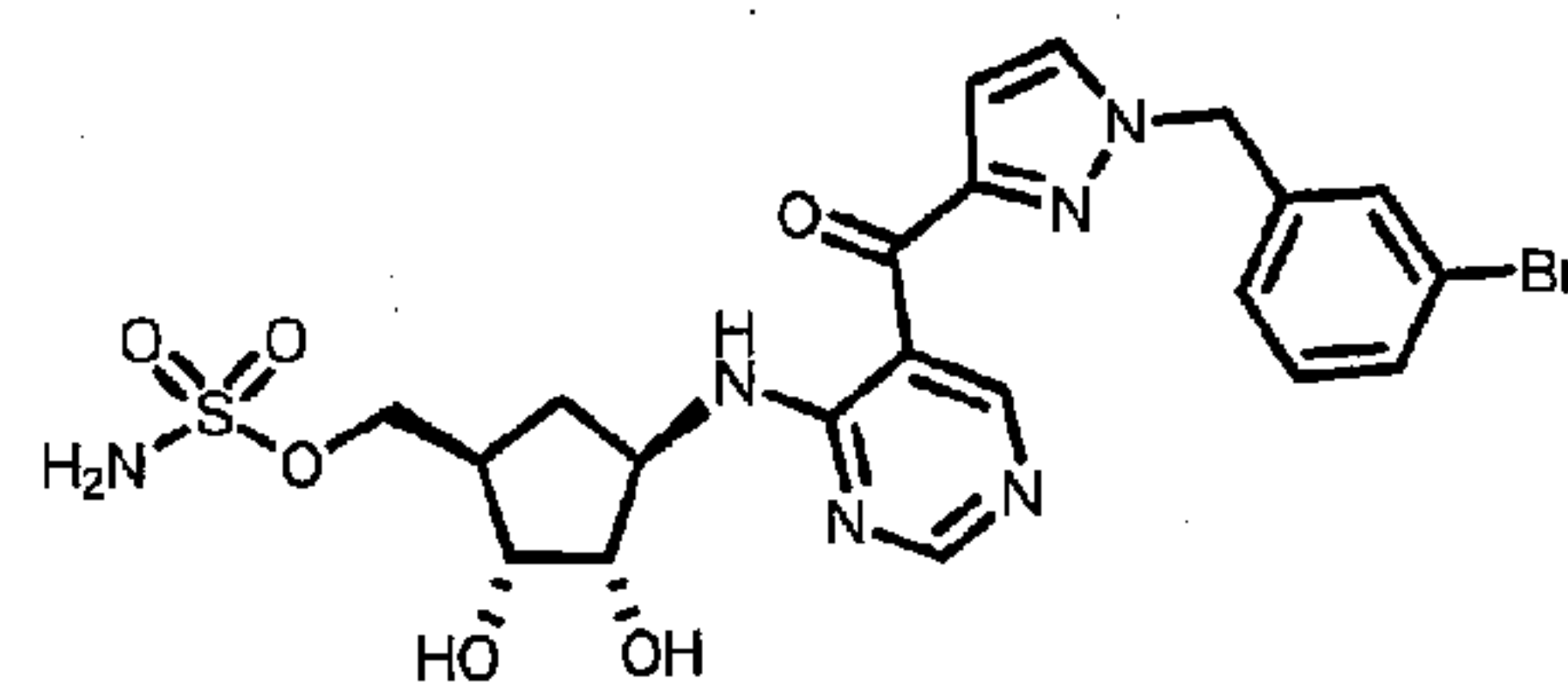


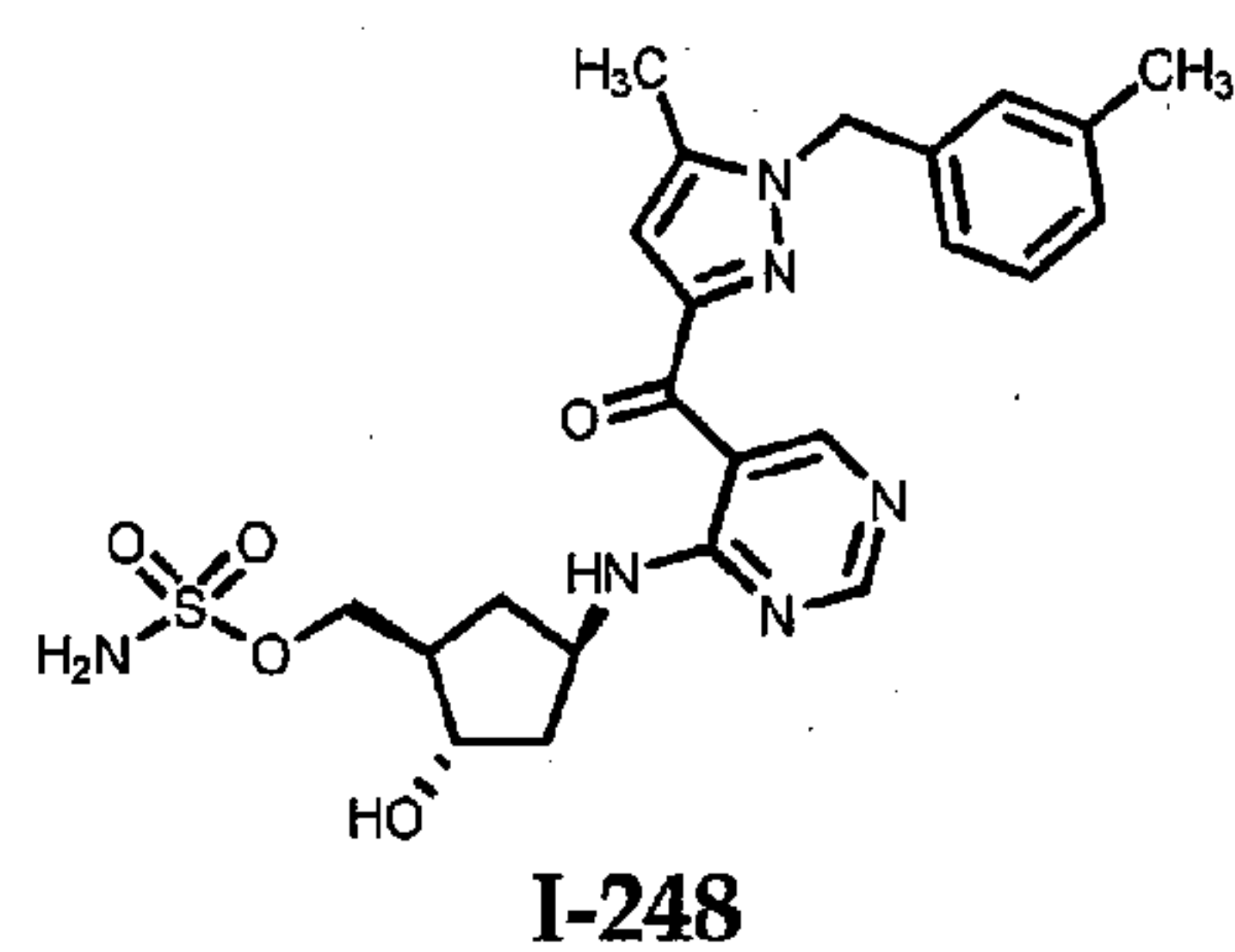
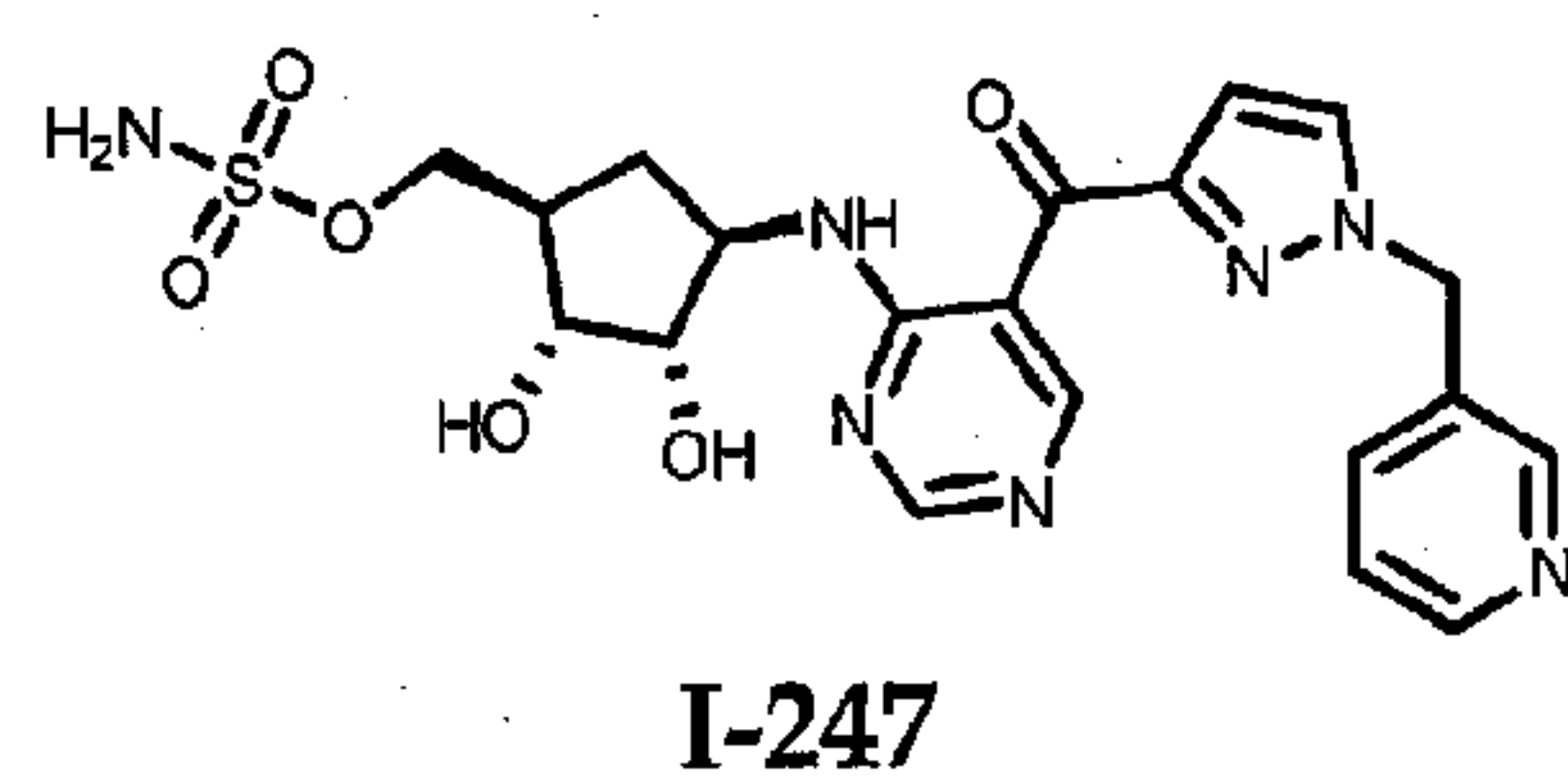
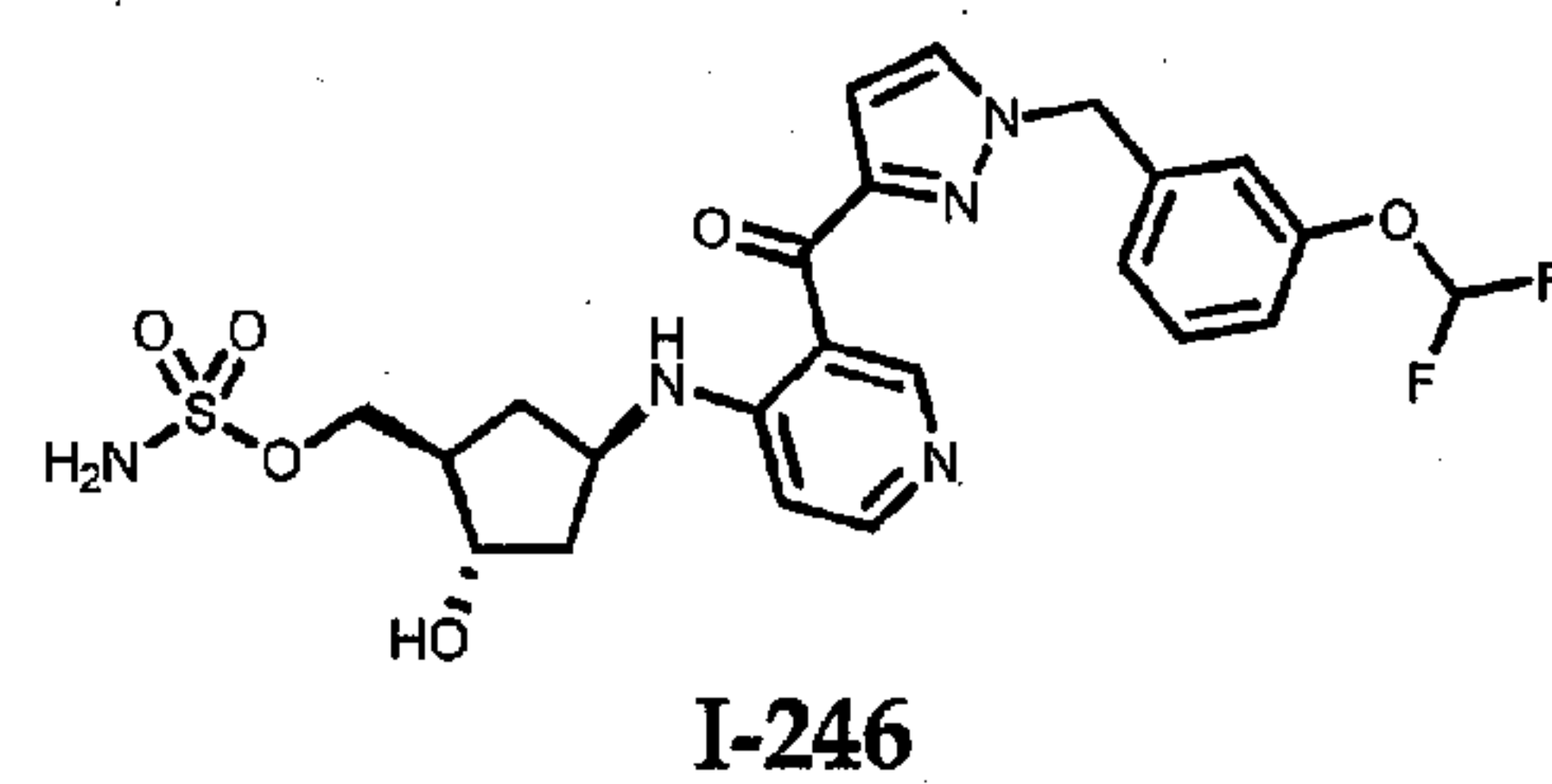
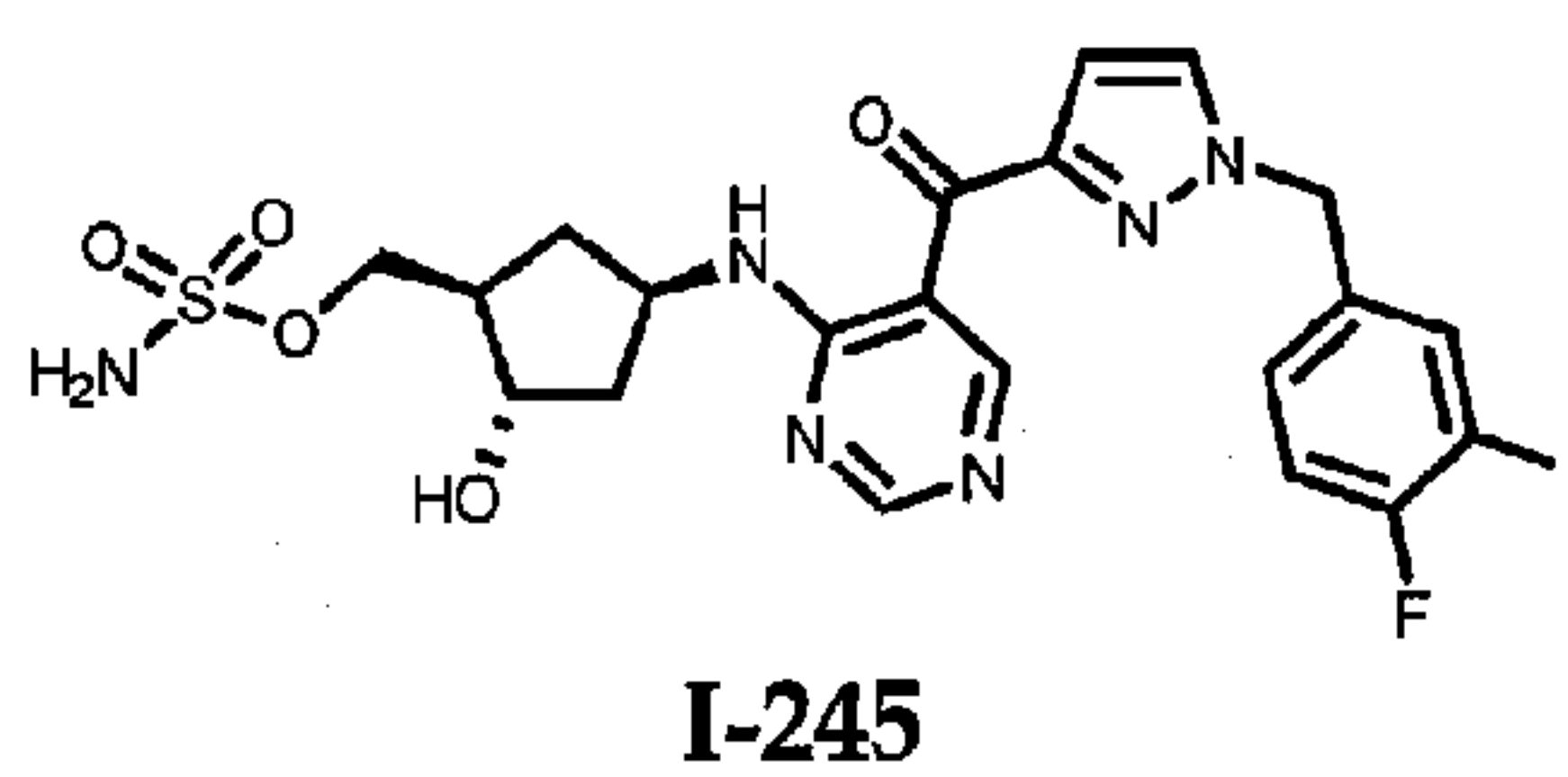
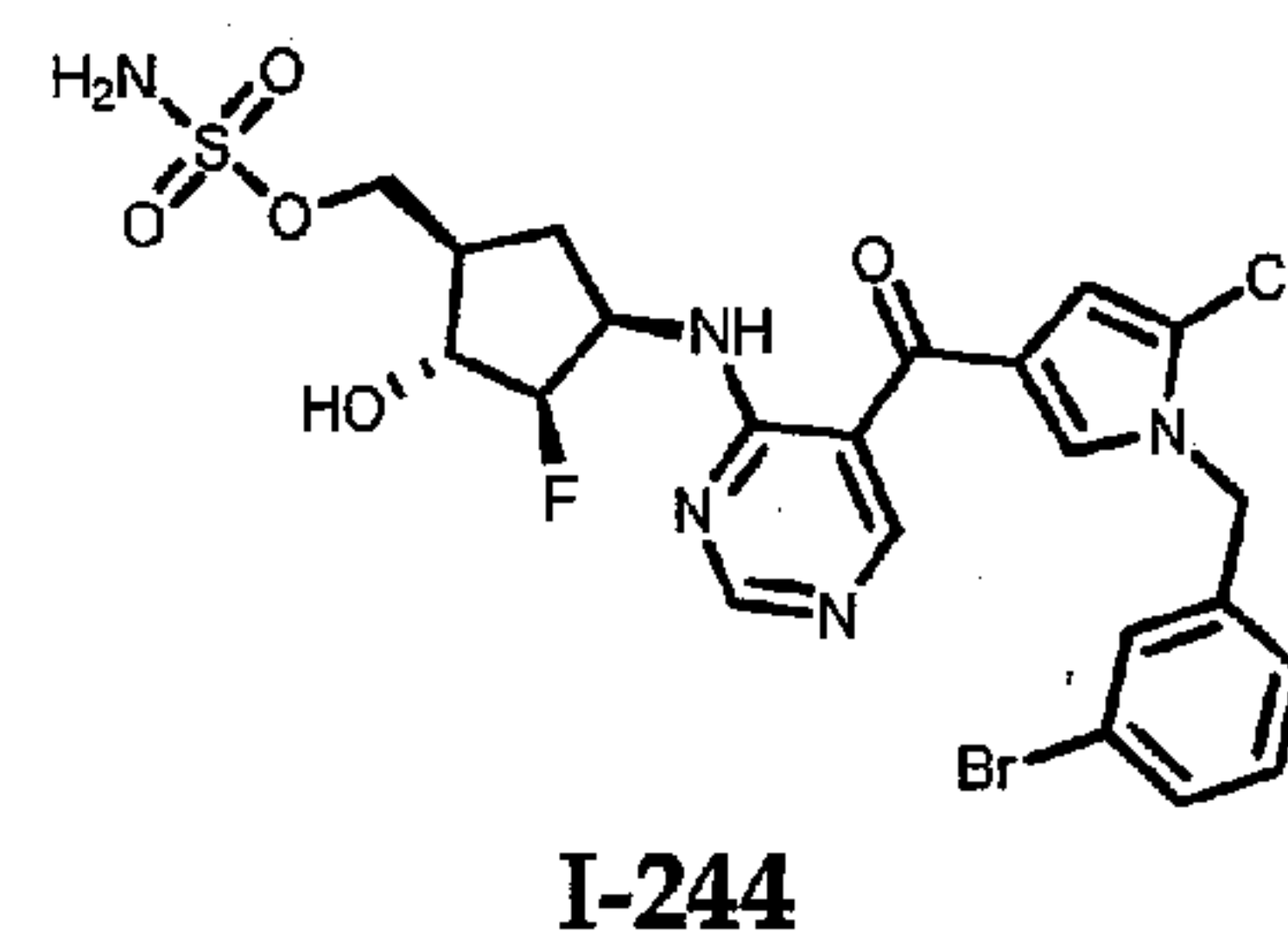
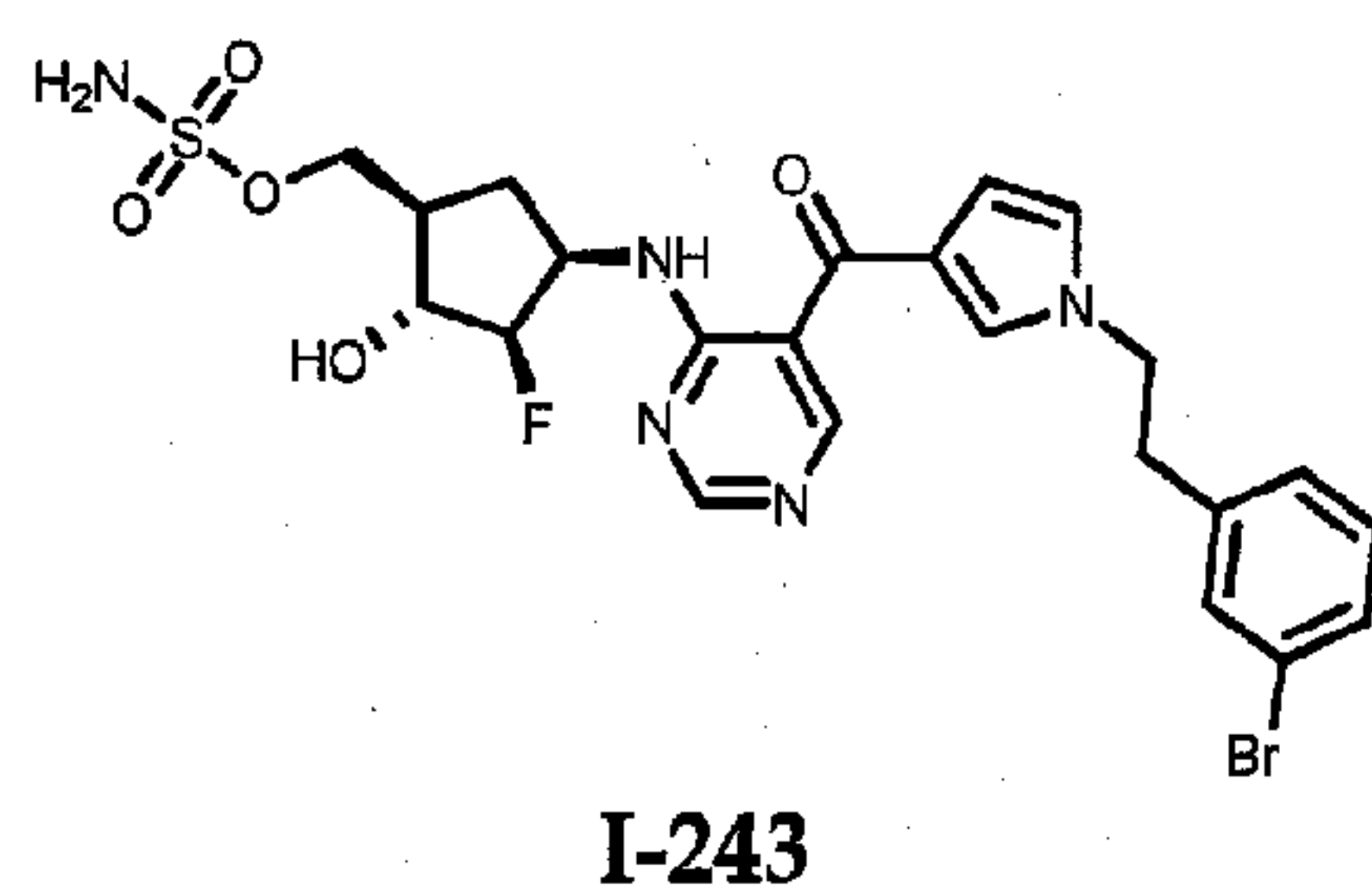
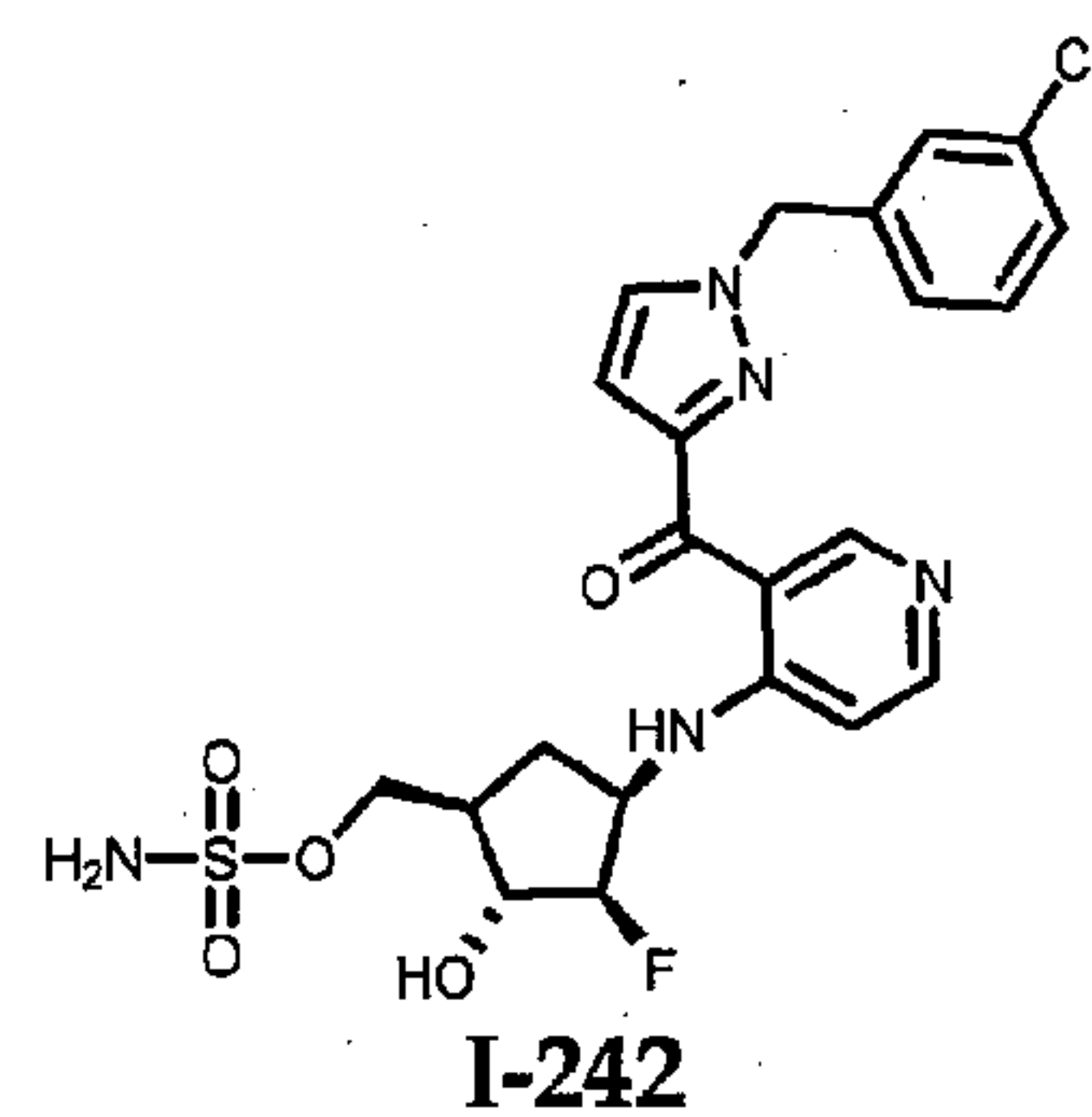
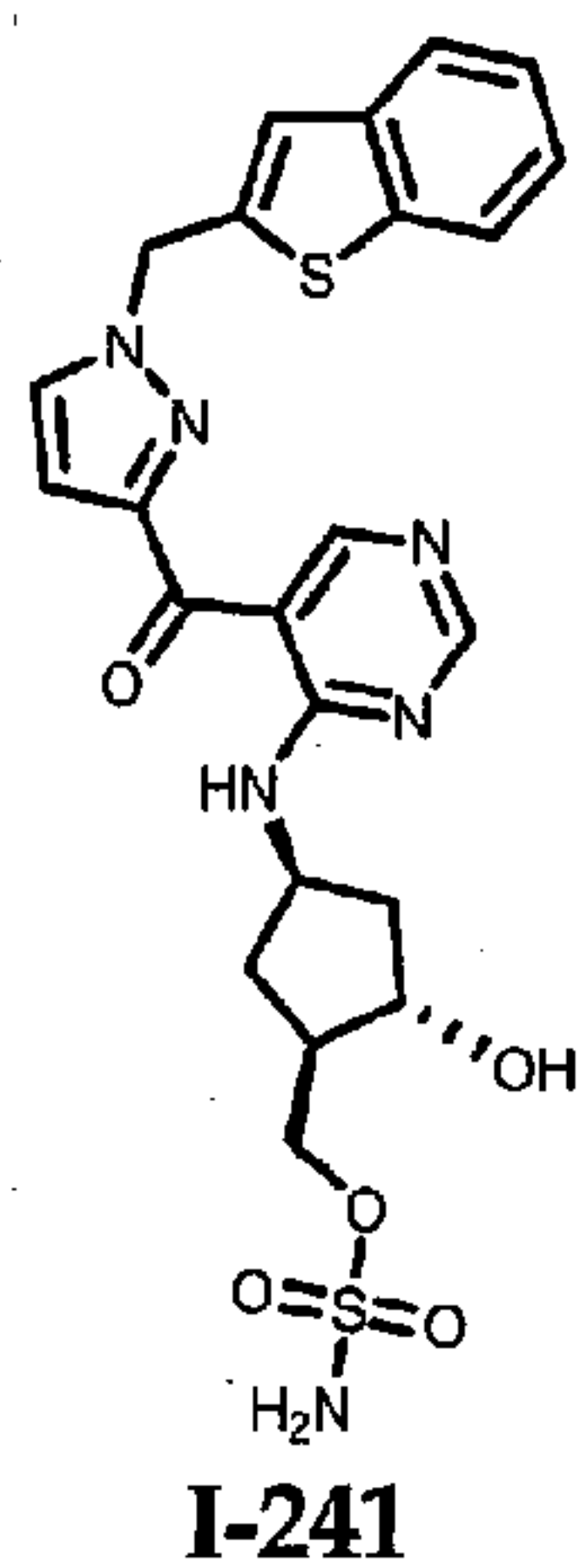


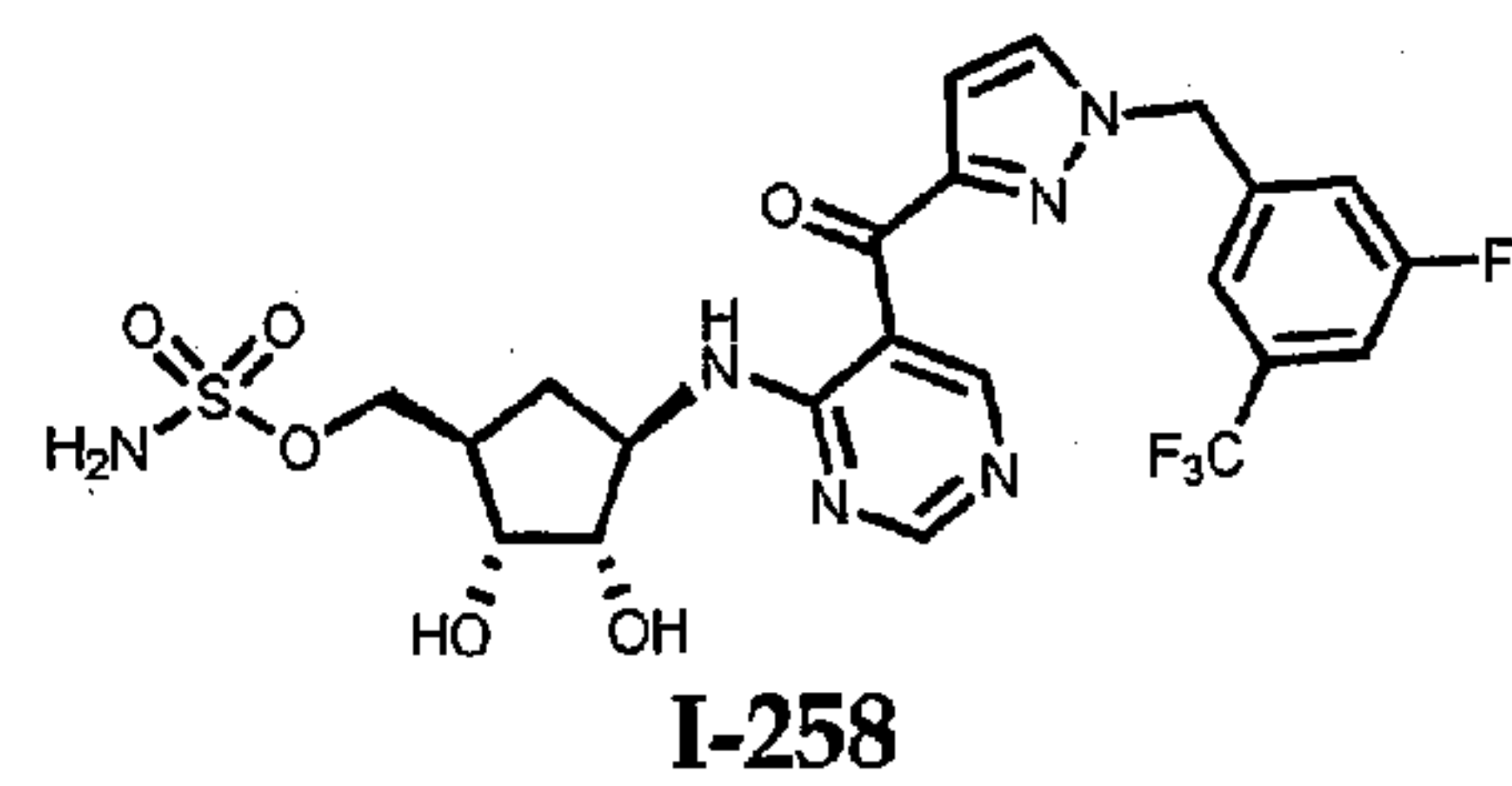
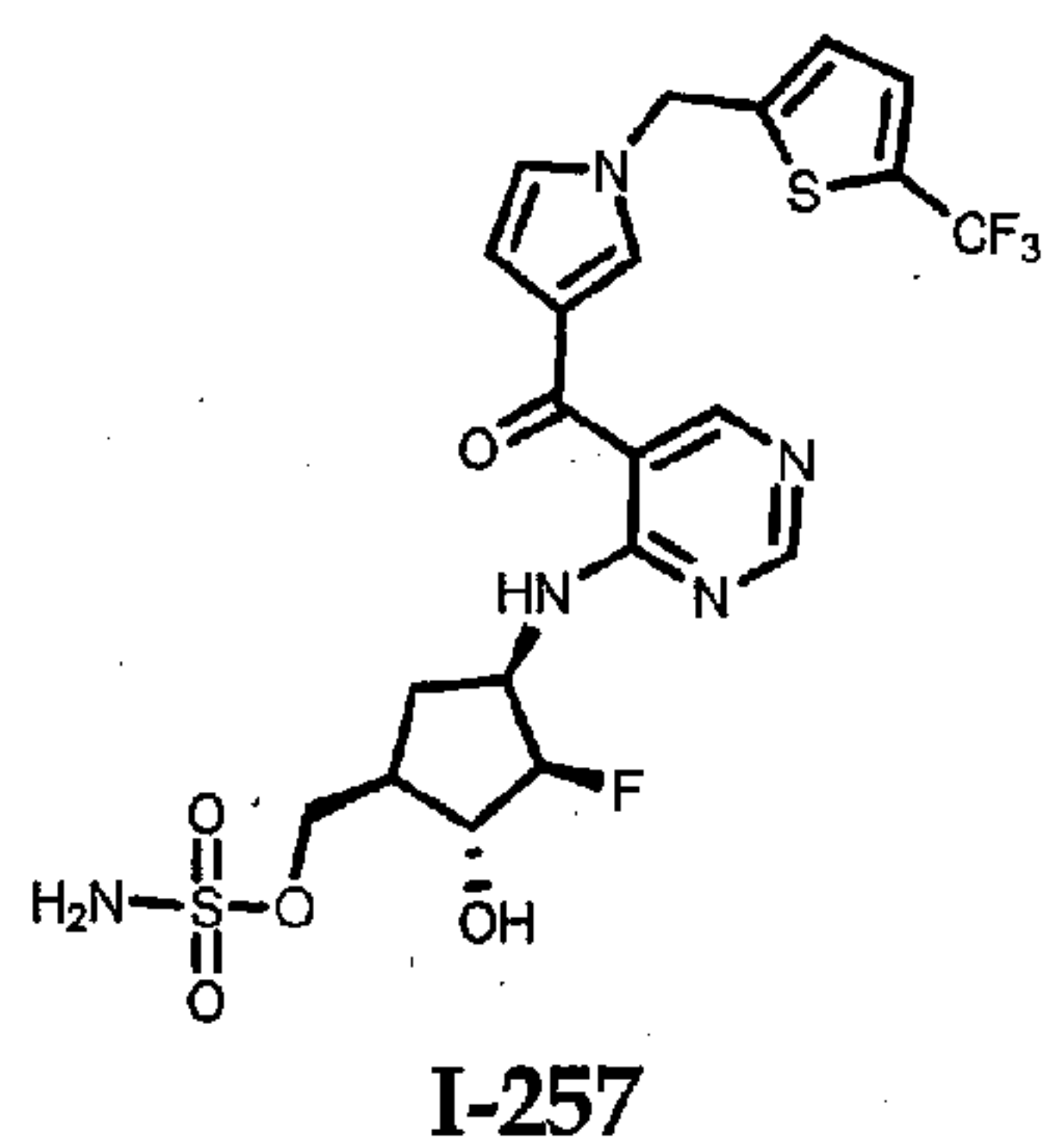
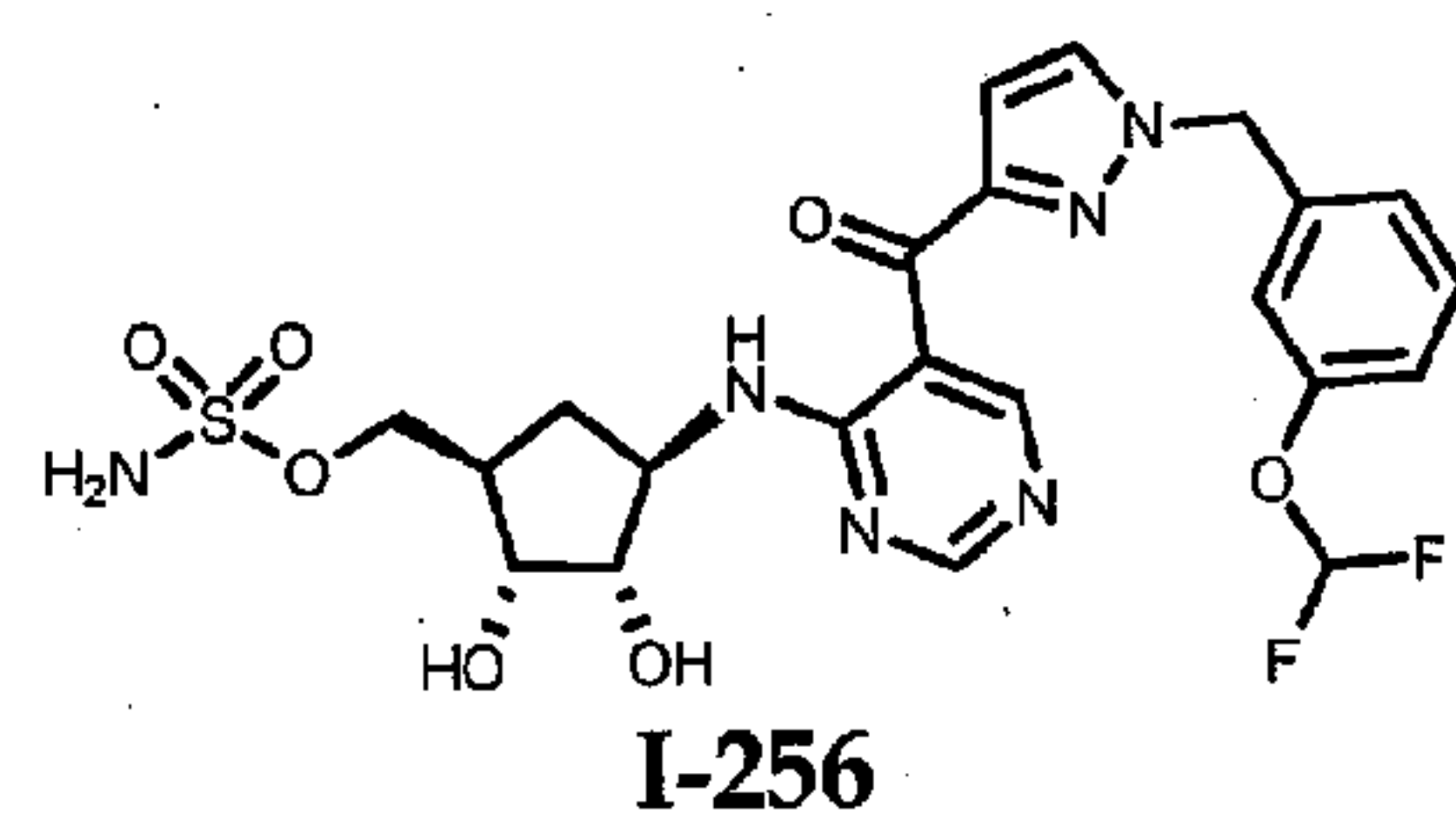
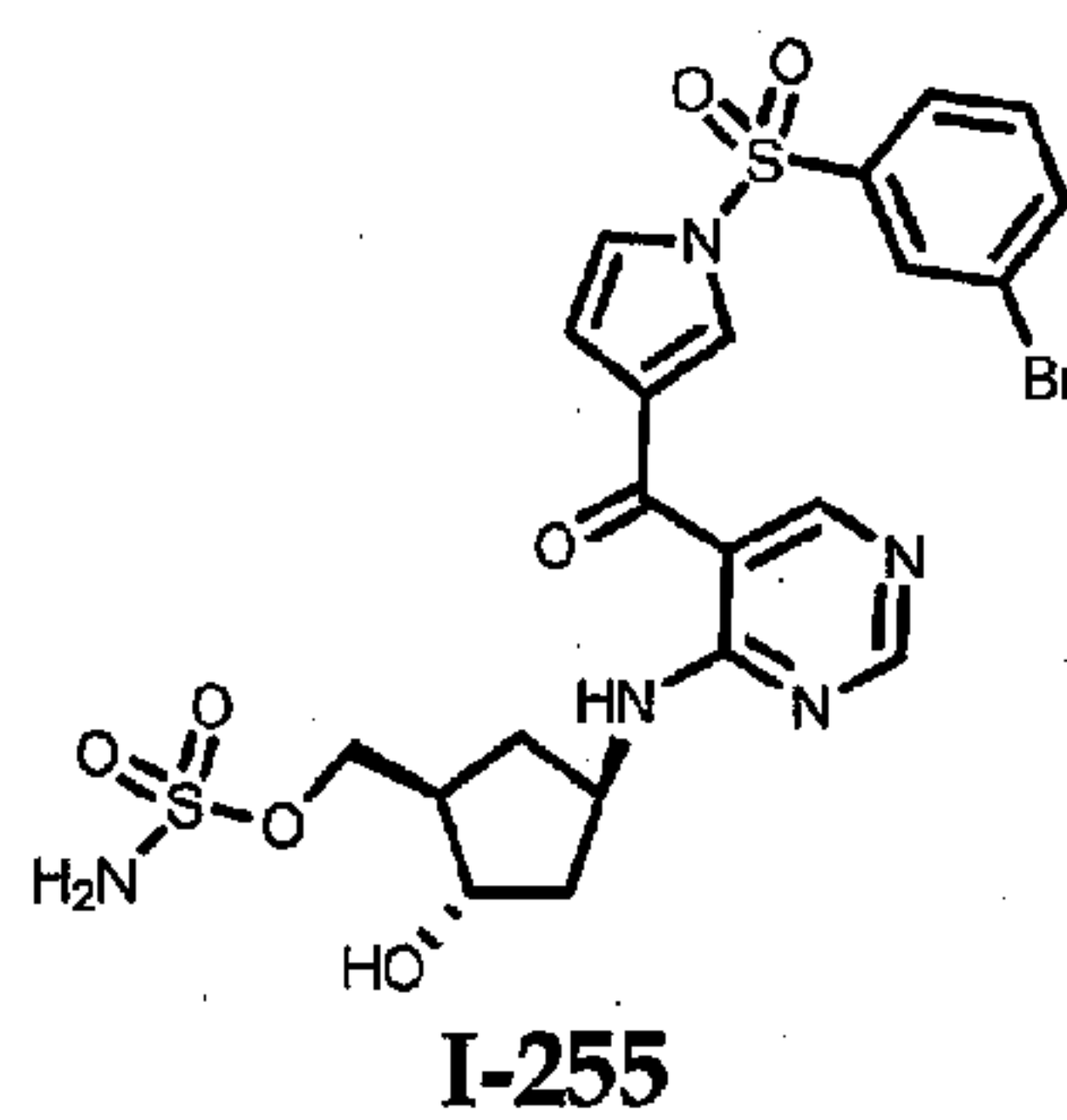
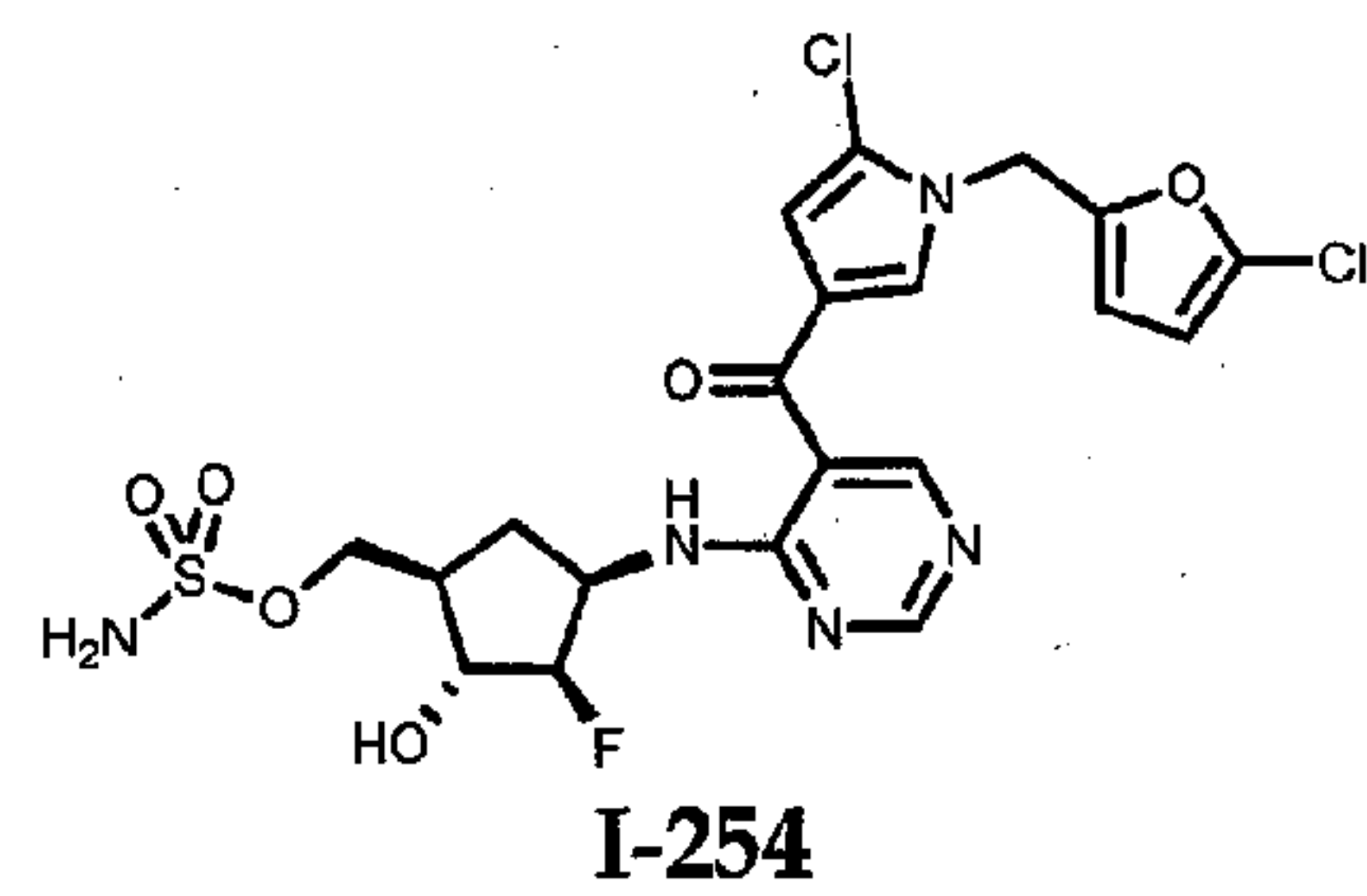
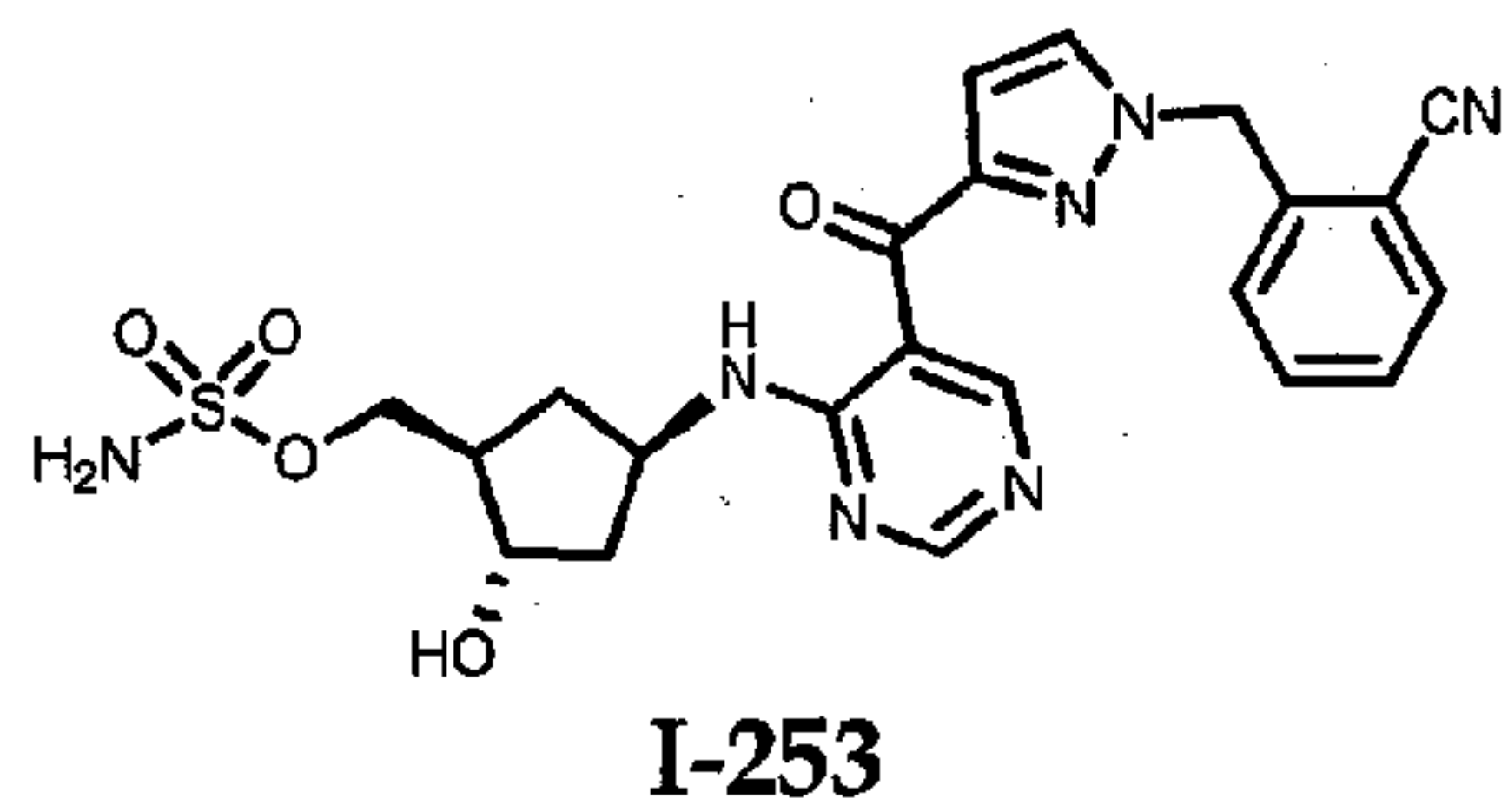
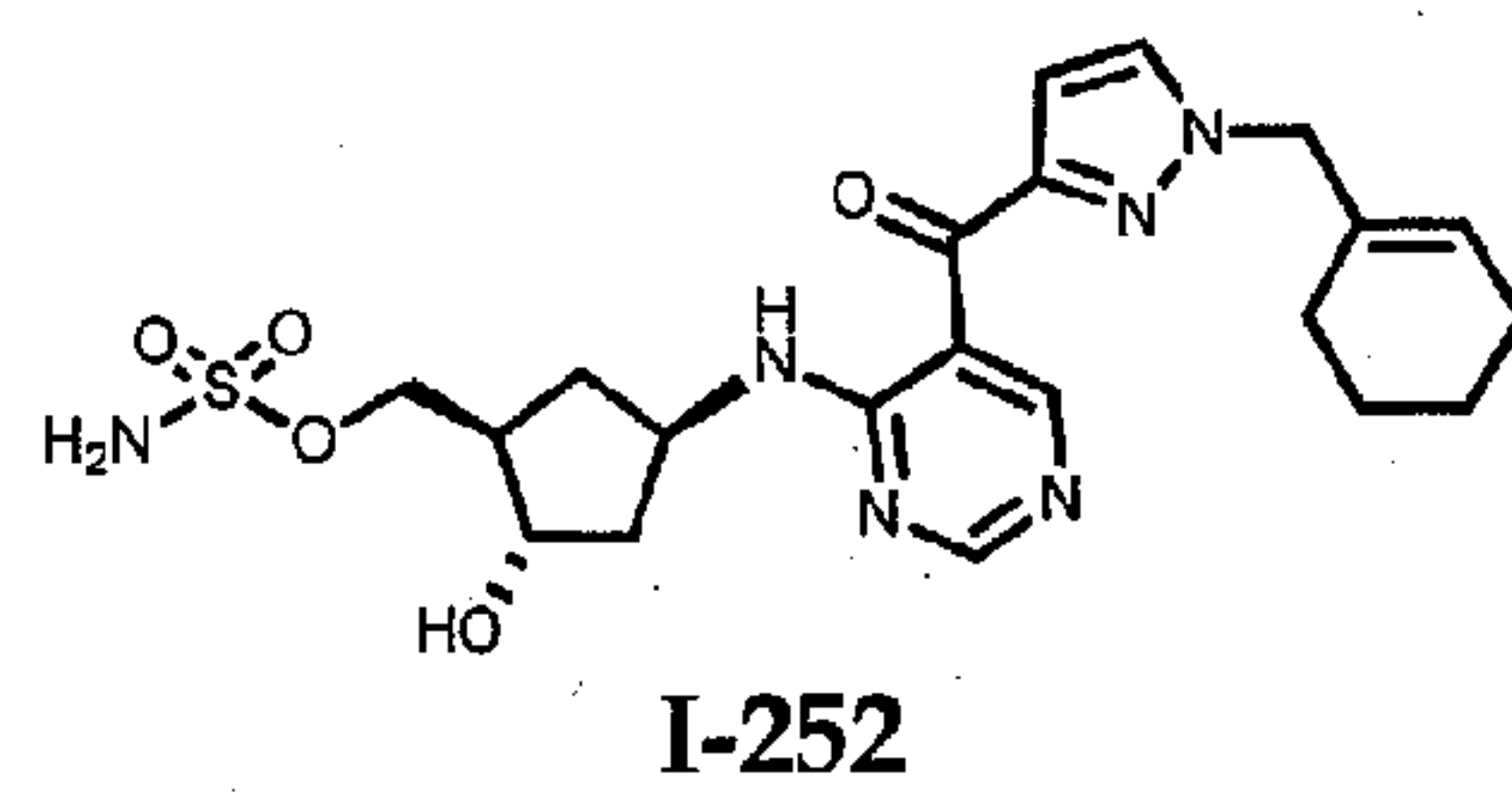
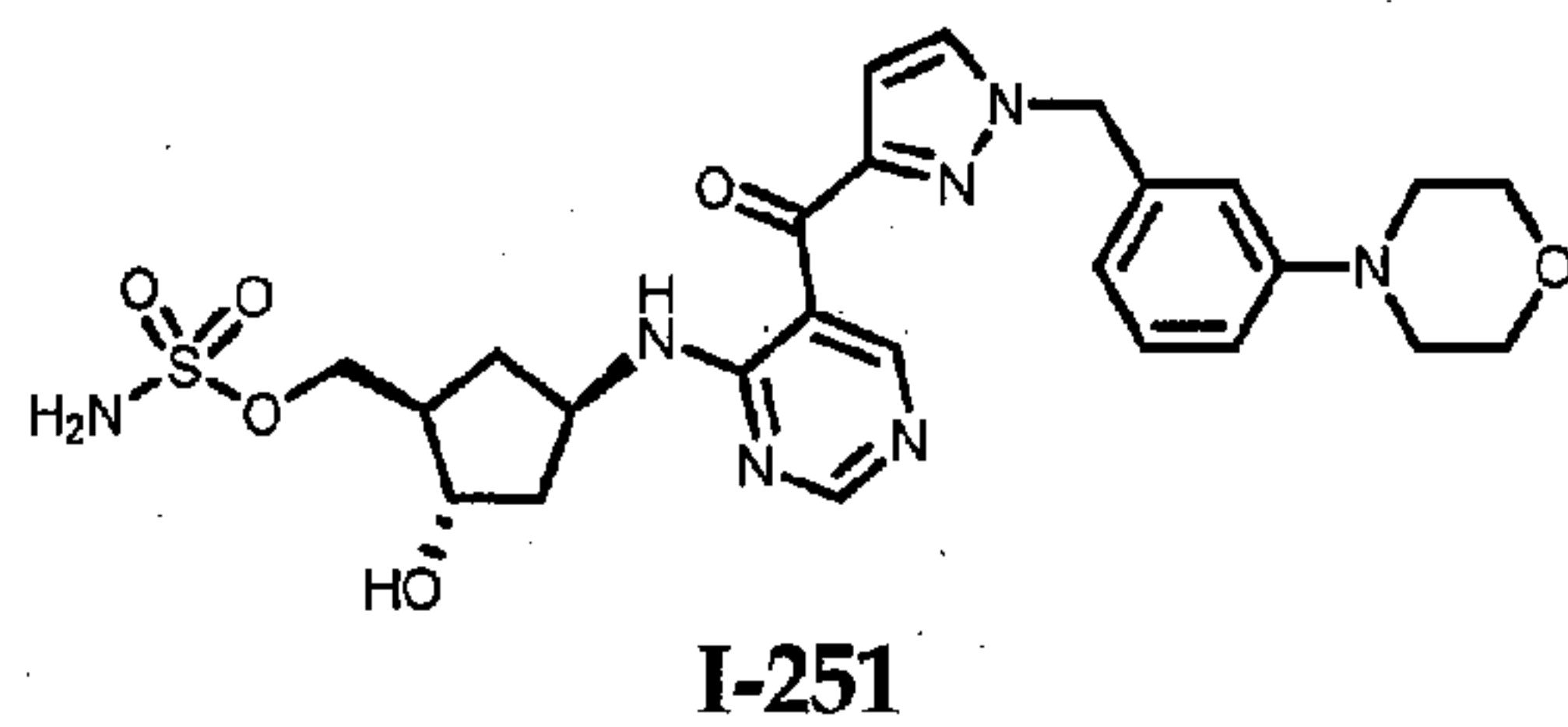
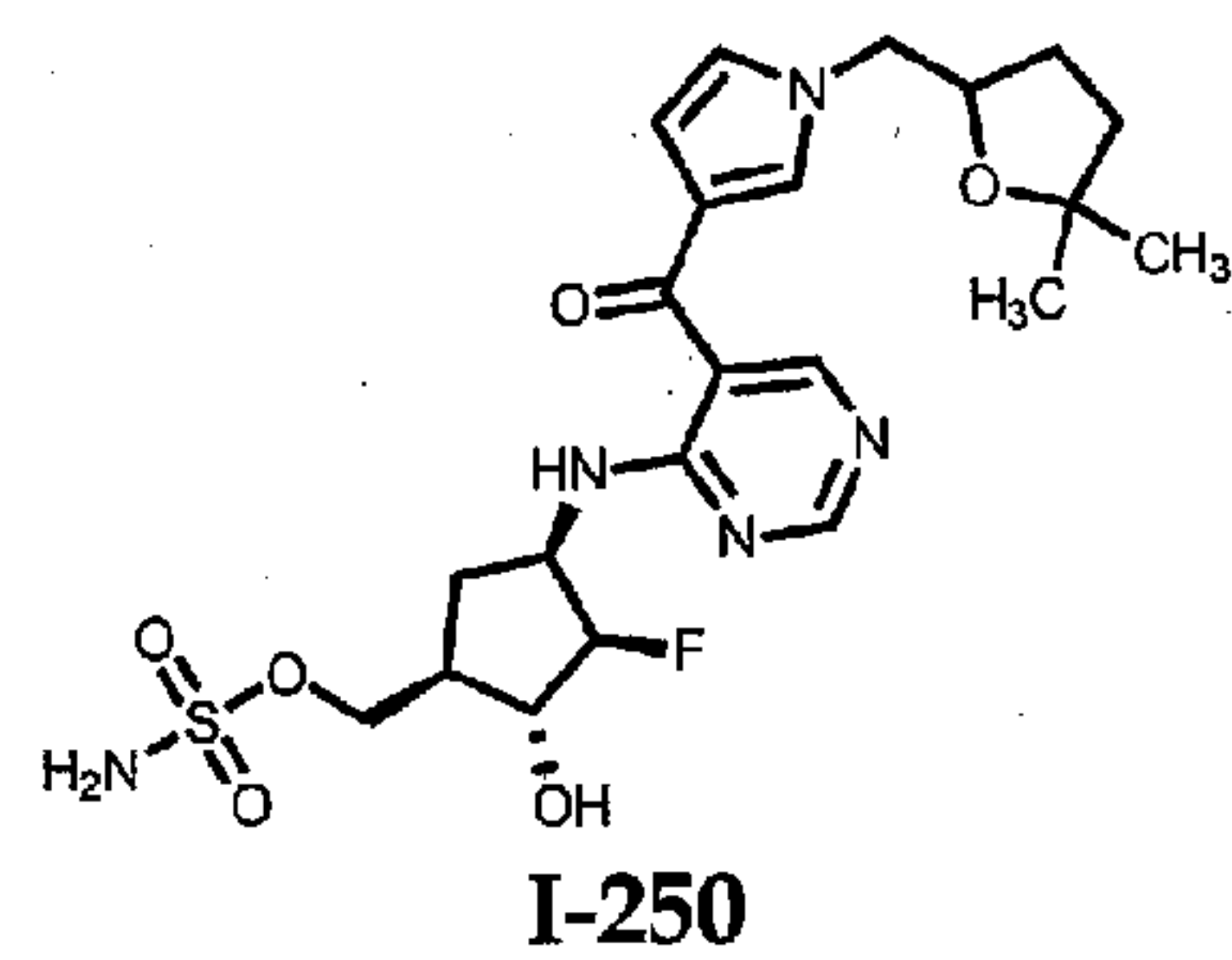
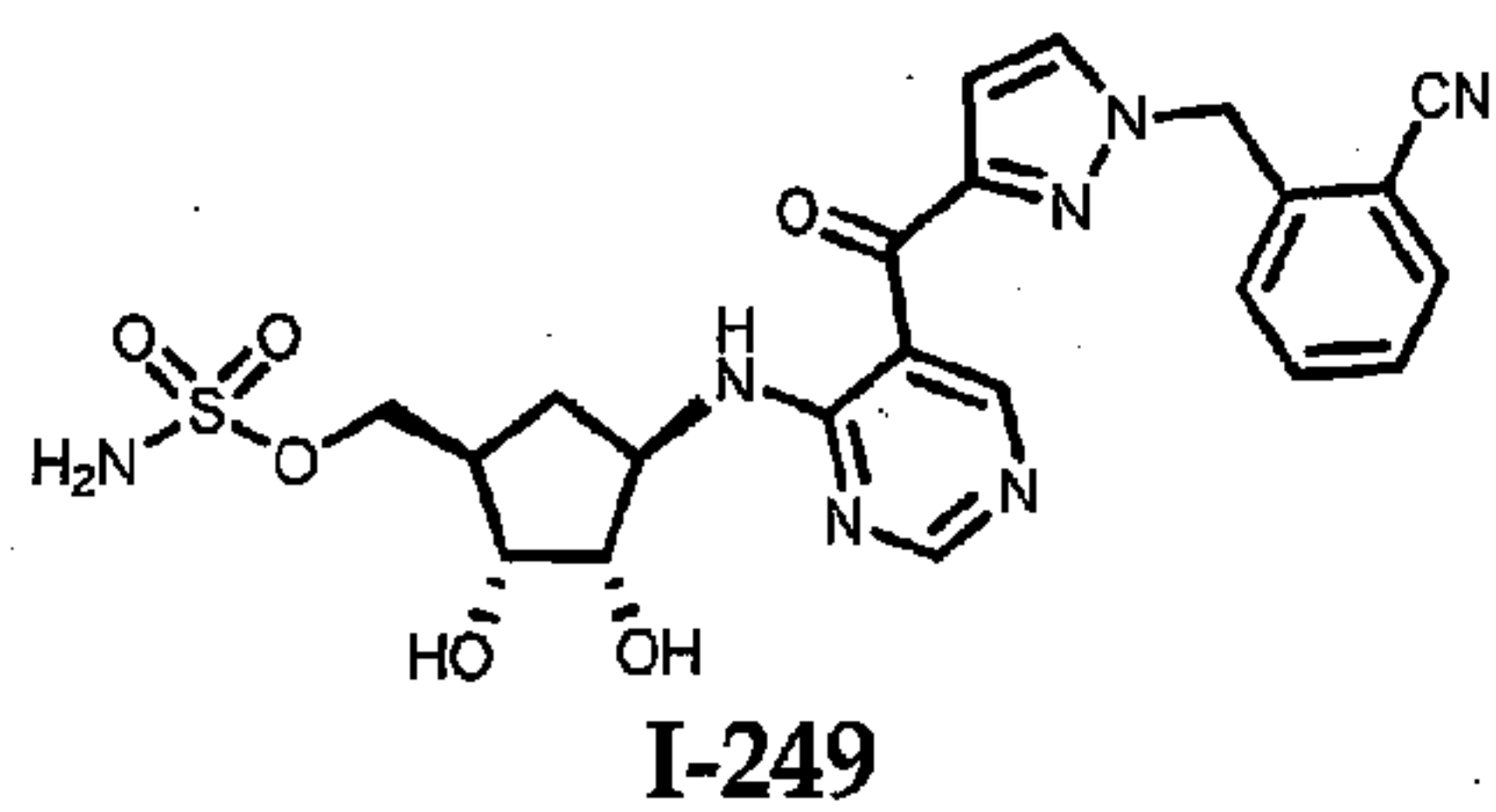


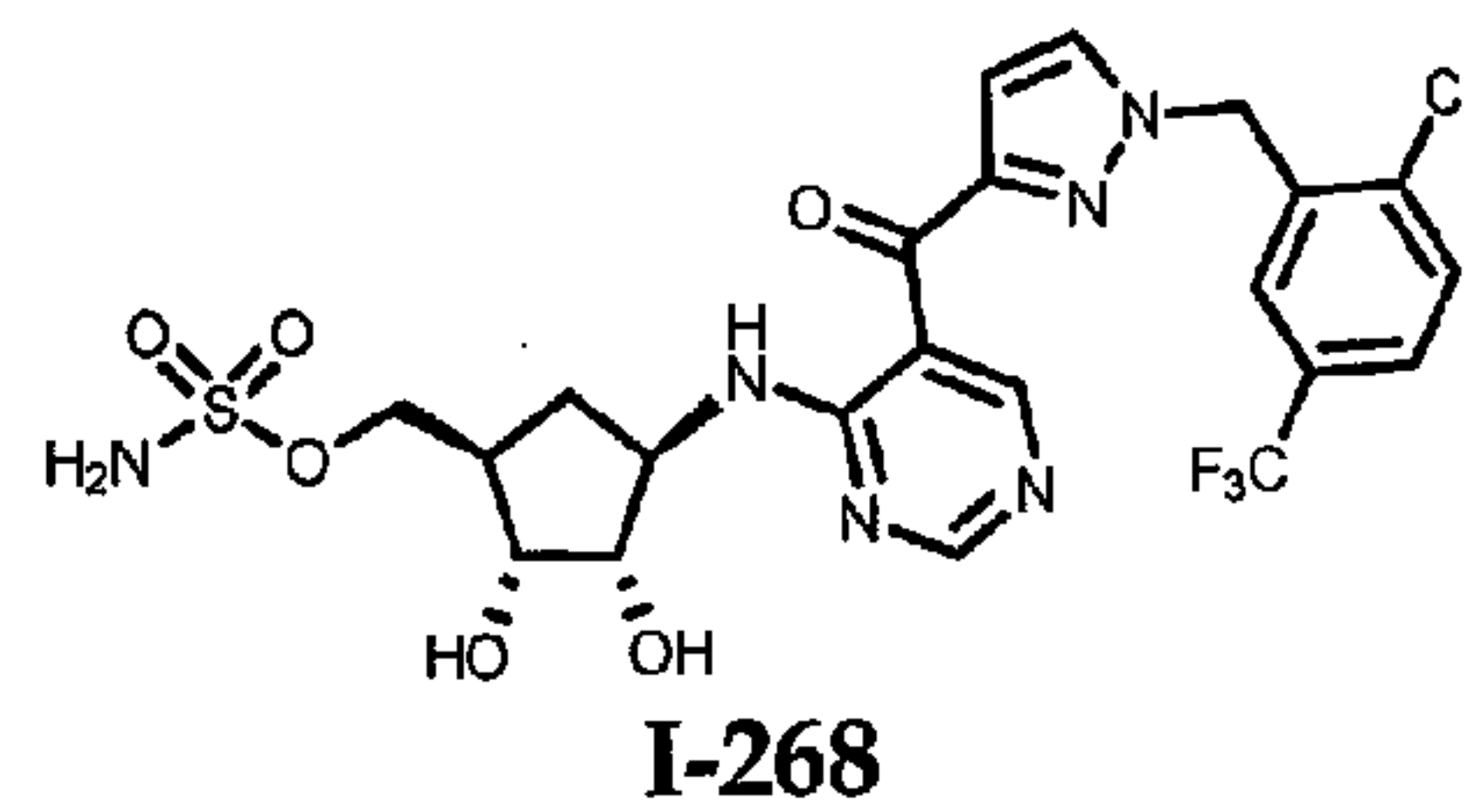
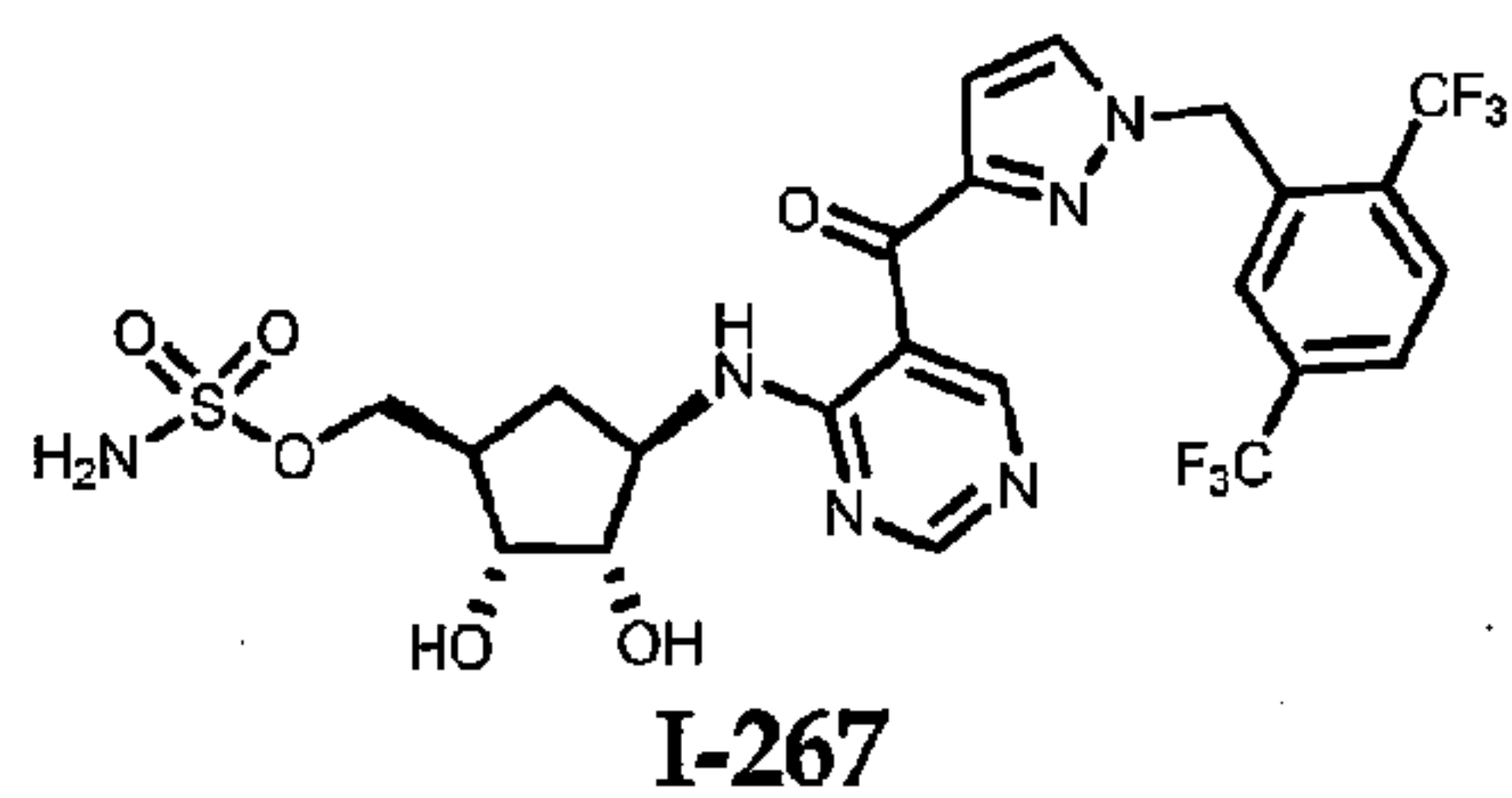
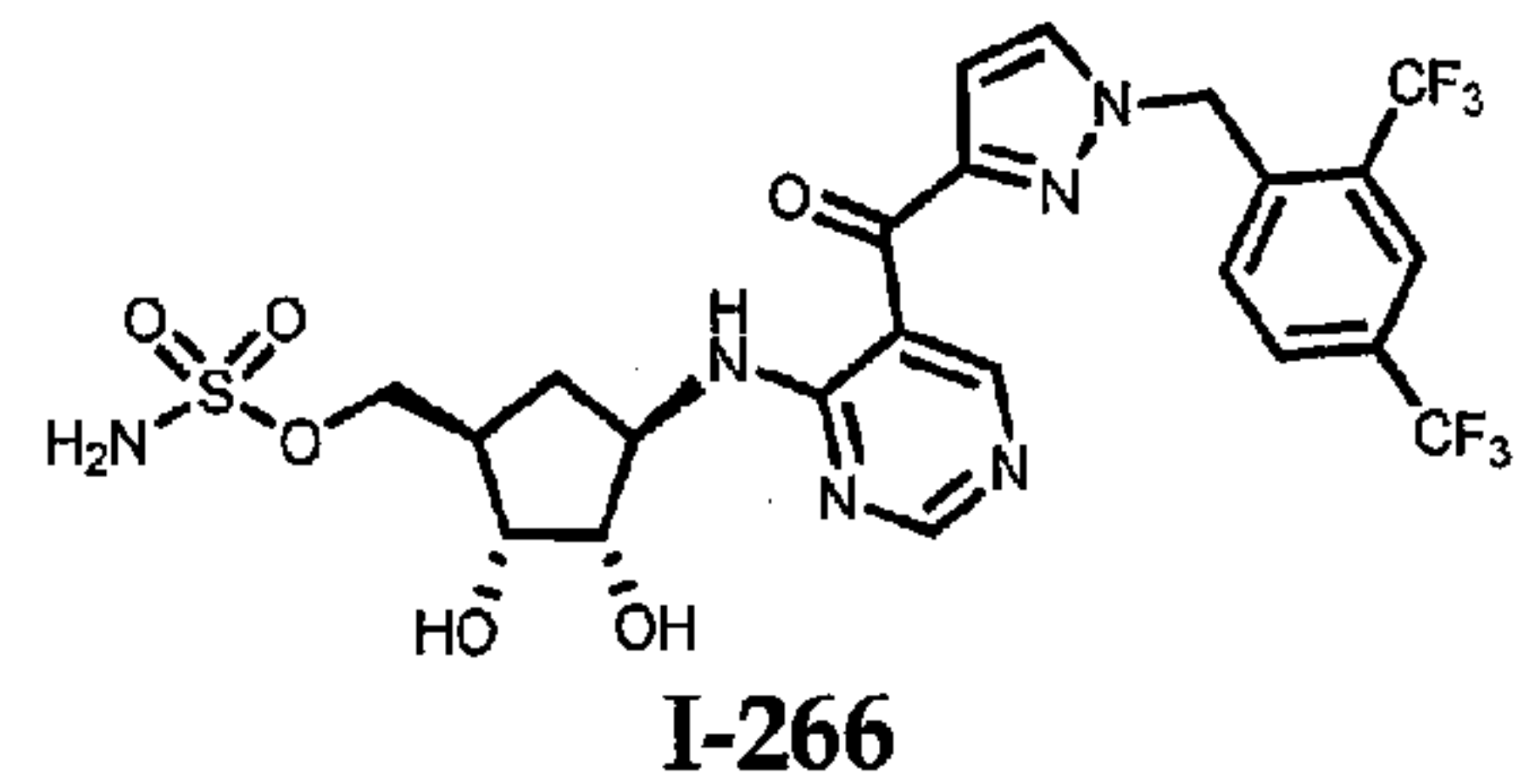
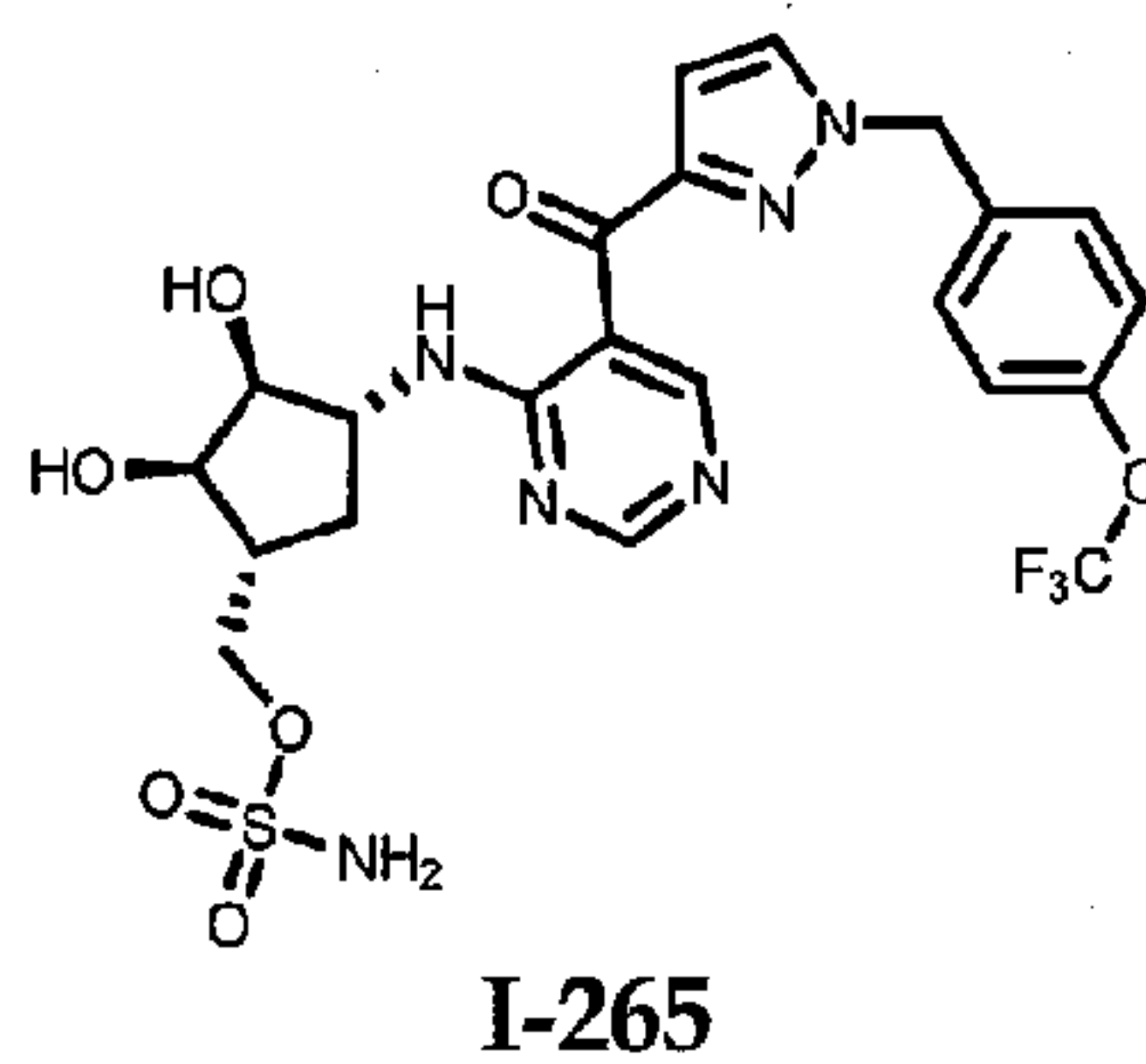
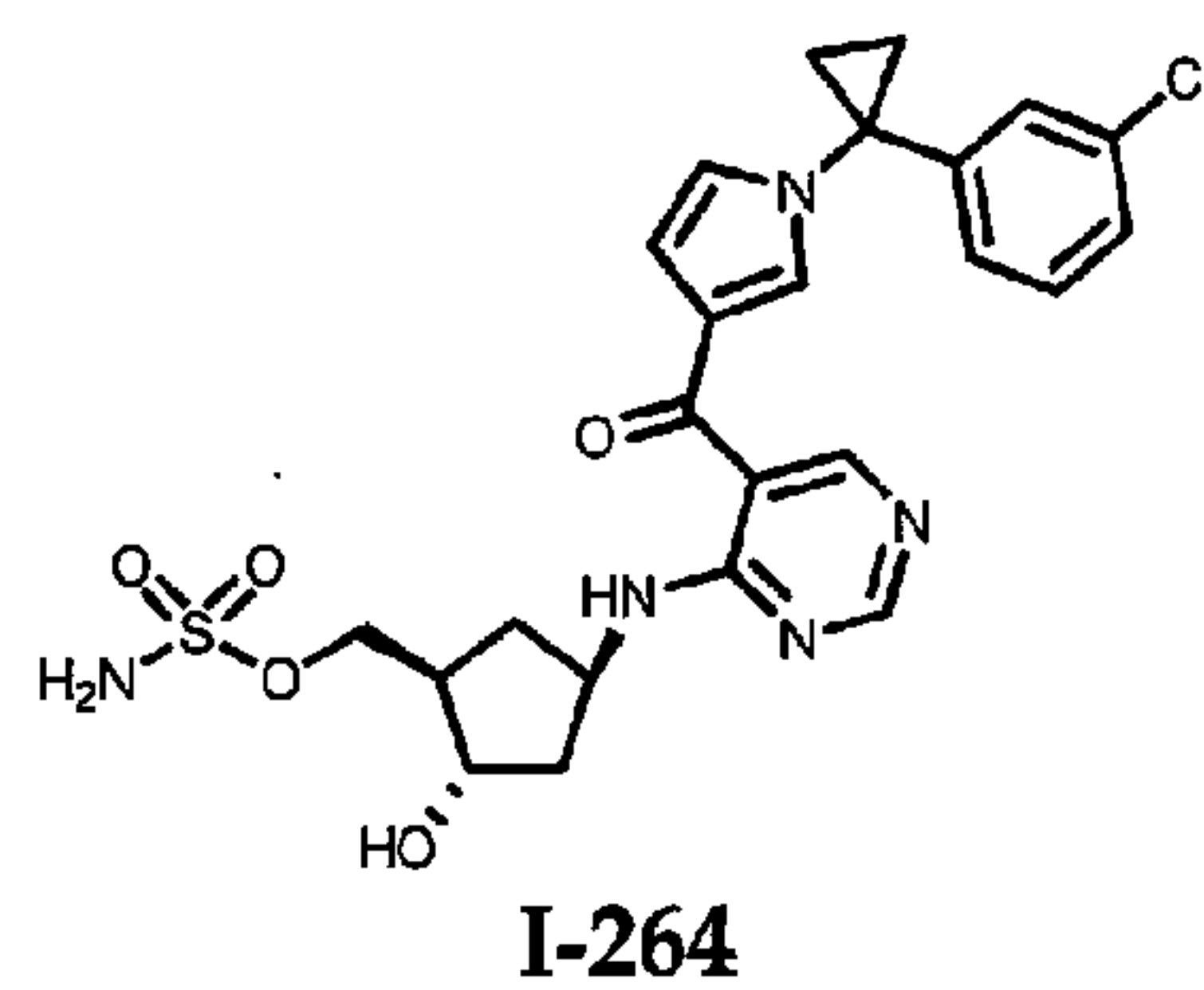
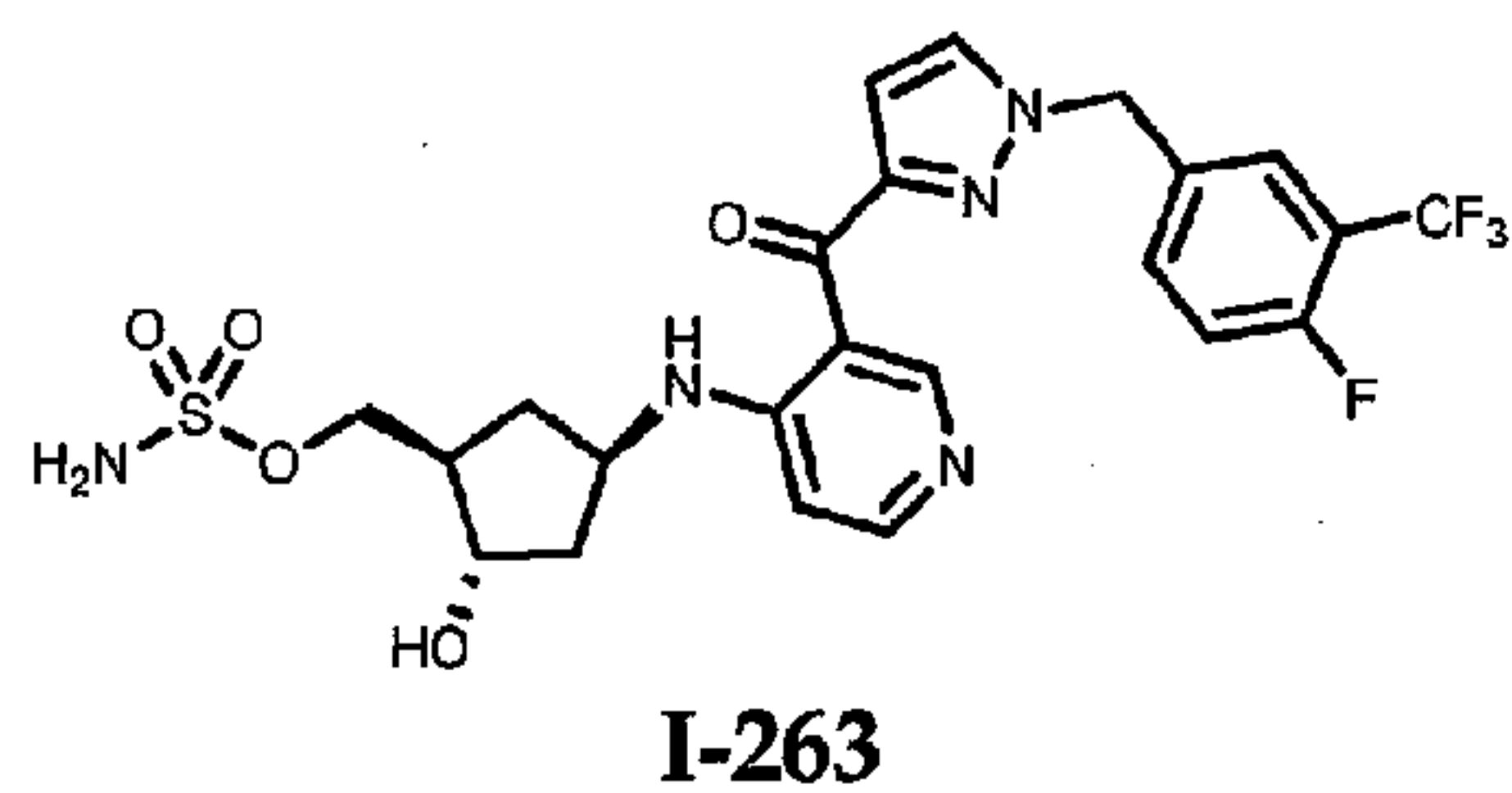
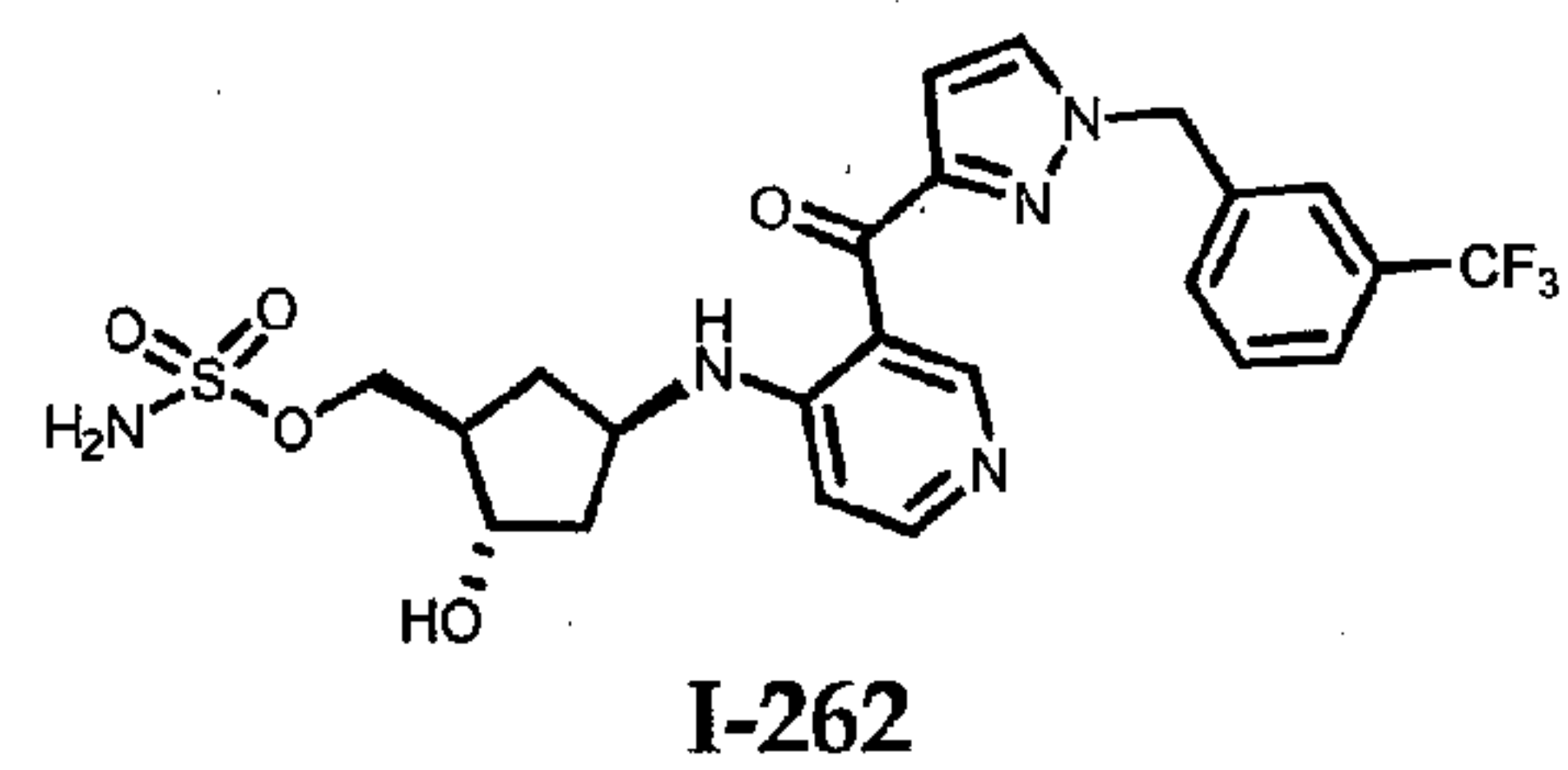
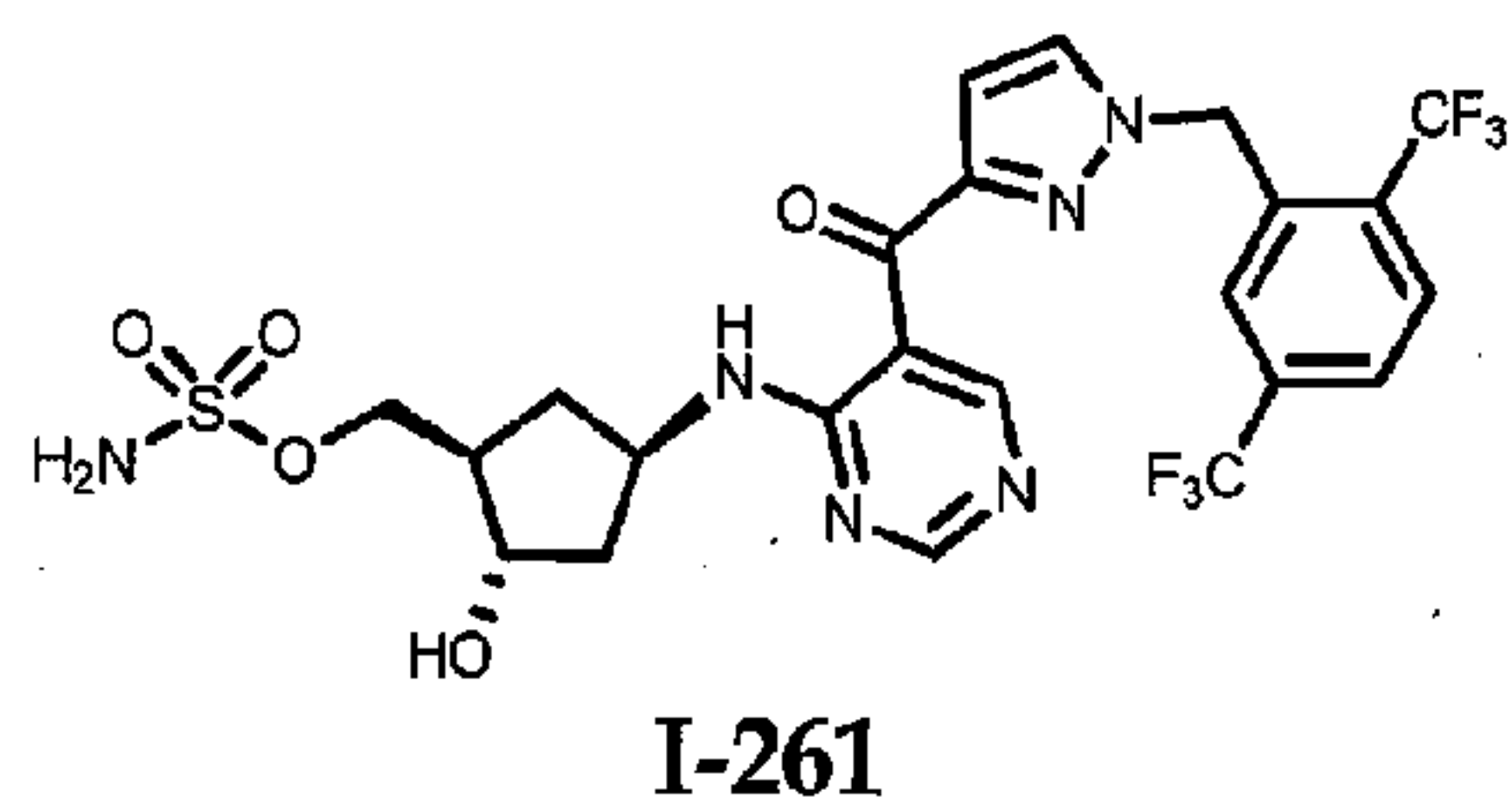
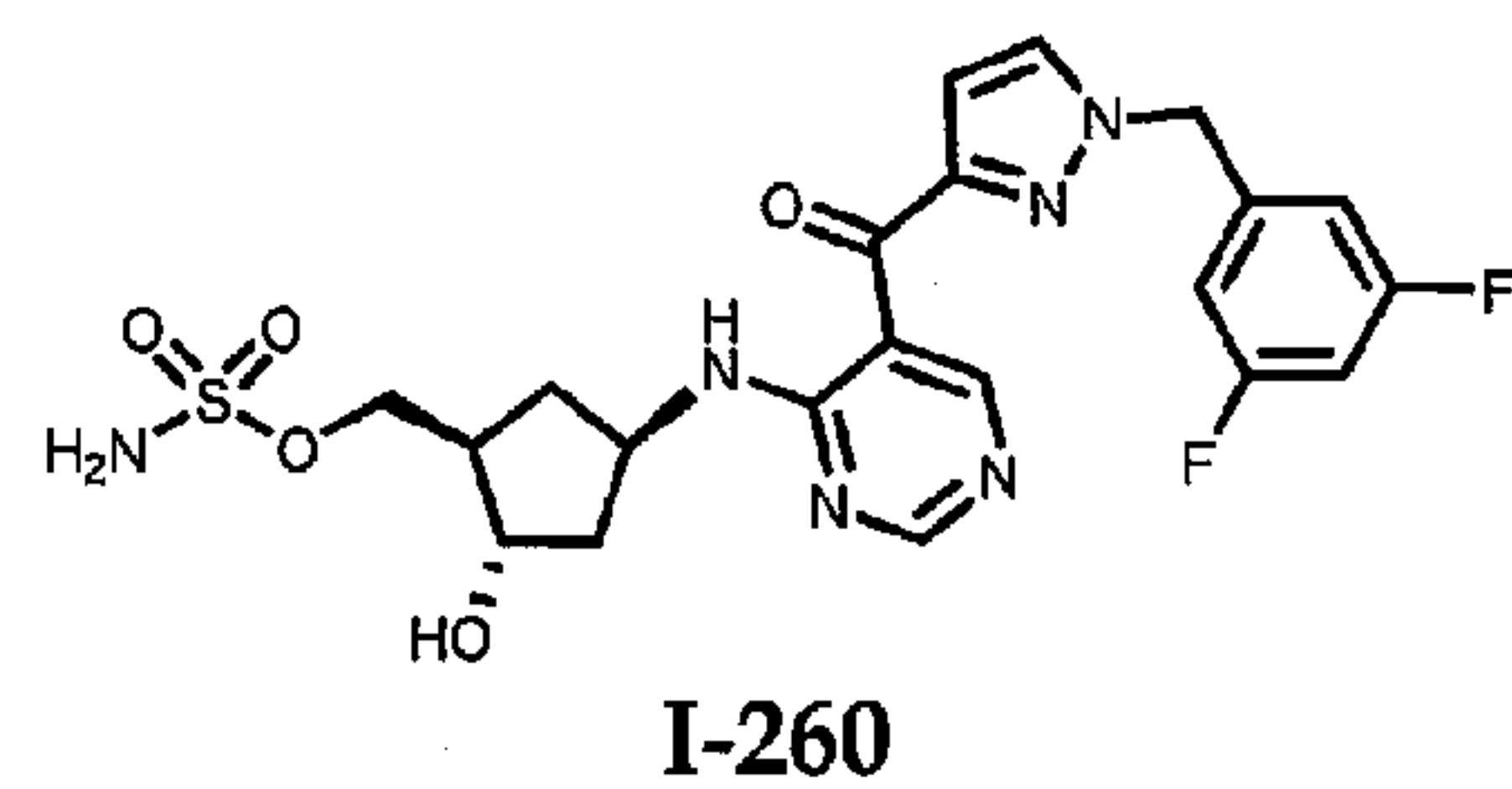
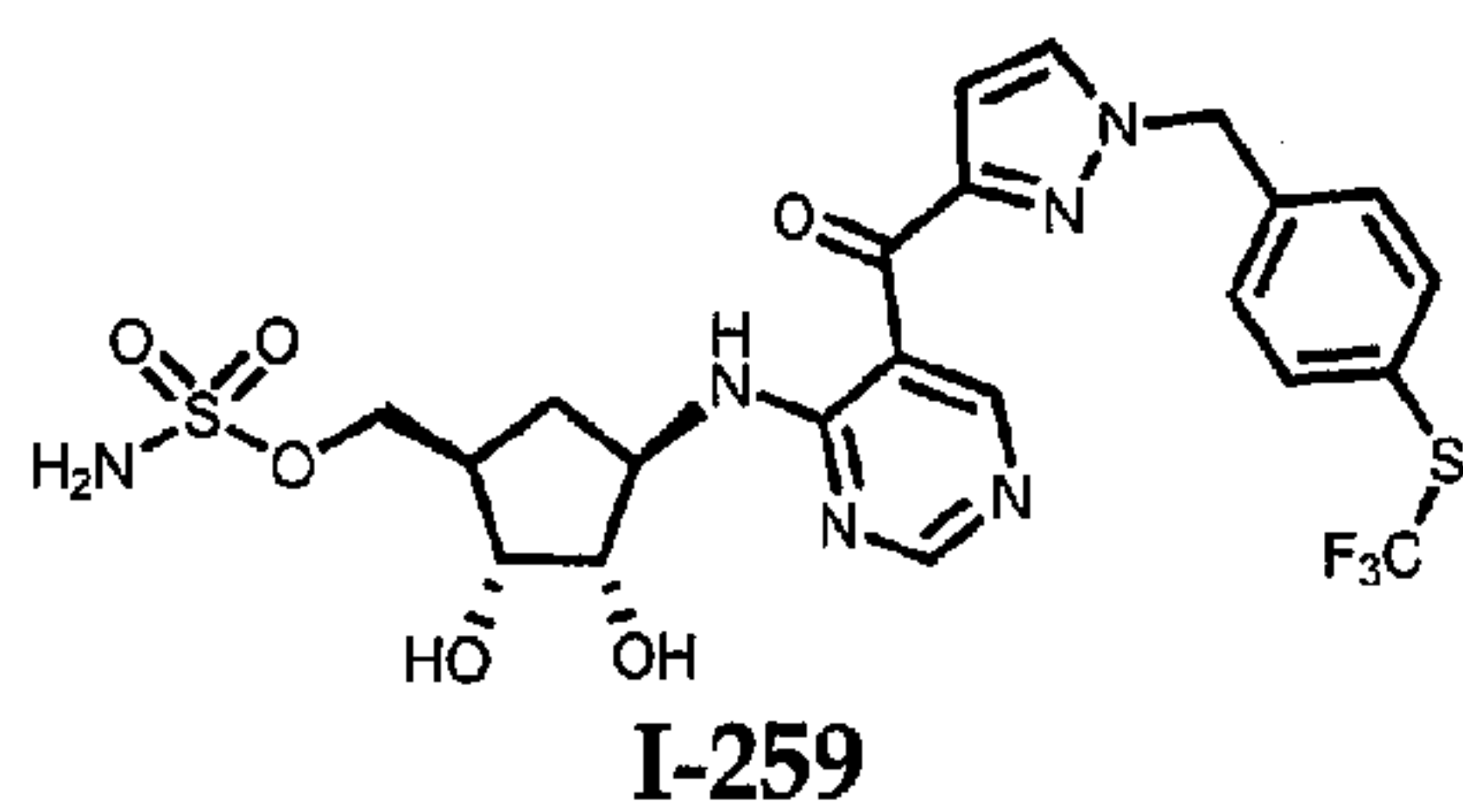
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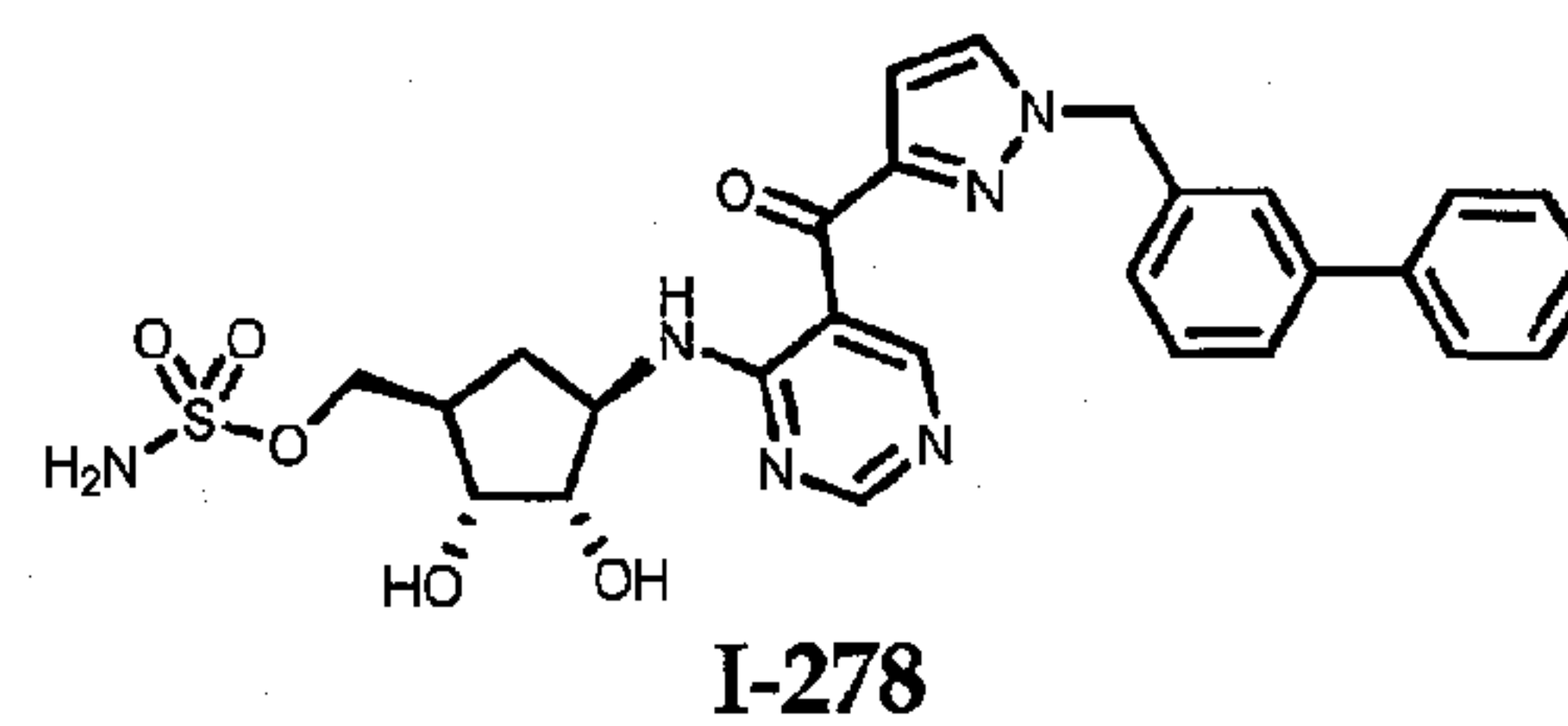
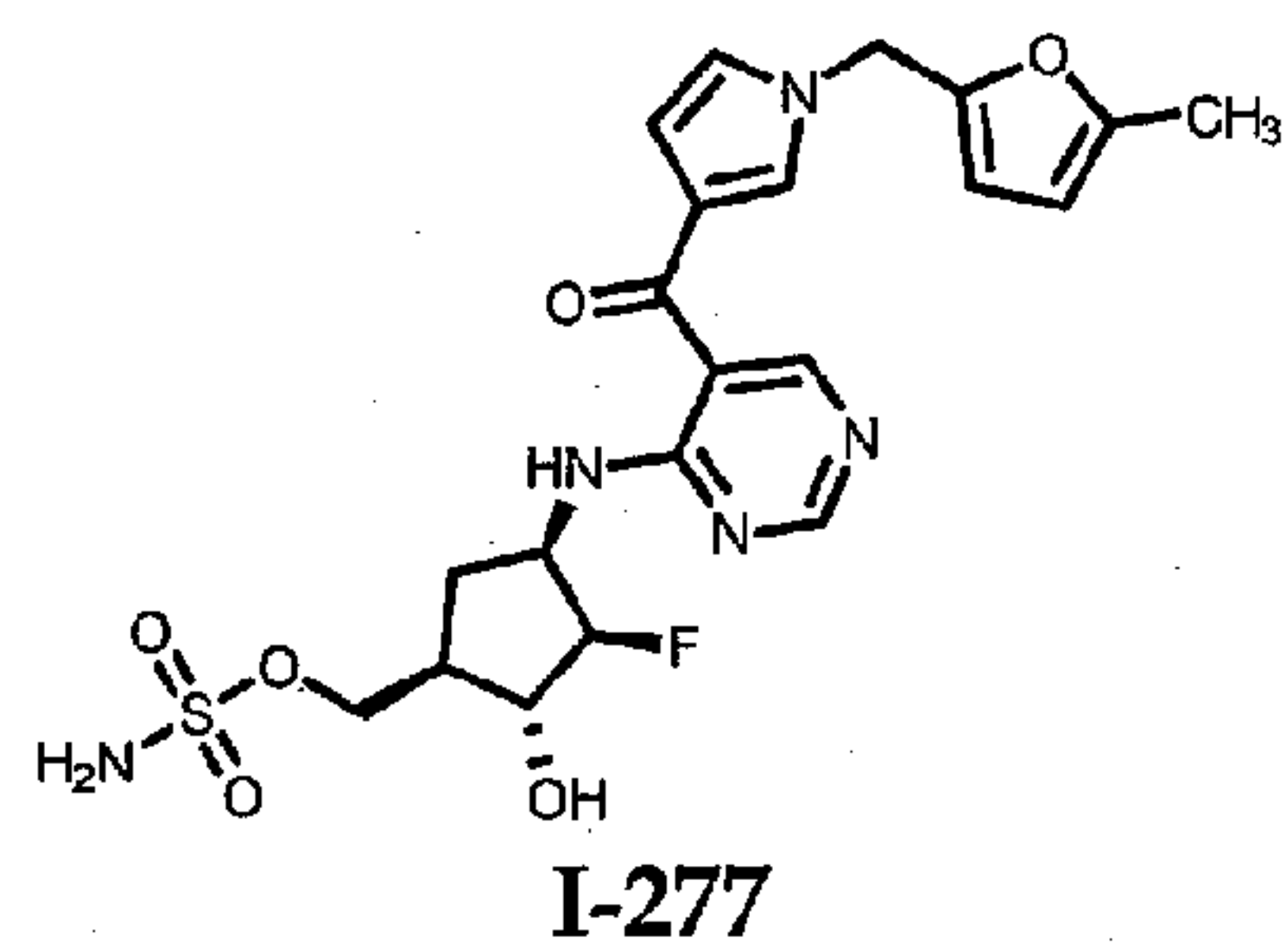
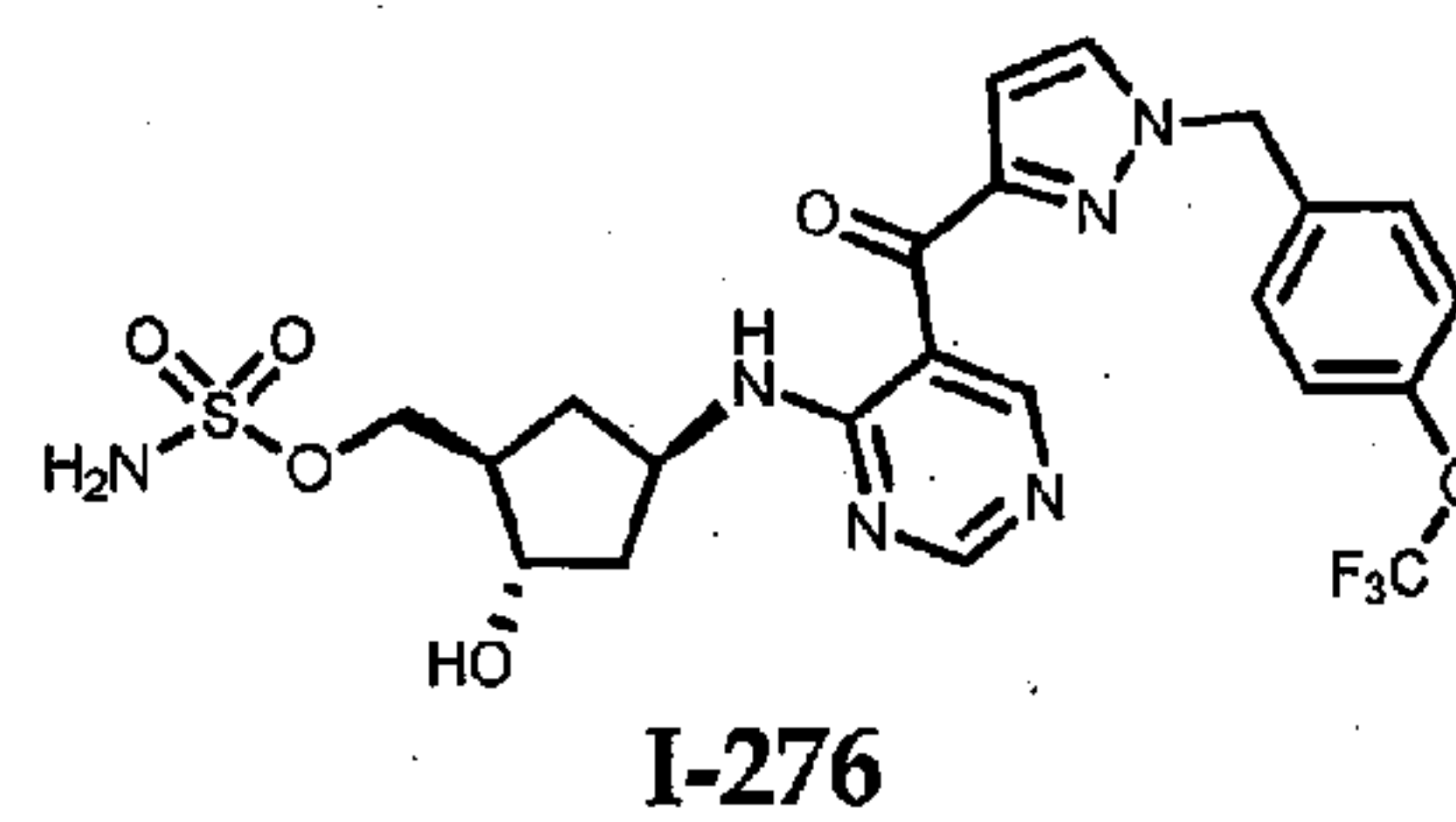
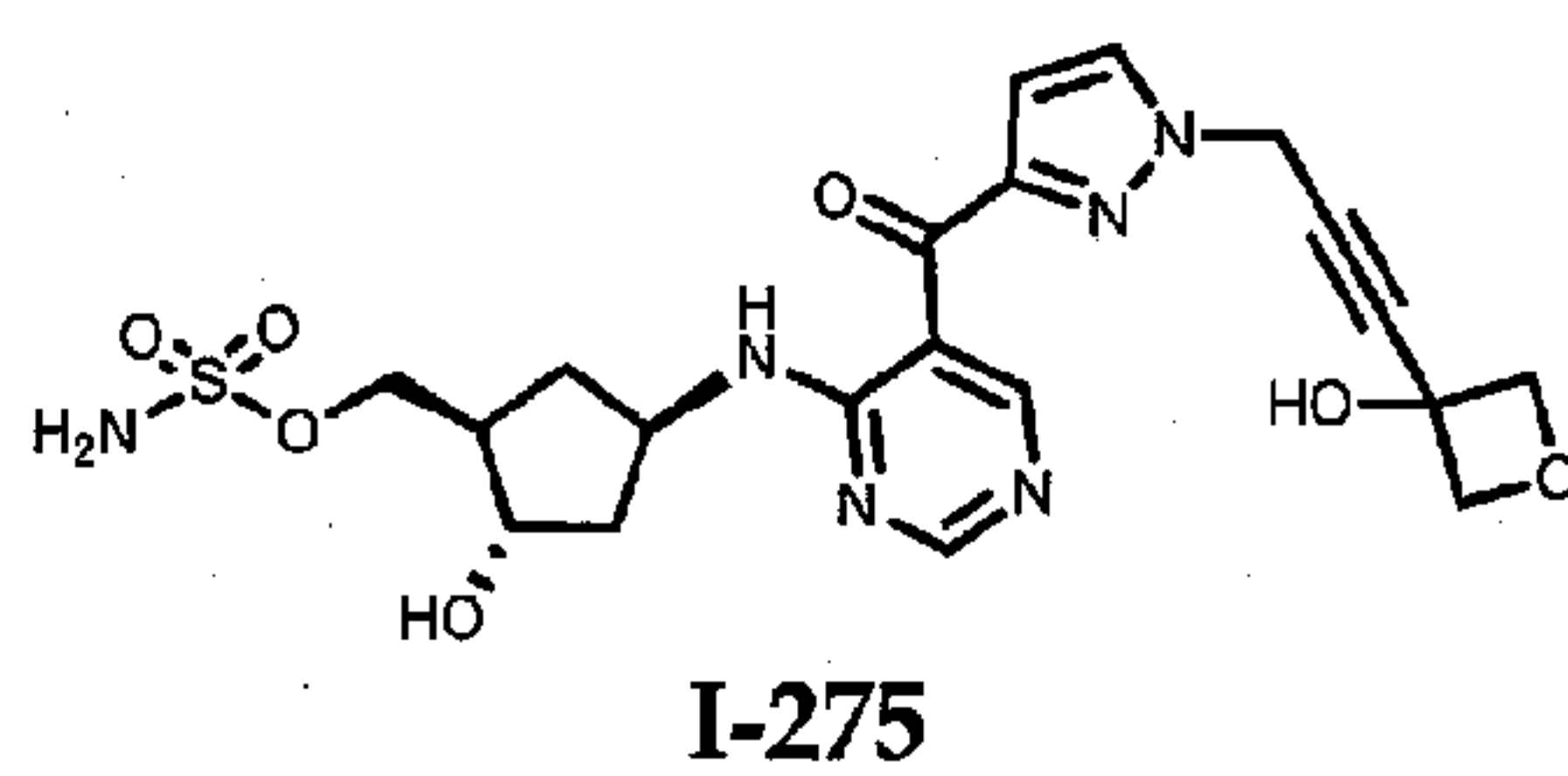
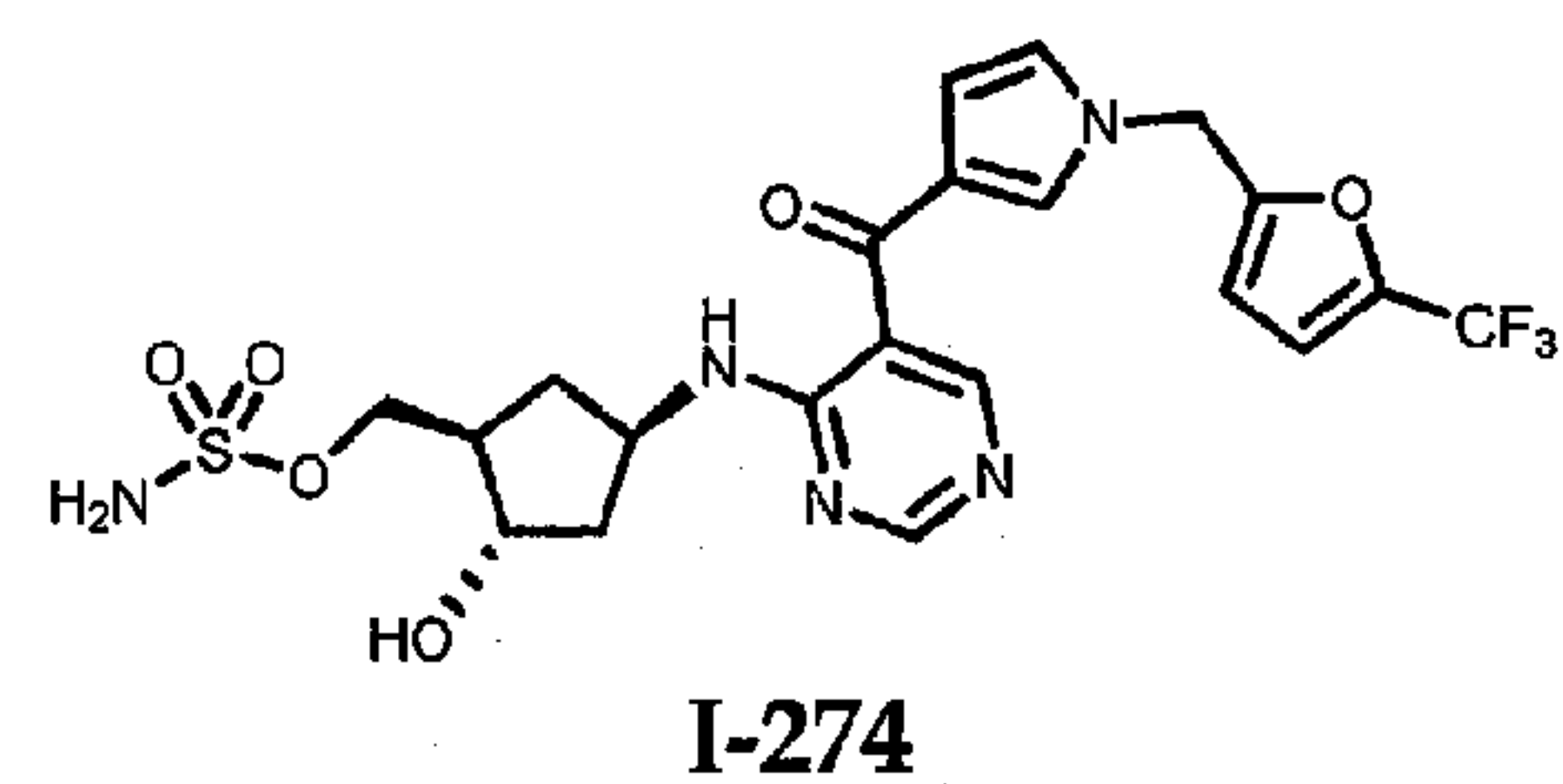
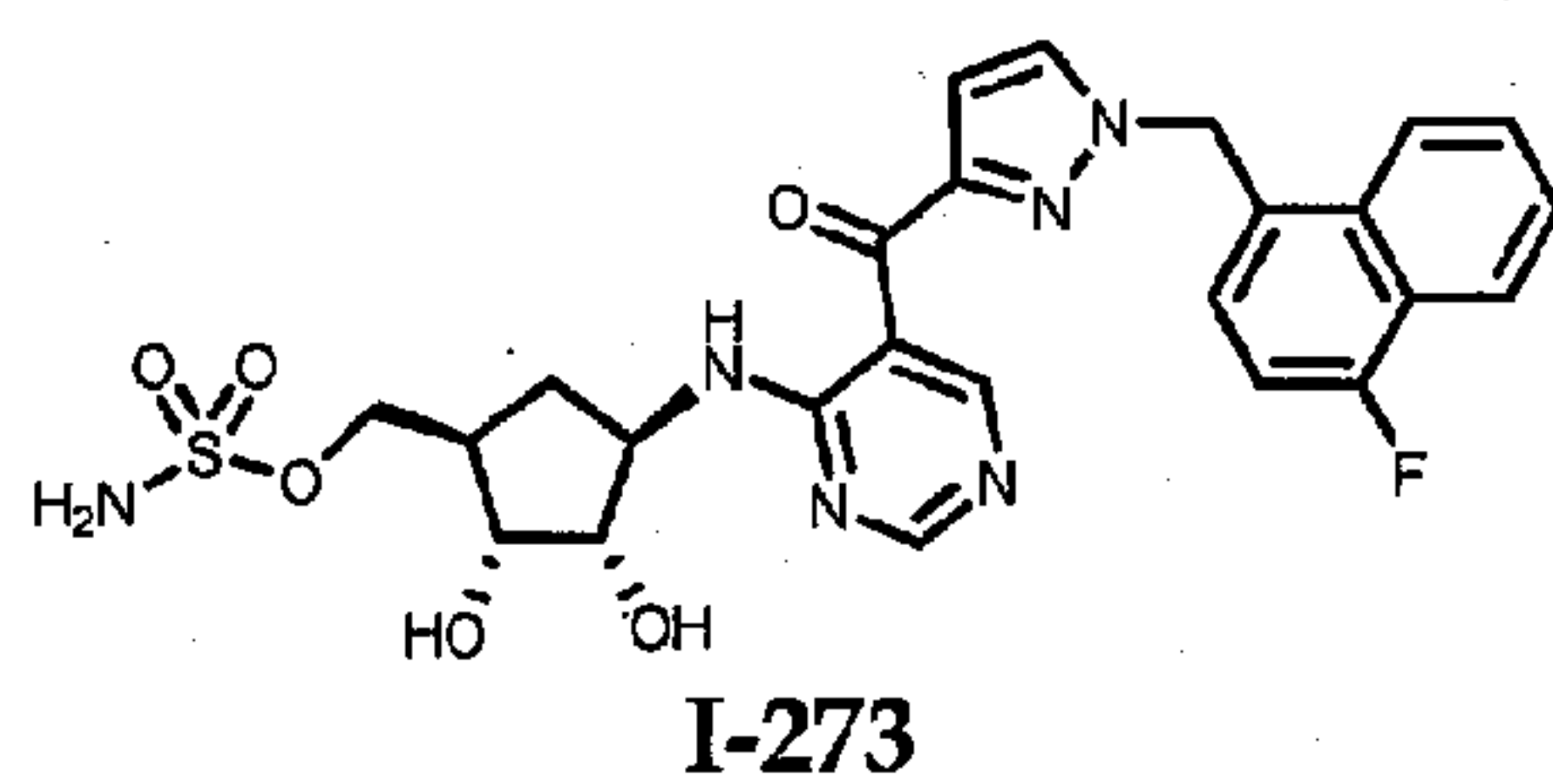
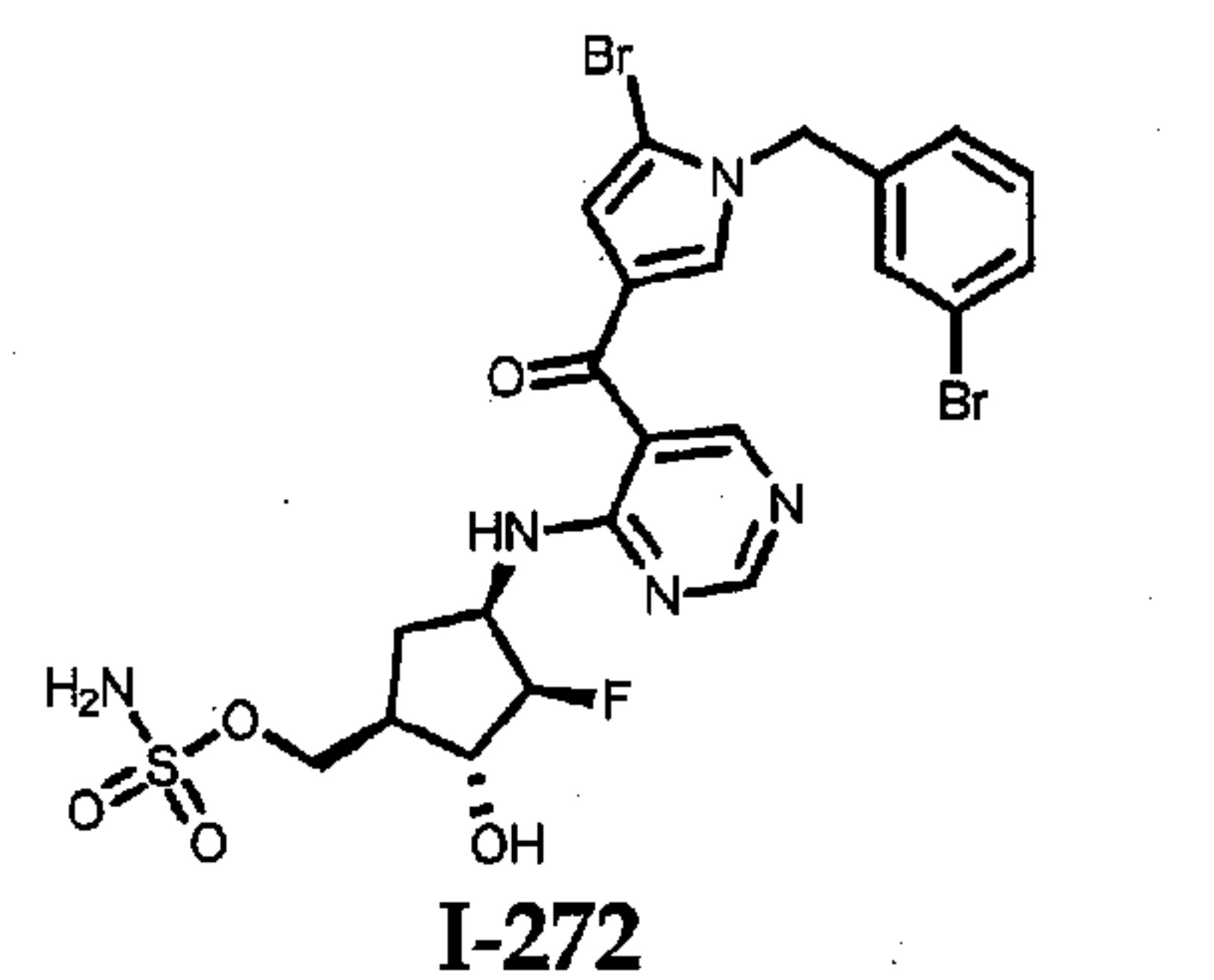
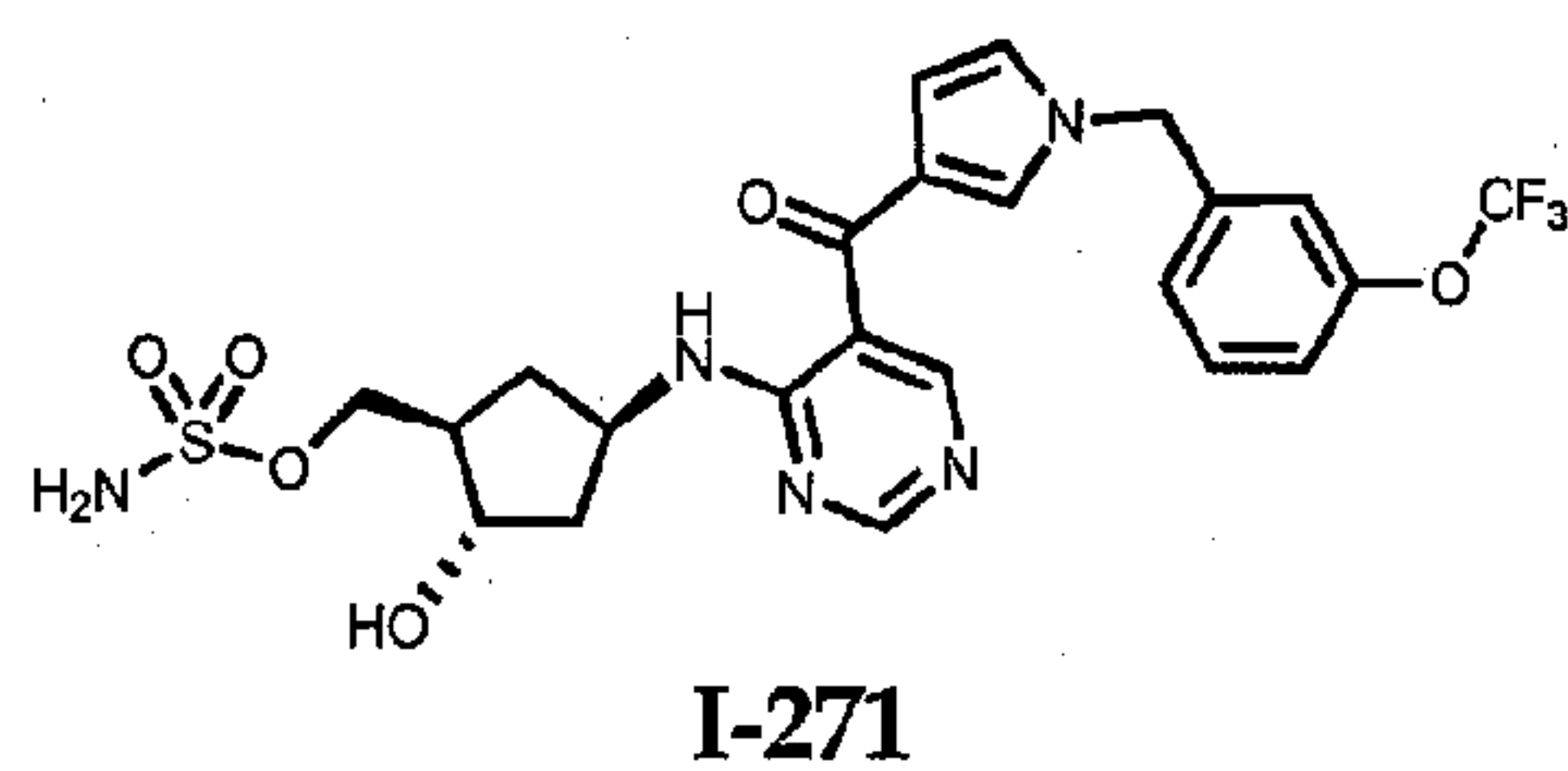
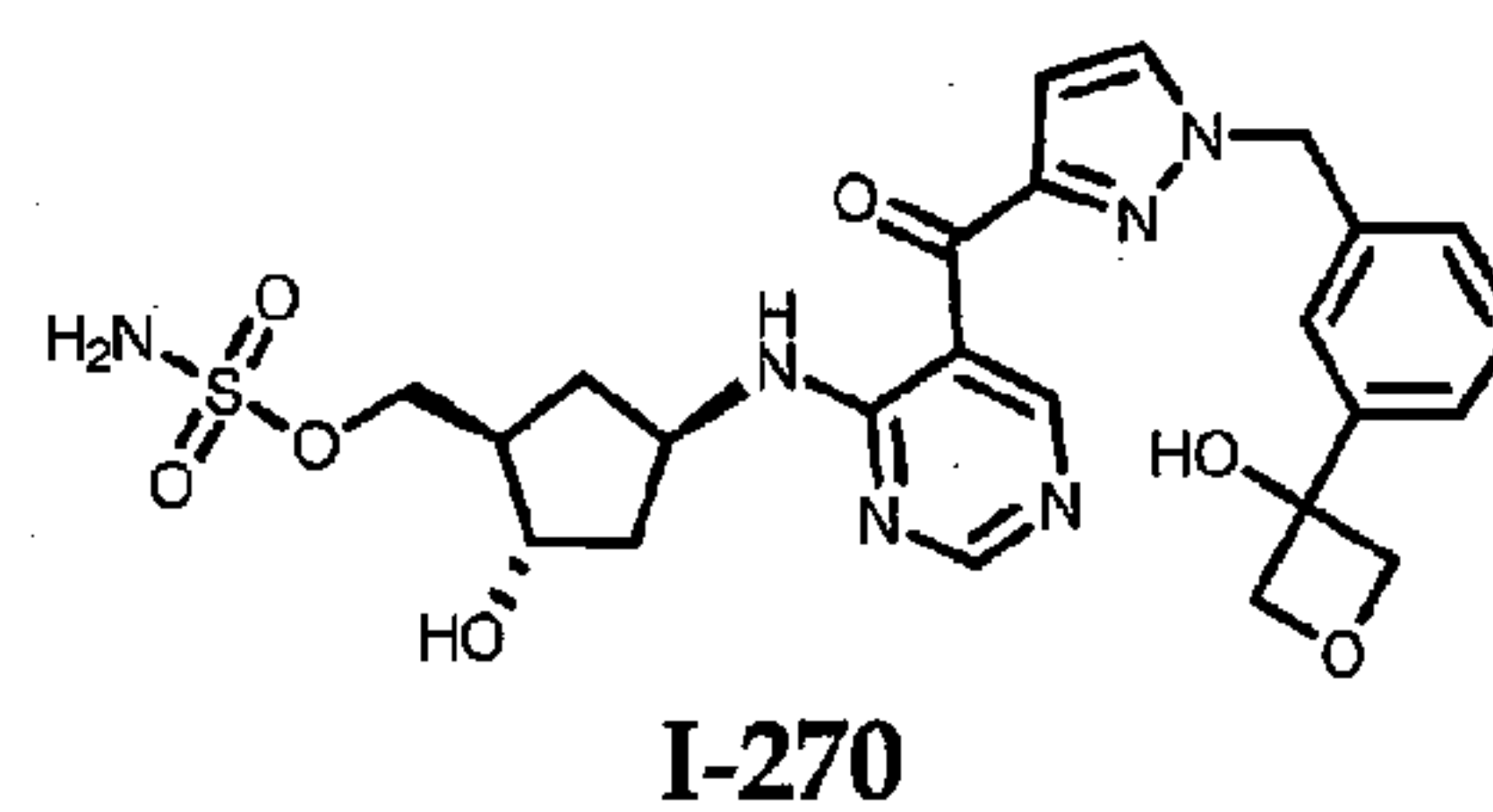
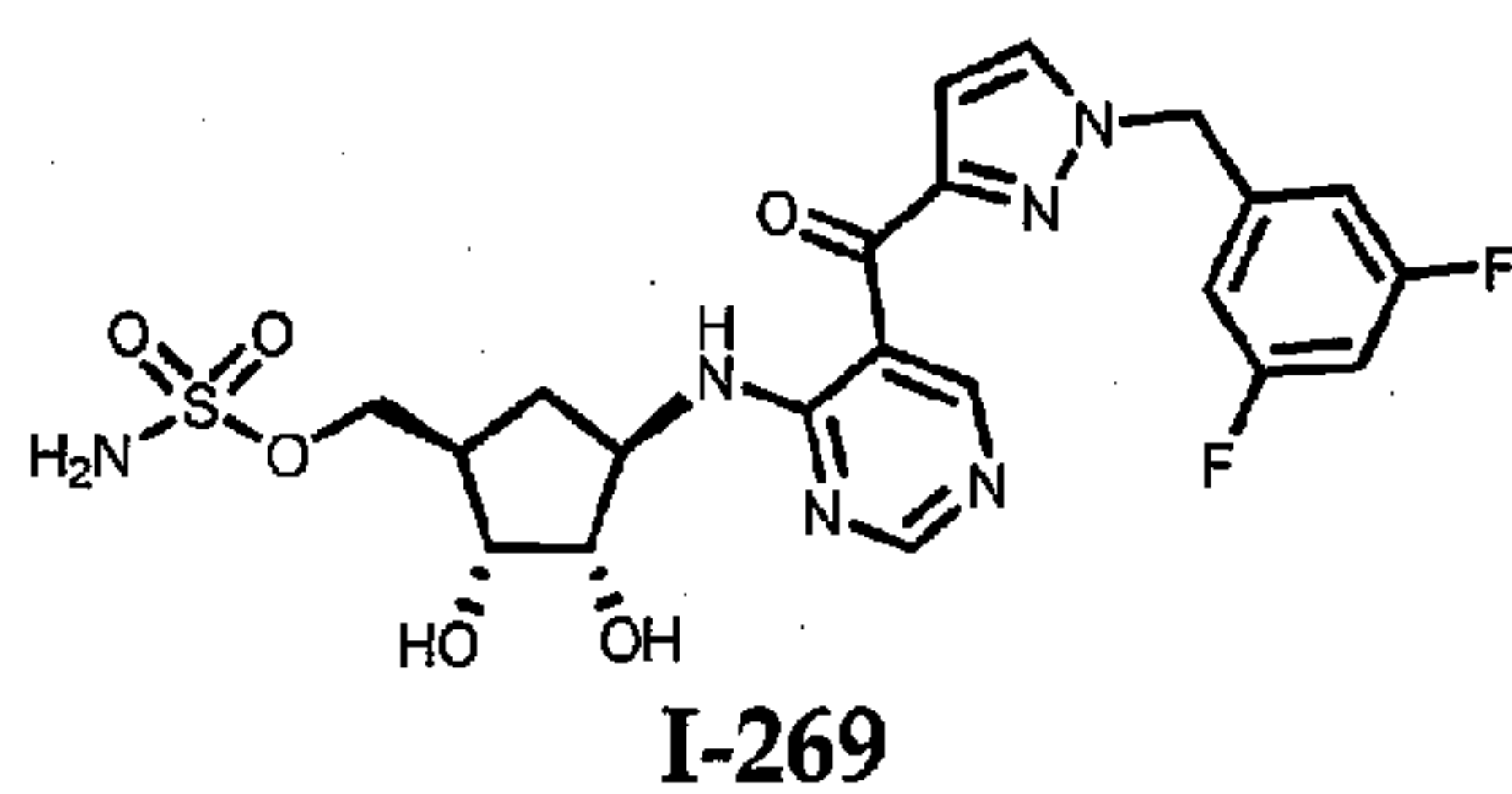
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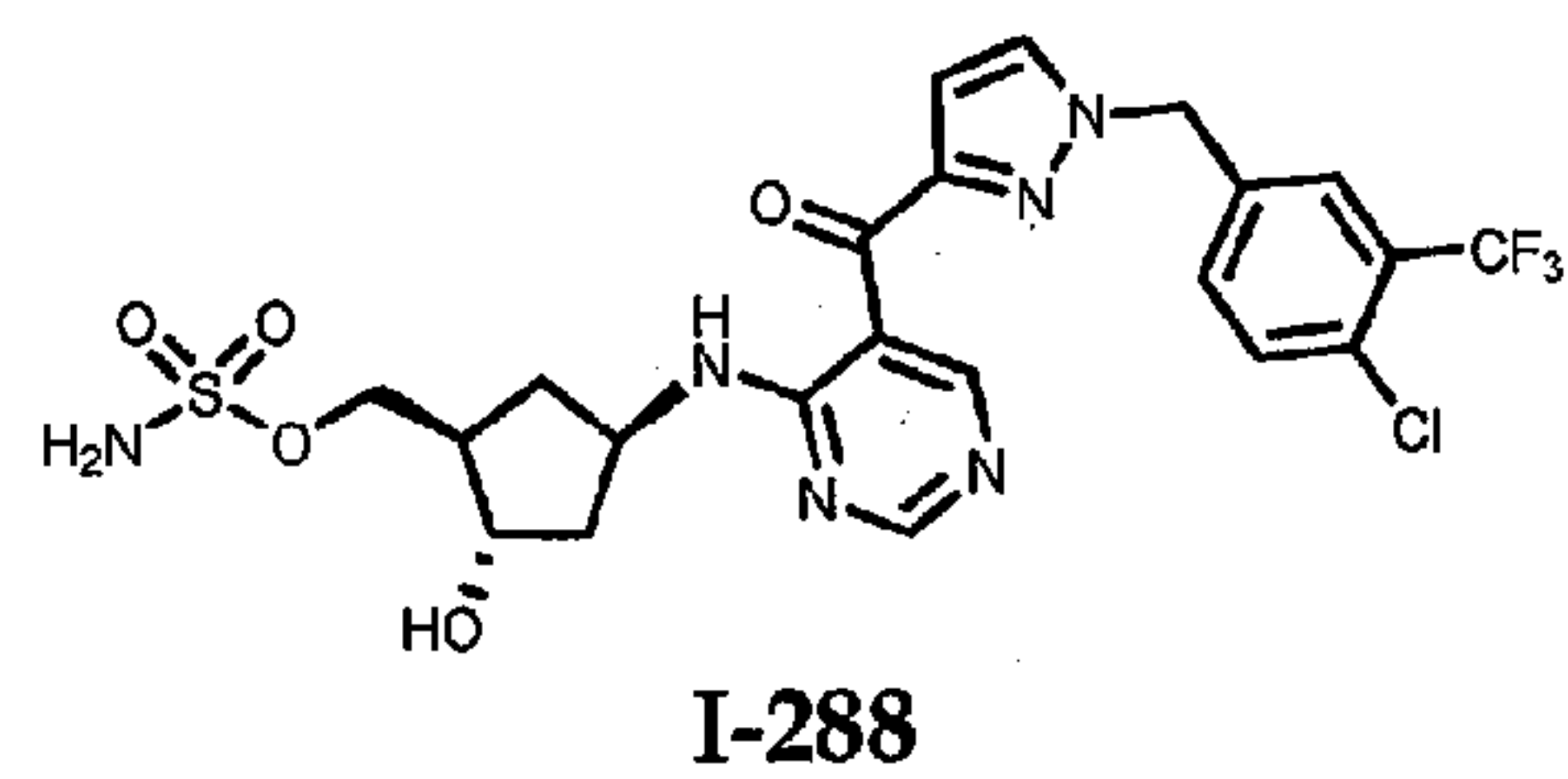
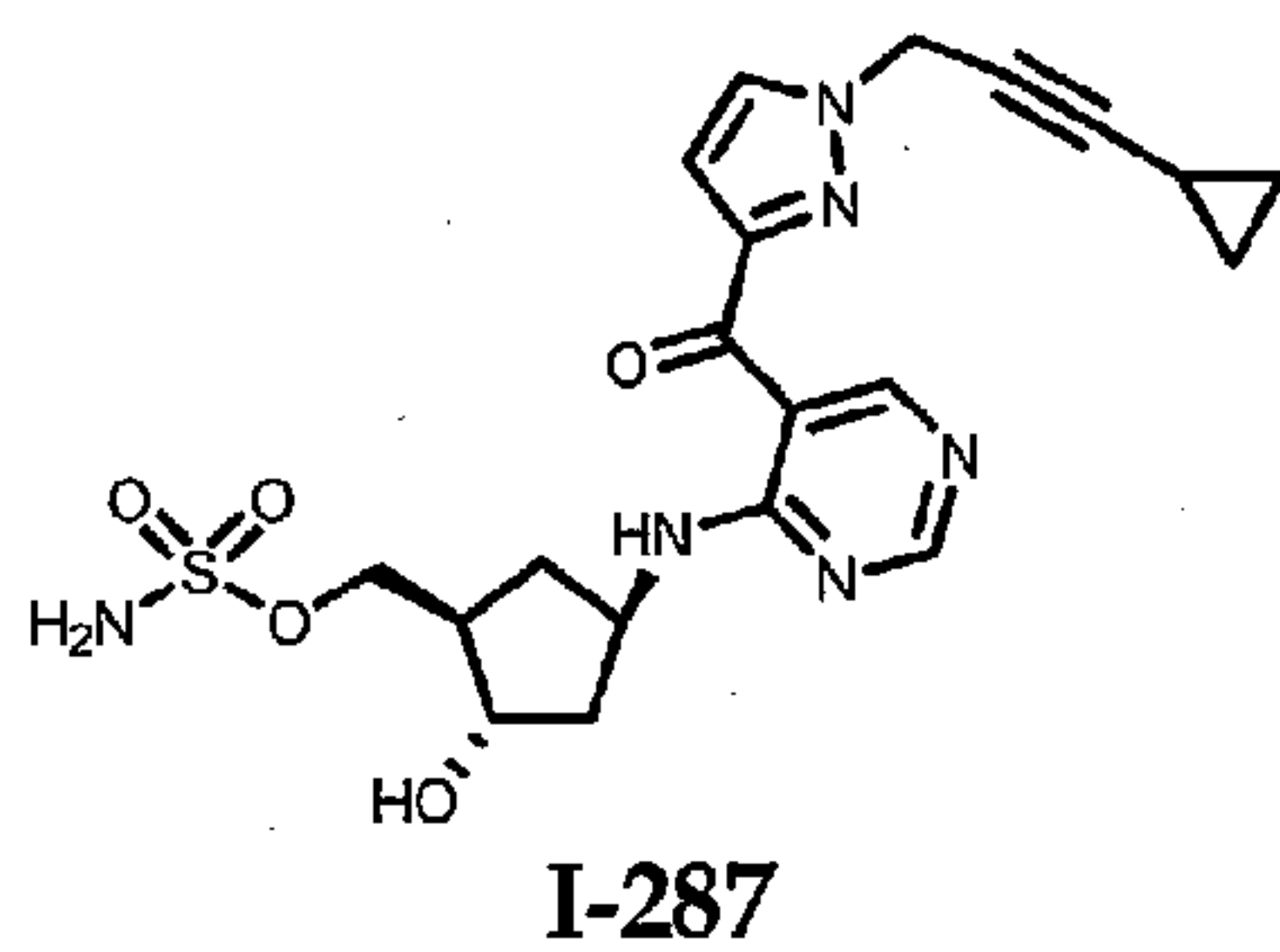
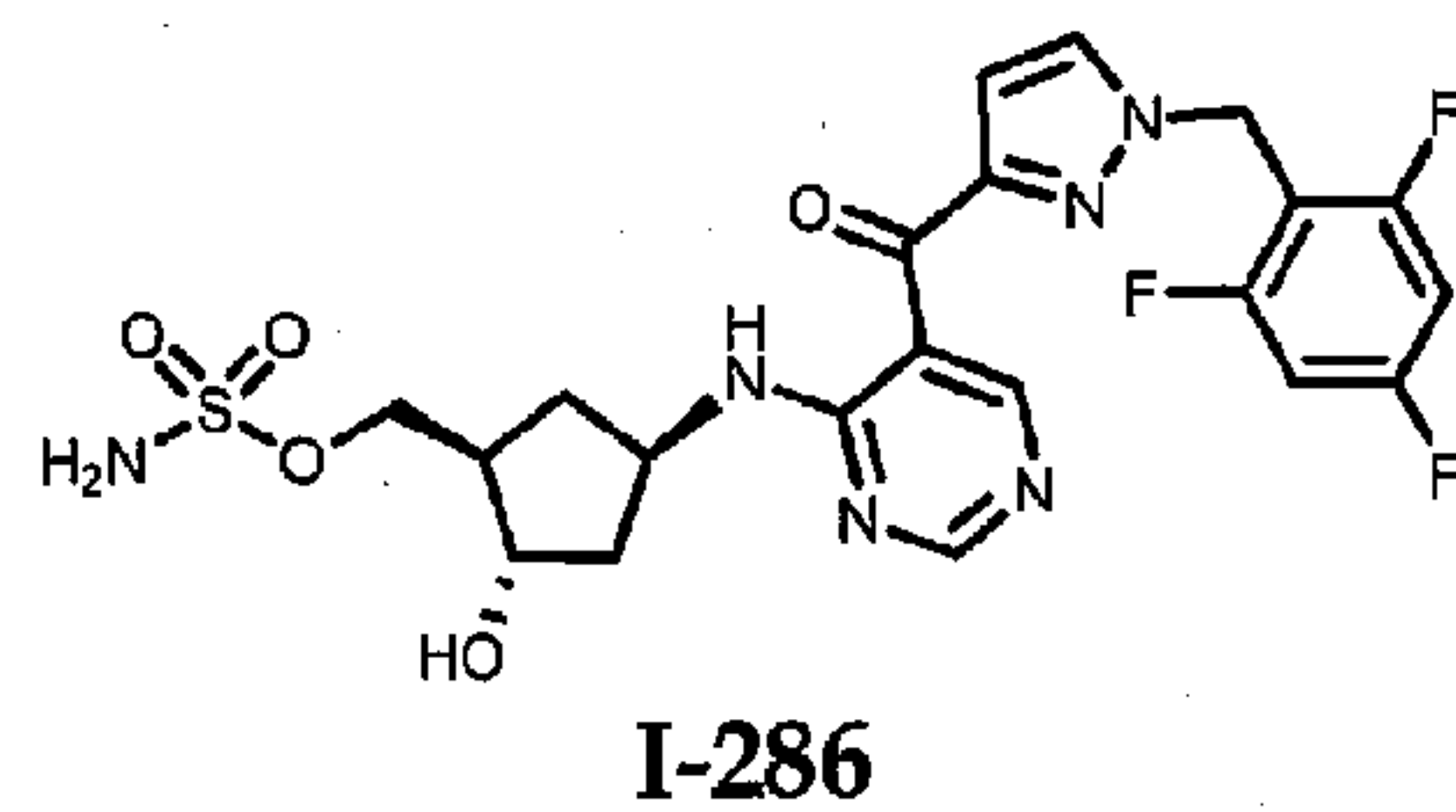
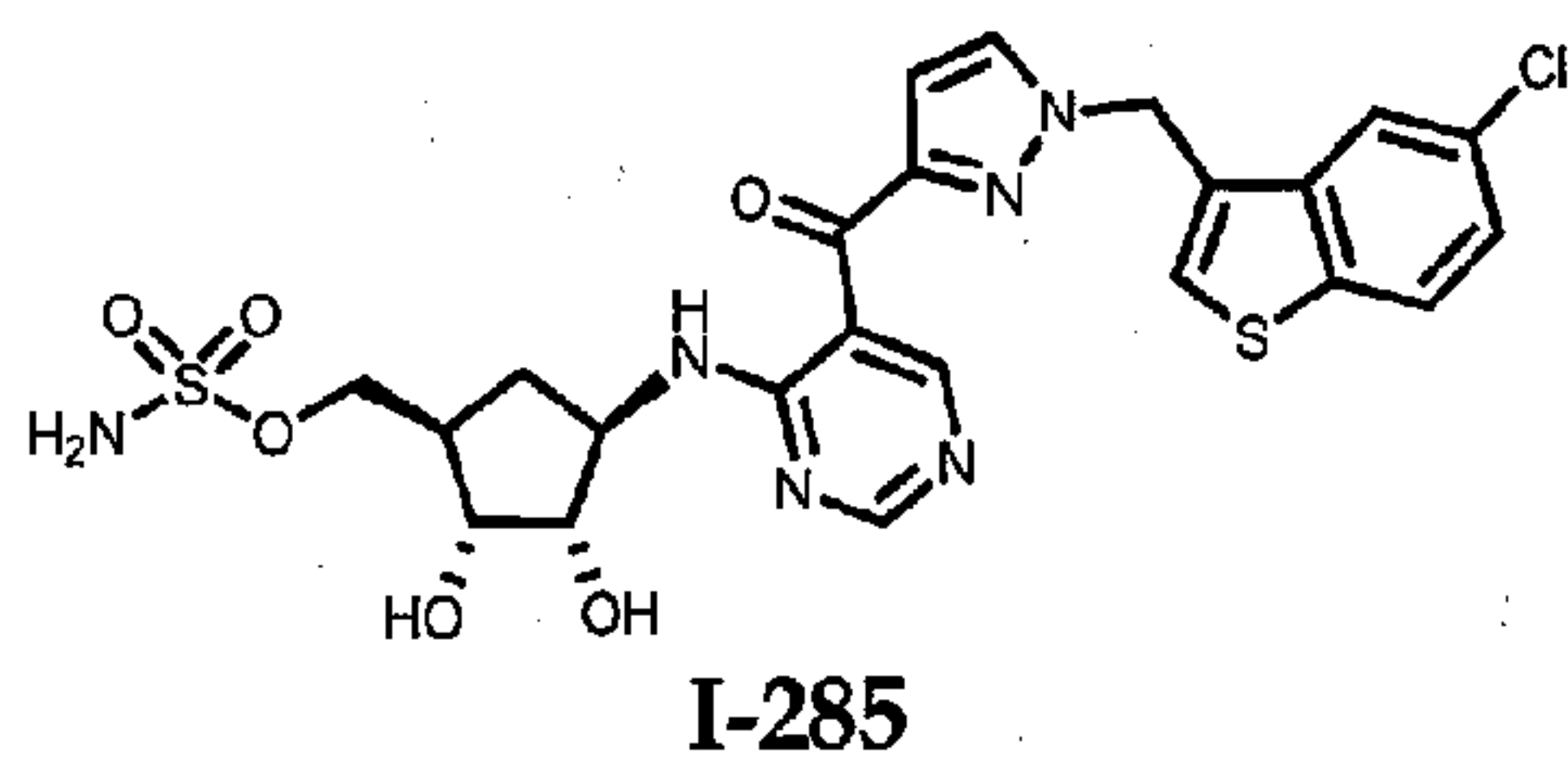
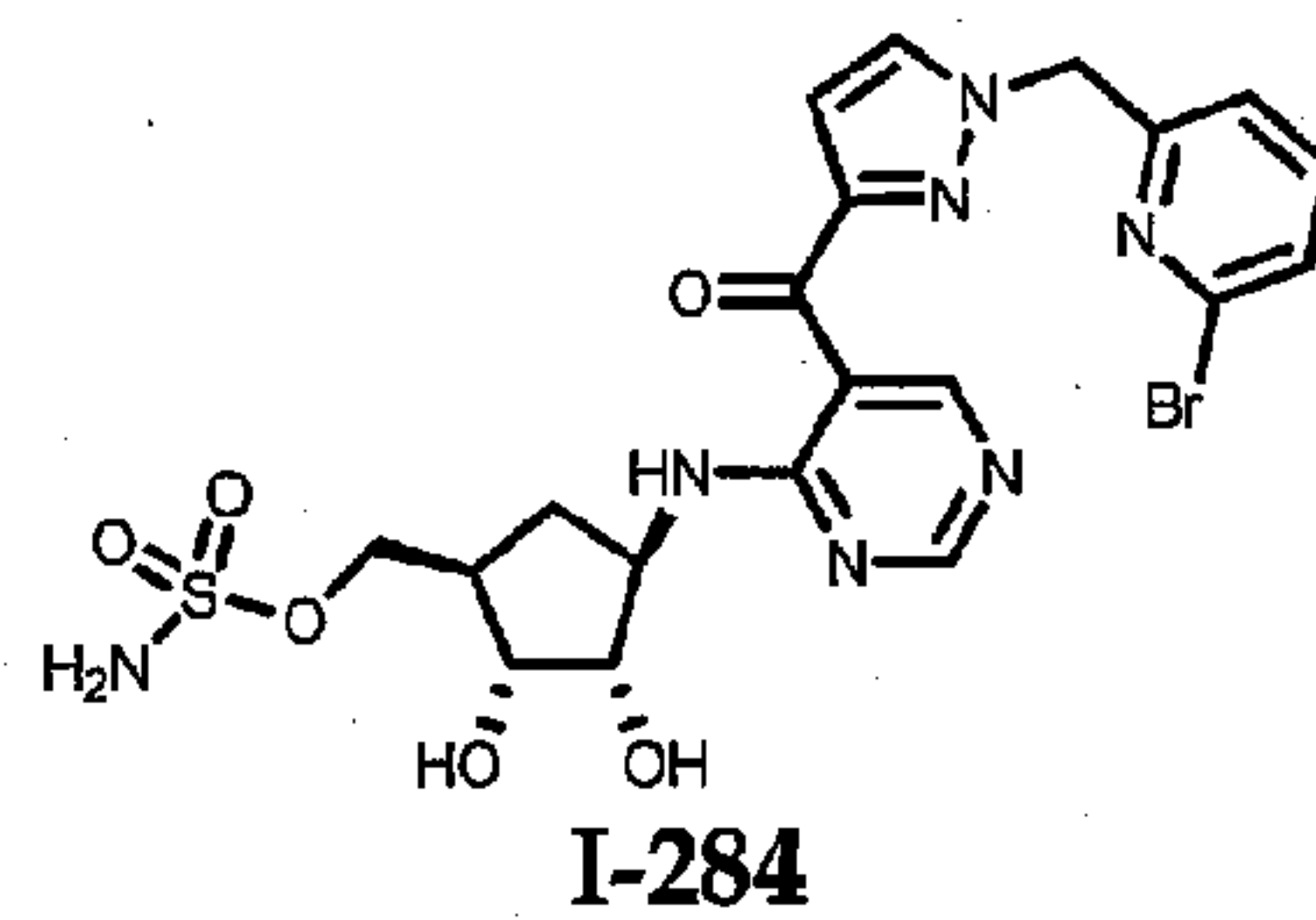
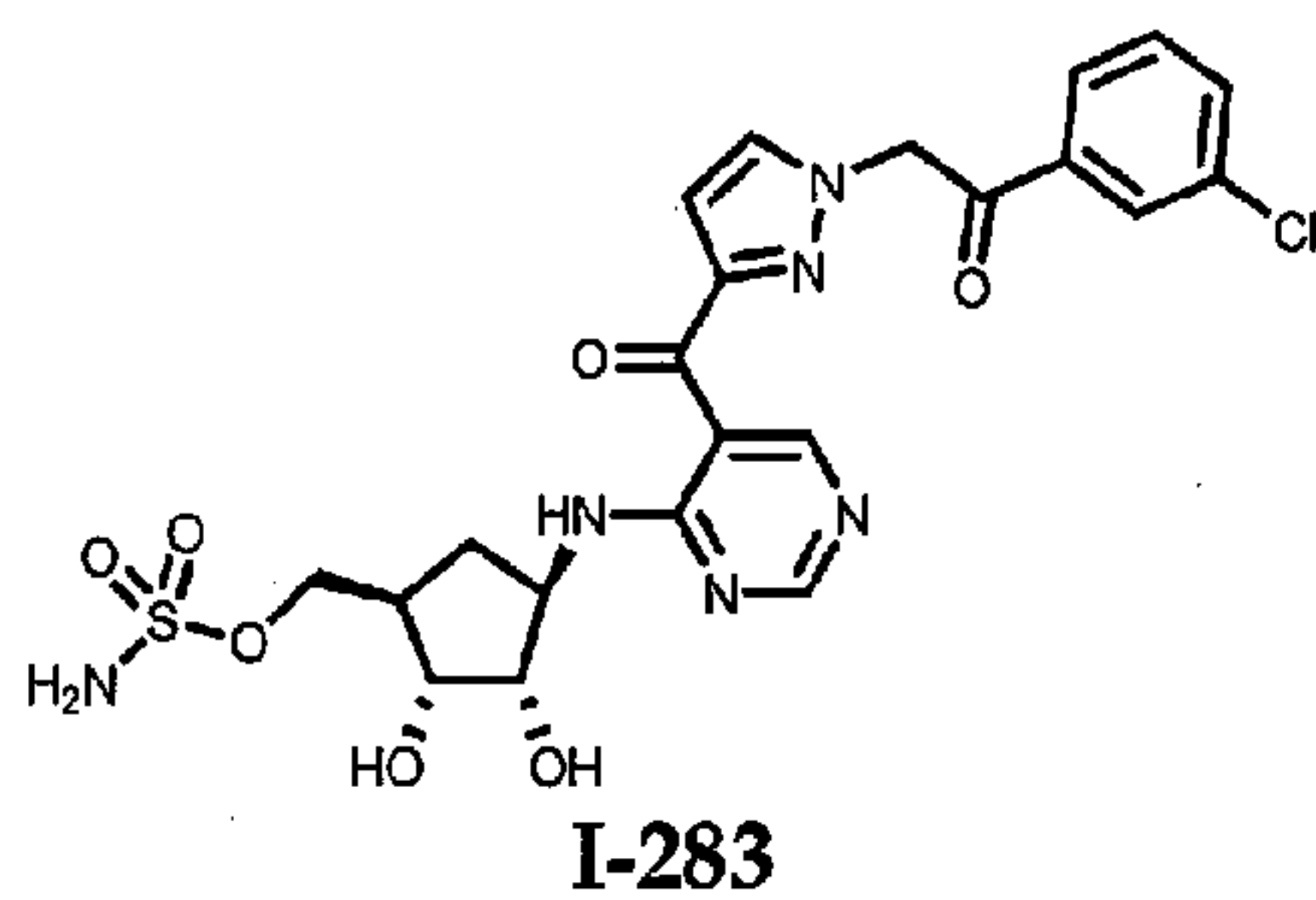
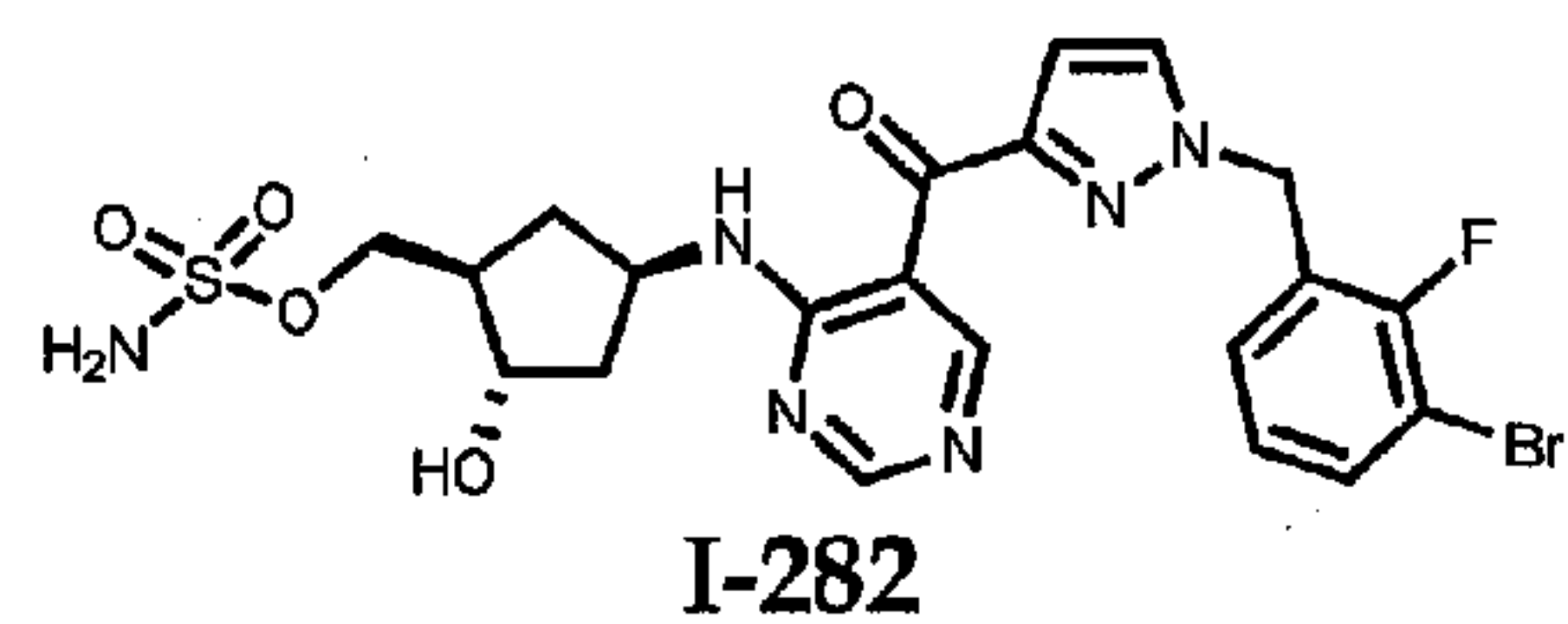
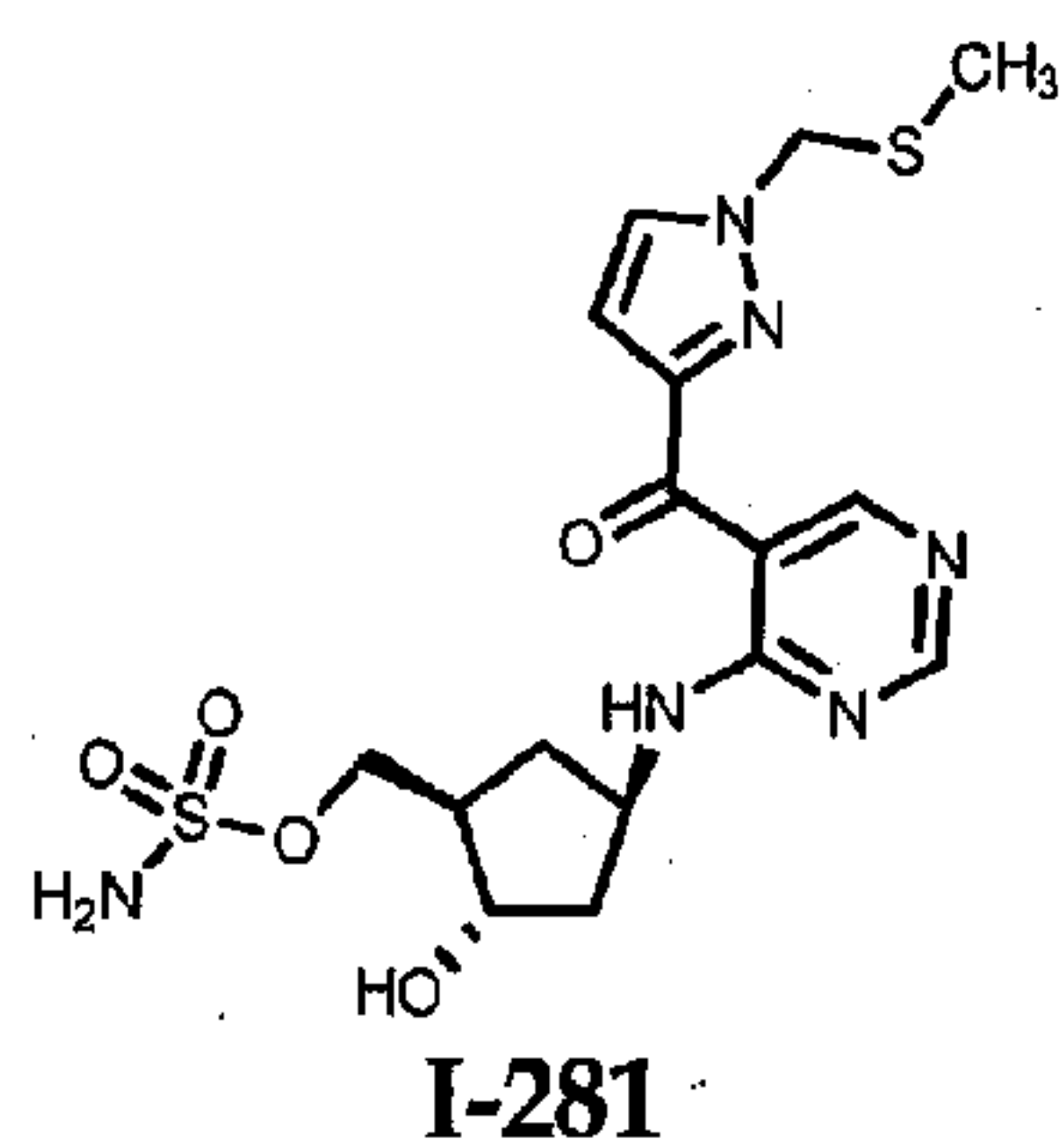
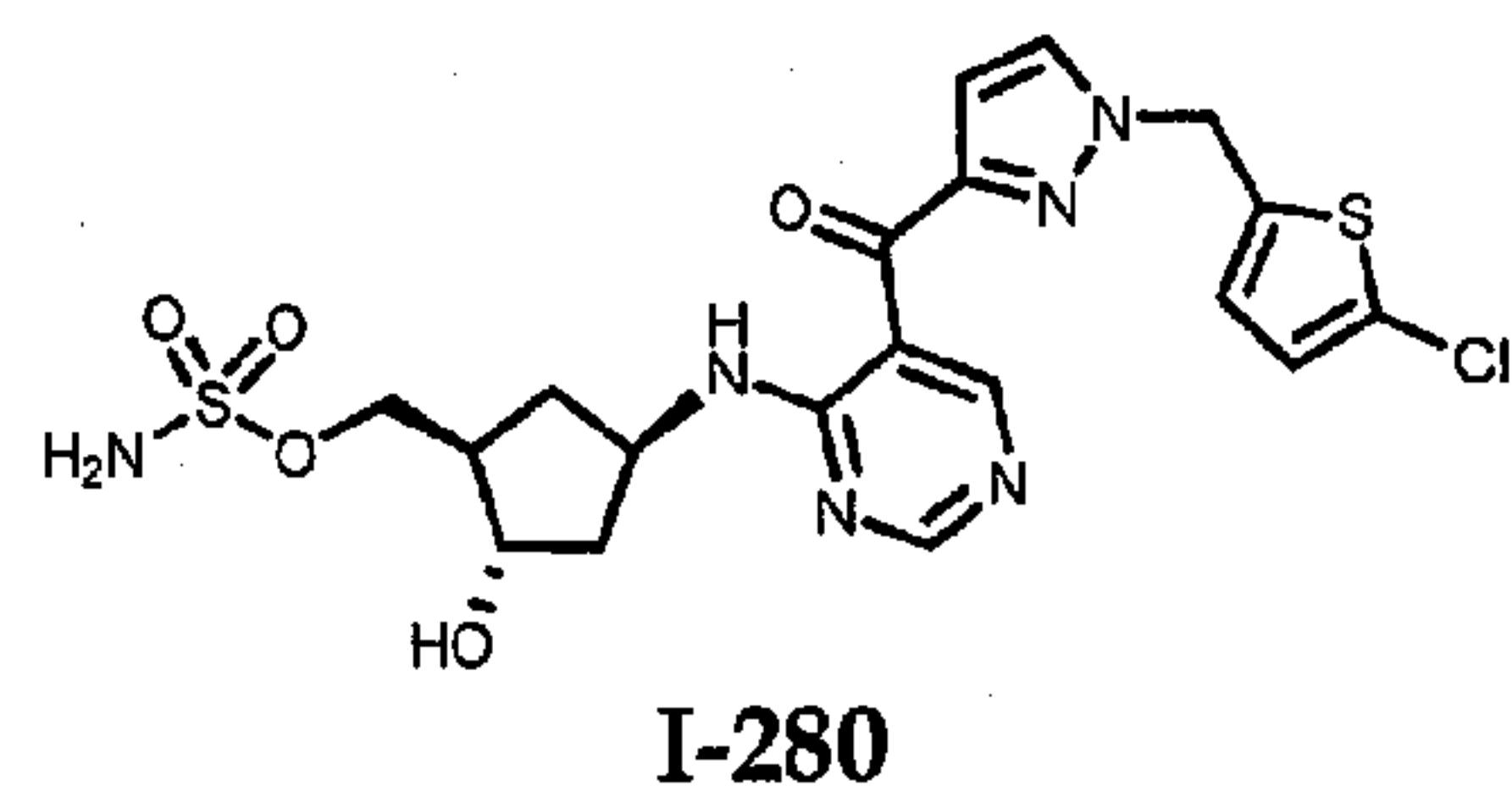
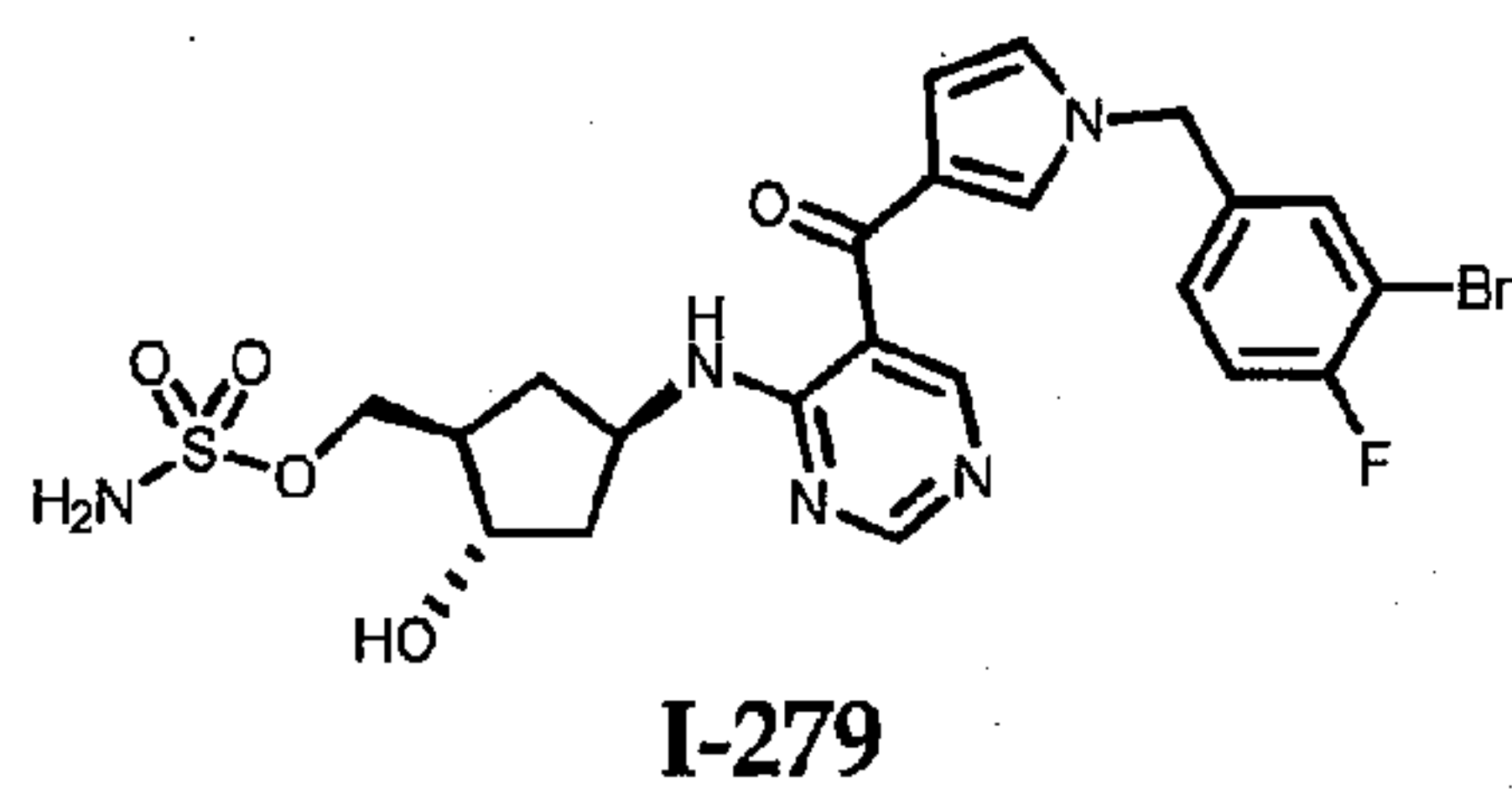
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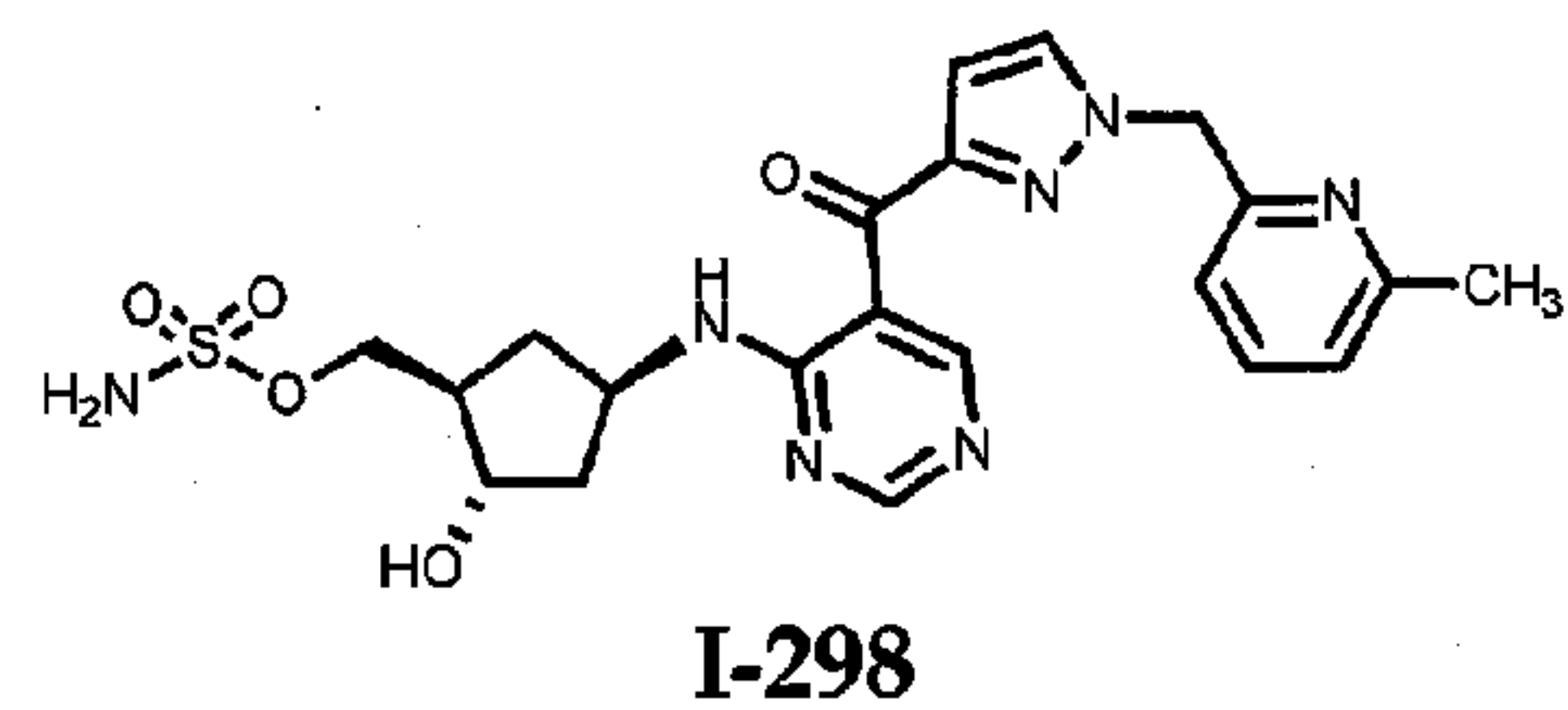
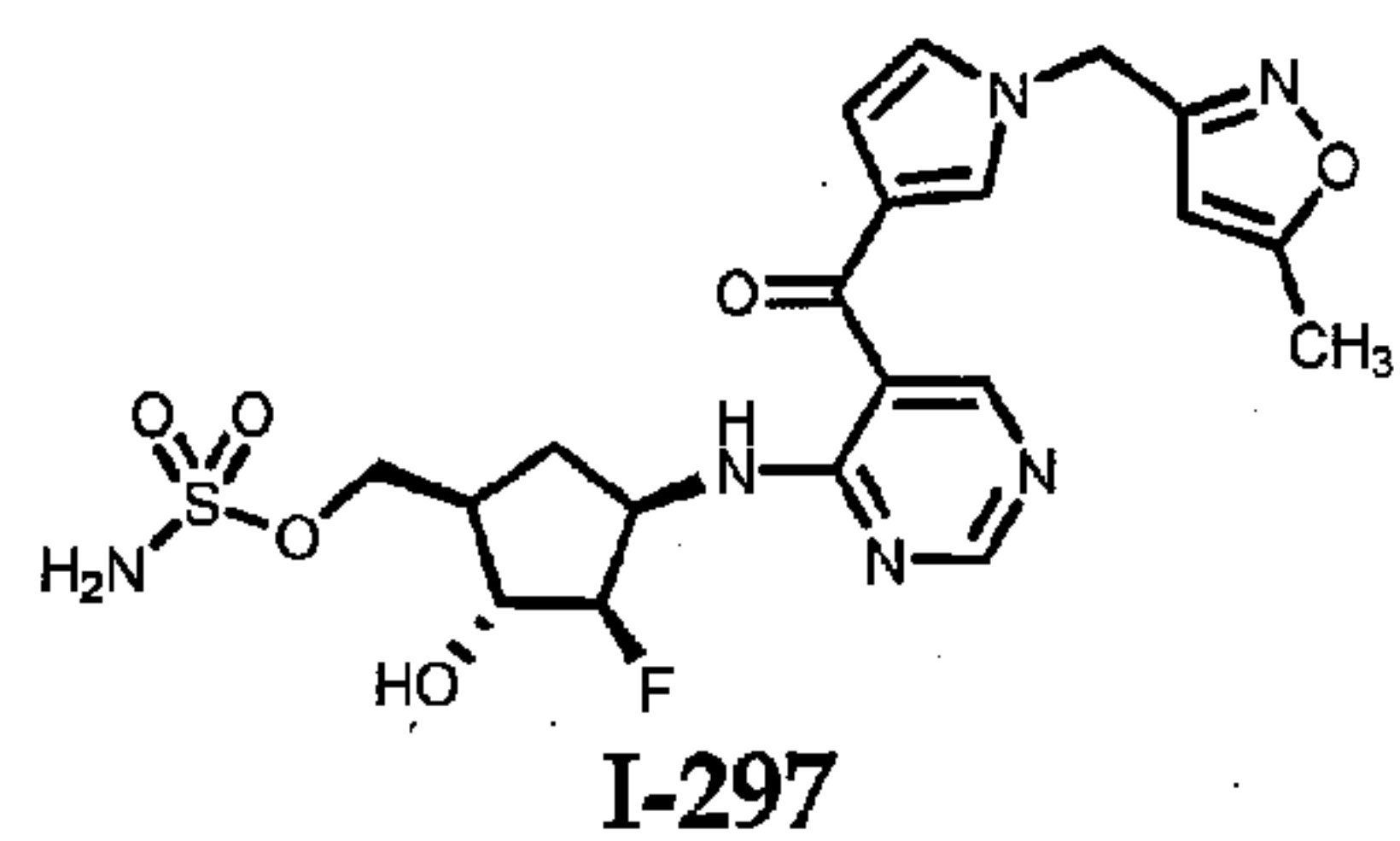
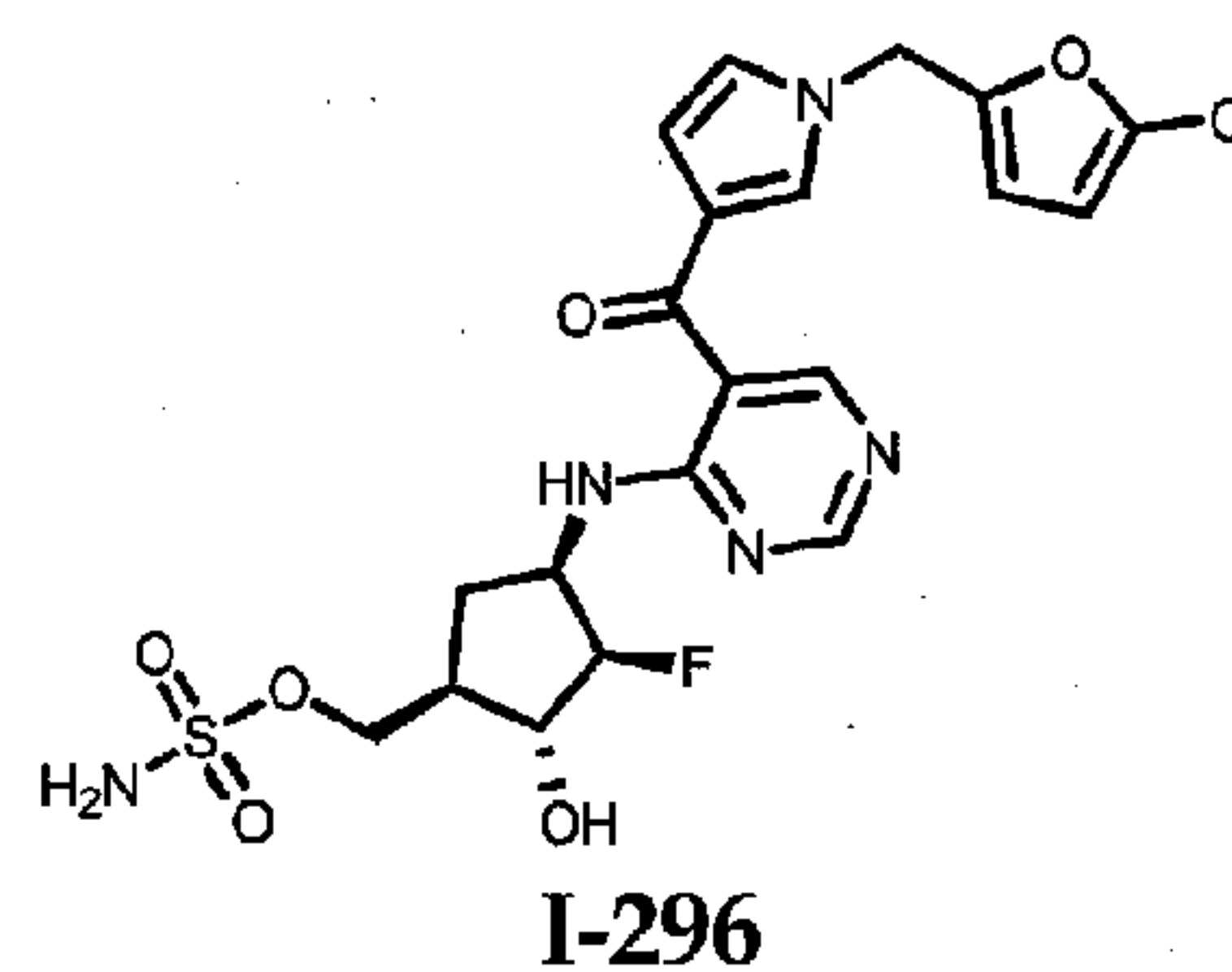
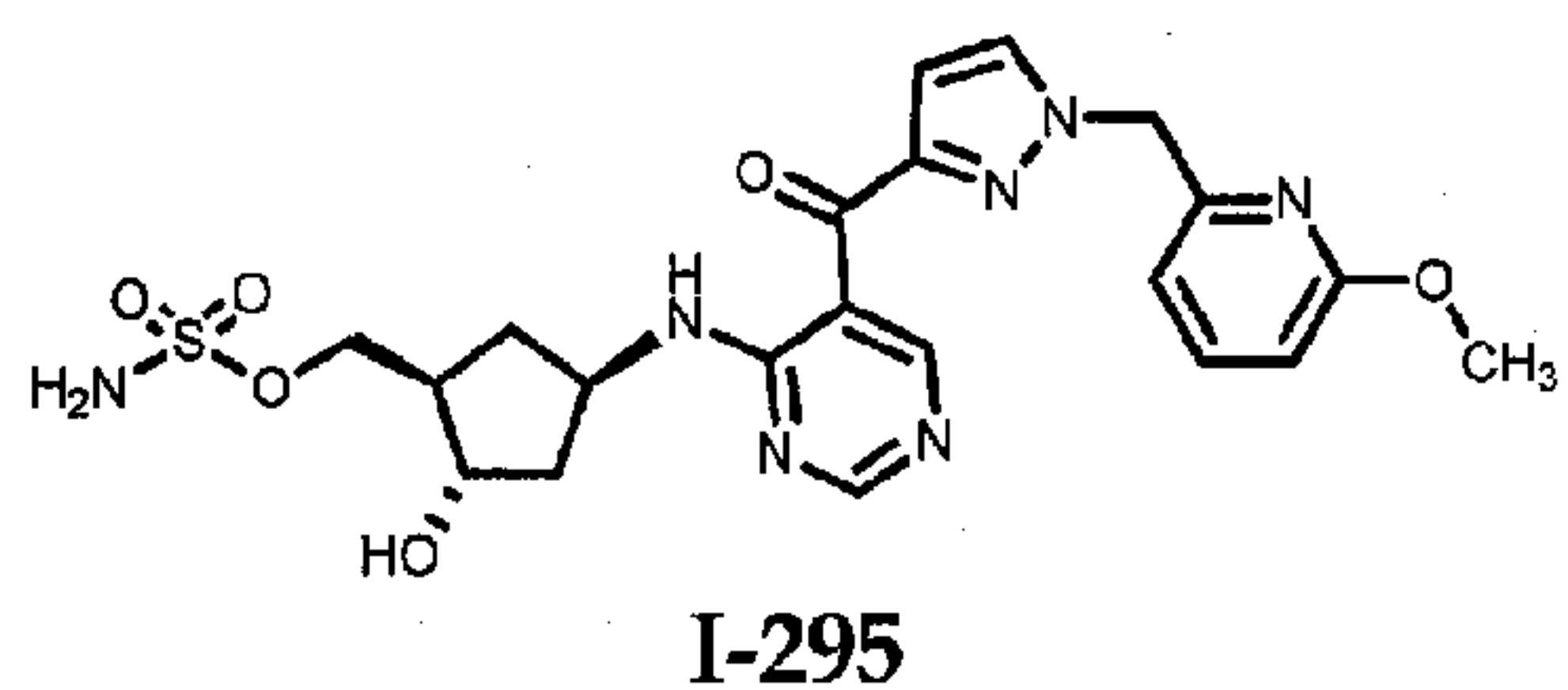
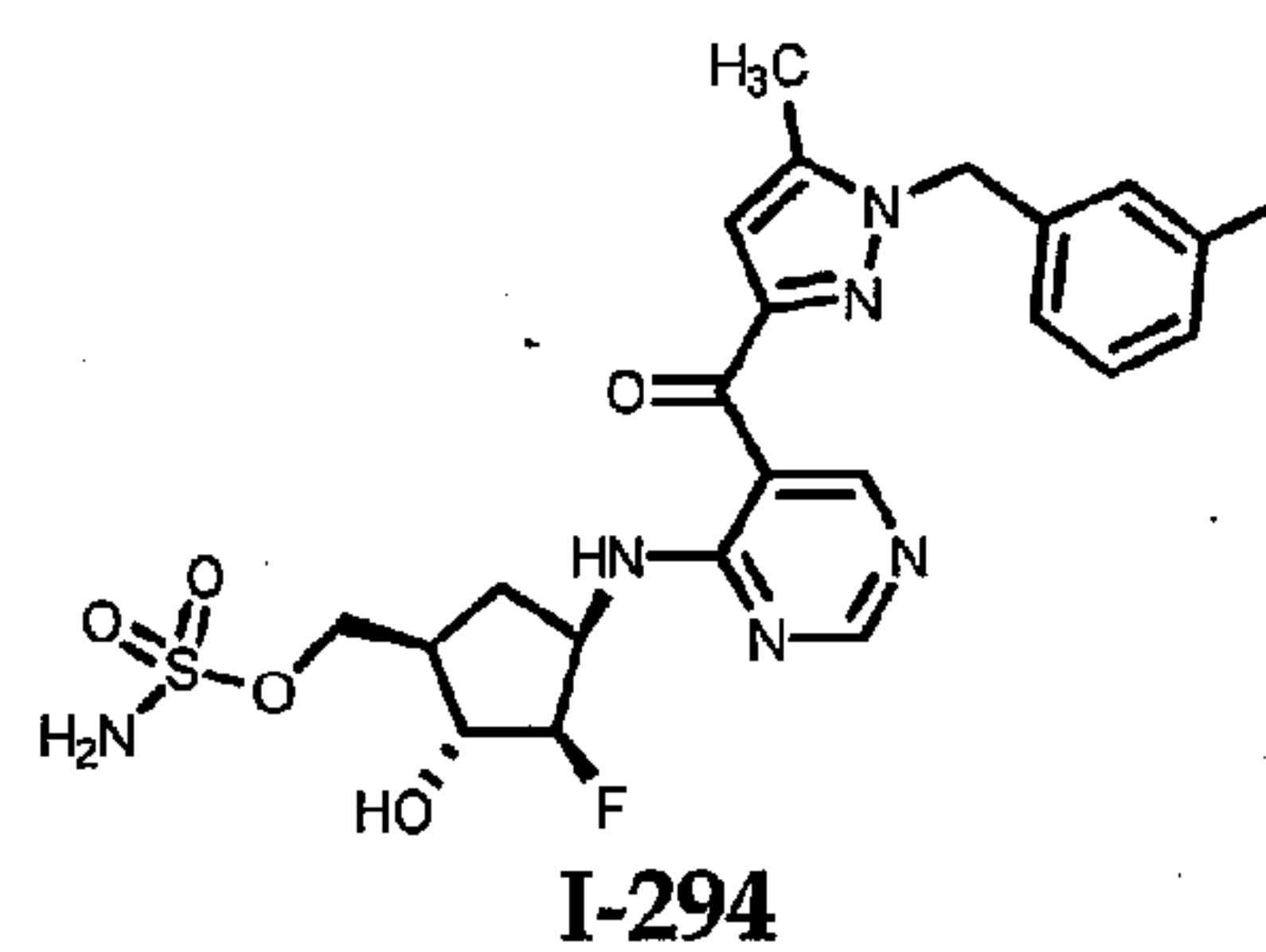
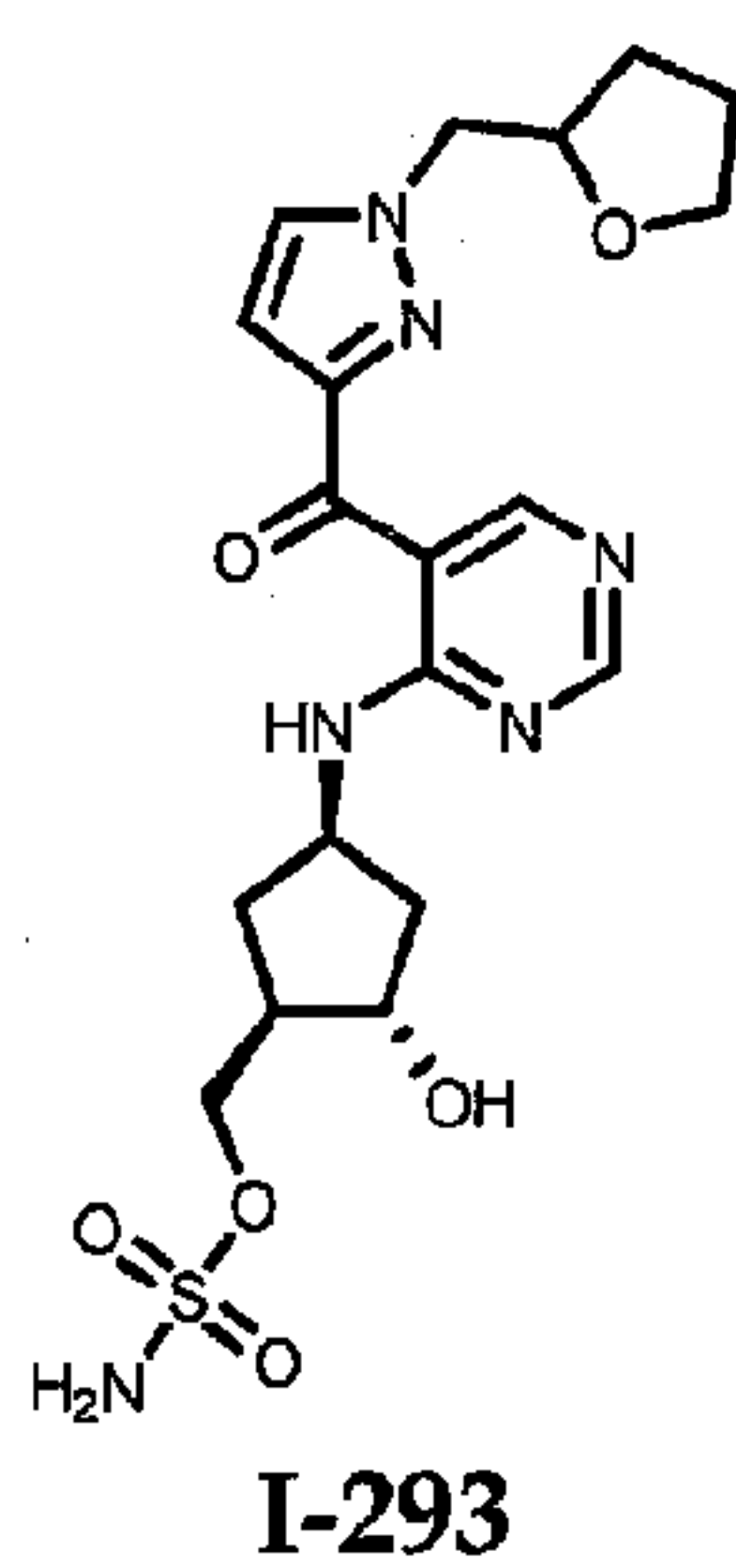
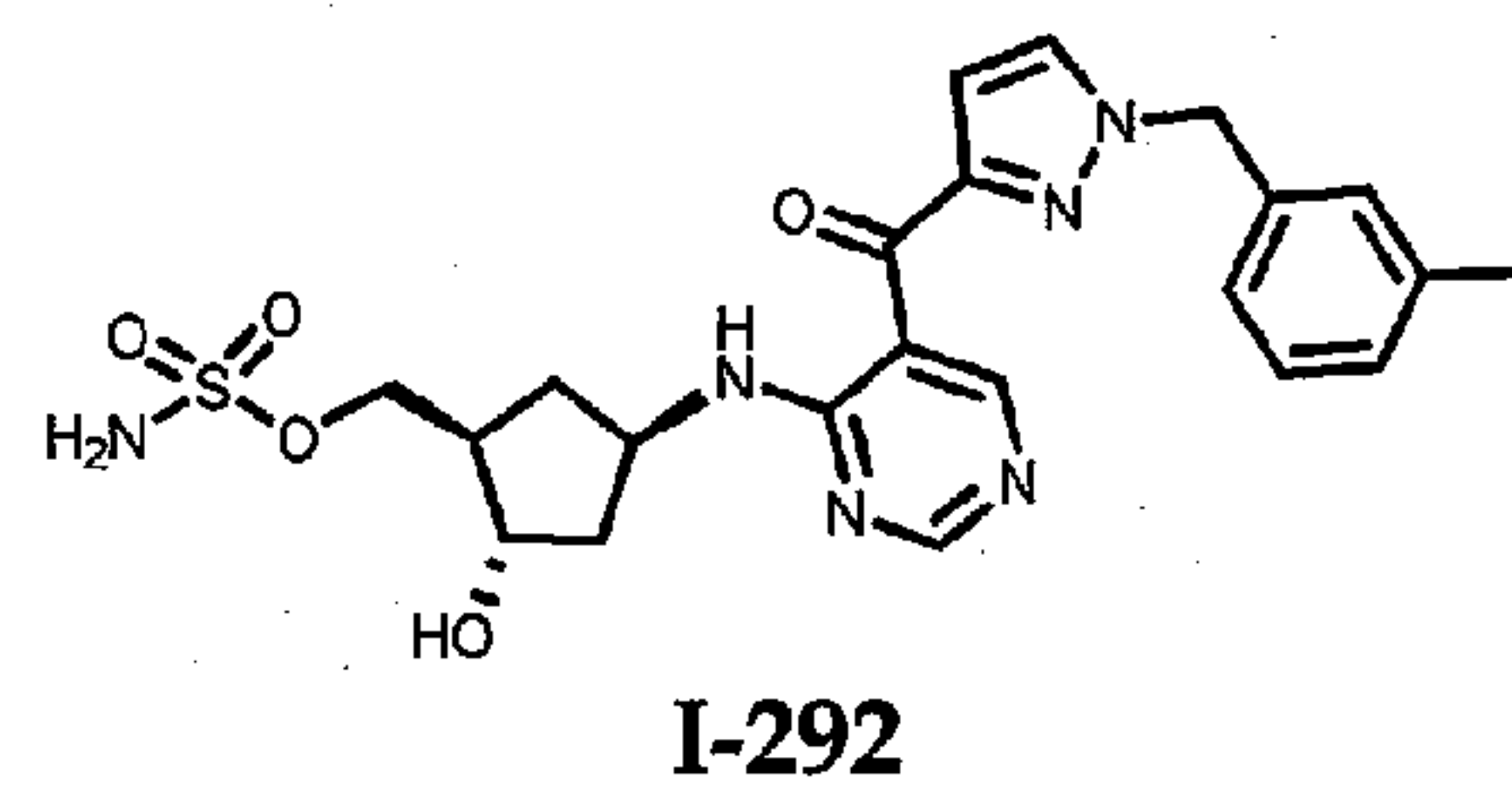
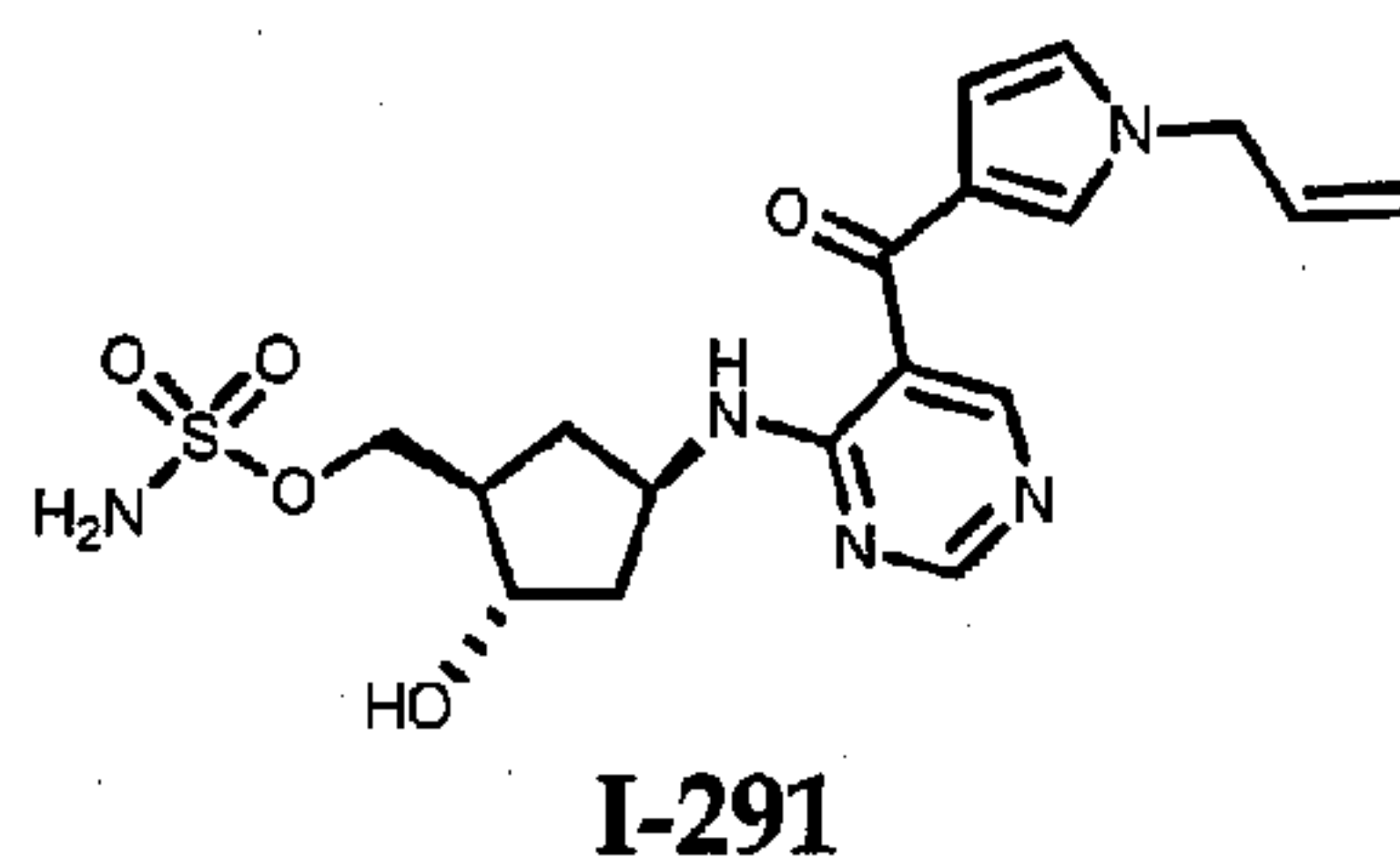
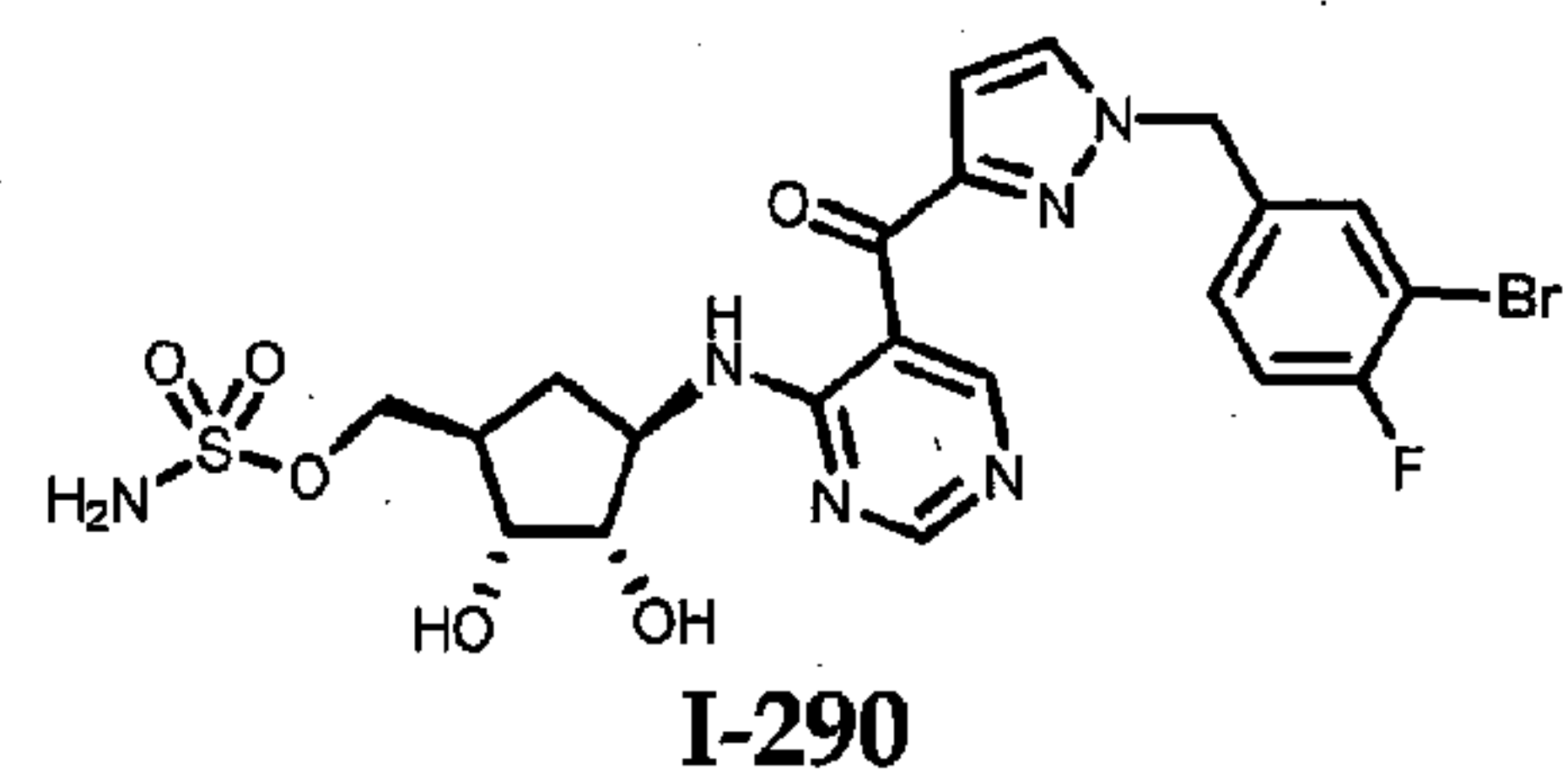
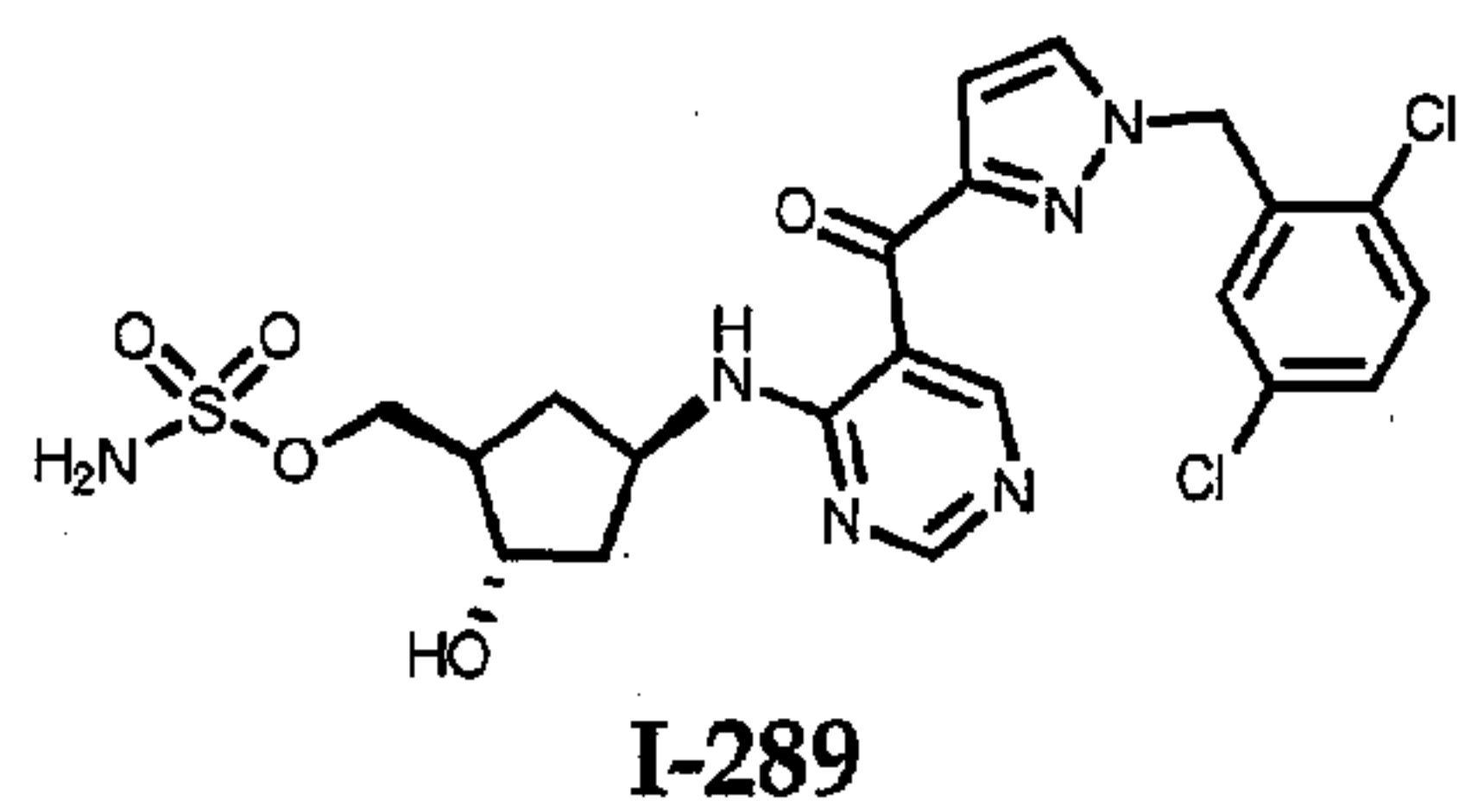


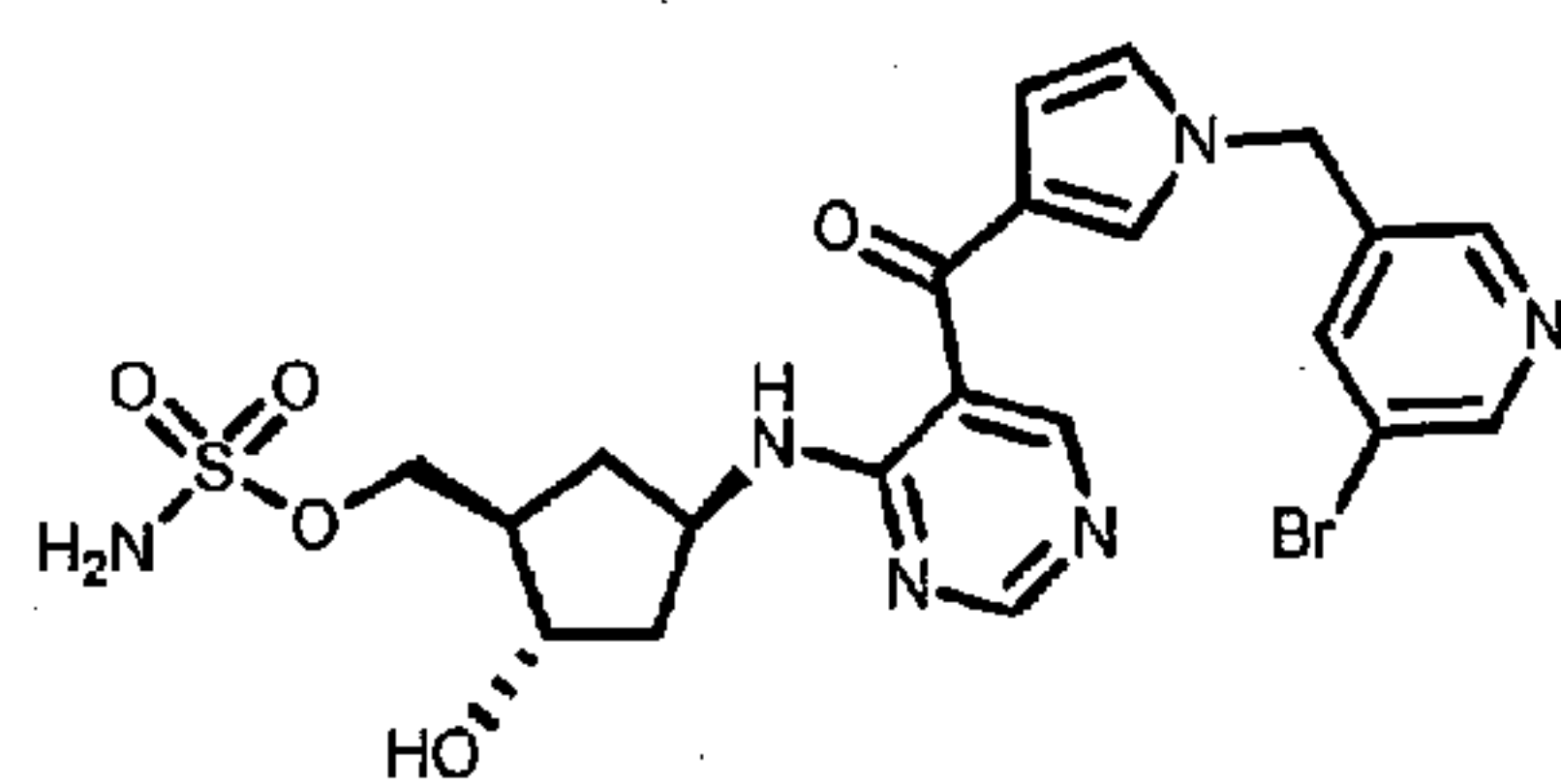
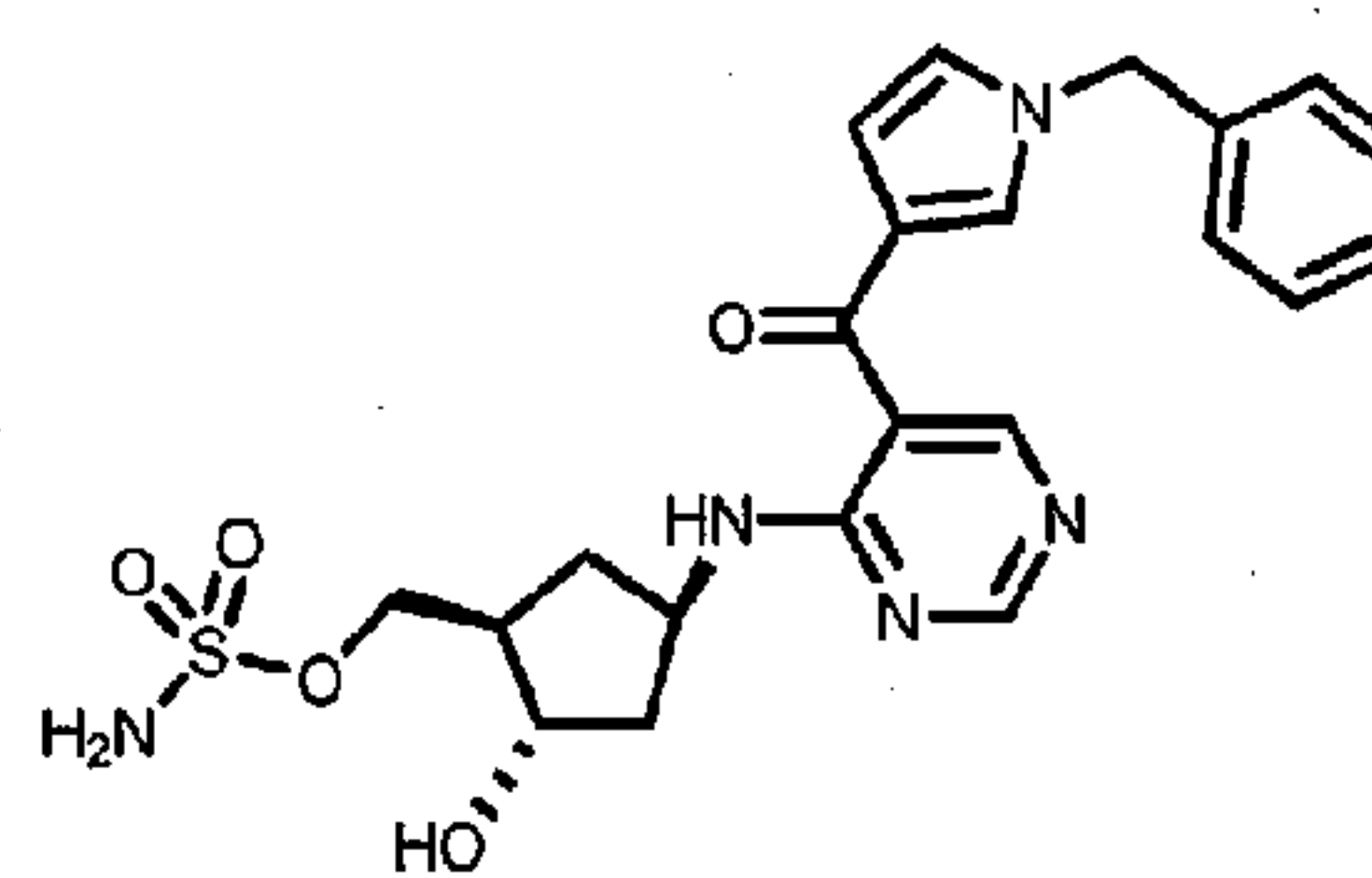
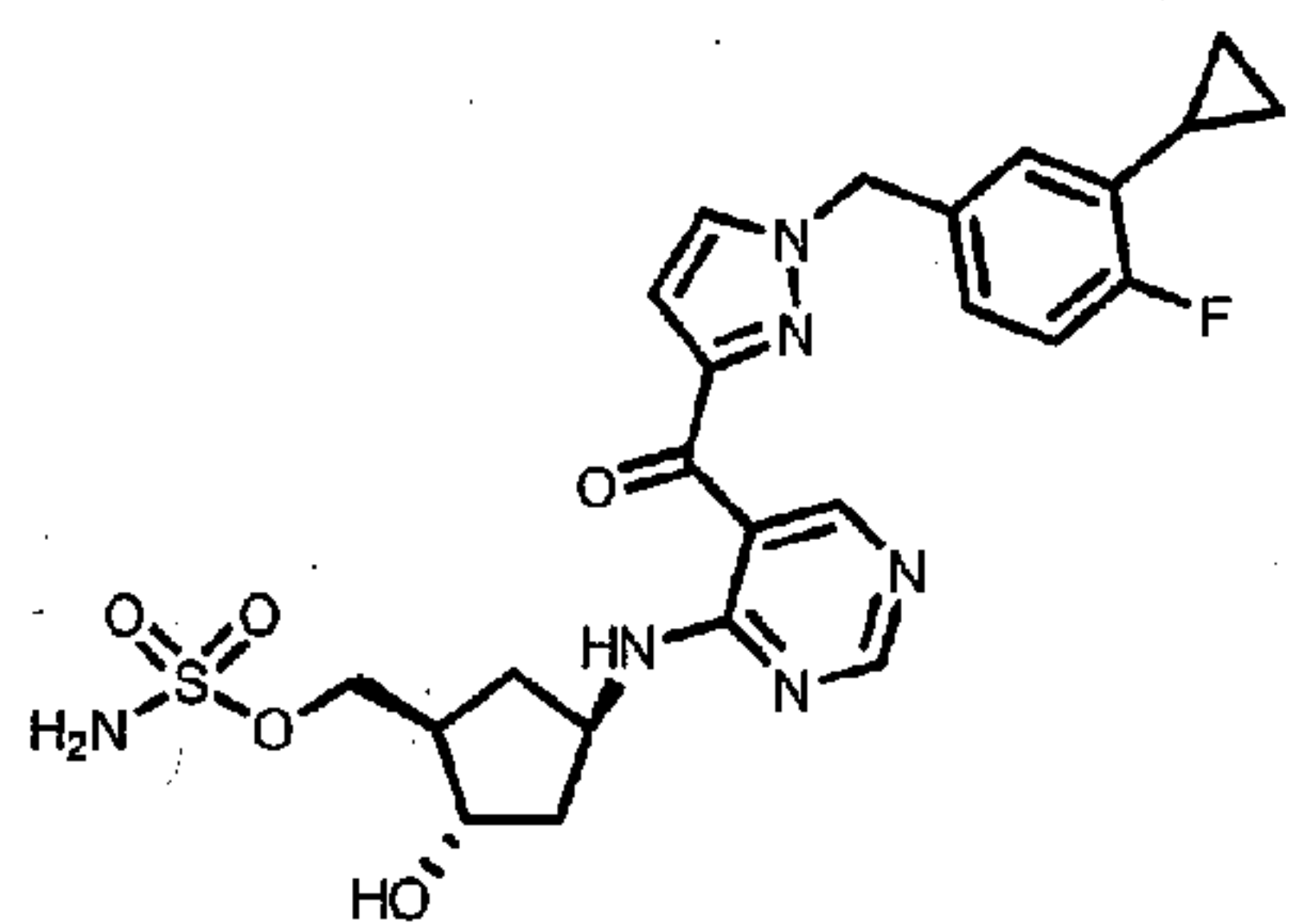
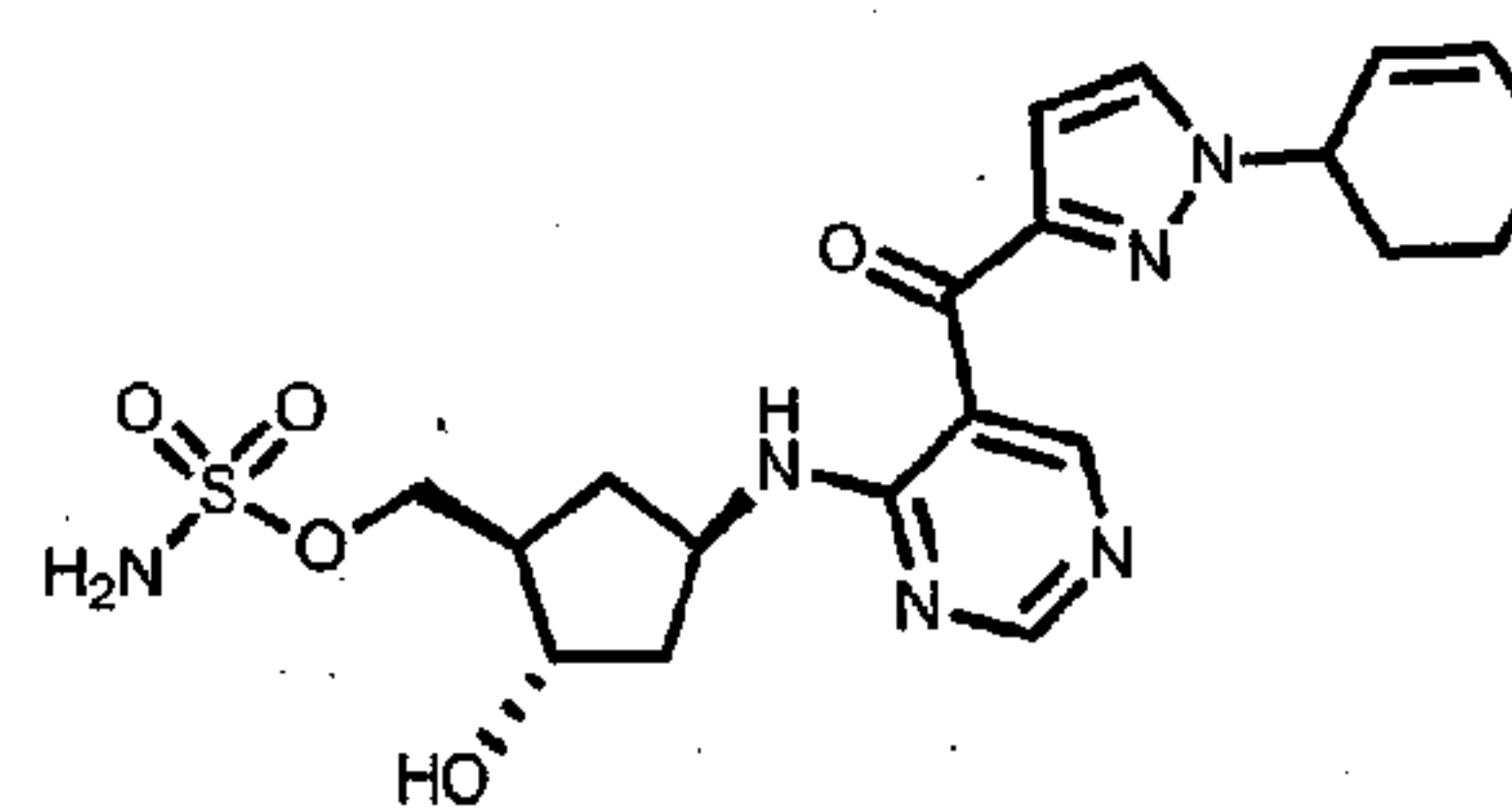
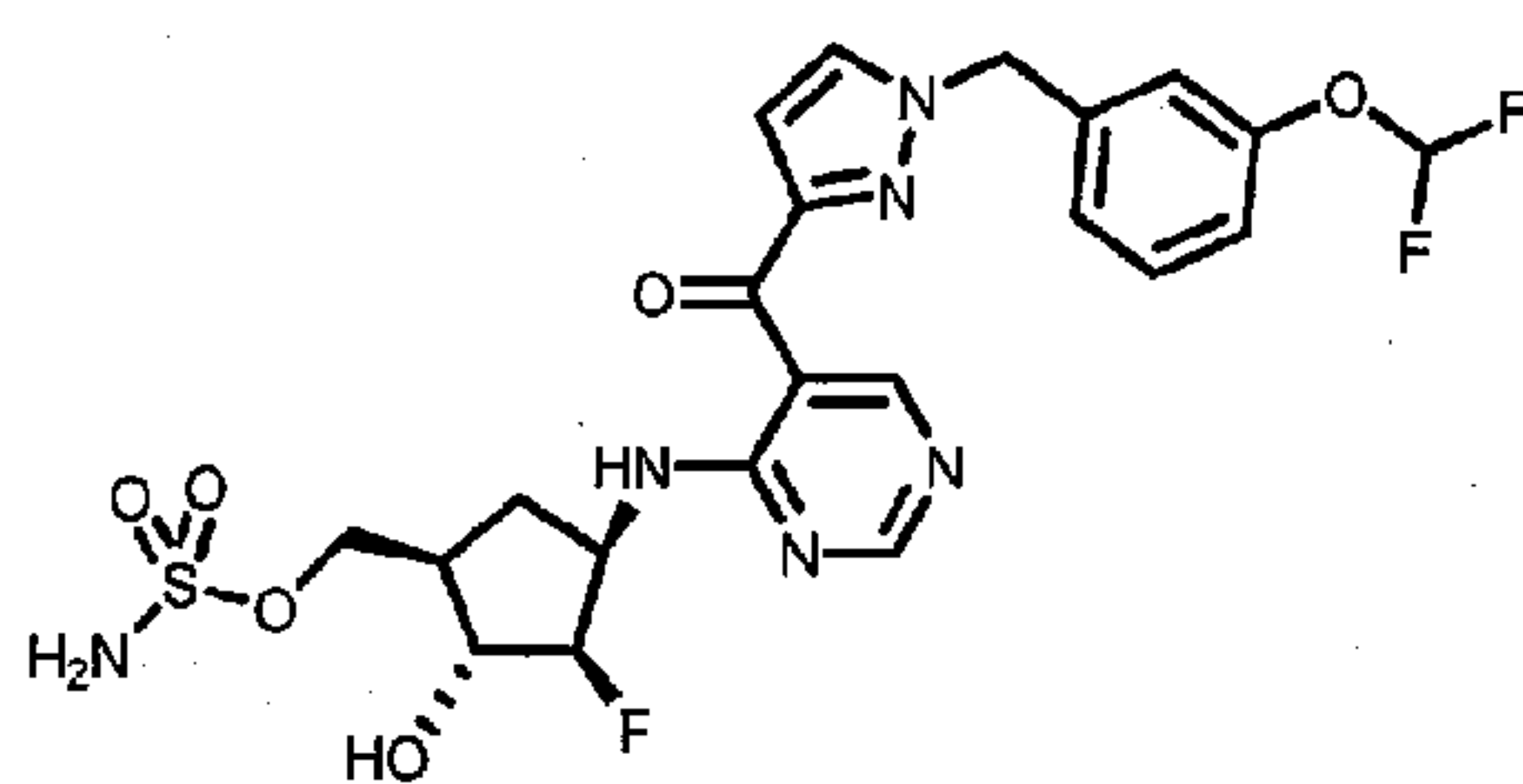
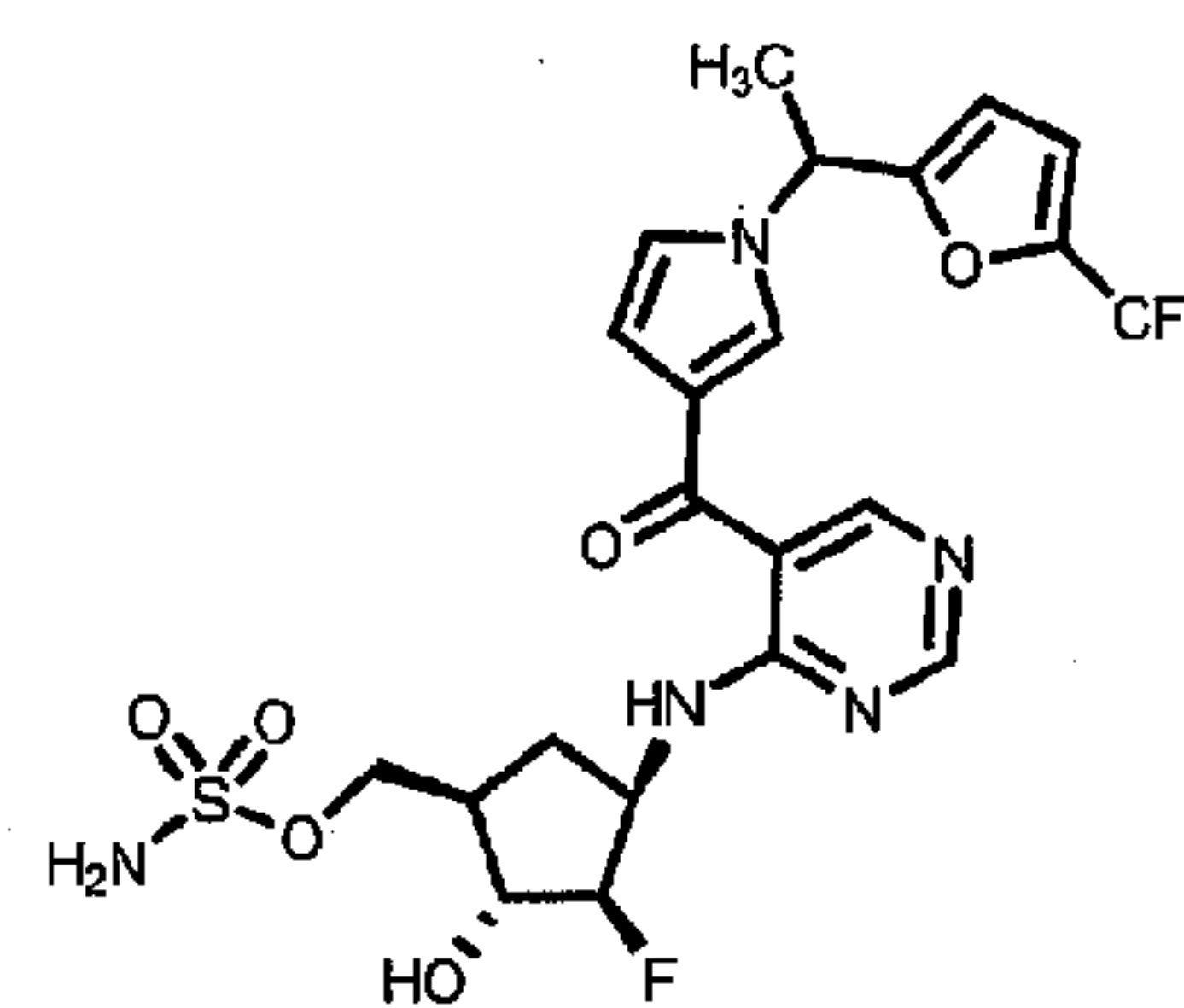
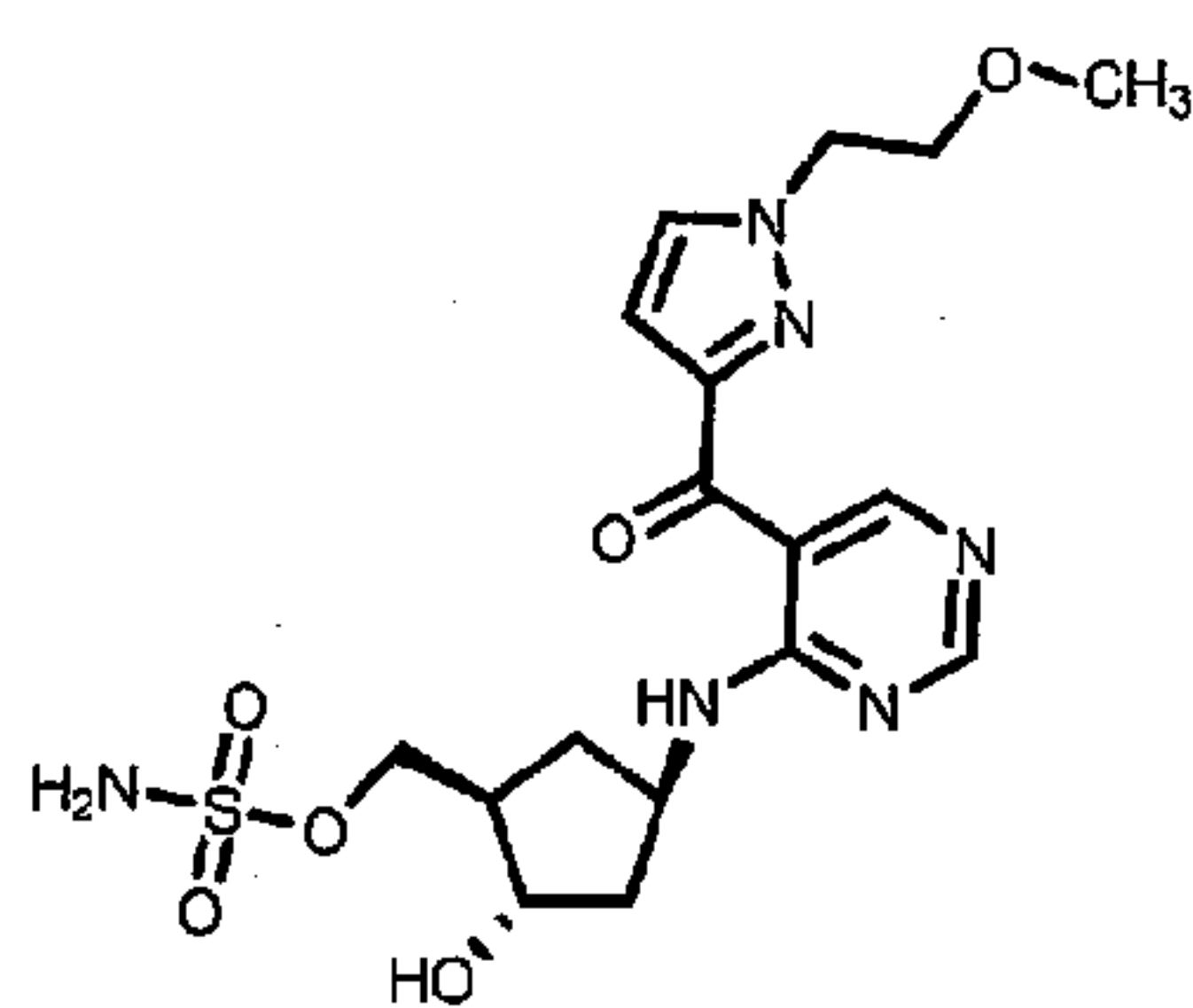
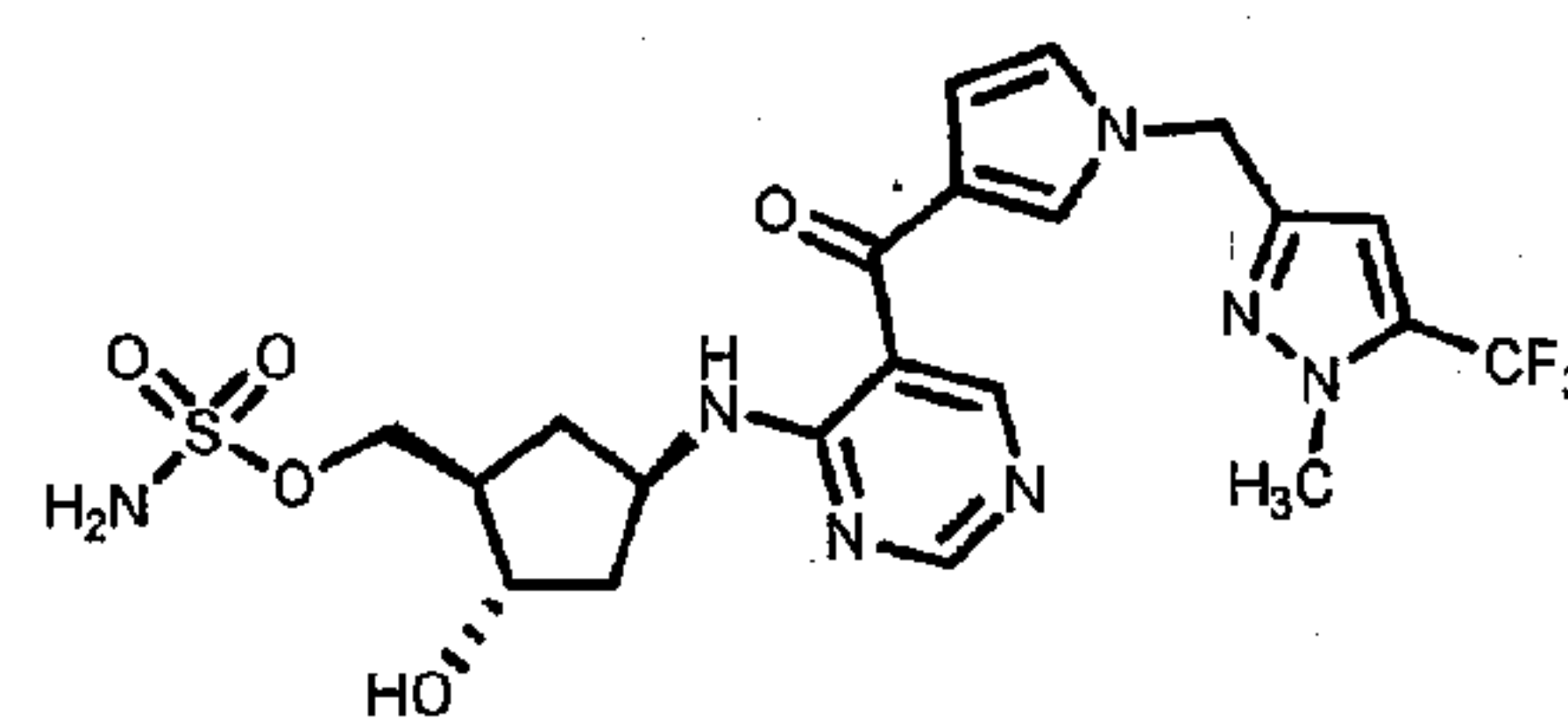
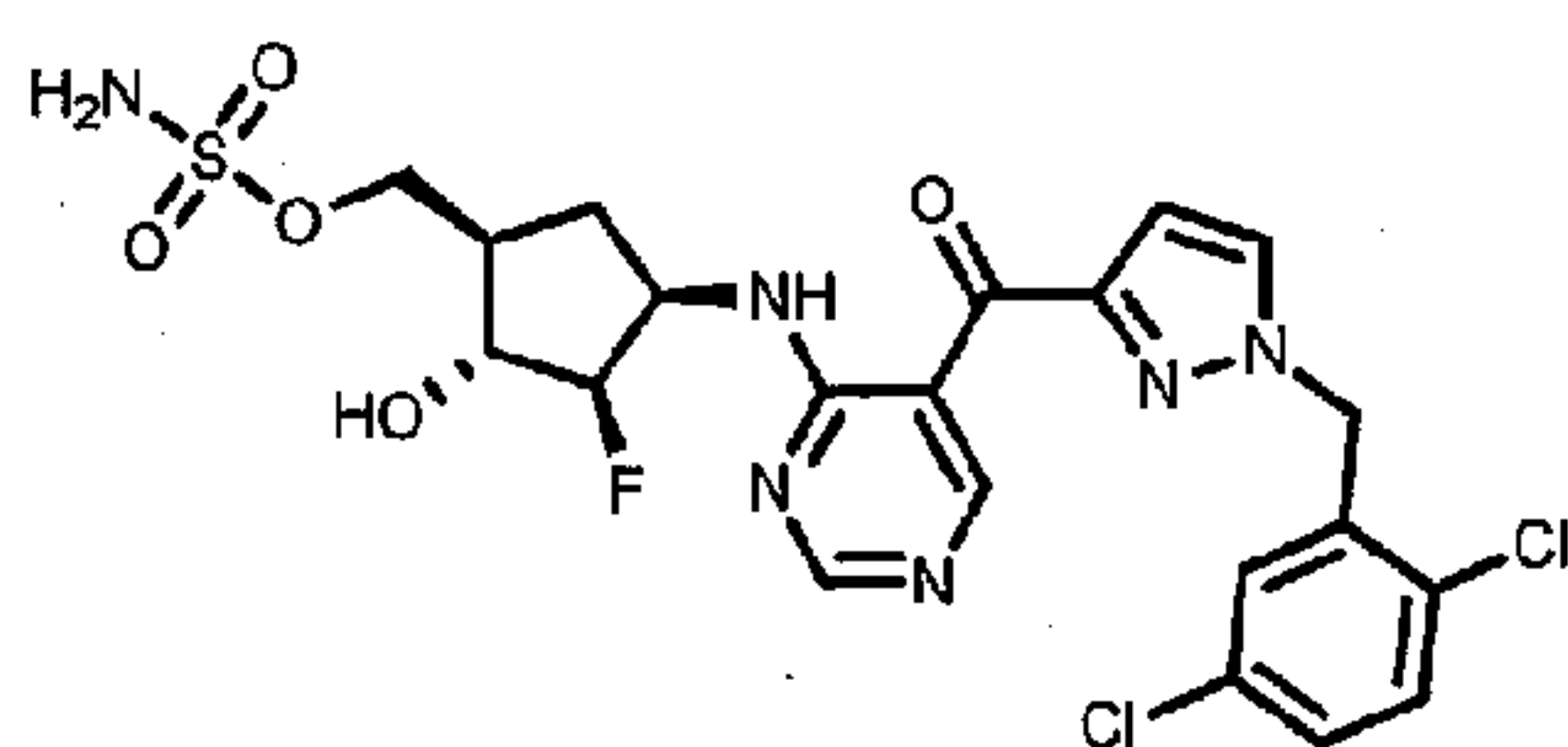
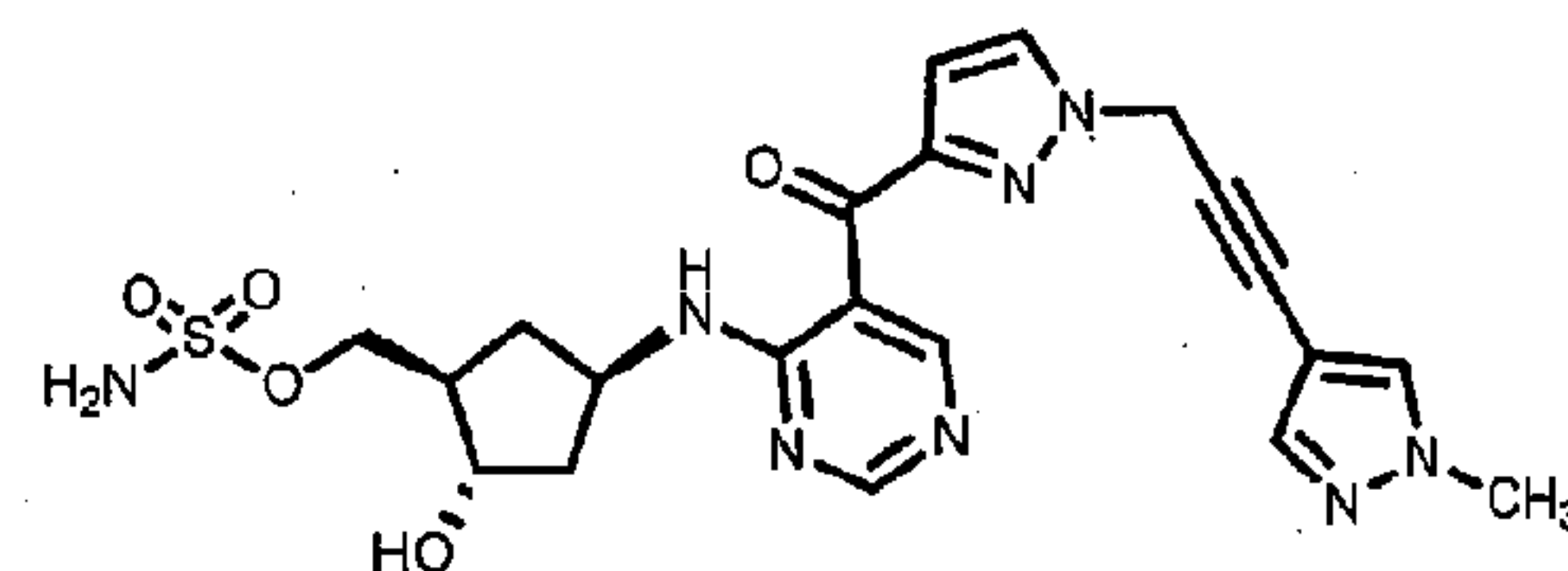


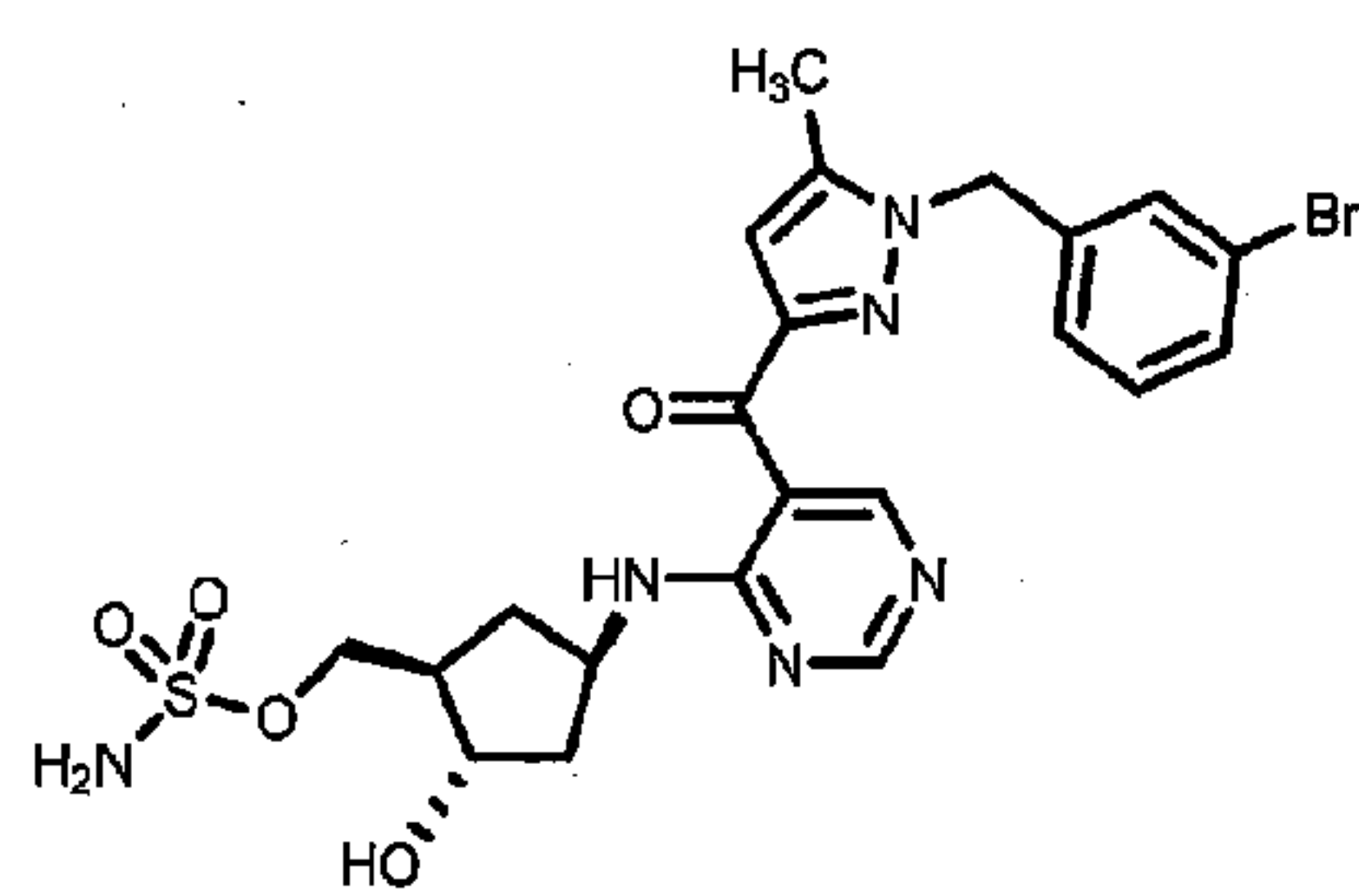
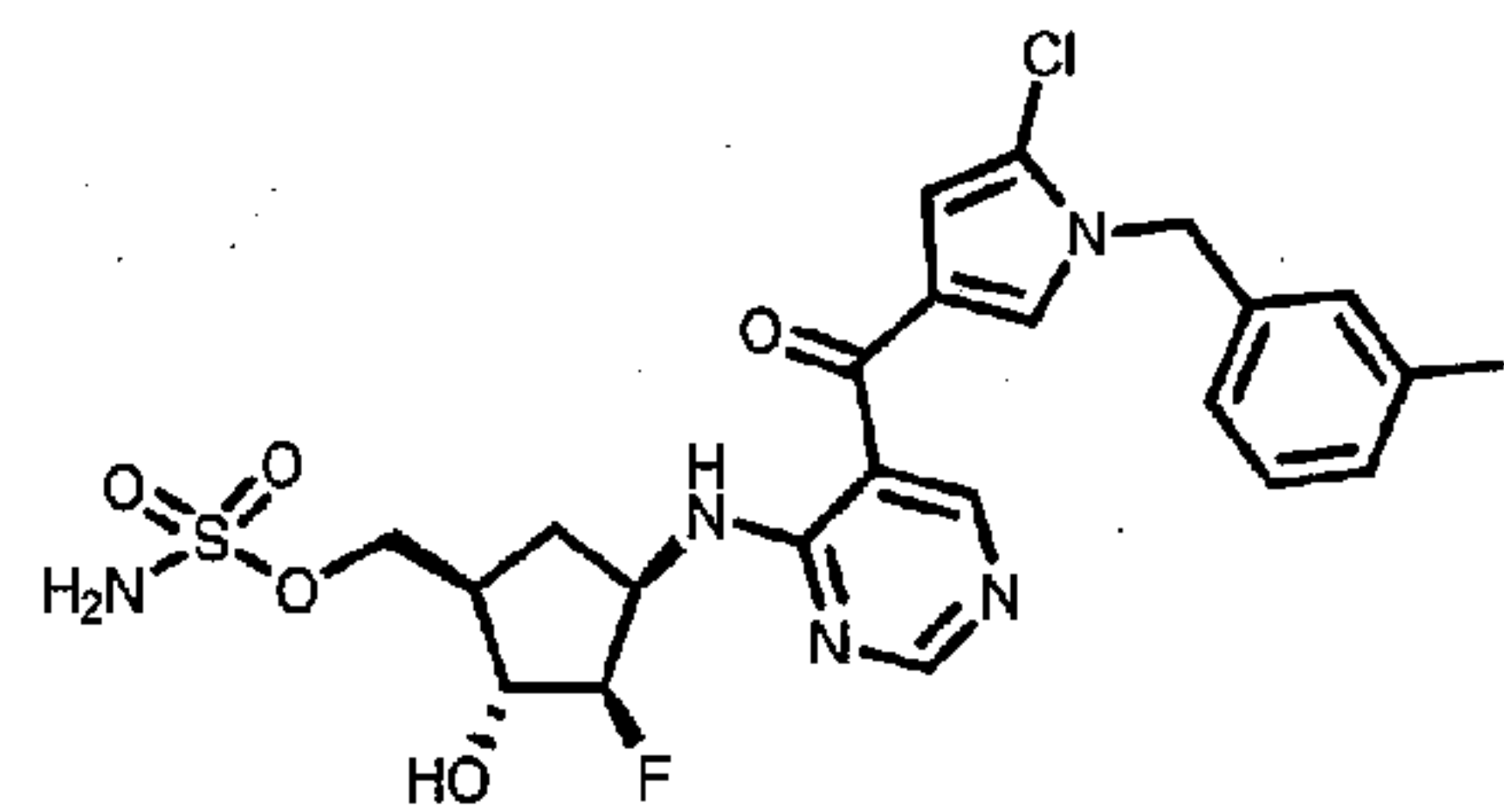
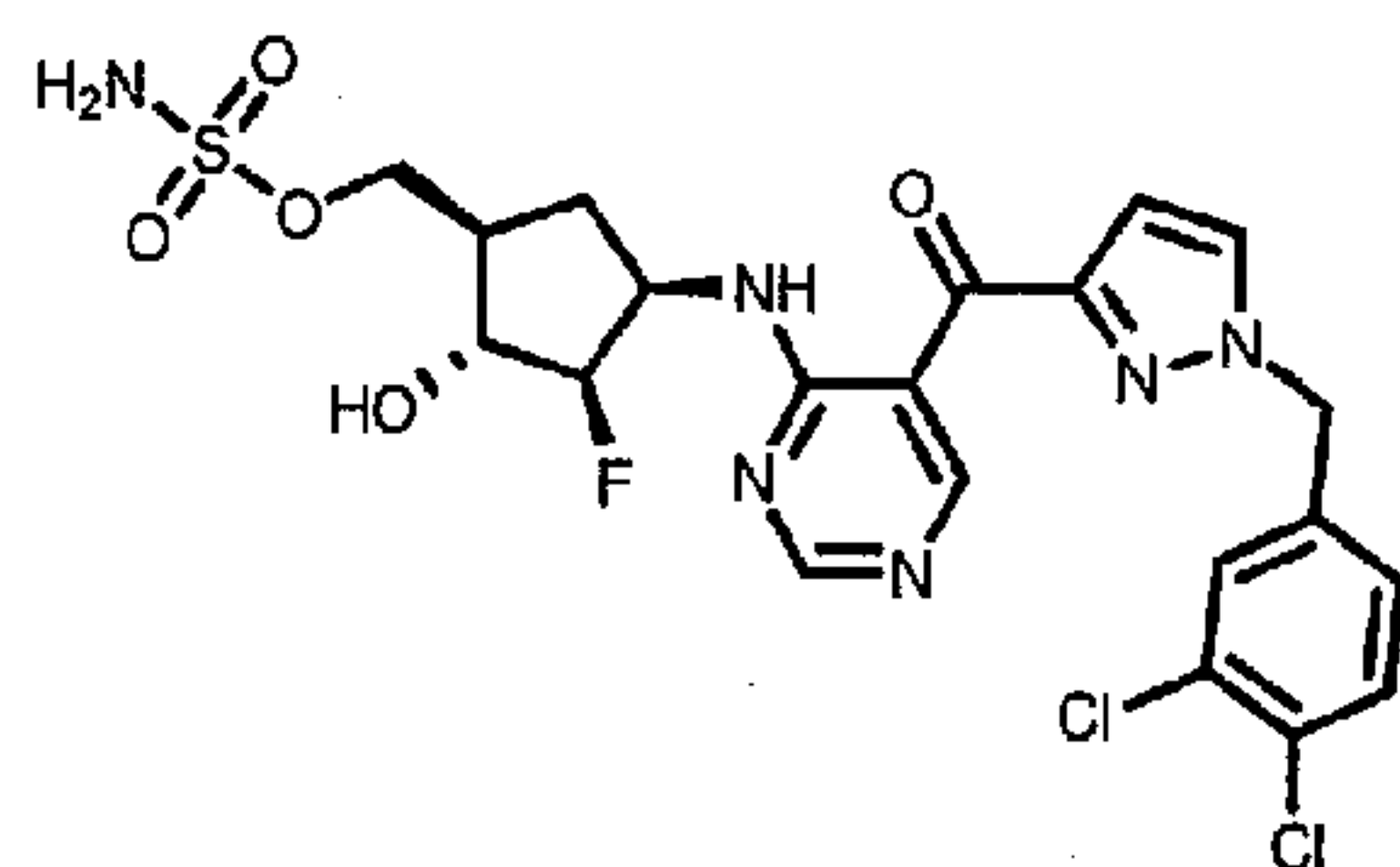
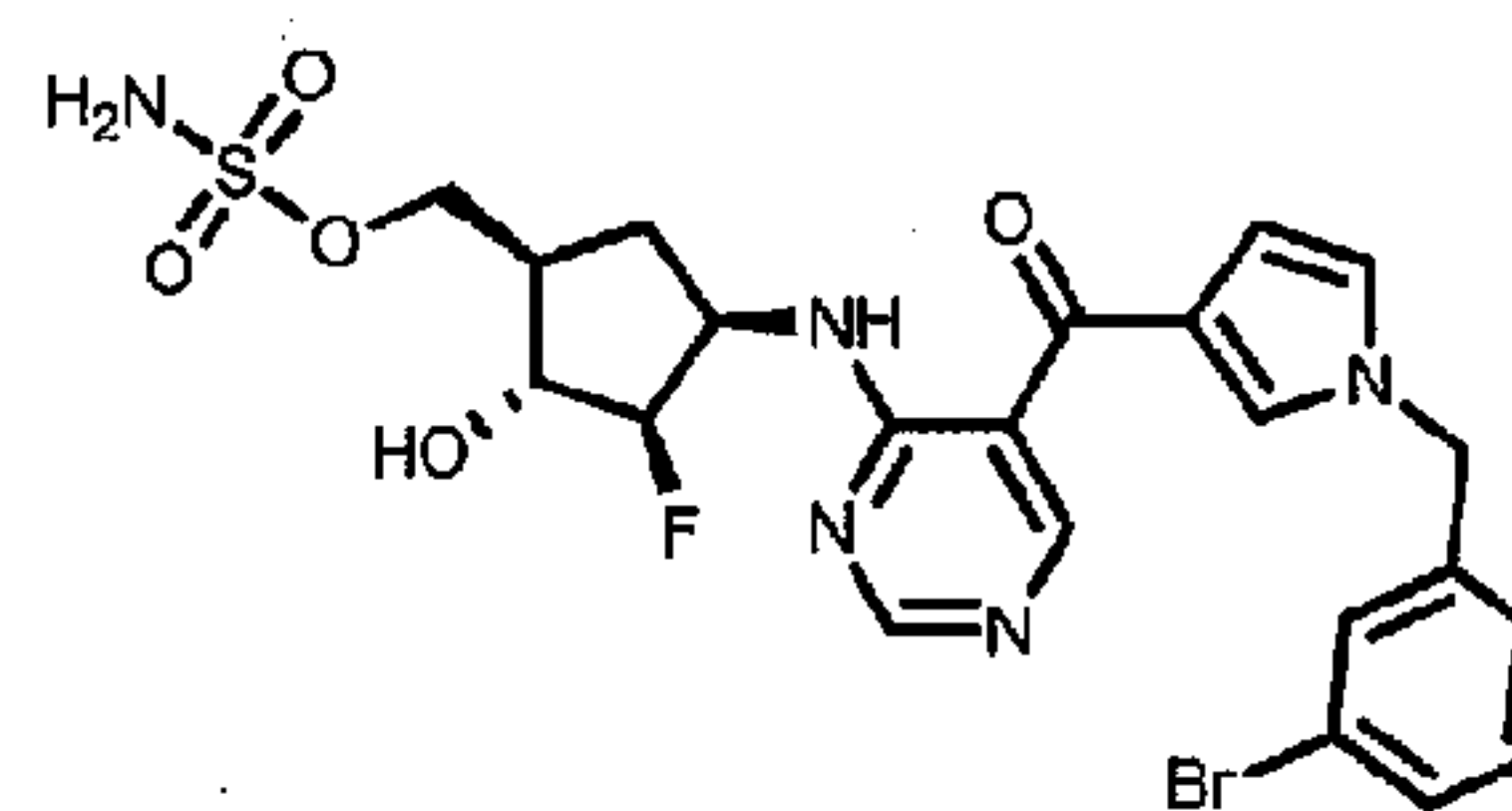
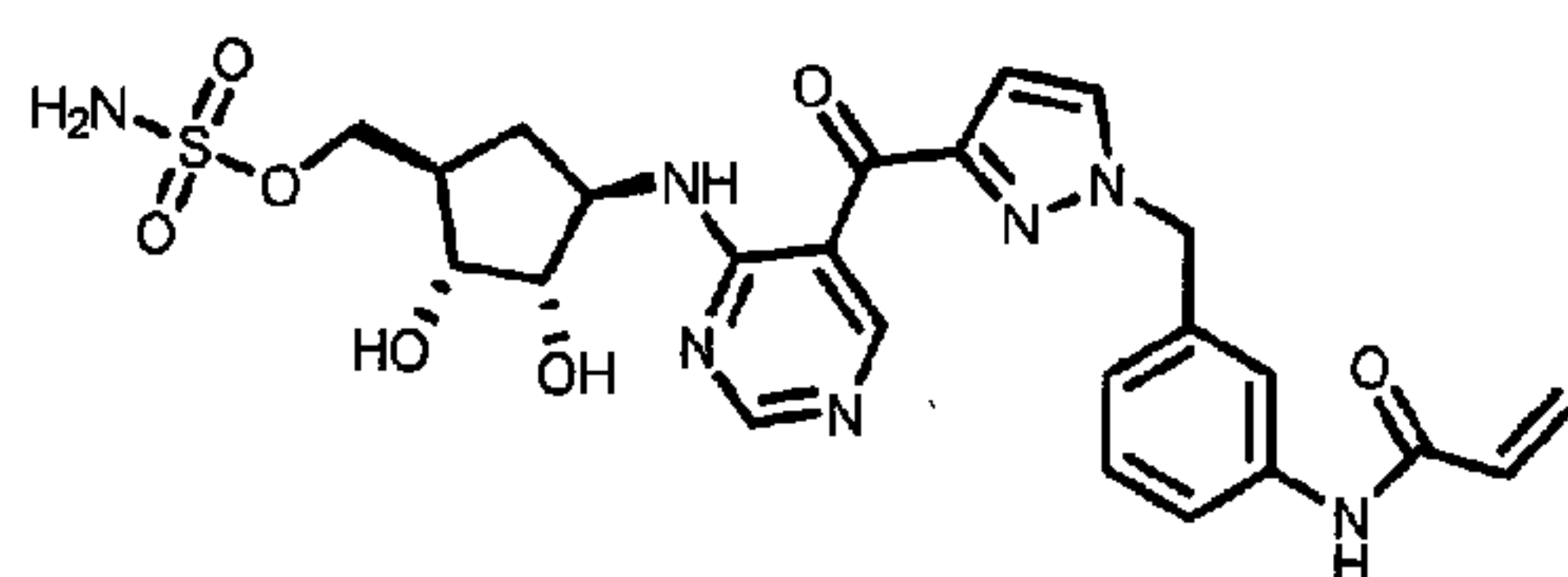
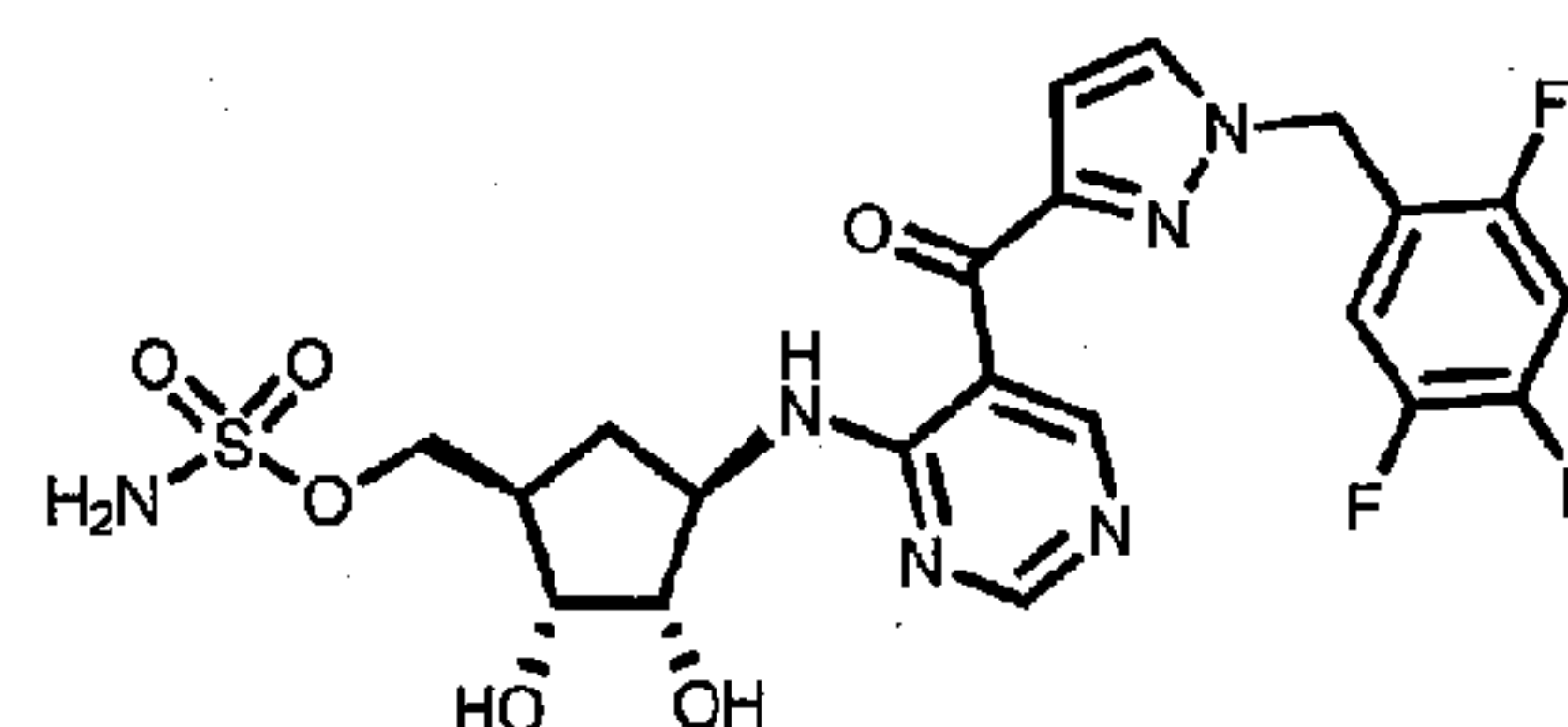
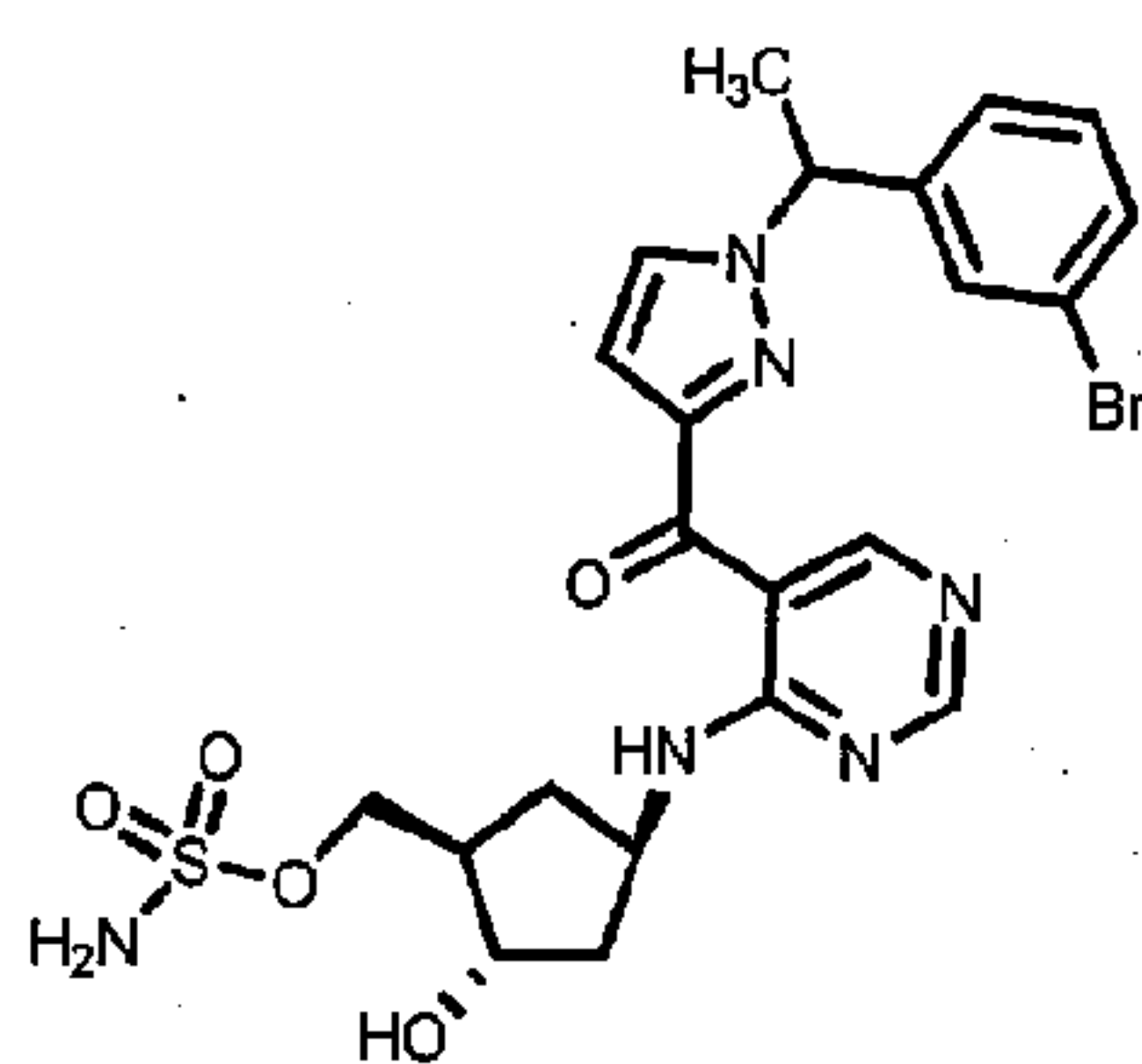
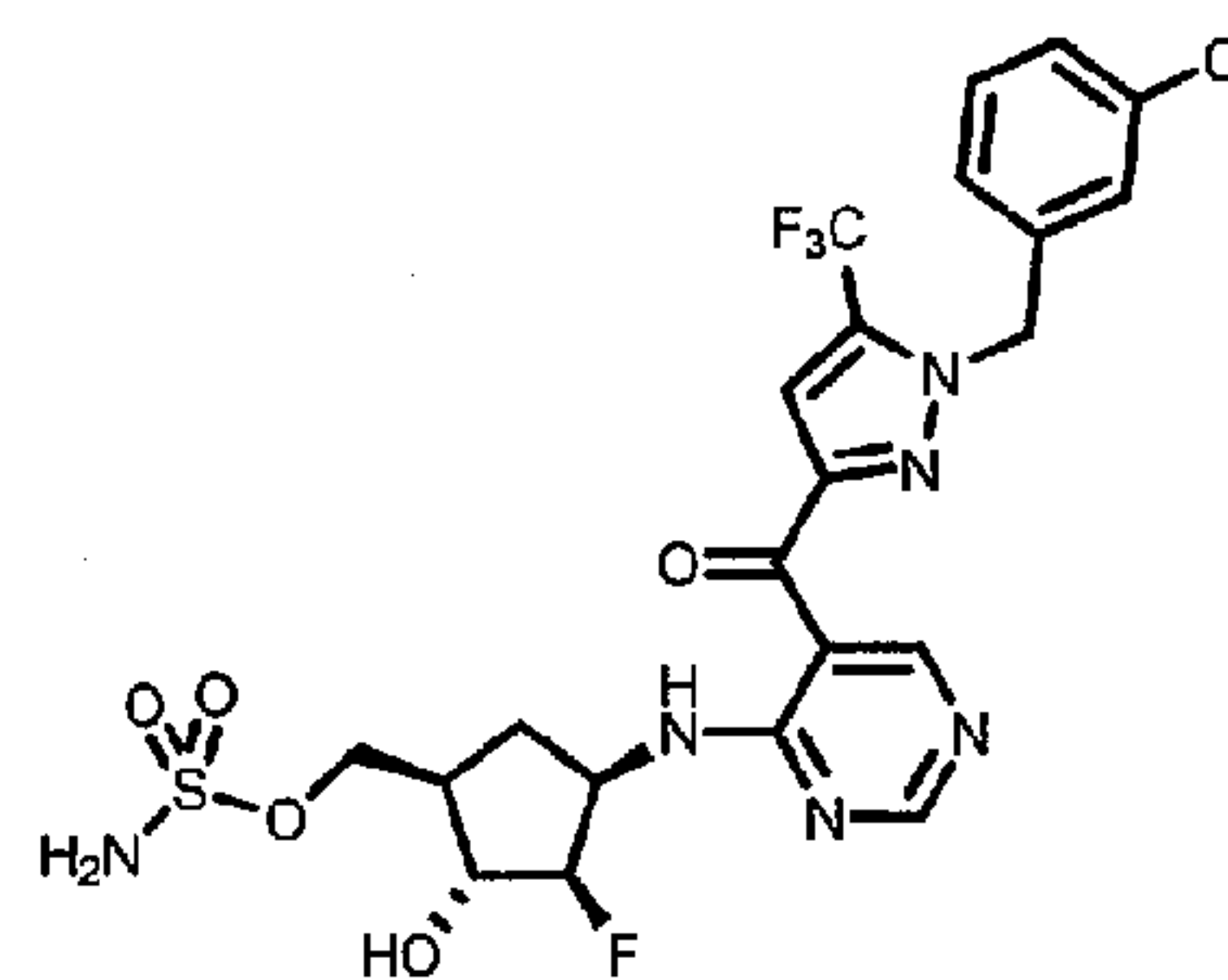
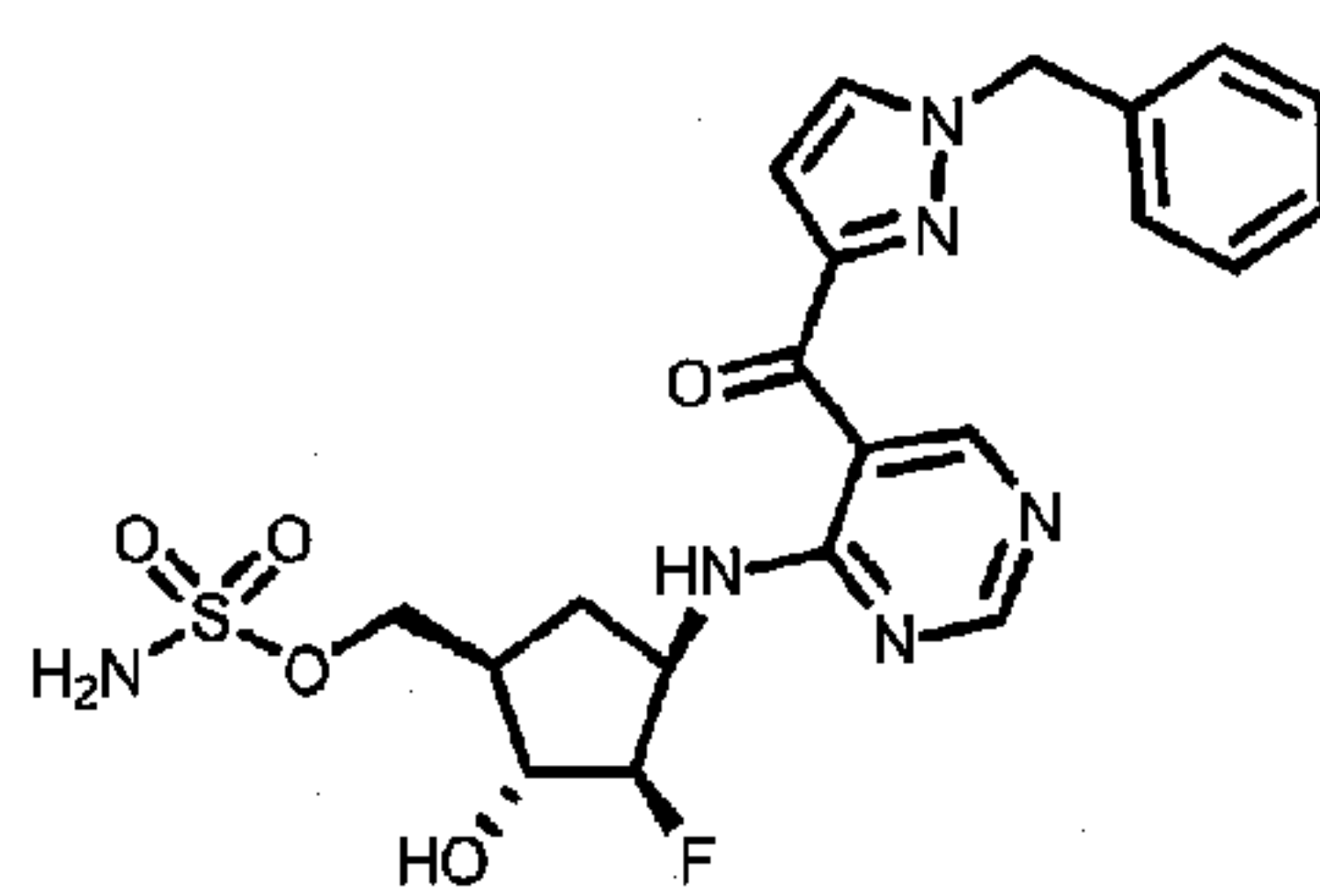
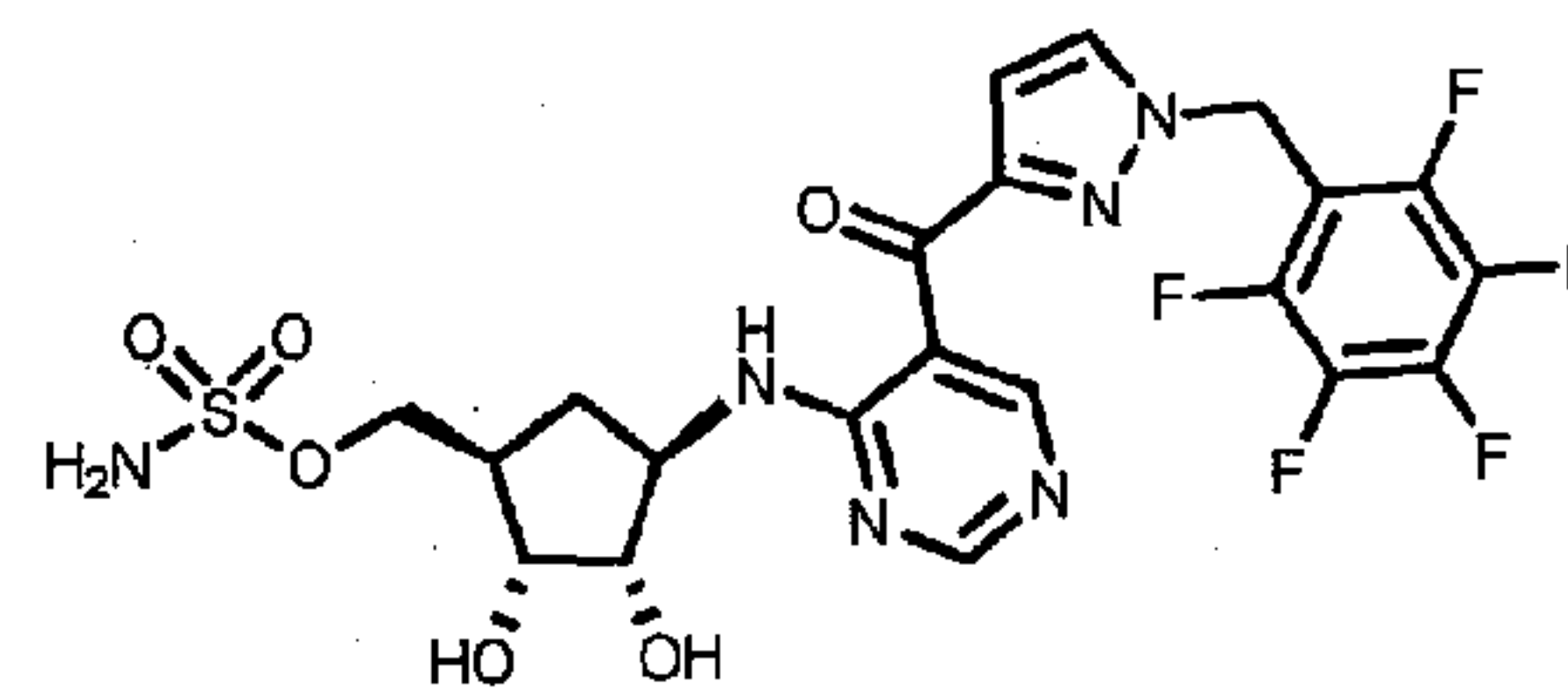


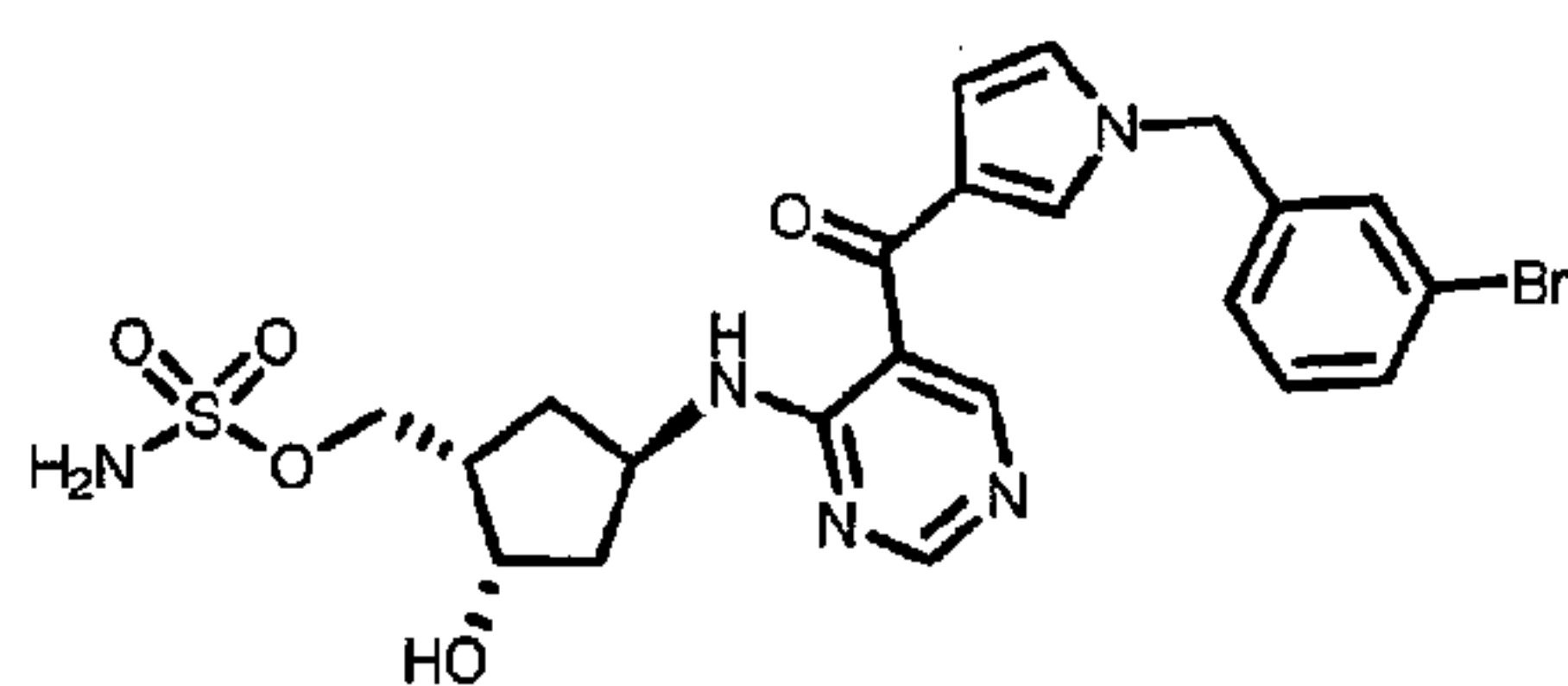
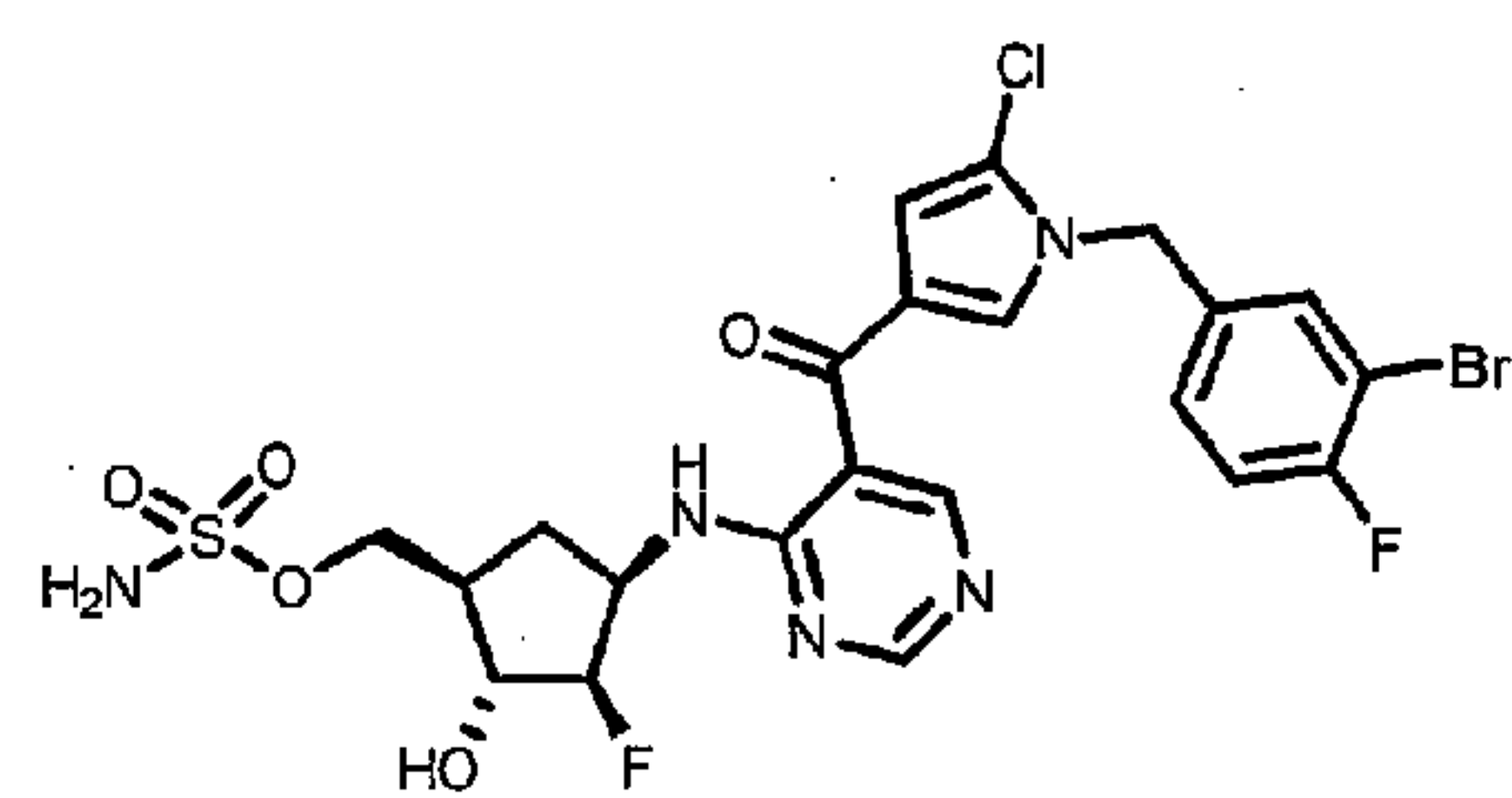
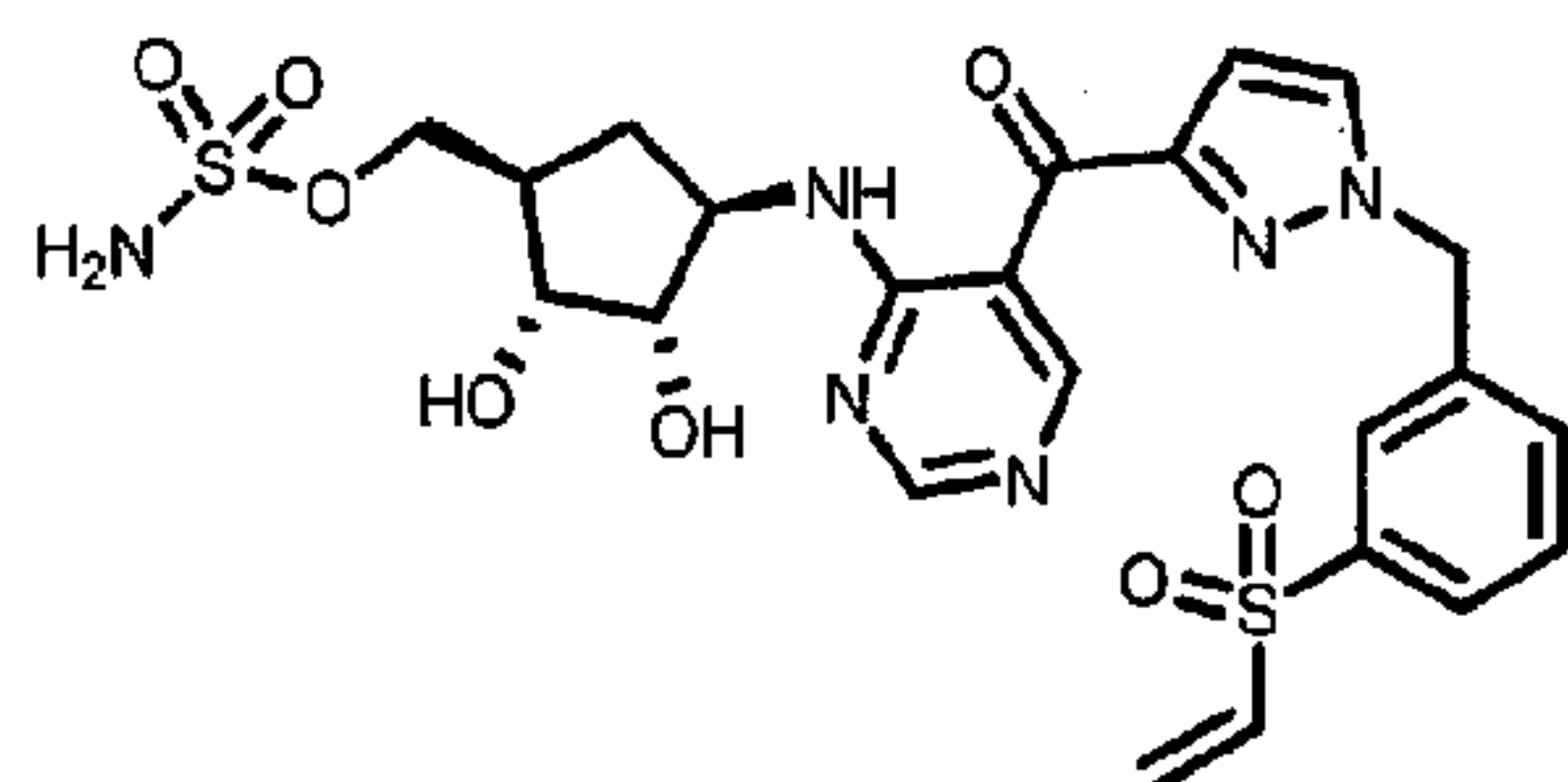
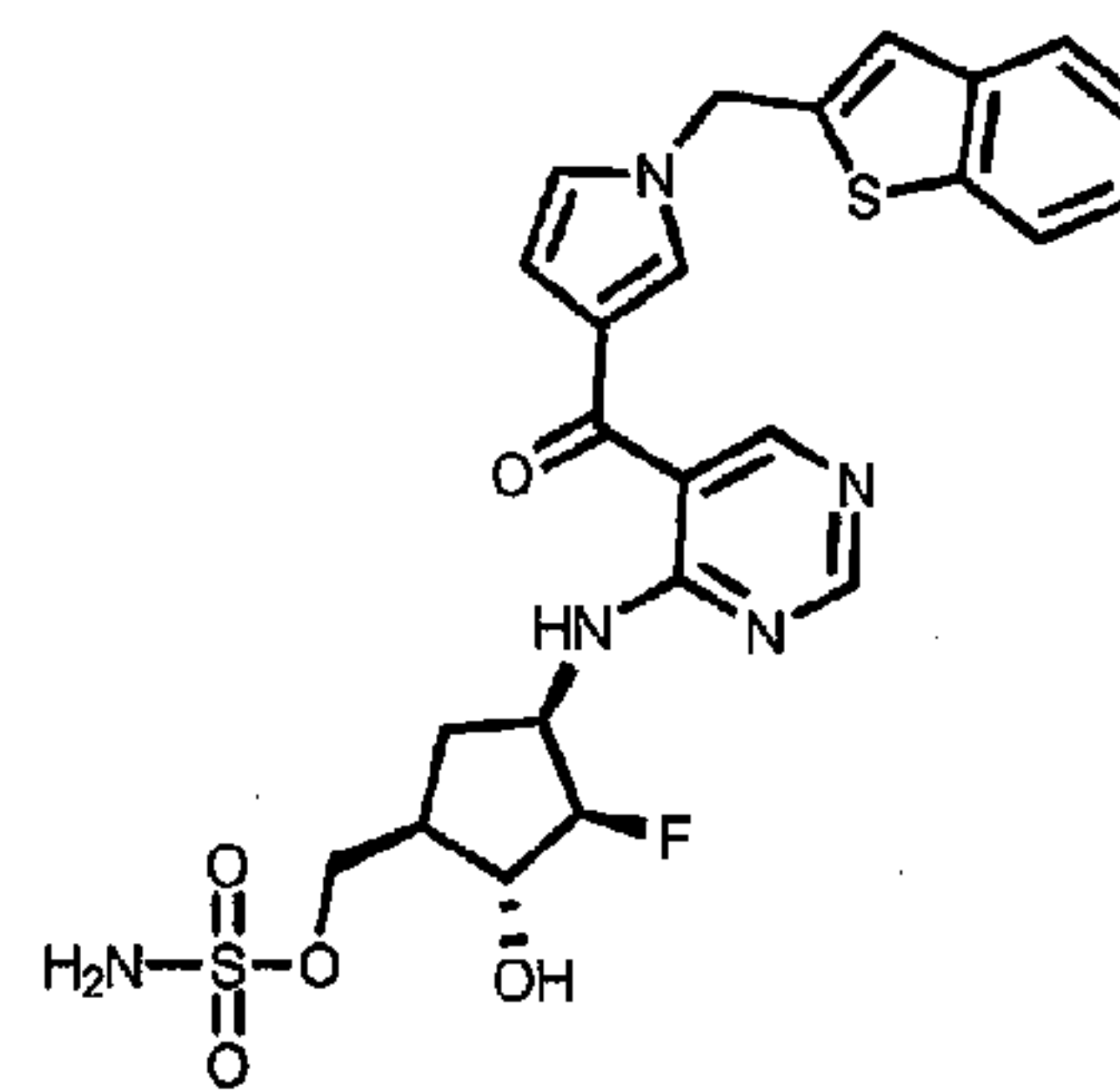
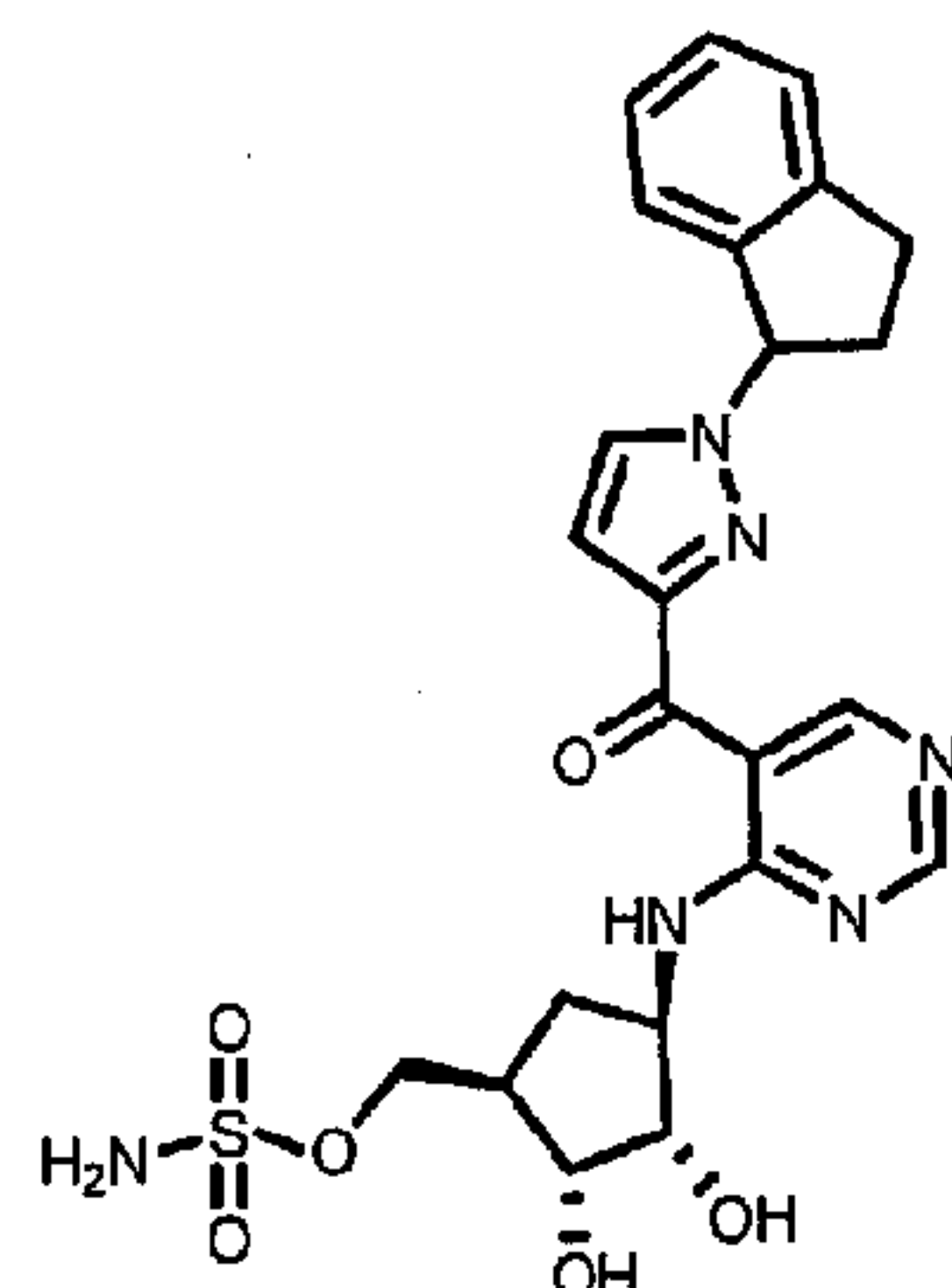
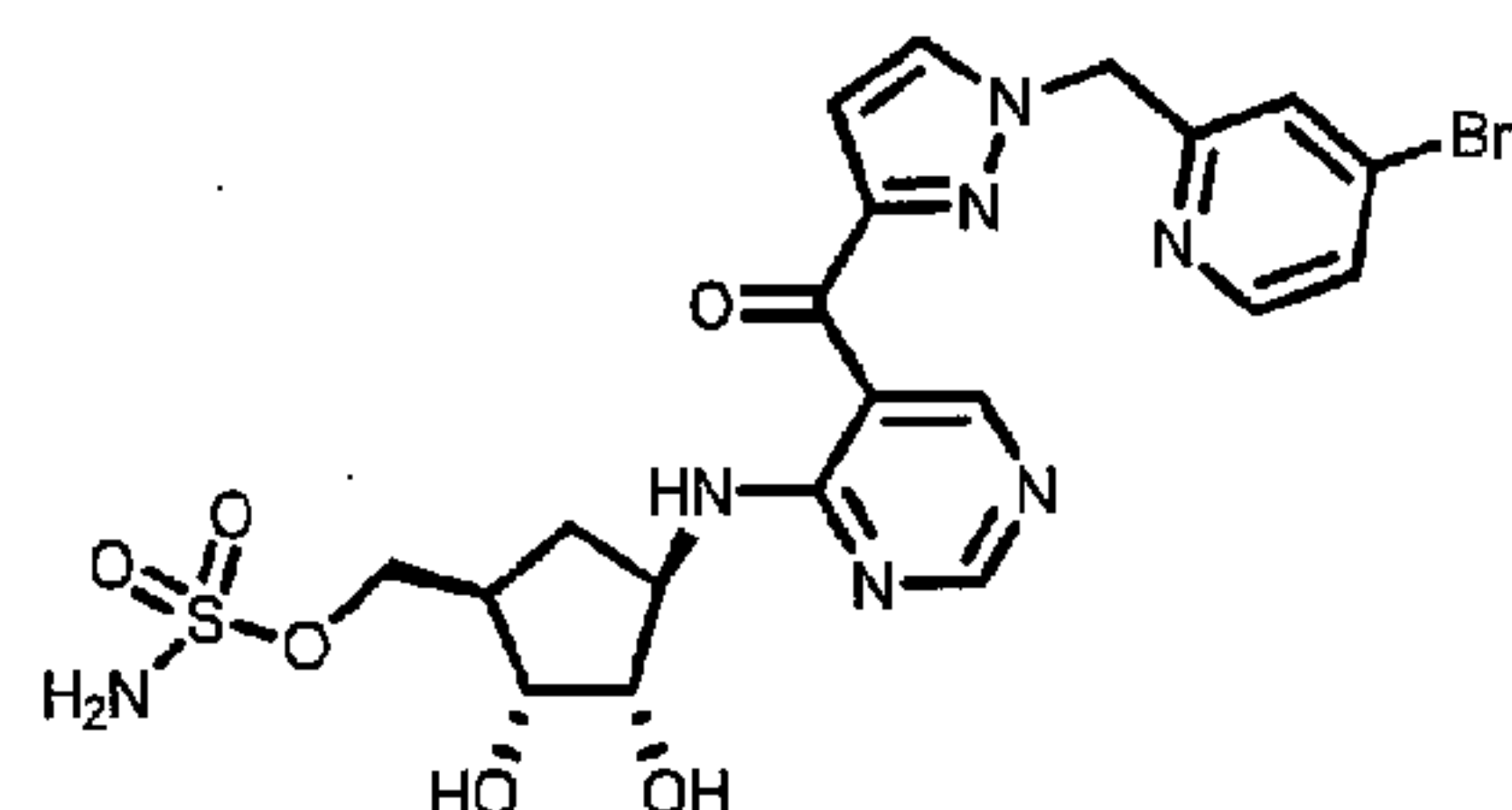
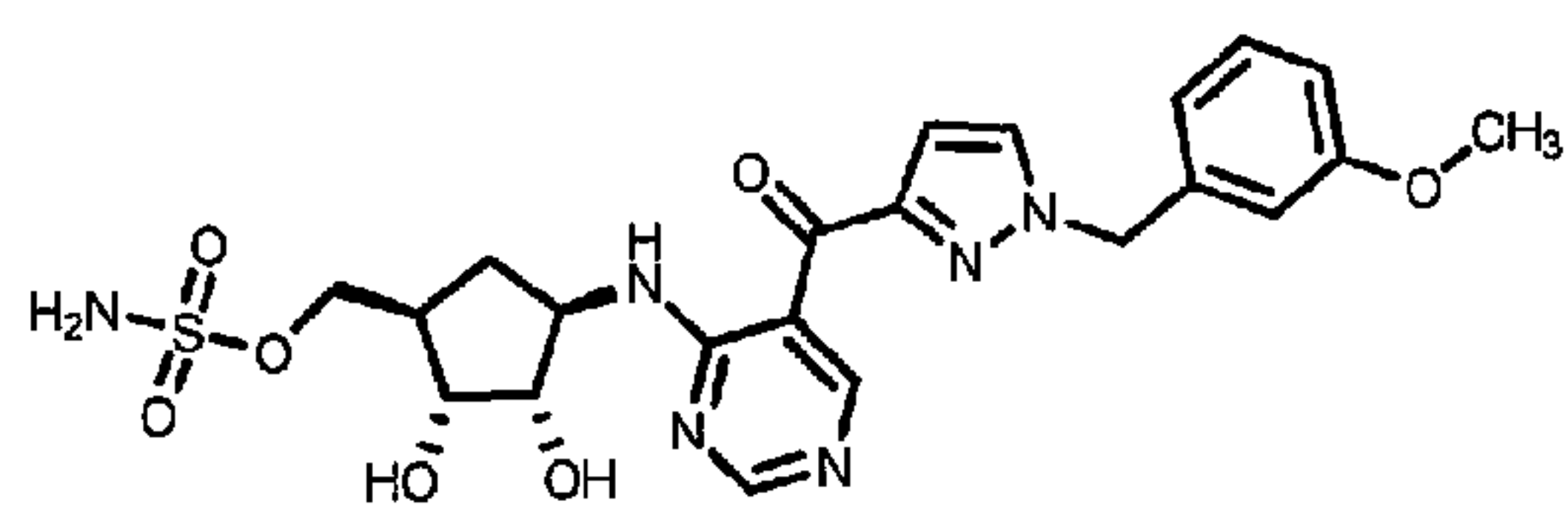
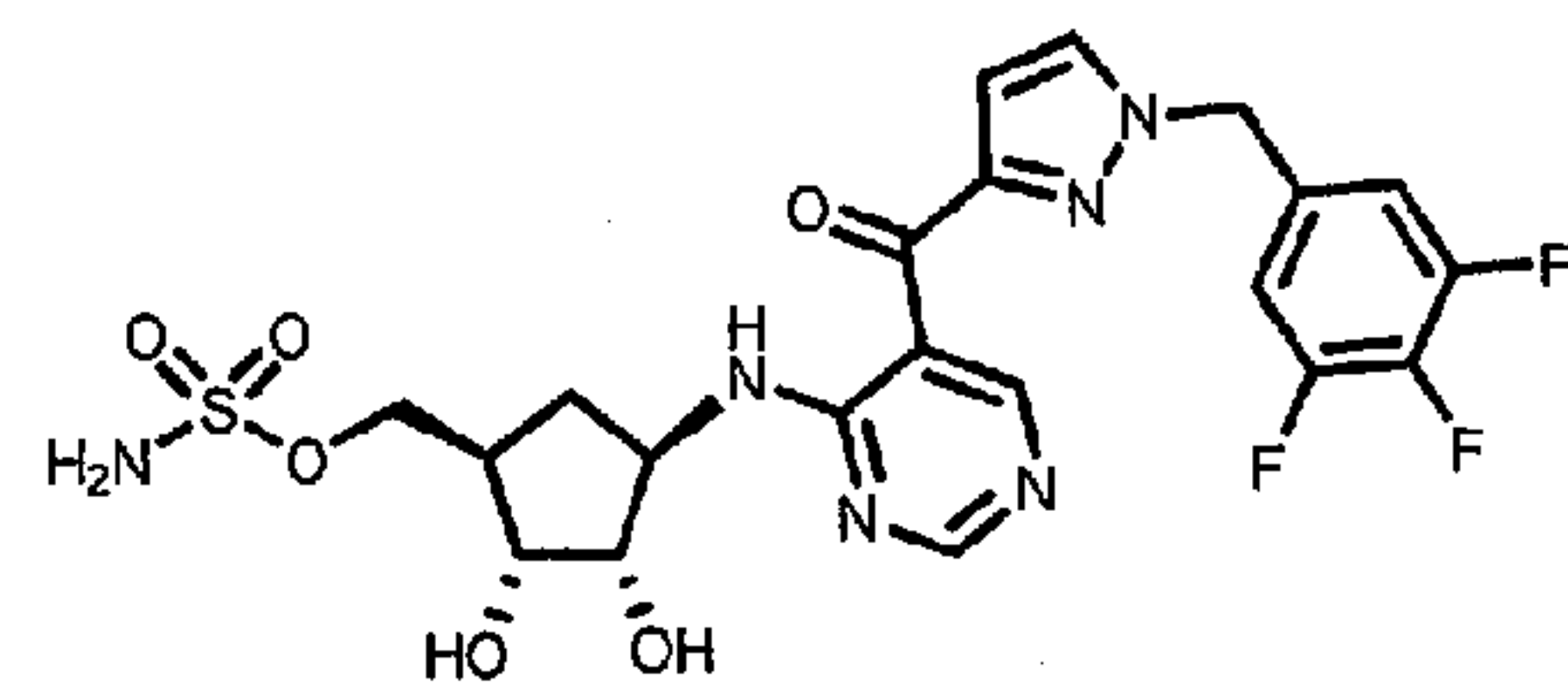
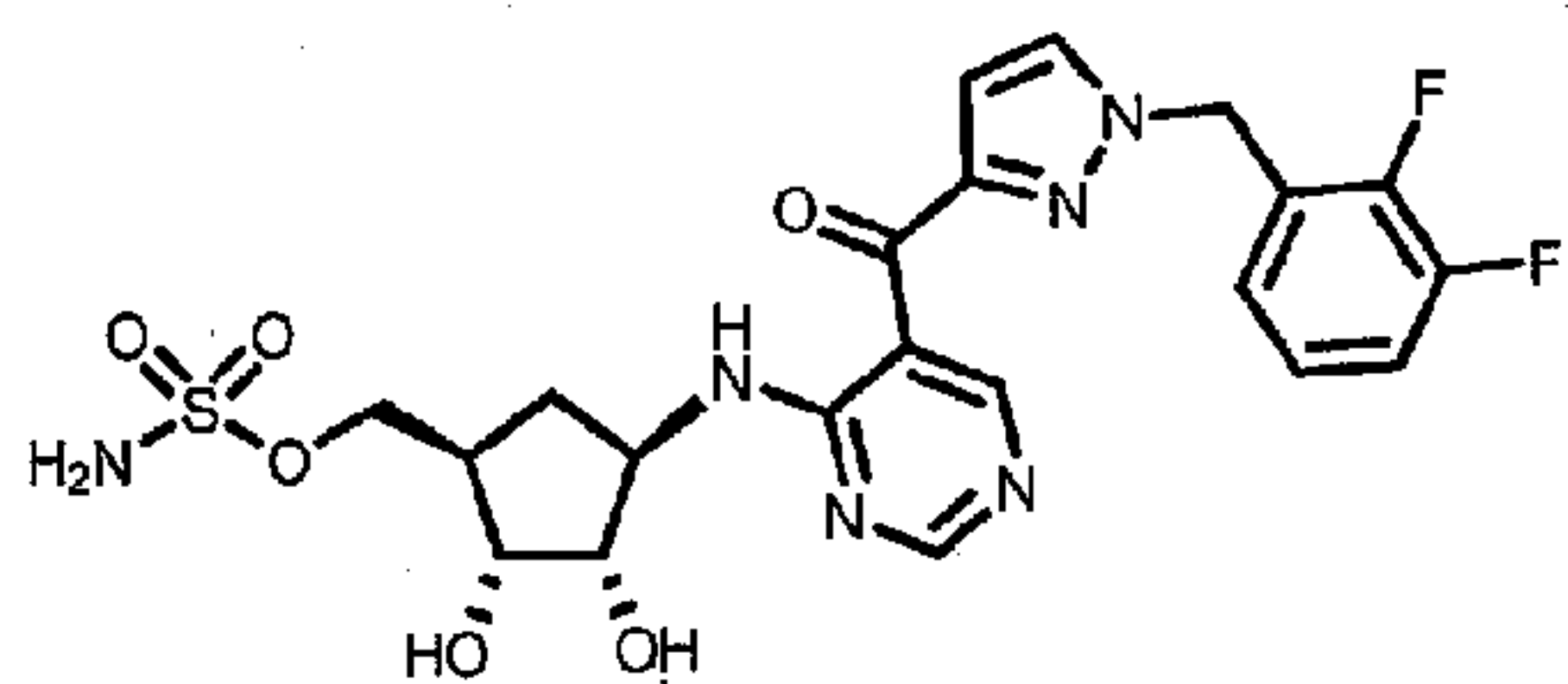
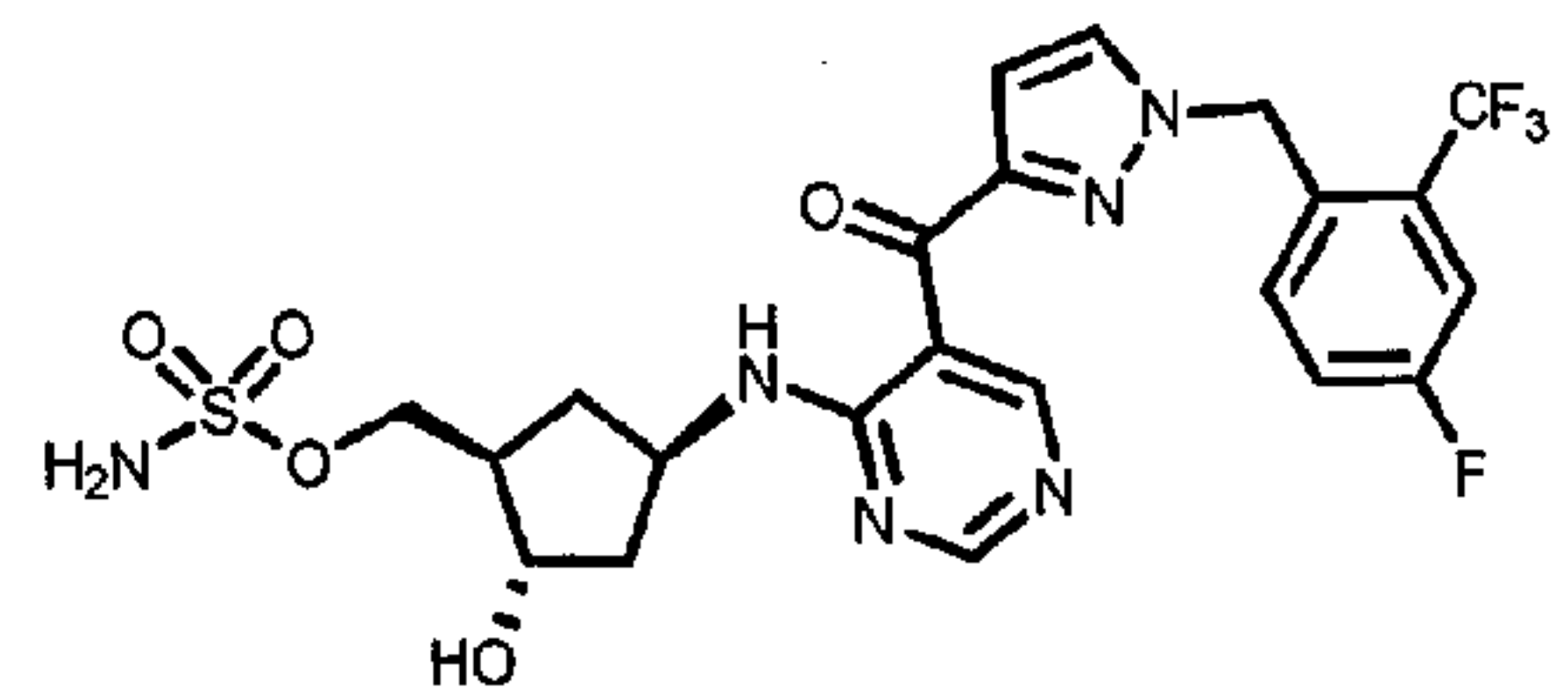


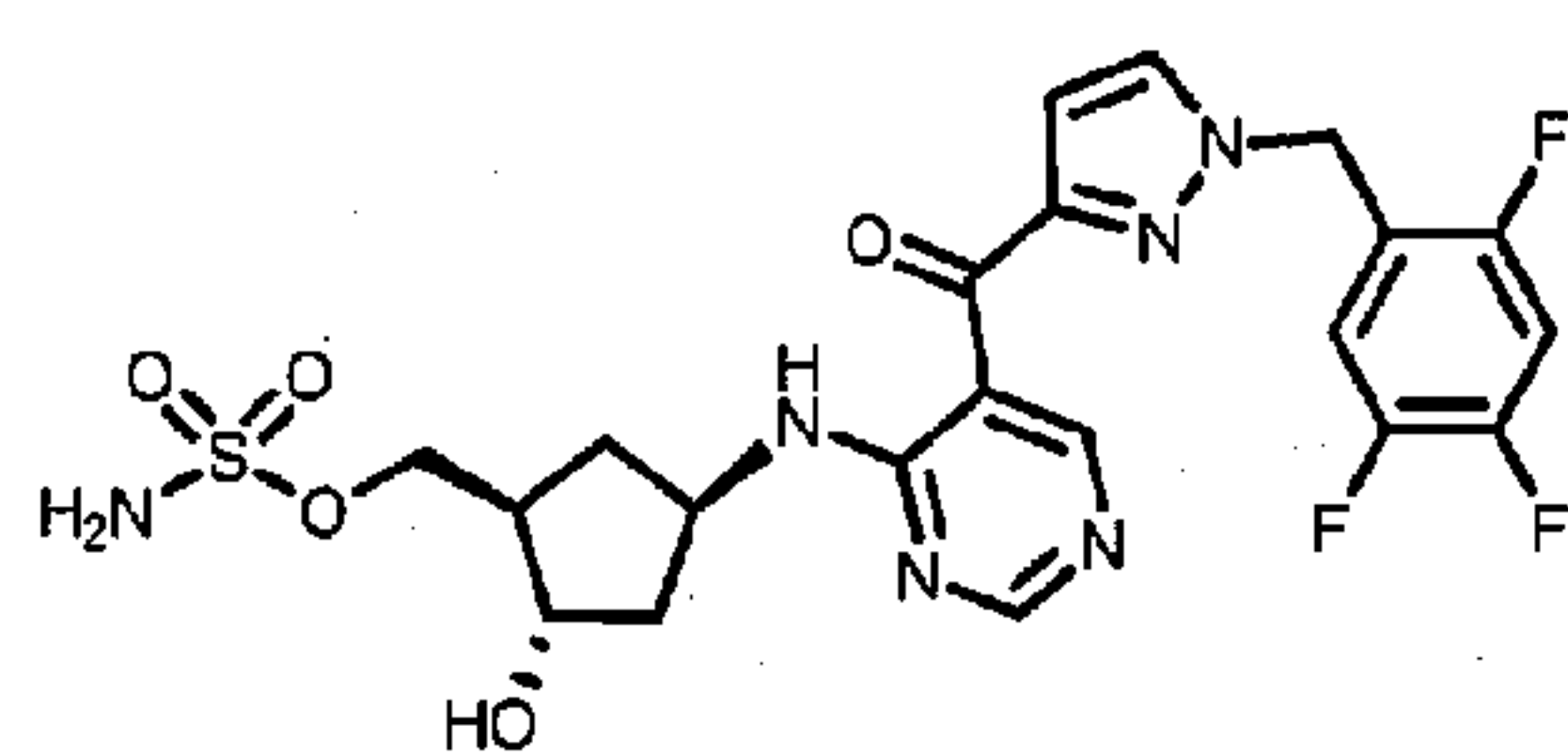
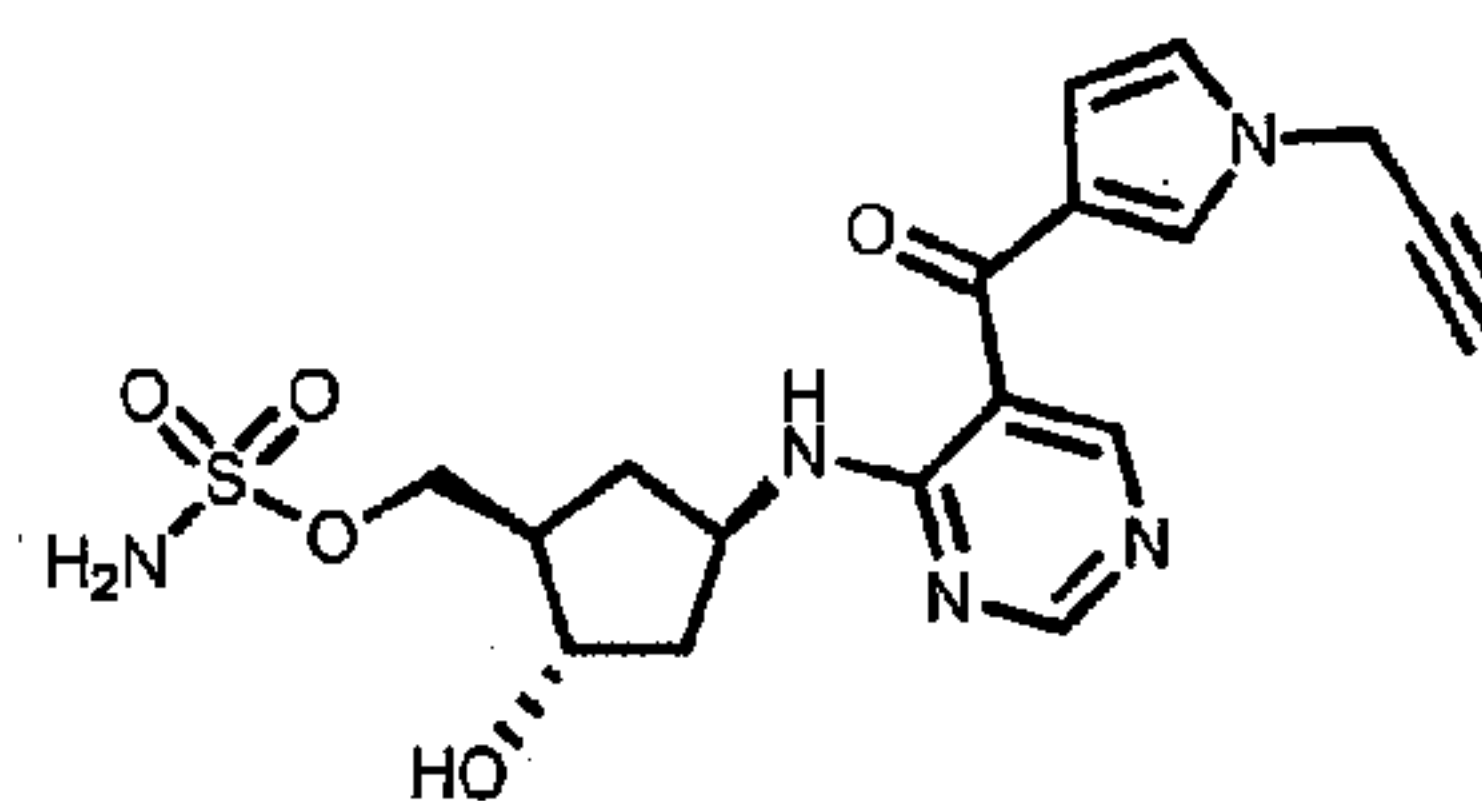
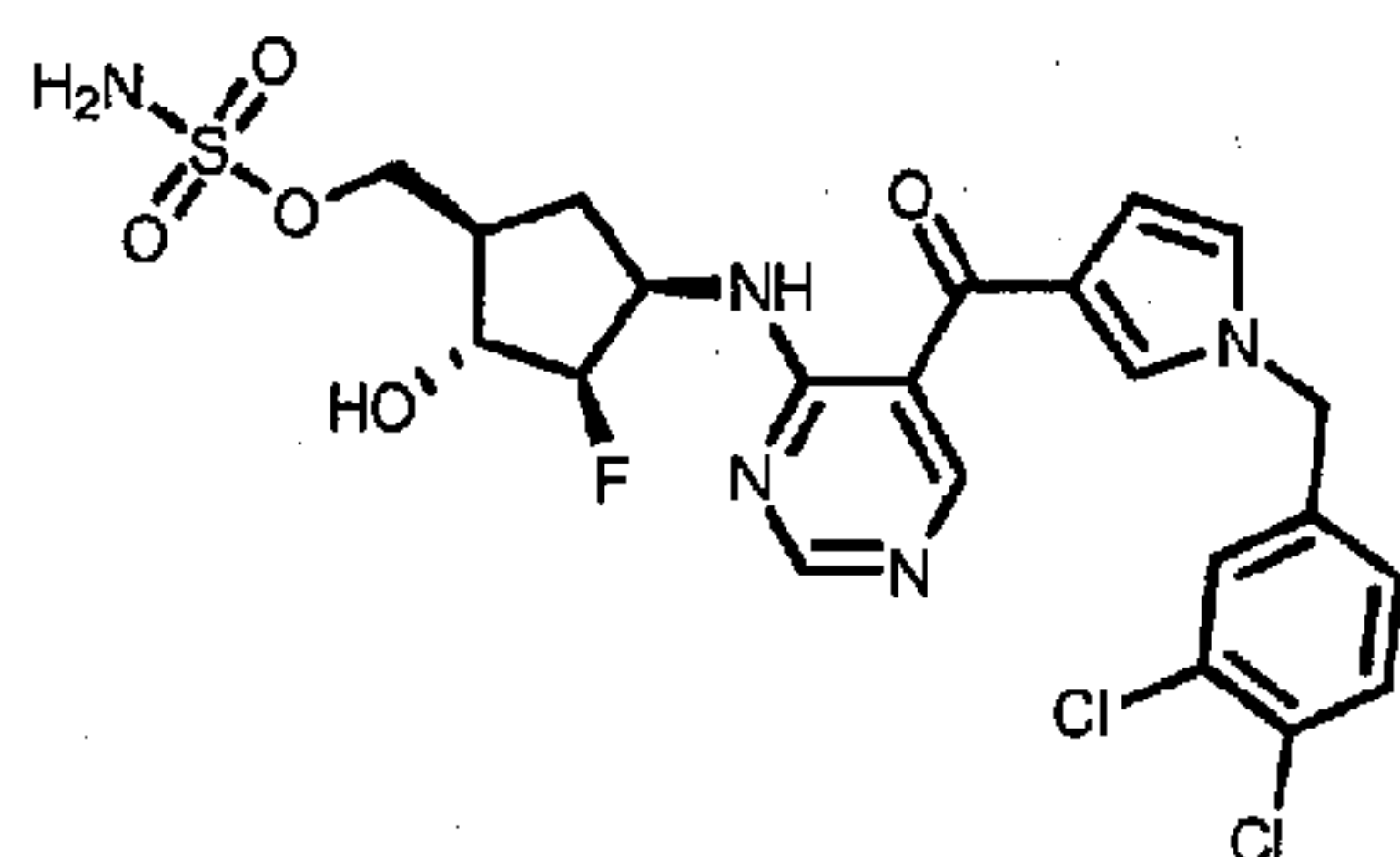
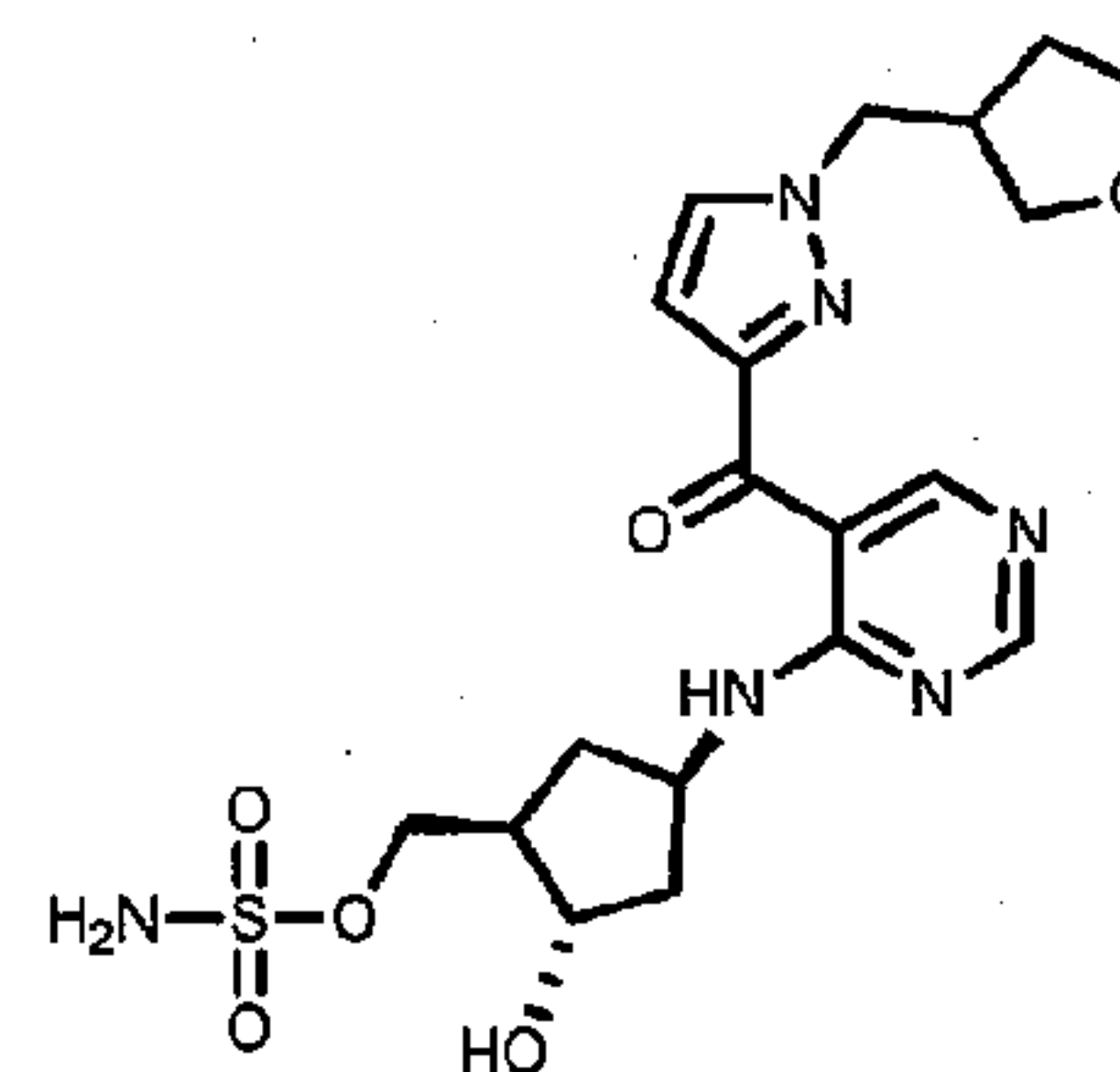
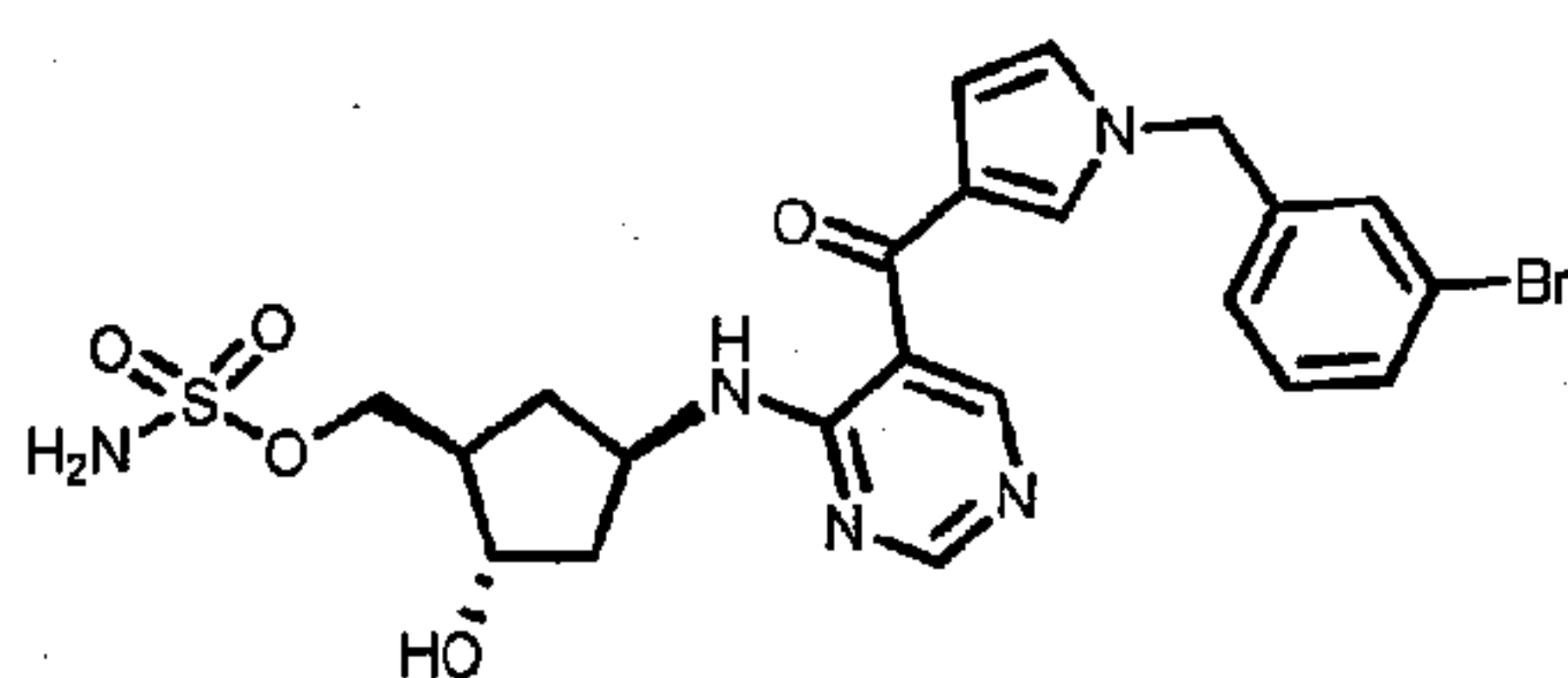
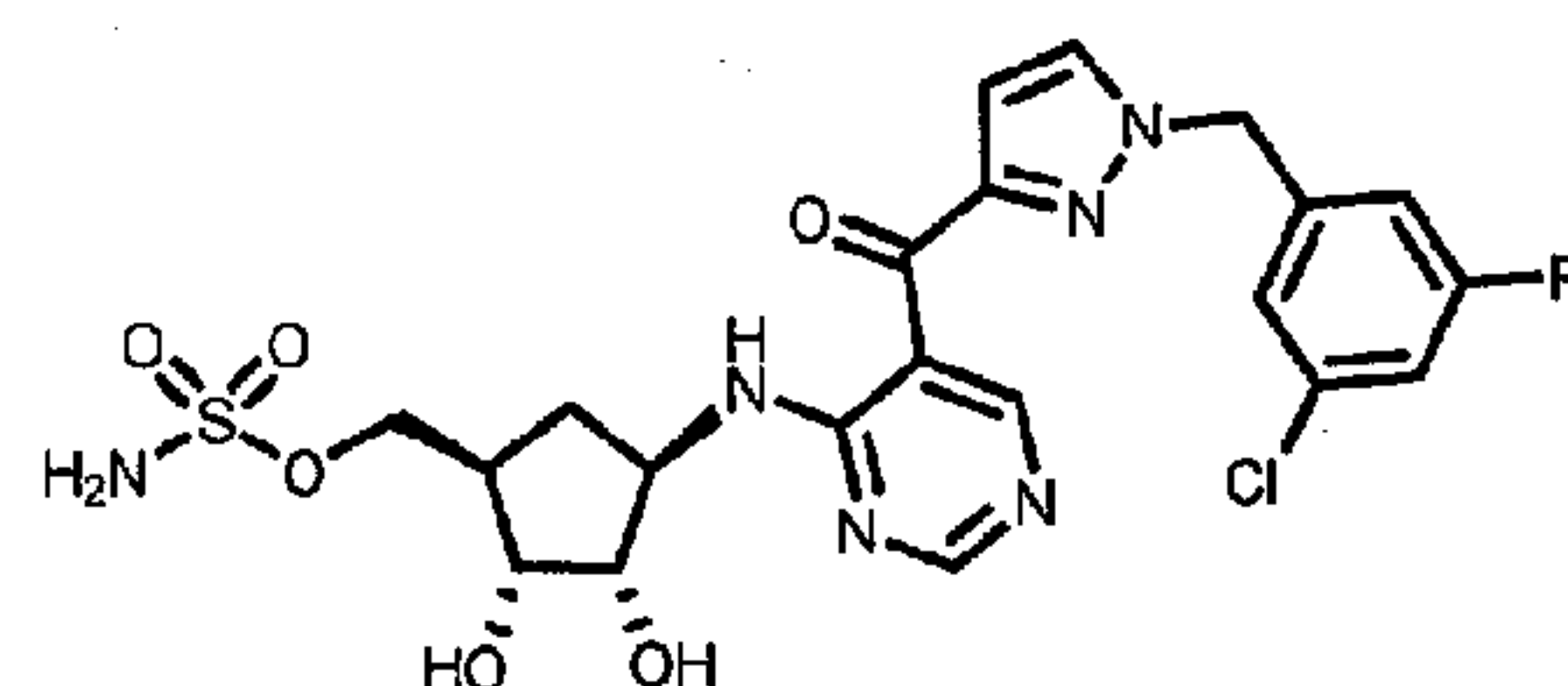
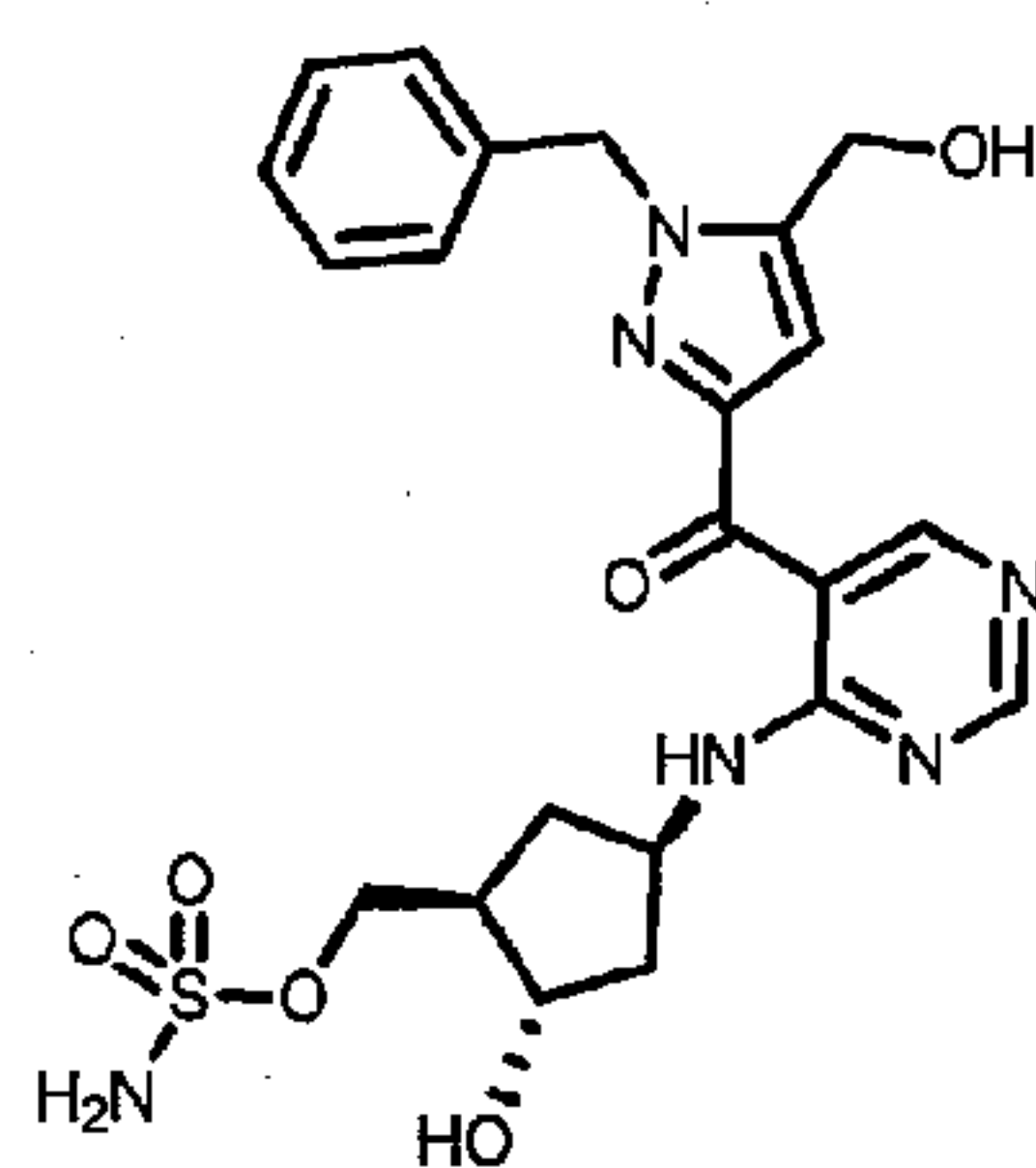
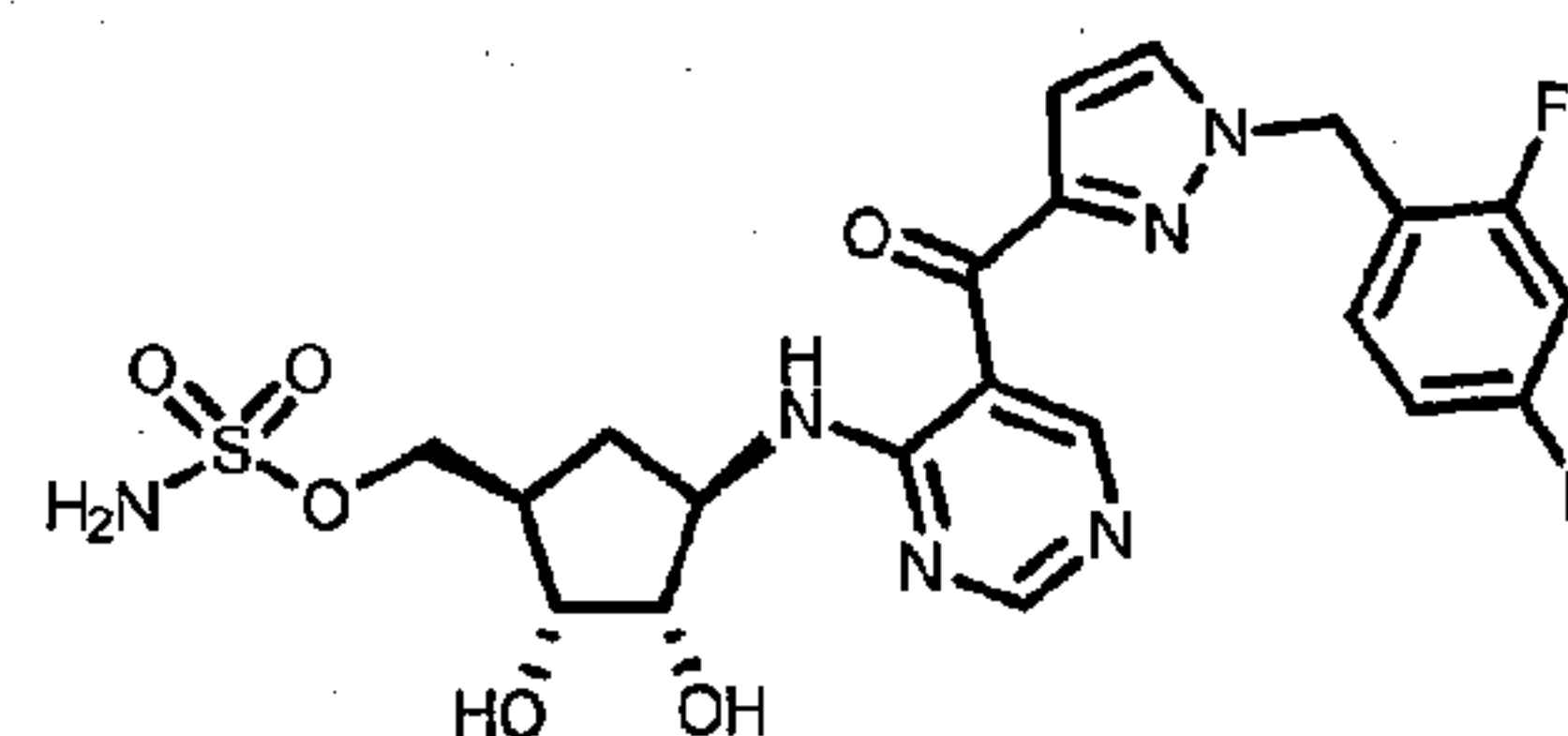
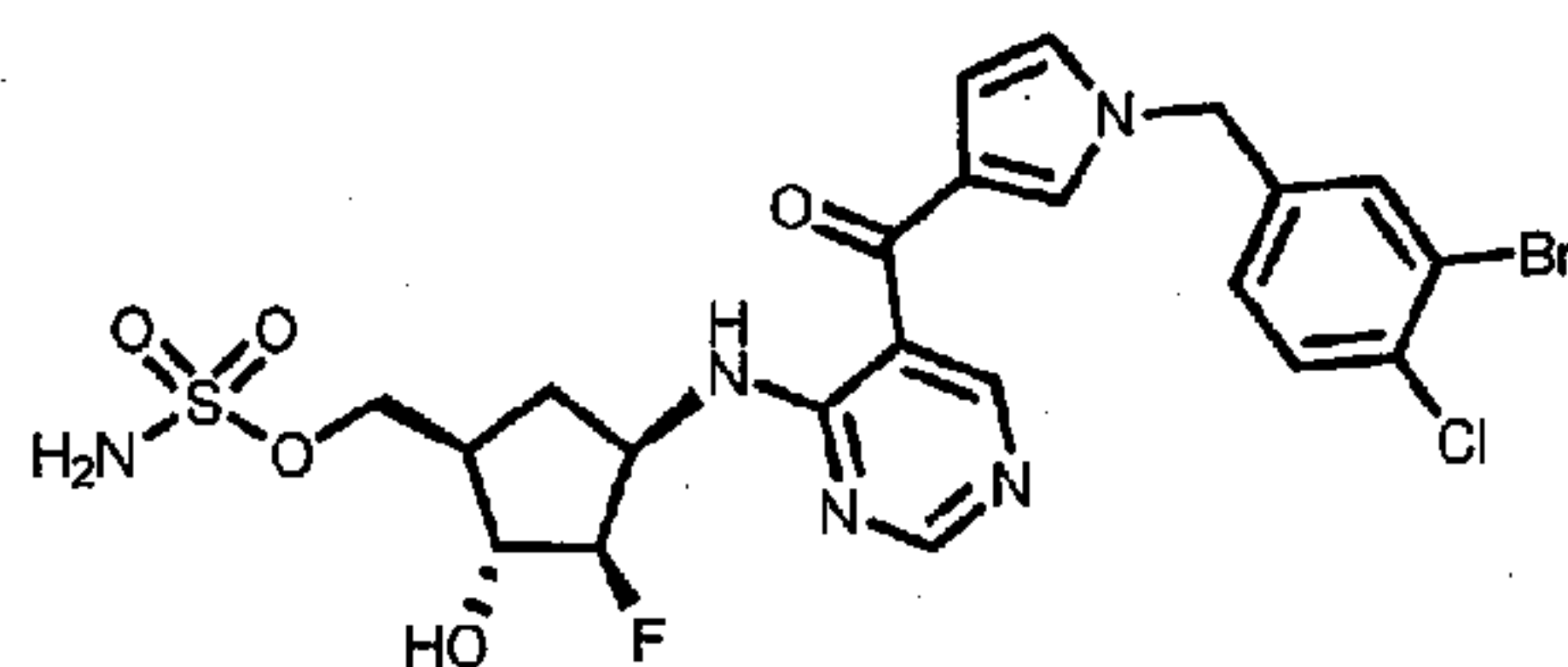
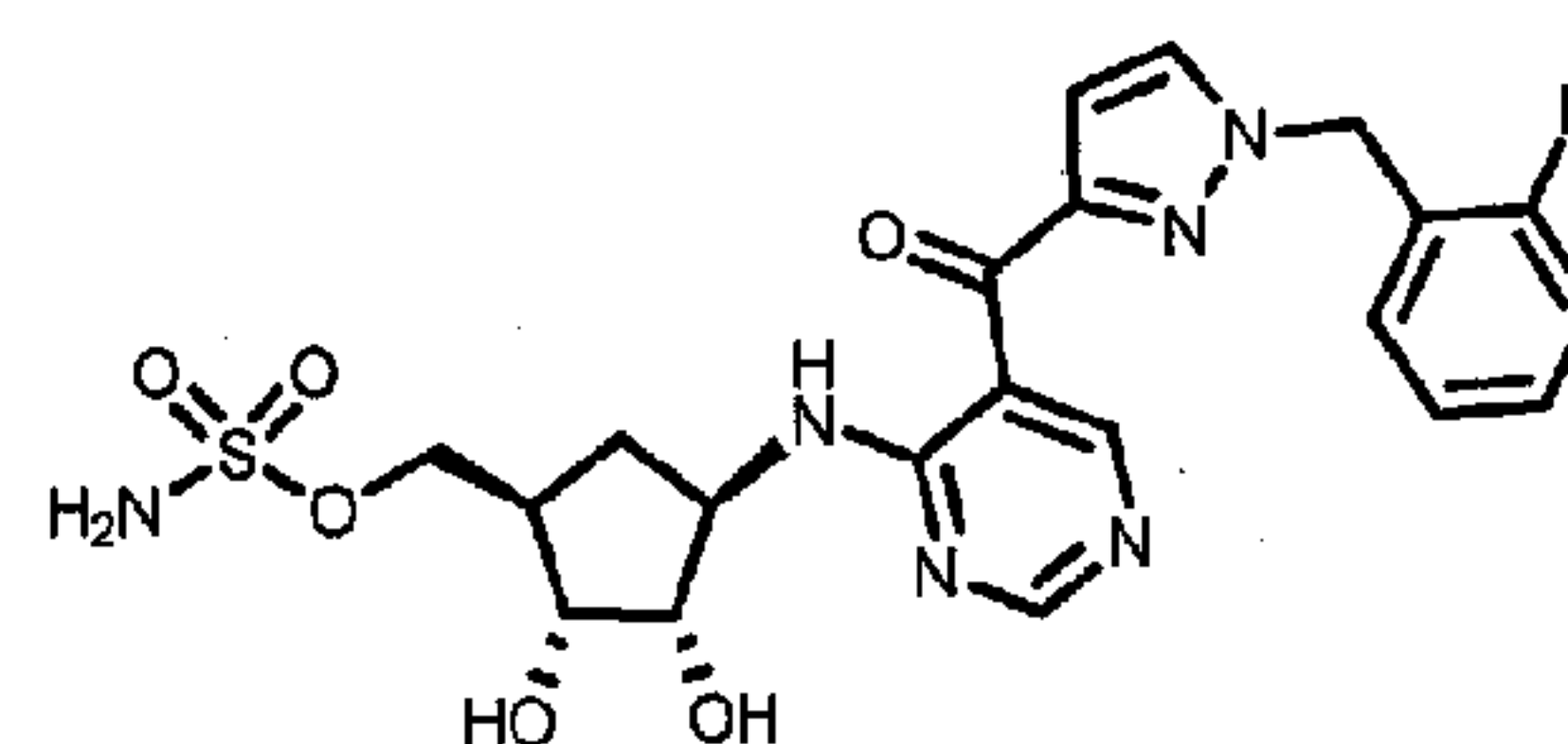


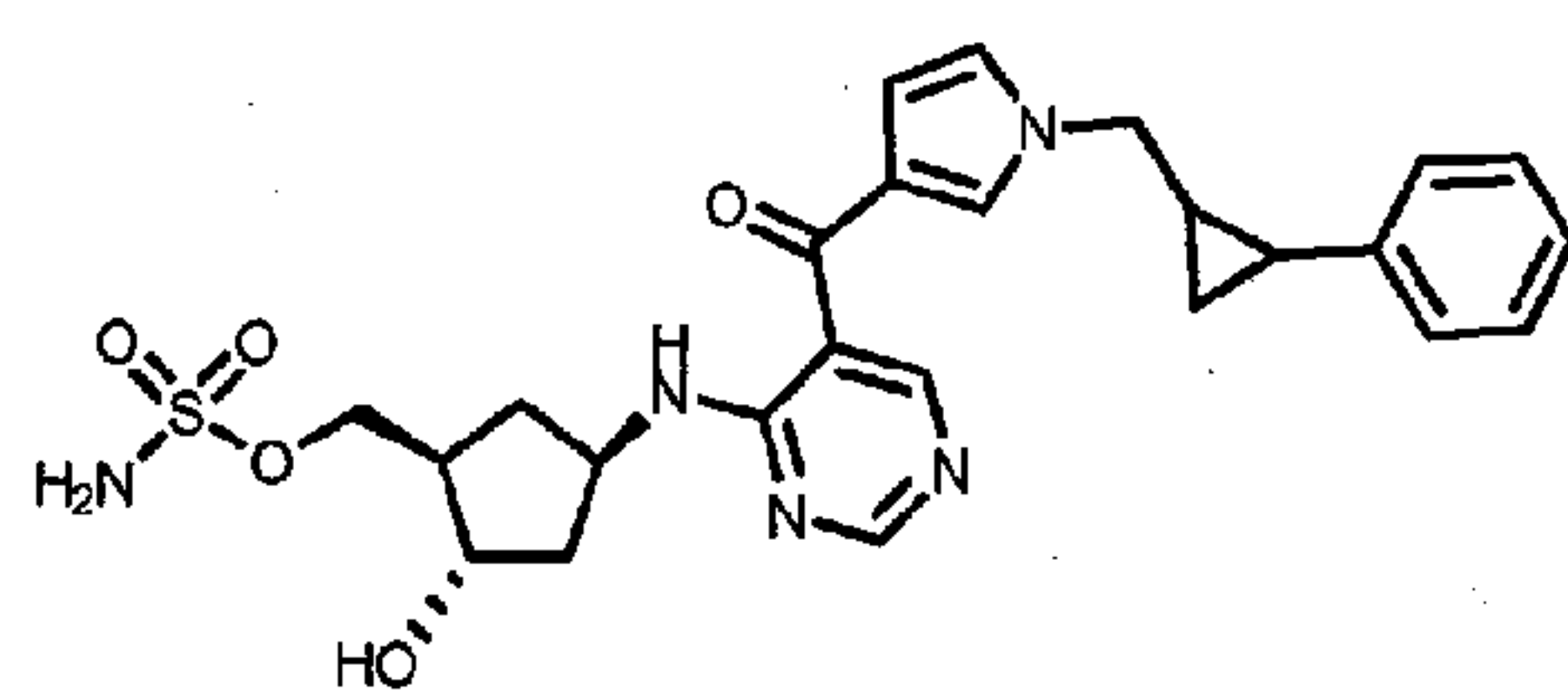
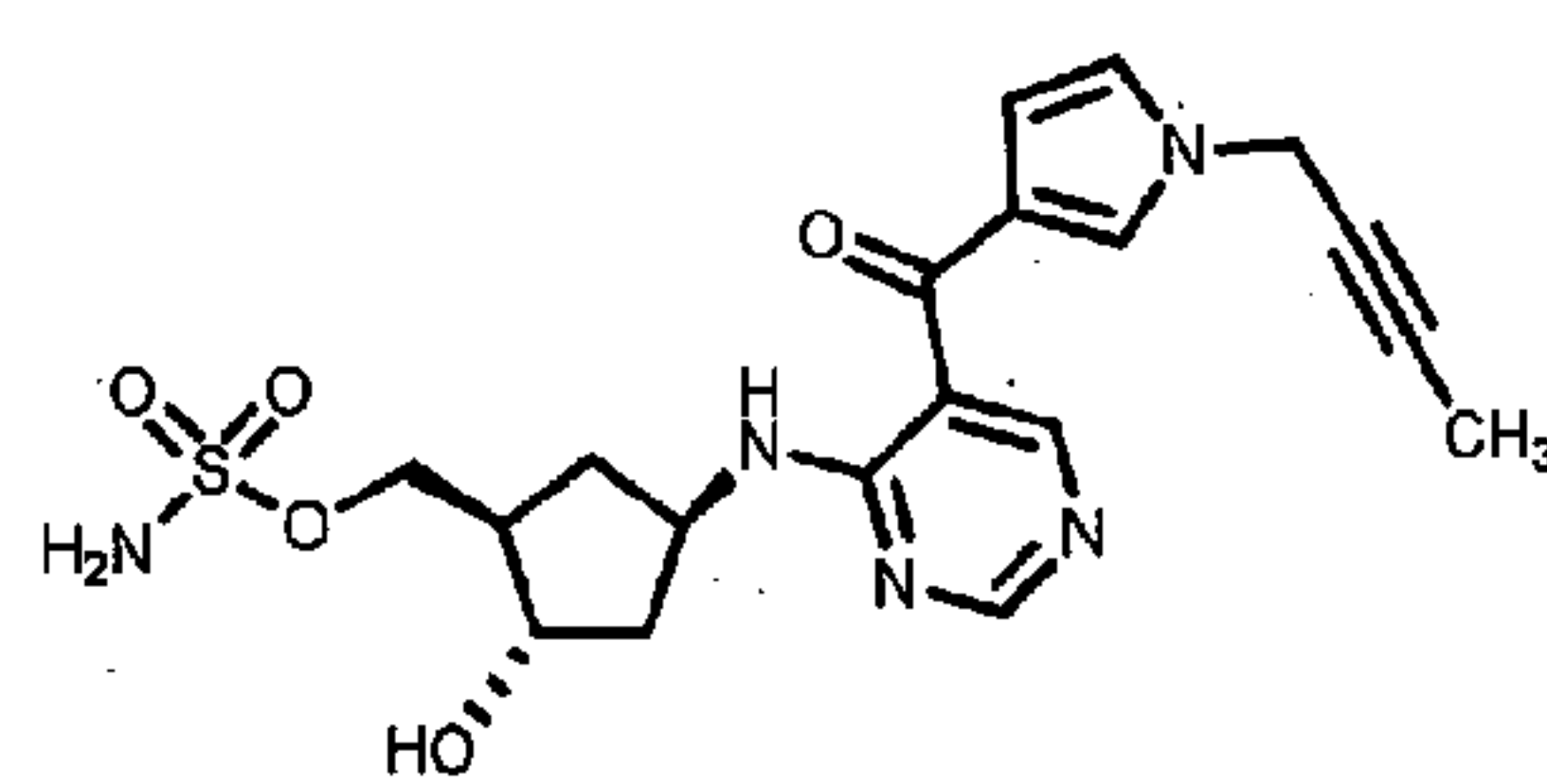
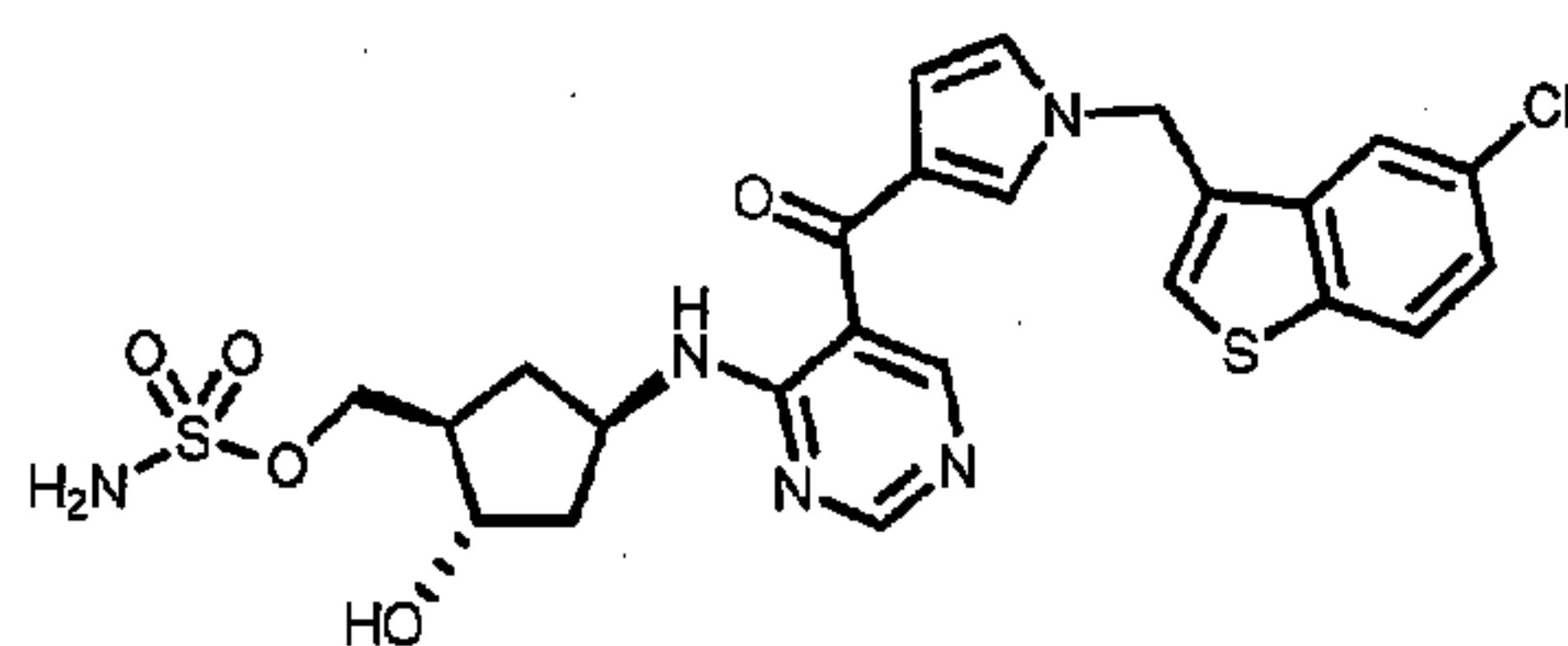
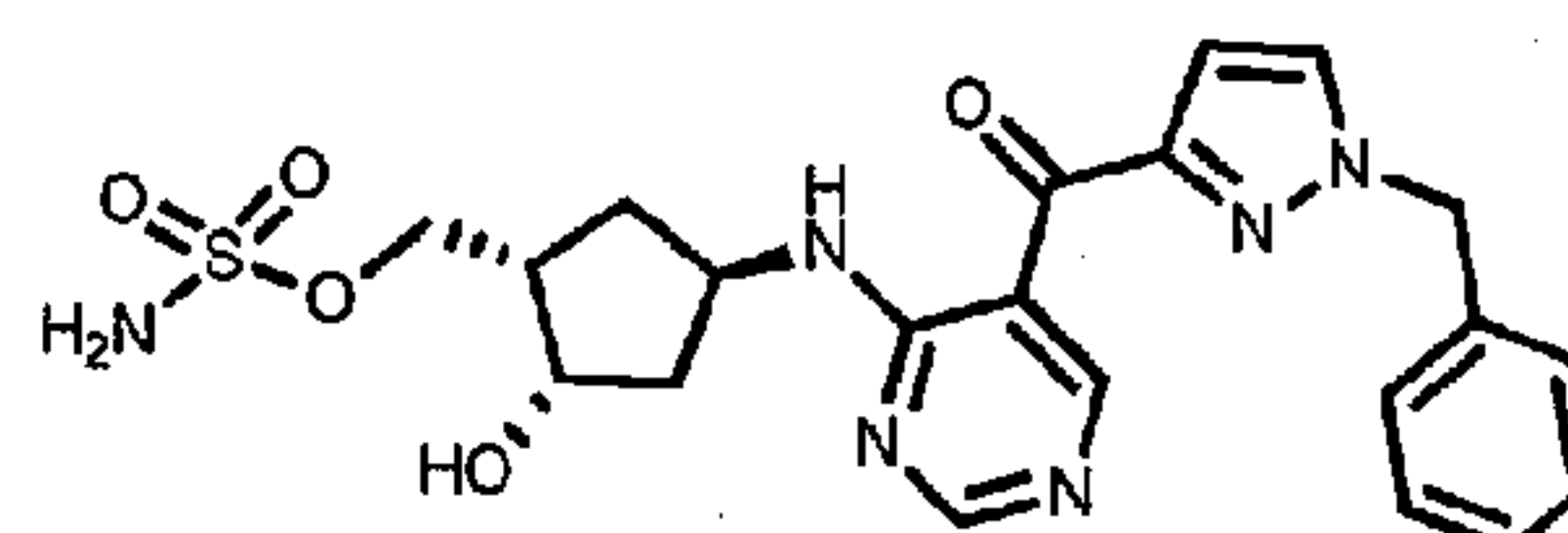
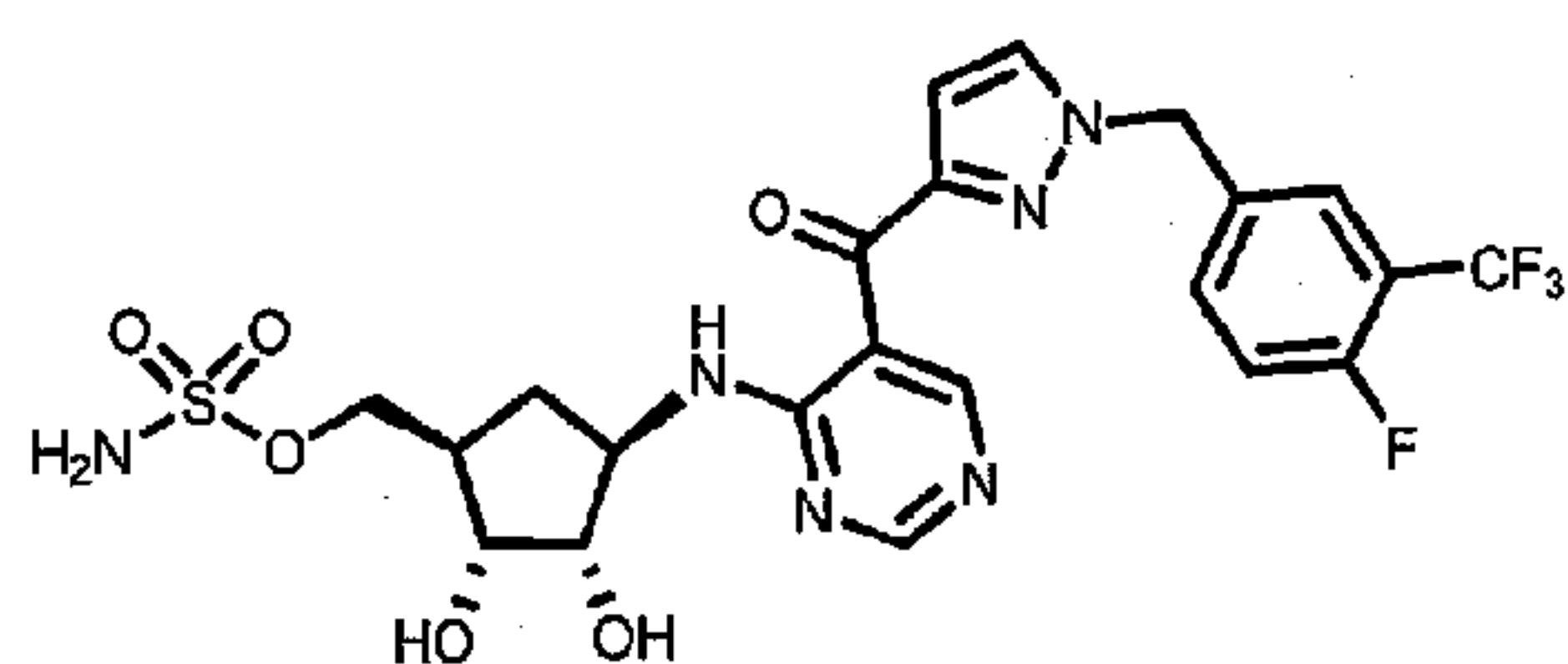
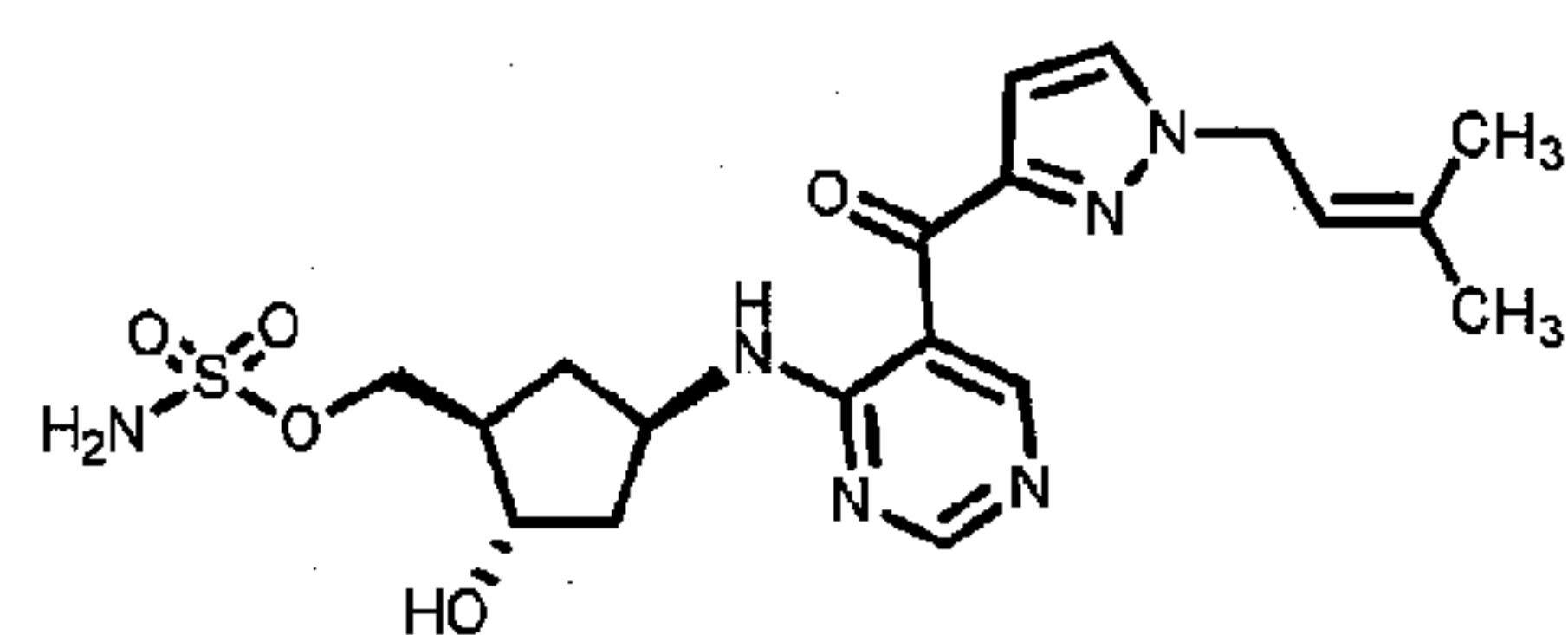
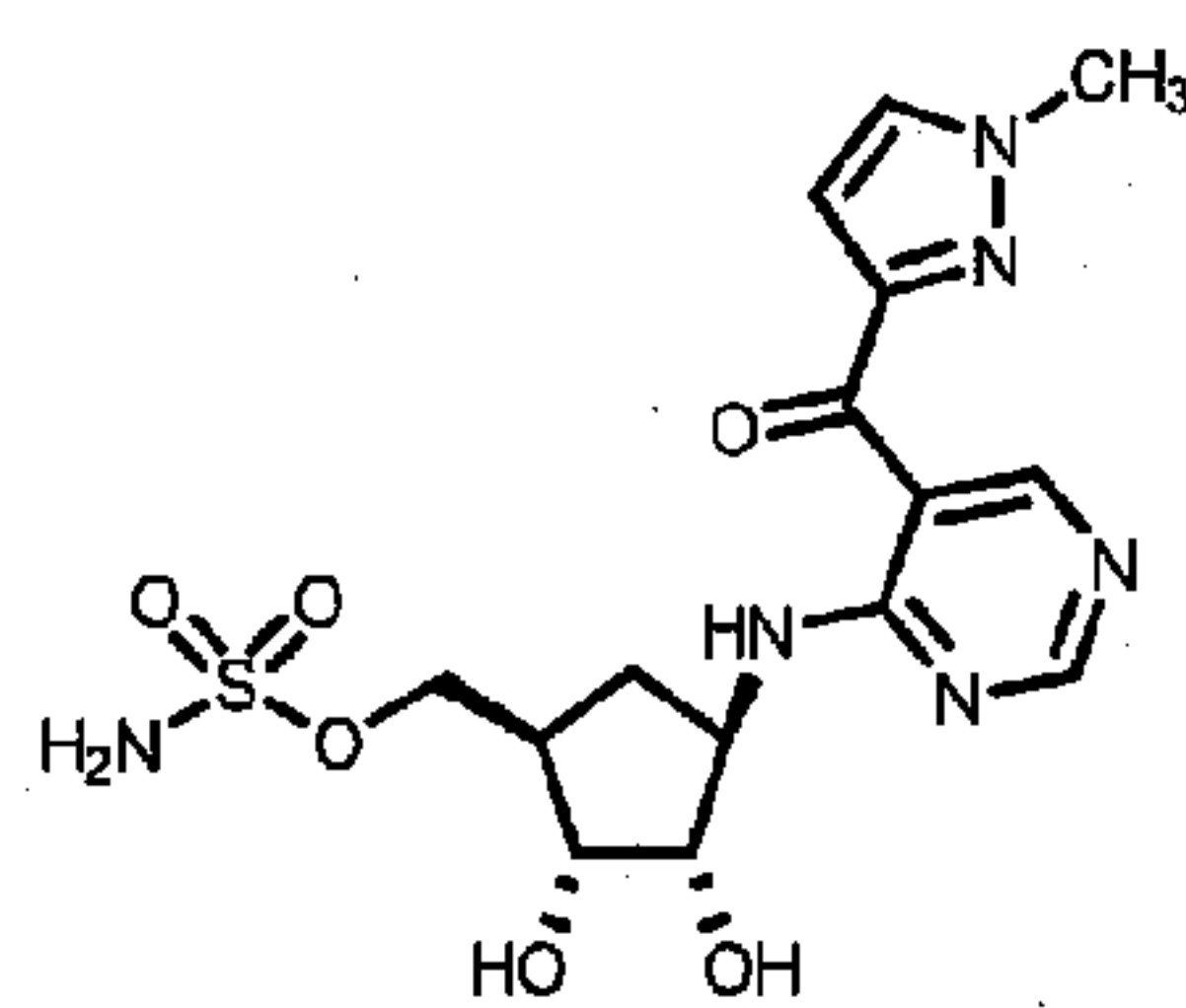
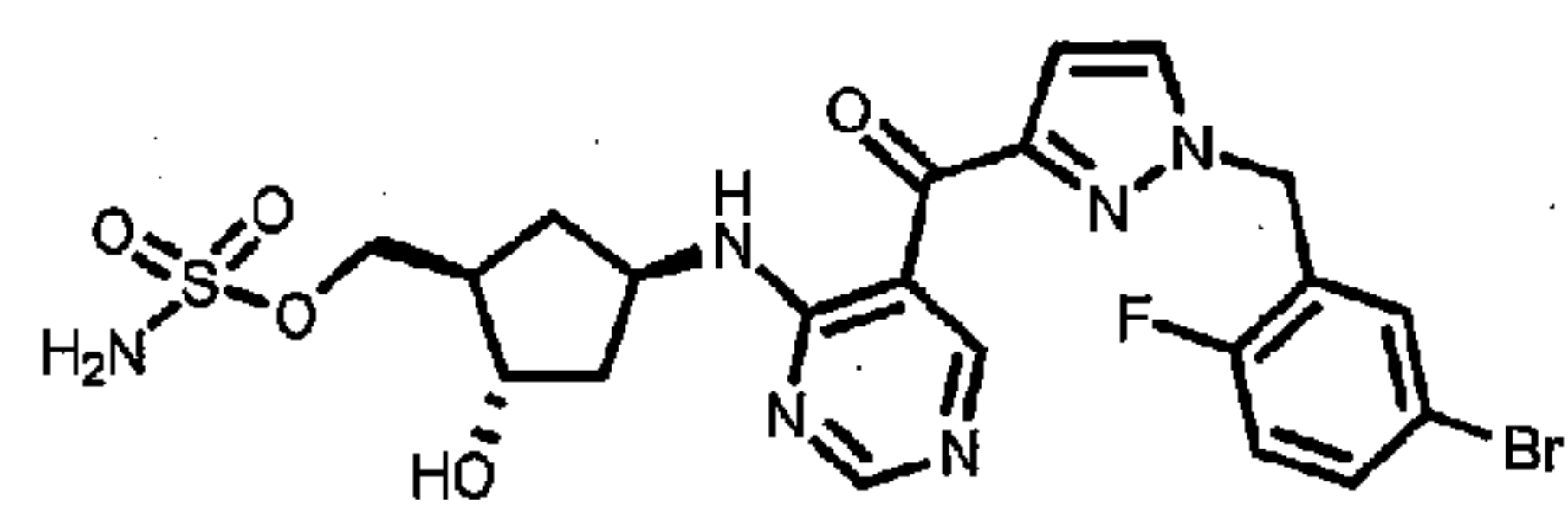
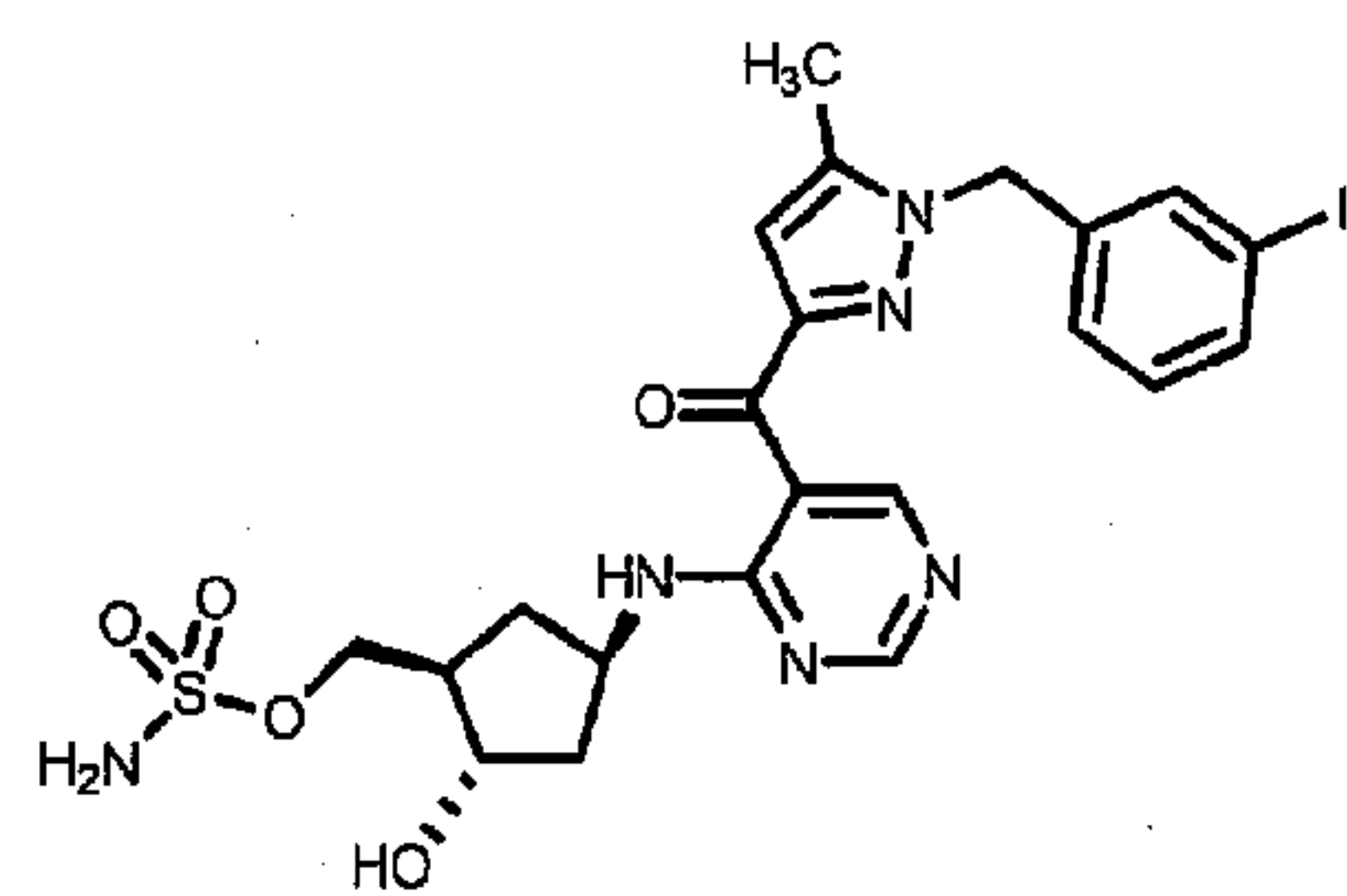
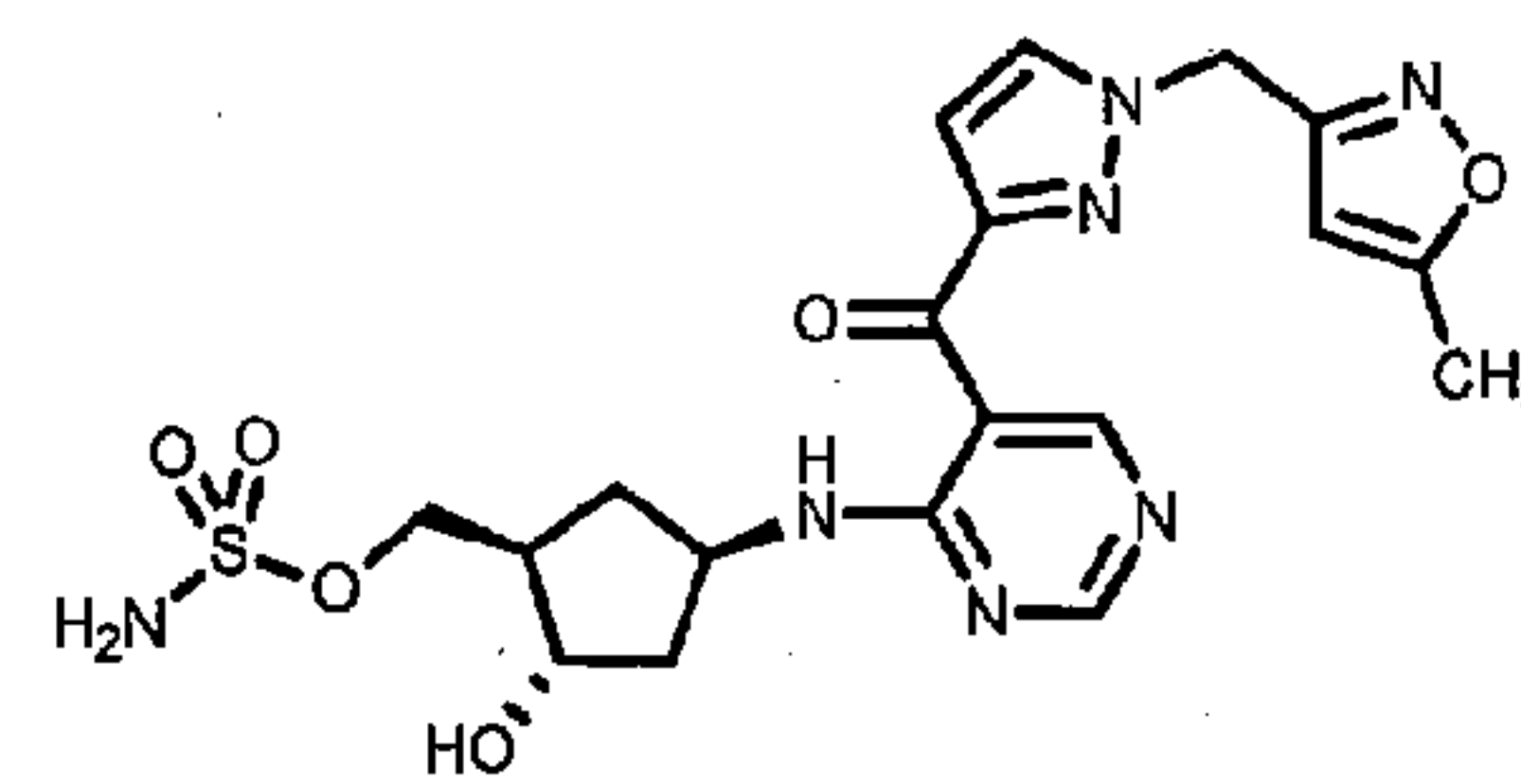


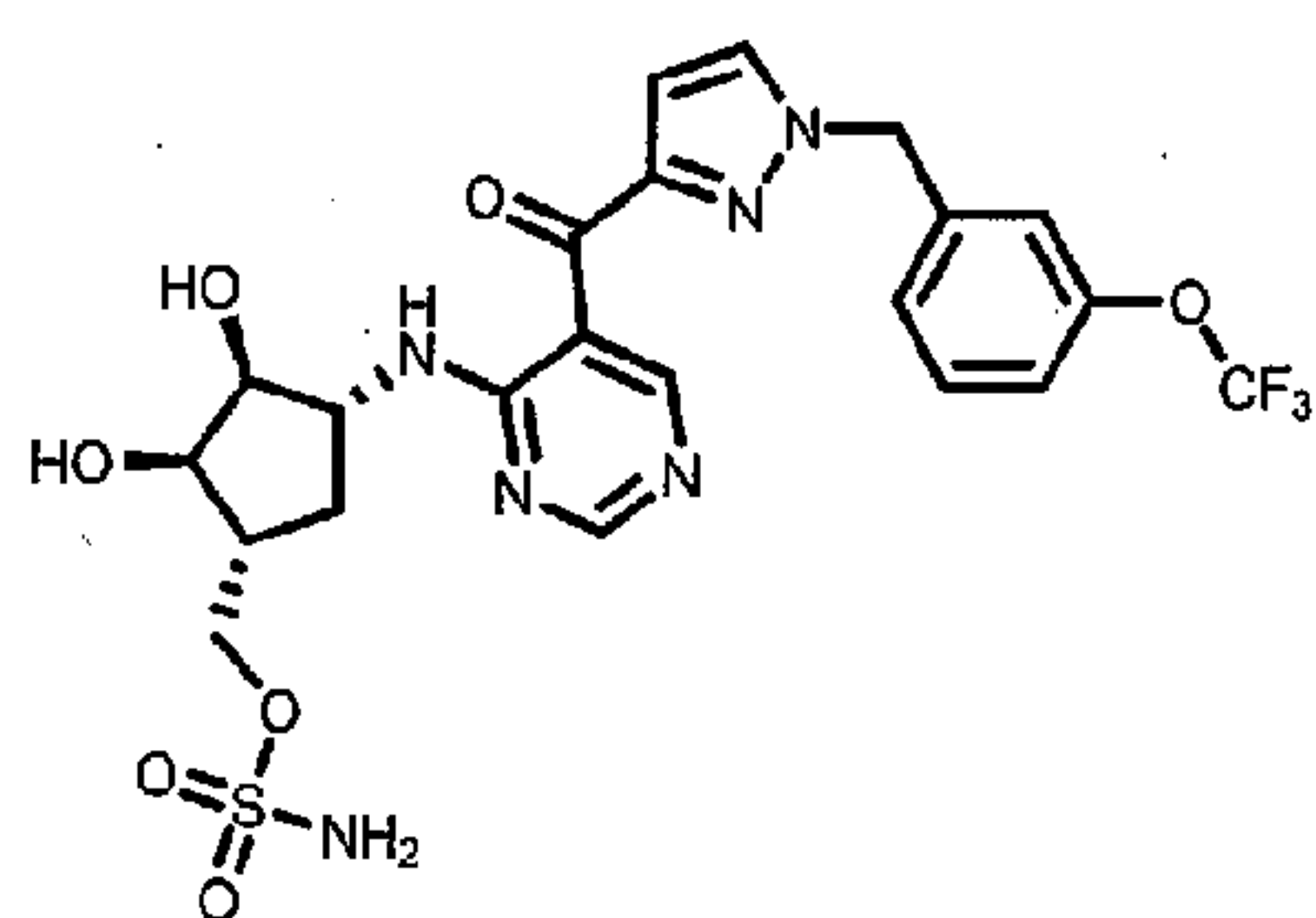
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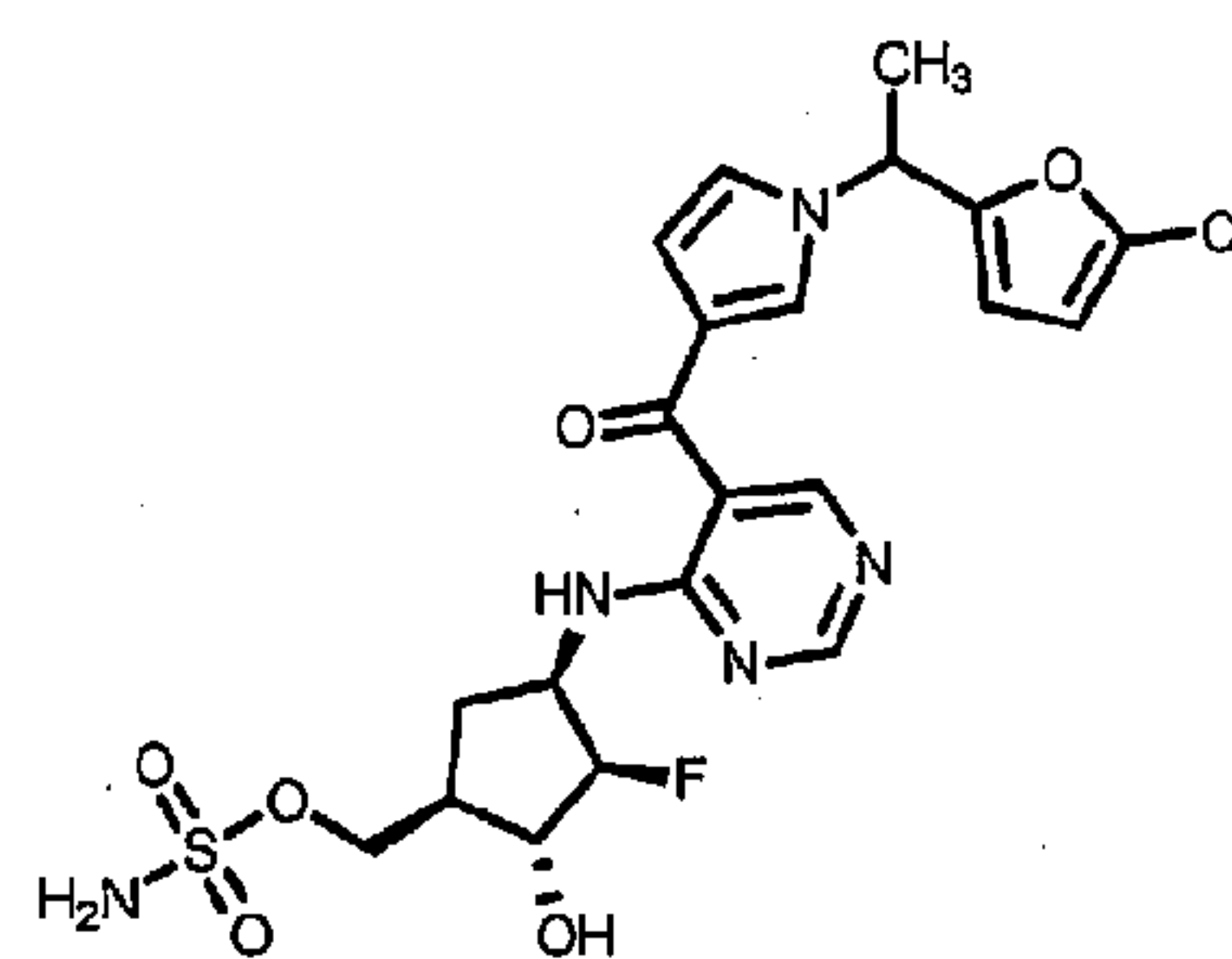
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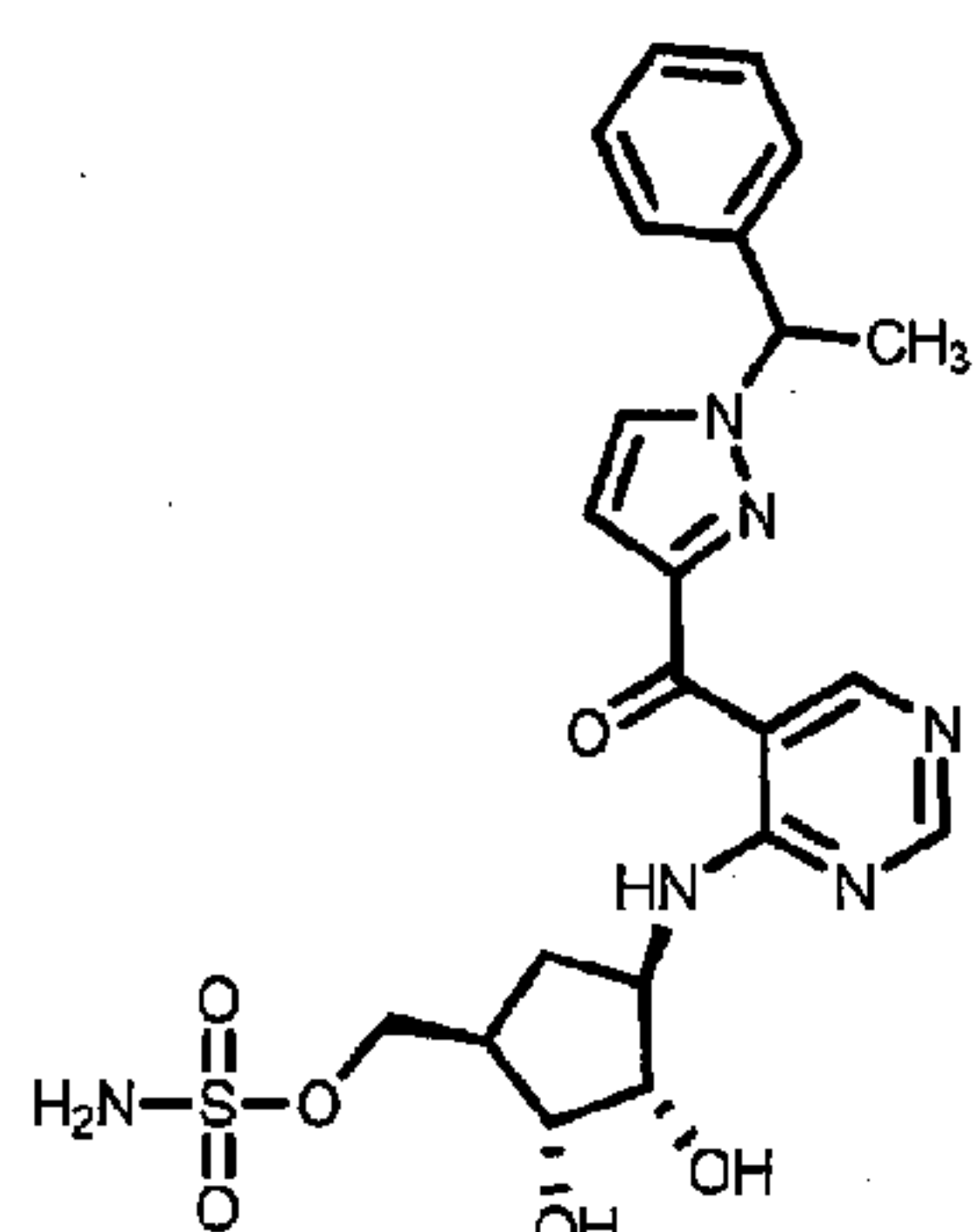
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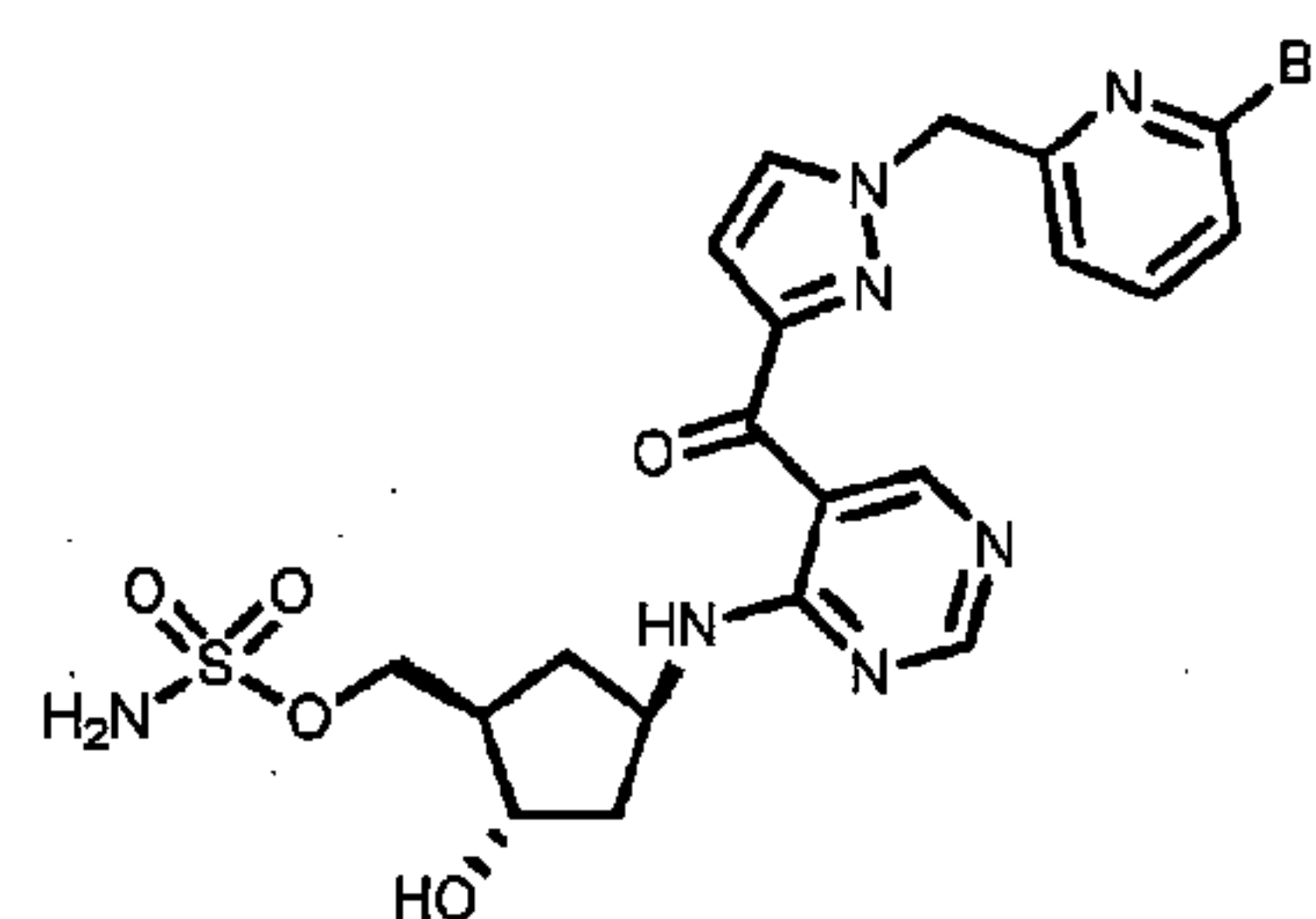
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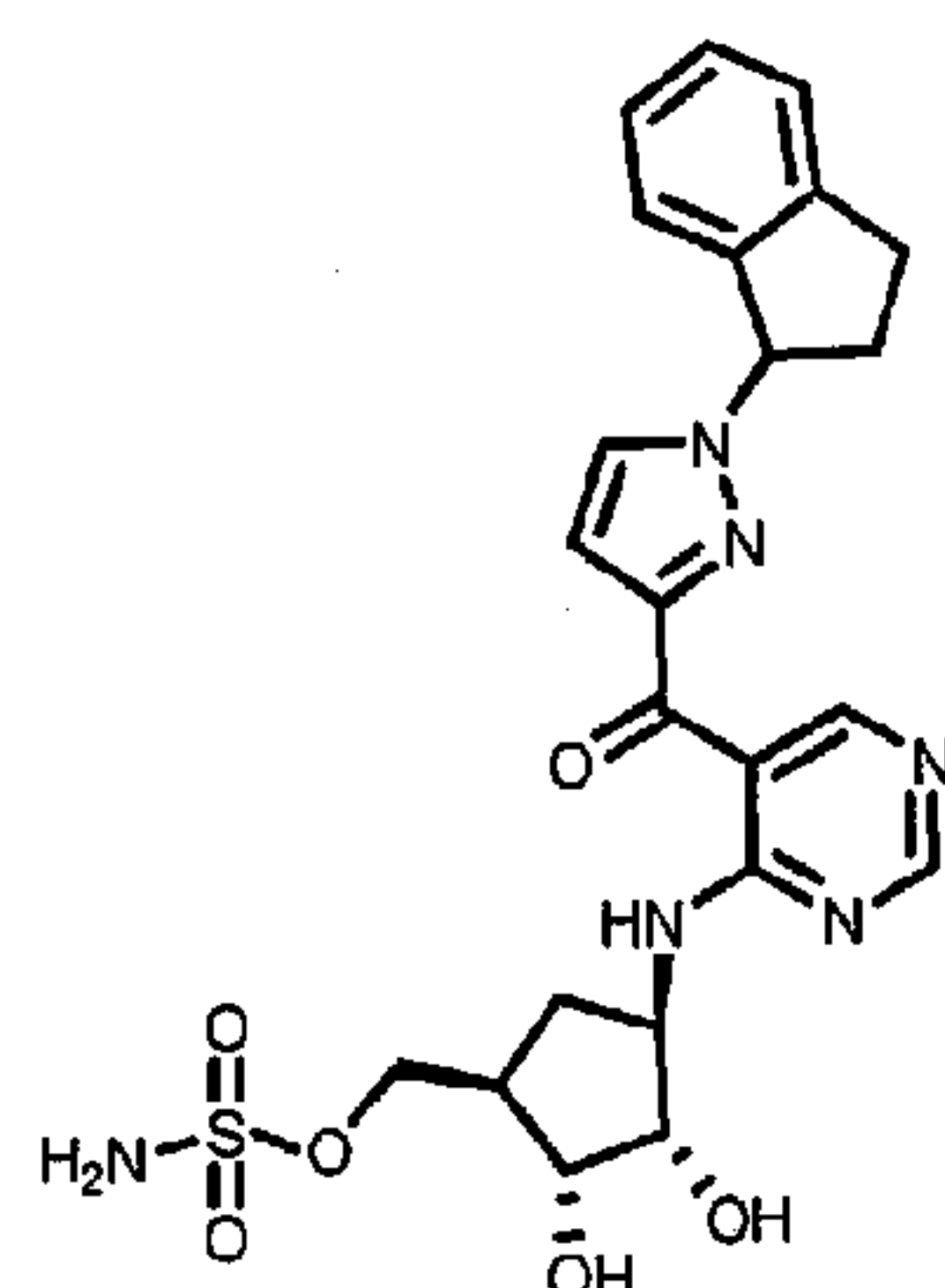
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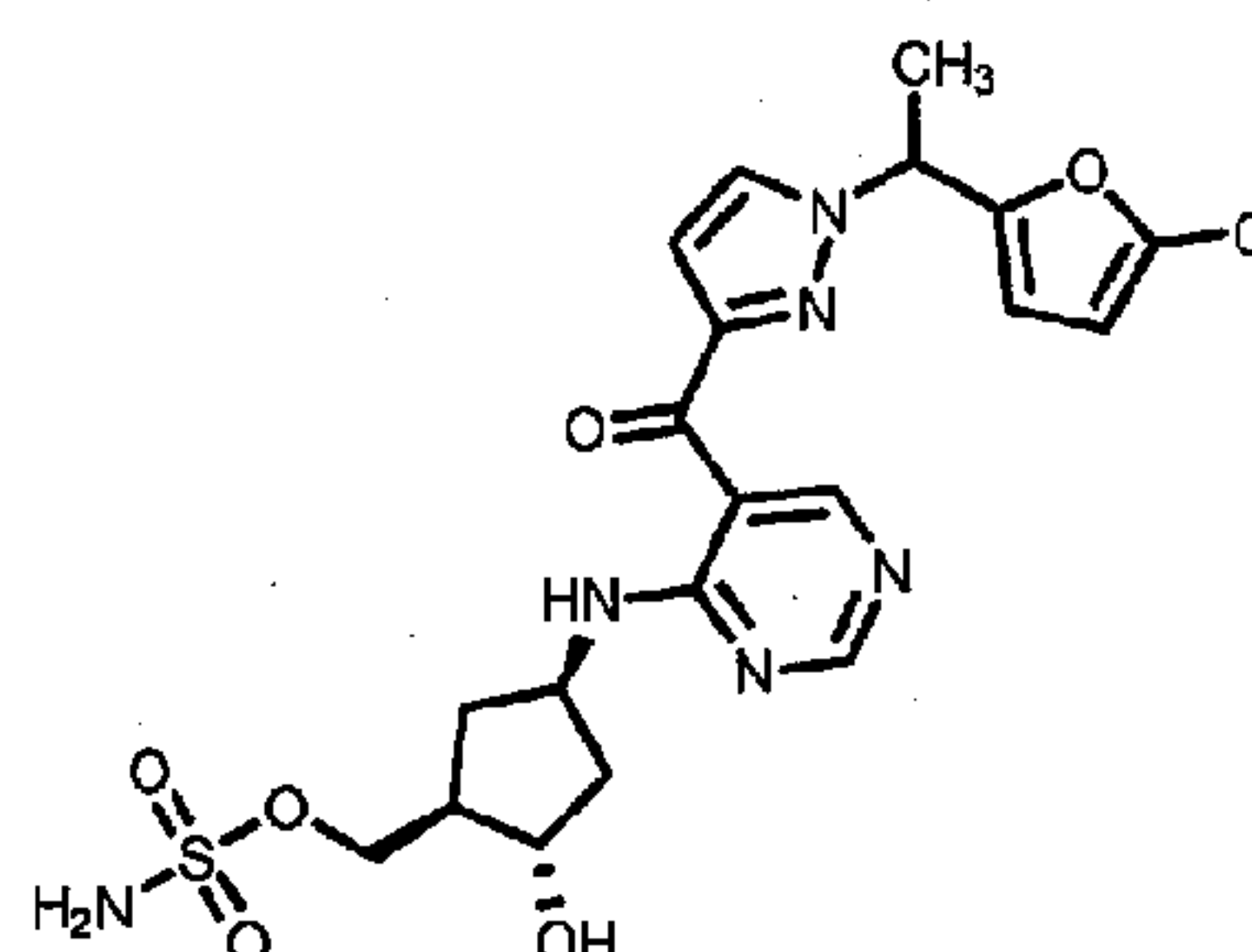
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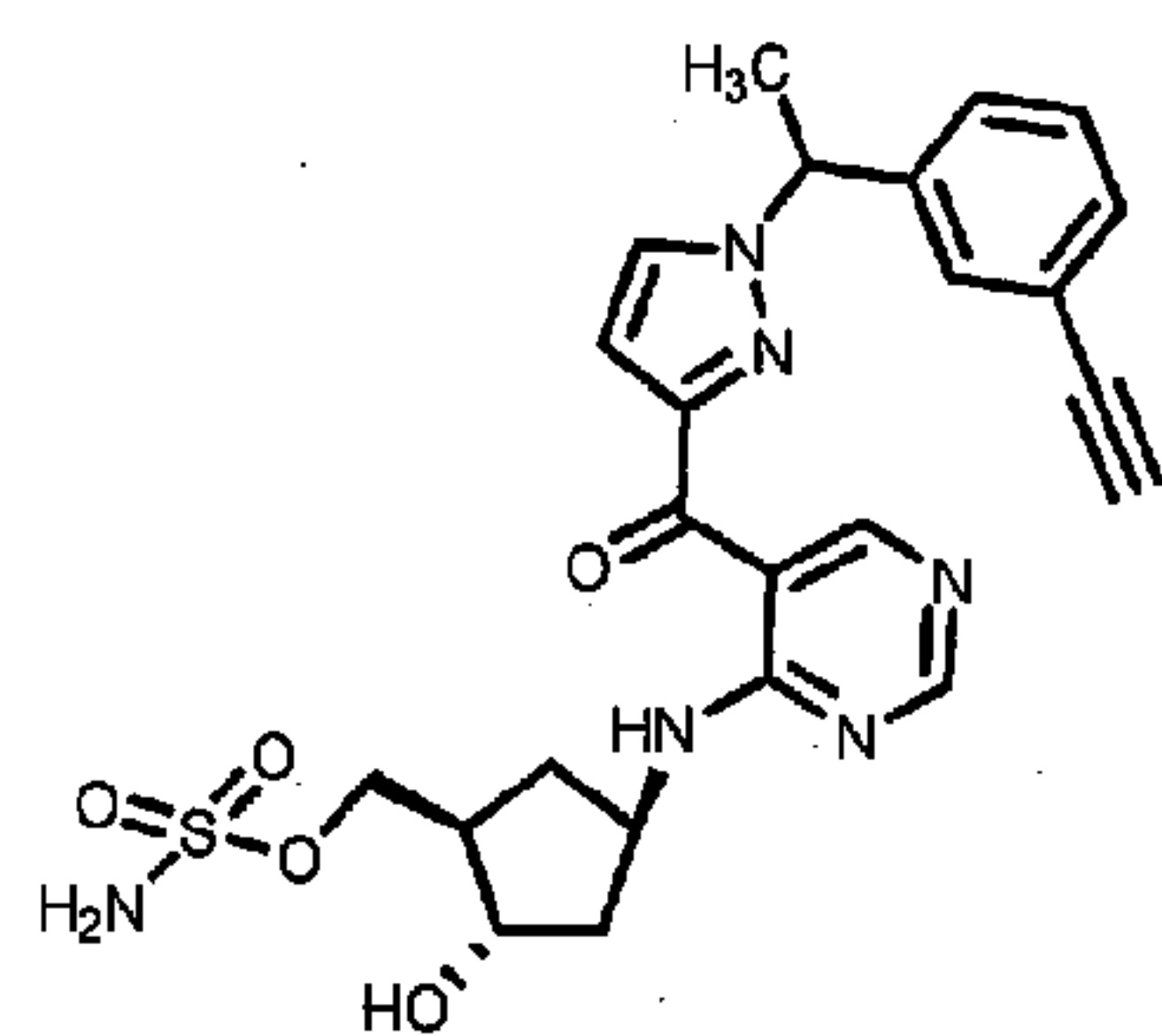
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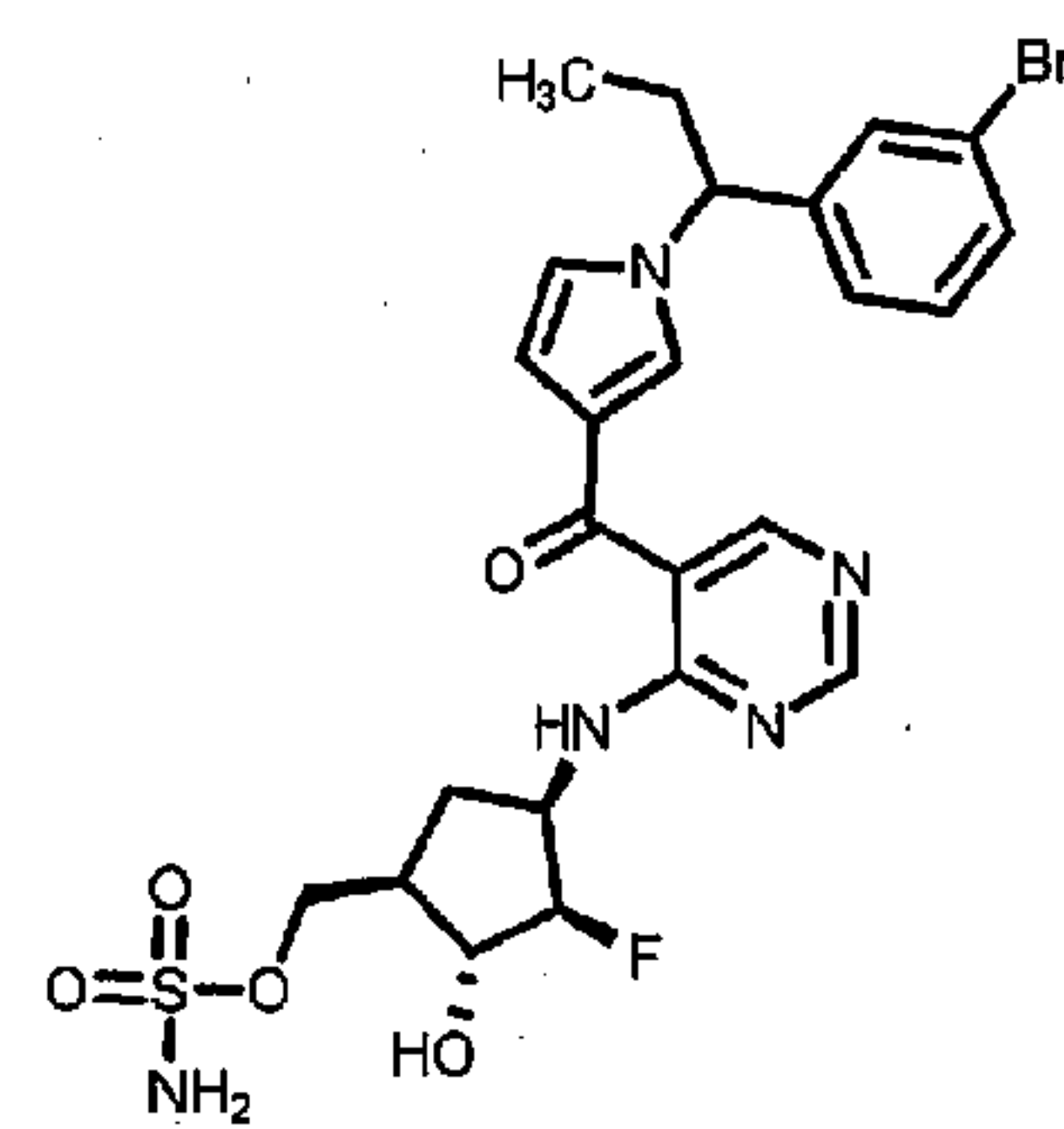
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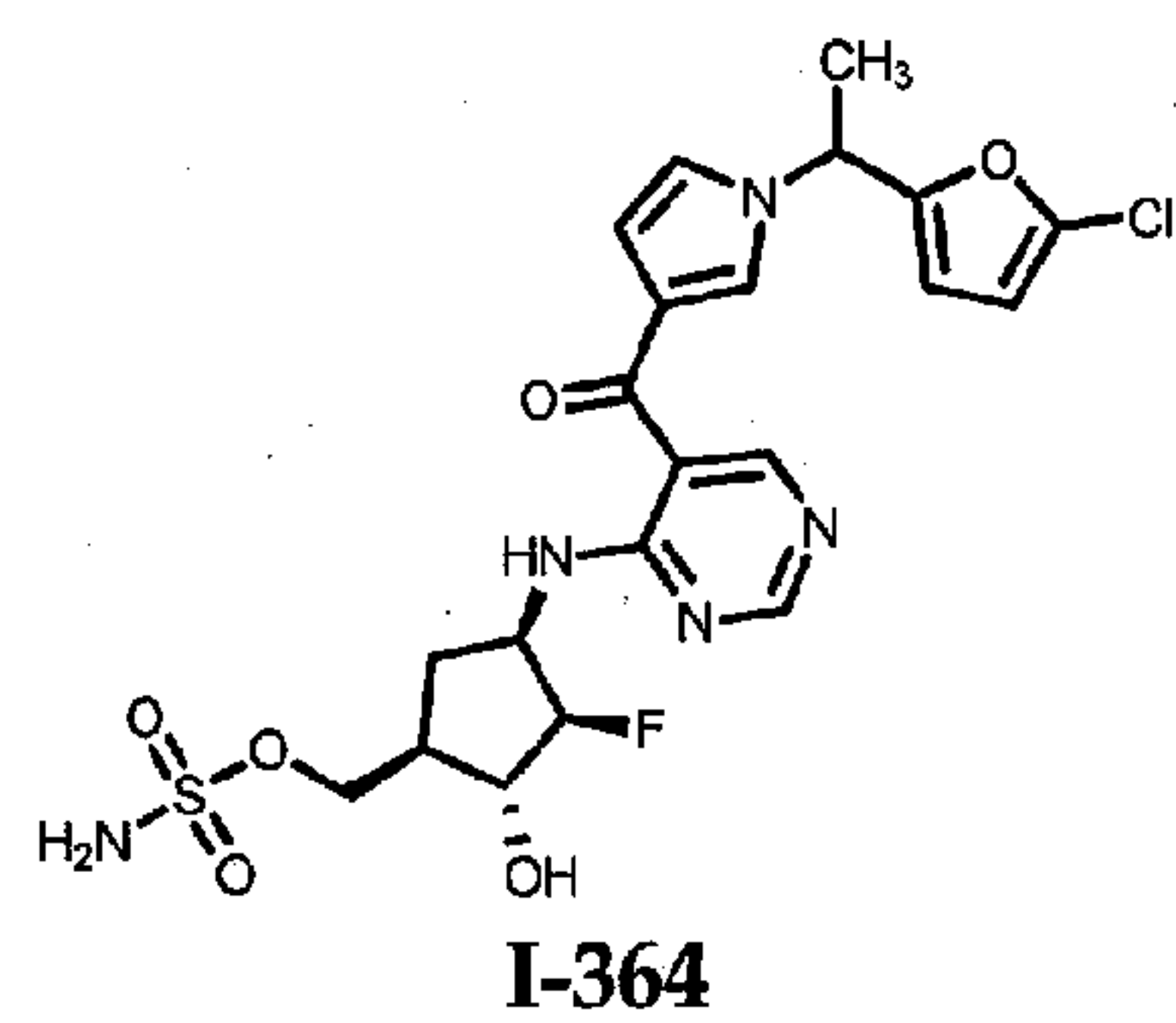
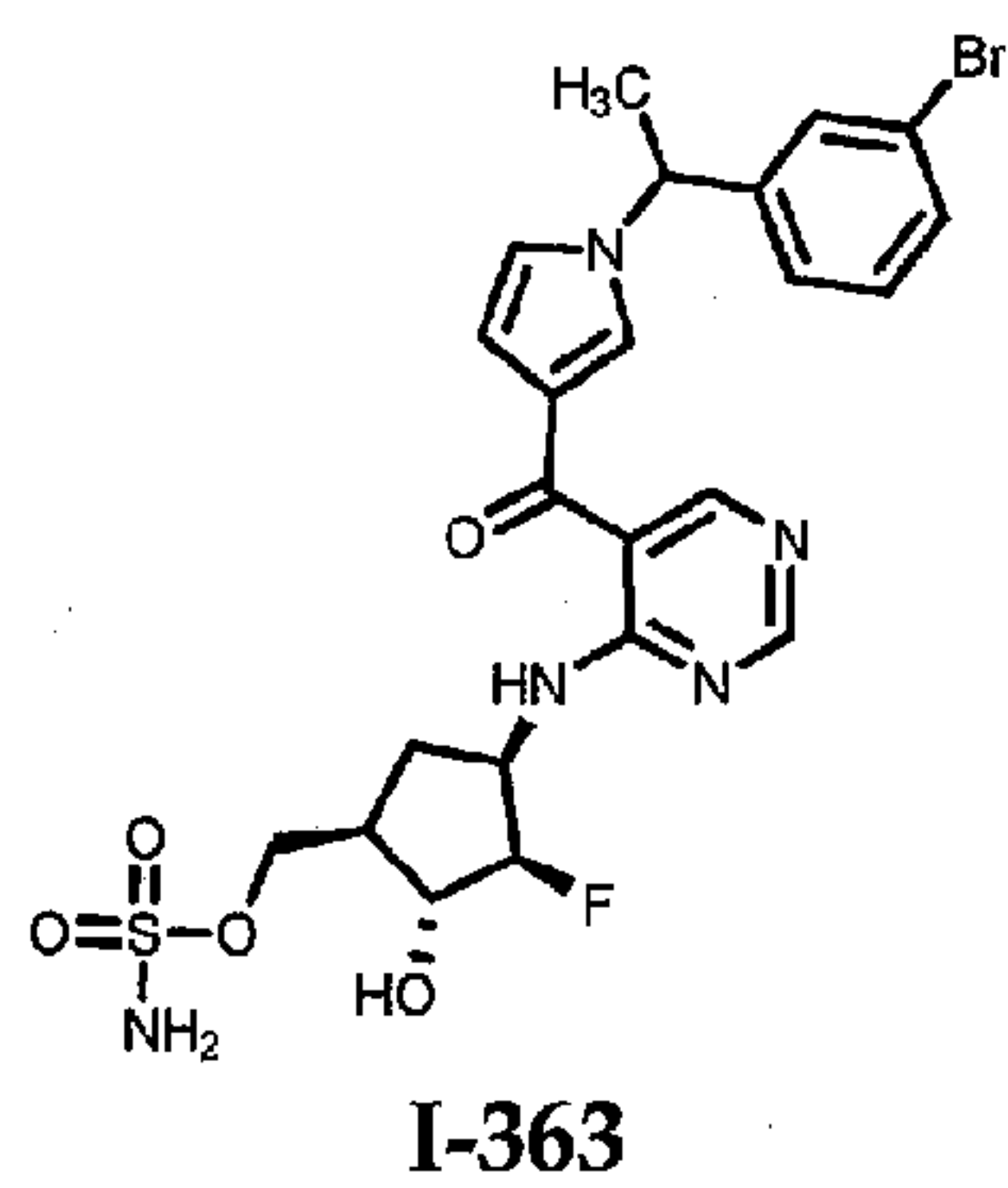
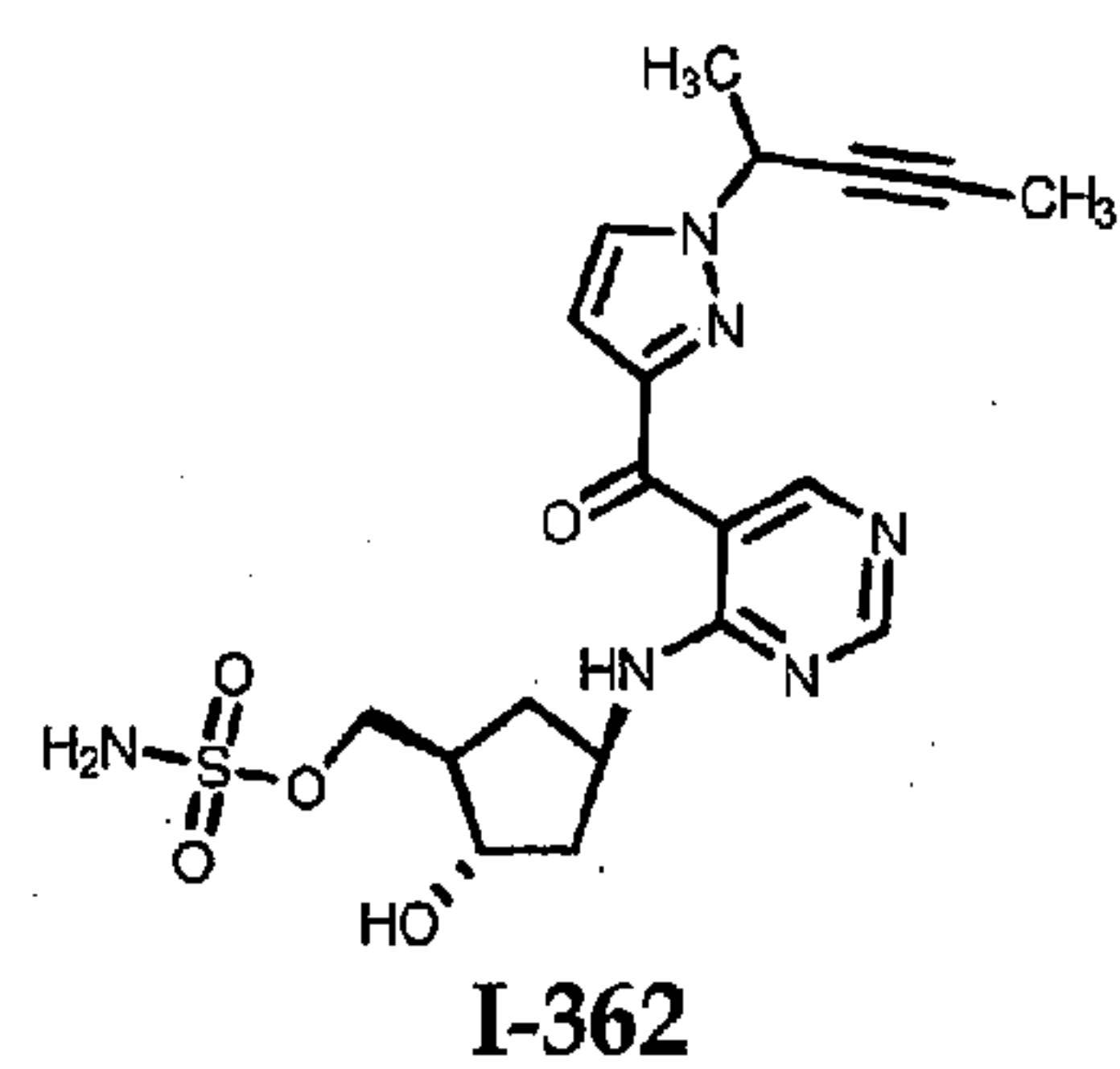
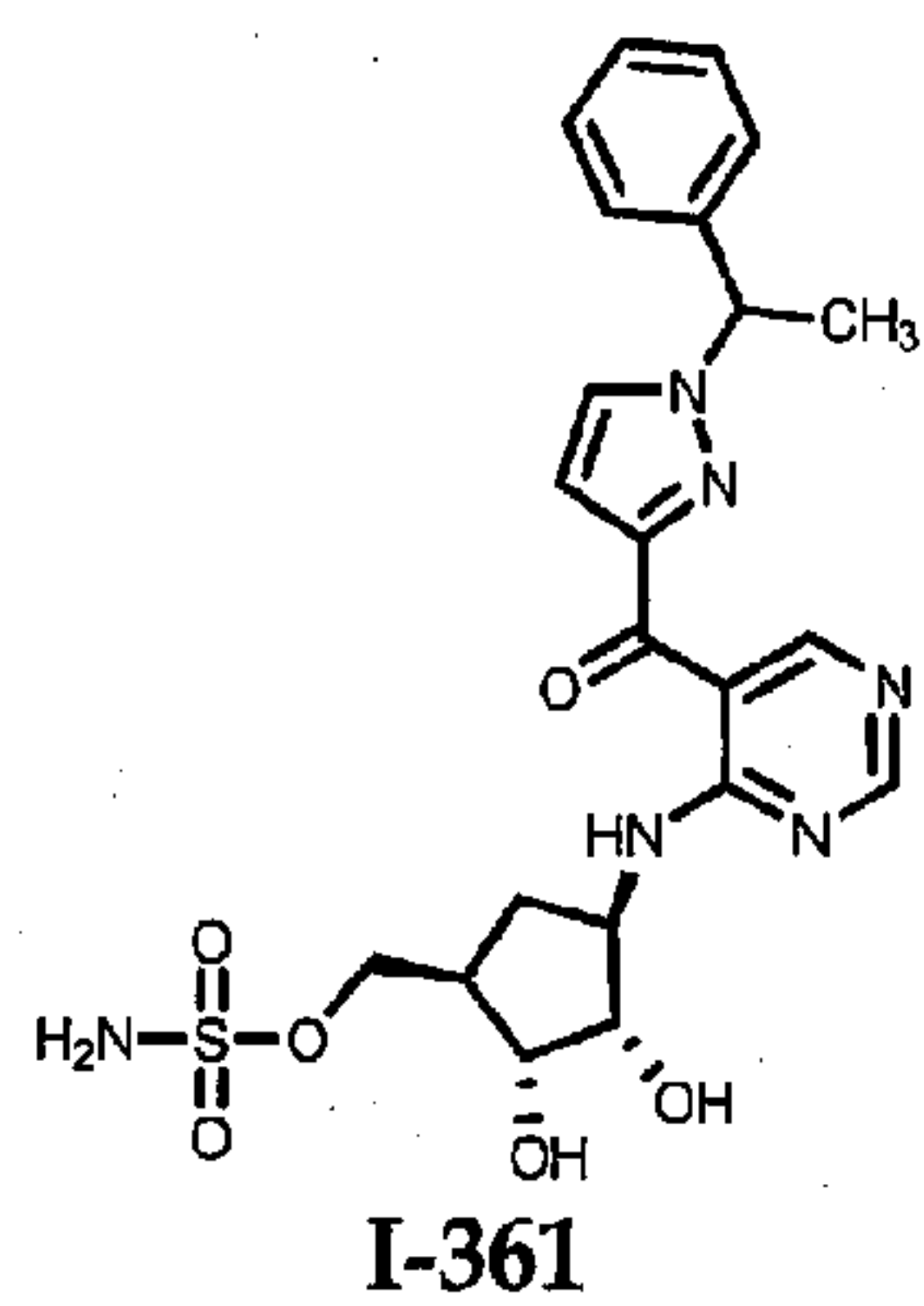
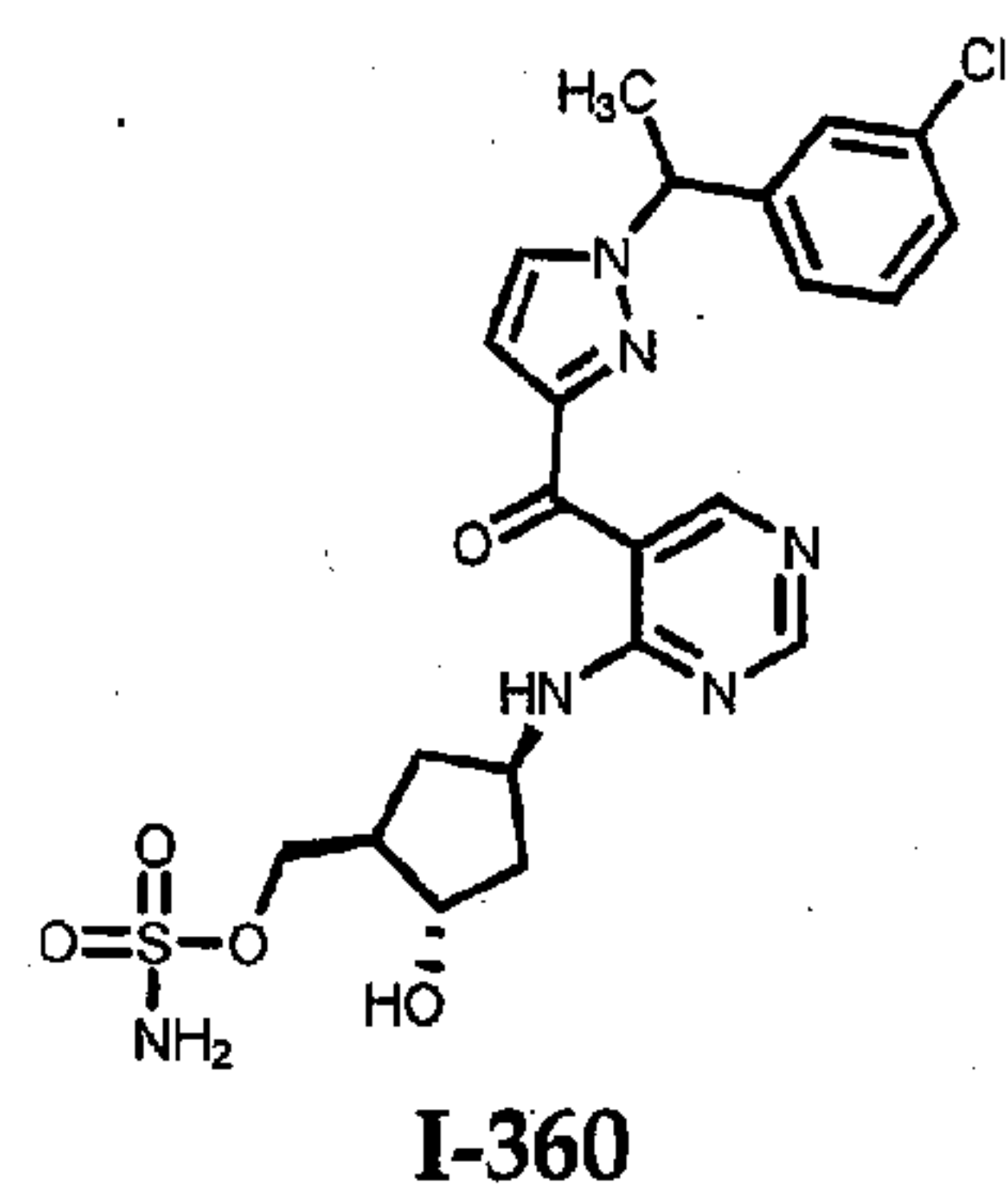
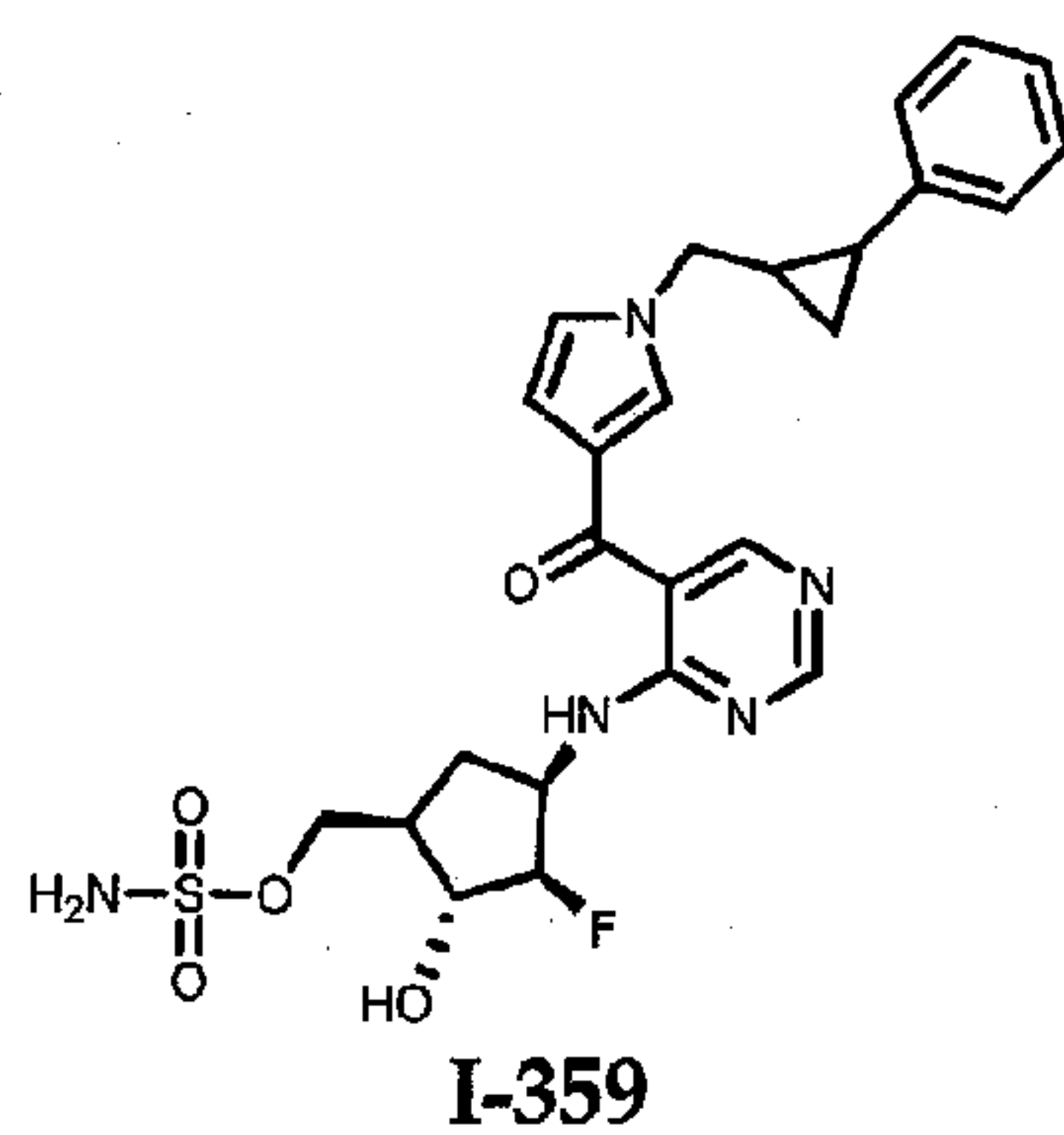
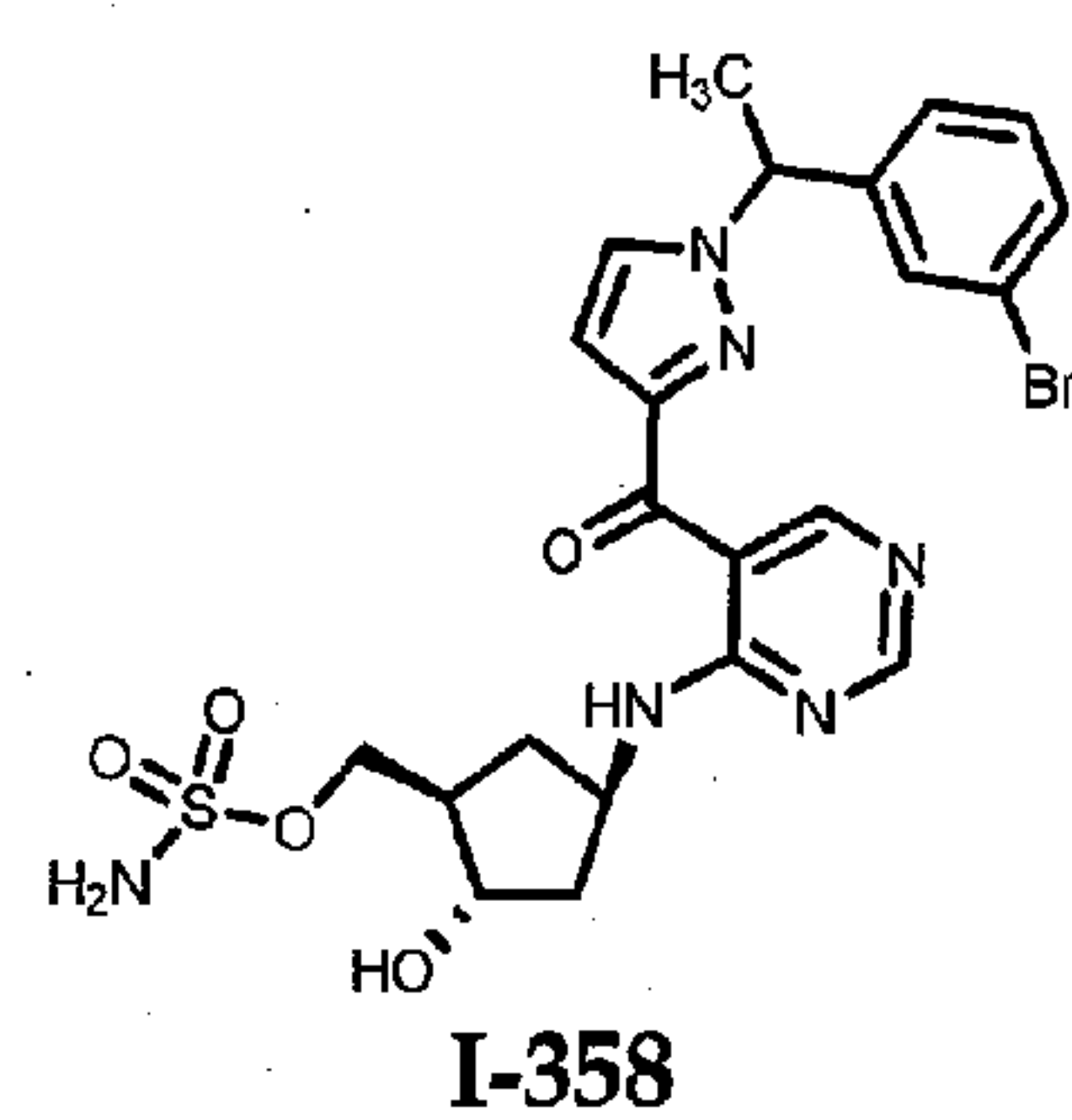
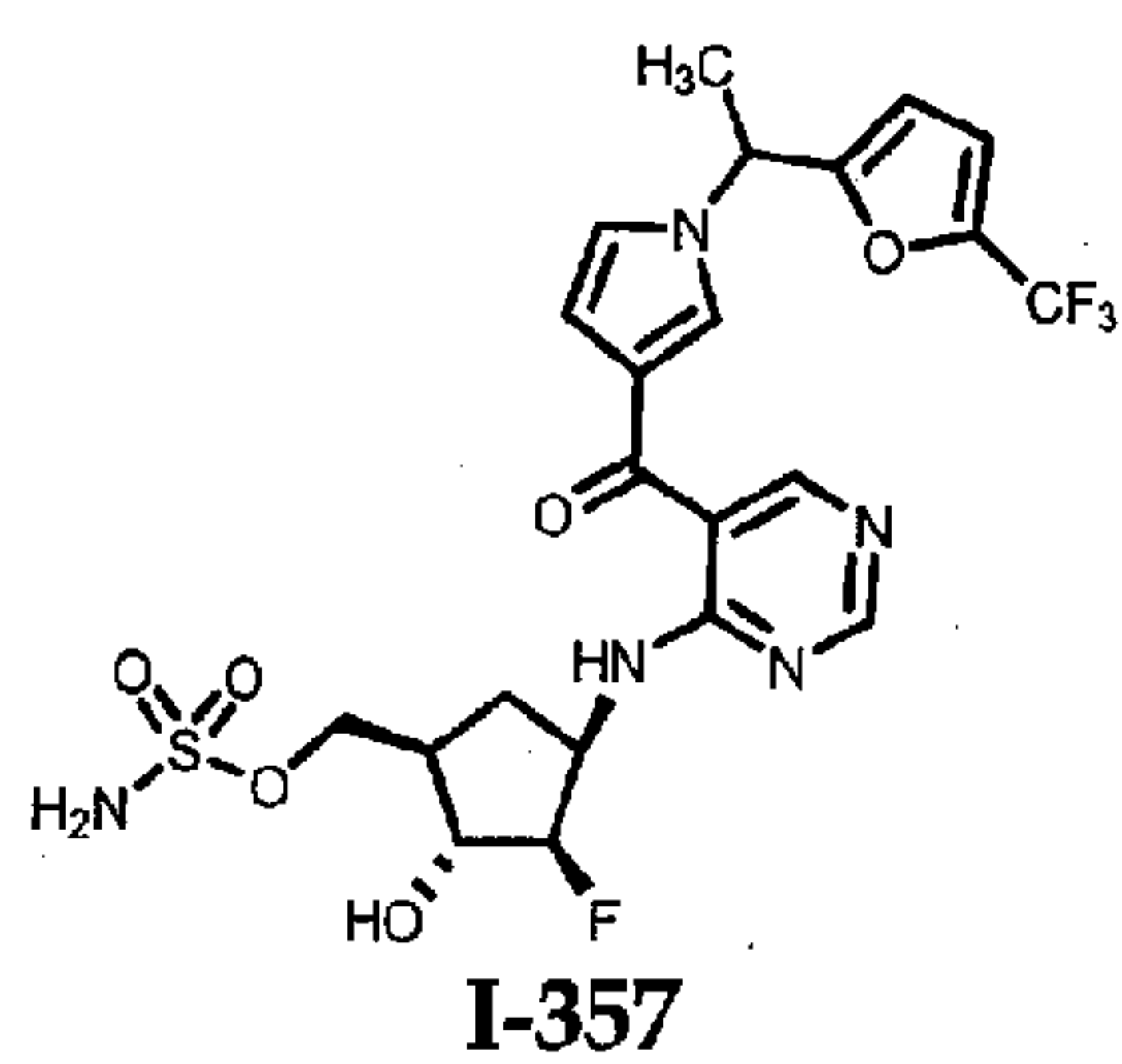
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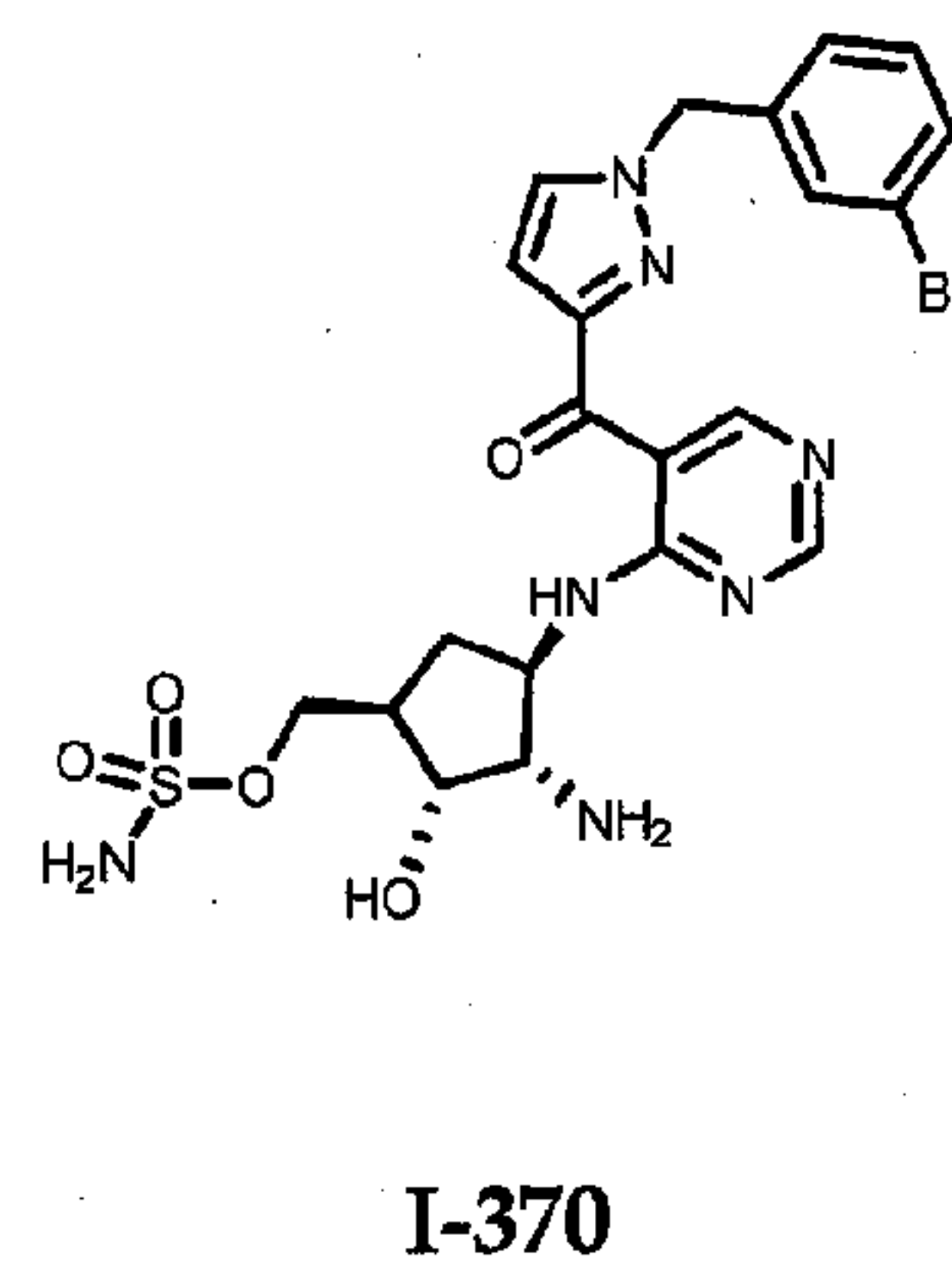
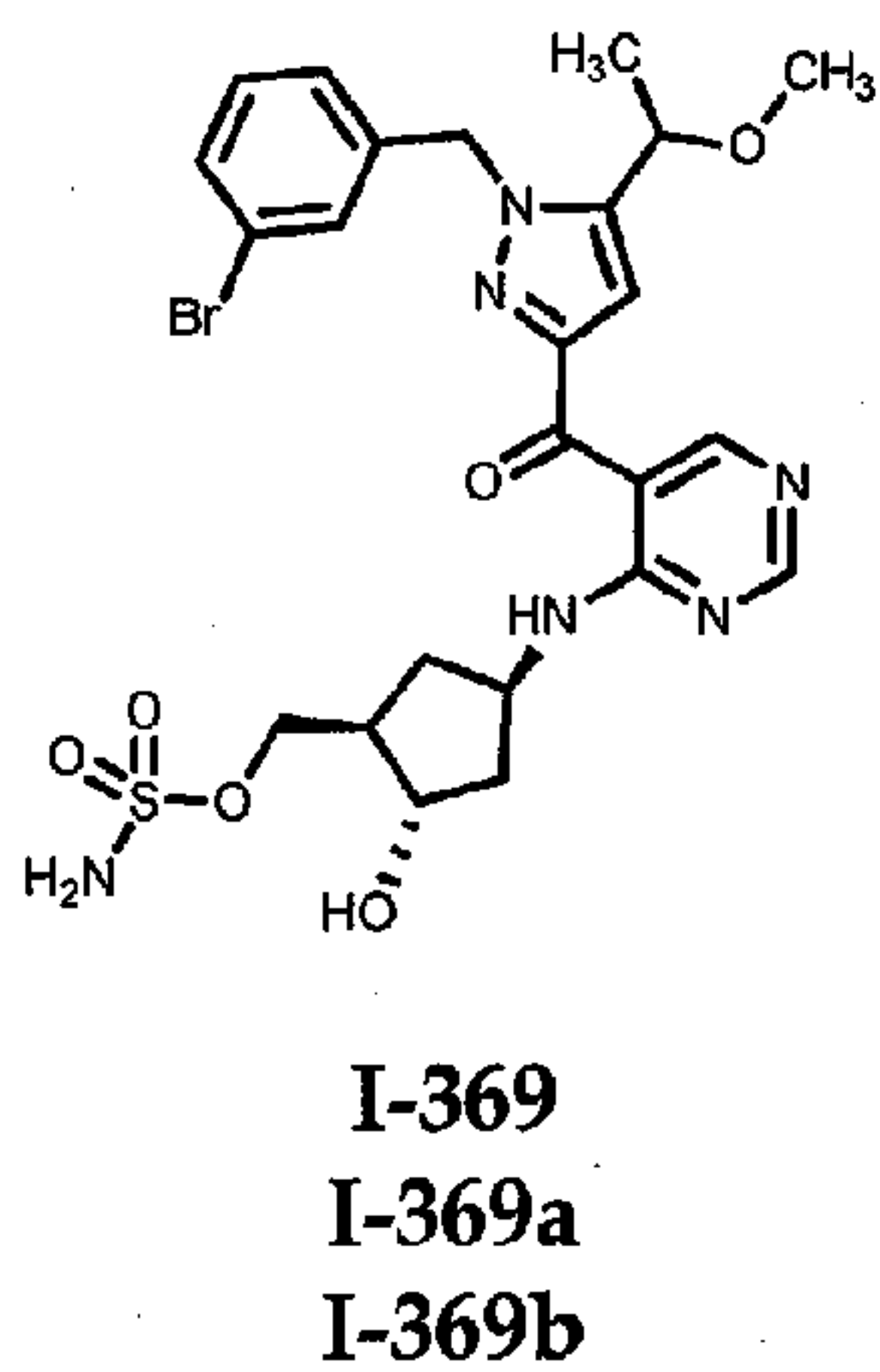
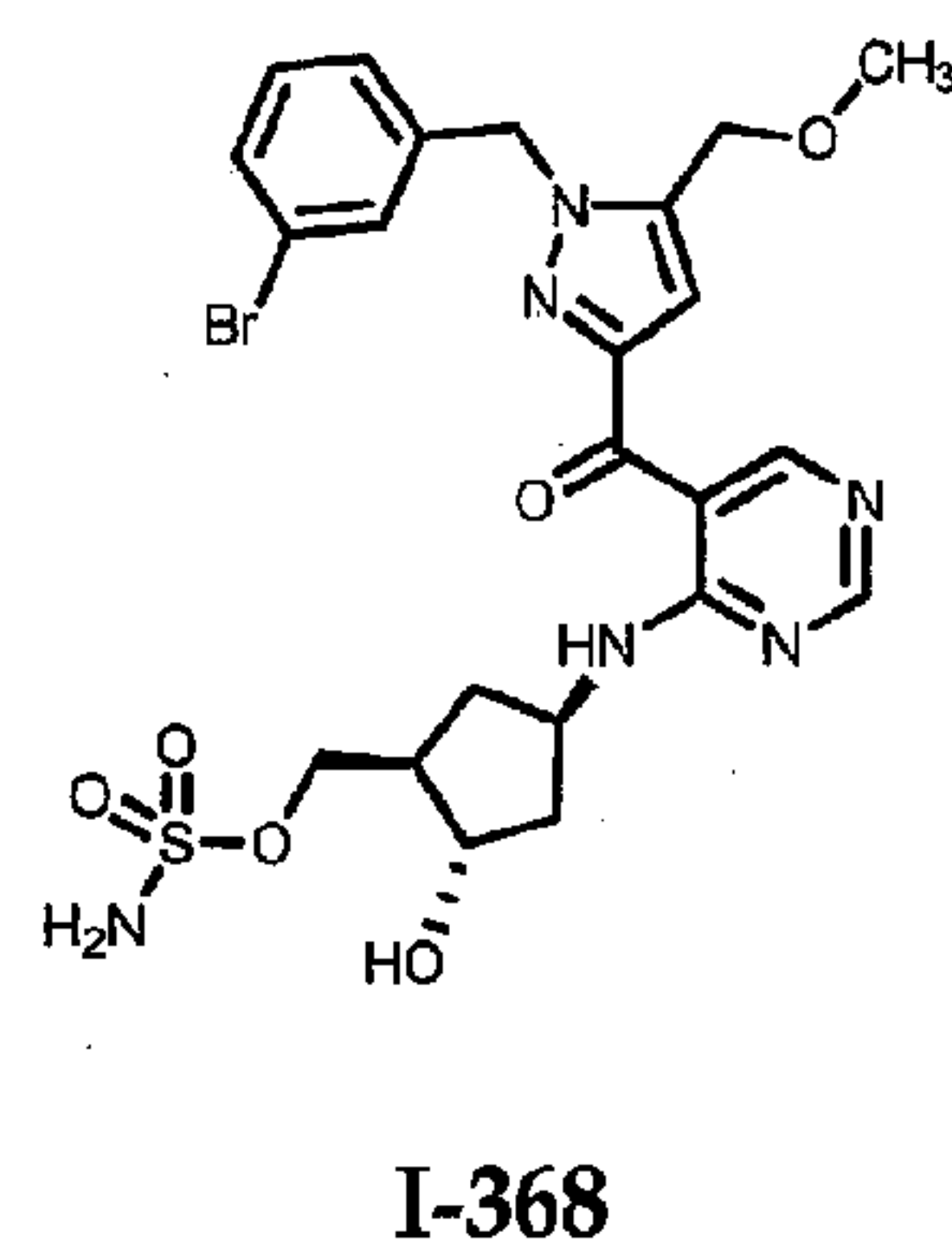
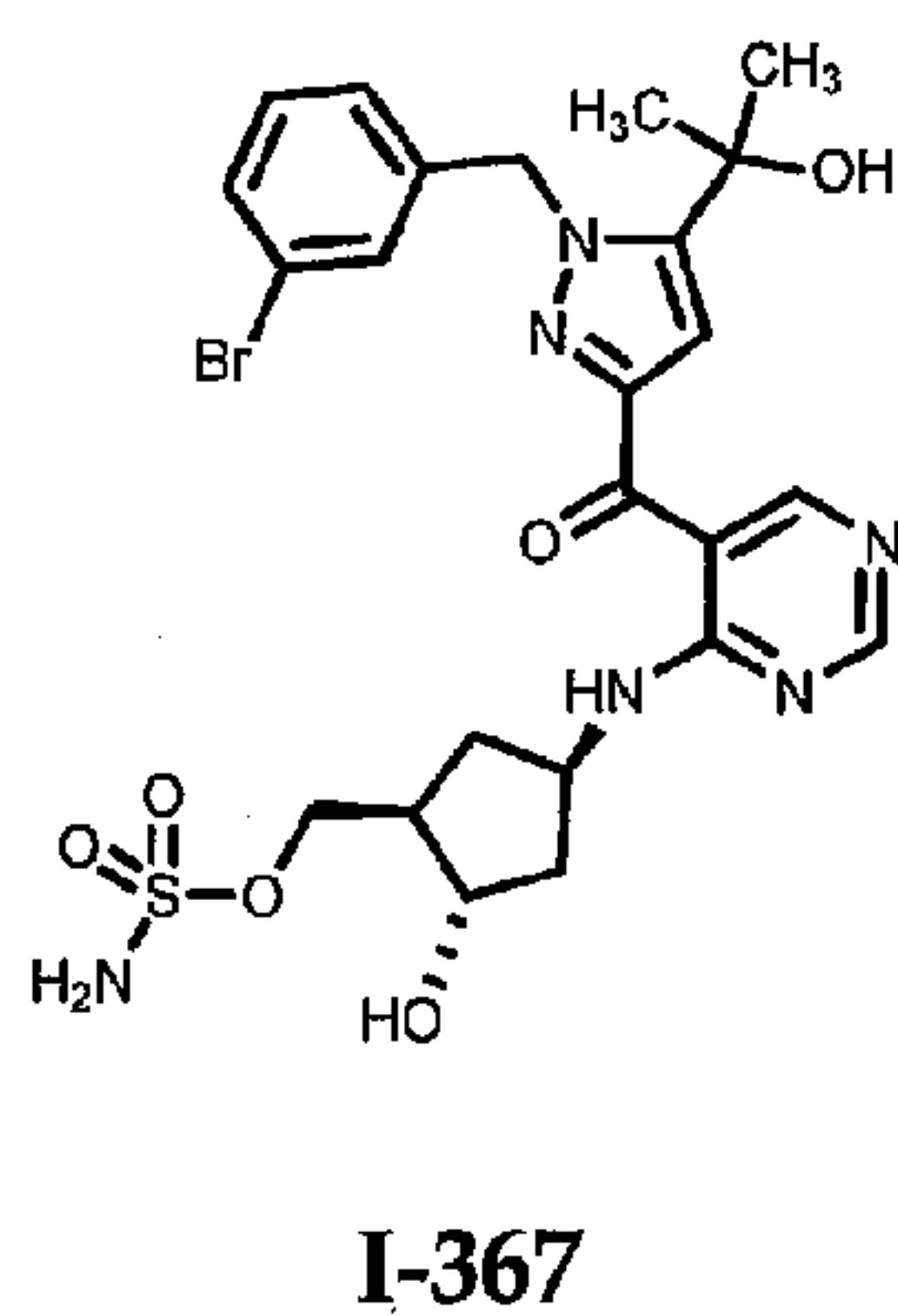
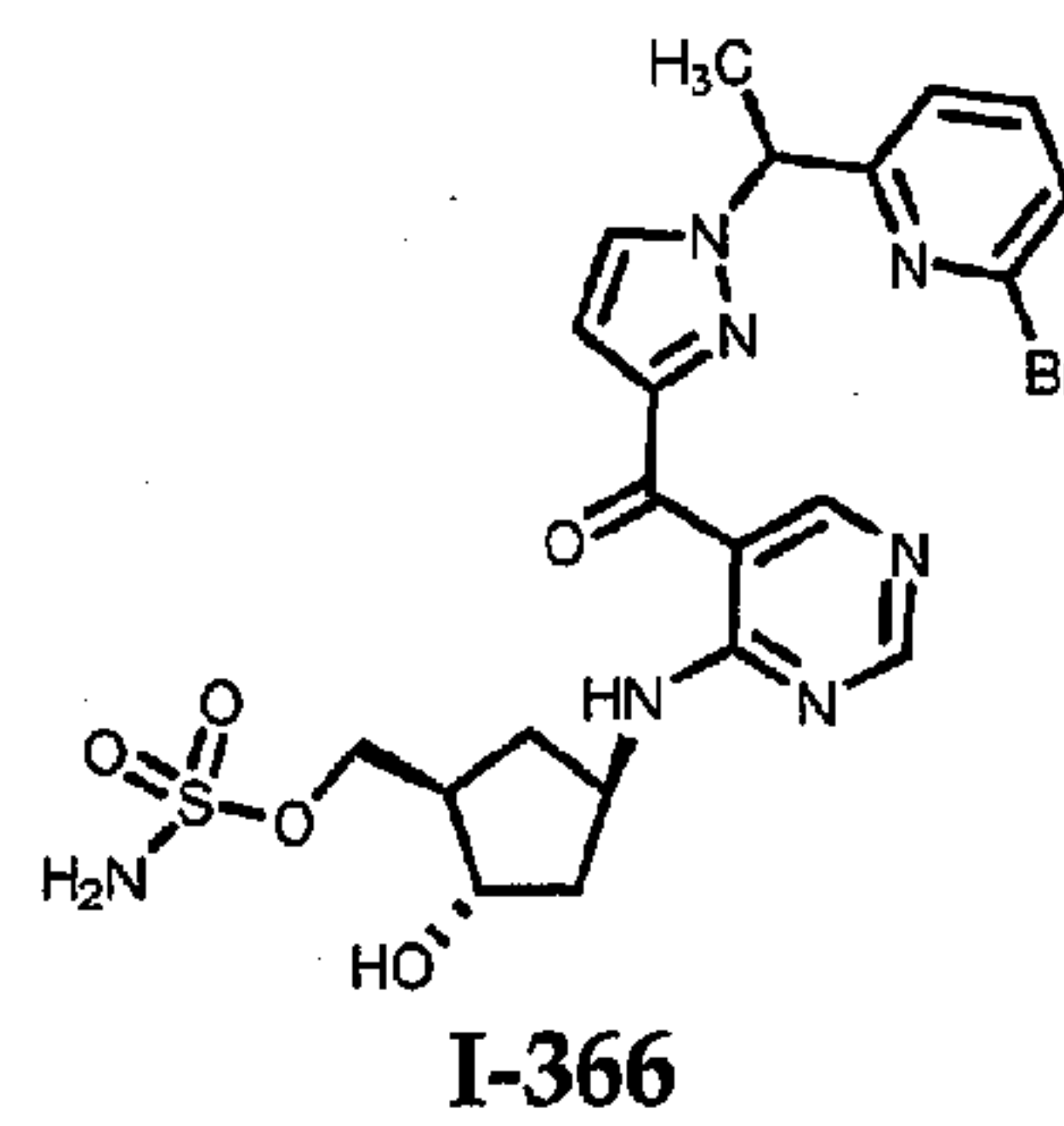
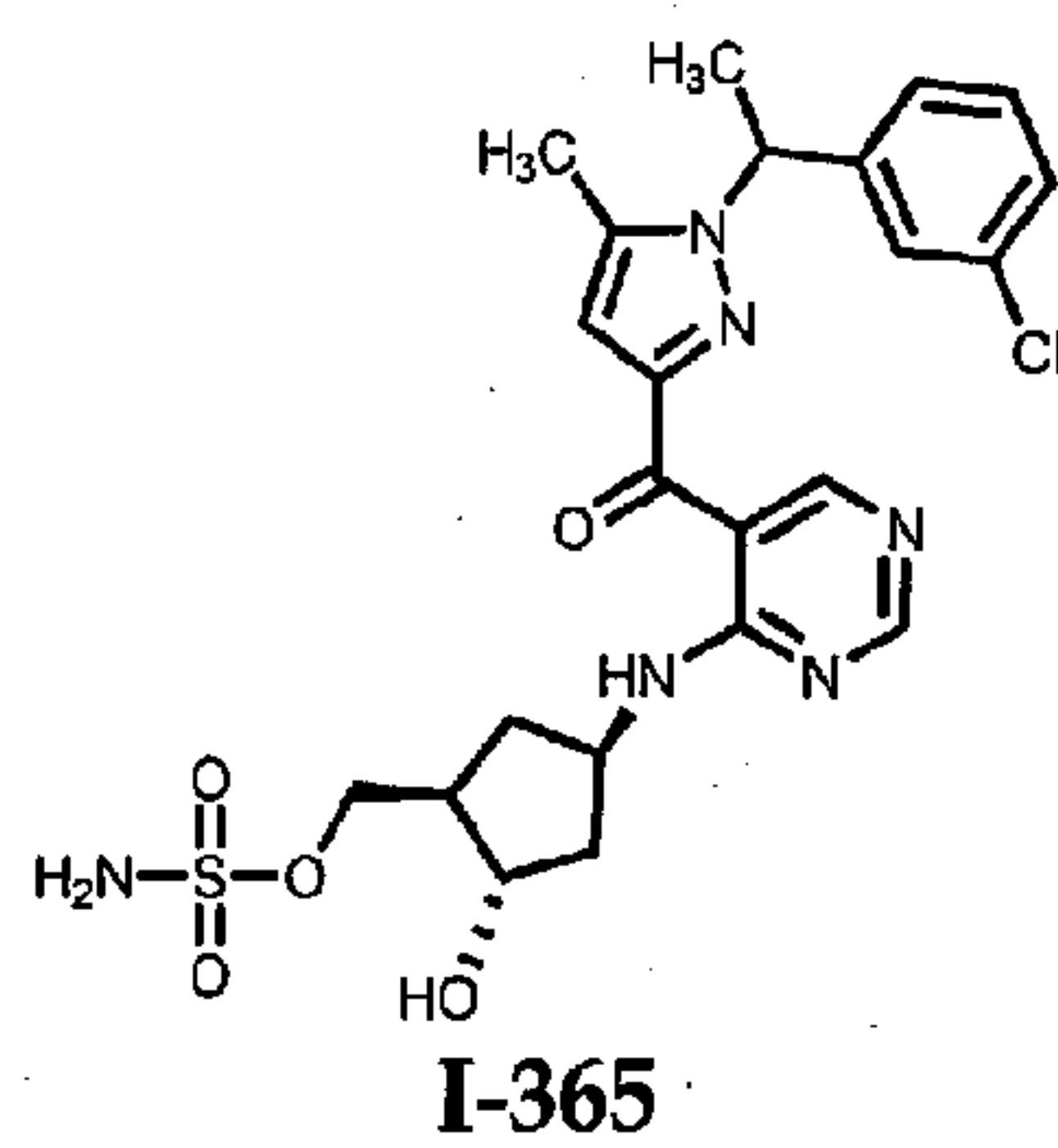


I-355



I-356





[0092] The compounds in Table 1 may also be identified by the following chemical names:

Compound	Name
I-1	[(1R,2R,3S,4R)-4-{[5-({1-[(3-bromophenyl)sulfonyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-2	{(1S,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl] carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-3	[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[6-(trifluoromethyl)pyridin-2-yl]methyl}-1H-pyrazol-3-yl) carbonyl]pyrimidin-4-yl} amino)cyclopentyl]methyl sulfamate
I-4	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[2-(3-methyl-1H-pyrazol-1-yl)ethyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-5	{(1R,2R,3R,4R)-4-[(5-{[1-(3,6-dihydro-2H-pyran-4-ylmethyl)-1H-pyrrol-3-yl] carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-6	{(1S,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl] carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-7	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[3-(trifluoromethyl)benzyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-8	[(1R,2R,3R,4R)-4-{[5-({1-[(6-chloropyridin-2-yl)methyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-9	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(1R,2R)-(2-phenylcyclopropyl)methyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate or [(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(1S,2S)-(2-phenylcyclopropyl)methyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-10	[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-11	{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl] carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-12	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[4-(tetrahydro-2H-pyran-4-yl)but-2-yn-1-yl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-13	{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(3-iodobenzyl)-1H-pyrrol-3-

Compound	Name
	yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-14	{{(1R,2S,4R)-4-[(5-{[1-(4-fluoro-3-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-15	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-16	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2,3,6-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-17	{{(1R,2S,4R)-4-[(5-{[1-(1-benzofuran-2-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-18	[(1R,2S,4R)-2-hydroxy-4-{[3-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-19	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[2-oxo-2-(pyrrolidin-1-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-20	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-21	[(1R,2S,4R)-4-{[5-({1-[4-fluoro-3-(trifluoromethyl)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-22	{{(1R,2S,4R)-4-[(5-{[1-(2-fluoro-3-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-23	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-24	[(1R,2R,3R,4R)-4-{[5-({1-[5-bromo-2-furyl]methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-25	{{(1R,2R,3S,4R)-4-[(5-{[1-(3-cyanobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-26	{{(1R,2R,3R,4R)-4-[(5-{[1-(4,4-dimethylpent-2-yn-1-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-27	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(4-hydroxytetrahydro-2H-pyran-4-

Compound	Name
	yl)prop-2-yn-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-28	{{(1R,2R,3S,4R)-4-[(5-{[1-(2-ethoxyethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-29	[(1R,2S,4R)-4-{[5-{[1-(5-bromopyridin-3-yl)methyl]-1H-pyrazol-3-yl}carbonyl]pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-30	{{(1R,2R,3S,4R)-4-[(5-{[1-(cyclopropylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-31	[(1R,2R,3S,4R)-4-({5-[(1-benzyl-5-methyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate
I-32	{{(1R,2S,4R)-4-[(5-{[1-(2-fluoro-5-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-33	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[2-(1H-indol-3-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-34	[(1R,2R,3S,4R)-4-{[5-({1-[4-chloro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-35	{{(1R,2S,4R)-4-[(5-{[1-(2,5-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-36	[(1R,2R,3R,4R)-4-({5-[(5-chloro-1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-37	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[2-(methylsulfanyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-38	2-{{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}ethanesulfonamide
I-39	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[2-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-40	{{(1R,2R,3S,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate

Compound	Name
I-41	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(1-{[5-(methoxymethyl)-2-furyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-42	{{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-43	{{(1R,2S,4R)-4-[(5-{[1-(3-bromo-4-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-44	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-5-fluoro-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-45	[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[1-methyl-3-(trifluoromethyl)-1H-pyrazol-5-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-46	[(1R,2R,3S,4R)-4-{{5-({1-[3-fluoro-4-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-47	{{(1R,2S,4R)-4-[(5-{[1-(4-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-48	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2-naphthylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-49	[(1R,2R,3R,4R)-4-{{5-({1-[(3-chloro-1-benzothiophen-2-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl}amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-50	[(1R,2S,4R)-4-{{5-({1-[2-chloro-5-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}-2-hydroxycyclopentyl]methyl sulfamate
I-51	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{{5-({1-[(4-methylpyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl]methyl sulfamate
I-52	{{(1R,2S,4R)-4-[(3-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-53	[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[2-(trifluoromethyl)pyridin-4-yl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-54	{{(1R,2S,4R)-4-[(6-chloro-5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate

Compound	Name
I-55	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(1S,2S)-2-methylcyclopropyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate and [(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(1R,2R)-2-methylcyclopropyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-56	[(1R,2R,3S,4R)-4-({3-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyridin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate
I-57	{(1R,2R,3R,4R)-3-fluoro-4-[(5-{[1-(4-fluoro-3-methoxybenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-58	{(1R,2S,4R)-4-[(5-{[1-(3,4-dichlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-59	{(1R,2S,4R)-4-[(5-{[1-(4-cyclopentylbut-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-60	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(2-hydroxypropan-2-yl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-61	{(1R,2R,3R,4R)-4-[(5-{[5-chloro-1-(3-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-62	{(1R,2S,4R)-4-[(5-{[1-(2,4-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-63	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(2-methoxypyridin-3-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-64	{(1R,2S,4R)-4-[(5-{[1-(3-tert-butylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-65	[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(6-bromopyridin-2-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(6-bromopyridin-2-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-66	[(1R,2S,4R)-4-({5-[(1-benzyl-5-methyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl]methyl sulfamate
I-67	[(1R,2R,3S,4R)-4-({5-[(1-{3-[(chloroacetyl)amino]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate
I-68	{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(3-iodobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate

Compound	Name
I-69	[(1R,2S,4R)-4-{[5-({1-[2,4-bis(trifluoromethyl)benzyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-70	[(1R,2R,3S,4R)-4-{[5-({1-[(4-chloropyridin-2-yl)methyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-71	{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-5-methyl-1H-pyrrol-3-yl] carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-72	{(1R,2S,4R)-4-[(5-{[1-(3-bromo-4-fluorobenzyl)-1H-pyrazol-3-yl] carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-73	[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[2-(trifluoromethyl)-1,3-thiazol-5-yl]methyl}-1H-pyrrol-3-yl) carbonyl]pyrimidin-4-yl} amino)cyclopentyl]methyl sulfamate
I-74	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[3-((R)-vinylsulfinyl)benzyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate and [(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[3-((S)-vinylsulfinyl)benzyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-75	{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(4-methoxy-4-methylpent-2-yn-1-yl)-1H-pyrrol-3-yl] carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-76	{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2-phenylpropan-2-yl)-1H-pyrrol-3-yl] carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-77	[(1R,2S,4R)-4-({5-[(1-{[(2R)-5,5-dimethyltetrahydrofuran-2-yl]methyl}-1H-pyrazol-3-yl) carbonyl]pyrimidin-4-yl} amino)-2-hydroxycyclopentyl]methyl sulfamate and [(1R,2S,4R)-4-({5-[(1-{[(2S)-5,5-dimethyltetrahydrofuran-2-yl]methyl}-1H-pyrazol-3-yl) carbonyl]pyrimidin-4-yl} amino)-2-hydroxycyclopentyl]methyl sulfamate
I-78	{(1R,2S,4R)-4-[(3-{[1-(3,4-dichlorobenzyl)-1H-pyrazol-3-yl] carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-79	[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(5-chloro-2-furyl)ethyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(5-chloro-2-furyl)ethyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-80	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(1-methyl-2-oxo-1,2-dihydropyridin-3-yl)methyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate

Compound	Name
I-81	{{(1R,2R,3S,4R)-4-[(3-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-2,3-dihydroxycyclopentyl} methyl sulfamate
I-82	{{(1R,2R,3S,4R)-4-[(5-{[1-(cyclohexylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl} methyl sulfamate
I-83	[(1R,2S,4R)-2-hydroxy-4-{[3-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrrol-3-yl}carbonyl)pyridin-4-yl]amino}cyclopentyl]methyl sulfamate
I-84	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(prop-1-yn-1-yl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-85	{{(1R,2S,4R)-4-[(5-{[1-(3-ethynylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate
I-86	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2S)-(pent-3-yn-2-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate or {{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2R)-(pent-3-yn-2-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate
I-87	[(1R,2R,3R,4R)-4-({5-[(1-{[5-(difluoromethyl)-2-furyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-88	{{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(2,4,6-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate
I-89	{{(1R,2R,3S,4R)-4-[(5-{[1-(3-chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl} methyl sulfamate
I-90	{{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-5-(hydroxymethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate
I-91	{{(1R,2R,3S,4R)-4-[(5-{[1-(2,5-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl} methyl sulfamate
I-92	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl} methyl sulfamate
I-93	{{(1R,2S,4R)-4-[(5-{[1-(cyclohexylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate
I-94	{{(1R,2R,3R,4R)-4-[(5-{[1-benzyl-5-(trifluoromethyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl} methyl

Compound	Name
	sulfamate
I-95	[(1R,2S,4R)-4-{[5-({1-[(6-chloropyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-96	[(1R,2R,3S,4R)-4-{[5-({1-[2-(3-bromophenyl)-2-oxoethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-97	{(1R,2S,4R)-4-[(3-{[1-(3-chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-98	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[2-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-99	[(1R,2S,4R)-4-{[5-({1-[(6-chloropyridin-2-yl)methyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-100	[(1R,2R,3S,4R)-4-{[5-({1-[4-chloro-3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-101	[(1R,2S,4R)-4-{[5-({1-[(5-chloro-2-furyl)methyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-102	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-103	{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(2-naphthylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-104	{(1R,2S,4R)-4-[(5-{[1-(2-chloro-5-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-105	{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-2,5-dichloro-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-106	{(1R,2R,3S,4R)-4-[(5-{[1-(4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-107	[(1R,2S,4R)-4-{[5-({1-[(2E)-but-2-en-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-108	{(1R,2S,4R)-4-[(5-{[1-(cyanomethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-

Compound	Name
	4-yl)amino]-2-hydroxycyclopentyl)methyl sulfamate
I-109	[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[6-(2-hydroxypropan-2-yl)pyridin-2-yl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl)methyl sulfamate
I-110	{(1R,2R,3R,4R)-4-[(5-{[1-(1-benzofuran-2-ylmethyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl)methyl sulfamate
I-111	{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-4-chloro-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl)methyl sulfamate
I-112	{(1R,2R,3S,4R)-4-[(5-{[1-(4-chloro-3-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl)methyl sulfamate
I-113	{(1R,2S,4R)-4-[(5-{[1-(4,4-dimethylpent-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl)methyl sulfamate
I-114	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(1-{[4-(trifluoromethyl)-2-furyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl)methyl sulfamate
I-115	{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(pent-3-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl)methyl sulfamate
I-116	[(1R,2R,3R,4R)-4-({5-[(1-{3-[acryloyl(methyl)amino]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl)methyl sulfamate
I-117	[(1R,2S,4R)-4-{[5-({1-[3-(difluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate
I-118	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[2-(1-naphthyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl)methyl sulfamate
I-119	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl)methyl sulfamate
I-120	[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[6-(3-hydroxyoxetan-3-yl)pyridin-2-yl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl)methyl sulfamate
I-121	[(1R,2R,3S,4R)-4-{[5-({1-[4-fluoro-2-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl)methyl sulfamate

Compound	Name
I-122	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-123	{{(1R,2R,3S,4R)-4-[(5-{[1-(3-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-124	{{(1R,2R,3R,4R)-4-[(3-{[1-(3-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyridin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-125	{{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(2-oxo-2-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-126	[(1R,2R,3S,4R)-4-({5-[(1-{4-chloro-3-[(trifluoromethyl)sulfanyl]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate
I-127	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-4-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-128	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(3-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-129	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(trifluoromethyl)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-130	[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-131	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-132	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[3-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrrol-3-yl}carbonyl)pyridin-4-yl]amino}cyclopentyl]methyl sulfamate
I-133	[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-chlorophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-chlorophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-134	[(1R,2R,3S,4R)-4-{[5-({1-[4-fluoro-3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate

Compound	Name
I-135	[(1R,2R,3R,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate
I-136	N-({(1R,2R,3S,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl)sulfuric diamide
I-137	[(1R,2S,4R)-2-hydroxy-4-{{5-({1-[3-(trimethylsilyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl]methyl sulfamate
I-138	[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(5-methyl-1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-139	[(1R,2R,3S,4R)-4-({5-[(1-benzyl-4-chloro-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate
I-140	[(1R,2S,4R)-2-hydroxy-4-{{5-({1-[3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl]methyl sulfamate
I-141	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-chloro-4-fluorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-142	[(1R,2R,3S,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate
I-143	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-4-fluorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-144	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(imidazo[1,2-a]pyridin-6-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-145	{{(1R,2S,4R)-4-[(5-{[1-(5,6-dihydro-2H-pyran-3-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-146	{{(1R,2R,3S,4R)-4-[(5-{[1-(4-chloro-2-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-147	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-148	[(1R,2R,3R,4R)-4-({5-[(5-chloro-1-{[5-(trifluoromethyl)isoxazol-3-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-

Compound	Name
	hydroxycyclopentyl)methyl sulfamate
I-149	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-4-methyl-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-150	{{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(pyridin-2-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-151	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(4-methoxy-4-methylpent-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-152	[(1R,2S,4R)-4-{[5-({1-[4-chloro-3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate
I-153	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(5-methylhex-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-154	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(4-hydroxy-4-methylpent-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-155	[(1R,2R,3S,4R)-4-{[5-({1-[3,5-bis(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl)methyl sulfamate
I-156	[(1R,2R,3R,4R)-4-{[5-({1-[4-chloro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl)methyl sulfamate
I-157	{{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)(methyl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-158	[(1R,2S,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl)methyl sulfamate
I-159	{{(1R,2R,3S,4R)-4-[(5-{[1-(3,4-dichlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-160	{{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(pyridin-4-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-161	{{(1R,2S,4R)-4-[(5-{[1-(4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-162	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(4-methylpyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl)methyl sulfamate

Compound	Name
I-163	[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-164	{(1R,2S,4R)-4-[(5-{[1-(3-ethynylbenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-165	{(1R,2S,4R)-4-[(5-{[1-(3-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-166	{(1R,2S,4R)-4-[(5-{[1-(3-ethynyl-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-167	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[4-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-168	[(1R,2S,4R)-4-{[5-({1-[3,5-bis(trifluoromethyl)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-169	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[(5-methylisoxazol-3-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-170	{(1R,2S,4R)-4-[(5-{[1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-171	[(1R,2S,4R)-2-hydroxy-4-({5-({1-[4-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-172	[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-chlorophenyl)ethyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-chlorophenyl)ethyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-173	[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(1-isobutyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-174	[(1R,2S,4R)-4-{[3-({1-[4-chloro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyridin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-175	[(1R,2R,3R,4R)-4-{[5-({1-[(1S)-1-(3-bromophenyl)propyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2R,3R,4R)-4-{[5-({1-[(1R)-1-(3-bromophenyl)propyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-176	{(1R,2R,3R,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl

Compound	Name
	sulfamate
I-177	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-2-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-178	{{(1R,2R,3R,4R)-3-fluoro-4-[(5-{[1-(4-fluoro-3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-179	{{(1R,2S,4R)-4-[(5-{[1-(3-bromo-4-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-180	[(1R,2S,4R)-4-{[5-({1-[(5-chloro-2-furyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-181	[(1R,2R,3R,4R)-4-{[5-({1-[2-chloro-5-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-182	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[2-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-183	[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[5-(trifluoromethyl)-2-thienyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-184	[(1R,2R,3R,4R)-4-{[5-({5-chloro-1-[3-(trifluoromethyl)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-185	{{(1R,2S,4R)-4-[(5-{[1-(2-chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-186	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-187	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-5-ethyl-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-188	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(6-methoxypyridin-2-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-189	[(1R,2R,3R,4R)-4-{[5-({1-[(5-chloro-2-thienyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate

Compound	Name
I-190	{{(1R,2R,3S,4R)-4-[(5-{[1-(3,4-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-191	{{(1R,2S,4R)-4-[(5-{[1-(4-chloro-2-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-192	[(1R,2R,3R,4R)-4-{[5-({1-[(1S)-1-(3-bromophenyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2R,3R,4R)-4-{[5-({1-[(1R)-1-(3-bromophenyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-193	{{(1R,2R,3S,4R)-4-[(5-{[1-(2-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-194	{{(1R,2R,3S,4R)-4-[(5-{[1-(2-chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-195	{{(1R,2R,3R,4R)-4-[(5-{[1-(but-2-yn-1-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-196	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(phenylethynyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-197	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(5-methyl-1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-198	{{(1R,2R,3S,4R)-4-[(5-{[1-(3-fluoro-4-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-199	[(1R,2S,4R)-4-{[5-({1-[3-(2-furyl)prop-2-yn-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-200	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(Z)-2-phenylvinyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-201	{{(1R,2S,4R)-4-[(3-{[1-(3-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-202	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(pentafluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate

Compound	Name
I-203	[(1R,2R,4R)-4-(5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl)amino)-3,3-difluoro-2-hydroxycyclopentyl]methyl sulfamate
I-204	{(1R,2R,3S,4R)-4-[(5-{[1-(3-bromo-4-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-205	[(1R,2S,4R)-2-hydroxy-4-(5-[(1-phenyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl)amino)cyclopentyl]methyl sulfamate
I-206	{(1R,2S,4R)-4-[(5-{[1-(2-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-207	{(1R,2R,3R,4R)-4-[(5-{[1-(5-bromo-2-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-208	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{5-([1-[(3-methylisoxazol-5-yl)methyl]-1H-pyrrol-3-yl]carbonyl)pyrimidin-4-yl}amino}cyclopentyl]methyl sulfamate
I-209	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-(5-[(1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl)amino)cyclopentyl]methyl sulfamate
I-210	{(1R,2S,4R)-4-[(5-{[1-(3-fluoro-4-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-211	[(1R,2S,4R)-4-{5-([1-[4-fluoro-3-(trifluoromethoxy)benzyl]-1H-pyrrol-3-yl]carbonyl)pyrimidin-4-yl}amino}-2-hydroxycyclopentyl]methyl sulfamate
I-212	{(1R,2S,4R)-4-[(5-{[1-(3,4-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-213	[(1R,2S,4R)-4-{5-([1-[3-fluoro-5-(trifluoromethyl)benzyl]-1H-pyrrol-3-yl]carbonyl)pyrimidin-4-yl}amino}-2-hydroxycyclopentyl]methyl sulfamate
I-214	{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(imidazo[1,2-a]pyridin-2-yl)methyl]-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-215	{(1R,2S,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-216	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{5-([1-[(1-methyl-2-oxo-1,2-dihydropyridin-3-yl)methyl]-1H-pyrrol-3-yl]carbonyl)pyrimidin-4-yl}amino}cyclopentyl]methyl sulfamate
I-217	[(1R,2R,3S,4R)-4-(5-[(1-benzyl-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-

Compound	Name
	yl} amino)-2,3-dihydroxycyclopentyl]methyl sulfamate
I-218	[(1R,2R,3R,4R)-4-{{5-({1-[4-chloro-3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl} amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-219	{{(1R,2S,4R)-4-[(5-{{1-(2,3-difluorobenzyl)-1H-pyrazol-3-yl} carbonyl} pyrimidin-4-yl) amino]-2-hydroxycyclopentyl} methyl sulfamate
I-220	[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(1-isopropyl-1H-pyrazol-3-yl) carbonyl]pyrimidin-4-yl} amino)cyclopentyl]methyl sulfamate
I-221	{{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{{1-(3-iodobenzyl)-1H-pyrazol-3-yl} carbonyl} pyrimidin-4-yl) amino]cyclopentyl} methyl sulfamate
I-222	{{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{{1-(tetrahydro-2H-pyran-4-yl)methyl)-1H-pyrrol-3-yl} carbonyl} pyrimidin-4-yl) amino]cyclopentyl} methyl sulfamate
I-223	{{(1R,2S,4R)-4-[(3-{{1-(3-bromobenzyl)-1H-pyrazol-3-yl} carbonyl} pyridin-4-yl) amino]-2-hydroxycyclopentyl} methyl sulfamate
I-224	[(1R,2R,3R,4R)-4-{{5-({1-[3-(difluoromethoxy)benzyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl} amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-225	{{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{{1-(2,3,6-trifluorobenzyl)-1H-pyrazol-3-yl} carbonyl} pyrimidin-4-yl) amino]cyclopentyl} methyl sulfamate
I-226	[(1R,2S,4R)-2-hydroxy-4-{{5-({1-[2-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl} amino} cyclopentyl]methyl sulfamate
I-227	[(1R,2R,3S,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl) carbonyl]pyrimidin-4-yl} amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-228	{{(1R,2S,4R)-4-[(5-{{1-(but-2-yn-1-yl)-1H-pyrazol-3-yl} carbonyl} pyrimidin-4-yl) amino]-2-hydroxycyclopentyl} methyl sulfamate
I-229	[(1R,2R,3S,4R)-4-{{5-({1-[3-(4-fluorophenoxy)benzyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl} amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-230	[(1R,2R,3S,4R)-4-{{5-({1-[2-fluoro-5-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl} amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-231	[(1R,2R,3R,4R)-3-fluoro-4-{{5-({1-[(5-fluoro-2-furyl)methyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl} amino}-2-hydroxycyclopentyl]methyl sulfamate

Compound	Name
I-232	[(1R,2S,4R)-4-{[5-({1-[(3-chloro-2-thienyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-233	{(1R,2S,4R)-4-[(3-{[1-(3,4-dichlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-234	{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(pent-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-235	[(1R,2S,4R)-4-({5-[(1-{[5-(difluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl]methyl sulfamate
I-236	{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(4-methoxybut-2-yn-1-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-237	{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(imidazo[1,2-a]pyridin-5-ylmethyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-238	[(1R,2S,4R)-4-{[5-({1-[(6-bromopyridin-2-yl)methyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-239	{(1R,2S,4R)-4-[(5-{[1-(5-bromo-2-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-240	{(1R,2R,3S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-241	{(1R,2S,4R)-4-[(5-{[1-(1-benzothiophen-2-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-242	{(1R,2R,3R,4R)-4-[(3-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-243	[(1R,2R,3R,4R)-4-{[5-({1-[2-(3-bromophenyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-244	{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-5-chloro-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-245	{(1R,2S,4R)-4-[(5-{[1-(4-fluoro-3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate

Compound	Name
I-246	[(1R,2S,4R)-4-{[3-({1-[3-(difluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyridin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-247	{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(pyridin-3-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-248	{(1R,2S,4R)-2-hydroxy-4-[(5-{[5-methyl-1-(3-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-249	{(1R,2R,3S,4R)-4-[(5-{[1-(2-cyanobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-250	[(1R,2R,3R,4R)-4-({5-[(1-{[(2R)-5,5-dimethyltetrahydrofuran-2-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate and [(1R,2R,3R,4R)-4-({5-[(1-{[(2S)-5,5-dimethyltetrahydrofuran-2-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-251	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(morpholin-4-yl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-252	{(1R,2S,4R)-4-[(5-{[1-(cyclohex-1-en-1-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-253	{(1R,2S,4R)-4-[(5-{[1-(2-cyanobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-254	[(1R,2R,3R,4R)-4-{[5-({5-chloro-1-[(5-chloro-2-furyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-255	[(1R,2S,4R)-4-{[5-({1-[(3-bromophenyl)sulfonyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-256	[(1R,2R,3S,4R)-4-{[5-({1-[3-(difluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-257	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(1-{[5-(trifluoromethyl)-2-thienyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-258	[(1R,2R,3S,4R)-4-{[5-({1-[3-fluoro-5-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate

Compound	Name
I-259	[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(1-{4-[(trifluoromethyl)sulfanyl]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl)methyl sulfamate
I-260	{(1R,2S,4R)-4-[(5-{[1-(3,5-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-261	[(1R,2S,4R)-4-{[5-({1-[2,5-bis(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-262	[(1R,2S,4R)-2-hydroxy-4-{[3-({1-[3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyridin-4-yl]amino}cyclopentyl]methyl sulfamate
I-263	[(1R,2S,4R)-4-{[3-({1-[4-fluoro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyridin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-264	[(1R,2S,4R)-4-{[5-({1-[1-(3-chlorophenyl)cyclopropyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-265	[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-({1-[4-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-266	[(1R,2R,3S,4R)-4-({5-({1-[2,4-bis(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl)methyl sulfamate
I-267	[(1R,2R,3S,4R)-4-({5-({1-[2,5-bis(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl)methyl sulfamate
I-268	[(1R,2R,3S,4R)-4-({5-({1-[2-chloro-5-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl)methyl sulfamate
I-269	{(1R,2R,3S,4R)-4-[(5-{[1-(3,5-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-270	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(3-hydroxyoxetan-3-yl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-271	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-272	{(1R,2R,3R,4R)-4-[(5-{[5-bromo-1-(3-bromobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate

Compound	Name
I-273	[(1R,2R,3S,4R)-4-{[5-({1-[(4-fluoro-1-naphthyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-274	[(1R,2S,4R)-2-hydroxy-4-({5-({1-[[5-(trifluoromethyl)-2-furyl]methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-275	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(3-hydroxyoxetan-3-yl)prop-2-yn-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-276	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[4-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-277	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(5-methyl-2-furyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-278	{(1R,2R,3S,4R)-4-[(5-({1-(biphenyl-3-yl)methyl)-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-279	{(1R,2S,4R)-4-[(5-({1-(3-bromo-4-fluorobenzyl)-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino)-2-hydroxycyclopentyl}methyl sulfamate
I-280	[(1R,2S,4R)-4-{[5-({1-[(5-chloro-2-thienyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-281	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(methylsulfanyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-282	{(1R,2S,4R)-4-[(5-({1-(3-bromo-2-fluorobenzyl)-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino)-2-hydroxycyclopentyl}methyl sulfamate
I-283	[(1R,2R,3S,4R)-4-{[5-({1-[2-(3-chlorophenyl)-2-oxoethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-284	[(1R,2R,3S,4R)-4-{[5-({1-[(6-bromopyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-285	[(1R,2R,3S,4R)-4-{[5-({1-[(5-chloro-1-benzothiophen-3-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-286	{(1R,2S,4R)-2-hydroxy-4-[(5-({1-(2,4,6-trifluorobenzyl)-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino)cyclopentyl}methyl sulfamate

Compound	Name
I-287	{{(1R,2S,4R)-4-[(5-{[1-(3-cyclopropylprop-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate
I-288	[(1R,2S,4R)-4-{[5-({1-[4-chloro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-289	{{(1R,2S,4R)-4-[(5-{[1-(2,5-dichlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate
I-290	{{(1R,2R,3S,4R)-4-[(5-{[1-(3-bromo-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl} methyl sulfamate
I-291	[(1R,2S,4R)-4-({5-[(1-allyl-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl} amino)-2-hydroxycyclopentyl]methyl sulfamate
I-292	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate
I-293	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(2R)-tetrahydrofuran-2-ylmethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate and [(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(2S)-tetrahydrofuran-2-ylmethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-294	{{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(3-iodobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate
I-295	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(6-methoxypyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-296	[(1R,2R,3R,4R)-4-{[5-({1-[(5-chloro-2-furyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-297	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(5-methylisoxazol-3-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-298	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(6-methylpyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-299	[(1R,2S,4R)-4-{[5-({1-[(5-bromopyridin-3-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-300	[(1R,2S,4R)-4-({5-[(1-benzyl-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl} amino)-2-hydroxycyclopentyl]methyl sulfamate
I-301	{{(1R,2S,4R)-4-[(5-{[1-(3-cyclopropyl-4-fluorobenzyl)-1H-pyrazol-3-

Compound	Name
	yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-302	[(1R,2S,4R)-4-{[5-({1-[(1R)-cyclohex-2-en-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate and [(1R,2S,4R)-4-{[5-({1-[(1S)-cyclohex-2-en-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-303	[(1R,2R,3R,4R)-4-{[5-({1-[3-(difluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-304	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(1-({(1S)-1-[5-(trifluoromethyl)-2-furyl]ethyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate or [(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(1-({(1R)-1-[5-(trifluoromethyl)-2-furyl]ethyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-305	{(1R,2S,4R)-2-hydroxy-4-[(5-({1-(2-methoxyethyl)-1H-pyrazol-3-yl}carbonyl}pyrimidin-4-yl)amino)cyclopentyl}methyl sulfamate
I-306	[(1R,2S,4R)-2-hydroxy-4-({5-[(1-({1-methyl-5-(trifluoromethyl)-1H-pyrazol-3-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-307	{(1R,2R,3R,4R)-4-[(5-({1-(2,5-dichlorobenzyl)-1H-pyrazol-3-yl}carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-308	[(1R,2S,4R)-2-hydroxy-4-({5-({1-[3-(1-methyl-1H-pyrazol-4-yl)prop-2-yn-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-309	{(1R,2S,4R)-4-[(5-({1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl}carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-310	{(1R,2R,3R,4R)-4-[(5-({5-chloro-1-(3-iodobenzyl)-1H-pyrrol-3-yl}carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-311	{(1R,2R,3R,4R)-4-[(5-({1-(3,4-dichlorobenzyl)-1H-pyrazol-3-yl}carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-312	{(1R,2R,3R,4R)-4-[(5-({1-(3-bromobenzyl)-1H-pyrrol-3-yl}carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate

Compound	Name
I-313	[(1R,2R,3S,4R)-4-{[5-({1-[3-(acryloylamino)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-314	{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(2,4,5-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-315	[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-bromophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-bromophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-316	{(1R,2R,3R,4R)-4-[(5-{[1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-317	[(1R,2R,3R,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-318	{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(pentafluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-319	{(1S,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-320	{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-4-fluorobenzyl)-5-chloro-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-321	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[3-(vinylsulfonyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-322	{(1R,2R,3R,4R)-4-[(5-{[1-(1-benzothiophen-2-ylmethyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate
I-323	{(1R,2R,3S,4R)-4-[(5-{[1-((1R)-2,3-dihydro-1H-inden-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate or {(1R,2R,3S,4R)-4-[(5-{[1-((1S)-2,3-dihydro-1H-inden-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-324	[(1R,2R,3S,4R)-4-{[5-({1-[(4-bromopyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-325	{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(3-methoxybenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate

Compound	Name
I-326	{{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(3,4,5-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate
I-327	{{(1R,2R,3S,4R)-4-[(5-{[1-(2,3-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl} methyl sulfamate
I-328	[(1R,2S,4R)-4-{[5-({[1-(4-fluoro-2-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino}-2-hydroxycyclopentyl]methyl sulfamate
I-329	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2,4,5-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate
I-330	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(prop-2-yn-1-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate
I-331	{{(1R,2R,3R,4R)-4-[(5-{[1-(3,4-dichlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl} methyl sulfamate
I-332	[(1R,2S,4R)-2-hydroxy-4-{[5-({[1-(3R)-tetrahydrofuran-3-ylmethyl]-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino}cyclopentyl]methyl sulfamate and [(1R,2S,4R)-2-hydroxy-4-{[5-({[1-(3S)-tetrahydrofuran-3-ylmethyl]-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino}cyclopentyl]methyl sulfamate
I-333	{{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate
I-334	{{(1R,2R,3S,4R)-4-[(5-{[1-(3-chloro-5-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl} methyl sulfamate
I-335	{{(1R,2S,4R)-4-[(5-{[1-benzyl-5-(hydroxymethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate
I-336	{{(1R,2R,3S,4R)-4-[(5-{[1-(2,4-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl} methyl sulfamate
I-337	{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-4-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl} methyl sulfamate
I-338	{{(1R,2R,3S,4R)-4-[(5-{[1-(2-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl} methyl sulfamate
I-339	[(1R,2S,4R)-2-hydroxy-4-{[5-({[1-(1S,2S)-(2-phenylcyclopropyl)methyl]-

Compound	Name
	1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate and [(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(1R,2R)-(2-phenylcyclopropyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-340	{(1R,2S,4R)-4-[(5-{[1-(but-2-yn-1-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-341	[(1R,2S,4R)-4-{[5-({1-[(5-chloro-1-benzothiophen-3-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-342	[(1S,2S,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl]methyl sulfamate
I-343	[(1R,2R,3S,4R)-4-{[5-({1-[4-fluoro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate
I-344	{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(3-methylbut-2-en-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-345	[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(1-methyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate
I-346	{(1R,2S,4R)-4-[(5-{[1-(5-bromo-2-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate
I-347	{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(3-iodobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-348	[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(5-methylisoxazol-3-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-349	[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate
I-350	[(1R,2R,3R,4R)-4-{[5-({1-[(1S)-1-(5-chloro-2-furyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2R,3R,4R)-4-{[5-({1-[(1R)-1-(5-chloro-2-furyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-351	{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-((1S)-1-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate or {(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-((1R)-1-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate
I-352	[(1R,2S,4R)-4-{[5-({1-[(6-bromopyridin-2-yl)methyl]-1H-pyrazol-3-

Compound	Name
	yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate
I-353	{{(1R,2R,3S,4R)-4-[(5-{[1-((1R)-2,3-dihydro-1H-inden-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate or {(1R,2R,3S,4R)-4-[(5-{[1-((1S)-2,3-dihydro-1H-inden-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate
I-354	[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(5-chloro-2-furyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(5-chloro-2-furyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate
I-355	[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate
I-356	[(1R,2R,3R,4R)-4-{[5-({1-[(1S)-1-(3-bromophenyl)propyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl)methyl sulfamate or [(1R,2R,3R,4R)-4-{[5-({1-[(1R)-1-(3-bromophenyl)propyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl)methyl sulfamate
I-357	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(1-[(1S)-1-[5-(trifluoromethyl)-2-furyl]ethyl]-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl)methyl sulfamate or [(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(1-[(1R)-1-[5-(trifluoromethyl)-2-furyl]ethyl]-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl)methyl sulfamate
I-358	[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-bromophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-bromophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate
I-359	[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(1R,2R)-(2-phenylcyclopropyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl)methyl sulfamate or [(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(1S,2S)-(2-phenylcyclopropyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl)methyl sulfamate
I-360	[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-chlorophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-chlorophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate
I-361	{{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-((1S)-1-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate or

Compound	Name
	{{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-((1R)-1-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate
I-362	{{(1R,2S,4R)-2-hydroxy-4-[(5-{[(1S)-1-(pent-3-yn-2-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate or {{(1R,2S,4R)-2-hydroxy-4-[(5-{[(1R)-1-(pent-3-yn-2-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate
I-363	[(1R,2R,3R,4R)-4-{[5-({1-[(1S)-1-(3-bromophenyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2R,3R,4R)-4-{[5-({1-[(1R)-1-(3-bromophenyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-364	[(1R,2R,3R,4R)-4-{[5-({1-[(1S)-1-(5-chloro-2-furyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2R,3R,4R)-4-{[5-({1-[(1R)-1-(5-chloro-2-furyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate
I-365	[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-chlorophenyl)ethyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-chlorophenyl)ethyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-366	[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(6-bromopyridin-2-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(6-bromopyridin-2-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-367	{{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-5-(2-hydroxypropan-2-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate
I-368	{{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-5-(methoxymethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate
I-369	[(1R,2S,4R)-4-{[5-({1-(3-bromobenzyl)-5-[(1S)-1-methoxyethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate and [(1R,2S,4R)-4-{[5-({1-(3-bromobenzyl)-5-[(1R)-1-methoxyethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl

	sulfamate
I-369a	[(1R,2S,4R)-4-{[5-({1-(3-bromobenzyl)-5-[(1S)-1-methoxyethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-(3-bromobenzyl)-5-[(1R)-1-methoxyethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-369b	[(1R,2S,4R)-4-{[5-({1-(3-bromobenzyl)-5-[(1S)-1-methoxyethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate or [(1R,2S,4R)-4-{[5-({1-(3-bromobenzyl)-5-[(1R)-1-methoxyethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate
I-370	{(1R,2R,3S,4R)-3-amino-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate

[0093] As discussed above, the present disclosure provides compounds that are useful as inhibitors of SAE, and thus the present compounds can be useful for treating proliferative, inflammatory, cardiovascular and neurodegenerative disorders.

[0094] The compounds and pharmaceutical compositions of the present disclosure are can be useful for the treatment of cancer. As used herein, the term "cancer" refers to a cellular disorder characterized by uncontrolled or dysregulated cell proliferation, decreased cellular differentiation, inappropriate ability to invade surrounding tissue, and/or ability to establish new growth at ectopic sites. The term "cancer" includes, but is not limited to, solid tumors and bloodborne tumors (hematologic malignancies). The term "cancer" encompasses diseases of skin, tissues, organs, bone, cartilage, blood, and vessels. The term "cancer" further encompasses primary and metastatic cancers.

[0095] In some embodiments, therefore, the present disclosure provides the compound of formula (I), or a pharmaceutically acceptable salt thereof, for use in treating cancer. In some embodiments, the present disclosure provides a pharmaceutical composition (as described herein) for the treatment of cancer comprising the compound of formula (I), or a pharmaceutically acceptable salt thereof. In some embodiments, the present disclosure provides the use of the compound of formula (I), or a pharmaceutically acceptable salt thereof, for the preparation of a pharmaceutical composition (as described herein) for the treatment of cancer. In some embodiments, the present disclosure provides the

use of an effective amount of the compound of formula (I), or a pharmaceutically acceptable salt thereof, for the treatment of cancer. In some embodiments, the present disclosure provides the compound of formula (I), or a pharmaceutically acceptable salt thereof, for the preparation of a medicament for use in treating cancer.

[0096] Non-limiting examples of solid tumors that can be treated with the disclosed inhibitors include pancreatic cancer; bladder cancer including invasive bladder cancer; colorectal cancer; thyroid cancer, gastric cancer, breast cancer, including metastatic breast cancer; prostate cancer, including androgen-dependent and androgen-independent prostate cancer; renal cancer, including, e.g., metastatic renal cell carcinoma; liver cancer including e.g. hepatocellular cancer and intrahepatic bile duct; lung and bronchus cancer, including non-small cell lung cancer (NSCLC), squamous lung cancer, bronchioloalveolar carcinoma (BAC), adenocarcinoma of the lung, and small cell lung cancer (SCLC); ovarian cancer, including, e.g., progressive epithelial or primary peritoneal cancer; cervical cancer; uterine cancer including e.g. uterine corpus and uterine cervix; endometrial cancer; gastric cancer; esophageal cancer; head and neck cancer, including, e.g., squamous cell carcinoma of the head and neck, nasopharyngeal cancer, oral cavity and pharynx; melanoma; neuroendocrine cancer, including metastatic neuroendocrine tumors; brain cancer, including, e.g., glioma/glioblastoma, anaplastic oligodendroglioma, adult glioblastoma multiforme, and adult anaplastic astrocytoma; neuroendocrine, including metastatic neuroendocrine tumors; bone cancer; and soft tissue sarcoma.

[0097] Non-limiting examples of hematologic malignancies that can be treated with the disclosed inhibitors include acute myeloid leukemia (AML); chronic myelogenous leukemia (CML), including accelerated CML and CML blast phase (CML-BP); acute lymphoblastic leukemia (ALL); chronic lymphocytic leukemia (CLL); Hodgkin's disease (HD); non-Hodgkin's lymphoma (NHL), including follicular lymphoma and mantle cell lymphoma; B-cell lymphoma including diffuse large B-cell lymphoma (DLBCL); T-cell lymphoma; multiple myeloma (MM); amyloidosis; Waldenstrom's macroglobulinemia; myelodysplastic syndromes (MDS), including refractory anemia (RA), refractory anemia with ringed siderblasts (RARS), (refractory anemia with excess blasts (RAEB), and RAEB in transformation (RAEB-T); and myeloproliferative syndromes.

[0098] In some embodiments, compounds of the present disclosure are suitable for the treatment of breast cancer, lung cancer, ovarian cancer, multiple myeloma, acute myeloid leukemia or acute lymphoblastic leukemia.

[0099] In other embodiments, compounds of the present disclosure are suitable for the treatment of inflammatory, cardiovascular and neurodegenerative disorders including, but not limited to, allergies/anaphylaxis, acute and/or chronic inflammation, rheumatoid arthritis, autoimmunity disorders, thrombosis, hypertension, cardiac hypertrophy, heart failure, Huntington's disease and Alzheimers.

[00100] Accordingly, in another aspect of the present disclosure, pharmaceutical compositions are provided, wherein these compositions comprise any of the compounds as described herein, and optionally comprise a pharmaceutically acceptable carrier, adjuvant or vehicle. In certain embodiments, these compositions optionally further comprise one or more additional therapeutic agents.

[00101] It will also be appreciated that certain of the compounds of present disclosure can exist in free form for treatment, or where appropriate, as a pharmaceutically acceptable derivative thereof. According to the present disclosure, a pharmaceutically acceptable derivative includes, but is not limited to, pharmaceutically acceptable prodrugs, salts, esters, salts of such esters, or any other adduct or derivative which upon administration to a patient in need is capable of providing, directly or indirectly, a compound as otherwise described herein, or a metabolite or residue thereof.

[00102] As used herein, the term "pharmaceutically acceptable salt" refers to those salts which are, within the scope of sound medical judgment, suitable for use in contact with the tissues of humans and lower mammals without undue toxicity, irritation, allergic response and the like, and are commensurate with a reasonable benefit/risk ratio. A "pharmaceutically acceptable salt" means any non-toxic salt or salt of an ester of a compound of this invention that, upon administration to a recipient, is capable of providing, either directly or indirectly, a compound of this invention or an inhibitorily active metabolite or residue thereof. As used herein, the term "inhibitorily active metabolite or residue thereof" means that a metabolite or residue thereof is also an inhibitor of SAE.

[00103] Pharmaceutically acceptable salts are well known in the art. For example, S. M. Berge *et al.*, describe pharmaceutically acceptable salts in detail in *J. Pharmaceutical Sciences*, **1977**, *66*, 1-19. Pharmaceutically acceptable salts of the compounds of this disclosure include those derived from suitable inorganic and organic acids and bases. Examples of pharmaceutically acceptable, nontoxic acid addition salts are salts of an amino group formed with inorganic acids such as hydrochloric acid, hydrobromic acid, phosphoric acid, sulfuric acid and perchloric acid or with organic acids such as acetic acid, oxalic acid, maleic acid, tartaric acid, citric acid, succinic acid or malonic acid or by using other methods used in the art such as ion exchange. Other pharmaceutically acceptable salts include adipate, alginate, ascorbate, aspartate, benzenesulfonate, benzoate, bisulfate, borate, butyrate, camphorate, camphorsulfonate, citrate, cyclopentanepropionate, digluconate, dodecylsulfate, ethanesulfonate, formate, fumarate, glucoheptonate, glycerophosphate, gluconate, hemisulfate, heptanoate, hexanoate, hydroiodide, 2-hydroxy-ethanesulfonate, lactobionate, lactate, laurate, lauryl sulfate, malate, maleate, malonate, methanesulfonate, 2-naphthalenesulfonate, nicotinate, nitrate, oleate, oxalate, palmitate, pamoate, pectinate, persulfate, 3-phenylpropionate, phosphate, picrate, pivalate, propionate, stearate, succinate, sulfate, tartrate, thiocyanate, p-toluenesulfonate, undecanoate, valerate salts, and the like. Salts derived from appropriate bases include alkali metal, alkaline earth metal,

ammonium and $N^+(C_{1-4}alkyl)_4$ salts. This present disclosure also envisions the quaternization of any basic nitrogen-containing groups of the compounds disclosed herein. Water or oil-soluble or dispersable products may be obtained by such quaternization. Representative alkali or alkaline earth metal salts include sodium, lithium, potassium, calcium, magnesium, and the like. Further pharmaceutically acceptable salts include, when appropriate, nontoxic ammonium, quaternary ammonium, and amine cations formed using counterions such as halide, hydroxide, carboxylate, sulfate, phosphate, nitrate, loweralkyl sulfonate and aryl sulfonate.

[00104] As described above, the pharmaceutically acceptable compositions of the present disclosure additionally comprise a pharmaceutically acceptable carrier, adjuvant, or vehicle, which, as used herein, includes any and all solvents, diluents, or other liquid vehicle, dispersion or suspension aids, surface active agents, isotonic agents, thickening or emulsifying agents, preservatives, solid binders, lubricants and the like, as suited to the particular dosage form desired. Remington's Pharmaceutical Sciences, Sixteenth Edition, E. W. Martin (Mack Publishing Co., Easton, Pa., 1980) discloses various carriers used in formulating pharmaceutically acceptable compositions and known techniques for the preparation thereof. Except insofar as any conventional carrier medium is incompatible with the compounds of the present disclosure, such as by producing any undesirable biological effect or otherwise interacting in a deleterious manner with any other component(s) of the pharmaceutically acceptable composition, its use is contemplated to be within the scope of the present disclosure. Some examples of materials which can serve as pharmaceutically acceptable carriers include, but are not limited to, ion exchangers; alumina; aluminum stearate; lecithin; serum proteins, such as human serum albumin; buffer substances such as phosphates (including but not limited to phosphate buffer solutions), glycine, sorbic acid, or potassium sorbate; partial glyceride mixtures of saturated vegetable fatty acids; water; salts or electrolytes, such as protamine sulfate, disodium hydrogen phosphate, potassium hydrogen phosphate, sodium chloride, and zinc salts; colloidal silica; magnesium trisilicate; polyvinyl pyrrolidone; polyacrylates; waxes; polyethylene-polyoxypropylene-block polymers; wool fat; sugars such as lactose, glucose and sucrose; starches such as corn starch and potato starch; cellulose and its derivatives such as sodium carboxymethyl cellulose, ethyl cellulose and cellulose acetate; powdered tragacanth; malt; gelatin; talc; excipients such as cocoa butter and suppository waxes; oils such as peanut oil, cottonseed oil, safflower oil, sesame oil, olive oil, corn oil and soybean oil; glycols; such a propylene glycol or polyethylene glycol; esters such as ethyl oleate and ethyl laurate; agar; buffering agents such as magnesium hydroxide and aluminum hydroxide; alginic acid; pyrogen-free water; isotonic saline; Ringer's solution; ethyl alcohol, and non-toxic compatible lubricants such as sodium lauryl sulfate and magnesium stearate, as well as coloring agents, releasing agents, coating agents, sweetening, flavoring and perfuming agents,

preservatives and antioxidants can also be present in the composition, according to the judgment of the formulator.

[00105] In yet another aspect, a method for treating a proliferative, inflammatory, cardiovascular or neurodegenerative disorder is provided comprising administering an effective amount of a compound, or a pharmaceutical composition to a subject in need thereof. In certain embodiments of the present disclosure an "effective amount" of the compound or pharmaceutical composition is that amount effective for treating a proliferative, inflammatory, infectious, neurological or cardiovascular disorder, or is that amount effective for treating cancer. In other embodiments, an "effective amount" of a compound is an amount which inhibits binding of SAE.

[00106] The compounds and compositions, according to the method of the present disclosure, may be administered using any amount and any route of administration effective for treating the disease. The exact amount required will vary from subject to subject, depending on the species, age, and general condition of the subject, the severity of the infection, the particular agent, its mode of administration, and the like. The compounds of the present disclosure are frequently formulated in dosage unit form for ease of administration and uniformity of dosage. The expression "dosage unit form" as used herein refers to a physically discrete unit of agent appropriate for the patient to be treated. It will be understood, however, that the total daily usage of the compounds and compositions of the present disclosure will be decided by the attending physician within the scope of sound medical judgment. The specific effective dose level for any particular patient or organism will depend upon a variety of factors including the disease being treated and the severity of the disease; the activity of the specific compound employed; the specific composition employed; the age, body weight, general health, sex and diet of the patient; the time of administration, route of administration, and rate of excretion of the specific compound employed; the duration of the treatment; drugs used in combination or coincidental with the specific compound employed, and like factors well known in the medical arts. The term "patient", as used herein, means an animal, for instance a mammal such as a human.

[00107] The pharmaceutically acceptable compositions of the present disclosure can be administered to humans and other animals orally, rectally, parenterally, intracisternally, intravaginally, intraperitoneally, topically (as by powders, ointments, lotions, or drops), buccally, as an oral or nasal spray, or the like, depending on the severity of the infection being treated. In certain embodiments, the compounds of the present disclosure may be administered orally or parenterally at dosage levels of about 0.01 mg/kg to about 50 mg/kg for instance from about 1 mg/kg to about 25 mg/kg, of subject body weight per day, one or more times a day, to obtain the desired therapeutic effect.

[00108] Liquid dosage forms for oral administration include, but are not limited to, pharmaceutically acceptable emulsions, microemulsions, solutions, suspensions, syrups and elixirs. In addition to the active

compounds, the liquid dosage forms may contain inert diluents commonly used in the art such as, for example, water or other solvents, solubilizing agents and emulsifiers such as ethyl alcohol, isopropyl alcohol, ethyl carbonate, ethyl acetate, benzyl alcohol, benzyl benzoate, propylene glycol, 1,3-butylene glycol, dimethylformamide, oils (for instance, cottonseed, groundnut, corn, germ, olive, castor, and sesame oils), glycerol, tetrahydrofurfuryl alcohol, polyethylene glycols and fatty acid esters of sorbitan, and mixtures thereof. Besides inert diluents, the oral compositions can also include adjuvants such as wetting agents, emulsifying and suspending agents, sweetening, flavoring, and perfuming agents.

[00109] Injectable preparations, for example, sterile injectable aqueous or oleaginous suspensions may be formulated according to the known art using suitable dispersing or wetting agents and suspending agents. The sterile injectable preparation may also be a sterile injectable solution, suspension or emulsion in a nontoxic parenterally acceptable diluent or solvent, for example, as a solution in 1,3-butanediol. Among the acceptable vehicles and solvents that may be employed are water, Ringer's solution, U.S.P. and isotonic sodium chloride solution. In addition, sterile, fixed oils are conventionally employed as a solvent or suspending medium. For this purpose any bland fixed oil can be employed including synthetic mono- or diglycerides. In addition, fatty acids such as oleic acid are used in the preparation of injectables.

[00110] The injectable formulations can be sterilized, for example, by filtration through a bacterial-retaining filter, or by incorporating sterilizing agents in the form of sterile solid compositions which can be dissolved or dispersed in sterile water or other sterile injectable medium prior to use.

[00111] In order to prolong the effect of a compound of the present disclosure, it is often desirable to slow the absorption of the compound from subcutaneous or intramuscular injection. This may be accomplished by the use of a liquid suspension of crystalline or amorphous material with poor water solubility. The rate of absorption of the compound then depends upon its rate of dissolution that, in turn, may depend upon crystal size and crystalline form. Alternatively, delayed absorption of a parenterally administered compound form is accomplished by dissolving or suspending the compound in an oil vehicle. Injectable depot forms are made by forming microencapsule matrices of the compound in biodegradable polymers such as polylactide-polyglycolide. Depending upon the ratio of compound to polymer and the nature of the particular polymer employed, the rate of compound release can be controlled. Examples of other biodegradable polymers include poly(orthoesters) and poly(anhydrides). Depot injectable formulations are also prepared by entrapping the compound in liposomes or microemulsions that are compatible with body tissues.

[00112] Compositions for rectal or vaginal administration are for instance suppositories which can be prepared by mixing the compounds of the present disclosure with suitable non-irritating excipients or carriers such as cocoa butter, polyethylene glycol or a suppository wax which are solid at ambient

temperature but liquid at body temperature and therefore melt in the rectum or vaginal cavity and release the active compound.

[00113] Solid dosage forms for oral administration include capsules, tablets, pills, powders, and granules. In such solid dosage forms, the active compound is mixed with at least one inert, pharmaceutically acceptable excipient or carrier such as sodium citrate or dicalcium phosphate and/or a) fillers or extenders such as starches, lactose, sucrose, glucose, mannitol, and silicic acid, b) binders such as, for example, carboxymethylcellulose, alginates, gelatin, polyvinylpyrrolidone, sucrose, and acacia, c) humectants such as glycerol, d) disintegrating agents such as agar--agar, calcium carbonate, potato or tapioca starch, alginic acid, certain silicates, and sodium carbonate, e) solution retarding agents such as paraffin, f) absorption accelerators such as quaternary ammonium compounds, g) wetting agents such as, for example, cetyl alcohol and glycerol monostearate, h) absorbents such as kaolin and bentonite clay, and i) lubricants such as talc, calcium stearate, magnesium stearate, solid polyethylene glycols, sodium lauryl sulfate, and mixtures thereof. In the case of capsules, tablets and pills, the dosage form may also comprise buffering agents.

[00114] Solid compositions of a similar type may also be employed as fillers in soft and hard-filled gelatin capsules using such excipients as lactose or milk sugar as well as high molecular weight polyethylene glycols and the like. The solid dosage forms of tablets, dragees, capsules, pills, and granules can be prepared with coatings and shells such as enteric coatings and other coatings well known in the pharmaceutical formulating art. They may optionally contain opacifying agents and can also be of a composition that they release the active ingredient(s) only, or for instance in a certain part of the intestinal tract, optionally, in a delayed manner. Examples of embedding compositions that can be used include polymeric substances and waxes. Solid compositions of a similar type may also be employed as fillers in soft and hard-filled gelatin capsules using such excipients as lactose or milk sugar as well as high molecular weight polyethylene glycols and the like.

[00115] The active compounds can also be in micro-encapsulated form with one or more excipients as noted above. The solid dosage forms of tablets, dragees, capsules, pills, and granules can be prepared with coatings and shells such as enteric coatings, release controlling coatings and other coatings well known in the pharmaceutical formulating art. In such solid dosage forms the active compound may be admixed with at least one inert diluent such as sucrose, lactose or starch. Such dosage forms may also comprise, as is normal practice, additional substances other than inert diluents, e.g., tableting lubricants and other tableting aids such as magnesium stearate and microcrystalline cellulose. In the case of capsules, tablets and pills, the dosage forms may also comprise buffering agents. They may optionally contain opacifying agents and can also be of a composition that they release the active ingredient(s) only, or for instance in a

certain part of the intestinal tract, optionally, in a delayed manner. Examples of embedding compositions that can be used include polymeric substances and waxes.

[00116] Dosage forms for topical or transdermal administration of a compound of the present disclosure include ointments, pastes, creams, lotions, gels, powders, solutions, sprays, inhalants or patches. The active component is admixed under sterile conditions with a pharmaceutically acceptable carrier and any needed preservatives or buffers as may be required. Ophthalmic formulation, ear drops, and eye drops are also contemplated as being within the scope of the present disclosure. Additionally, the present disclosure contemplates the use of transdermal patches, which have the added advantage of providing controlled delivery of a compound to the body. Such dosage forms can be made by dissolving or dispensing the compound in the proper medium. Absorption enhancers can also be used to increase the flux of the compound across the skin. The rate can be controlled by either providing a rate controlling membrane or by dispersing the compound in a polymer matrix or gel.

[00117] In some embodiments, the compounds of the present disclosure or a pharmaceutical composition thereof is administered in conjunction with an anticancer agent. As used herein, the term "anticancer agent" refers to any agent that is administered to a subject with cancer for purposes of treating the cancer. Combination therapy includes administration of the therapeutic agents concurrently or sequentially. Alternatively, the therapeutic agents can be combined into one composition which is administered to the patient.

[00118] In some embodiments, the compounds of the present disclosure are used in combination with other therapeutic agents. In some embodiments, a compound of the present disclosure is administered in conjunction with another therapeutic agent wherein the therapeutic agent is cytotoxic agents, radiotherapy or immunotherapy.

[00119] Non-limiting examples of DNA damaging chemotherapeutic agents include topoisomerase I inhibitors (e.g., irinotecan, topotecan, camptothecin and analogs or metabolites thereof, and doxorubicin); topoisomerase II inhibitors (e.g., etoposide, teniposide, and daunorubicin); alkylating agents (e.g., melphalan, chlorambucil, busulfan, thiotepa, ifosfamide, carmustine, lomustine, semustine, streptozocin, decarbazine, methotrexate, mitomycin C, and cyclophosphamide); DNA intercalators (e.g., cisplatin, oxaliplatin, and carboplatin); DNA intercalators and free radical generators such as bleomycin; and nucleoside mimetics (e.g., 5-fluorouracil, capecitabine, gemcitabine, fludarabine, cytarabine, mercaptopurine, thioguanine, pentostatin, and hydroxyurea).

[00120] Chemotherapeutic agents that disrupt cell replication include: paclitaxel, docetaxel, and related analogs; vincristine, vinblastin, and related analogs; thalidomide, lenalidomide, and related analogs (e.g., CC-5013 and CC-4047); protein tyrosine kinase inhibitors (e.g., imatinib mesylate and gefitinib); proteasome inhibitors (e.g., bortezomib); NF- κ B inhibitors, including inhibitors of I κ B kinase;

antibodies which bind to proteins overexpressed in cancers and thereby downregulate cell replication (e.g., trastuzumab, rituximab, cetuximab, and bevacizumab); and other inhibitors of proteins or enzymes known to be upregulated, over-expressed or activated in cancers, the inhibition of which downregulates cell replication. In certain embodiments, a compound of the present disclosure is administered in conjunction with a proteasome inhibitor.

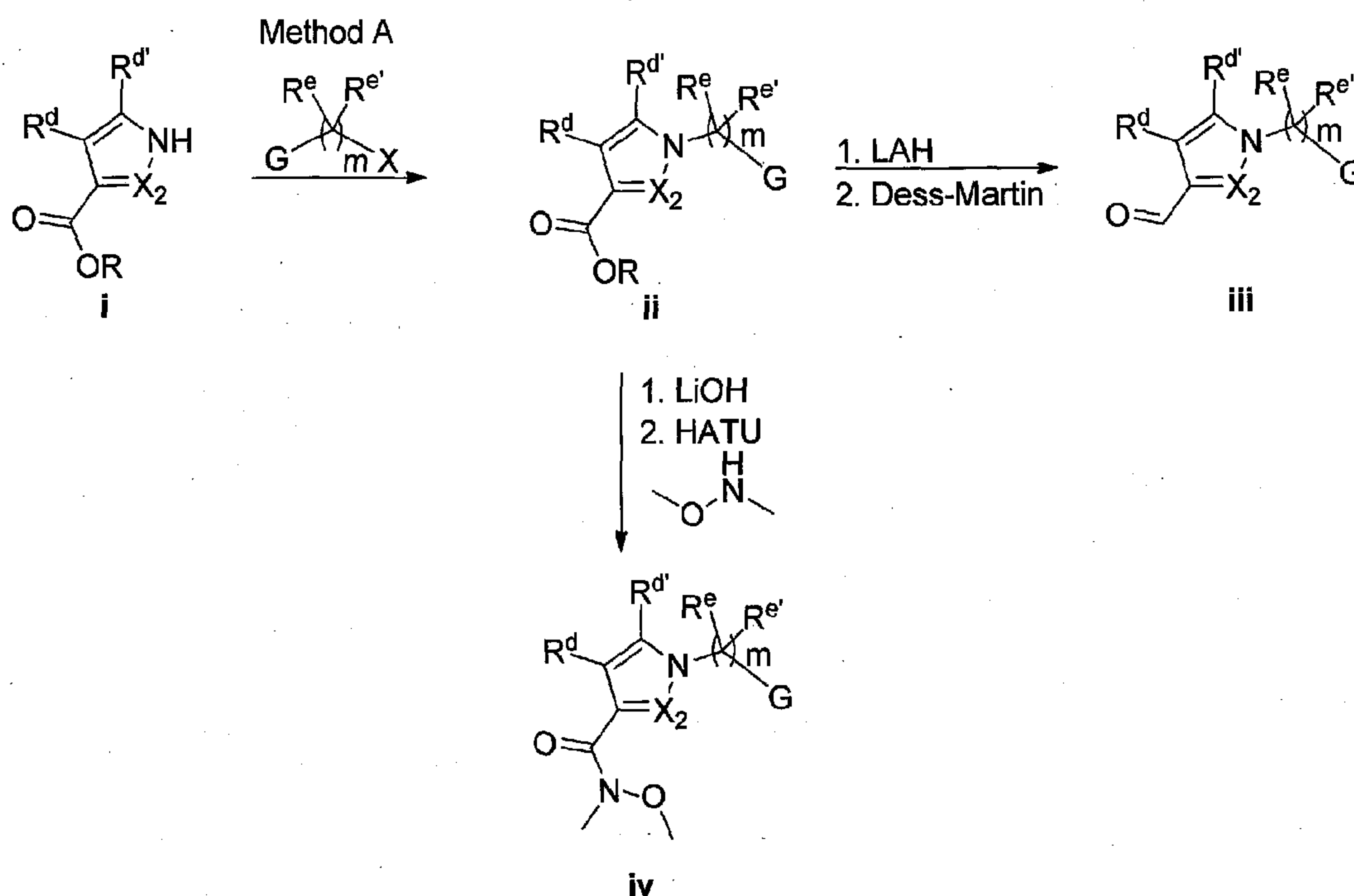
[00121] Another aspect of the present disclosure relates to inhibiting SAE activity in a biological sample or a patient, which method comprises administering to the patient, or contacting said biological sample with a compound of formula (I), or a composition comprising said compound. The term “biological sample”, as used herein, generally includes *in vivo*, *in vitro*, and *ex vivo* materials, and also includes, without limitation, cell cultures or extracts thereof; biopsied material obtained from a mammal or extracts thereof; and blood, saliva, urine, feces, semen, tears, or other body fluids or extracts thereof.

[00122] Still another aspect of the present disclosure is to provide a kit comprising separate containers in a single package, wherein a pharmaceutical compound or compositions and/or salts thereof disclosed herein is provided in combination with one or more pharmaceutically acceptable carriers for use in treating one or more disorders, symptoms and diseases where SAE plays a role.

General Synthetic Methods and Intermediates

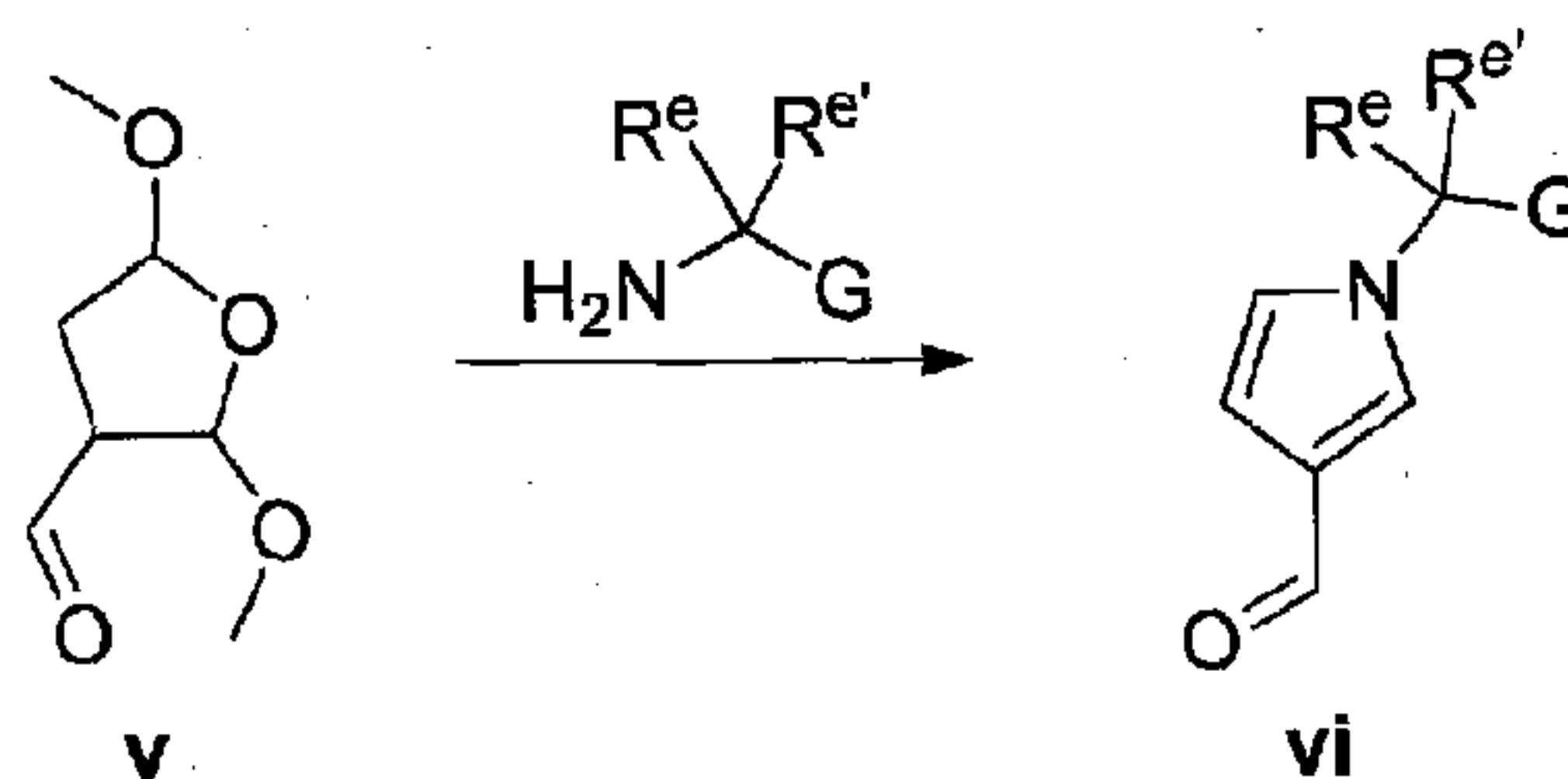
[00123] The compounds of the present disclosure can be prepared by methods known to one of ordinary skill in the art and / or by reference to the schemes shown below and the synthetic examples. Exemplary synthetic routes are set forth in Schemes below and in the Examples.

Scheme 1: General method for the preparation of pyrazole and pyrrole aldehydes iii



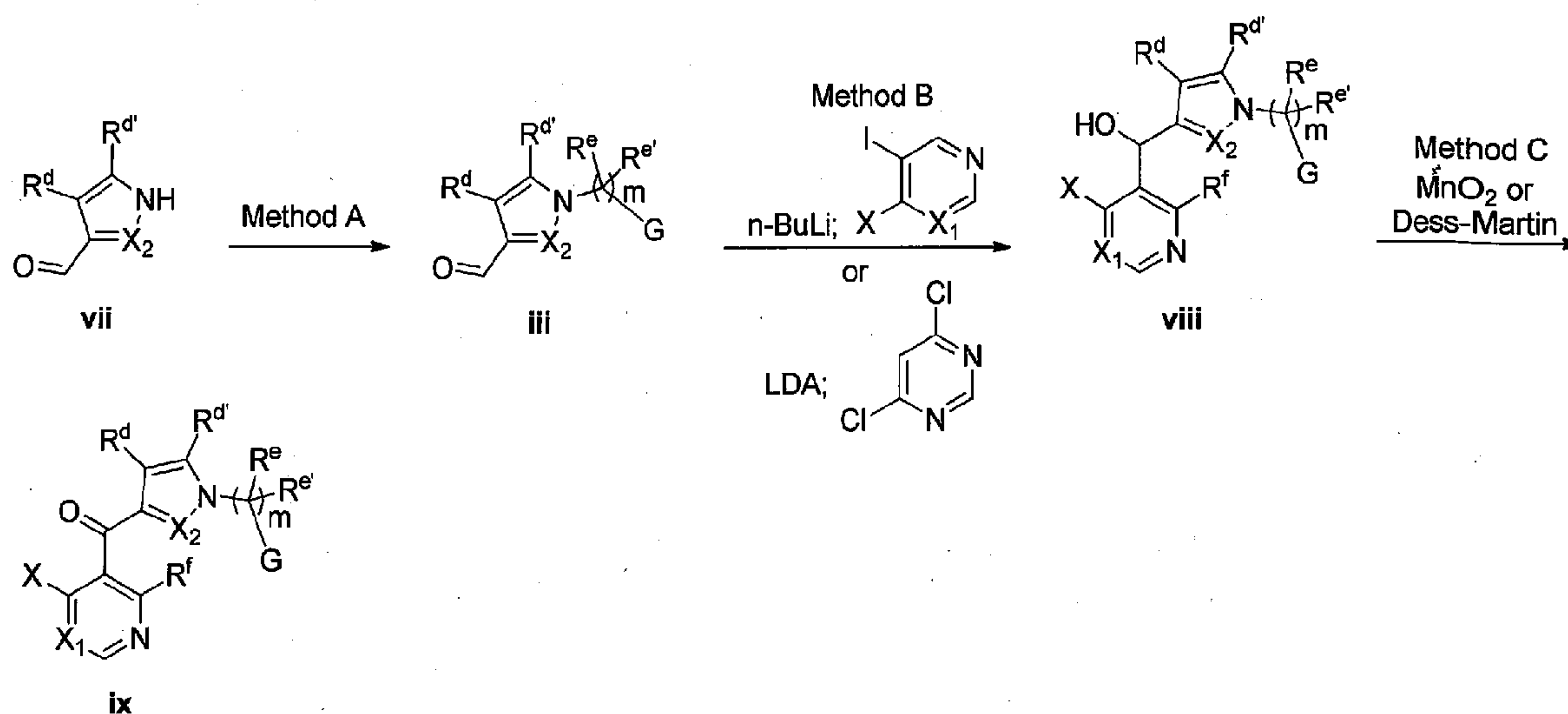
[00124] Scheme 1 describes a general route to the substituted pyrrole and pyrrole aldehydes, **iii**, as well as Weinreb amide **iv**. Alkylation of **i** can provide compounds **ii** by treatment of the starting materials with a base such as DIEA, Cs_2CO_3 , or K_2CO_3 in the presence of an appropriate electrophile in a solvent such as DMF or THF (Method A). In certain cases when $m = 0$, a standard copper assisted cross-coupling reaction (CuI , K_3PO_4) will also achieve the desired transformation. Subsequent reduction of the ester and reoxidation to the aldehyde affords **iii**. Some substituted pyrroles can be converted to the corresponding Weinreb amide, **iv**, by conversion to the carboxylic acid using bases such as LiOH, KOH, or NaOH followed by amide formation.

Scheme 2: General method for the preparation of substituted pyrroles vi



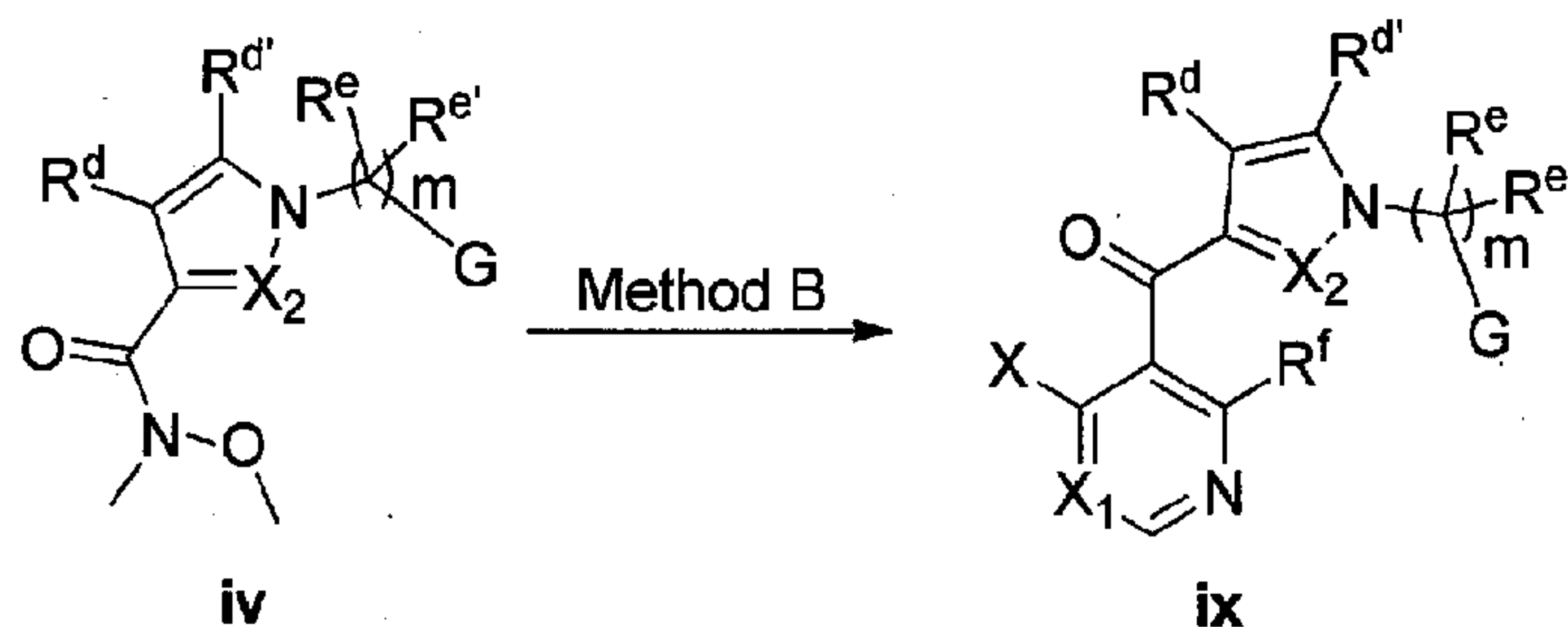
[00125] Scheme 2 demonstrates that N-substituted pyrroles, **vi**, can be generated by the reaction of 2,5-dimethoxy-3-tetrahydrofurancarboxaldehyde **v** with appropriately substituted tertiary amines in the presence of acetic acid as described by Yoshida, M. et al. (PCT Application Publication WO2009/148004).

Scheme 3: General method for the preparation of diaryl ketones ix



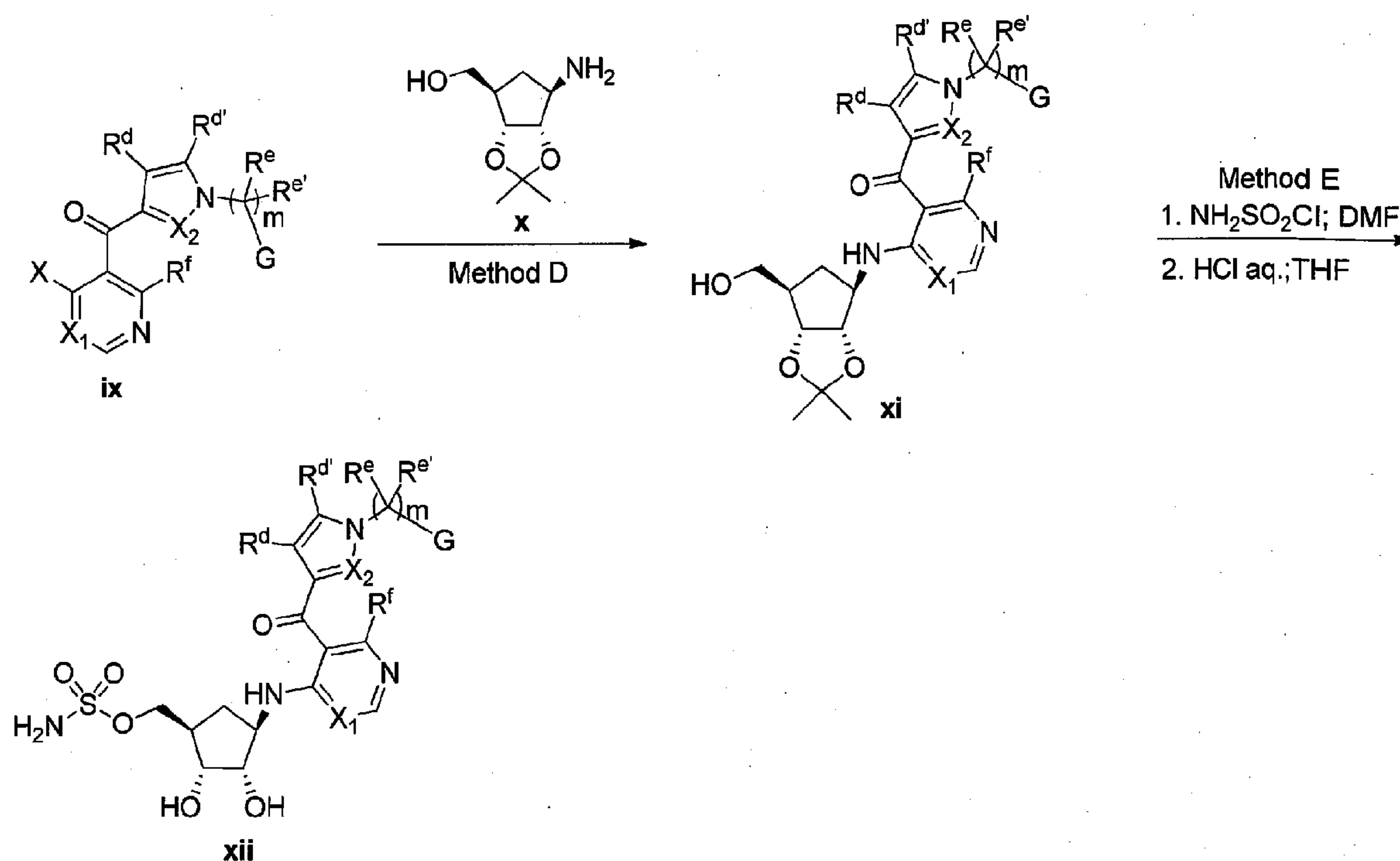
[00126] Scheme 3 depicts the synthesis of diaryl ketone intermediates **ix**. Pyrazole and pyrrole aldehydes **vii** can be N-alkylated with the desired electrophile via Method A. In this scheme Method A can also be an aryl coupling between **vii** and an aryl iodide to generate **iii**. Lithiation of a bis-halogenated pyrimidine or pyridine can be followed by addition of aldehydes **iii** to give secondary alcohols **viii** (Method B). The aldehydes **iii** generated in Scheme 1 could also be inserted into step 2 to give **viii** via Method B. Oxidation conditions (Method C: manganese(IV) oxide or Dess-Martin periodinane) can be utilized to complete diarylketones **ix**.

Scheme 4: General method for the preparation of diaryl ketones **ix**



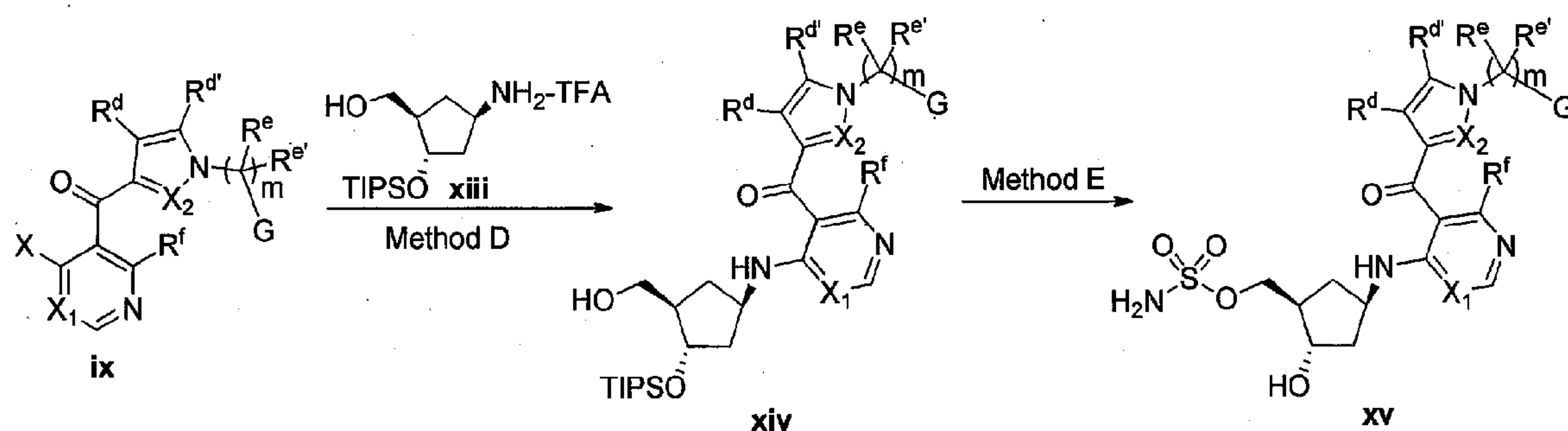
[00127] Scheme 4 demonstrates that in similar fashion Method B can also generate diaryl ketones **ix** from Weinreb amide **iv** by employment of Method B.

Scheme 5: General method for the synthesis of keto arylamines **xii**



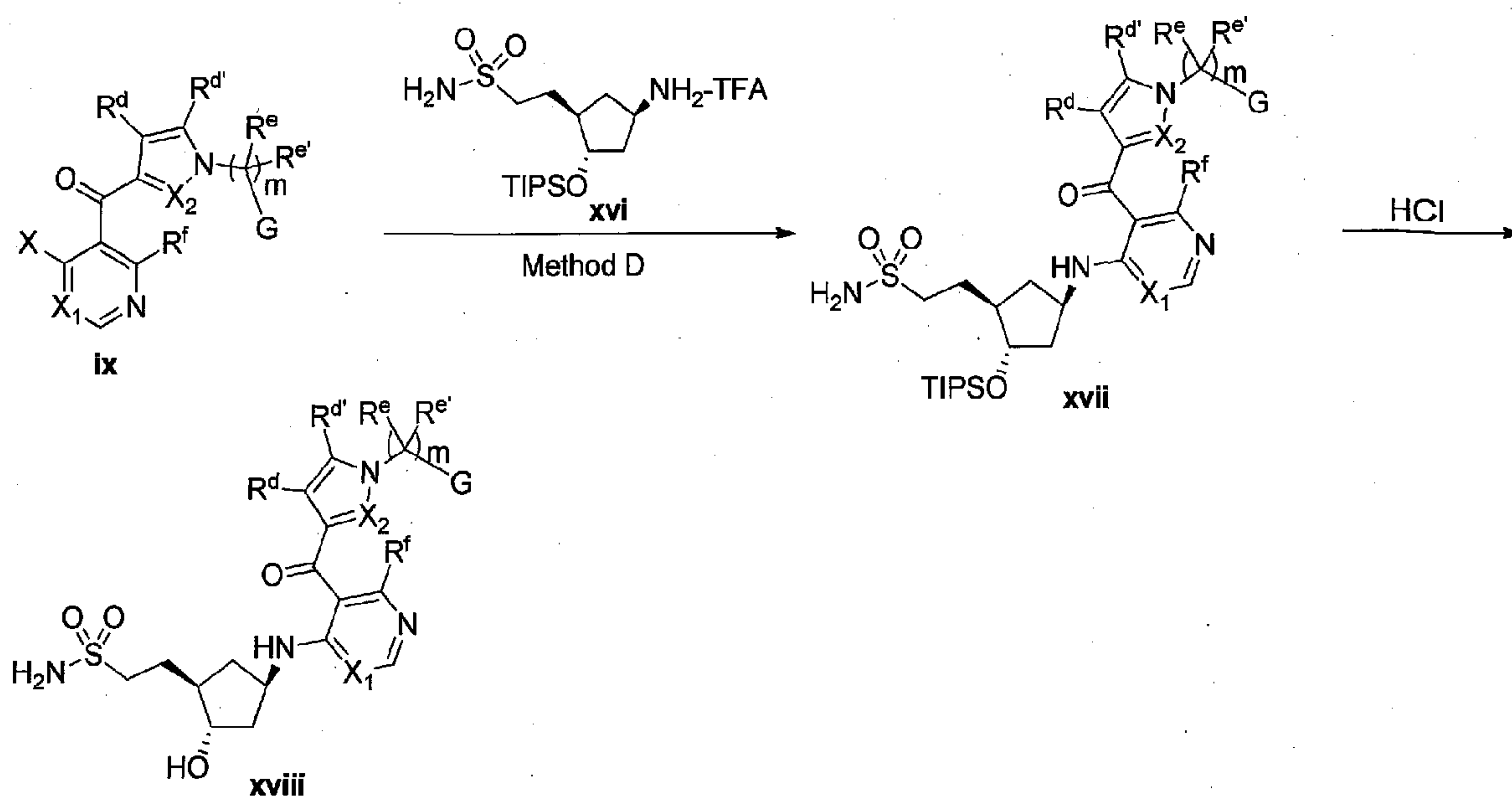
[00128] Scheme 5 shows a synthetic route for the preparation of compounds of formula **xii**. In Method D diaryl ketones **ix** can be treated with (1R,2S,3R,4R)-1-amino-2,3-(isopropylidenedi)hydroxy-4-hydroxymethyl cyclopentane **x** (prepared according to Claiborne, C.F. et al; PCT Application Publication WO 2008/019124) in the presence of base (K_2CO_3 , DIEA, TEA) in a polar solvent (iPrOH, PrOH, nBuOH, DMF). A two step sequence consisting of sulfamation and deprotection of the acetonide under acidic conditions (Method E) can complete the synthesis of ketopyrimidines **xii**.

Scheme 6: General method for the preparation of keto arylamines **xv**



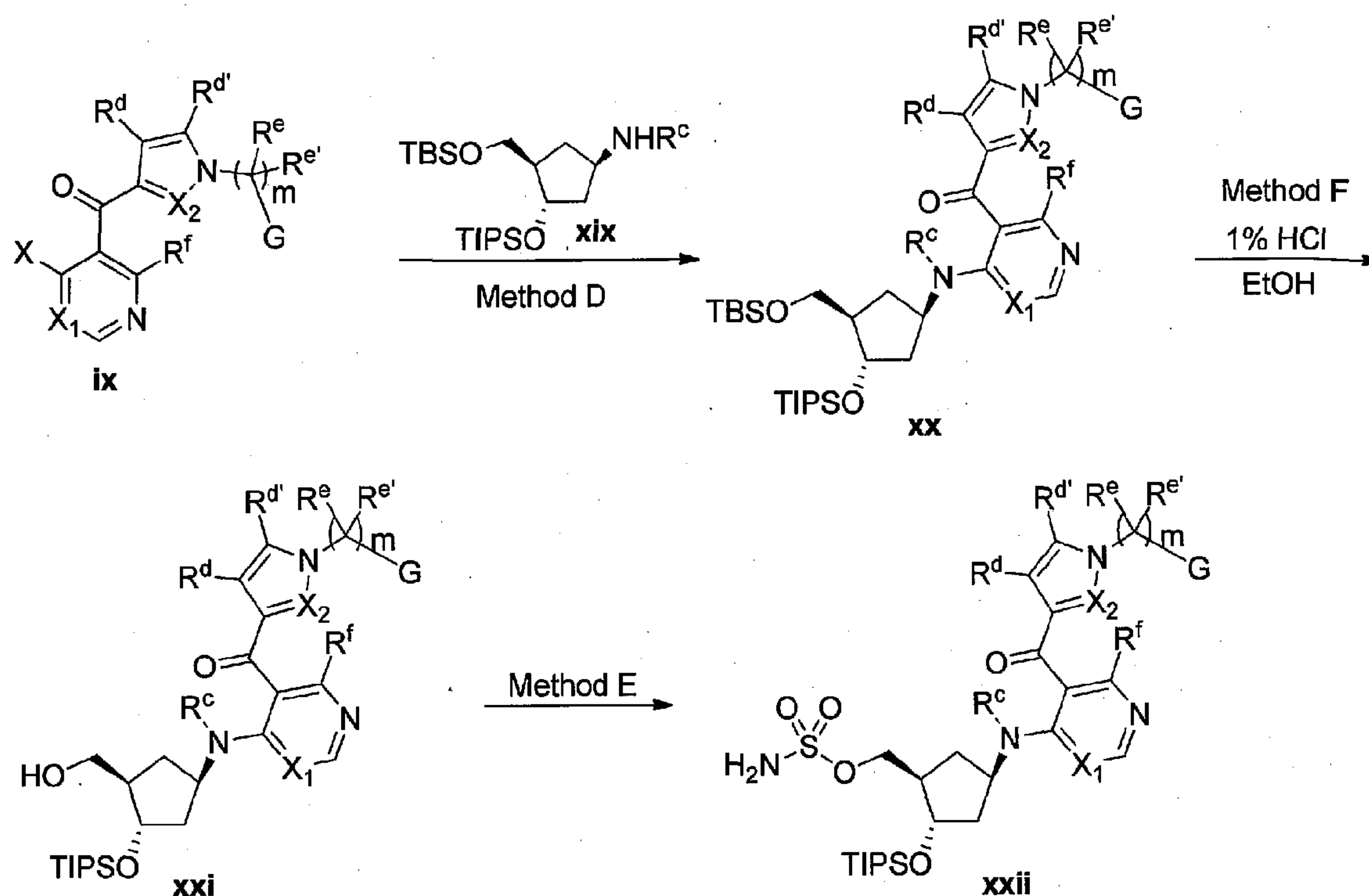
[00129] Scheme 6 illustrates the syntheses of compounds with general structure **xv**. Diaryl ketones **ix** can be coupled with the TFA salt of cyclopentylamine **xiii** under conditions of Method D to provide compounds **xiv**. Employment of Method E (sulfamation followed by TIPS removal) can then lead to compounds **xv**.

Scheme 7: General method for the preparation of keto arylamines **xviii**



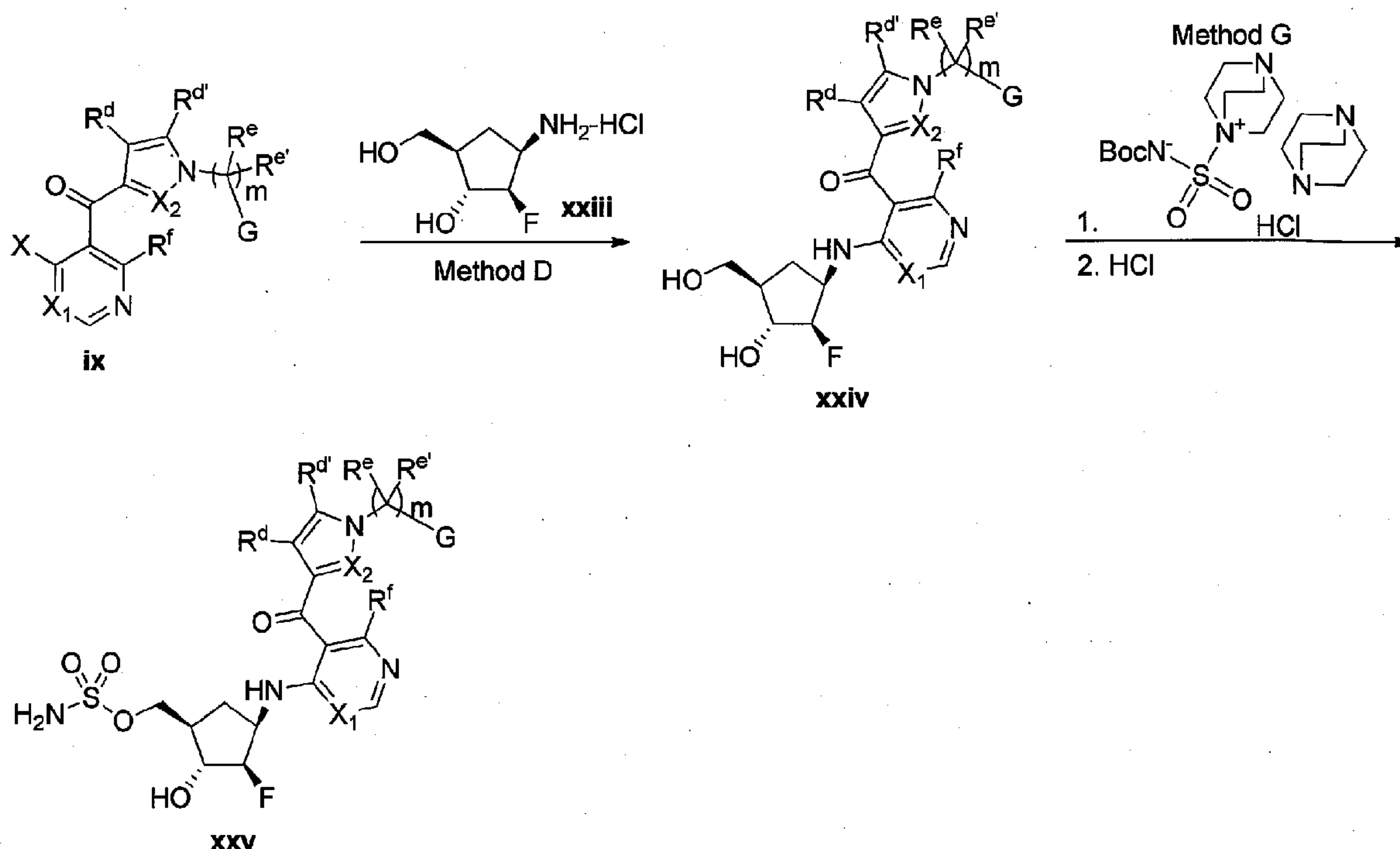
[00130] Scheme 7 illustrates that sulfonamides **xviii** can also be constructed by a similar route. Diaryl ketones **ix** can be coupled with cyclopentylamine **xvi** to give compounds of formula **xvii** (Method D). Removal of the TIPS protecting group on the secondary alcohol completes the synthesis of **xviii**.

Scheme 8: General method for the preparation of keto arylamines **xxii**



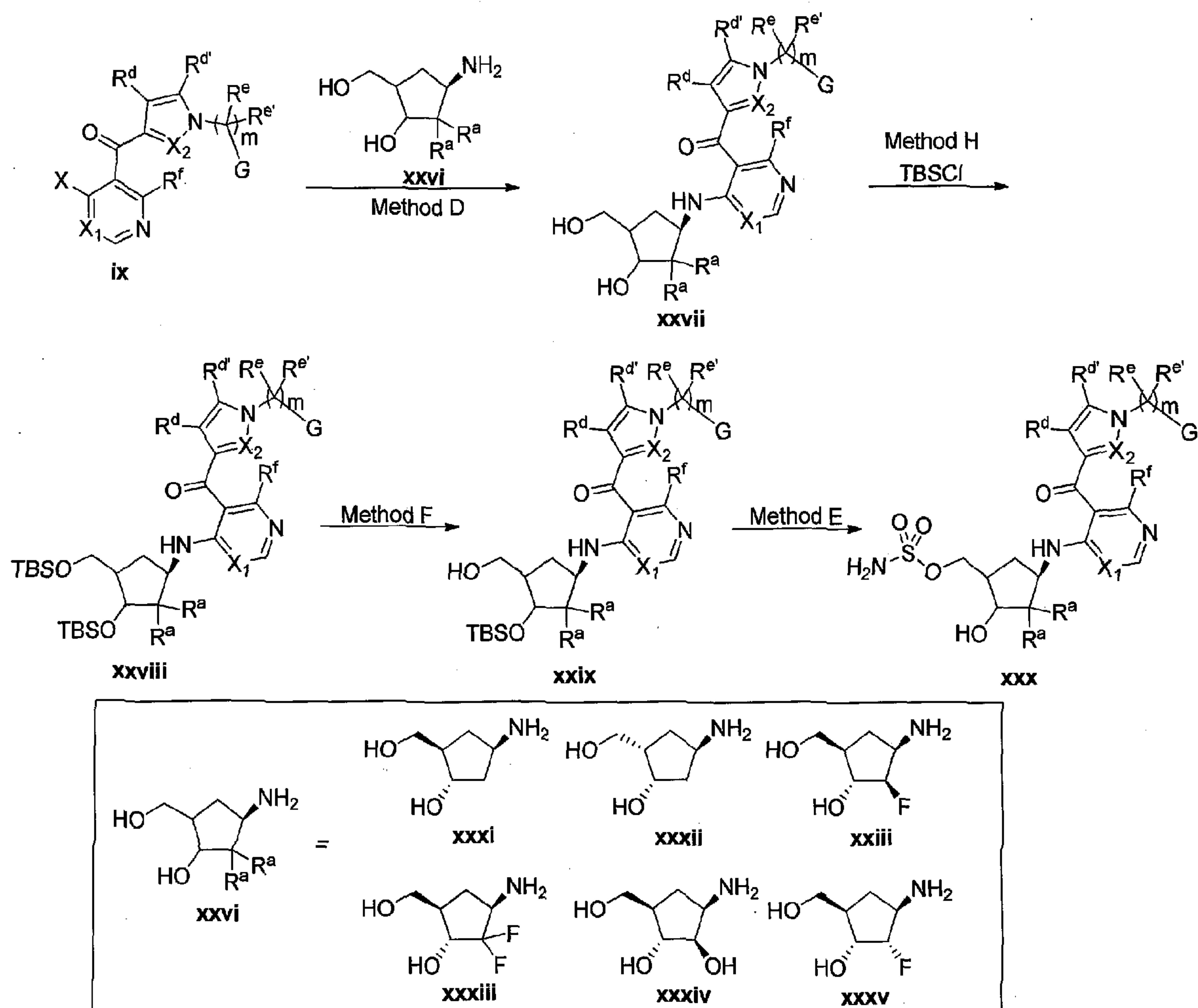
[00131] Scheme 8 describes a route for the preparation of compounds of formula **xxii**. By use of Method D diaryl ketones **ix** could be coupled to cyclopentylamine **xix** to give the corresponding aryl amines **xx**. In the second step these aryl amines can be subjected to a dilute acidic solution in ethanol to selectively remove the TBS protecting group in the presence of the TIPS protecting group (Method F). Sulfamation of the newly revealed primary alcohol followed by removal of the TIPS protecting group under acidic conditions (Method E) provides compounds of formula **xxii**.

Scheme 9: General method for the preparation of keto arylamines **xxv**



[00132] Scheme 9 demonstrates the synthesis of fluorinated compounds of formula **xxv**. Addition of (1R,2R,3R,5R)-3-amino-2-fluoro-5-(hydroxymethyl)cyclopentanol hydrochloride **xxiii** (Biggadike, K. et al. *J. Chem. Soc. Perkin Trans.* **1988**, 3, 549-554.; Borthwick, A.D. et al. *J. Med. Chem.* **1990**, 33, 179-186.) to **ix** can lead to formation of aryl amines **xxiv**. A selective sulfamation of the primary alcohol by treatment with a modified Burgess reagent (Armitage, I. et al. *Org. Lett.* **2012**, 14, 2626-2629.) can then be followed by treatment with acid to remove the Boc group on the sulfamate (Method G) and results in the synthesis of fluorinated compounds **xxv**.

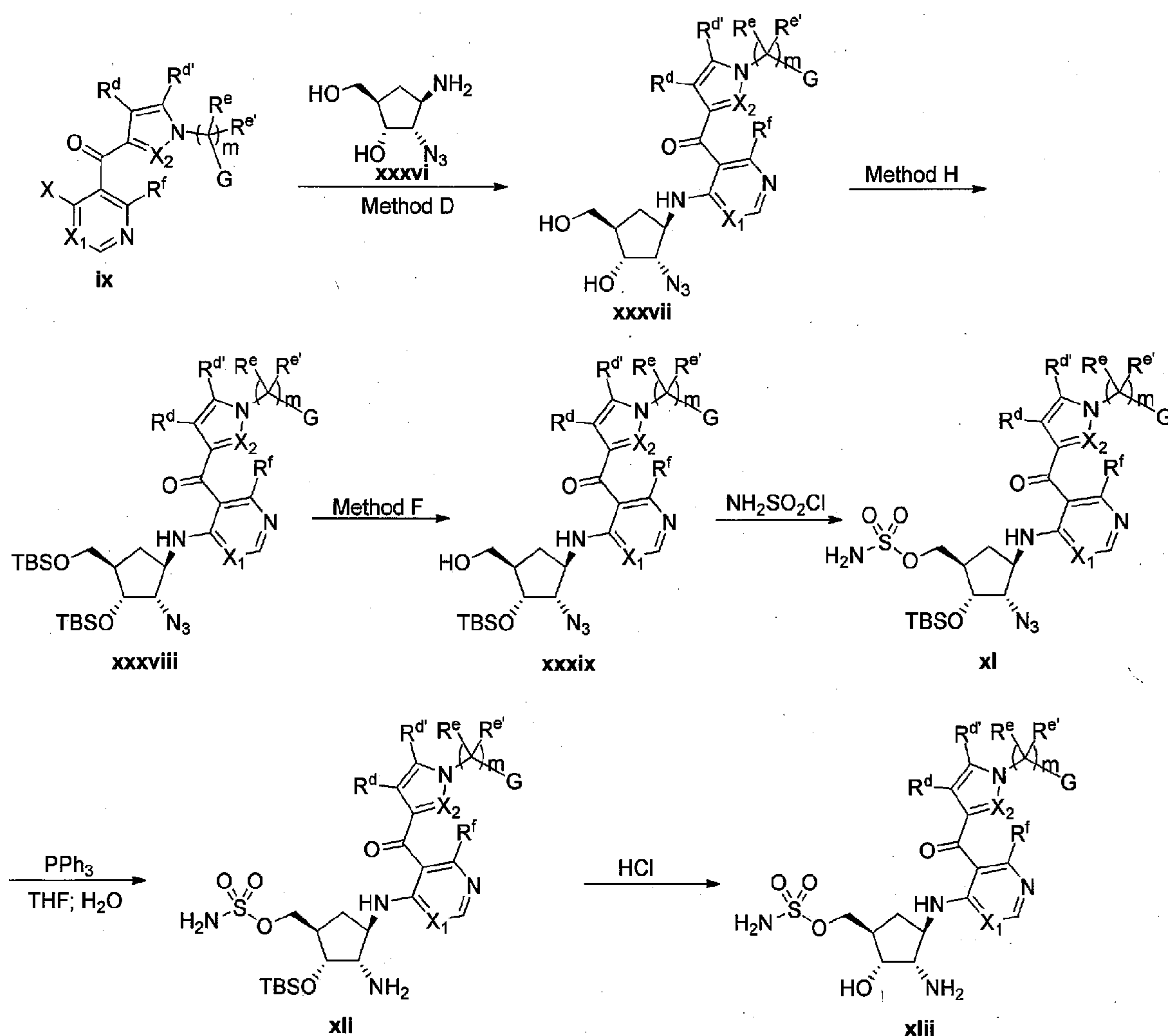
Scheme 10: General method for the preparation of keto arylamines **xxx**



[00133] Scheme 10 illustrates the synthesis of compounds of general structure **xxx**. Method D can be exploited for the addition of cyclopentylamines of general structure **xxvi** to diaryl ketones **ix**. In this sequence **xxvi** can be any of the cyclopentylamines **xxxi**, **xxxii**, **xxxiii**, **xxxiv**, and **xxxv** (for **xxxi** see: Ober, M. et al. *J. Am. Chem. Soc.* **2005**, 127, 18143-18149.; for **xxxii** see: Armitage, I. et al. US Patent Application Publication 2009/0036678; for **xxxiii**, **xxxiv**, **xxxv** see: Biggadike, K. et al. *J. Chem. Soc. Perkin Trans.* **1988**, 3, 549-554.; Borthwick, A.D. et al. *J. Med. Chem.* **1990**, 33, 179-186.).

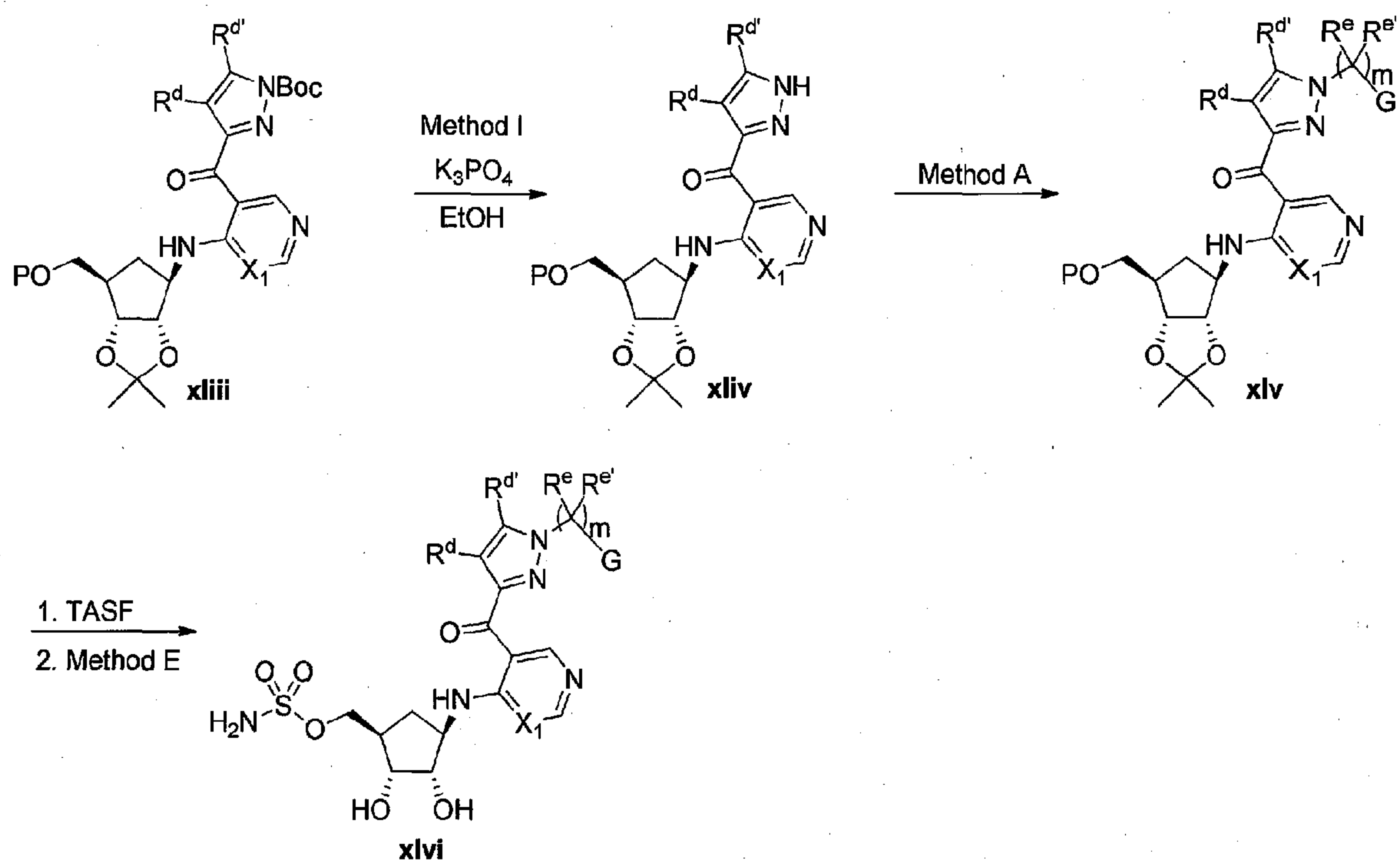
Protection of the free alcohols can be accomplished by prolonged treatment with TBSCl in DMF (Method H) to give compounds **xxviii**, which can then undergo selective deprotection of the primary silyl ether by use of Method F at reduced temperature (<4°C). Subsequent sulfamation/acid deprotection (Method E) of the secondary silyl ether in compound **xxix** can provide analogues **xxx**.

Scheme 11. General method for the preparation of keto arylamines xlii



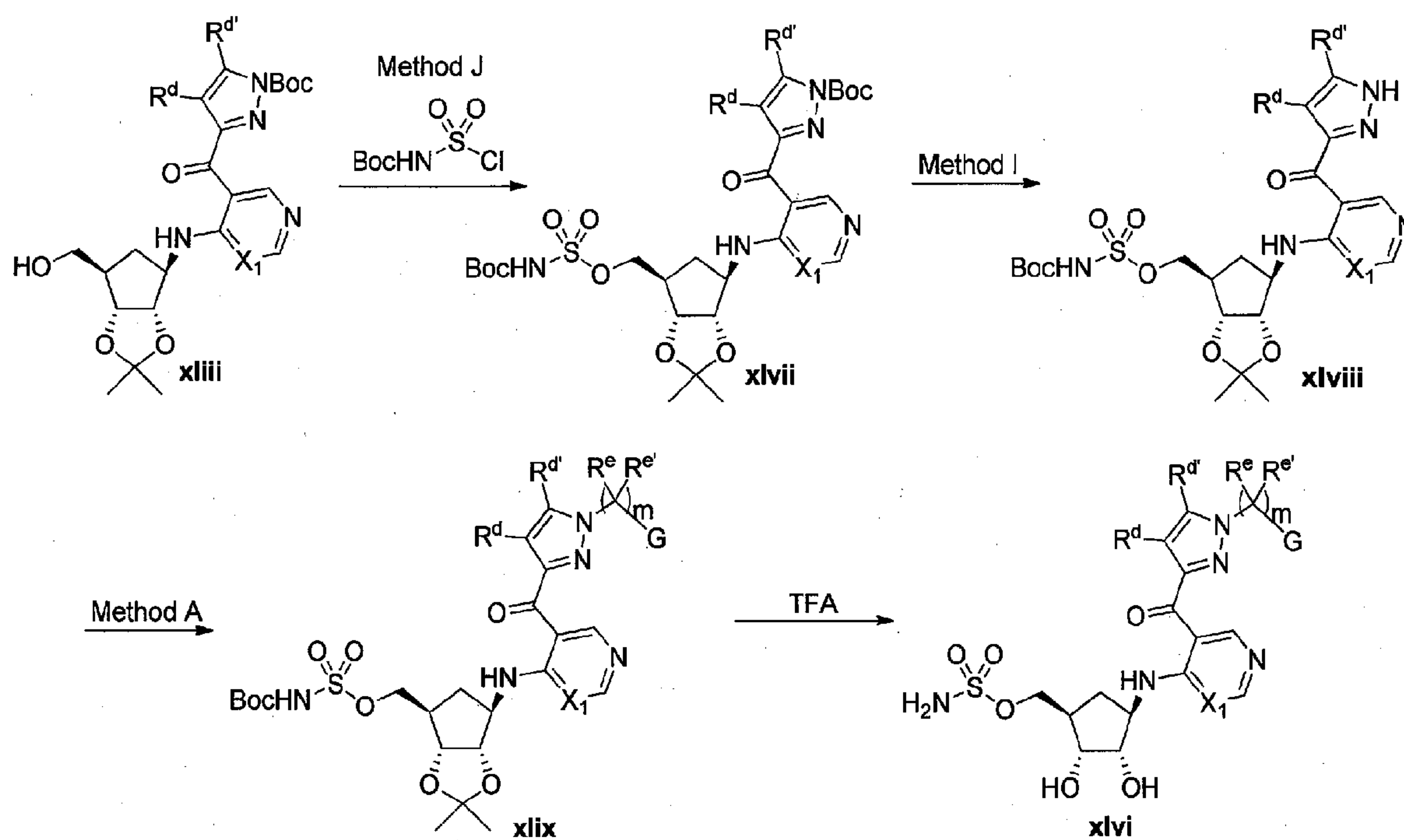
[00134] Scheme 11 depicts the synthesis of keto arylamines possessing an amino group at the 2' position of the cyclopentylamine. Similar to Scheme 10, the azide-containing cyclopentylamine **xxxvi** can be coupled with diaryl ketones **ix** to give **xxxvii**. (For the construction of **xxxvi**, an adapted synthesis of those reported in the following publications can be used: Biggadike, K. et al. *J. Chem. Soc. Perkin Trans.* **1988**, 3, 549-554.; Borthwick, A.D. et al. *J. Med. Chem.* **1990**, 33, 179-186.) Standard protecting group manipulations (Methods E, F) followed by sulfamation of **xxxix** can provide intermediates **xl**. The 2' azide can then be reduced to the corresponding amine via Staudinger reduction followed by removal of the remaining protecting groups under acidic conditions to generate compounds **xlii**.

Scheme 12: General method for the preparation of keto arylamines **xlvi**



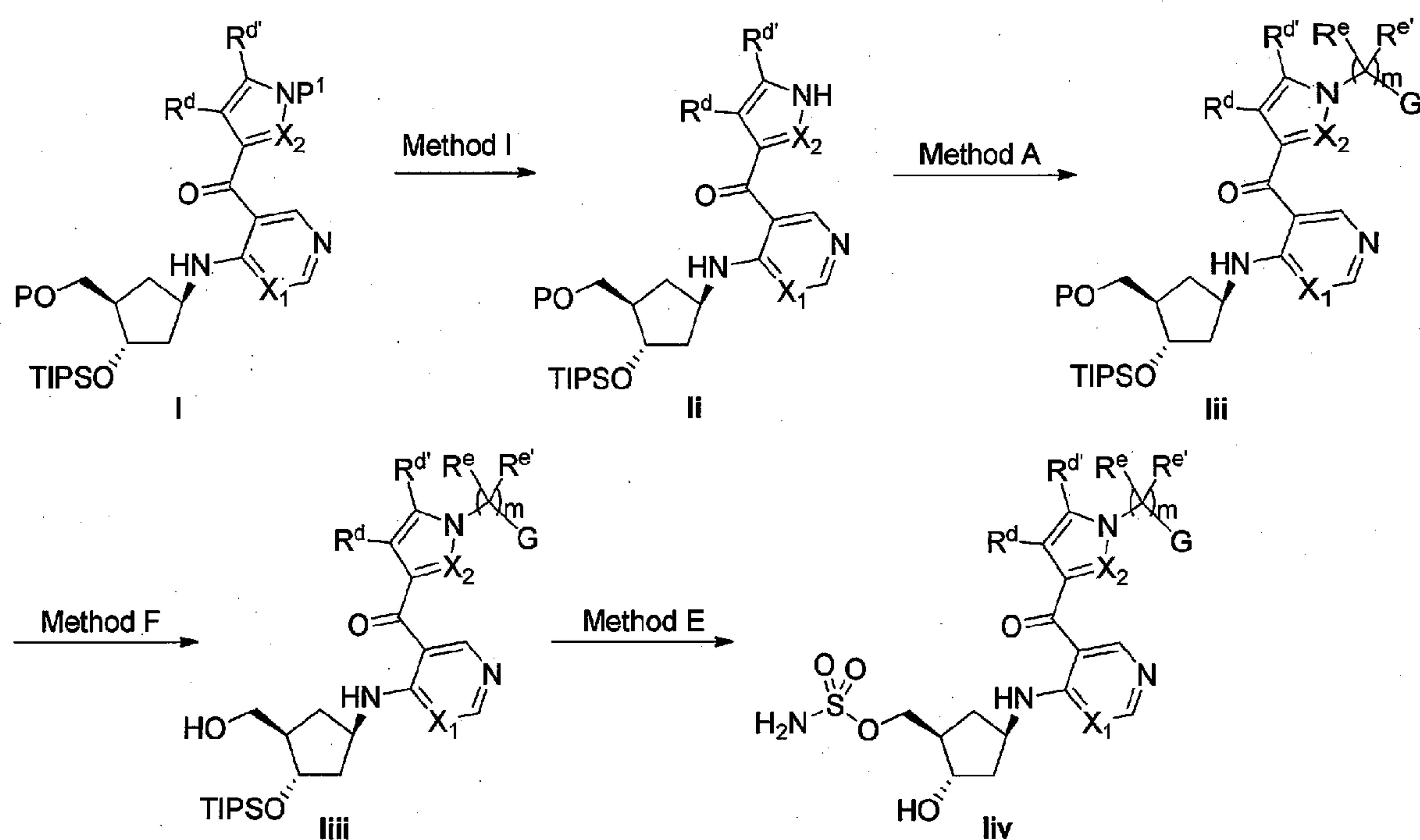
[00135] Scheme 12 shows the use of an advanced intermediate to make pyrazole analogues **xlvii**. Advanced intermediates **xlviii** ($P = H$ or TBS) can be generated by the routes outlined in Schemes 3 and 5 with the appropriate Boc-protected pyrazole intermediates. Removal of the Boc protecting group can be accomplished by treatment with K_3PO_4 in ethanol (Method I) to generate intermediates **xlv**. Intermediates **xlv** can then be alkylated by use of Method A. If $P = TBS$ then treatment of **xlv** with an appropriate fluoride source (TASF, TBAF) can remove the TBS protecting group. The final steps in this sequence are Method E which can accomplish sulfamation and acetonide removal to produce compounds **xlvii**.

Scheme 13: General method for an alternative synthesis of keto arylamines xlvii



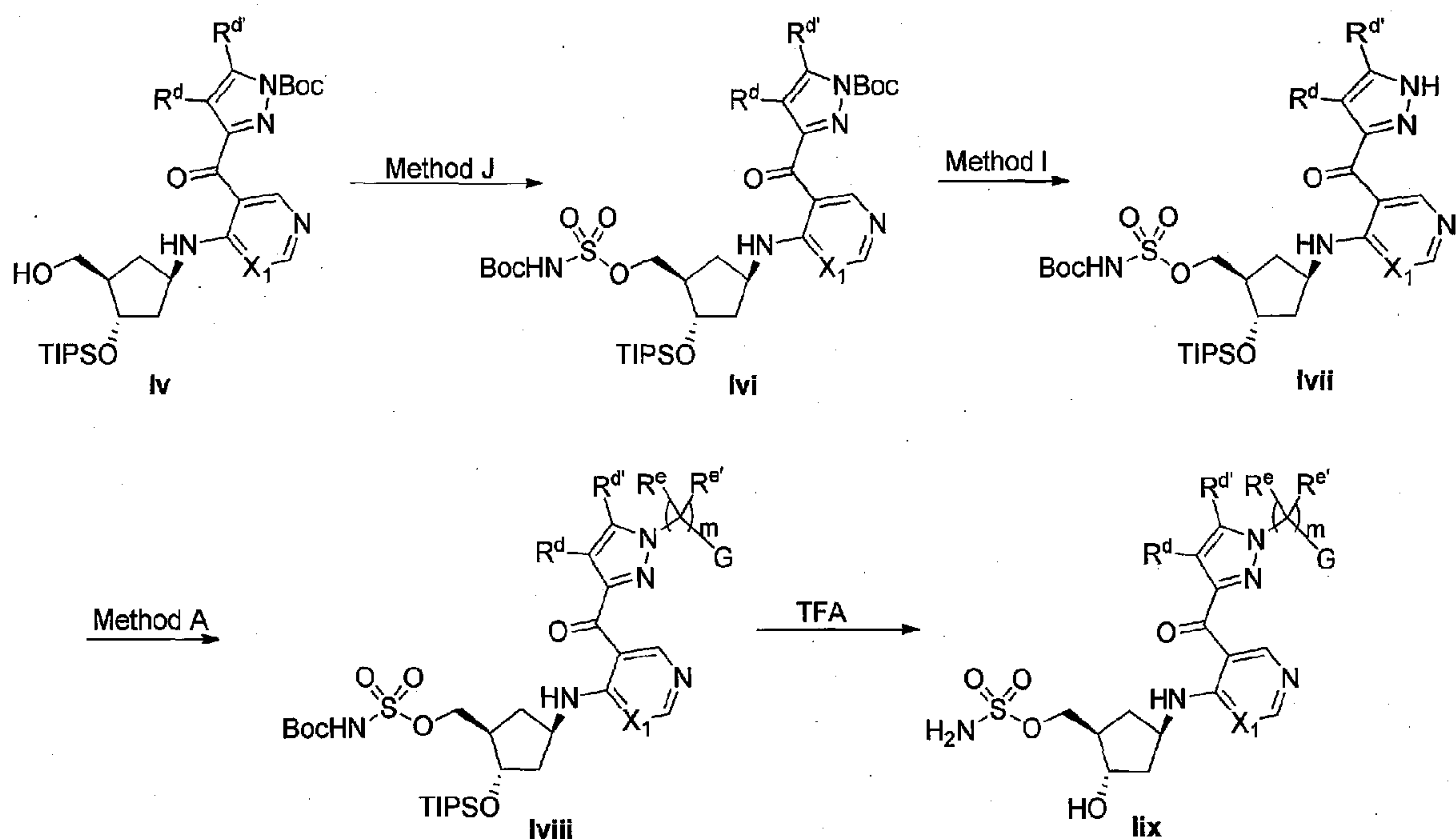
[00136] Scheme 13 demonstrates an alternative synthetic sequence to compounds **xlvi**. Intermediates **xliii** ($P = H$) can be converted to the Boc protected sulfamates **xlvi** by addition of Boc protected chlorosulfonamide (Method J). Removal of the pyrazole Boc protecting group (Method I) can be followed by alkylation of intermediates **xlvi** to provide intermediates **xlix** (Method A). Final deprotection of the Boc and acetonide groups can be realized by treatment of intermediates **xlix** with TFA to produce analogues of general structure **xlvi**.

Scheme 14: General method for the preparation of keto arylamines **liv**



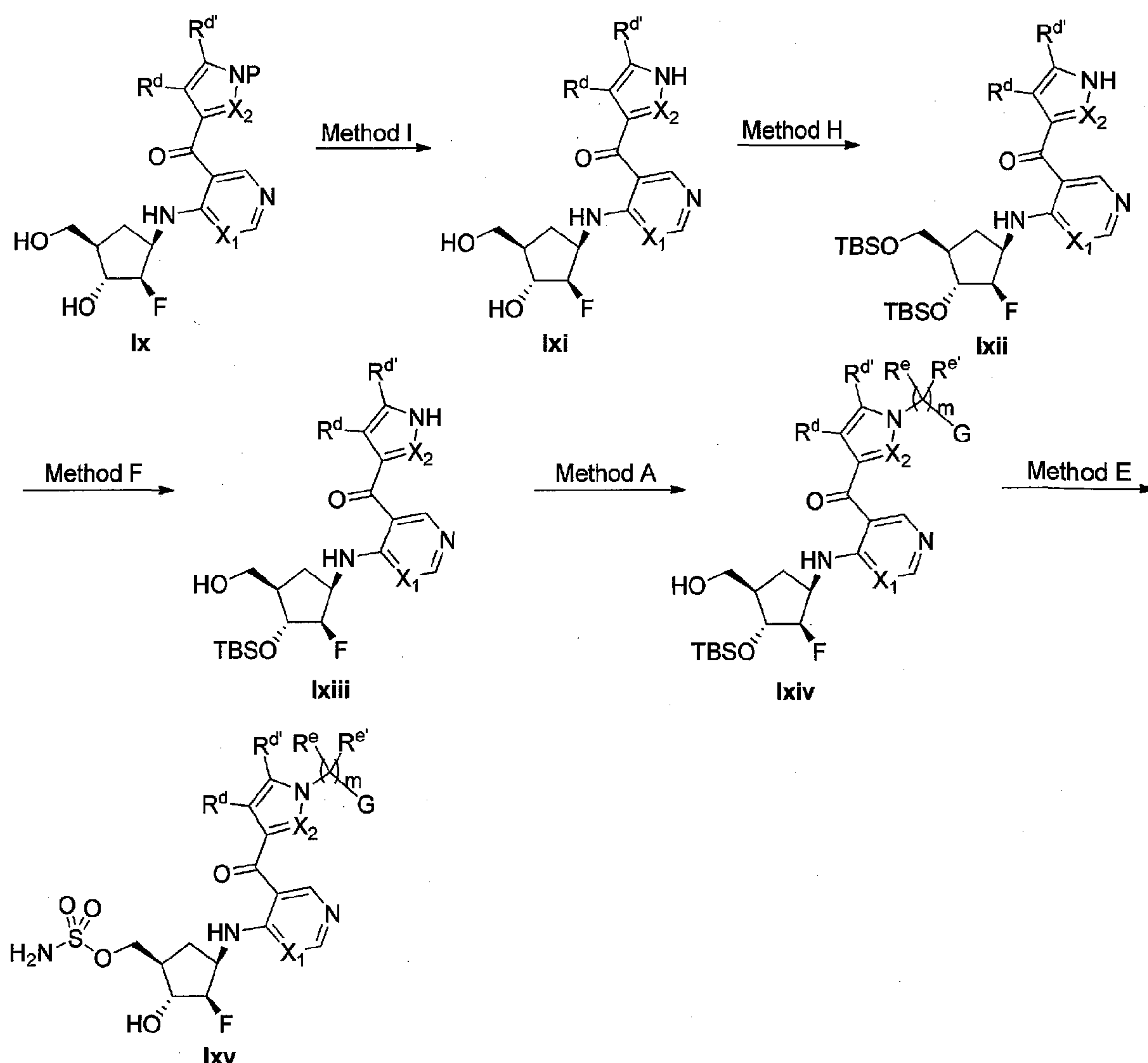
[00137] In a similar fashion Scheme 14 shows the use of advanced intermediates to synthesize analogues **liv**. Advanced intermediates **I** can be generated by the routes outlined in Schemes 3 and 6 or Schemes 3 and 8 by using the appropriately protected pyrazole and pyrrole intermediates. P can be either TBS or H in compounds **I** while P^1 can be either Boc (pyrazole, pyrrole) or tosyl (pyrrole). The first step in this sequence (removal of nitrogen protecting group on the heterocycle) can be achieved by Method I to generate compounds **II**. In this sequence Method I refers to either the removal of a Boc protecting group (pyrazole: $K_3PO_4/EtOH$; pyrrole: $K_2CO_3/MeOH$) or the removal of a tosyl group (pyrrole: $K_2CO_3/MeOH$). Employment of Method A can then be used to alkylate intermediates **II** to give compounds **III**. If $P = TBS$ then subjection of **III** to Method F can remove the TBS protecting group leading to intermediates **IIII**. Use of Method E (sulfamation followed by deprotection of the TIPS ether) can complete the synthesis of compounds **lix**.

Scheme 15: General method for the preparation of keto arylamines **lix**



[00138] Scheme 15 gives an alternative method for the synthesis of pyrazole analogues **lix**. Intermediates **iv** can be converted to the Boc protected sulfamates **vi** via Method J. Method I can be utilized to remove the pyrazole Boc protecting group and subsequent alkylation of intermediates **vii** by Method A can lead to formation of compounds **viii**. Removal of the Boc and TIPS protecting groups by treatment with acid can finish construction of analogues of general structure **lix**.

Scheme 16: General method for the synthesis of keto arylamines lxx



[00139] Scheme 16 also outlines the use of an advanced intermediate for analogue construction. In this case intermediates **Ix** can be used to synthesize fluorinated analogues **Ixv**. Advanced intermediates **Ix** can be generated by use of the routes outlined in Schemes 3 and 9 implementing the appropriately protected pyrazole and pyrrole intermediates. Removal of the nitrogen protecting group on the heterocycle can be achieved by Method I to generate compounds **Ixi**. Method I can refer to the removal of the Boc protecting group if the heterocycle is pyrazole ($K_3PO_4/EtOH$) or the removal of a tosyl group if the heterocycle is a pyrrole ($K_2CO_3/MeOH$). Use of Method H can promote protection of the alcohols as TBS ethers to produce intermediates **Ixii**. Removal of the primary silyl protecting group (Method F) can be followed by alkylation of the nitrogen heterocycle (Method A) to achieve intermediates **Ixiv**. These two steps can also be done in the reverse order (alkylation followed by deprotection). Again, the final

The reaction scheme illustrates the synthesis of compound Ixv from compound Ixi. Compound Ixi is a substituted pyrimidine with a 2,3,4,5-tetrahydro-2H-pyran-2-yl group at position 6, a fluorine atom at position 4, and a hydroxyl group at position 3. It is linked via a carbonyl group to a pyrimidine ring at position 2, which has substituents R^d and R^{d'} at positions 4 and 5, and a substituent X₂ at position 6. The reaction proceeds via Method A to form intermediate Ixvi, which is identical to Ixi but with an additional substituent R^e and a group G attached to the nitrogen at position 1 of the pyrimidine ring. This intermediate then undergoes Method G to yield compound Ixv, where the group G is a sulfamoyl group (SO₂NH₂).

Preparation of Exemplary Compounds

AA	LCMS method using ammonium acetate
aq.	aqueous
Boc	<i>tert</i> -butoxycarbonyl
C	Celsius
DCM	dichloromethane
DIBAL-H	diisobutylaluminum hydride
DIEA	diisopropylethylamine
DMA	dimethyl acetamide
DMAP	4-dimethylaminopyridine
DMF	dimethyl formamide
DMSO	dimethyl sulfoxide
EtOAc	ethyl acetate
EtOH	ethanol
FA	LCMS method using formic acid

h	hour(s)
HATU	(<i>O</i> -(7-azabenzotriazol-1-yl)- <i>N,N,N',N'</i> -tetramethyluronium hexafluorophosphate)
IC ₅₀	inhibitory concentration 50%
LAH	lithium aluminum hydride
LCMS	liquid chromatography mass spectrometry
LDA	lithium diisopropyl amide
<i>m/z</i>	mass to charge
min	minute(s)
NBS	N-bromosuccinimide
NMP	N-methylpyrrolidine
PPTS	pyridinium para-toluenesulfonate
RBF	round bottomed flask
rt	room temperature
TBS	<i>tert</i> -butyldimethylsilyl
TBAF	tetra- <i>n</i> -butylammonium fluoride
TEA	triethylamine
TFA	trifluoroacetic acid
THF	tetrahydrofuran
TIPS	triisopropylsilyl
TLC	thin layer chromatography
Tosyl	p-toluenesulfonyl

[00142] Analytical Methods

NMR conditions:

[00143] ¹H NMR spectra are run on either a 300 MHz or 400 MHz Bruker instrument unless otherwise stated.

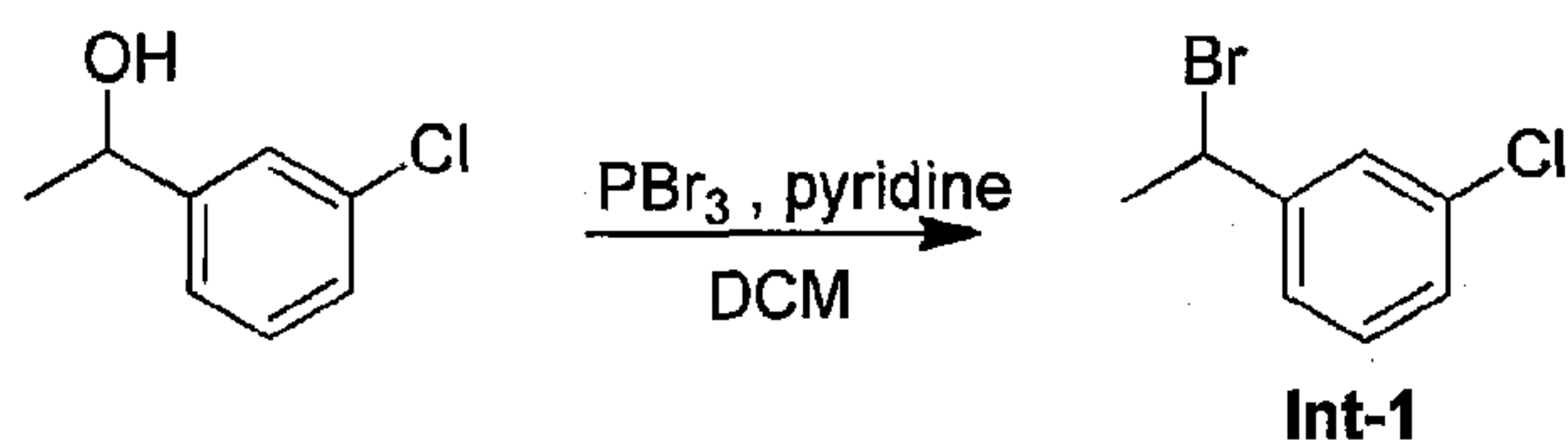
LCMS conditions:

[00144] LCMS data are acquired on either an Agilent 1100 Series HPLC system or a Waters Acquity UPLC system, connected to a Waters ZQ Mass Spectrometer. Various gradients and run times are used in order to best characterize the compounds under reverse phase conditions using C18 columns. Mobile phase compositions are based on Water/MeCN mixtures containing one of two modifiers: 0.1% formic acid (methods indicated FA) or 10 mM ammonium acetate (methods indicated AA). An example of an HPLC FA gradient program that is applied is running from 100% A to 100 % B at a flow rate of 1 mL/min over 16.5 min, where A = 99% Water + 1% MeCN + 0.1% Formic Acid and B = 95% MeCN + 5% Water + 0.1% Formic Acid.

[00145] One of ordinary skill in the art will recognize that modifications of the gradient, column length, and flow rate are possible and that some conditions may be more suitable for compound characterization than others, depending on the chemical species being analyzed.

Starting materials described were either purchased commercially or prepared by the literature routes if a citation is shown.

Example 1: 1-(1-Bromoethyl)-3-chlorobenzene Int-1

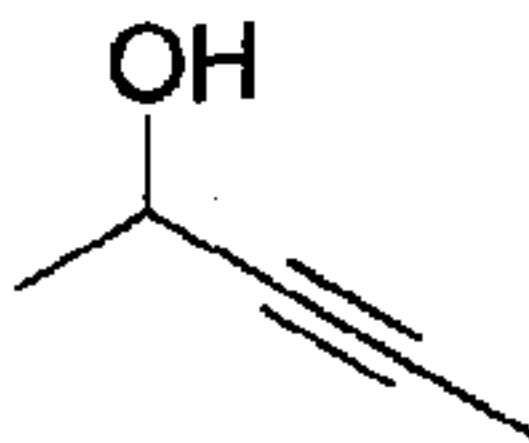
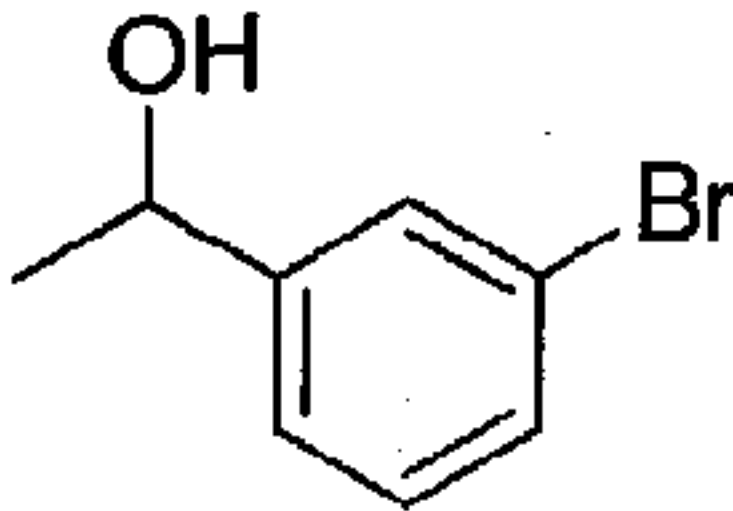
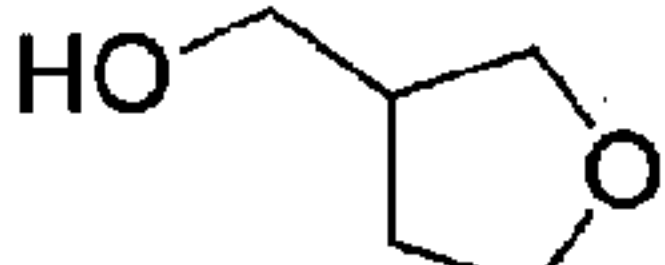


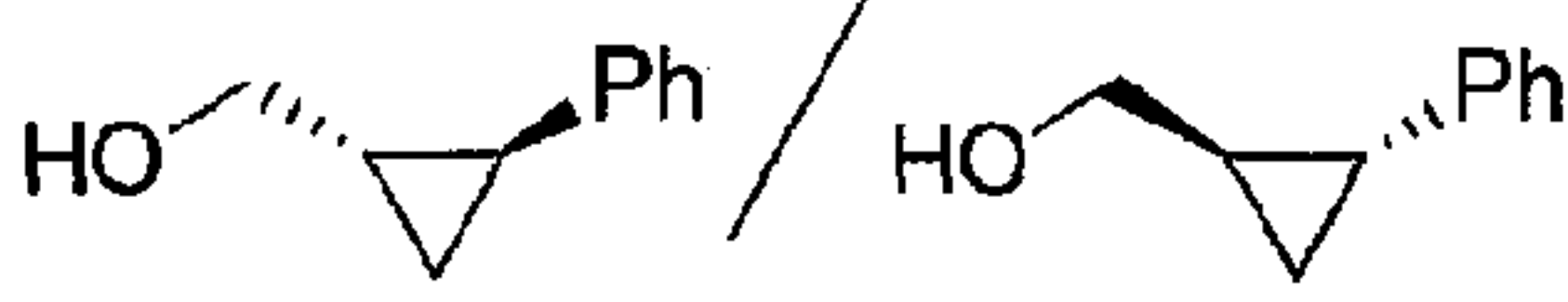
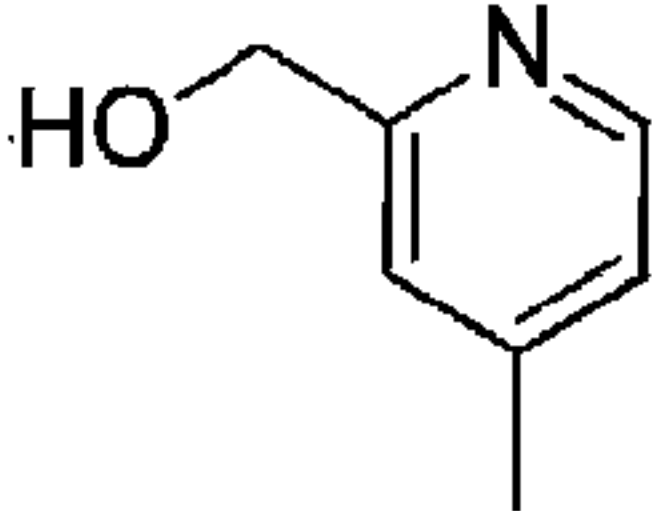
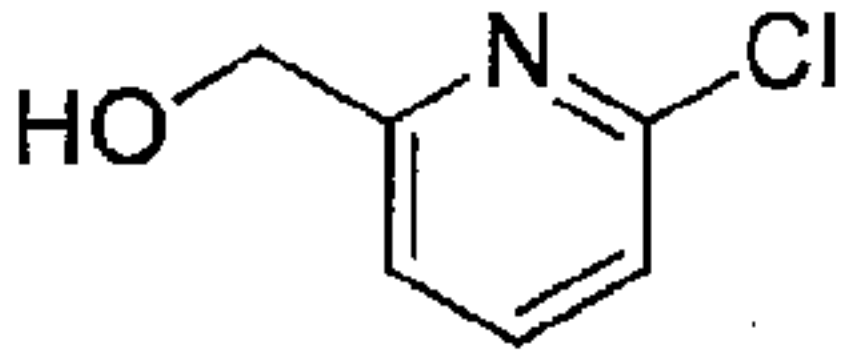
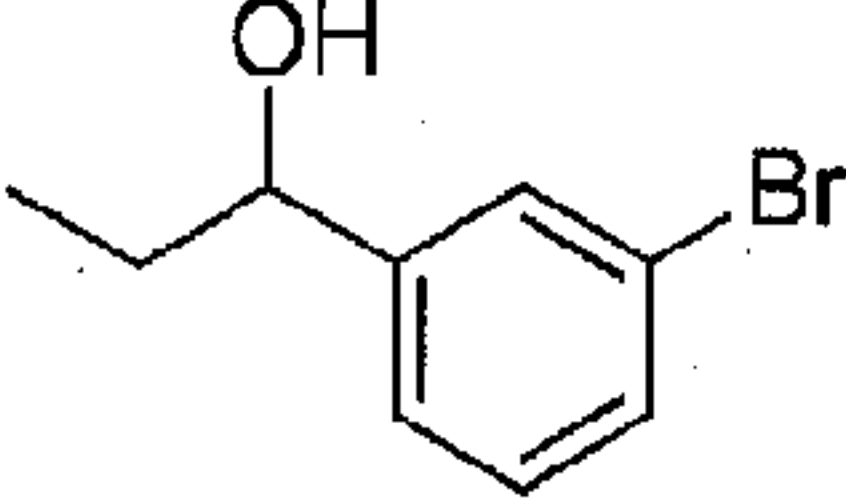
Step 1: 1-(1-Bromoethyl)-3-chlorobenzene Int-1

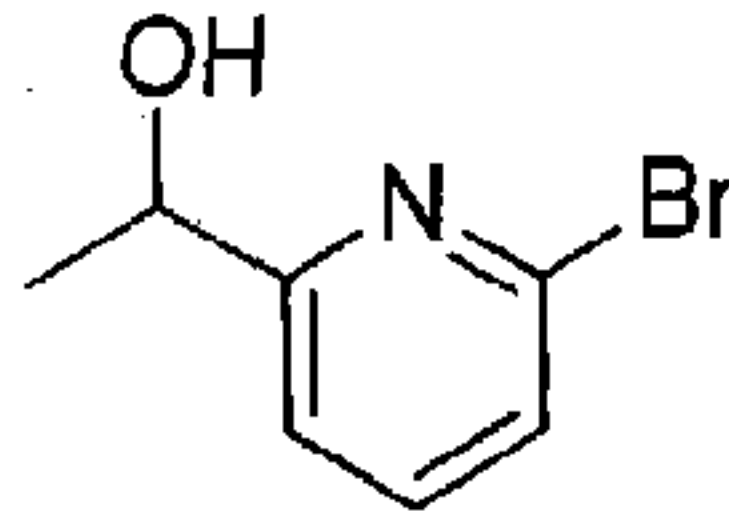
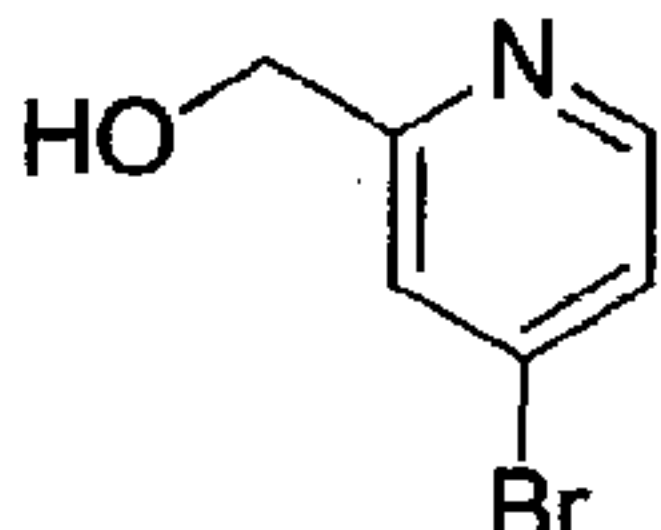
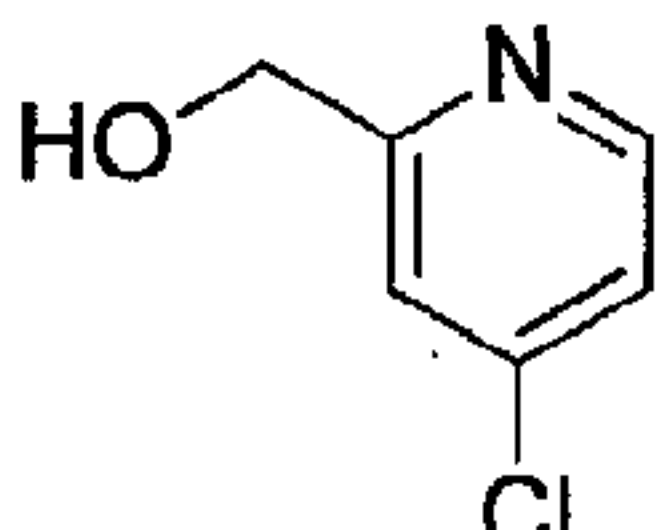
[00146] To a solution of m-chlorophenylmethylcarbinol (0.50 g, 3.2 mmol) and pyridine (0.052 mL, 0.64 mmol) in DCM (10 mL) at -75°C was added phosphorus tribromide (0.30 mL, 3.2 mmol) dropwise. The mixture was stirred for 10 min and left to stand in a -25°C freezer overnight. The mixture was then placed in an ice bath and 3 mL water was added slowly. The mixture was partitioned into DCM and water. The organic layer was washed successively with water, 1M NaHCO₃ and brine, dried over Na₂SO₄, filtered, and then concentrated to give 1-(1-bromoethyl)-3-chlorobenzene (700 mg, 100%). ¹H NMR (CDCl₃) δ 7.43 (s, 1H), 7.33 – 7.29 (m, 1H), 7.28 – 7.24 (m, 2H), 5.13 (q, J = 6.9 Hz, 1H), 2.03 (d, J = 6.9 Hz, 3H).

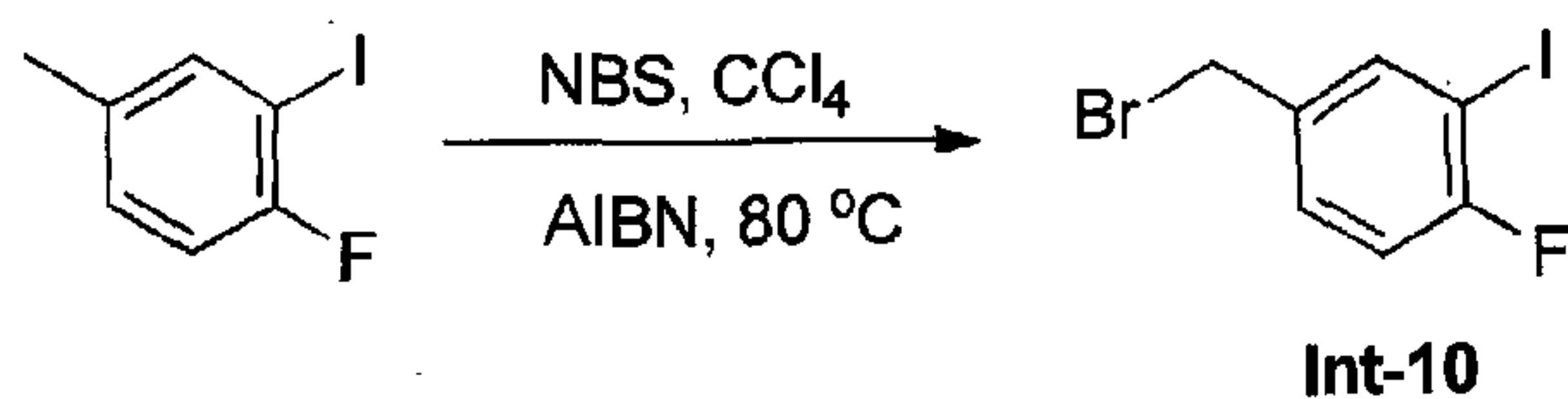
[00147] The compounds listed in the table below were prepared in an analogous fashion to that described above starting from the listed starting materials. Standard bromination conditions employing

NBS/PPh₃ in DCM or CBr₄/PPh₃ in DCM were used in some cases in lieu of the described reaction conditions in Example 1.

Starting material	Compound Name / No.	Characterization Data
	2-Bromo-3-pentyne / Int-2	¹ H NMR (CDCl ₃) δ 4.67 – 4.57 (m, 1H), 1.91 – 1.87 (m, 6H).
	1-Bromo-3-(1-bromoethyl)benzene / Int-3	¹ H NMR (CDCl ₃) δ 7.58 (s, 1H), 7.42 (d, <i>J</i> = 7.9 Hz, 1H), 7.36 (d, <i>J</i> = 7.8 Hz, 1H), 7.21 (t, <i>J</i> = 7.9 Hz, 1H), 5.12 (q, <i>J</i> = 6.9 Hz, 1H), 2.02 (d, <i>J</i> = 6.9 Hz, 3H).
 (mixture of <i>trans</i> isomers)	(1R,2R)-1-(Bromomethyl)-2-methylcyclopropane and (1S,2S)-1-(Bromomethyl)-2-methylcyclopropane / Int-4	¹ H NMR (CDCl ₃) δ 3.40 – 3.28 (m, 2H), 1.06 (d, <i>J</i> = 6.0 Hz, 3H), 1.04 – 0.96 (m, 1H), 0.81 – 0.70 (m, 1H), 0.55 – 0.47 (m, 2H).
	3-(Bromomethyl)tetrahydrofuran / Int-5	¹ H NMR (CDCl ₃) δ 3.94 – 3.86 (m, 2H), 3.82 – 3.74 (m, 1H), 3.60 (dd, <i>J</i> = 9.0, 5.7 Hz, 1H), 3.45 – 3.35 (m, 2H), 2.76 – 2.63 (m, 1H), 2.13 (dtd, <i>J</i> = 13.0, 8.0, 5.4 Hz, 1H), 1.69 (dt, <i>J</i> = 13.0, 7.1 Hz, 1H).

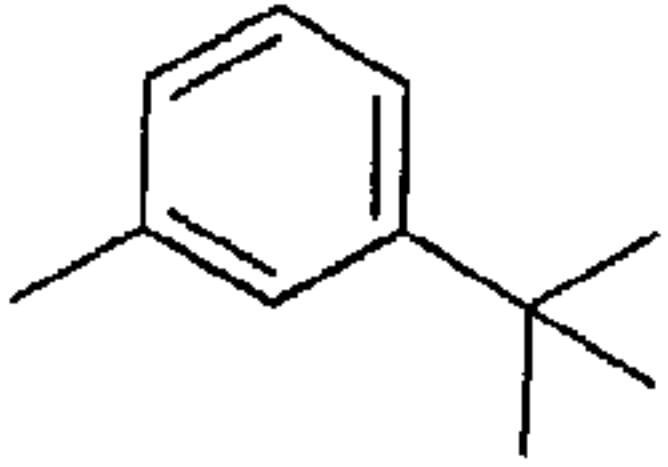
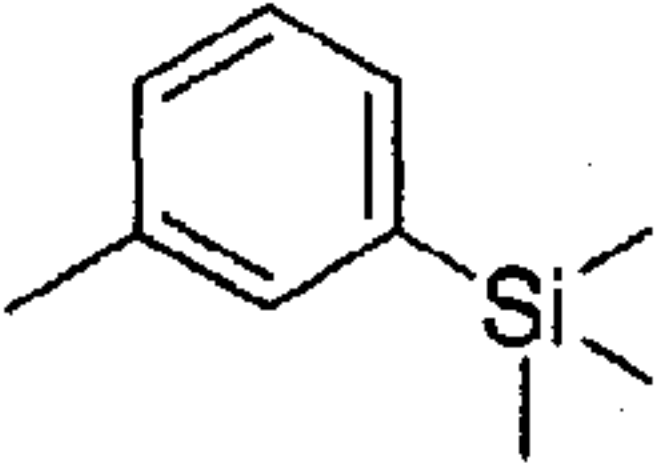
 (mixture of <i>trans</i> isomers)	(1R,2R)-2-(Bromomethyl)cyclopropylbenzene and (1S,2S)-2-(Bromomethyl)cyclopropylbenzene / Int-6	¹H NMR (CDCl₃) δ 6.99 – 7.51 (m, 5H), 3.55 (dd, <i>J</i> = 10.2, 7.4 Hz, 1H), 3.45 (dd, <i>J</i> = 10.2, 7.8 Hz, 1H), 1.90 – 2.04 (m, 1H), 1.63 (m, 1H), 1.25 (m, 1H), 1.06 (dt, <i>J</i> = 9.0, 5.4 Hz, 1H).
	2-(Bromomethyl)-4-methylpyridine / Int-7	¹H NMR (CDCl₃) δ 8.43 (d, <i>J</i> = 5.0 Hz, 1H), 7.26 (s, 1H), 7.03 (d, <i>J</i> = 4.6 Hz, 1H), 4.52 (s, 2H), 2.36 (s, 3H).
	2-(Bromomethyl)-6-chloropyridine / Int-8	¹H NMR (CDCl₃) δ 7.66 (t, <i>J</i> = 7.8 Hz, 1H), 7.38 (dd, <i>J</i> = 7.6, 0.7 Hz, 1H), 7.26 (d, <i>J</i> = 7.7 Hz, 1H), 4.49 (s, 2H).
	1-Bromo-3-(1-bromopropyl)benzene / Int-9	¹H NMR (CDCl₃) δ 7.54 (t, <i>J</i> = 1.8 Hz, 1H), 7.41 (ddd, <i>J</i> = 7.9, 1.9, 1.1 Hz, 1H), 7.34 – 7.29 (m, 1H), 7.21 (t, <i>J</i> = 7.8 Hz, 1H), 4.79 (dd, <i>J</i> = 7.9, 6.9 Hz, 1H), 2.33 – 2.20 (m, 1H), 2.13 (dp, <i>J</i> = 14.3, 7.2 Hz, 1H), 1.00 (t, <i>J</i> = 7.3 Hz, 3H).

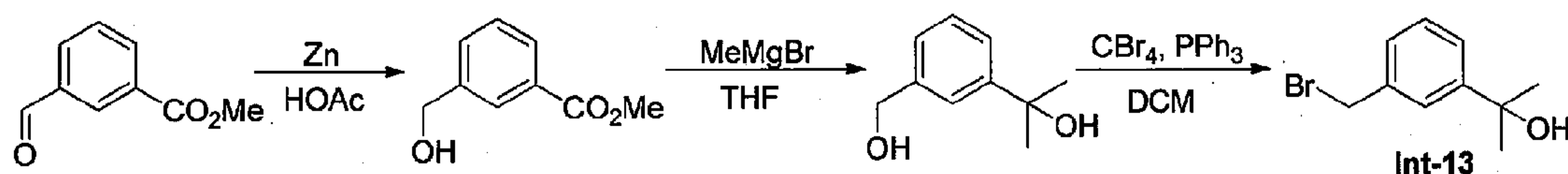
	2-Bromo-6-(1-bromoethyl)pyridine / Int-109	¹ H NMR (CDCl ₃) δ 7.64 – 7.53 (m, 1H), 7.47 (d, <i>J</i> = 7.3 Hz, 1H), 7.42 (d, <i>J</i> = 7.8 Hz, 1H), 5.19 (q, <i>J</i> = 6.9 Hz, 1H), 2.07 (d, <i>J</i> = 6.9 Hz, 3H).
	4-Bromo-2-(bromomethyl)pyridine / Int-110	¹ H NMR (CDCl ₃) δ 8.42 (d, <i>J</i> = 5.3 Hz, 1H), 7.65 (d, <i>J</i> = 1.6 Hz, 1H), 7.42 (dd, <i>J</i> = 5.3, 1.8 Hz, 1H), 4.52 (s, 2H).
	2-(Bromomethyl)-4-chloropyridine / Int-111	¹ H NMR (DMSO) δ 8.54 (d, <i>J</i> = 5.3 Hz, 1H), 7.73 (d, <i>J</i> = 1.6 Hz, 1H), 7.50 (dd, <i>J</i> = 5.4, 2.0 Hz, 1H), 4.69 (s, 2H).

Example 2: 4-(Bromomethyl)-1-fluoro-2-iodobenzene Int-10

Step 1: 4-(Bromomethyl)-1-fluoro-2-iodobenzene Int-10

[00148] A mixture of 4-fluoro-3-iodotoluene (5 g, 21 mmol), NBS (3.77 g, 21 mmol) and azobisisobutyronitrile (35 mg, 0.21 mmol) in CCl₄ (30 mL) was heated to reflux for 4 h. The reaction was cooled to rt and concentrated. The residue was purified on silica gel to obtain 4-(bromomethyl)-1-fluoro-2-iodobenzene (1.7 g, 26%). ¹H NMR (CDCl₃) δ 7.78 - 7.80 (m, 1H), 7.32 - 7.37 (m, 1H), 7.00 - 7.05 (m, 1H), 4.41 (s, 2H).

[00149] The compounds listed in the table below were prepared using similar methods to that described above starting from the listed starting materials:

Starting material	Compound Name / No.	Characterization Data
	1-(Bromomethyl)-3-(tert-butyl)benzene / Int-11	$^1\text{H NMR (CDCl}_3\text{)}$ δ 7.21 - 7.41 (m, 4H), 4.52 (s, 2H), 0.28 (s, 9H).
 Ball, L.T. et al. <i>Chem. Eur. J.</i> 2012, 18, 2931-2937.	(3-(Bromomethyl)phenyl)trimethylsilane / Int-12	$^1\text{H NMR (CDCl}_3\text{)}$ δ 7.30 - 7.53 (m, 4H), 4.52 (s, 2H), 1.33 (s, 9H).

Example 3: 2-[3-(Bromomethyl)phenyl]propan-2-ol Int-13**Step 1: 3-Hydroxymethyl-benzoic acid methyl ester**

[00150] Methyl 3-formylbenzoate (1.64 g, 10.0 mmol) was dissolved in acetic acid (30 mL), and zinc (3.9 g, 60 mmol) was added to this solution at rt. It was then allowed to stir at rt for 2 h. The resulting solid was filtered and poured into 1N HCl (100 mL). The mixture was extracted with DCM (2x). The combined organic layers were then concentrated and the crude product was purified on silica gel to give 3-hydroxymethyl-benzoic acid methyl ester (0.94 g, 57%).

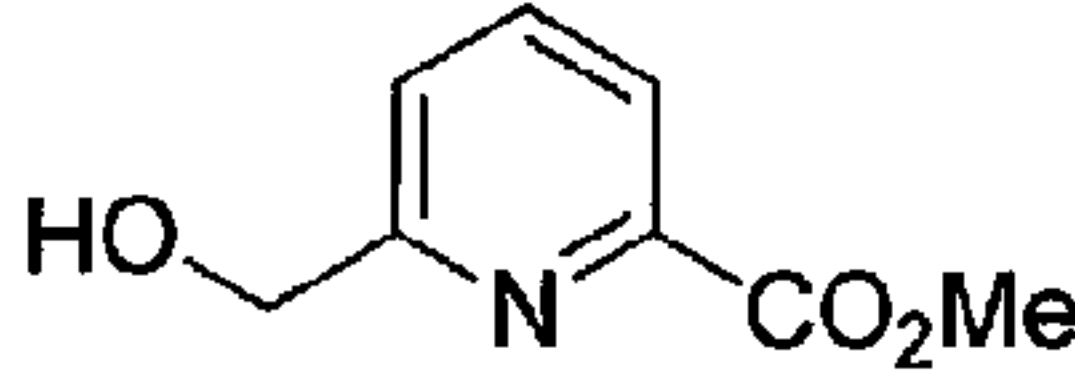
Step 2: 2-[3-(Hydroxymethyl)phenyl]propan-2-ol

[00151] 3-Hydroxymethyl-benzoic acid methyl ester (0.94 g, 5.7 mmol) was dissolved in THF (70 mL) and the solution was cooled to 0°C. Methylmagnesium bromide (3.0 M solution in ether; 9.4 mL, 28 mmol) was added dropwise to this solution. The reaction was allowed to warm to rt and then stirred for 4 h. The reaction was then quenched with a saturated NH_4Cl solution (aq.) and the mixture extracted with DCM (3x). The combined organic layers were dried over MgSO_4 , filtered, and concentrated. The residue was purified on silica gel to give 2-[3-(hydroxymethyl)phenyl]propan-2-ol (0.82 g, 87%).

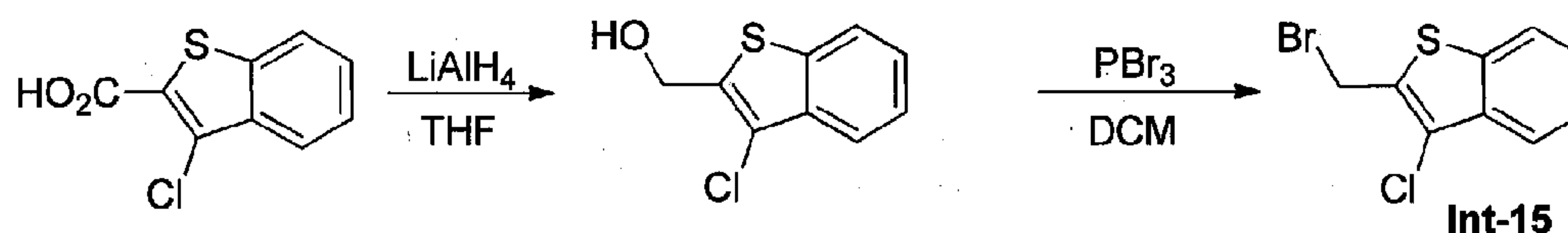
Step 3: 2-[3-(Bromomethyl)phenyl]propan-2-ol Int-13

[00152] 2-[3-(Hydroxymethyl)phenyl]propan-2-ol (0.82 g, 4.9 mmol) and carbon tetrabromide (0.49 g, 1.5 mmol) were dissolved in DCM (30 mL). Triphenylphosphine (0.39 g, 1.5 mmol) was added to this solution at rt and the reaction was allowed to stir for 16 h. The reaction mixture was then concentrated and the crude mixture purified on silica gel to provide 2-[3-(bromomethyl)phenyl]propan-2-ol (0.40 g, 36%). ¹H NMR (CDCl₃) δ 7.56 (s, 1H), 7.35 (m, 2H), 7.31 (dt, *J* = 3.5, 1 Hz, 1H), 4.54 (s, 2H), 1.61 (s, 6H).

[00153] The compound listed in the table below were prepared in an analogous fashion to that described above starting from the listed starting materials in step 2:

Starting material	Compound Name / No.	Characterization Data
	2-[6-(Bromomethyl)pyridin-2-yl]propan-2-ol / Int-14	¹ H NMR (CDCl ₃) δ 7.71 (dd, <i>J</i> = 9.5, 6.0 Hz, 1H), 7.31 (d, <i>J</i> = 10.9 Hz, 1H), 7.22 (d, <i>J</i> = 7.6, 1H), 4.77 (s, 2H), 1.56 (s, 6H).

Example 4: 2-(Bromomethyl)-3-chlorobenzo[b]thiophene Int-15



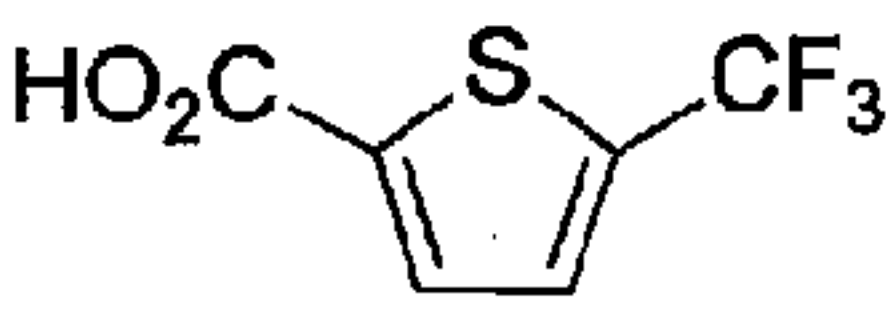
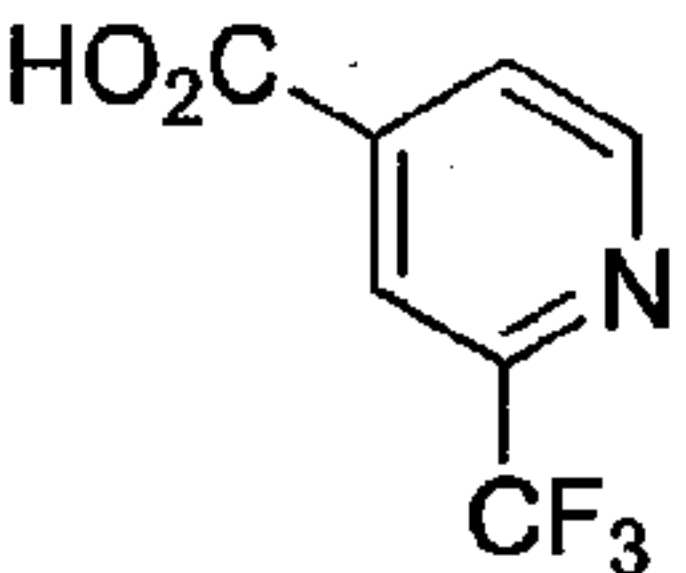
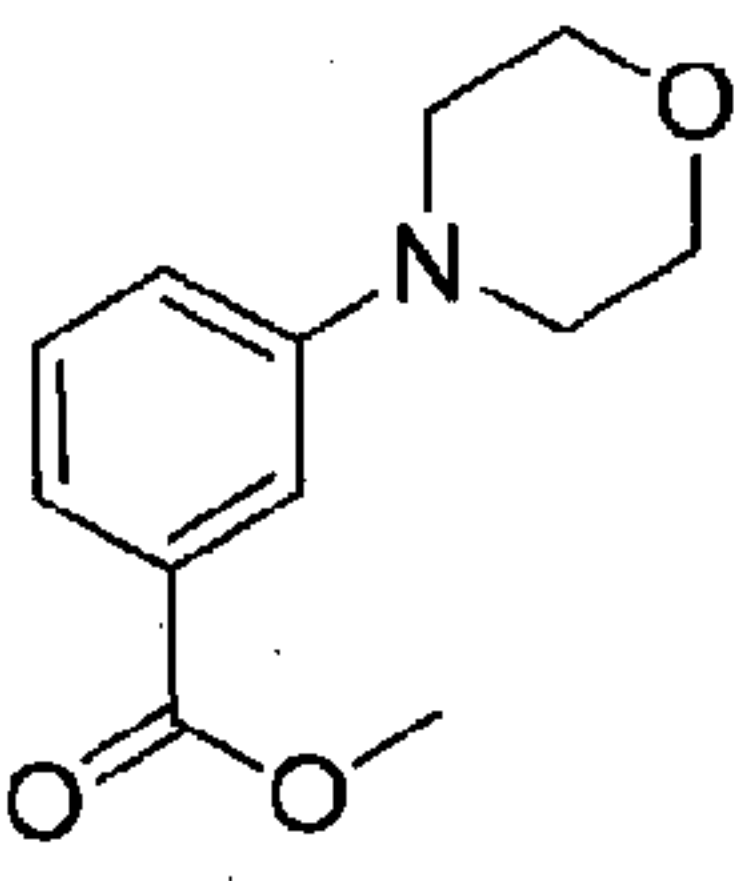
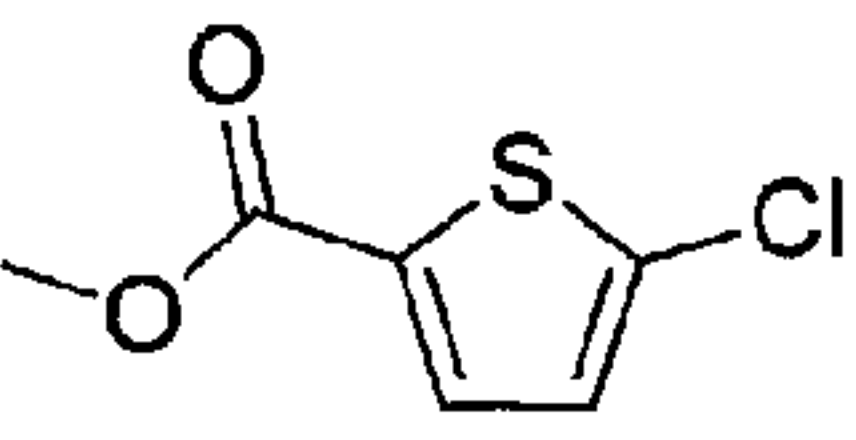
Step 1: (3-Chloro-1-benzothiophen-2-yl)methanol

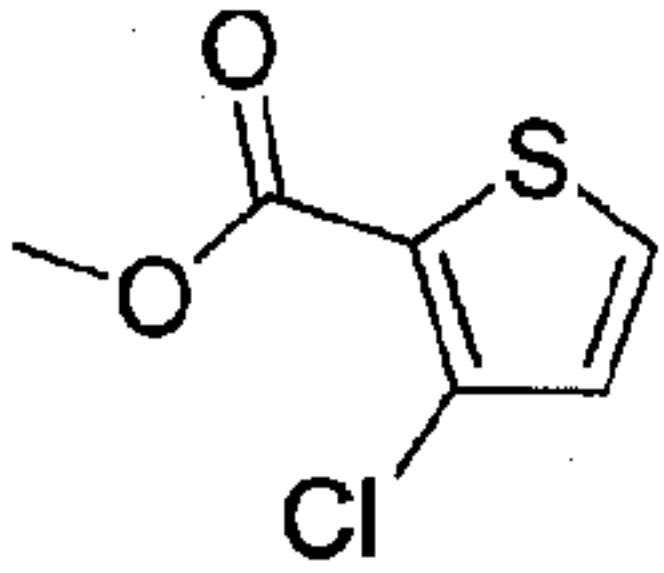
[00154] To a RBF was added 3-chloro-1-benzothiophene-2-carboxylic acid (1.0 g, 4.7 mmol) in THF (15 mL) and cooled to 0°C. Lithium aluminium hydride (2.0 M solution in THF; 2.35 mL, 4.70 mmol) was then added slowly and the resulting mixture was stirred at 0°C for 1h. Additional lithium aluminium hydride (2.0 M solution in THF; 2.0 mL, 4.0 mmol) was then added and the reaction was stirred at rt for 2 h. The reaction was then quenched slowly with water and a saturated solution of Rochelle's salt was added and the mixture stirred for 30 min. The reaction was next extracted with EtOAc (3x). The combined organic layers were washed with water and brine, dried over Na₂SO₄, filtered and concentrated to give (3-chloro-1-benzothiophen-2-yl)methanol (0.53 g, 56%).

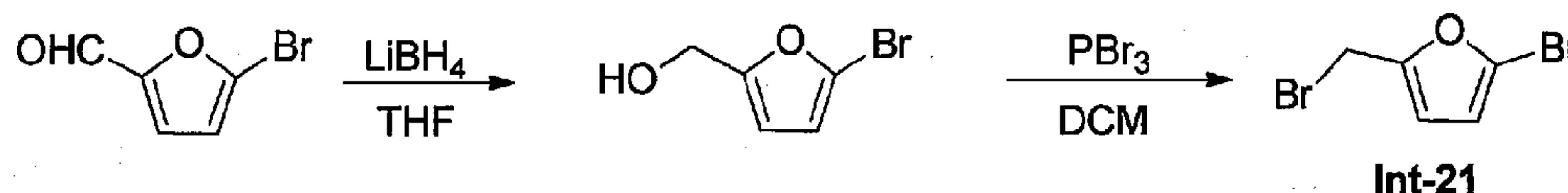
Step 2: 2-(Bromomethyl)-3-chlorobenzo[b]thiophene Int-15

[00155] To a solution of (3-chloro-1-benzothien-2-yl)methanol (0.25 g, 1.26 mmol) and pyridine (0.020 mL, 0.25 mmol) in DCM (5 mL) at -75°C was added phosphorus tribromide (0.13 mL, 1.38 mmol) dropwise. The mixture was stirred at -75°C for 1 h. The mixture was allowed to stand in a freezer (at -25 °C) for 2 h. The mixture was cooled to 0°C and quenched slowly with water (3 mL). The mixture was then partitioned into DCM and water. The separated organic layer was washed successively with water, 1M NaHCO₃, and brine. The solution was then dried over Na₂SO₄, filtered and concentrated to provide 2-(bromomethyl)-3-chlorobenzo[b]thiophene (0.33 g, 100%). The crude product was used in the next step without purification (see Example 88).

[00156] The compounds listed in the table below were prepared using similar methods to that described above starting from the listed starting materials in the first step. Standard bromination conditions employing CBr₄/PPh₃ in DCM were used in some cases in lieu of the described reaction conditions for step 2.

Starting material	Compound Name / No.	Characterization Data
	2-(Bromomethyl)-5-(trifluoromethyl)thiophene / Int-16	¹ H NMR (CDCl ₃) δ 7.30 (s, 1H), 7.10 (s, 1H), 4.70 (s, 2H).
	4-(Bromomethyl)-2-(trifluoromethyl)pyridine / Int-17	¹ H NMR (CDCl ₃) δ 8.72 (d, J = 5.0 Hz, 1H), 7.70 (s, 1H), 7.51 (dd, J = 5.0, 1.2 Hz, 1H), 4.45 (s, 2H).
	4-(3-(Bromomethyl)phenyl)morpholine / Int-18	¹ H NMR (CDCl ₃) δ 7.22 - 7.27 (m, 1H), 6.83 - 6.93 (m, 3H), 4.46 (s, 2H), 3.85 - 3.88 (m, 4H), 3.16 - 3.19 (m, 4H).
	2-(Bromomethyl)-5-chlorothiophene / Int-19	¹ H NMR (CDCl ₃) δ 6.88 (d, J = 4 Hz, 1H), 6.74 (d, J = 4 Hz, 1H), 4.62 (s, 2H), 3.85 - 3.88 (m, 4H), 3.16 - 3.19 (m, 4H).

	2-(Bromomethyl)-3-chlorothiophene / Int-20	¹ H NMR (CDCl ₃) δ 7.31 (d, <i>J</i> = 5.4 Hz, 1H), 6.90 (d, <i>J</i> = 5.4 Hz, 1H), 4.68 (s, 2H).

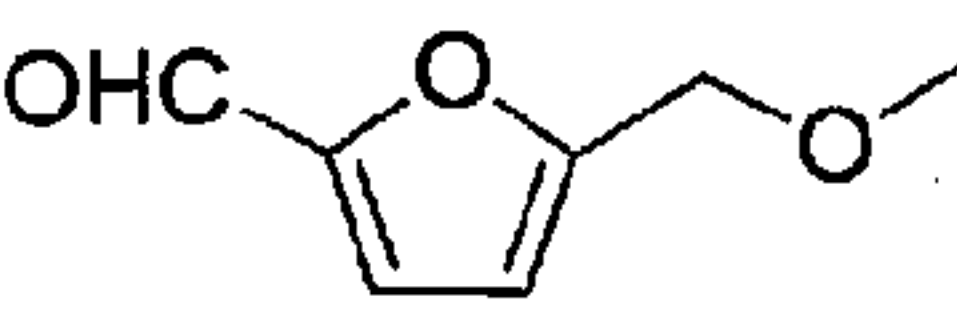
Example 5: 2-Bromo-5-(bromomethyl)furan Int-21**Step 1: 5-Bromo-furan-2-yl-methanol**

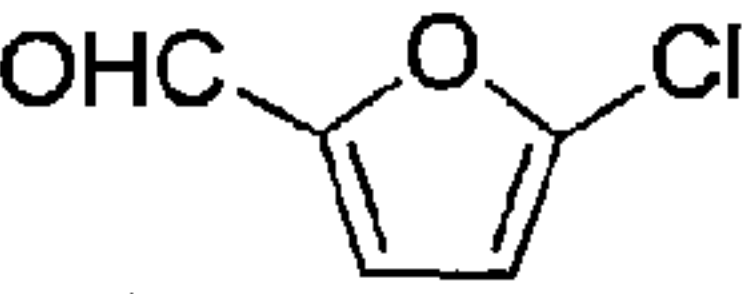
[00157] To a RBF was added lithium borohydride (0.052 g, 2.4 mmol) and THF (18 mL). The resulting reaction mixture was stirred at 0 °C for 5 min then 5-bromo-2-furaldehyde (0.42 g, 2.4 mmol) was added and the mixture was allowed to warm to rt and stir for 16 h. 1 M HCl (aq.) was added carefully to quench the reaction. Solid NaCl was then added until the solution was saturated and the mixture was extracted with EtOAc (2x). The combined organic extracts were washed with brine, dried over MgSO₄, and concentrated to give 5-bromo-furan-2-yl-methanol (0.38 g, 90%). ¹H NMR (CDCl₃) δ 6.16 (s, 1H), 6.15 (s, 1H), 4.44 (s, 2H).

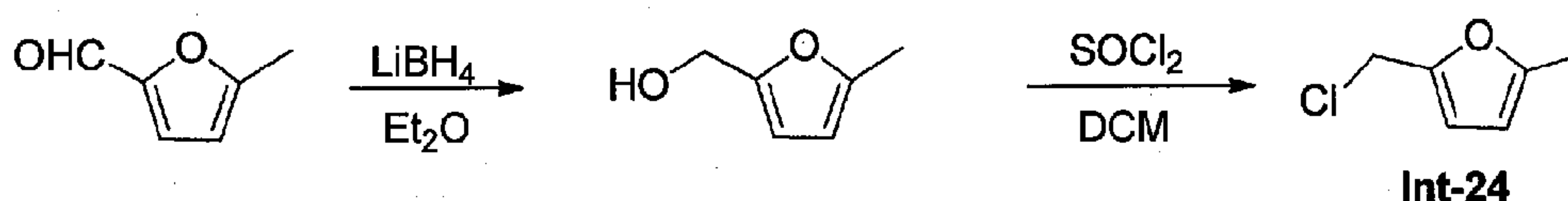
Step 2: 2-Bromo-5-(bromomethyl)furan Int-21

[00158] To a RBF was added 5-bromo-furan-2-yl-methanol (0.38 g, 2.1 mmol), ether (15 mL), and phosphorus tribromide (0.20 mL, 2.2 mmol). The resulting reaction mixture was stirred at rt for 18 h. Water was then added and the mixture was extracted with EtOAc (2x). The combined organic extracts were washed with brine, dried over MgSO₄, and concentrated to give 2-bromo-5-(bromomethyl)furan (0.45 g, 87%). ¹H NMR (CDCl₃) δ 6.28 (d, *J* = 3.3 Hz, 1H), 6.19 (d, *J* = 3.3 Hz, 1H), 4.37 (s, 2H).

[00159] The compounds listed in the table below were prepared using similar methods to that described above starting from the listed starting materials.

Starting material	Compound Name / No.	Characterization Data
	2-(Bromomethyl)-5-(methoxymethyl)furan / Int-22	¹ H NMR (CDCl ₃) δ 6.37 (d, <i>J</i> = 3.3 Hz, 1H), 6.30 (d, <i>J</i> = 3.2 Hz, 1H), 4.51 (s, 2H), 4.41 (s, 2H), 3.44 –

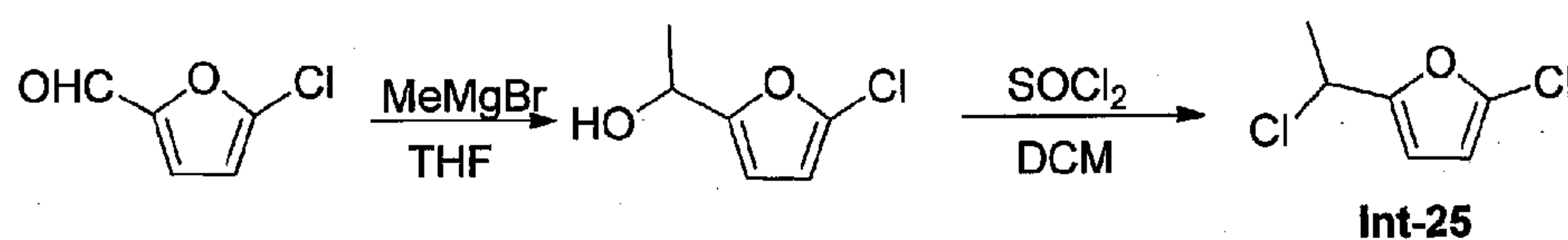
		3.37 (s, 3H).
	2-(Bromomethyl)-5-chlorofuran / Int-23	$^1\text{H NMR (CDCl}_3\text{)}$ δ 6.40 (d, $J = 3.3$ Hz, 1H), 6.15 (d, $J = 3.3$ Hz, 1H), 4.46 (s, 2H).

Example 6: 2-(Chloromethyl)-5-methylfuran Int-24**Step 1: 5-Methyl-2-furanmethanol**

[00160] To a RBF was added lithium borohydride (0.10 g, 4.5 mmol) and diethyl ether (10 mL). The resulting reaction mixture was stirred at 0°C for 5 min then 5-methyl-2-furancarboxaldehyde (0.50 g, 4.5 mmol) was added and the mixture was allowed to warm to rt and stir for 16 h. 1 M HCl (aq.) was added carefully to quench the reaction. Solid NaCl was then added until the solution was saturated and the mixture was extracted with ether (2x). The combined organic extracts were washed with brine, dried over MgSO_4 , and concentrated to give 5-methyl-2-furanmethanol (0.38 g, 90%). $^1\text{H NMR (CDCl}_3\text{)}$ δ 6.18 (d, $J = 3.0$ Hz, 1H), 5.93 (d, $J = 2.9$ Hz, 1H), 4.56 (s, 2H), 2.30 (s, 3H).

Step 2: 2-(Chloromethyl)-5-methylfuran Int-24

[00161] To a RBF was added 5-methyl-2-furanmethanol (0.13 g, 1.1 mmol), DCM (15 mL), and TEA (0.16 mL, 1.1 mmol). The resulting reaction mixture was cooled in an ice bath and thionyl chloride (0.10 mL, 1.4 mmol) was added dropwise. The mixture was allowed to stir at 0°C for 45 min whereupon water was added. The organic layer was separated, dried over MgSO_4 , filtered and concentrated to give 2-(chloromethyl)-5-methylfuran (0.15 g, 100%). $^1\text{H NMR (CDCl}_3\text{)}$ δ 6.31 – 6.25 (m, 1H), 5.95 (m, 1H), 4.59 (s, 2H), 2.33 (s, 3H).

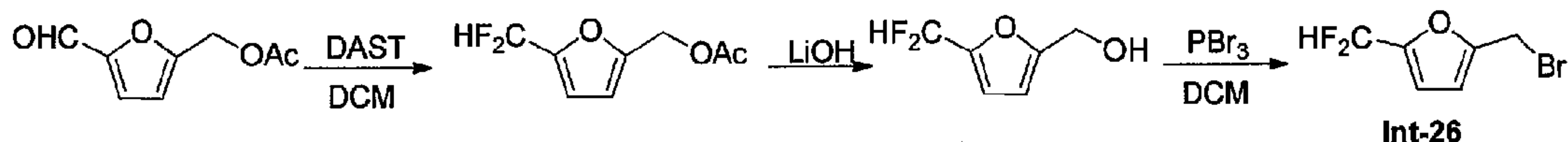
Example 7: 2-Chloro-5-(1-chloroethyl)furan Int-25**Step 1: 1-(5-Chloro-2-furyl)ethanol**

[00162] To a RBF was added 5-chloro-2-furaldehyde (0.74 g, 5.7 mmol) and THF (35 mL). The resulting reaction mixture was cooled to 0°C and methylmagnesium bromide (3.0 M solution in ether; 3.5 mL, 10.50 mmol) was added dropwise. The mixture was then stirred at 0°C for 25 min and the reaction was quenched by addition of a saturated solution of NH₄Cl. The mixture was extracted with EtOAc (2x). The combined organic extracts were washed with brine, dried over MgSO₄, and concentrated to give 1-(5-chloro-2-furyl)ethanol (0.82 g, 99%). ¹H NMR (CDCl₃) δ 6.13 (dd, *J* = 3.3, 0.7 Hz, 1H), 6.01 (d, *J* = 3.3 Hz, 1H), 4.71 (q, *J* = 6.4 Hz, 1H), 2.56 (s, 1H), 1.42 (d, *J* = 6.6 Hz, 3H).

Step 2: 2-Chloro-5-(1-chloroethyl)furan Int-25

[00163] To a solution of 1-(5-chloro-2-furyl)ethanol (0.49 g, 3.3 mmol) in DCM (30 mL) at 0°C was added thionyl chloride (0.49 mL, 6.7 mmol) dropwise. The mixture was stirred for 1 h at 0°C then at rt overnight. Water (20 ml) and a saturated solution of NaHCO₃ (30 ml) were added. The organic layer was separated, dried over MgSO₄, filtered and concentrated to give 2-chloro-5-(1-chloroethyl)furan (0.55 g, 100%). ¹H NMR (CDCl₃) δ 6.33 (dd, *J* = 3.3, 0.7 Hz, 1H), 6.14 (d, *J* = 3.3 Hz, 1H), 5.14 – 5.05 (m, 1H), 1.87 (d, *J* = 6.9 Hz, 3H).

Example 8: 2-(Bromomethyl)-5-(difluoromethyl)furan Int-26



Step 1: [5-(Difluoromethyl)-2-furyl]methyl acetate

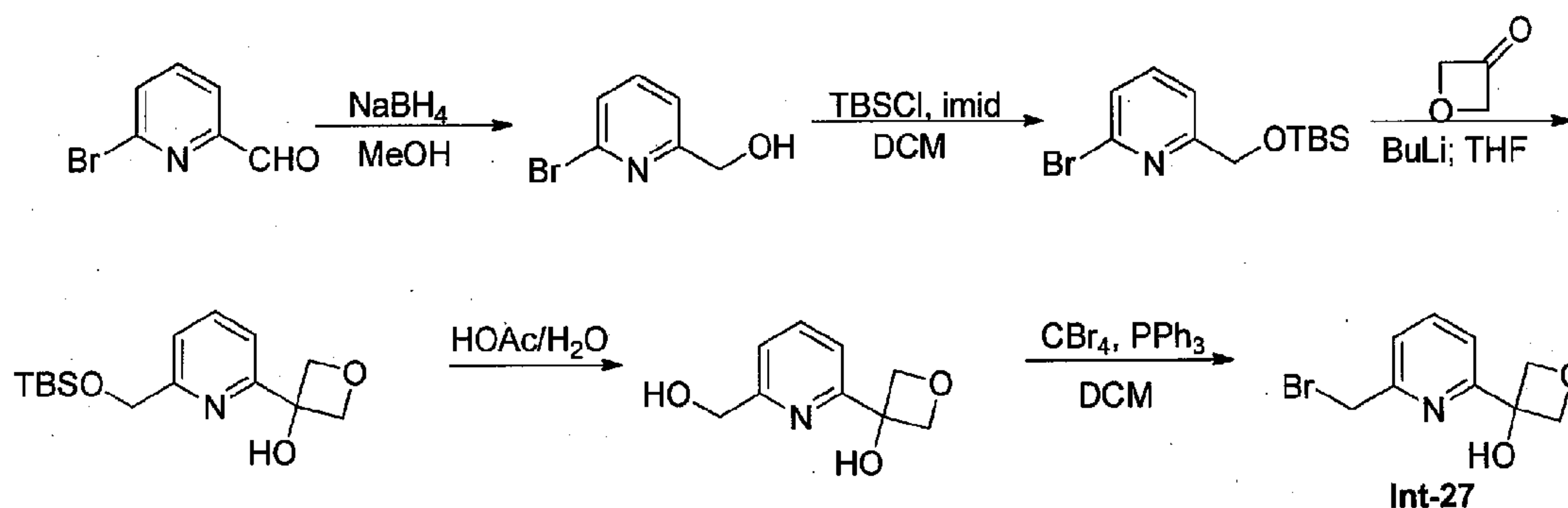
[00164] 5-Acetoxy-2-furaldehyde (3.0 g, 18 mmol) was dissolved in DCM (50 mL) and diethylaminosulfur trifluoride (DAST) (4.3 g, 27 mmol) was added to the solution at 0 °C. The reaction mixture was then allowed to warm to rt and stir for 16 h. The mixture was then quenched with water and extracted with DCM (50 mL). The organic layer was concentrated and the resulting residue was purified on silica gel to give [5-(difluoromethyl)-2-furyl]methyl acetate (2.2 g, 66%).

Step 2: [5-(Difluoromethyl)-2-furyl]methanol

[00165] [5-(Difluoromethyl)-2-furyl]methyl acetate (2.2 g, 11.8 mmol) was dissolved in methanol (30 mL) and a solution of lithium hydroxide (0.85 g, 35 mmol) in water (10 mL) was added at rt. The resulting mixture was stirred at rt for 4 h. The mixture was concentrated to remove the methanol and the remaining aqueous mixture was neutralized by addition of 1N HCl (50 mL). The mixture was extracted with DCM (3x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to give [5-(difluoromethyl)-2-furyl]methanol (1.1 g, 61%).

Step 3: 2-(Bromomethyl)-5-(difluoromethyl)furan Int-26

[00166] [5-(Difluoromethyl)-2-furyl]methanol (1.1 g, 7.2 mmol) and phosphorus tribromide (1.0 mL, 10.8 mmol) were dissolved in DCM (30 mL) and the reaction was allowed to stir for 16 h. The reaction mixture was then concentrated and the crude mixture purified on silica gel to yield 2-(bromomethyl)-5-(difluoromethyl)furan (0.98 g, 65%). ¹H NMR (CDCl₃) δ 6.65 - 6.62 (m, 1H), 6.45 - 6.50 (m, 2H), 4.50 (s, 2H).

Example 9: 3-[6-(Bromomethyl)pyridin-2-yl]oxetan-3-ol Int-27**Step 1: 6-Bromo-2-(hydroxymethyl)pyridine**

[00167] 6-Bromo-2-pyridine carboxaldehyde (2.8 g, 15 mmol) was dissolved in methanol (30 mL) and cooled to 0 °C. Sodium tetrahydroborate (0.87 g, 23 mmol) was added portionwise over a period of 5 min. It was allowed to stir at 0°C for 1 h. The solution was then poured into water (80 mL), and the mixture was extracted with DCM (3x). The combined organic layers were washed with water and then concentrated to yield 6-bromo-2-(hydroxymethyl)pyridine (2.5 g, 88%).

Step 2: 2-Bromo-6-([*tert*-butyl(dimethyl)silyl]oxy)methyl)pyridine

[00168] 6-Bromo-2-(hydroxymethyl)pyridine (2.5 g, 13.2 mmol) and *tert*-butyldimethylsilyl chloride (2.4 g, 16 mmol) were dissolved in DCM (80 mL). 1H-Imidazole (1.2 g, 17 mmol) was then added to this solution at rt and it was allowed to stir for 4 h. The reaction was then washed with water and the organic layer was concentrated and purified on silica gel to afford 2-bromo-6-([*tert*-butyl(dimethyl)silyl]oxy)methyl)pyridine (2.2 g, 55%) as a clear liquid.

Step 3: 3-[6-([*tert*-Butyl(dimethyl)silyl]oxy)methyl]pyridin-2-yl]oxetan-3-ol

[00169] 2-Bromo-6-([*tert*-butyl(dimethyl)silyl]oxy)methyl)pyridine (2.2 g, 7.2 mmol) was dissolved in THF (50 mL) and then cooled to -78°C. *n*-Butyllithium (2.0 M solution in THF; 4.7 mL, 9.4 mmol) was then injected into the solution dropwise. The resulting deep brown solution was stirred at -78°C for

30 min. A solution of 3-oxetanone (0.54 g, 7.6 mmol) in THF (5 mL) was next added to the reaction and the resulting light yellow solution was stirred at -78°C for 2 h. The reaction was then quenched by addition of a saturated NH₄Cl solution (aq.), which was then extracted with EtOAc (2x). The combined organic layers were concentrated and purified on silica gel to provide 3-[6-([*tert*-butyl(dimethyl)silyl]oxy)methyl]pyridin-2-yl]oxetan-3-ol (1.6 g, 75%).

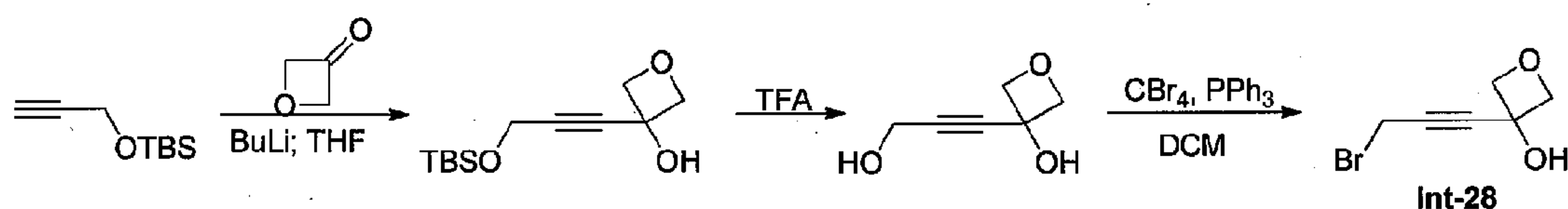
Step 4: 3-[6-(Hydroxymethyl)pyridin-2-yl]oxetan-3-ol

[00170] 3-[6-([*tert*-Butyl(dimethyl)silyl]oxy)methyl]pyridin-2-yl]oxetan-3-ol (1.6 g, 5.4 mmol) was dissolved into a solution of acetic acid (30 mL) and water (10 mL). The reaction was then stirred at 35°C for 16 h. The mixture was concentrated almost to dryness and then a saturated solution of NaHCO₃ was added to basify (pH > 8). The mixture was extracted with EtOAc (5x). The combined organic layers were dried, filtered and concentrated. The crude product was purified on silica gel to give 3-[6-(hydroxymethyl)pyridin-2-yl]oxetan-3-ol (0.64 g, 65%).

Step 5: 3-[6-(Bromomethyl)pyridin-2-yl]oxetan-3-ol Int-27

[00171] 3-[6-(Hydroxymethyl)pyridin-2-yl]oxetan-3-ol (0.64 g, 3.5 mmol) and carbon tetrabromide (1.4 g, 4.2 mmol) were dissolved in DCM (30 mL) at rt. Triphenylphosphine (1.1 g, 4.2 mmol) was added and the solution stirred for 16 h. The reaction mixture was concentrated and the residue purified on silica gel to yield 3-[6-(bromomethyl)pyridin-2-yl]oxetan-3-ol (0.68 g, 80%). ¹H NMR (CDCl₃) δ 7.87 – 7.99 (m, 2H), 7.45 – 7.51 (m, 1H), 5.90 (s, 1H), 5.03 – 5.22 (d, 2H), 4.68 – 4.84 (d, 2H), 4.57 (s, 2H).

Example 10: 3-(3-Bromoprop-1-yn-1-yl)oxetan-3-ol Int-28



Step 1: 3-(3-([*tert*-Butyl(dimethyl)silyl]oxy)prop-1-yn-1-yl)oxetan-3-ol

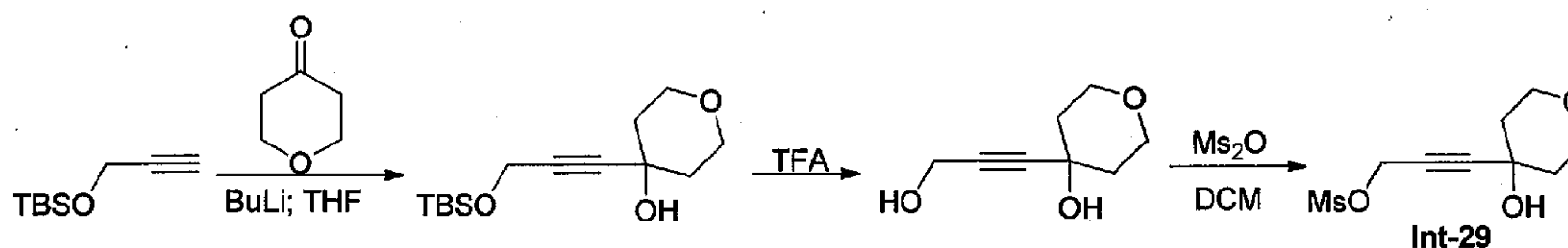
[00172] *tert*-Butyldimethyl(2-propynyloxy)silane (2.0 g, 11.7 mmol) was dissolved in THF (40 mL) and cooled to -78 °C. *n*-Butyllithium (2.5 M solution in hexanes; 5.15 mL, 12.9 mmol) was added dropwise and then the solution was warmed to -30°C for 20 min. The reaction was cooled again to -78 °C and 3-oxetanone (0.84 g, 11.7 mmol) was added. After stirring at -78 °C for 30 min, it was allowed to warm to rt and stir for 30 min. The reaction mixture was poured into a saturated aqueous solution of NH₄Cl and then extracted with EtOAc (2x). The combined organic layers were concentrated and purified on silica gel to afford 3-(3-([*tert*-butyl(dimethyl)silyl]oxy)prop-1-yn-1-yl)oxetan-3-ol (2.3 g, 81%).

Step 2: 3-(3-Hydroxyprop-1-yn-1-yl)oxetan-3-ol

[00173] 3-(3-{{*tert*-butyl(dimethyl)silyl}oxy}prop-1-yn-1-yl)oxetan-3-ol (2.3 g, 9.5 mmol) was dissolved in DCM (50 mL) followed by addition of a solution of water (0.86 mL, 48 mmol) and TFA (5.4 g, 48 mmol). The mixture was stirred at rt for 4 h. The reaction mixture was concentrated and purified on silica gel to give 3-(3-hydroxyprop-1-yn-1-yl)oxetan-3-ol (0.98 g, 81%).

Step 3: 3-(3-Bromoprop-1-yn-1-yl)oxetan-3-ol Int-28

[00174] 3-(3-Hydroxyprop-1-yn-1-yl)oxetan-3-ol (0.98 g, 7.7 mmol) and carbon tetrabromide (2.8 g, 8.4 mmol) were dissolved in DCM (30 mL) at rt. Triphenylphosphine (2.3 g, 8.8 mmol) was added and the solution stirred for 16 h. The reaction mixture was concentrated and the residue purified on silica gel to 3-(3-bromoprop-1-yn-1-yl)oxetan-3-ol (1.05 g, 72%). ¹H NMR (CDCl₃) δ 4.85 (d, *J* = 6.7, 0.9 Hz, 2H), 4.76 – 4.67 (d, 2H), 3.99 (s, 2H).

Example 11: 3-(4-Hydroxytetrahydro-2H-pyran-4-yl)prop-2-yn-1-yl methanesulfonate Int-29**Step 1: 4-(3-{{*tert*-Butyl(dimethyl)silyl}oxy}prop-1-yn-1-yl)tetrahydro-2H-pyran-4-ol**

[00175] *tert*-Butyldimethyl(2-propynyloxy)silane (1.6 g, 9.3 mmol) was dissolved in THF (40 mL) and cooled to -78 °C. *n*-Butyllithium (2.5 M solution in hexanes; 4.1 mL, 10.2 mmol) was added dropwise and then the solution was warmed to -30 °C for 20 min. The reaction was cooled again to -78 °C and tetrahydro-4H-pyran-4-one (0.93 g, 9.3 mmol) was added. After stirring at -78 °C for 30 min, it was allowed to warm to rt and stir for 30 min. The reaction mixture was poured into a saturated aqueous solution of NH₄Cl and then extracted with EtOAc (2x). The combined organic layers were concentrated and purified on silica gel to afford 4-(3-{{*tert*-butyl(dimethyl)silyl}oxy}prop-1-yn-1-yl)tetrahydro-2H-pyran-4-ol (1.9 g, 75%).

Step 2: 4-(3-Hydroxyprop-1-yn-1-yl)tetrahydro-2H-pyran-4-ol

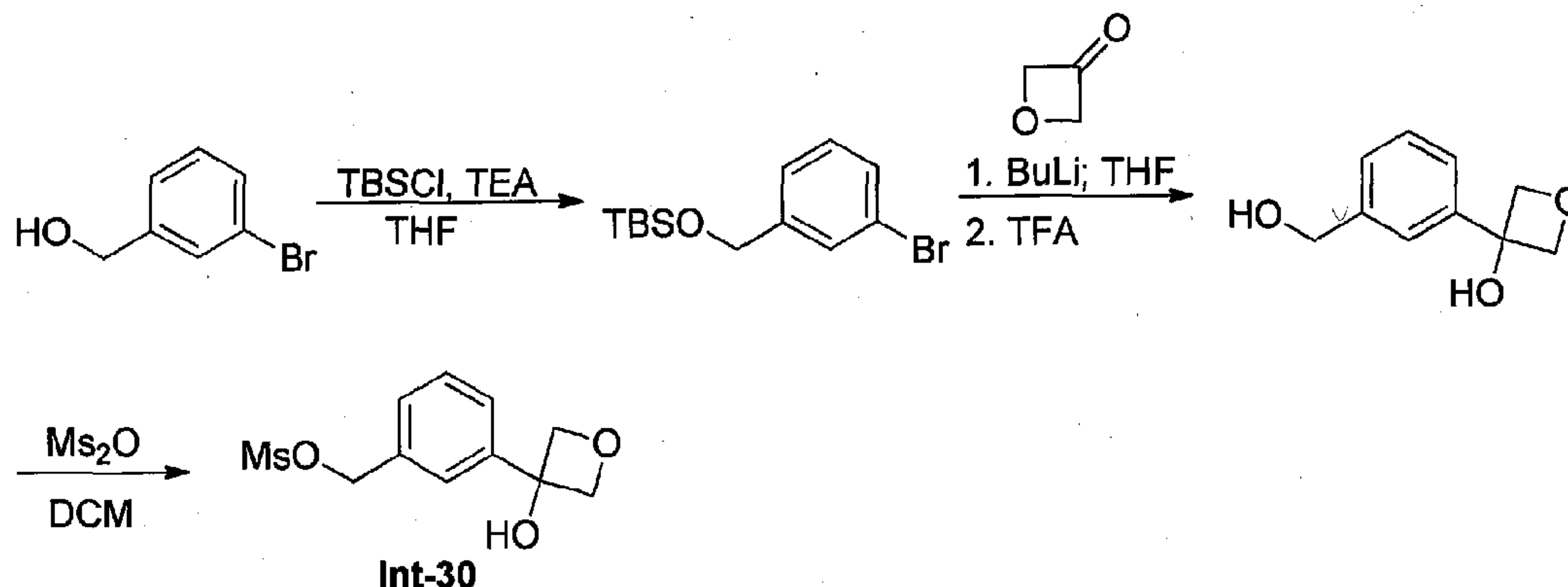
[00176] 4-(3-{{*tert*-butyl(dimethyl)silyl}oxy}prop-1-yn-1-yl)tetrahydro-2H-pyran-4-ol (1.9 g, 7.0 mmol) was dissolved in a solution of water (2 mL) and TFA (18 mL). The mixture was stirred at rt for 4 h then concentrated. The residue was dissolved in water (30 mL) and the mixture washed with DCM (2x).

The aqueous layer was collected and concentrated to yield 4-(3-hydroxyprop-1-yn-1-yl)tetrahydro-2H-pyran-4-ol (0.56 g, 51%).

Step 3: 3-(4-Hydroxytetrahydro-2H-pyran-4-yl)prop-2-yn-1-yl methanesulfonate Int-29

[00177] 4-(3-Hydroxyprop-1-yn-1-yl)tetrahydro-2H-pyran-4-ol (0.56 g, 3.6 mmol) was dissolved in THF (20 mL) and DIEA (1.4 g, 11 mmol) was added to this solution. The solution was cooled to 0 °C and methanesulfonic anhydride (0.81 g, 4.7 mmol) was added. It was then allowed to warm to rt and stir for 2 h. The solution was concentrated and the crude residue purified on silical gel to afford 3-(4-hydroxytetrahydro-2H-pyran-4-yl)prop-2-yn-1-yl methanesulfonate (0.52 g, 62%). ¹H NMR (CDCl₃) δ 4.85 (s, 2H), 3.84 (m, 2H), 3.58 (m, 2H), 3.05 (s, 3H), 1.92 – 1.82 (m, 2H), 1.76 (m, 2H).

Example 12: 3-(3-Hydroxyoxetan-3-yl)benzyl methanesulfonate Int-30



Step 1: [(3-Bromobenzyl)oxy](*tert*-butyl)dimethylsilane

[00178] To a solution of 3-bromobenzyl alcohol (1.9 g, 10.0 mmol) in THF (30 mL) was added *tert*-butyldimethylsilyl chloride (1.96 g, 13.0 mmol) and TEA (2.0 g, 20.0 mmol). The solution was stirred for 16 h at rt. The reaction was then quenched by addition of water (5 mL). EtOAc (50 mL) was added and this solution was washed with water (3x10mL). The organic layer was dried over MgSO₄, filtered, and concentrated to afford [(3-bromobenzyl)oxy](*tert*-butyl)dimethylsilane (3.5g, 100%).

Step 2: 3-[3-(Hydroxymethyl)phenyl]oxetan-3-ol

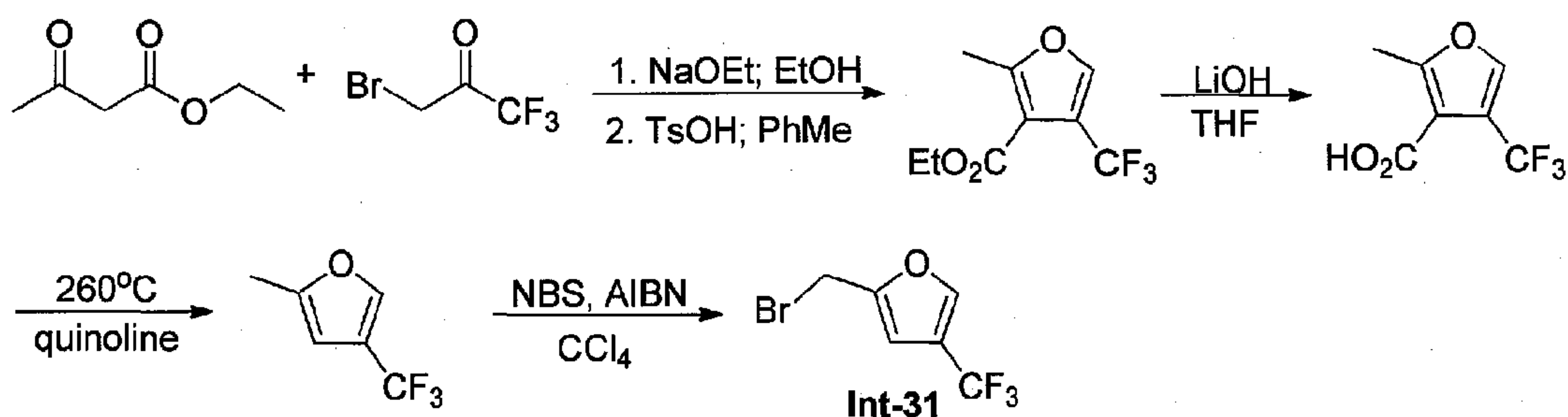
[00179] [(3-Bromobenzyl)oxy](*tert*-butyl)dimethylsilane (3.5 g, 11.6 mmol) was dissolved in THF (60 mL) and cooled to -78 °C. *n*-Butyllithium (2.5 M solution in hexanes; 7.6 mL, 15.1 mmol) was added dropwise and then the solution was warmed to -30 °C for 20 min. The reaction was cooled again to -78 °C and 3-oxetanone (0.84 g, 11.7 mmol) was added. After stirring at -78 °C for 30 min, it was allowed to warm to rt and stir for 30 min. The reaction mixture was poured into a saturated aqueous solution of

NH₄Cl and then extracted with EtOAc (2x). The combined organic layers were concentrated and purified on silica gel to give the unprotected alcohol, which was then dissolved in a solution of water (4 mL) and TFA (16 mL). The mixture was stirred at 0 °C for 2 h. The reaction mixture was concentrated and purified on silica gel to give 3-[3-(hydroxymethyl)phenyl]oxetan-3-ol (0.53 g, 25%).

Step 3: 3-(3-Hydroxyoxetan-3-yl)benzyl methanesulfonate Int-30

[00180] 3-[3-(Hydroxymethyl)phenyl]oxetan-3-ol (0.53 g, 2.9 mmol) was dissolved in THF (20 mL) and DIEA (1.4 g, 11 mmol) was added to this solution. The solution was cooled to 0 °C and methanesulfonic anhydride (0.67 g, 3.8 mmol) was added. It was then allowed to warm to rt and stir for 2 h. The solution was concentrated and the crude residue purified on silica gel to afford 3-(4-hydroxytetrahydro-2H-pyran-4-yl)prop-2-yn-1-yl methanesulfonate (0.33 g, 44%). ¹H NMR (CDCl₃) δ 7.70 (d, *J* = 7.0 Hz, 2H), 7.49 (s, 1H), 7.36 – 7.47 (m, 1H), 5.29 (s, 2H), 4.92 (m, 4H), 2.98 (s, 3H).

Example 13: 2-(Bromomethyl)-4-(trifluoromethyl)furan Int-31



Step 1: Ethyl 2-methyl-4-(trifluoromethyl)-3-furoate

[00181] 3-Bromo-1,1,1-trifluoroacetone (8.7 g, 46 mmol) was dissolved into a solution of sodium ethoxide (6.2 g, 91 mmol) in EtOH (100 mL) and then cooled to 0 °C. 3-Oxobutanoic acid ethyl ester (5.9 g, 46 mmol) was added to this solution while keeping the temperature under 10 °C. The reaction was then allowed to warm to rt and stir for 16 h. The reaction mixture was quenched by addition of a saturated aqueous solution of NH₄Cl (50 mL) and then extracted with DCM (3x). The combined organic layers were concentrated and the remaining residue dissolved in toluene (100 mL), followed by the addition of toluenesulfonic acid (1.6 g, 9.1 mmol). This mixture was heated to reflux for 4 h. The mixture was then allowed to cool to rt and washed with water (10 mL). The organic layer was concentrated and the crude product was purified on silica gel to give ethyl 2-methyl-4-(trifluoromethyl)-3-furoate (3.2 g, 31%).

Step 2: 2-Methyl-4-(trifluoromethyl)furan-3-carboxylic acid

[00182] Ethyl 2-methyl-4-(trifluoromethyl)-3-furoate (3.2 g, 14 mmol) was dissolved in THF (30 mL) then added to a solution of lithium hydroxide (1.0 g, 43 mmol) in water (20 mL). It was then stirred at rt for 16 h. 1N HCl (60 mL) was then added and it was extracted with EtOAc (3x). The combined organic layers were concentrated and purified on silica gel to yield 2-methyl-4-(trifluoromethyl)furan-3-carboxylic acid (1.0 g, 37%).

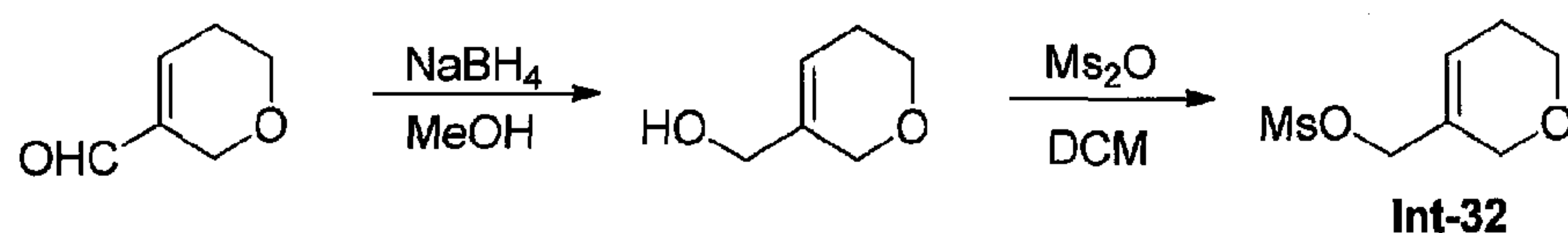
Step 3: 2-Methyl-4-(trifluoromethyl)furan

[00183] 2-Methyl-4-(trifluoromethyl)furan-3-carboxylic acid (1.0 g, 5.2 mmol) was dissolved in quinoline (15 mL) and copper(II) sulfate (0.25 g, 1.5 mmol) was added. The reaction flask was fitted with a distillation apparatus and the reaction heated at 250 °C with stirring. 2-methyl-4-(trifluoromethyl)furan (0.34 g, 44%) was collected as a liquid (bp: 72- 74 °C).

Step 4: 2-(Bromomethyl)-4-(trifluoromethyl)furan Int-31

[00184] 2-Methyl-4-(trifluoromethyl)furan (0.34 g, 2.3 mmol) and 2,2'-azo-bis-isobutyronitrile (0.019 g, 0.11 mmol) were dissolved in carbon tetrachloride (20 mL). NBS (0.40 g, 2.3 mmol) was added and the solution was stirred at rt for 16 h. The reaction mixture was concentrated and the crude product was purified on silica gel to give 2-(bromomethyl)-4-(trifluoromethyl) (0.27 g, 52 %). ¹H NMR (CDCl₃) δ 7.71 (s, 1H), 6.50 (s, 1H), 4.35 (s, 2H).

Example 14: 5,6-Dihydro-2H-pyran-3-ylmethanol Int-32



Step 1: 5,6-Dihydro-2H-pyran-3-ylmethanol

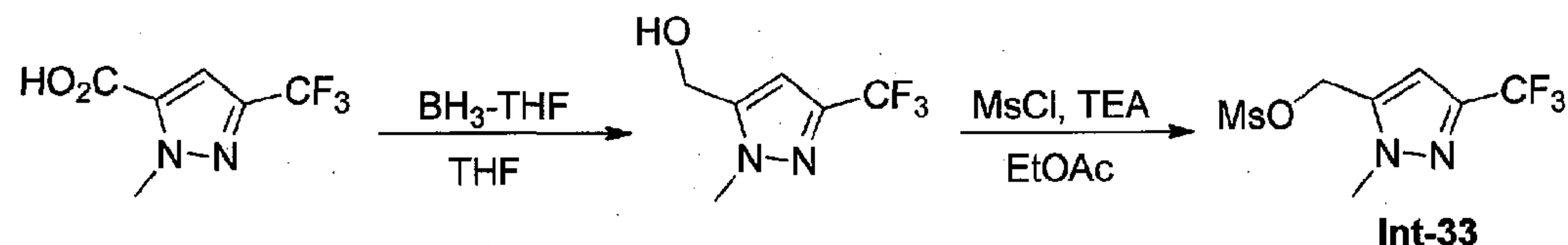
[00185] 5,6-Dihydro-2h-pyran-3-carbaldehyde (0.49 g, 4.4 mmol) was dissolved in methanol (20 mL) and cooled to 0 °C. Sodium tetrahydroborate (0.33 g, 8.7 mmol) was added portionwise over a period of 15 min. It was allowed to stir at 0 °C for 2 h. The solution was then poured into water (30 mL), and the mixture was extracted with DCM (3x). The combined organic layers were washed with water and then concentrated to yield 5,6-dihydro-2H-pyran-3-ylmethanol (0.27 g, 55%).

Step 2: 5,6-Dihydro-2H-pyran-3-ylmethyl methanesulfonate Int-32

[00186] 5,6-Dihydro-2H-pyran-3-ylmethanol (0.27 g, 2.4 mmol) was dissolved in DCM (20 mL) and DIEA (0.9 g, 7.1 mmol) was added to this solution. The solution was cooled to 0 °C and methanesulfonic

anhydride (0.62 g, 3.6 mmol) was added. It was then allowed to warm to rt and stir for 2 h. The reaction was diluted with DCM (100 mL) and washed with water (2x). The organic layer was dried over MgSO_4 , filtered, and concentrated to afford 5,6-dihydro-2H-pyran-3-ylmethyl methanesulfonate (0.40 g, 89%). ^1H NMR (CDCl_3) δ 6.10 (s, 1H), 4.65 (s, 2H), 4.20 (s, 2H), 3.75 (m, 2H), 3.0 (s, 3H), 2.25 (m, 2H).

Example 15: [1-Methyl-3-(trifluoromethyl)-1H-pyrazol-5-yl]methyl methanesulfonate Int-33



Step 1: 1-Methyl-3-(trifluoromethyl)-1H-pyrazol-5-yl]methanol

[00187] Borane (1M in THF; 9.0 mL, 9.0 mmol) was added to a solution of 1-methyl-5-(trifluoromethyl)pyrazole-3-carboxylic acid (350 mg, 1.8 mmol) in THF (10 mL) at rt. The mixture was stirred for 3 hours. It was then cooled to 0 °C and quenched with water. The mixture was extracted with EtOAc (3x) and the combined organic layers were washed with brine, dried over Na_2SO_4 , filtered, and concentrated. The residue was purified on silica gel to afford [1-methyl-3-(trifluoromethyl)-1H-pyrazol-5-yl]methanol (188 mg; 58%) as a colorless oil. LCMS (FA): m/z = 181 (M+H).

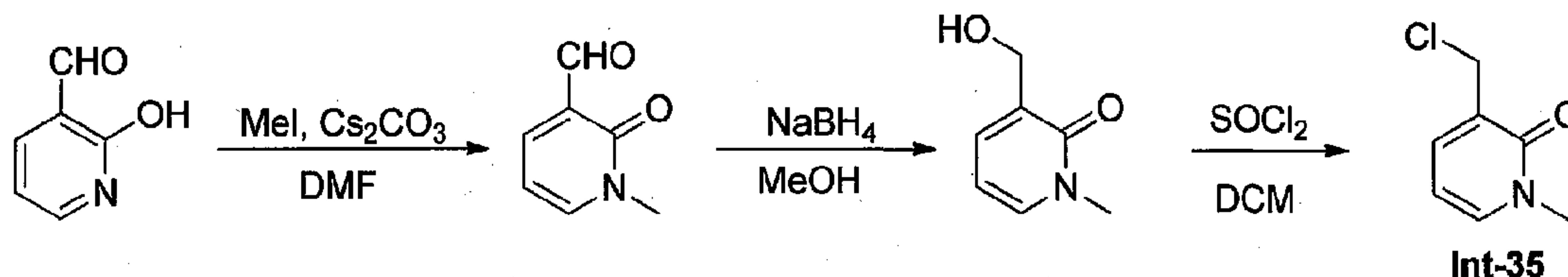
Step 2: [1-Methyl-3-(trifluoromethyl)-1H-pyrazol-5-yl]methyl methanesulfonate Int-33

[00188] To a solution of [1-methyl-3-(trifluoromethyl)-1H-pyrazol-5-yl]methanol (79 mg, 0.44 mmol) and methanesulfonyl chloride (0.037 mL, 0.47 mmol) in EtOAc (5 mL) was added TEA (0.091 mL, 0.65 mmol) and the mixture was stirred at RT for 3 h. The mixture was quenched with water and extracted with EtOAc (3x). The combined organic layers were washed with brine, dried over Na_2SO_4 , filtered and concentrated to yield [1-methyl-3-(trifluoromethyl)-1H-pyrazol-5-yl]methyl methanesulfonate (112 mg, 100%). LCMS (FA): m/z = 259.1 (M+H).

[00189] The compound listed in the table below was prepared in an analogous fashion to that described above starting from the listed starting material:

Starting material	Compound Name / No.
	[1-Methyl-5-(trifluoromethyl)-1H-pyrazol-3-yl]methyl

	methanesulfonate / Int-34

Example 16: 3-(Chloromethyl)-1-methylpyridin-2(1H)-one Int-35**Step 1: N-Methyl-3-formyl-2(1H)-pyridone**

[00190] To a solution of 2-oxo-1,2-dihydropyridine-3-carbaldehyde (1.0 g, 8.1 mmol) in DMF (20 mL) was added cesium carbonate (3.2 g, 9.8 mmol) at rt and the mixture was stirred for 15 minutes. Methyl iodide (0.61 mL, 9.8 mmol) was added to the mixture and it was stirred at rt for 3 hours. The mixture was quenched with aq. NH_4Cl and extracted with EtOAc (3x). The organic layer was washed with brine, dried over Na_2SO_4 and concentrated. The crude product was purified on silica gel to afford methyl-3-formyl-2(1H)-pyridone as a yellow powder (0.57 g, 51%). LCMS (FA): $m/z = 138$ (M+H).

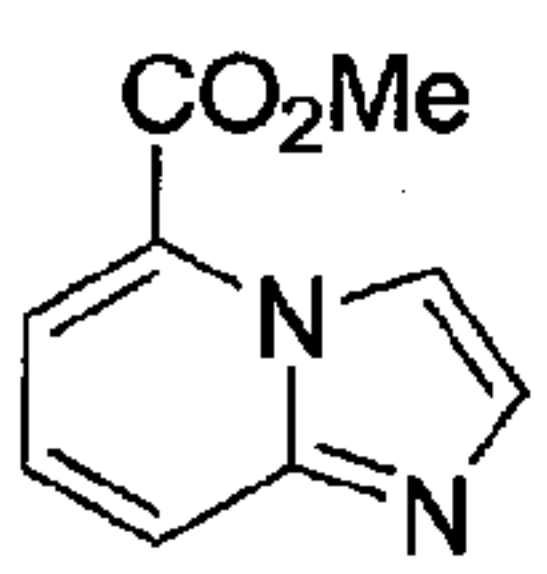
Step 2: 3-(Hydroxymethyl)-1-methylpyridin-2(1H)-one

[00191] To a solution of N-methyl-3-formyl-2(1H)-pyridone (570 mg, 4.2 mmol) in methanol (10 mL) was added sodium tetrahydroborate (160 mg, 4.2 mmol) at rt and the mixture was stirred for 2 h. The mixture was quenched with water and extracted with EtOAc (3x). The organic layer was washed with brine, dried over Na_2SO_4 and concentrated. The crude product was purified on silica gel to give 3-(hydroxymethyl)-1-methylpyridin-2(1H)-one (613 mg, 100%).

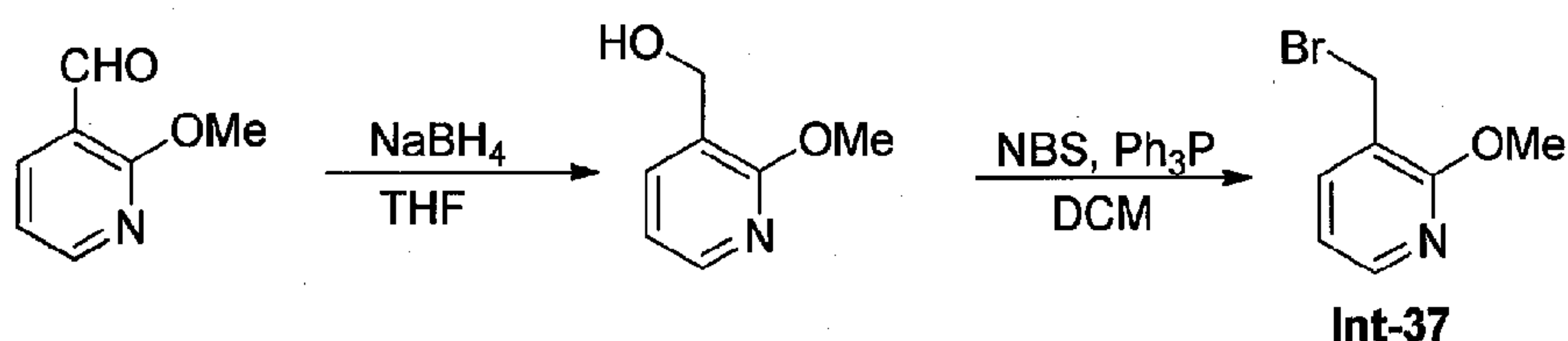
Step 3: 3-(Chloromethyl)-1-methylpyridin-2(1H)-one Int-35

[00192] To a solution of 3-(hydroxymethyl)-1-methylpyridin-2(1H)-one (459 mg, 3.30 mmol) in DCM (10 mL) was added thionyl chloride (0.29 mL, 4.0 mmol) at rt and the mixture was stirred for 2 hours. The volatiles were removed under reduced pressure and the residue was quenched with aq. NaHCO_3 and extracted with EtOAc. The organic layer was washed with brine, dried over Na_2SO_4 and concentrated. The crude product was purified on silica gel to afford 3-(chloromethyl)-1-methylpyridin-2(1H)-one (370 mg, 71%). LCMS (FA): $m/z = 158$ (M+H).

[00193] The compound listed in the table below was prepared in an analogous fashion to that described above starting from the listed starting material used in step 2:

Starting material	Compound Name / No.	Characterization Data
	5-(Chloromethyl)imidazo[1,2-a]pyridine / Int-36	LCMS (FA): $m/z = 167$ (M+H).

Example 17: 3-(Bromomethyl)-2-methoxypyridine Int-37



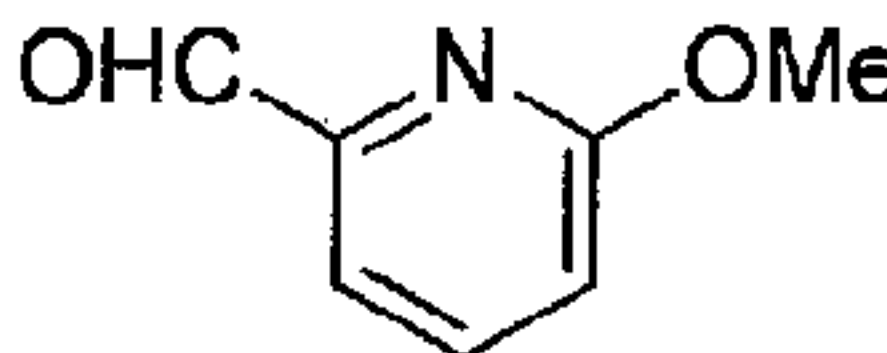
Step 1: (2-Methoxypyridin-3-yl)methanol

[00194] To a solution of 2-methoxy-pyridine-3-carbaldehyde (2.03 g, 14.8 mmol) in THF (35 mL) was added sodium tetrahydroborate (617 mg, 16.3 mmol) at rt and the mixture was stirred for 1 h. The mixture was quenched with water and extracted with EtOAc. The organic layer was washed with brine, dried over Na_2SO_4 and concentrated. The crude product was purified on silica gel to give (2-methoxypyridin-3-yl)methanol (2.05 g, 99%) as a clear oil. LCMS (FA): $m/z = 140$ (M+H).

Step 2: 3-(Bromomethyl)-2-methoxypyridine Int-37

[00195] To a solution of (2-methoxypyridin-3-yl)methanol (811 mg, 5.8 mmol) and N-bromosuccinimide (1.24 g, 7.0 mmol) in DCM (10 mL) was added triphenylphosphine (1.8 g, 7.0 mmol) at rt and the mixture was stirred for 2 h. The mixture was quenched with water and extracted with EtOAc. The organic layer was washed with brine, dried over Na_2SO_4 and concentrated. The crude product was purified on silica gel to give 3-(bromomethyl)-2-methoxypyridine (829 mg, 70%) as clear oil. ^1H NMR (CDCl_3) 8.14 (dd, $J = 5.0, 1.9$ Hz, 1H), 7.63 (dd, $J = 7.3, 1.9$ Hz, 1H), 6.89 (dd, $J = 7.3, 5.0$ Hz, 1H), 4.51 (s, 2H), 4.04 (s, 3H).

[00196] The compound listed in the table below was prepared in an analogous fashion to that described above starting from the listed starting material:

Starting material	Compound Name / No.	Characterization Data
	2-(Bromomethyl)-6-methoxypyridine / Int-38	¹ H NMR (CDCl ₃) δ 7.56 (dd, <i>J</i> = 8.3, 7.2 Hz, 1H), 7.01 (dd, <i>J</i> = 7.2, 0.5 Hz, 1H), 6.68 (d, <i>J</i> = 8.3 Hz, 1H), 4.48 (s, 2H), 3.96 (s, 3H).

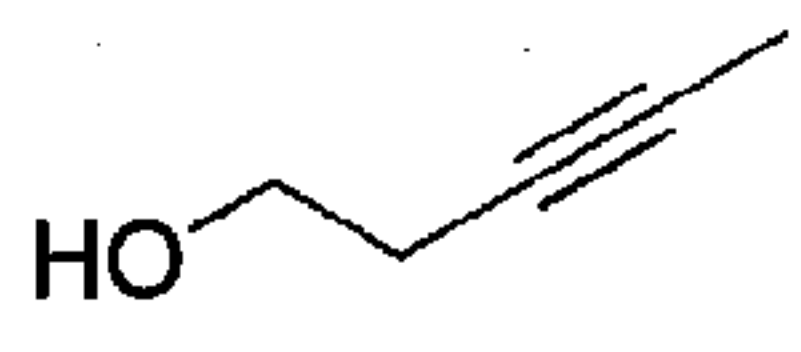
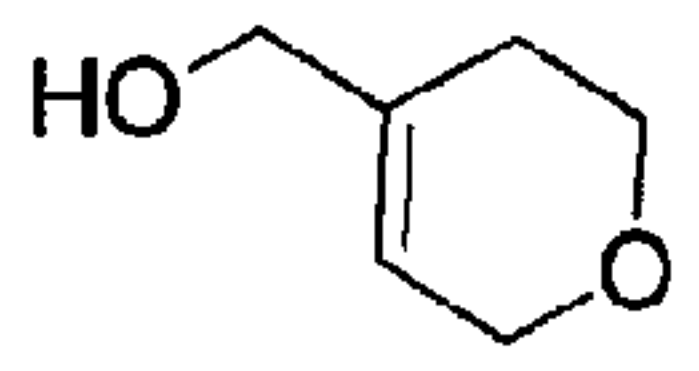
Example 18: Imidazo[1,2-a]pyridin-6-ylmethyl methanesulfonate Int-39**Step 1: Imidazo[1,2-a]pyridin-6-ylmethyl methanesulfonate Int-39**

[00197] To a solution of imidazo[1,2-a]pyridin-6-ylmethanol (54 mg, 0.37 mmol) and methanesulfonyl chloride (32 μ L, 0.41 mmol) in DCM (3 mL) was added TEA (66 μ L, 0.47 mmol) and the mixture was stirred at rt for 3 h. The mixture was filtered and the filtrate was concentrated to give imidazo[1,2-a]pyridin-6-ylmethyl methanesulfonate (84 mg, 100%). LCMS (FA): *m/z* = 227 (M+H).

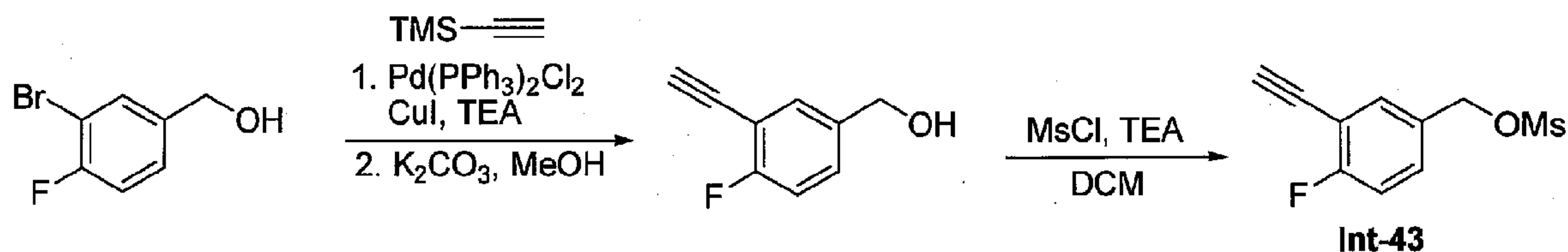
Example 19: (3-Methylisoxazol-5-yl)methyl 4-methylbenzenesulfonate Int-40**Step 1: 3-Methylisoxazol-5-yl)methyl 4-methylbenzenesulfonate Int-40**

[00198] TEA (1.2 mL, 8.8 mmol) was added to a solution of (3-methylisoxazol-5-yl)methanol (0.5 g, 4 mmol) and p-toluenesulfonyl chloride (1.3 g, 6.6 mmol) in THF (10 mL) at room temp under an atmosphere of argon. A catalytic amount of DMAP was added and the reaction stirred at rt. After 24 h the reaction was quenched by the addition of brine. The mixture was extracted with EtOAc (3x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The crude product was purified on silica gel to yield 3-methylisoxazol-5-yl)methyl 4-methylbenzenesulfonate (130 mg, 10%). LCMS (FA): *m/z* = 268 (M+H).

[00199] The compounds listed in the table below were prepared in a similar fashion to that described above starting from the listed starting materials:

Starting material	Compound Name / No.	Characterization Data
	Pent-3-yn-1-yl 4-methylbenzenesulfonate / Int-41	LCMS (FA): $m/z = 239.2$ (M+H).
 Hatano, M. et al. <i>J. Am. Chem. Soc.</i> 2003 , 125, 4704-4705.	3,6-Dihydro-2H-pyran-4-ylmethyl 4-methylbenzenesulfonate / Int-42	$^1\text{H NMR}$ (CDCl_3) δ 7.76 – 7.89 (m, 2H), 7.37 (d, $J = 8.0$ Hz, 2H), 5.75 – 5.79 (m, 1H), 4.47 (s, 2H), 4.10 (m, 2H), 3.72 (t, $J = 5.5$ Hz, 2H), 2.48 (s, 3H), 2.06 (dd, $J = 4.6, 2.6$ Hz, 2H).

Example 20: 3-Ethynyl-4-fluorobenzyl methanesulfonate Int-43



Step 1: {4-Fluoro-3-[(trimethylsilyl)ethynyl]phenyl}methanol

[00200] A reaction vial was charged with (3-bromo-4-fluorophenyl)methanol (1.0 g, 4.9 mmol), $(\text{PPh}_3)_2\text{PdCl}_2$ (68 mg, 0.10 mmol), CuI (37 mg, 0.20 mmol), and TEA (5.0 mL, 36 mmol). The vial was purged with argon and then sealed with a cap. After sonication, (trimethylsilyl)acetylene (1.0 mL, 7.3 mmol) was added to the mixture, and the resulting mixture was heated at 100 °C for 48 h. The reaction was diluted with EtOAc (100mL) and the EtOAc layer was washed with 1 M HCl (60 mLx2), water (60 mL) and brine (60 mL). The organic layer was dried over Na_2SO_4 , filtered, and concentrated *in vacuo*. The residue was purified on silica gel to give {4-fluoro-3-[(trimethylsilyl)ethynyl]phenyl}methanol (287 mg, 26%).

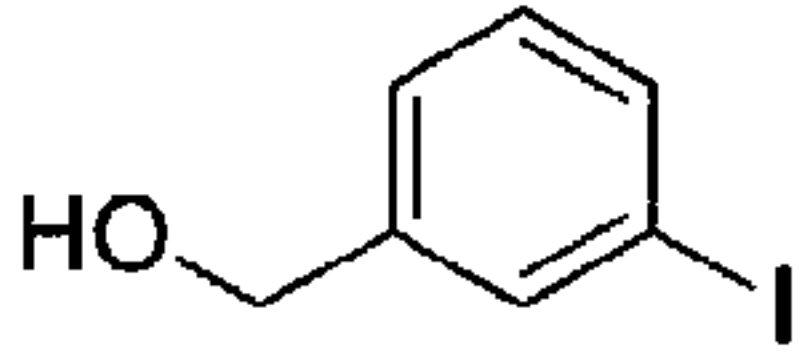
Step 2: (3-Ethynyl-4-fluorophenyl)methanol

[00201] To a solution of {4-fluoro-3-[(trimethylsilyl)ethynyl]phenyl}methanol (280 mg, 1.20 mmol) in MeOH (3 mL) was added K_2CO_3 (0.87 g, 6.30 mmol) at rt, and the mixture was stirred for 1 h. The reaction was concentrated in vacuo. To the residue was added water (50 mL) and extracted with Et_2O (50 mLx3). The combined organic layers were dried over Na_2SO_4 , filtered, and concentrated in vacuo. The residue was purified by silica gel column chromatography to give (3-ethynyl-4-fluorophenyl)methanol (178 mg, 94%) as a light brown oil.

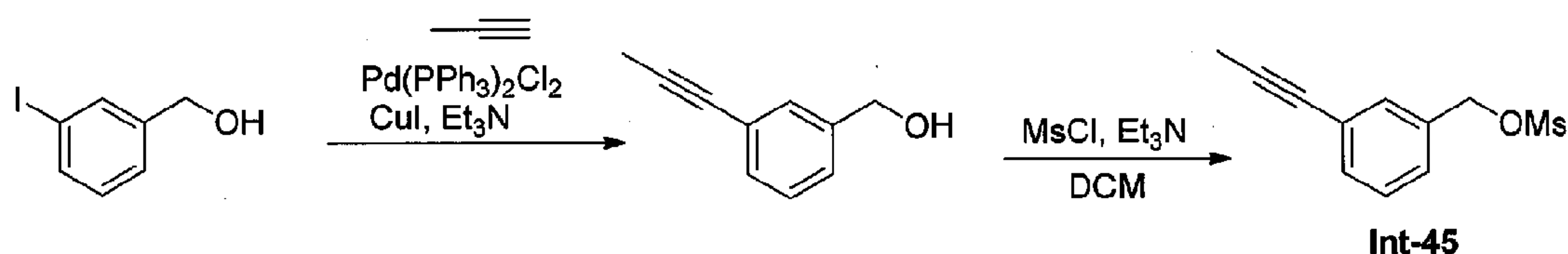
Step 3: 3-Ethynyl-4-fluorobenzyl methanesulfonate Int-43

[00202] To a solution of (3-ethynyl-4-fluorophenyl)methanol (180 mg, 1.2 mmol) in DCM (10 mL) was added TEA (0.24 mL, 1.8 mmol) followed by methanesulfonyl chloride (95 μ L, 1.2 mmol) at 0 °C under an atmosphere of argon. The mixture was stirred for 4 h. The reaction was quenched by addition of water (50 mL) and DCM (50 mL). After separation, the DCM layer was washed with water (50 mL) followed by brine (50 mL) and then dried over Na_2SO_4 . The mixture was filtered and concentrated in vacuo. The residue was purified on silica gel to give 3-ethynyl-4-fluorobenzyl methanesulfonate (145 mg, 55%) as a colorless solid. ^1H NMR ($CDCl_3$) δ 7.55 (dd, J = 6.5, 2.3 Hz, 1H), 7.43 – 7.37 (m, 1H), 7.13 (t, J = 8.7 Hz, 1H), 5.18 (s, 2H), 3.34 (s, 1H), 2.98 (s, 3H).

[00203] The compound listed in the table below was prepared in an analogous fashion to that described above starting from the listed starting material:

Starting material	Compound Name / No.	Characterization Data
	(3-Ethynylphenyl)methanol / Int-44	^1H NMR ($CDCl_3$) δ 7.50-7.60 (m, 2H), 7.35 – 7.45 (m, 2H), 5.23 (s, 2H), 3.15 (s, 1H), 2.95 (s, 3H).

Example 21: 3-(Prop-1-yn-1-yl)benzyl methanesulfonate Int-45



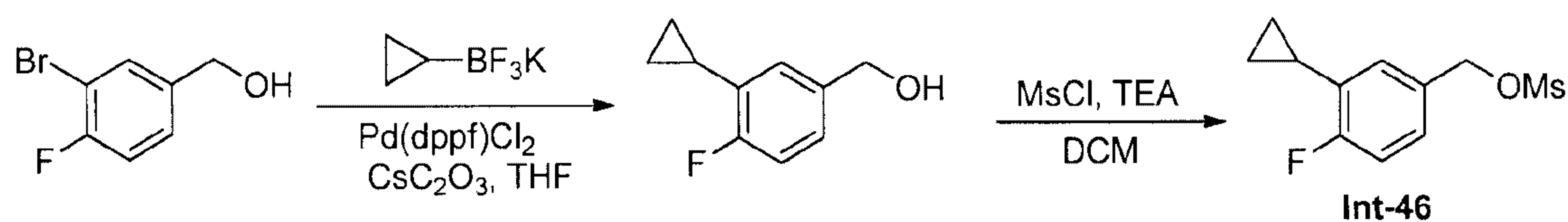
Step 1: [3-(Prop-1-yn-1-yl)phenyl]methanol

[00204] A 100 mL 2-necked RBF equipped with 3-way stopcock and septum was purged with argon and then the flask was cooled to -78 °C. To the flask was attached a needle connected with a propyne gas cylinder. Liquid propyne (1.7 mL, 30 mmol) was condensed and collected in the flask. To the flask was added TEA (5.0 mL, 36 mmol) followed by bis(triphenylphosphine)palladium(II) chloride (30 mg, 0.04 mmol), CuI (16 mg, 0.08 mmol), and a solution of 3-iodobenzyl alcohol (700 mg, 3.0 mmol) in TEA (2.00 mL, 14.3 mmol) at -78 °C, and the resulting mixture was heated at 50 °C for 2 h. The reaction was cooled to rt and diluted with EtOAc (70 mL). The mixture was filtered through a Celite™ pad and the residual solid was rinsed with EtOAc several times. The filtrate was washed with 1M HCl (x2), water, and brine. The organic layer was dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [3-(prop-1-yn-1-yl)phenyl]methanol (380 mg, 87%).

Step 2: 3-(Prop-1-yn-1-yl)benzyl methanesulfonate Int-45

[00205] To a solution of [3-(prop-1-yn-1-yl)phenyl]methanol (100 mg, 0.68 mmol) in DCM (5.0 mL) was added TEA (0.19 mL, 1.4 mmol) followed by methanesulfonyl chloride (0.06 mL, 0.72 mmol) at 0 °C, and the mixture was stirred for 6 h at rt. The reaction was quenched by addition of water (50 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give 3-(prop-1-yn-1-yl)benzyl methanesulfonate (61 mg, 40%) as a colorless oil. ¹H NMR (CDCl₃) δ 7.44 (s, 1H), 7.43 – 7.37 (m, 1H), 7.36 – 7.29 (m, 2H), 5.20 (s, 2H), 2.93 (s, 3H), 2.05 (s, 3H).

Example 22: 3-Cyclopropyl-4-fluorobenzyl methanesulfonate Int-46



Step 1: (3-Cyclopropyl-4-fluorophenyl)methanol

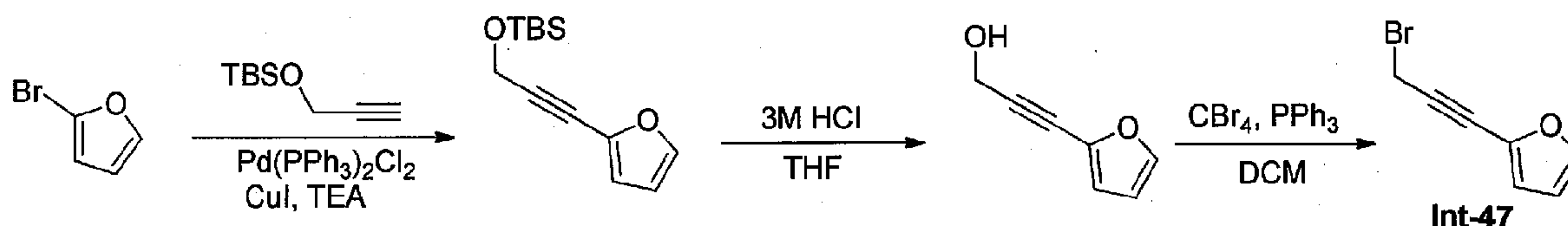
[00206] A microwave reaction vial was charged with (3-bromo-4-fluorophenyl)methanol (530 mg, 2.6 mmol), potassium cyclopropyltrifluoroborate (0.77 g, 5.2 mmol), Cs₂CO₃ (2.5 g, 7.8 mmol), 1,1'-bis(diphenylphosphino)ferrocenedichloropalladium(II) (95 mg, 0.13 mmol), THF (10.6 mL) and water (1.1 mL). After sealing with cap under an atmosphere of argon, the mixture was heated at 100 °C for 4 h. The reaction was diluted with EtOAc and the mixture was filtered through a celite pad. The residual solid was rinsed with EtOAc and water. The two layers were transferred into a separatory funnel and then

separated. The water layer was extracted with EtOAc (x2). The combined organic layers were dried over Na_2SO_4 , filtered, and concentrated. The residue was purified on silica gel to give (3-cyclopropyl-4-fluorophenyl)methanol (309 mg, 72%) as a light yellow oil.

Step 2: 3-Cyclopropyl-4-fluorobenzyl methanesulfonate Int-46

[00207] To a solution of (3-cyclopropyl-4-fluorophenyl)methanol (300 mg, 1.8 mmol) in DCM (10 mL) was added TEA (0.38 mL, 2.7 mmol) followed by methanesulfonyl chloride (0.15 mL, 1.9 mmol) at 0 °C, and the mixture was stirred for 3 h at rt. The reaction was quenched by addition of water (50 mL) and extracted with DCM (50 mLx3). The combined organic layers were dried over Na_2SO_4 , filtered, and concentrated. The residue was purified on silica gel to give 3-cyclopropyl-4-fluorobenzyl methanesulfonate (215 mg, 49%) as a colorless oil. ^1H NMR (CDCl_3) δ 7.20 – 7.15 (m, 1H), 7.03 (dd, J = 9.9, 8.4 Hz, 1H), 6.95 (dd, J = 7.1, 2.3 Hz, 1H), 5.15 (s, 2H), 2.91 (s, 3H), 2.09 (tt, J = 8.5, 5.2 Hz, 1H), 1.01 (ddd, J = 8.5, 6.4, 4.6 Hz, 2H), 0.74 (dt, J = 6.5, 4.7 Hz, 2H).

Example 23: 2-(3-Bromoprop-1-yn-1-yl)furan Int-47



Step 1: *tert*-Butyl{[3-(2-furyl)prop-2-yn-1-yl]oxy}dimethylsilane

[00208] Into a RBF was added 2-bromofuran (0.50 g, 3.4 mmol) dissolved in TEA (3.5 mL, 25 mmol). Copper(I) iodide (26 mg, 0.14 mmol) and bis(triphenylphosphine)palladium(II) chloride (48 mg, 0.07 mmol) were added next and the mixture was purged with argon. *tert*-Butyldimethyl(2-propynyloxy)silane (0.90 mL, 4.4 mmol) was then added and the mixture was heated at 70 °C overnight. The crude mixture was cooled to rt and extracted with EtOAc (3x). The combined organic layers were then washed with water and brine, dried over Na_2SO_4 , filtered and concentrated. The crude product was purified on silica gel to give *tert*-butyl{[3-(2-furyl)prop-2-yn-1-yl]oxy}dimethylsilane (0.91 g, 100%).

Step 2: 3-(2-Furyl)prop-2-yn-1-ol

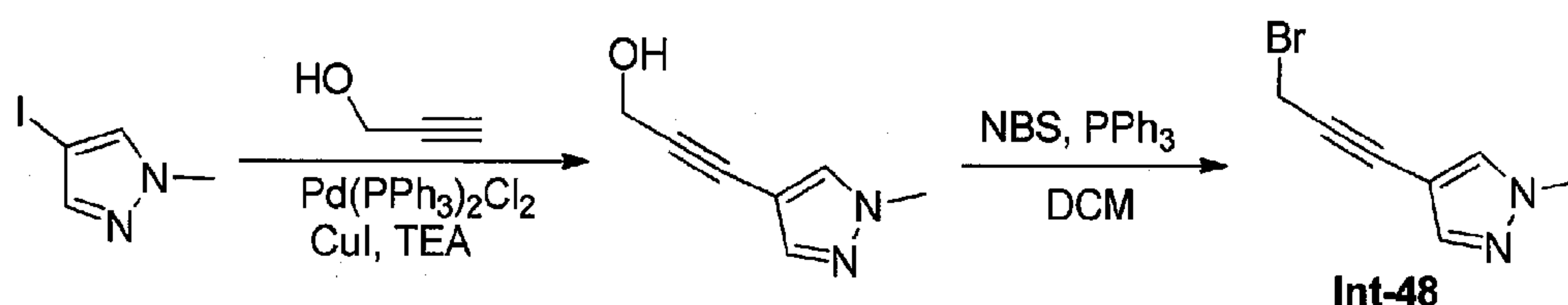
[00209] HCl (3 M solution in water; 0.13 mL, 0.38 mmol) was added to a solution of *tert*-butyl{[3-(2-furyl)prop-2-yn-1-yl]oxy}dimethylsilane (0.91 g, 3.8 mmol) in THF (20 mL) and the reaction was stirred overnight at rt. It was then quenched with a saturated solution of NaHCO_3 and extracted with EtOAc (3X). The combined organic layers were then washed with water and brine, dried over Na_2SO_4 , filtered

and concentrated. The crude product was purified on silica gel to give 3-(2-furyl)prop-2-yn-1-ol (0.48g, 100%).

Step 3: 2-(3-Bromoprop-1-yn-1-yl)furan Int-47

[00210] To a mixture of 3-(2-furyl)prop-2-yn-1-ol (0.48 g, 3.9 mmol) in DCM (15 mL) cooled at 0 °C was added triphenylphosphine (1.2 g, 4.7 mmol) followed by carbon tetrabromide (1.96 g, 5.90 mmol). The reaction was then stirred at 0 °C for 15 min and then concentrated. The crude product was purified on silica gel to provide 2-(3-bromoprop-1-yn-1-yl)furan (0.57g, 78%). ¹H NMR (CDCl₃) δ 7.40 (dd, *J* = 1.8, 0.7 Hz, 1H), 6.64 (d, *J* = 3.4 Hz, 1H), 6.40 (dd, *J* = 3.4, 1.9 Hz, 1H), 4.17 (s, 2H).

Example 24: 4-(3-Bromoprop-1-yn-1-yl)-1-methyl-1H-pyrazole Int-48



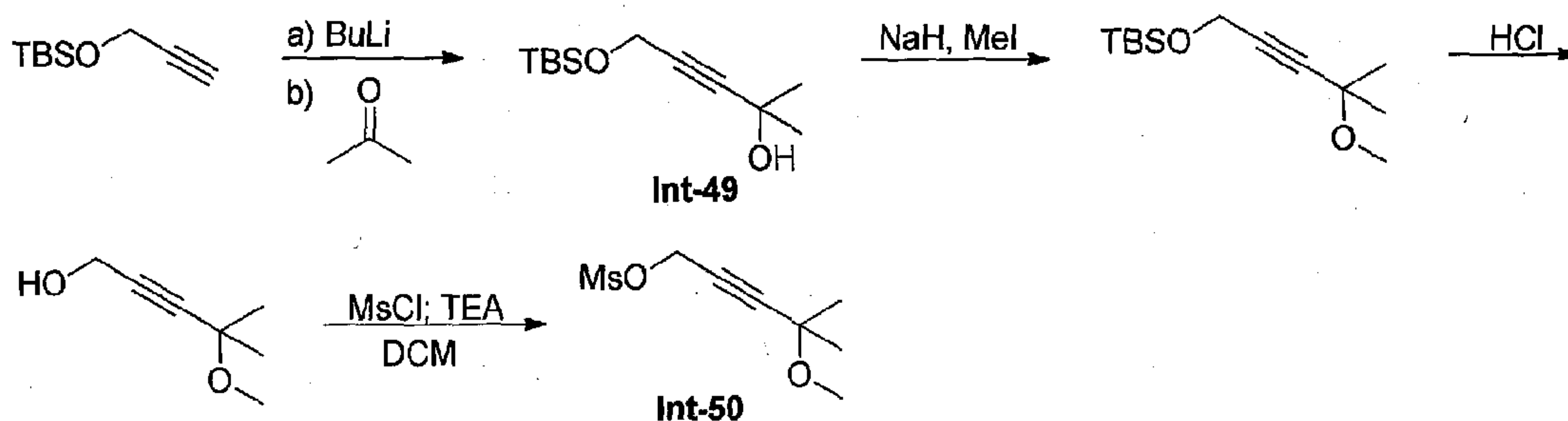
Step 1: 3-(1-Methyl-1H-pyrazol-4-yl)prop-2-yn-1-ol

[00211] A mixture of 2-propyn-1-ol (0.25 mL, 4.2 mmol), 1-methyl-4-iodo-1H-pyrazole (0.80 g, 3.9 mmol), bis(triphenylphosphine)palladium(II) chloride (0.13 g, 0.19 mmol), copper(I) iodide (0.073 g, 0.38 mmol), and TEA (1.1 mL, 7.7 mmol) in DMF (5.0 mL) was stirred at rt for 4 h. The mixture was purified on silica gel (directly charged to column) to afford 3-(1-methyl-1H-pyrazol-4-yl)prop-2-yn-1-ol (403 mg; 77%). LCMS (FA): *m/z* = 137 (M+H).

Step 2: 4-(3-Bromoprop-1-yn-1-yl)-1-methyl-1H-pyrazole Int-48

[00212] Triphenylphosphine (550 mg, 2.1 mmol) was added to a DCM (5 mL) solution of 3-(1-methyl-1H-pyrazol-4-yl)prop-2-yn-1-ol (258 mg, 1.9 mmol) and NBS (370 mg, 2.1 mmol) at rt and the mixture was stirred overnight. The mixture was purified on silica gel (directly charged to column) to afford 4-(3-bromoprop-1-yn-1-yl)-1-methyl-1H-pyrazole (297 mg; 79%) as a colorless oil. LCMS (FA): *m/z* = 199 (M+H).

Example 25: 4-Methoxy-4-methylpent-2-yn-1-yl methanesulfonate Int-50



Step 1: 5-[[*tert*-Butyl(dimethyl)silyl]oxy]-2-methylpent-3-yn-2-ol Int-49

[00213] *tert*-Butyldimethyl(2-propynyloxy)silane (2.4 mL, 12 mmol) was dissolved in THF (40 mL) then it was cooled to -78 °C. *n*-Butyllithium (2.50 M in hexanes; 5.2 mL, 12.9 mmol) was added and the resulting solution allowed to stir for 30 min at -78 °C. Acetone (1.0 mL, 14 mmol) was then added to the reaction, which was then allowed to stir at -78 °C for 30 min, followed by stirring at rt for 30 min. The reaction was then quenched by the addition of saturated aq solution of NH₄Cl. The mixture was extracted with ether (2x). The combined organic layers were dried over MgSO₄, filtered, and concentrated to provide 5-[[*tert*-butyl(dimethyl)silyl]oxy]-2-methylpent-3-yn-2-ol (2.7g, 100%). ¹H NMR (CDCl₃) δ 4.25 (s, 2H), 3.60 (m, 1H), 1.30 (s, 6H), 0.80 (s, 9H), 0.0 (s, 6H).

Step 2: *tert*-Butyl[(4-methoxy-4-methylpent-2-yn-1-yl)oxy]dimethylsilane

[00214] 5-[[*tert*-butyl(dimethyl)silyl]oxy]-2-methylpent-3-yn-2-ol (1.0 g, 4.4 mmol) was dissolved in THF (20 mL) under an atmosphere of argon and cooled to 0 °C in an ice bath. Sodium hydride (0.21 g, 5.2 mmol) was added and the resulting suspension was allowed to stir at 0 °C for 30 min. Methyl iodide (0.54 mL, 8.8 mmol) was then added and the reaction was allowed to slowly warm to rt. After stirring overnight at that temperature, TLC showed the reaction was complete. The reaction was quenched by addition of saturated NH₄Cl solution (aq.) then extracted with EtOAc (2x). The combined organic layers were dried over MgSO₄, filtered, and concentrated to give *tert*-butyl[(4-methoxy-4-methylpent-2-yn-1-yl)oxy]dimethylsilane (0.95 g, 90%). ¹H NMR (CDCl₃) δ 4.25 (s, 2H), 3.23 (s, 3H), 1.30 (s, 6H), 0.80 (s, 9H), 0.0 (s, 6H).

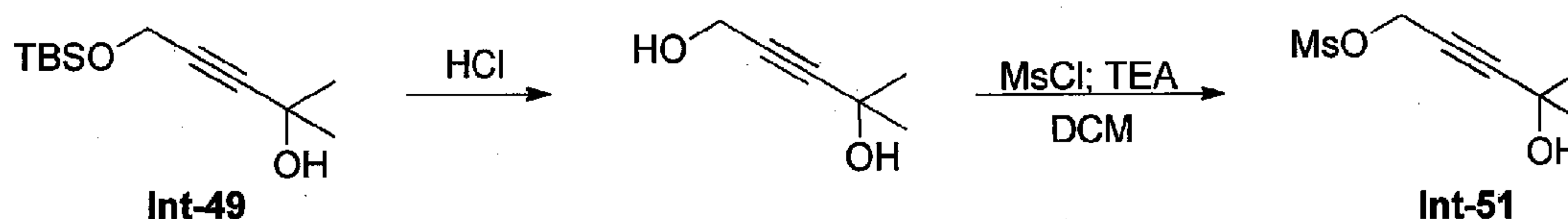
Step 3: 4-Methoxy-4-methylpent-2-yn-1-ol

[00215] HCl (3.0 M solution in water; 0.13 mL, 0.39 mmol) was added to a solution of *tert*-butyl[(4-methoxy-4-methylpent-2-yn-1-yl)oxy]dimethylsilane (0.95 g, 3.9 mmol) in THF (20 mL) at rt. The solution was allowed to stir overnight. The reaction was concentrated then purified on silica gel to yield 4-methoxy-4-methylpent-2-yn-1-ol (0.33 g, 66%). ¹H NMR (CDCl₃) δ 4.30 (s, 2H), 3.30 (s, 3H), 1.45 (s, 6H).

Step 4: 4-Methoxy-4-methylpent-2-yn-1-yl methanesulfonate Int-50

[00216] Methanesulfonyl chloride (0.20 mL, 2.6 mmol) was added to a solution of 4-methoxy-4-methylpent-2-yn-1-ol (0.32 g, 2.5 mmol) and TEA (0.52 mL, 3.7 mmol) in DCM (9 mL) at 0 °C under an atmosphere of argon. The reaction was then allowed to stir at 0 °C for 1 h and the reaction was quenched by the addition of water. This mixture was extracted with DCM (3x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The crude product was purified on silica gel to give 4-methoxy-4-methylpent-2-yn-1-yl methanesulfonate (380 mg, 74%). ¹H NMR (CDCl₃) δ 4.90 (s, 2H), 3.30 (s, 3H), 3.15 (s, 3H), 1.50 (s, 6H).

Example 26: 4-Hydroxy-4-methylpent-2-yn-1-yl methanesulfonate Int-51



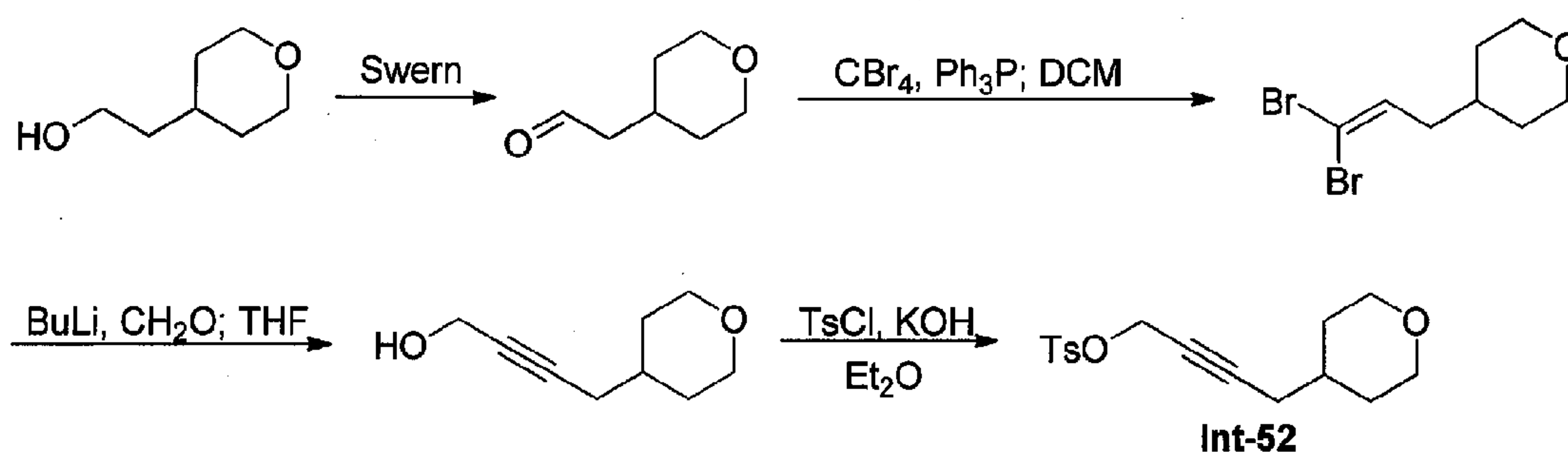
Step 1: 4-Methylpent-2-yne-1,4-diol

[00217] HCl (3.0 M solution in water; 0.14 mL, 0.44 mmol) was added to a solution of 5-[[*tert*-butyl(dimethyl)silyl]oxy]-2-methylpent-3-yn-2-ol (1.0 g, 4.4 mmol) in THF (20 mL) at rt. After stirring overnight the reaction was concentrated and purified on silica gel to afford 4-methylpent-2-yne-1,4-diol (0.35 g, 70%). ¹H NMR (CDCl₃) δ 4.30 (s, 2H), 1.55 (s, 6H).

Step 2: 4-Hydroxy-4-methylpent-2-yn-1-yl methanesulfonate Int-51

[00218] Methanesulfonyl chloride (0.23 mL, 3.0 mmol) was added to a solution of 4-methylpent-2-yne-1,4-diol (0.33 g, 2.9 mmol) and TEA (0.60 mL, 4.3 mmol) in DCM (10 mL) at 0 °C under an atmosphere of argon. The reaction was allowed to stir at 0 °C for 1 h. The reaction was then quenched by the addition of water and the resulting mixture was extracted with DCM (3x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The crude product was purified on silica gel to give 4-hydroxy-4-methylpent-2-yn-1-yl methanesulfonate (340 mg, 61%). ¹H NMR (CDCl₃) δ 4.90 (s, 2H), 3.15 (s, 3H), 1.60 (s, 6H).

Example 27: 4-(Tetrahydro-2H-pyran-4-yl)but-2-yn-1-yl 4-methylbenzenesulfonate Int-52



Step 1: (Tetrahydro-pyran-4-yl)-acetaldehyde

[00219] A 500 mL RBF under nitrogen charged with DCM (96 mL) and oxalyl chloride (3.6 mL, 42 mmol) was cooled to -60°C . Dimethyl sulfoxide (6.5 mL, 92 mmol) was added dropwise and the mixture stirred 10 min. A solution of 2-tetrahydropyran-4-ylethanol (5 g, 40 mmol) in DCM (40 mL) was added slowly and this mixture was stirred 15 minutes. TEA (30 mL, 200 mmol) was subsequently added slowly and the temperature allowed to rise to -30°C . The cooling bath was then removed and the reaction warmed to rt. The reaction was quenched with water and the aqueous layer was extracted with DCM (3x). The combined organic portions were washed with brine, dried over sodium sulfate, filtered, and concentrated. The crude oil was purified on silica gel to give (tetrahydro-pyran-4-yl)-acetaldehyde (3.7 g, 72%).

Step 2: 4-(3,3-Dibromoprop-2-en-1-yl)tetrahydro-2H-pyran

[00220] A RBF under nitrogen was charged with (tetrahydro-pyran-4-yl)-acetaldehyde (3.7 g, 29 mmol), DCM (10 mL), and triphenylphosphine (19 g, 71 mmol) and then cooled to 0°C . A solution of carbon tetrabromide (11.8 g, 36 mmol) in DCM was added dropwise keeping the internal temperature under 30°C . A precipitate formed. After stirring 30 min the solid was removed via filtration. The filtrate was concentrated and the resulting residue purified on silica gel to give 4-(3,3-dibromoprop-2-en-1-yl)tetrahydro-2H-pyran (6.04 g, 74%).

Step 3: 4-(Tetrahydro-2H-pyran-4-yl)but-2-yn-1-ol

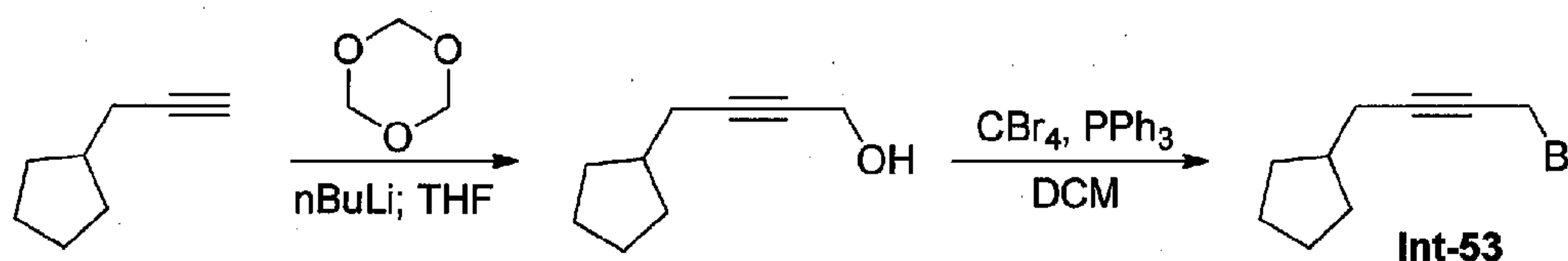
[00221] A 500mL oven-dried 2-neck RBF under nitrogen charged with 4-(3,3-dibromoprop-2-en-1-yl)tetrahydro-2H-pyran (3.0 g, 10.6 mmol) and THF (33 mL) was cooled to -10°C . n-Butyllithium (2.5 M solution in hexane; 8.4 mL, 21.0 mmol) was added slowly over 10 min keeping the internal temperature at 0°C . This mixture was kept at the same temperature and stirred 30 min. Paraformaldehyde (0.79 g, 26 mmol) was added in a single portion and the mixture allowed to warm slowly to rt and stir for 18 h. It was then cooled in an ice bath and quenched by slowly adding saturated ammonium chloride (10 mL). The organic solvents were removed in vacuo and water was added. The mixture was extracted with EtOAc

(3x). The combined organic portions were washed with brine, dried over sodium sulfate, filtered, and concentrated. The crude product was purified on silica gel to give 4-(tetrahydro-2H-pyran-4-yl)but-2-yn-1-ol (593 mg, 36%).

Step 4: 4-(Tetrahydro-2H-pyran-4-yl)but-2-yn-1-yl 4-methylbenzenesulfonate Int-52

[00222] A 50mL RBF under nitrogen charged with 4-(tetrahydro-2H-pyran-4-yl)but-2-yn-1-ol (0.59 g, 3.8 mmol), ether (10 mL) and p-toluenesulfonyl chloride (0.84 g, 4.4 mmol) was cooled to 0°C in an ice bath. Potassium hydroxide (2.8 g, 50 mmol) was then added in small portions. The reaction mixture was kept at 0°C and stirred for 1 h. The reaction was quenched with water and the aqueous layer was extracted with ether (3x). The combined organic portions were washed with brine, dried over magnesium sulfate, filtered, and concentrated. The crude product was purified on silica gel to give 4-(tetrahydro-2H-pyran-4-yl)but-2-yn-1-yl 4-methylbenzenesulfonate (520 mg, 44%). LCMS (FA): $m/z = 309$ (M+H).

Example 28: (4-Bromobut-2-yn-1-yl)cyclopentane Int-53



Step 1: 4-Cyclopentylbut-2-yn-1-ol

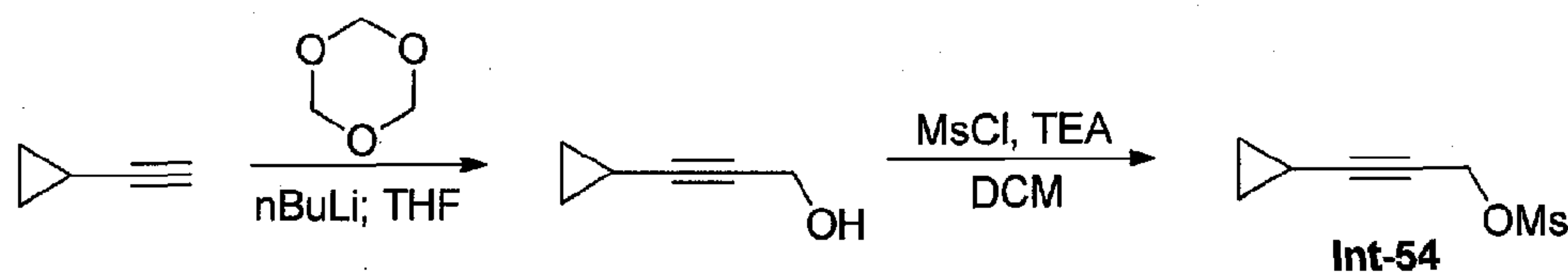
[00223] A 250 mL 2-necked round bottomed flask equipped with septum and 3-way stopcock was purged with argon. THF (12 mL) and 3-cyclopentyl-1-propyne (1 mL, 9 mmol) were added into the reaction vessel via syringe and the solution was cooled to -78 °C. To the solution was added n-butyllithium (2.5 M solution in hexane; 3.5 mL, 8.8 mmol), and the mixture was stirred for 30 min at -78 °C. To this mixture was added a suspension of 1,3,5-trioxane (0.83 g, 9.2 mmol) in THF (3.1 mL), and the resulting suspension was stirred for 30 min at -78 °C then warmed to rt gradually. The reaction was then quenched by addition of water (5 mL) and extracted with ether (8 mL). The ether layer was dried over Na₂SO₄, filtered, and concentrated in vacuo (at low temperature and low vacuum because of volatility of the product). The residue was purified on silica gel to provide 4-cyclopentylbut-2-yn-1-ol (785 mg, 63%).

Step 2: (4-Bromobut-2-yn-1-yl)cyclopentane Int-53

[00224] To a 50 mL RBF was added DCM (13 mL) followed by 4-cyclopentylbut-2-yn-1-ol (780 mg, 5.6 mmol) and carbon tetrabromide (2.8 g, 8.5 mmol). The reaction was cooled to 0 °C and

triphenylphosphine (2.2 g, 8.5 mmol) was added. The reaction was kept at this temperature for 2 hours while stirring. The reaction was then quenched with a saturated NaHCO_3 solution followed by water, and the mixture was extracted with EtOAc (2x). The organic layers were combined and dried (MgSO_4), filtered, and concentrated. The residue was purified on silica gel to give (4-bromobut-2-yn-1-yl)cyclopentane (1.0 g, 89%). ^1H NMR (CDCl_3) δ 3.87 (s, 2H), 2.25 – 2.11 (m, 2H), 2.04 – 1.90 (m, 1H), 1.77 – 1.66 (m, 2H), 1.64 – 1.41 (m, 4H), 1.28 – 1.10 (m, 2H).

Example 29: 3-Cyclopropylprop-2-yn-1-yl methanesulfonate Int-54



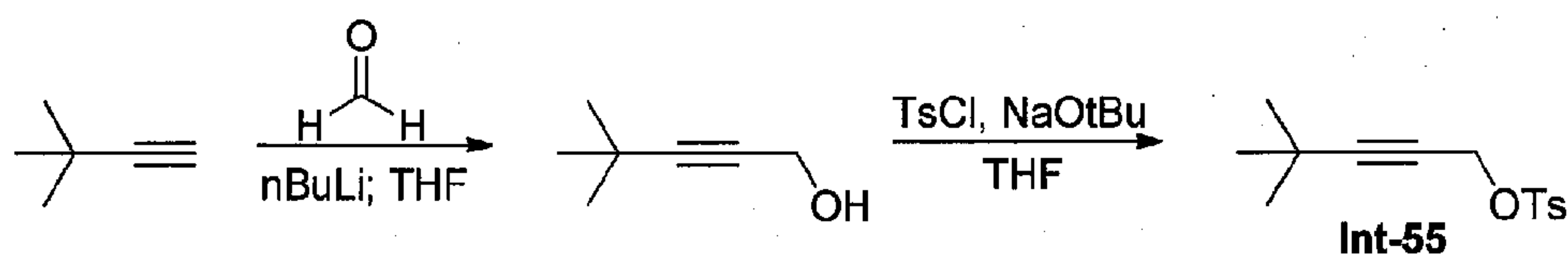
Step 1: 3-Cyclopropylprop-2-yn-1-ol

[00225] A 250 mL 2-necked round bottomed flask equipped with septum and 3-way stopcock was purged with argon. THF (40 mL) and cyclopropyl acetylene (2.5 mL, 30 mmol) were added into the reaction vessel and the solution was cooled to -78°C . To the solution was added n-butyllithium (2.50 M in hexane; 11.5 mL, 28.7 mmol), and the mixture was stirred for 30 min at -78°C . To the mixture was added a suspension of 1,3,5-trioxane (2.7 g, 30 mmol) in THF (10 mL), and the resulting suspension was stirred for 30 min at -78°C then warmed up to rt gradually. The reaction was quenched by addition of water (50 mL) and extracted with Et_2O (80 mL). The organic layer was dried over Na_2SO_4 , filtered, and concentrated. The residue was purified on silica gel to give 3-cyclopropylprop-2-yn-1-ol (2.61 g, 81%) as a colorless oil.

Step 2: 3-Cyclopropylprop-2-yn-1-yl methanesulfonate Int-54

[00226] To a solution of 3-cyclopropylprop-2-yn-1-ol (300 mg, 3.1 mmol) in DCM (15 mL) was added TEA (0.65 mL, 4.7 mmol) followed by methanesulfonyl chloride (0.25 mL, 3.3 mmol) at 0°C under an atmosphere of argon. The mixture was stirred for 2 h and then quenched by the addition of water (80 mL) followed by extraction with DCM (100 mL). The DCM layer was washed with brine, dried over Na_2SO_4 , filtered, and concentrated. The residue was purified on silica gel to afford 3-cyclopropylprop-2-yn-1-yl methanesulfonate (265 mg, 49%) as a colorless oil. ^1H NMR (CDCl_3) δ 4.82 (d, $J = 2.1$ Hz, 2H), 3.10 (s, 3H), 1.34 – 1.24 (m, 1H), 0.87 – 0.81 (m, 2H), 0.76 – 0.70 (m, 2H).

Example 30: 4,4-Dimethylpent-2-yn-1-yl 4-methylbenzenesulfonate Int-55



Step 1: 4,4-Dimethylpent-2-yn-1-ol

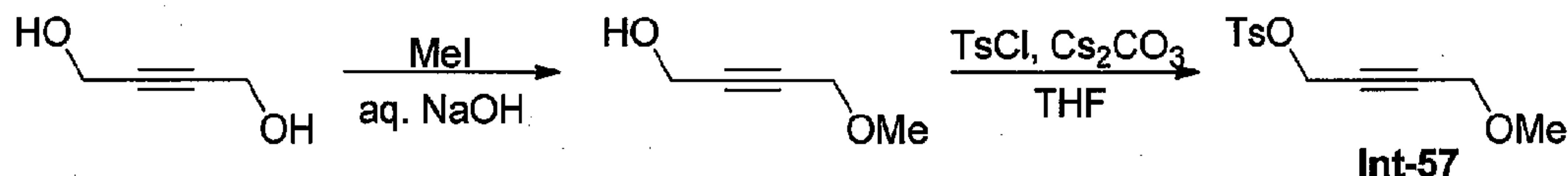
[00227] 3,3-Dimethyl-1-butyne (3.0 mL, 25 mmol) was dissolved in THF (86 mL) and cooled to -78 °C. *n*-Butyllithium (2.5 M solution in hexanes; 11.1 mL, 27.6 mmol) was added dropwise and then the solution was allowed to stir for 30 min. Formaldehyde (0.80 mL, 29 mmol) was then added and stirred at -78 °C for 30 min. It was then allowed to warm to rt and stir for 30 min. The reaction mixture was poured into a saturated aqueous solution of NH_4Cl and then extracted ether (2x). The combined organic layers were dried over MgSO_4 , filtered, and concentrated to give 4,4-dimethylpent-2-yn-1-ol (2.8 g, 98%).

Step 2: 4,4-Dimethylpent-2-yn-1-yl 4-methylbenzenesulfonate Int-55

[00228] To a RBF was added 4,4-dimethylpent-2-yn-1-ol (0.28 g, 2.5 mmol), *p*-toluenesulfonyl chloride (0.57 g, 3.0 mmol), and THF (20 mL). The resulting reaction mixture was stirred at 0 °C and sodium *tert*-butoxide (0.72 g, 7.5 mmol) was added. The mixture was then stirred at 0 °C for 30 min followed by the addition of saturated NaHCO_3 (10 mL) and water (10 mL). The mixture was extracted with EtOAc (2x). The combined organic layers were dried over MgSO_4 , filtered, and concentrated to give the crude product which was purified on silica gel to give 4,4-dimethylpent-2-yn-1-yl 4-methylbenzenesulfonate (0.37 g, 56%). ^1H NMR (CDCl_3) δ 7.79 (d, J = 8.3 Hz, 2H), 7.32 (d, J = 8.0 Hz, 2H), 4.70 (s, 2H), 2.45 (s, 3H), 1.20 (s, 9H).

[00229] The compound listed in the table below was prepared in an analogous fashion to that described above starting from the listed starting material:

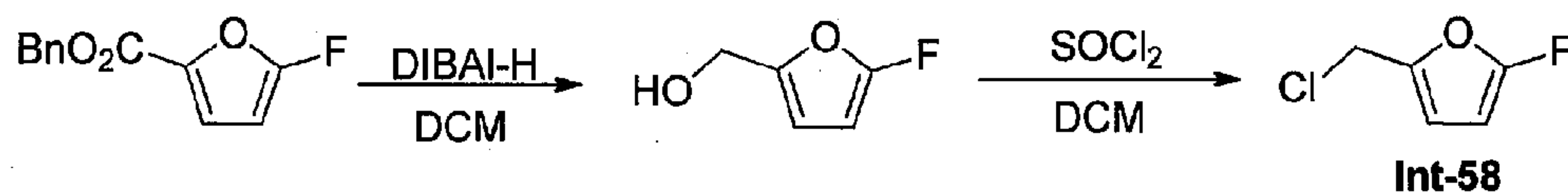
Starting material	Compound Name / No.	Characterization Data
	5-Methylhex-2-yn-1-yl 4-methylbenzenesulfonate / Int-56	^1H NMR (CDCl_3) δ 7.83 (d, J = 8.3 Hz, 2H), 7.36 (d, J = 8.0 Hz, 2H), 4.73 (s, 2H), 2.46 (s, 3H), 2.05 – 1.93 (m, 2H), 1.77 – 1.61 (m, 1H), 0.91 (d, J = 6.4 Hz, 6H).

Example 31: 4-Methoxybut-2-yn-1-yl 4-methylbenzenesulfonate Int-57**Step 1: 4-Methoxybut-2-yn-1-ol**

[00230] To a RBF was added 2-butyne-1,4-diol (30 g, 350 mmol) and 50% aq NaOH (5.6 mL). The resulting reaction mixture was heated to 60 °C and methyl iodide (4.3 mL, 70 mmol) was added dropwise. After addition was complete, the mixture was stirred at 60 °C for 3 h. The mixture was then distilled to isolate 4-methoxybut-2-yn-1-ol (0.53 g, 8%). ¹H NMR (CDCl₃) δ 4.38 – 4.31 (m, 2H), 4.16 (t, *J* = 1.8 Hz, 2H), 3.41 (s, 3H), 1.88 – 1.79 (m, 1H).

Step 2: 4-Methoxybut-2-yn-1-yl 4-methylbenzenesulfonate Int-57

[00231] To a RBF were added 4-methoxybut-2-yn-1-ol (0.50 g, 5.0 mmol), p-toluenesulfonyl chloride (2.0 g, 11 mmol), THF (12 mL), and cesium carbonate (8.1 g, 25 mmol). The resulting reaction mixture was stirred at rt for 18 h. The mixture was then concentrated and water was added to the crude residue. The mixture was extracted with EtOAc (2x). The combined organic extracts were washed with brine, dried over MgSO₄, and concentrated. The crude product was purified on silica gel to give 4-methoxybut-2-yn-1-yl 4-methylbenzenesulfonate (0.11 g, 9%). ¹H NMR (CDCl₃) δ 7.87 – 7.78 (m, 2H), 7.36 (dd, *J* = 8.5, 0.6 Hz, 2H), 4.76 (t, *J* = 1.8 Hz, 2H), 4.01 (t, *J* = 1.8 Hz, 2H), 3.29 (s, 3H), 2.46 (s, 3H).

Example 32: 2-(Chloromethyl)-5-fluorofuran Int-58**Step 1: (5-Fluoro-2-furyl)methanol**

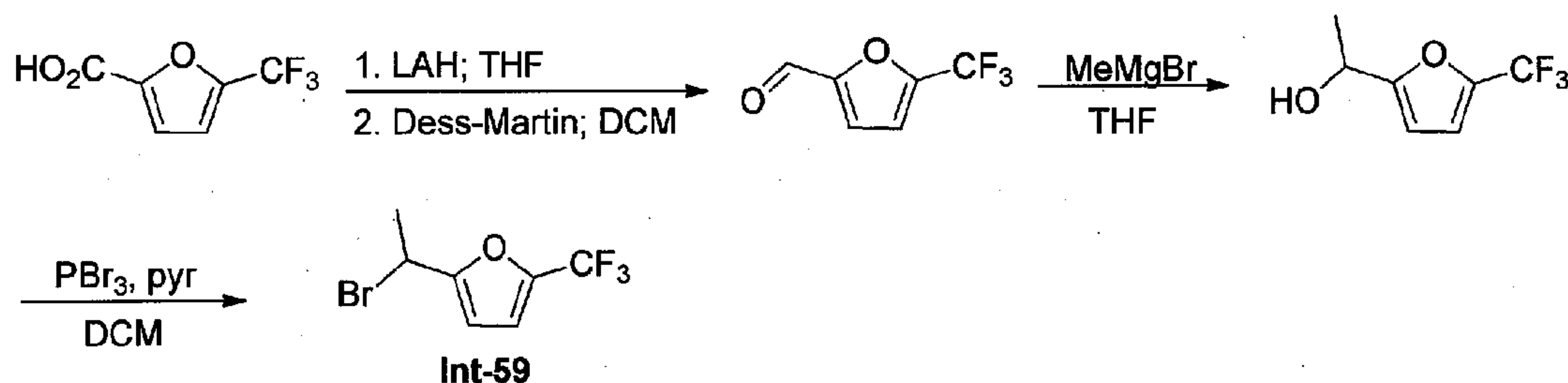
[00232] To a RBF was added benzyl 5-fluoro-2-furoate (0.40 g, 1.8 mmol; for prep see: Song, R.; Lin, W.; Jiang, Q. *Tetrahedron Lett.* **2011**, 52, 4965-4966.) and DCM (20 mL). The resulting reaction mixture was stirred at 0 °C and DIBAL-H (1.0 M solution in DCM; 4.6 mL, 4.6 mmol) was added dropwise. The mixture was stirred at 0 °C for 10 min and then warmed to rt and stirred for 30 min. The mixture was subsequently cooled to 0 °C and 1M HCl was added to quench the reaction. The mixture was extracted with DCM (2x). The combined organic extracts were washed with brine, dried over MgSO₄, and

concentrated. The crude product was purified on silica gel to afford (5-fluoro-2-furyl)methanol (0.24 g, 100%). ^1H NMR (CDCl_3) δ 7.42 (s, 1H), 7.41 (d, $J = 1.4$ Hz, 1H), 7.31 (s, 1H), 4.78 – 4.70 (s, 2H).

Step 2: 2-(Chloromethyl)-5-fluorofuran Int-58

[00233] To a solution of (5-fluoro-2-furyl)methanol (0.20 g, 1.7 mmol) and TEA (0.24 mL, 1.7 mmol) in DCM (23 mL) at 0 °C was added thionyl chloride (0.15 mL, 2.1 mmol) dropwise. The mixture was stirred for 1 h at 0 °C then at rt for 1 h. Water (20 mL) was added to quench and the organic layer was separated, dried over MgSO_4 , filtered and concentrated to give 2-chloro-5-(1-chloroethyl)furan (0.55 g, 100%). The product was used crude in the next reaction without purification (see Example 92).

Example 33: 2-(1-Bromoethyl)-5-(trifluoromethyl)furan Int-59



Step 1: 5-(Trifluoromethyl)-2-furaldehyde

[00234] To a round bottomed flask was added 5-(trifluoromethyl)-2-furoic acid (2.5 g, 14 mmol) and THF (50 mL). The solution was cooled to 0 °C. A 2.0 M of lithium aluminium hydride in THF (9.0 mL, 18 mmol) was then added slowly and the resulting mixture was stirred at rt overnight. Water (1 mL) was added slowly to quench the reaction mixture. Na_2SO_4 solid was added and the mixture stirred at rt for 1 h. The mixture was filtered through a pad of celite and the filtrate concentrated. The alcohol intermediate was then dissolved in DCM (50 mL). Dess-Martin periodinane (7.1 g, 16.7 mmol) was added and the resulting reaction mixture was stirred at rt for 2 h. The reaction was then quenched by the addition of saturated $\text{Na}_2\text{S}_2\text{O}_3$, and extracted with DCM (3X). The combined organic layers were then washed with brine, dried over Na_2SO_4 , filtered and concentrated. The crude product was purified on silica gel to provide 5-(trifluoromethyl)-2-furaldehyde (0.80 g, 38%).

Step 2: 1-[5-(Trifluoromethyl)-2-furyl]ethanol

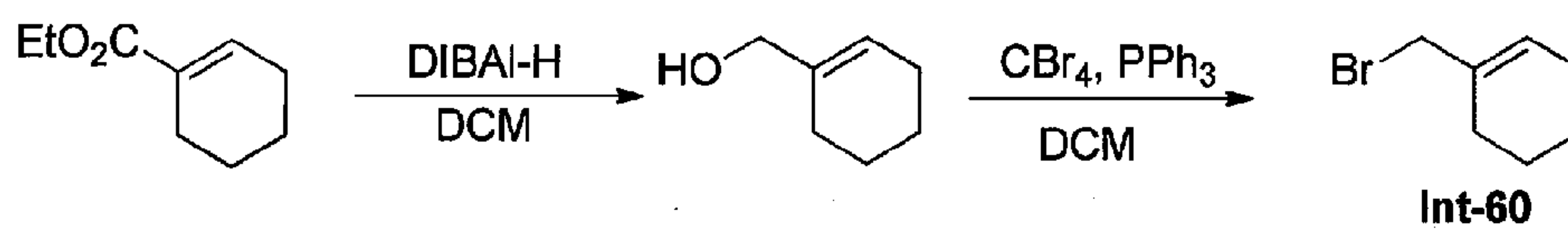
[00235] Into a RBF was added 5-(trifluoromethyl)-2-furaldehyde (0.80 g, 4.9 mmol) dissolved in THF (12 mL). The solution was cooled to 0 °C and a 3.0 M solution of methylmagnesium bromide in ether (3.25 mL, 9.75 mmol) was added dropwise over 30 min. The resulting mixture was then stirred at 0 °C for 1 h. The reaction was quenched with a saturated solution of NH_4Cl and extracted with EtOAc (3X). The

combined organic layers were then washed with brine, dried over Na_2SO_4 , filtered and concentrated to give 1-[5-(trifluoromethyl)-2-furyl]ethanol (0.92 g, 100%).

Step 3: 2-(1-Bromoethyl)-5-(trifluoromethyl)furan Int-59

[00236] To a solution of 1-[5-(trifluoromethyl)-2-furyl]ethanol (0.27 g, 1.5 mmol) and pyridine (0.024 mL, 0.30 mmol) in DCM (5 mL) at -75°C was added phosphorus tribromide (0.14 mL, 1.5 mmol) dropwise. The mixture was stirred for 10 min and then allowed to stand in a freezer (-25°C) overnight. The mixture was then cooled in an ice bath and water (3 mL) was added slowly. The mixture was then partitioned into DCM and water. The separated organic layer was washed successively with water, 1M NaHCO_3 and brine. It was then dried over Na_2SO_4 , filtered, and concentrated to yield 2-(1-bromoethyl)-5-(trifluoromethyl)furan (0.36 g, 100%). ^1H NMR (CDCl_3) δ 6.73 (dd, $J = 3.3, 1.0$ Hz, 1H), 6.40 (d, $J = 3.4$ Hz, 1H), 5.18 (q, $J = 7.0$ Hz, 1H), 2.05 (d, $J = 7.0$ Hz, 3H).

Example 34: 1-(Bromomethyl)cyclohexene Int-60



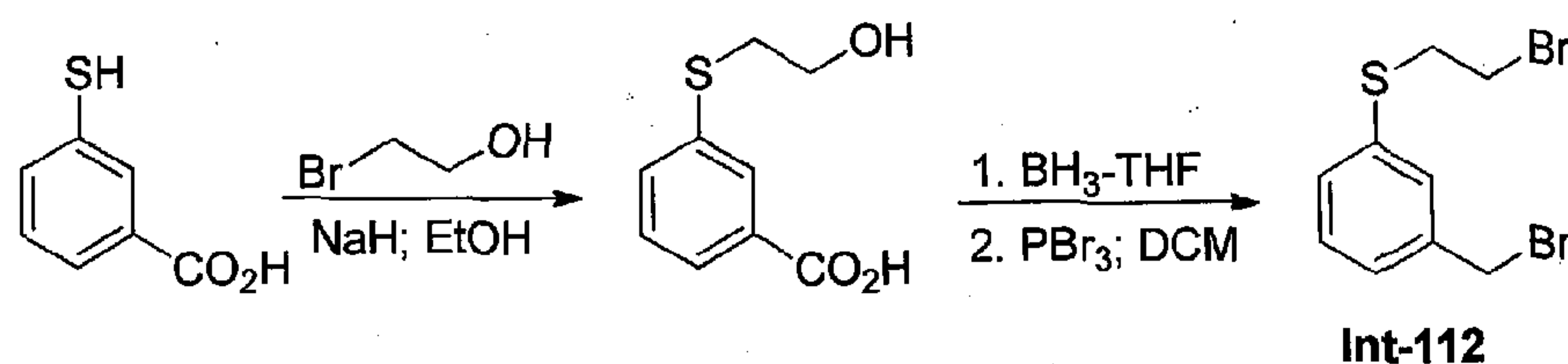
Step 1: Cyclohex-1-en-1-ylmethanol

[00237] To a solution of methyl 1-cyclohexene-1-carboxylate (1.50 mL, 11.0 mmol) in DCM (30 mL) was added diisobutylaluminum hydride (1M solution in toluene; 25 mL, 25 mmol) at -78°C and the mixture was stirred for 1 h. TLC (3:1 hex:EtOAc) showed that the reaction was then complete. The mixture was quenched with methanol (10 mL) and 1N NaOH (10 mL) and then was allowed to stir at rt for 2.5 h. The mixture was extracted with DCM (3x). The combined organic layers were washed with brine, dried over MgSO_4 , filtered and concentrated to give cyclohex-1-en-1-ylmethanol (1.3 g, 100%).

Step 2: 1-(Bromomethyl)cyclohexene Int-60

[00238] Triphenylphosphine (3.2 g, 12.3 mmol) was added to a solution of cyclohex-1-en-1-ylmethanol (1.25 g, 11.1 mmol) and carbon tetrabromide (4.4 g, 13.4 mmol) in DCM (25 mL) at 0°C . The mixture was then allowed to slowly warm to rt and stir overnight. After 16 h the mixture was concentrated and purified on silica gel. The product is very nonpolar and coelutes with carbon tribromide. Carbon tribromide was removed under reduced pressure to yield 1-(bromomethyl)cyclohexene (1.8 g, 92%). ^1H NMR (CDCl_3) δ 5.90 (s, 1H), 3.97 (s, 2H), 2.18 – 2.11 (m, 2H), 2.10 – 2.02 (m, 2H), 1.75 – 1.65 (m, 2H), 1.65 – 1.52 (m, 2H).

Example 35: 1-[(2-Bromoethyl)sulfanyl]-3-(bromomethyl)benzene2-bromoethyl 3-(bromomethyl)phenyl sulfide Int-112



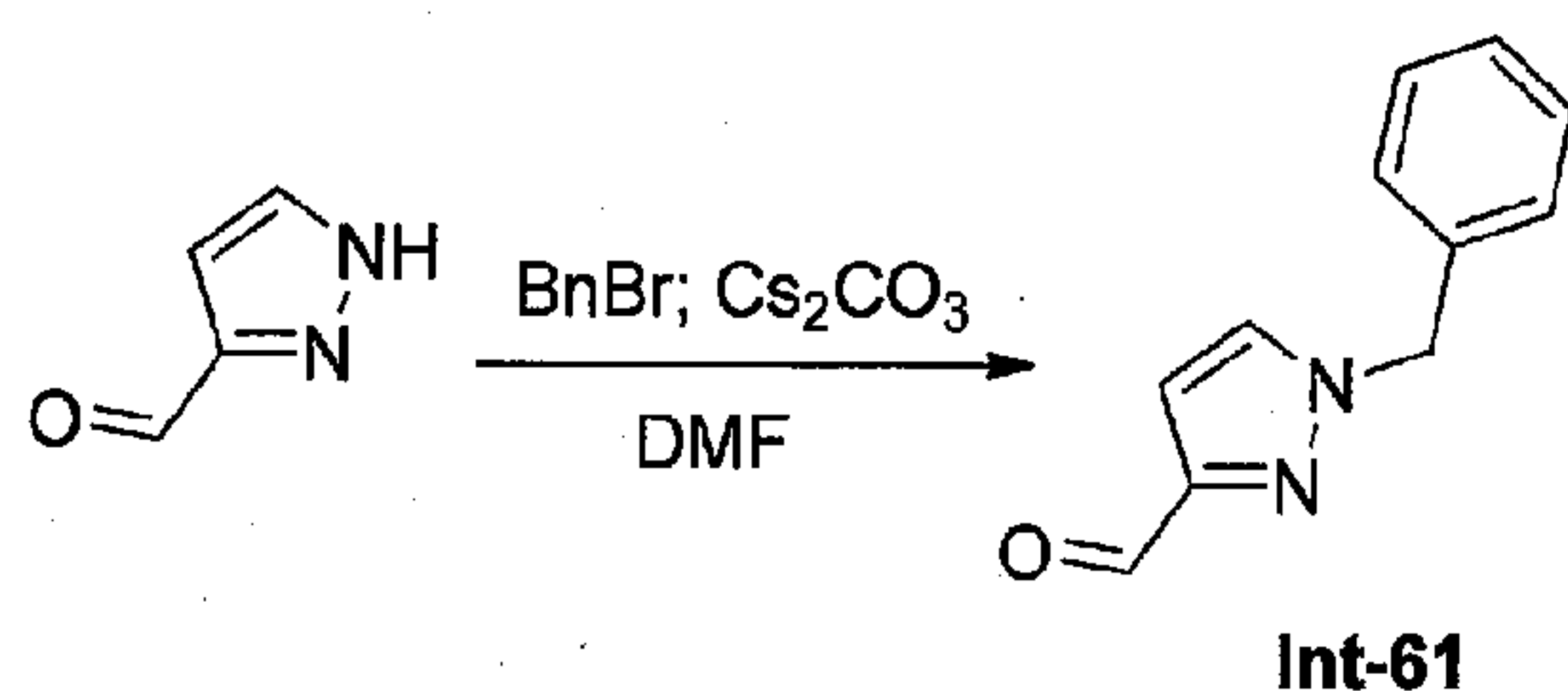
Step 1: 3-[(2-Hydroxyethyl)sulfanyl]benzoic acid

[00239] Sodium hydride (0.45 g, 19 mmol) was added slowly to a solution of m-mercaptobenzoic acid (0.97 g, 6.3 mmol) in ethanol (25.0 mL) at rt. Then, 2-bromoethanol (0.79 g, 6.3 mmol) was added to this solution at rt and the resulting mixture was allowed to stir for 2 h at rt. Acetic acid (5 mL) was added to the solution and the mixture was concentrated. Water (30 mL) was added to dissolve the crude residue and the mixture was extracted with DCM (2x). The combined organic layers were dried over MgSO_4 , filtered and concentrated to provide 3-[(2-hydroxyethyl)sulfanyl]benzoic acid (1.2 g, 94%).

Step 2: 1-[(2-Bromoethyl)sulfanyl]-3-(bromomethyl)benzene2-bromoethyl 3-(bromomethyl)phenyl sulfide Int-112

[00240] Borane-THF complex (1.04 mL, 10.6 mmol) was added dropwise to a solution of 3-[(2-hydroxyethyl)sulfanyl]benzoic acid (1.05 g, 5.3 mmol) in THF (30 mL). The reaction was allowed to stir at rt for 6 h. The reaction was then diluted with ethyl acetate (80 mL) and the solution was washed with water (2x). The organic layer was dried over MgSO_4 , filtered, and concentrated to give the crude alcohol intermediate. This intermediate was then stirred as a solution of 2-[(3-(hydroxymethyl)phenyl)sulfanyl]ethanol (0.60 g, 3.3 mmol) in DCM (20 mL) at rt. To this mixture was added phosphorus tribromide (1.8 g, 6.5 mmol) dropwise. The mixture was stirred for 1 hr at rt and then diluted with DCM (50 mL). The mixture was washed with water. The organic layer was then dried over Na_2SO_4 , filtered, and concentrated. The crude product was purified on silica gel to yield 1-[(2-bromoethyl)sulfanyl]-3-(bromomethyl)benzene2-bromoethyl 3-(bromomethyl)phenyl sulfide (0.79 g, 78%). ^1H NMR (CDCl_3) δ 7.40 (s, 1H), 7.23-7.31 (m, 3H), 4.45 (s, 2H), 3.40-3.50 (m, 2H), 3.25-3.35 (m, 2H).

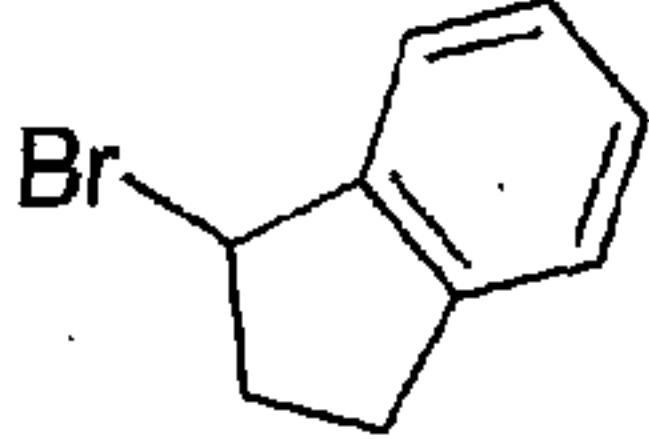
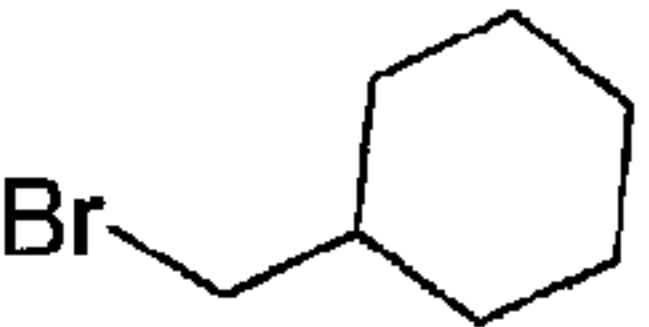
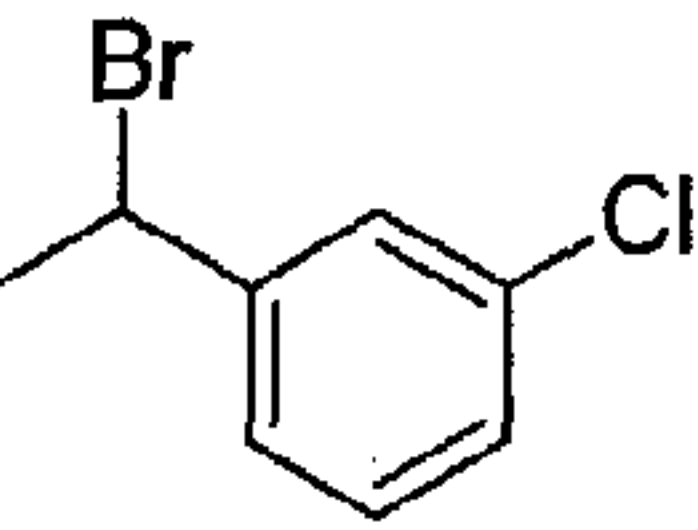
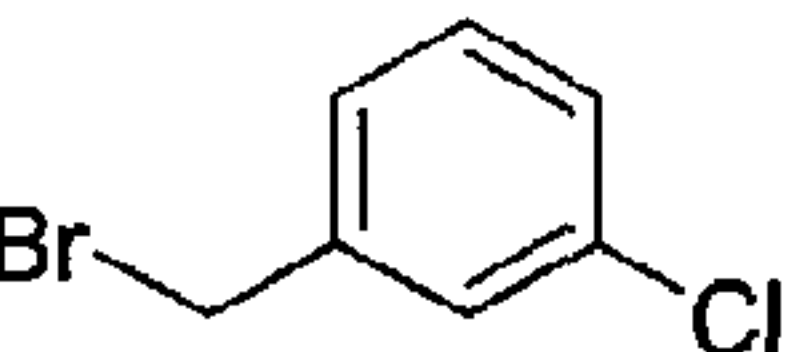
Example 36: 1-Benzyl-1H-pyrazole-3-carbaldehyde Int-61

**Step 1: 1-Benzyl-1H-pyrazole-3-carbaldehyde Int-61**

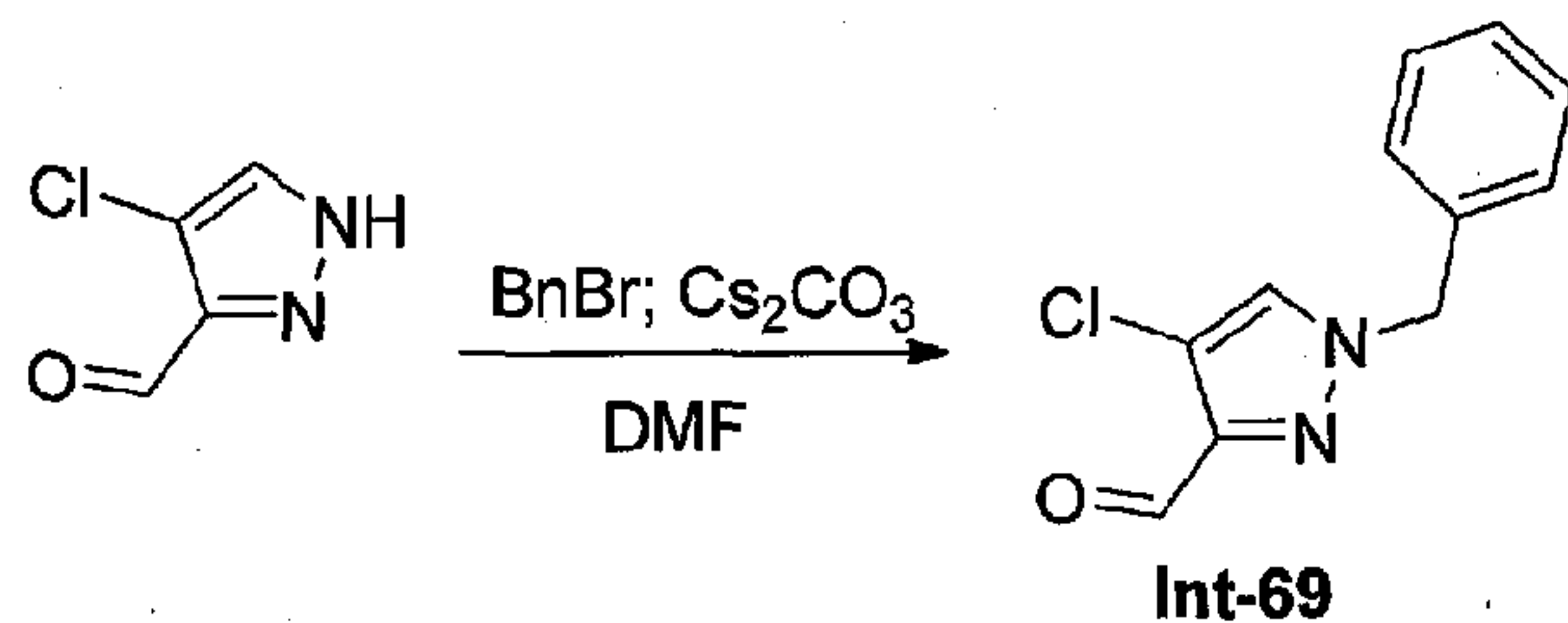
[00241] A 100 mL round bottomed flask was charged with pyrazol-3-carbaldehyde (250 mg, 2.60 mmol), Cs_2CO_3 (2.12 g, 6.50 mmol), and DMF (10 mL). To the suspension was added benzyl bromide (325 μL , 2.7 mmol), and the reaction was stirred for 1 h. The reaction mixture was poured into water (50 mL) and the mixture was extracted with EtOAc (50 mLx3). The combined organic layers were washed with brine, dried over Na_2SO_4 , filtered, and concentrated in vacuo. The residue was purified on silica gel to provide 1-benzyl-1H-pyrazole-3-carbaldehyde (372 mg, 77%). ^1H NMR (CDCl_3) δ 10.01 – 9.98 (m, 1H), 7.42 (d, $J = 2.3$ Hz, 1H), 7.41 – 7.32 (m, 3H), 7.28 – 7.23 (m, 2H), 6.82 (d, $J = 2.4$ Hz, 1H), 5.40 (s, 2H).

[00242] The compounds listed in the table below were prepared in a method similar to that described above starting from the listed starting materials:

Starting material	Compound Name / No.	Characterization Data
	1-(1-Phenylethyl)-1H-pyrazole-3-carbaldehyde / Int-62	LCMS (FA): $m/z = 201$ (M+H).
	1-isoPropyl-1H-pyrazole-3-carbaldehyde / Int-63	^1H NMR (CDCl_3) δ 9.97 (s, 1H), 7.47 (d, $J = 2.3$ Hz, 1H), 6.80 (d, $J = 2.3$ Hz, 1H), 4.66 – 4.45 (m, 1H), 1.56 (d, $J = 6.7$ Hz, 6H).
	1-isoButyl-1H-pyrazole-3-carbaldehyde / Int-	^1H NMR (CDCl_3) δ 9.97 (s, 1H), 7.41 (d, $J = 2.4$ Hz, 1H), 6.80 (d, $J = 2.4$ Hz, 1H), 4.01 (d, $J = 7.3$ Hz, 2H), 2.34

	64	- 2.16 (m, 1H), 0.94 (d, $J = 6.7$ Hz, 6H).
 Arp, F.U. et al. <i>J. Am. Chem. Soc.</i> 2005 , 127, 10482-10483.	1-(2,3-Dihydro-1H-inden-1-yl)-1H-pyrazole-3-carbaldehyde / Int-65	LCMS (FA): $m/z = 213$ (M+H).
	1-(Cyclohexylmethyl)-1H-pyrazole-3-carbaldehyde / Int-66	LCMS (FA): $m/z = 193$ (M+H).
 Int-1	1-[1-(3-Chlorophenyl)ethyl]-1H-pyrazole-3-carbaldehyde / Int-67	LCMS (FA): $m/z = 235$ (M+H).
	1-(3-Chlorobenzyl)-1H-pyrazole-3-carbaldehyde / Int-68	LCMS (FA): $m/z = 221$ (M+H).

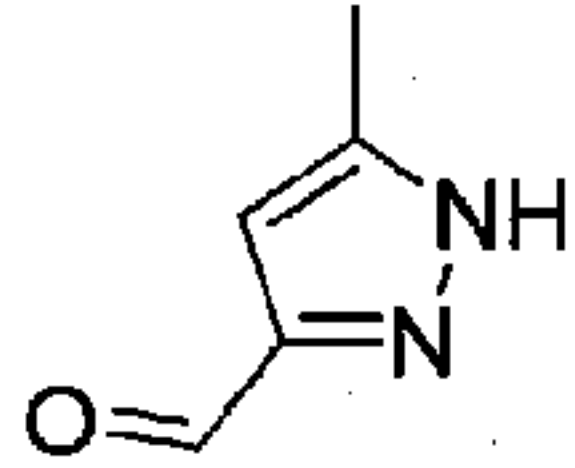
Example 37: 1-Benzyl-4-chloro-1H-pyrazole-3-carbaldehyde Int-69



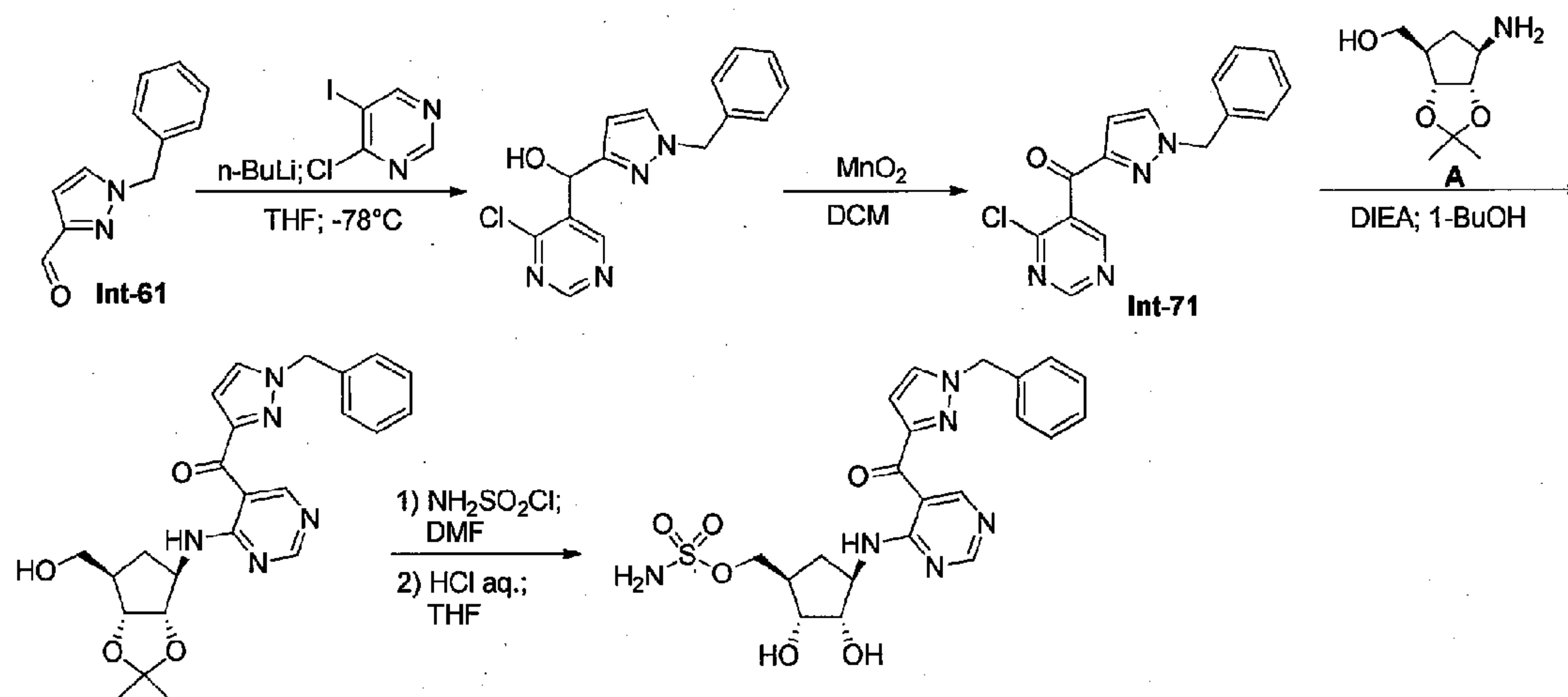
Step 1: 1-Benzyl-4-chloro-1H-pyrazole-3-carbaldehyde Int-69

[00243] To a solution of 4-chloro-3-formylpyrazole (500 mg, 3.8 mmol) in DMF (20 mL) was added Cs_2CO_3 (3.1 g, 9.6 mmol) followed by benzyl bromide (0.50 mL, 4.2 mmol) at rt, and the mixture was stirred for 1 h. The reaction was quenched by addition of water (100 mL) and extracted with Et_2O (100 mLx3). The combined organic layers were dried over Na_2SO_4 , filtered, and concentrated. The residue was purified on silica gel to afford 1-benzyl-4-chloro-1H-pyrazole-3-carbaldehyde (570 mg, 67%). ^1H NMR (DMSO) δ 9.87 (d, J = 0.6 Hz, 1H), 8.35 (d, J = 0.5 Hz, 1H), 7.41 – 7.30 (m, 5H), 5.44 (s, 2H).

[00244] The compound listed in the table below was prepared in an analogous fashion to that described above starting from the listed starting material:

Starting material	Compound Name / No.	LCMS Data
	1-Benzyl-5-methyl-1H-pyrazole-3-carbaldehyde / Int-70	LCMS (FA): m/z = 201.1 (M+H).

Example 38: [(1R,2R,3S,4R)-4-({5-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate I-142



Step 1: (1-Benzyl-1H-pyrazol-3-yl)(4-chloropyrimidin-5-yl)methanol

[00245] 4-Chloro-5-iodopyrimidine (300 mg, 1.25 mmol) was weighed into a 100 mL 2 necked RBF and the flask was purged with argon. This starting material was dissolved in THF (10 mL) and the solution was cooled to -78 °C. To the solution was added n-Butyllithium (2.50 M in hexane; 1.0 mL, 2.5 mmol) at -78 °C and then the mixture was stirred for 30 min. To this mixture was added dropwise a solution of 1-benzyl-1H-pyrazole-3-carbaldehyde (211 mg, 1.1 mmol) in THF (4 mL), and the resulting mixture was stirred for 30 min. The reaction was quenched by addition of saturated NH₄Cl (50 mL) and extracted with EtOAc (50 mLx4). The combined organic layers were washed with brine, dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to provide (1-benzyl-1H-pyrazol-3-yl)(4-chloropyrimidin-5-yl)methanol (304 mg, 85%) as a light yellow oil. LCMS (FA): m/z = 301.4 (M+H).

Step 2: (1-Benzyl-1H-pyrazol-3-yl)(4-chloropyrimidin-5-yl)methanone Int-71

[00246] To a solution of (1-benzyl-1H-pyrazol-3-yl)(4-chloropyrimidin-5-yl)methanol (285 mg, 0.95 mmol) in DCM (10 mL) was added manganese(IV) oxide (0.82 g, 9.5 mmol), and the mixture was stirred for 15 h at rt. The reaction was filtered through a celite pad and the residual solid was washed with DCM several times. The filtrate was concentrated in vacuo and the residue was purified on silica gel column to give (1-benzyl-1H-pyrazol-3-yl)(4-chloropyrimidin-5-yl)methanone (257 mg, 91%) as a colorless solid. LCMS (FA): m/z = 299.4 (M+H).

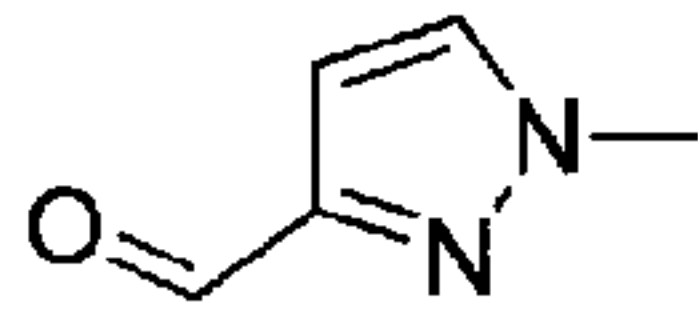
Step 3: (1-Benzyl-1H-pyrazol-3-yl)(4-[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)methanone

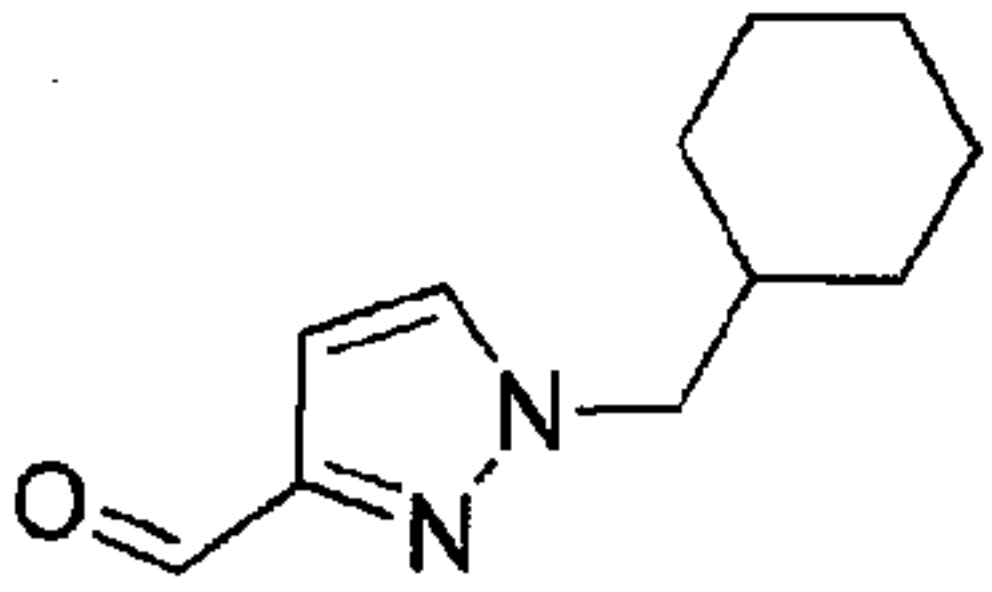
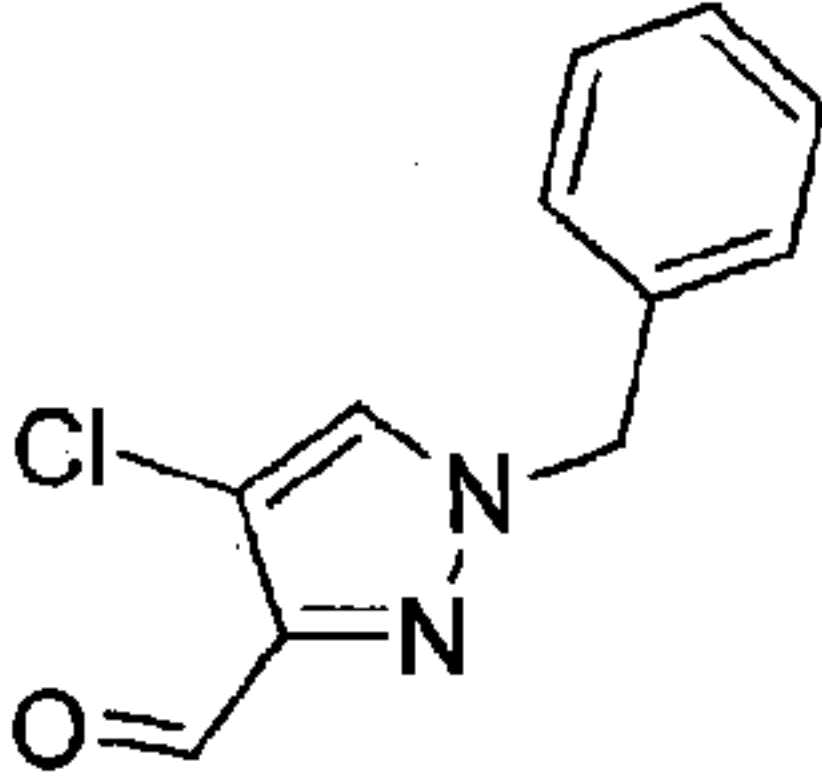
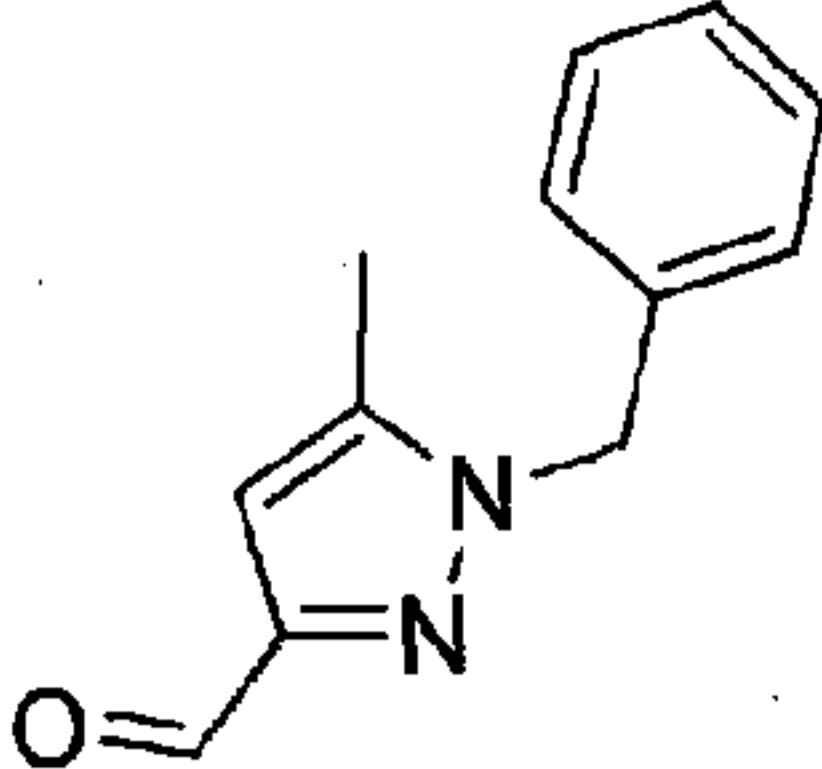
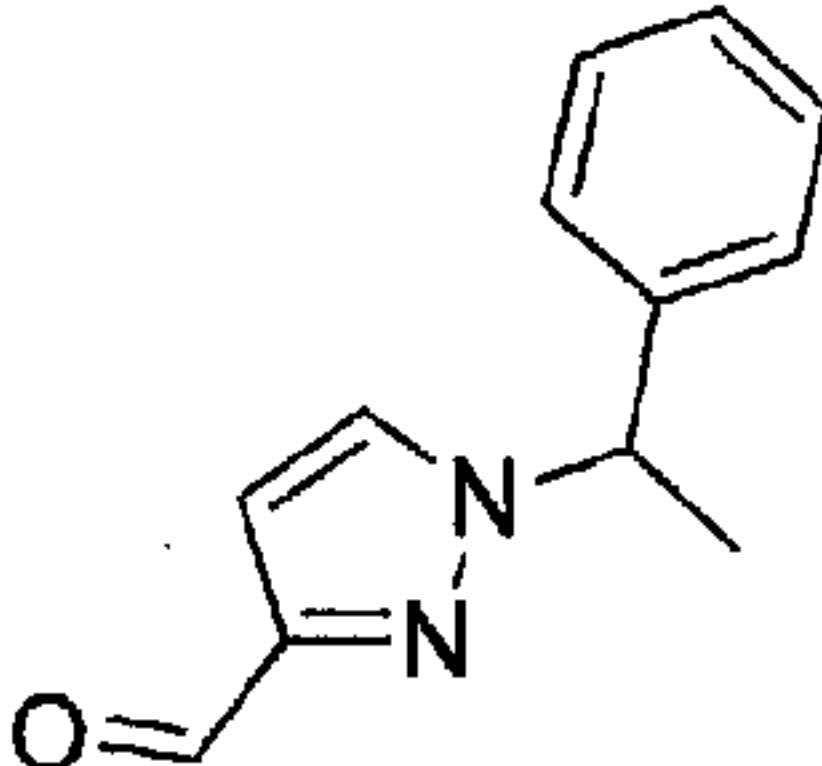
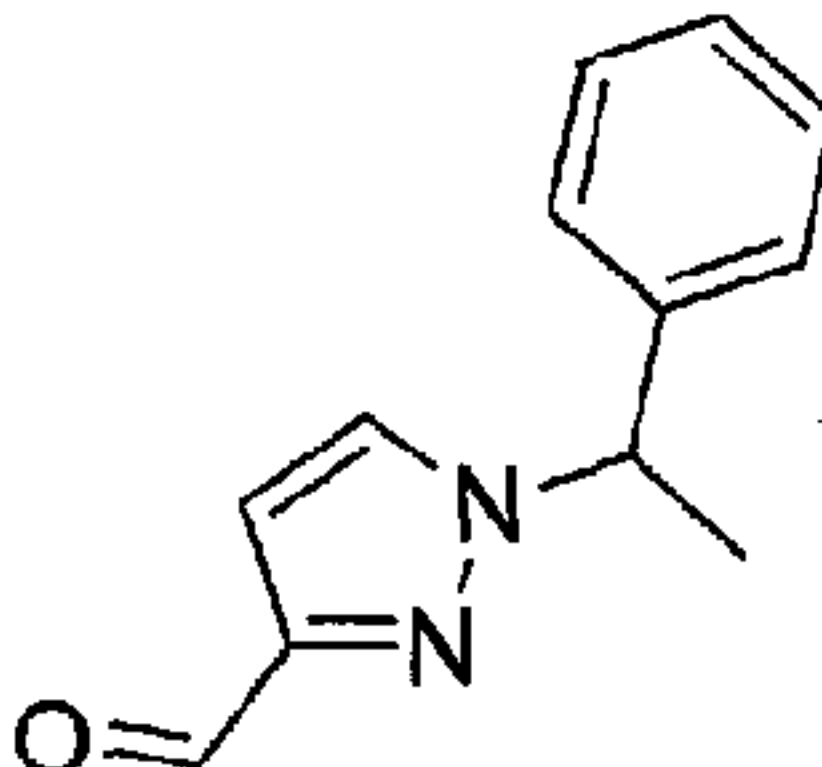
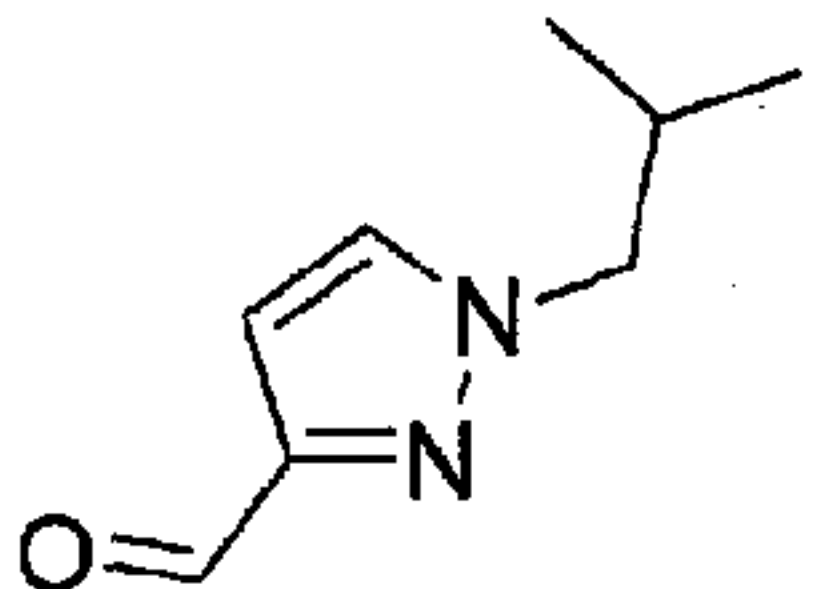
[00247] (1-Benzyl-1H-pyrazol-3-yl)(4-chloropyrimidin-5-yl)methanone (120 mg, 0.40 mmol) and (1R,2S,3R,4R)-1-amino-2,3-(isopropylidenyl)dihydroxy-4-hydroxymethyl cyclopentane (A) (90 mg, 0.48 mmol) (for synthesis of this starting material see: Claiborne, C.F. et al. PCT Application Publication WO2008/019124) were weighed into a reaction vessel. To this mixture was added 1-BuOH (2.4 mL) and DIEA (0.14 mL, 0.80 mmol), and the tube was sealed under an atmosphere of argon. The resulting mixture was stirred for 2 h at 105 °C. After cooling to rt, the reaction was concentrated in vacuo. To this residue was added water (30 mL) and the resulting mixture was extracted with EtOAc (50 mLx4). The combined organic layers were washed with brine, dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to make (1-benzyl-1H-pyrazol-3-yl)(4-[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)methanone (175 mg, 92%) as a colorless solid. LCMS (FA): m/z = 450.5 (M+H).

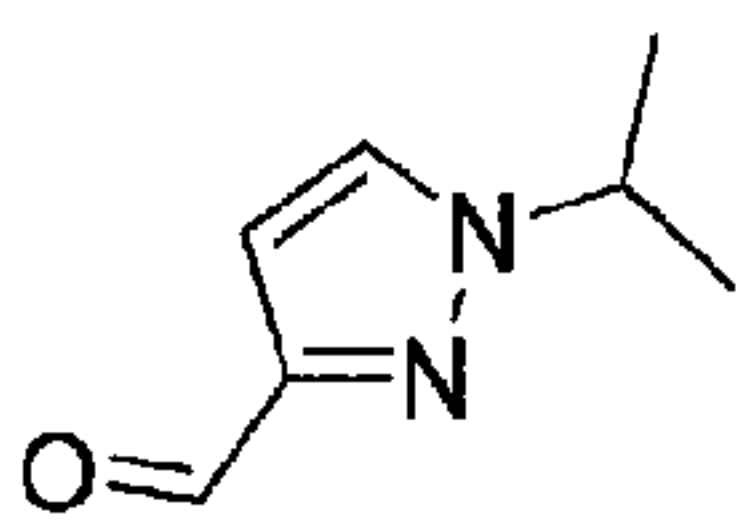
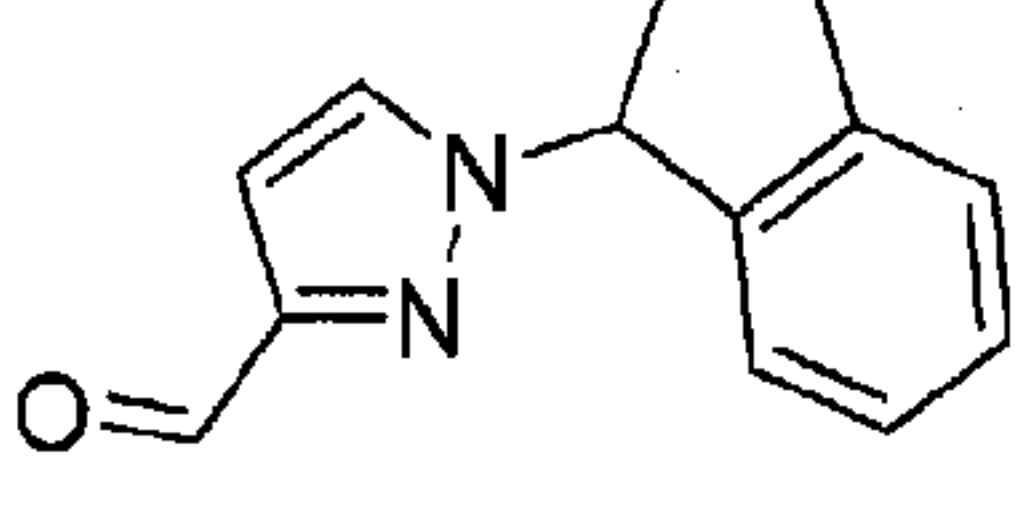
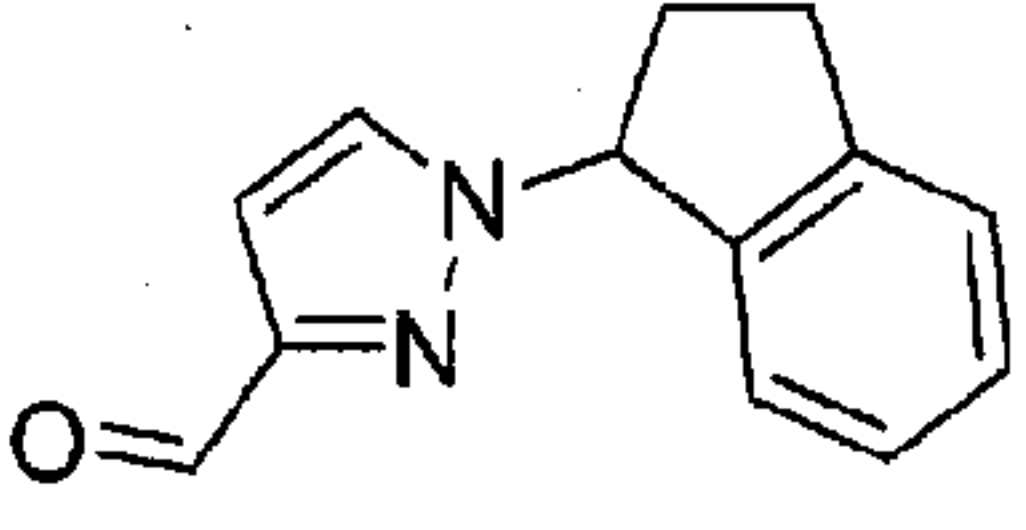
Step 4: [(1R,2R,3S,4R)-4-({5-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl)methyl sulfamate I-142

[00248] To a solution of (1-benzyl-1H-pyrazol-3-yl)(4-{{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)methanone (162 mg, 0.36 mmol) in DMF (2.0 mL) was added chlorosulfonamide (83 mg, 0.72 mmol) at rt, and the mixture was stirred for 10 min. The reaction was quenched by addition of saturated NaHCO₃ (30 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give the sulfamate intermediate [(162 mg, 81%); LCMS (FA): *m/z* = 529.5 (M+H).] which was then dissolved in THF (2.0 mL). To this solution was added water (2 mL) and conc. HCl (0.35 mL, 4.2 mmol) at rt, and the mixture was stirred for 2 h. The reaction was quenched by addition of saturated NaHCO₃ (30 mL) and extracted with EtOAc (50 mLx4). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated. The residue was purified on silica gel to give [(1R,2R,3S,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl)methyl sulfamate (128 mg, 89%). ¹H NMR (DMSO) δ 9.47 (s, 1H), 9.07 (d, *J* = 7.4 Hz, 1H), 8.61 (s, 1H), 8.07 (d, *J* = 2.4 Hz, 1H), 7.45 (s, 2H), 7.41 – 7.26 (m, 5H), 6.92 (d, *J* = 2.4 Hz, 1H), 5.51 (s, 2H), 4.92 (d, *J* = 6.0 Hz, 1H), 4.74 (d, *J* = 4.8 Hz, 1H), 4.50 – 4.41 (m, 1H), 4.07 (dd, *J* = 9.7, 6.1 Hz, 1H), 3.98 (dd, *J* = 9.7, 6.6 Hz, 1H), 3.79 (dd, *J* = 13.0, 5.8 Hz, 1H), 3.71 (dd, *J* = 9.5, 4.8 Hz, 1H), 2.38 – 2.28 (m, 1H), 2.25 – 2.15 (m, 1H), 1.15 (dt, *J* = 12.9, 8.7 Hz, 1H); LCMS (FA): *m/z* = 489.5 (M+H).

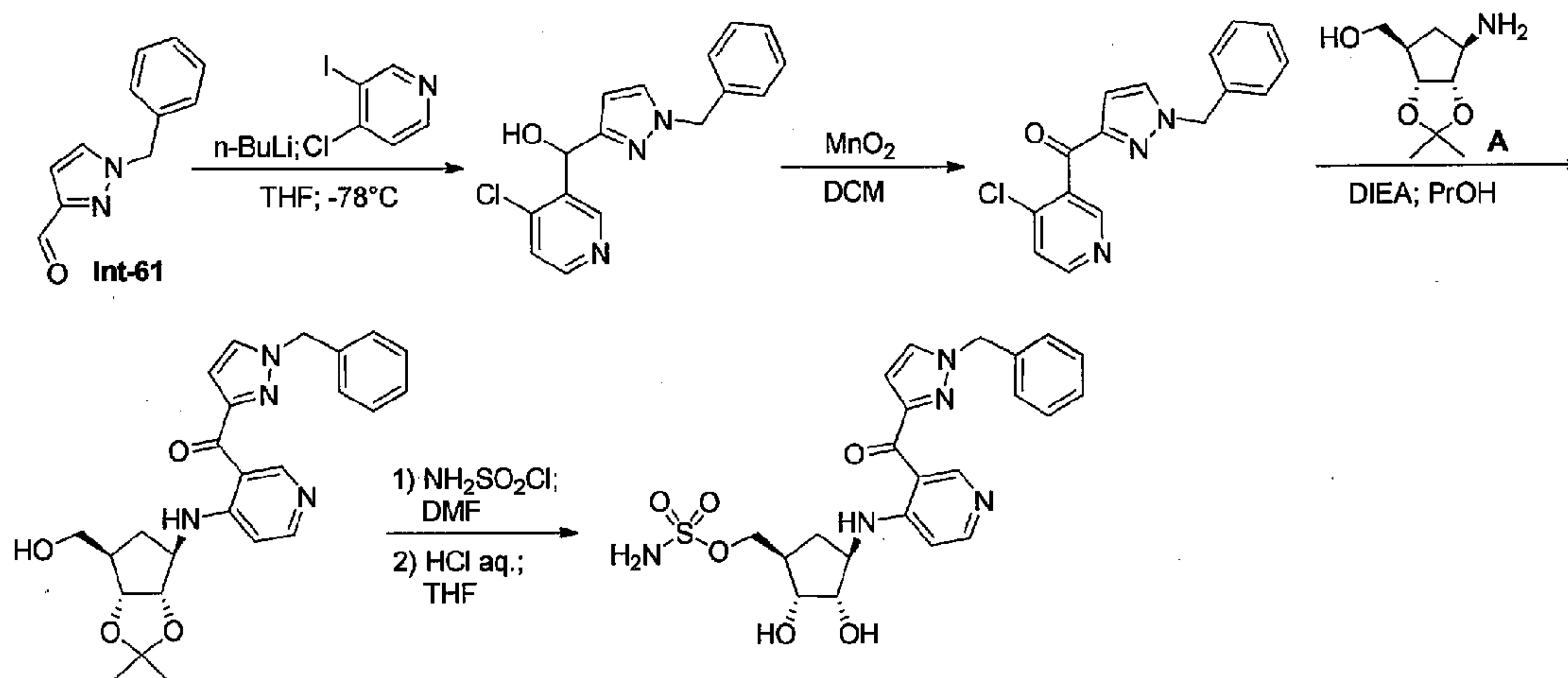
[00249] The compounds listed in the table below were prepared in an analogous fashion to that described above starting from the appropriate starting materials. The following alternative conditions could be employed in the described reaction steps. Step 2: Dess-Martin oxidation instead of manganese dioxide oxidation. Step 3: K₂CO₃/DMF; DIEA/1-propanol instead of DIEA/1-butanol. Step 5: aq. TFA and aq. H₃PO₄ instead of aq. HCl. I-351/I-361 and I-323/I-353 (benzylic centers) were made as diastereomeric mixtures and separated via HPLC (chiral column). Absolute configurations of the undefined stereocenters are unknown.

Starting material	Compound No.	LCMS Data
	I-345	LCMS (FA): <i>m/z</i> = 413.5 (M+H).

 Int-66	I-82	LCMS (FA): $m/z = 495.4$ (M+H).
 Int-69	I-139	LCMS (FA): $m/z = 523.3$ (M+H).
 Int-70	I-31	LCMS (FA): $m/z = 503.5$ (M+H).
 Int-62	I-351	LCMS (FA): $m/z = 503.5$ (M+H).
 Int-62	I-361	LCMS (FA): $m/z = 503.5$ (M+H).
 Int-64	I-173	LCMS (FA): $m/z = 455.4$ (M+H).

 Int-63	I-220	LCMS (FA): $m/z = 441.5$ (M+H).
 Int-65	I-323	LCMS (FA): $m/z = 515.5$ (M+H).
 Int-65	I-353	LCMS (FA): $m/z = 515.6$ (M+H).

Example 39: [(1R,2R,3S,4R)-4-({3-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyridin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate I-56



Step 1: (1-Benzyl-1H-pyrazol-3-yl)(4-chloropyridin-3-yl)methanol

[00250] Into a flame dried RBF with stirbar was added 4-chloro-5-iodopyrimidine (0.69 g, 2.9 mmol) dissolved in THF (15 mL). The flask was purged with argon and cooled to -78 °C. To this solution was added dropwise n-butyllithium (2.5 M in hexane; 2.3 mL, 5.8 mmol) at -78 °C and the mixture was stirred for 30 min. To this mixture was added 1-benzyl-1H-pyrazole-3-carbaldehyde (0.49 g, 2.6 mmol) dissolved in THF (6 mL) dropwise. The reaction was stirred at -78 °C for 1 h. The reaction was quenched

with a saturated solution of NH_4Cl and then extracted with EtOAc (3x). The combined organic layers were then washed with water and brine, dried over Na_2SO_4 , filtered and concentrated. The crude product was purified on silica gel to give (1-benzyl-1H-pyrazol-3-yl)(4-chloropyridin-3-yl)methanol (0.57 g, 66%). LCMS (FA): $m/z = 300.4$ (M+H).

Step 2: (1-Benzyl-1H-pyrazol-3-yl)(4-chloropyridin-3-yl)methanone

[00251] To a solution of (1-benzyl-1H-pyrazol-3-yl)(4-chloropyridin-3-yl)methanol (0.57 g, 1.9 mmol) in DCM (20 mL) was added manganese(IV) oxide (1.66 g, 19.1 mmol). The suspension was stirred for 19 h at rt. The reaction was then filtered through a celite pad and the residual solid was washed with DCM several times. The filtrate was then concentrated in vacuo and the residue was purified on silica gel to (1-benzyl-1H-pyrazol-3-yl)(4-chloropyridin-3-yl)methanone (0.53 g, 94%). LCMS (FA): $m/z = 298.3$ (M+H).

Step 3: (1-Benzyl-1H-pyrazol-3-yl)(4-[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyridin-3-yl)methanone

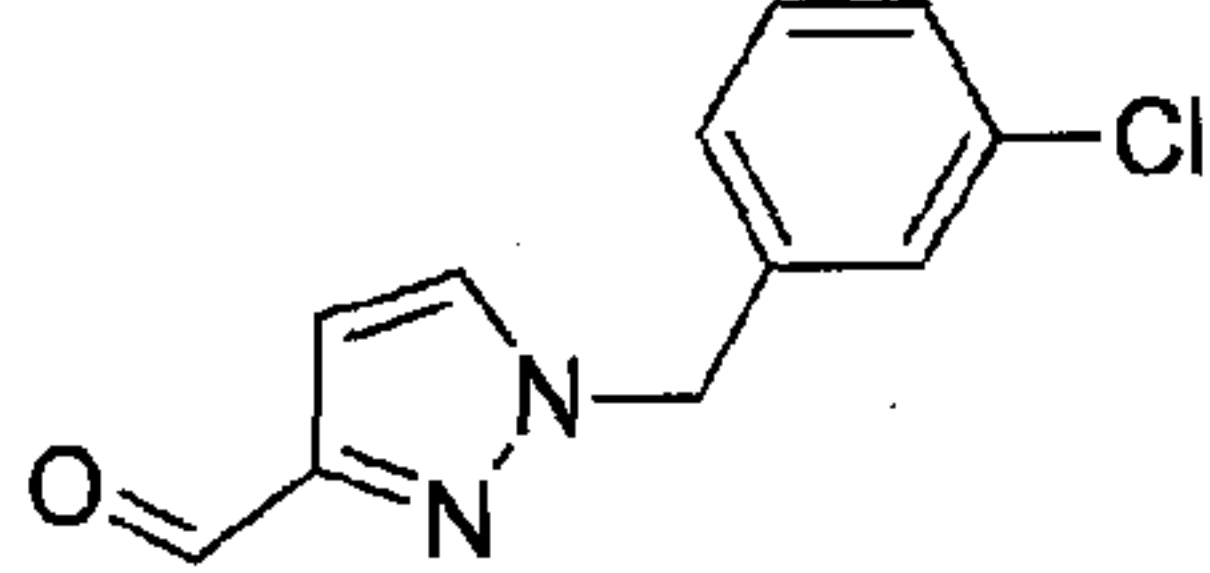
[00252] (1-Benzyl-1H-pyrazol-3-yl)(4-chloropyridin-3-yl)methanone (0.26 g, 0.87 mmol) and A (0.18 g, 0.96 mmol) were weighed into a 20 mL reaction vessel. To this mixture was added 1-propanol (5 mL) and DIEA (0.30 mL, 1.7 mmol). The resulting mixture was sealed and stirred at 110 °C for 4 h. The reaction was then heated at 160 °C in a microwave reactor for 90 min. It was then cooled to rt and quenched with water. The reaction was then extracted with EtOAc (3x). The combined organic layers were washed with brine, dried over Na_2SO_4 , filtered, and concentrated in vacuo. The crude product was purified on silica gel to afford (1-benzyl-1H-pyrazol-3-yl)(4-[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyridin-3-yl)methanone (0.17 g, 43%); LCMS (FA): $m/z = 449.5$ (M+H).

Step 4: [(1R,2R,3S,4R)-4-((3-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyridin-4-yl)amino)-2,3-dihydroxycyclopentyl]methyl sulfamate I-56

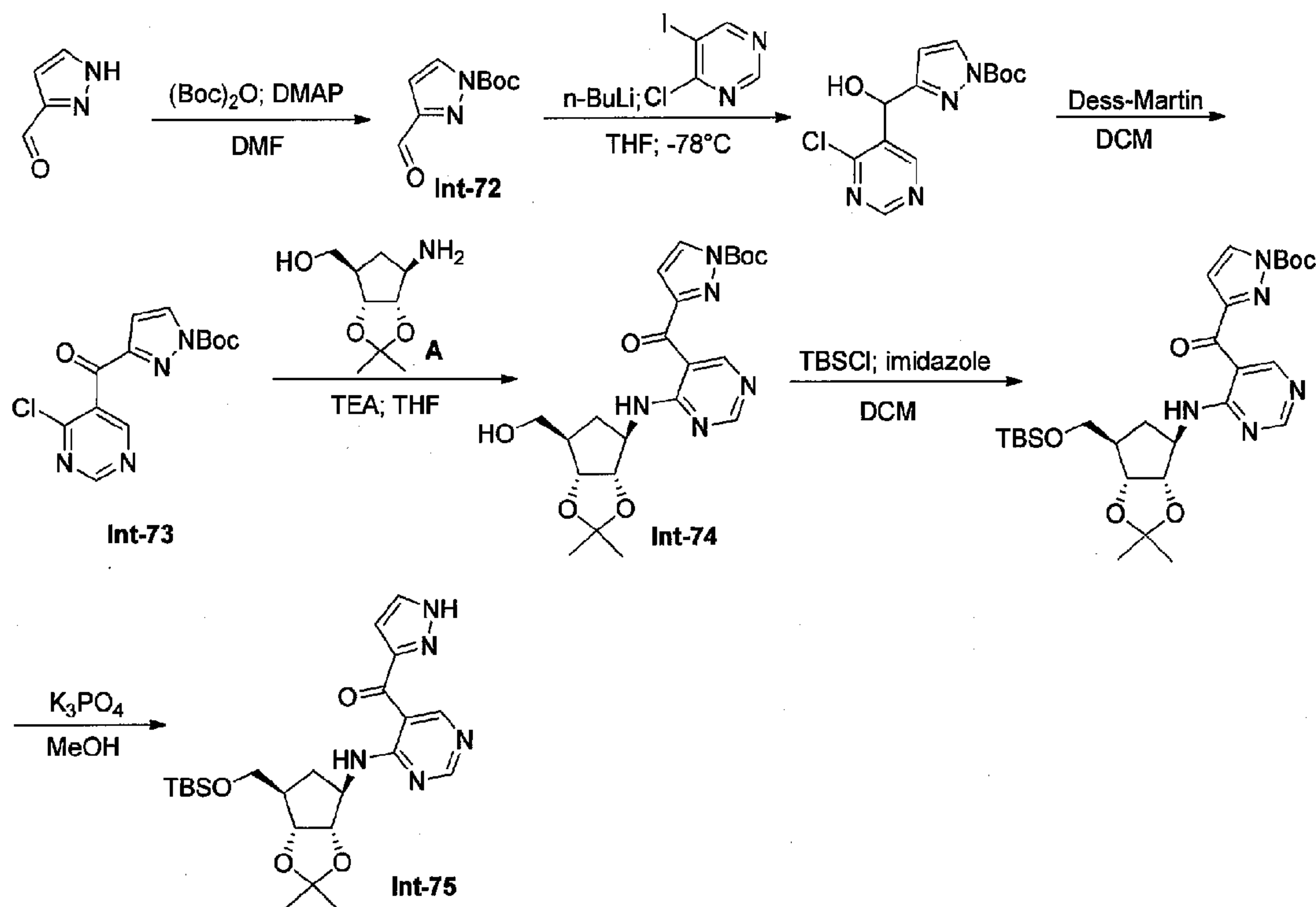
[00253] To a solution of (1-benzyl-1H-pyrazol-3-yl)(4-[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyridin-3-yl)methanone (0.17 g, 0.37 mmol) in DMF (3 mL) was added chlorosulfonamide (86 mg, 0.74 mmol) at rt, and the mixture was stirred for 2 h. The reaction was quenched by addition of a saturated solution of NaHCO_3 and diluted with water. The mixture was extracted with EtOAc (3x). The combined organic layers were dried over MgSO_4 , filtered, and concentrated. The crude sulfamate intermediate was dissolved in THF (3 mL) and water (3 mL). Concentrated HCl (0.47 mL, 5.6 mmol) was added to the solution. The reaction was stirred for 16 h at rt. The reaction was quenched by the addition of a saturated solution of NaHCO_3 and extracted with

EtOAc (4x). The combined organic layers were dried over MgSO_4 , filtered, and concentrated. The residue was purified by prep HPLC to afford [(1R,2R,3S,4R)-4-({3-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyridin-4-yl}amino)-2,3-dihydroxycyclopentyl)methyl sulfamate (0.075 g, 41%). ^1H NMR (DMSO) δ 9.34 (s, 1H), 8.91 (d, $J = 6.7$ Hz, 1H), 8.20 (d, $J = 6.1$ Hz, 1H), 8.04 (d, $J = 2.3$ Hz, 1H), 7.41 – 7.25 (m, 5H), 6.91 – 6.84 (m, 2H), 5.49 (s, 2H), 4.12 (dd, $J = 9.7, 5.3$ Hz, 1H), 4.00 (dd, $J = 9.7, 6.9$ Hz, 1H), 3.85 – 3.75 (m, 1H), 3.72 – 3.66 (m, 2H), 2.45 – 2.36 (m, 1H), 2.29 – 2.19 (m, 1H), 1.21 – 1.10 (m, 1H); LCMS (FA): $m/z = 488.4$ (M+H).

[00254] The compound listed in the table below was prepared in an analogous fashion to that described above starting from the listed starting material:

Starting material	Compound No.	LCMS Data
 Int-68	I-81	LCMS (FA): $m/z = 522.5$ (M+H).

Example 40: (4-[(3aS,4R,6R,6aR)-6-({[*tert*-Butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(1H-pyrazol-3-yl)methanone **Int-75**



Step 1: *tert*-Butyl 3-formyl-1H-pyrazole-1-carboxylate Int-72

[00255] Pyrazol-3-carbaldehyde (6.2 g, 65 mmol) and DMAP (0.79 g, 6.5 mmol) were dissolved in DMF (50.0 mL), di-*tert*-butyldicarbonate (21 g, 97 mmol) was added to this solution. It was cooled down to 0°C and TEA (4.5 mL, 32 mmol) was added. It was allowed to stir for 1h at 0°C . DCM (80 mL) was added to dilute the reaction, and it was washed with water (2x). The organic layer was concentrated and purified on silica gel to give *tert*-butyl 3-formyl-1H-pyrazole-1-carboxylate (9.1 g, 71%).

Step 2: *tert*-Butyl 3-[(4-chloropyrimidin-5-yl)(hydroxy)methyl]-1H-pyrazole-1-carboxylate

[00256] Into a flame dried RBF with stirbar was added 4-chloro-5-iodopyrimidine (12.3 g, 51 mmol) dissolved in THF (200 mL). The flask was purged with argon and cooled to -95°C . To this solution was added dropwise *n*-butyllithium (2.5 M in hexane; 43 mL, 107 mmol) at -95°C and the mixture was stirred for 10 min. To this mixture was added *tert*-butyl 3-formyl-1H-pyrazole-1-carboxylate (9.1 g, 46 mmol) dissolved in THF (30 mL) dropwise at -95°C . The reaction was stirred at -78°C for 30 min. The reaction was quenched with a solution of acetic acid (7.9 mL) in THF (15 mL) and then allowed to warm to rt. Water (80 mL) was added and the mixture extracted with EtOAc (3x). The combined organic layers were then washed with water and brine, dried over Na_2SO_4 , filtered and concentrated. The crude product was purified on silica gel to give *tert*-butyl 3-[(4-chloropyrimidin-5-yl)(hydroxy)methyl]-1H-pyrazole-1-carboxylate (10.2 g, 64%). LCMS (AA): $m/z = 311$ (M+H).

Step 3: *tert*-Butyl 3-[(4-chloropyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate Int-73

[00257] *tert*-Butyl 3-[(4-chloropyrimidin-5-yl)(hydroxy)methyl]-1H-pyrazole-1-carboxylate (1.0 g, 3.3 mmol) was dissolved in DCM (30 mL) and Dess-Martin periodinane (2.1 g, 4.9 mmol) was added to this solution. The mixture was then stirred at 40 °C for 2 h. TLC showed the reaction was done. The reaction was concentrated and purified on silica gel to provide *tert*-butyl 3-[(4-chloropyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate (0.92, 90%). LCMS (AA): $m/z = 309$ (M+H).

Step 4: *tert*-Butyl 3-[(4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate Int-74

[00258] A (1.9 g, 9.9 mmol) and [*tert*-butyl 3-[(4-chloropyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate (2.8 g, 9.0 mmol) were weighed into a 50 mL RBF with stirbar. To this mixture was added 1-butanol (5 mL) followed by addition of DIEA (3.1 mL, 18 mmol) and the resulting mixture was stirred at rt for 16 h. Water (50 mL) was then added and the mixture was extracted with EtOAc (4x). The combined organic layers were washed with brine, dried over Na₂SO₄, filtered, and concentrated in vacuo. The crude product was purified on silica gel to afford [*tert*-butyl 3-[(4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate] (2.5 g, 61%). LCMS (AA): $m/z = 460$ (M+H).

Step 5: *tert*-Butyl 3-[(4-{[(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate

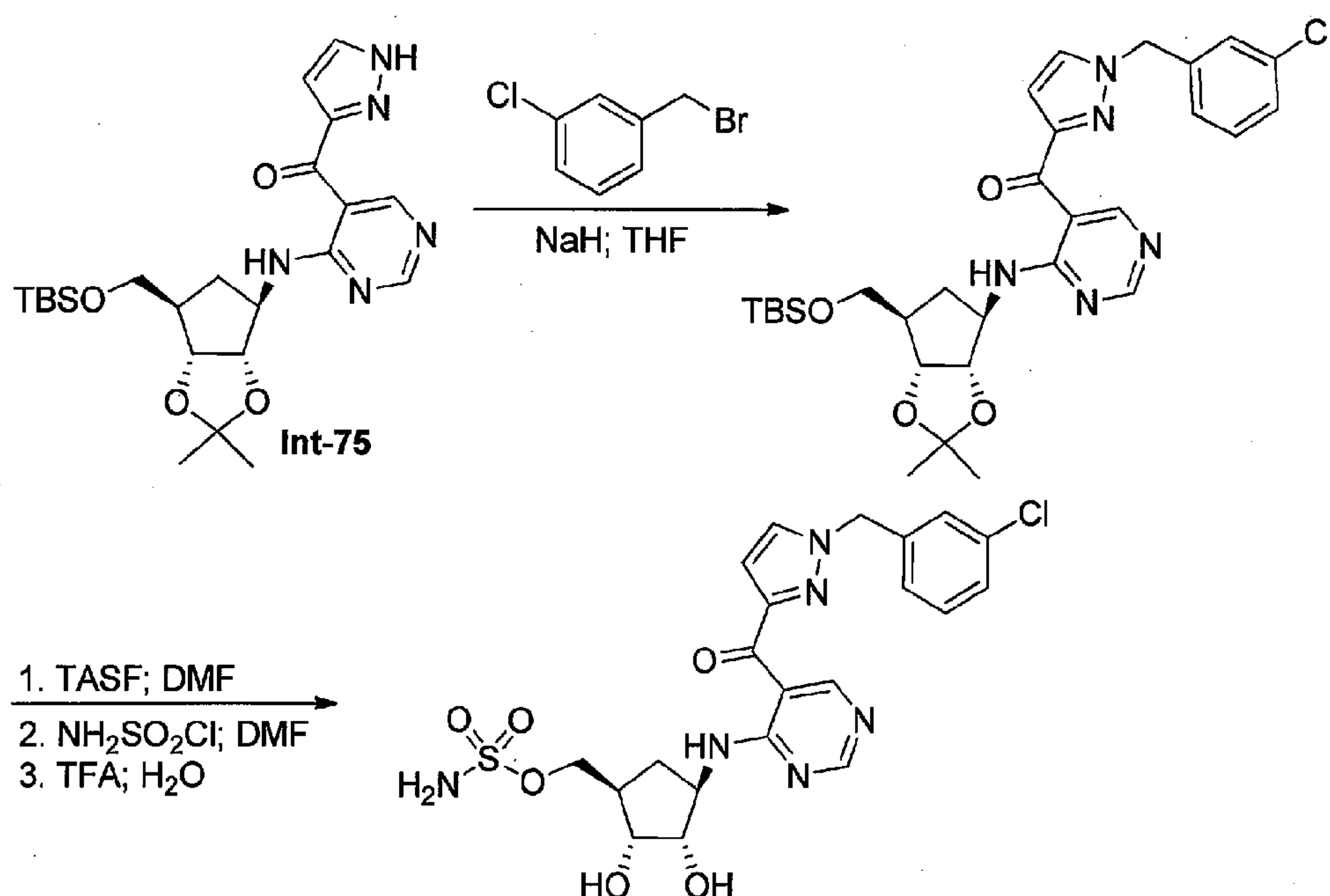
[00259] *tert*-Butyl 3-[(4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate (0.31 g, 0.66 mmol) and 1H-imidazole (0.14 g, 2.0 mmol) were dissolved in DCM (15 mL). *tert*-Butyldimethylsilyl chloride (0.15 g, 1.0 mmol) was added to this solution and it was stirred at rt for 6 h. The reaction solution was concentrated and the residue was purified on silica gel to afford *tert*-butyl 3-[(4-{[(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate (0.33 g, 86%). LCMS (AA): $m/z = 575$ (M+H).

Step 6: (4-{[(3aS,4R,6R,6aR)-6-({[*tert*-Butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(1H-pyrazol-3-yl)methanone Int-75

[00260] *tert*-Butyl 3-[(4-{[(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate (2.4 g, 4.1 mmol) was dissolved in methanol (25 mL) and a solution of potassium phosphate

(0.44 g, 2.1 mmol) in water (3 mL) was added. It was allowed to stir at rt for 3 h. The reaction was concentrated and diluted with EtOAc (100 mL). This mixture was washed with water (2x). The organic layer was dried over MgSO_4 , filtered, and concentrated to yield (4-{[(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(1H-pyrazol-3-yl)methanone (1.8 g, 90%). LCMS (AA): m/z = 475 (M+H).

Example 41: {(1R,2R,3S,4R)-4-[(5-{[1-(3-Chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate I-40



Step 1: (4-{[(3aS,4R,6R,6aR)-6-({[*tert*-Butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone

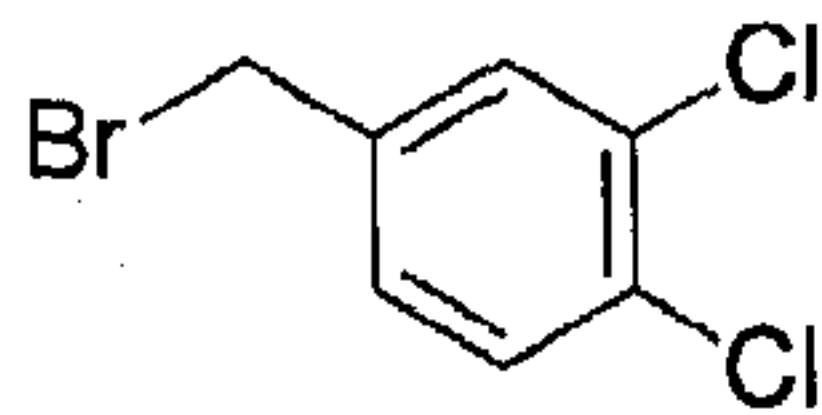
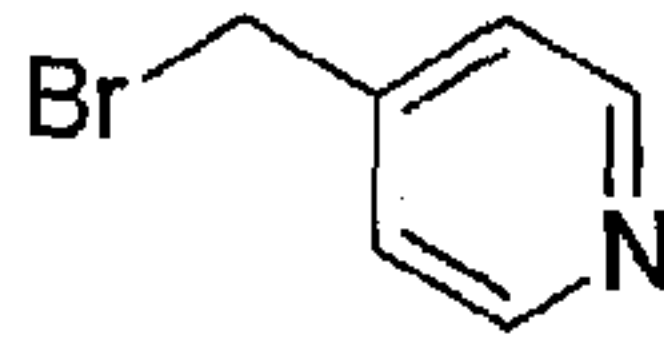
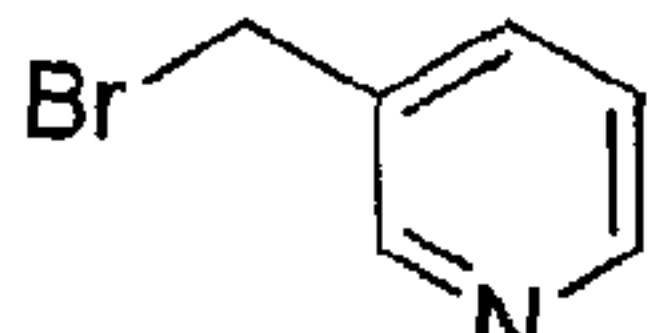
[00261] (4-{[(3aS,4R,6R,6aR)-6-({[*tert*-Butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(1H-pyrazol-3-yl)methanone (0.13 g, 0.26 mmol) was dissolved in THF (15 mL). Sodium hydride (0.025 g, 1.0 mmol) was added to this solution at rt and it was stirred at rt for 1 h. 1-(Bromomethyl)-3-chloro-benzene (0.11 g, 0.52 mmol) was added to this solution and it was stirred at rt for 6 h. A solution of acetic acid (1 mL) and methanol (2 mL) was next added to quench the reaction. The mixture was concentrated and the crude product was purified on silica gel to yield (4-{[(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-

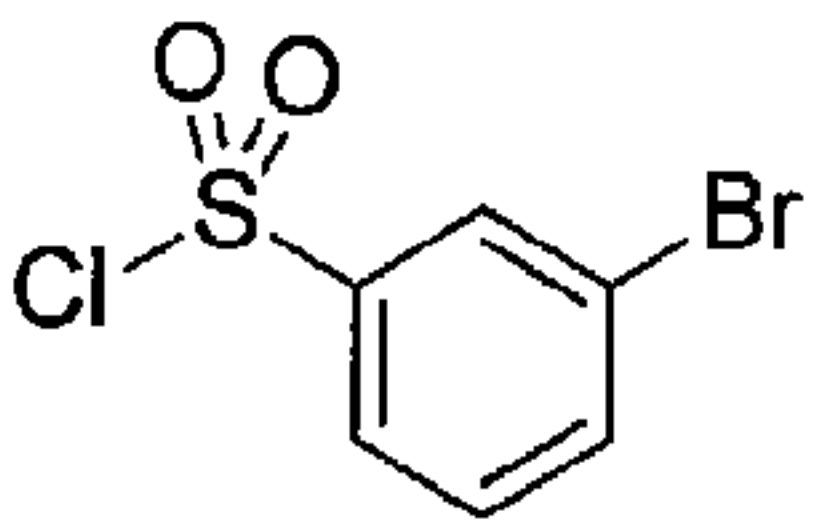
3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone (0.053 g, 34%). LCMS (AA): $m/z = 598$ (M+H).

Step 2: {(1R,2R,3S,4R)-4-[(5-{[1-(3-Chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate I-40

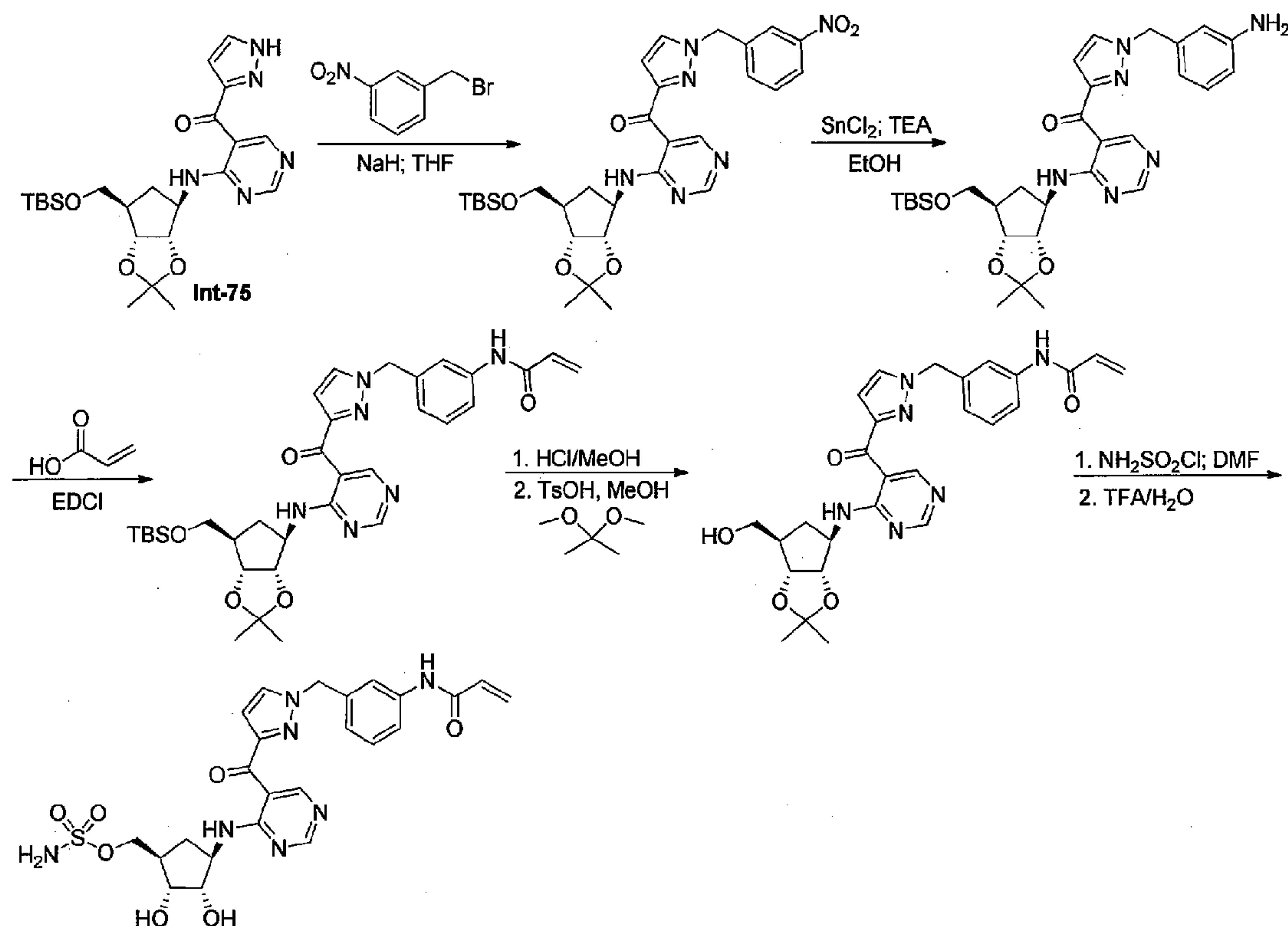
[00262] (4-{[(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy)methyl}-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone (0.053 g, 0.09 mmol) was dissolved in DMF (1 mL). Tris(dimethylamino)sulfonium trimethylsilyldifluoride (TASF) in DMF (0.25 M solution in DMF; 1.8 mL, 0.44 mmol) was added to this solution at rt and it was allowed to stir for 20 min. Chlorosulfonamide (0.051 g, 0.44 mmol) was next added to this solution and it was stirred for 20 min. Water was then added to the reaction mixture and it was extracted with EtOAc (2x). The combined organic layers were concentrated and dissolved in a solution of TFA (5.0 mL) and water (0.50 mL). The solution was allowed to stir at rt for 30 min then concentrated and the crude residue purified by prep HPLC to give {(1R,2R,3S,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate (25 mg, 50%). ¹H NMR (MeOD) δ 9.62 (s, 1H), 8.56 (s, 1H), 7.84 (d, $J = 2.4$ Hz, 1H), 7.38 – 7.29 (m, 3H), 7.23 (dd, $J = 6.4, 2.1$ Hz, 1H), 6.96 (d, $J = 2.4$ Hz, 1H), 5.46 (s, 2H), 4.64 – 4.51 (m, 1H), 4.18 (dd, $J = 8.3, 7.2$ Hz, 2H), 3.94 (dd, 2H), 2.59 – 2.45 (m, 1H), 2.45 – 2.27 (m, 1H), 1.44 – 1.30 (m, 1H). LCMS (AA): $m/z = 523.1$ (M+H).

[00263] The compounds listed in the table below were prepared using similar methods to that described above starting from the listed starting materials. The following alternative conditions could be employed in the described reaction steps. Step 1: Cs₂CO₃ instead of NaH. Step 2: HF/pyridine instead of TASF; aq. HCl is an acceptable replacement for aq. TFA.

Starting material	Compound No.	LCMS Data
	I-159	LCMS (FA): $m/z = 557.1$ (M+H).
	I-160	LCMS (FA): $m/z = 490.1$ (M+H).
	I-247	LCMS (FA): $m/z = 490.1$ (M+H).

	I-1	LCMS (FA): $m/z = 616.9$ (M+H).

Example 42: [(1R,2R,3S,4R)-4-{[5-({1-[3-(Acryloylamino)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate I-313



Step 1: (4-{[(3aS,4R,6R,6aR)-6-({[*tert*-Butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-nitrobenzyl)-1H-pyrazol-3-yl]methanone

[00264] Sodium hydride (0.030 g, 1.3 mmol) was added to a solution of (4-{[(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(1H-pyrazol-3-yl)methanone (0.18 g, 0.39 mmol) in THF (15 mL) at rt. This mixture was allowed to stir at rt for 1 h, then 1-(bromomethyl)-3-nitro-benzene (0.14 g, 0.65 mmol) was added. The resulting mixture was stirred at rt for 16 h. A solution of acetic acid (1 mL) and methanol (2 mL) was added to quench and the resulting solution was concentrated. The residue was purified on silica gel to yield (4-{[(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-

3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-nitrobenzyl)-1H-pyrazol-3-yl]methanone (192 mg, 81%). LCMS (FA): m/z = 609.3 (M+H).

Step 2: [1-(3-Aminobenzyl)-1H-pyrazol-3-yl](4-{{(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)methanone

[00265] (4-{{(3aS,4R,6R,6aR)-6-({[*tert*-Butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-nitrobenzyl)-1H-pyrazol-3-yl]methanone (0.20 g, 0.33 mmol) was dissolved in absolute ethanol (20 mL). Tin dichloride (0.63 g, 3.3 mmol) was added to this solution and the resulting mixture was allowed to stir at rt for 16 h. TEA (1 mL) was added and the resulting solid was filtered and washed with methanol. The filtrate was concentrated to give [1-(3-aminobenzyl)-1H-pyrazol-3-yl](4-{{(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)methanone (0.16 g, 80%). LCMS (FA): m/z = 579.5 (M+H).

Step 3: N-[3-({3-[(4-{{(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazol-1-yl)methyl)phenyl]acrylamide

[00266] [1-(3-Aminobenzyl)-1H-pyrazol-3-yl](4-{{(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)methanone (0.053 g, 0.092 mmol) and N-(3-dimethylaminopropyl)-N'-ethylcarbodiimide hydrochloride (0.053 g, 0.28 mmol) were stirred as a solution in THF (10 mL). TEA (0.047 g, 0.46 mmol) and acrylic acid (0.013 g, 0.18 mmol) were added to this solution and it was allowed to stir at rt for 3 h. The reaction was concentrated and the residue was purified on silica gel to afford N-[3-({3-[(4-{{(3aS,4R,6R,6aR)-6-({[*tert*-butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazol-1-yl)methyl)phenyl]acrylamide (38 mg, 65%). LCMS (FA): m/z = 633.5 (M+H).

Step 4: N-[3-({3-[(4-{{(3aS,4R,6R,6aR)-6-(Hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazol-1-yl)methyl)phenyl]acrylamide

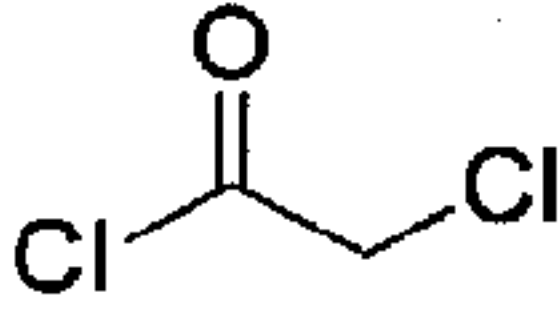
[00267] N-[3-({3-[(4-{{(3aS,4R,6R,6aR)-6-({[*tert*-Butyl(dimethyl)silyl]oxy}methyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazol-1-yl)methyl)phenyl]acrylamide (0.037 g, 0.058 mmol) was added to a solution of 0.05 M HCl in methanol (8.0 mL, 0.40 mmol) and the resulting solution was allowed to stir at rt for 1 h. At this point LCMS

analysis showed that TBS group removal was complete, but the acetonide protecting group was also removed. The reaction mixture was concentrated and methanol (10 mL), 2,2-dimethoxypropane (0.069 g, 0.66 mmol), and p-toluenesulfonic acid (0.017 g, 0.099 mmol) were added. The resulting mixture was allowed to stir at rt for 1 h. The reaction mixture was concentrated and the residue was purified on silica gel to give N-[3-({3-[(4-[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazol-1-yl)methyl)phenyl]acrylamide (18 mg, 60%). LCMS (FA): m/z = 519.5 (M+H).

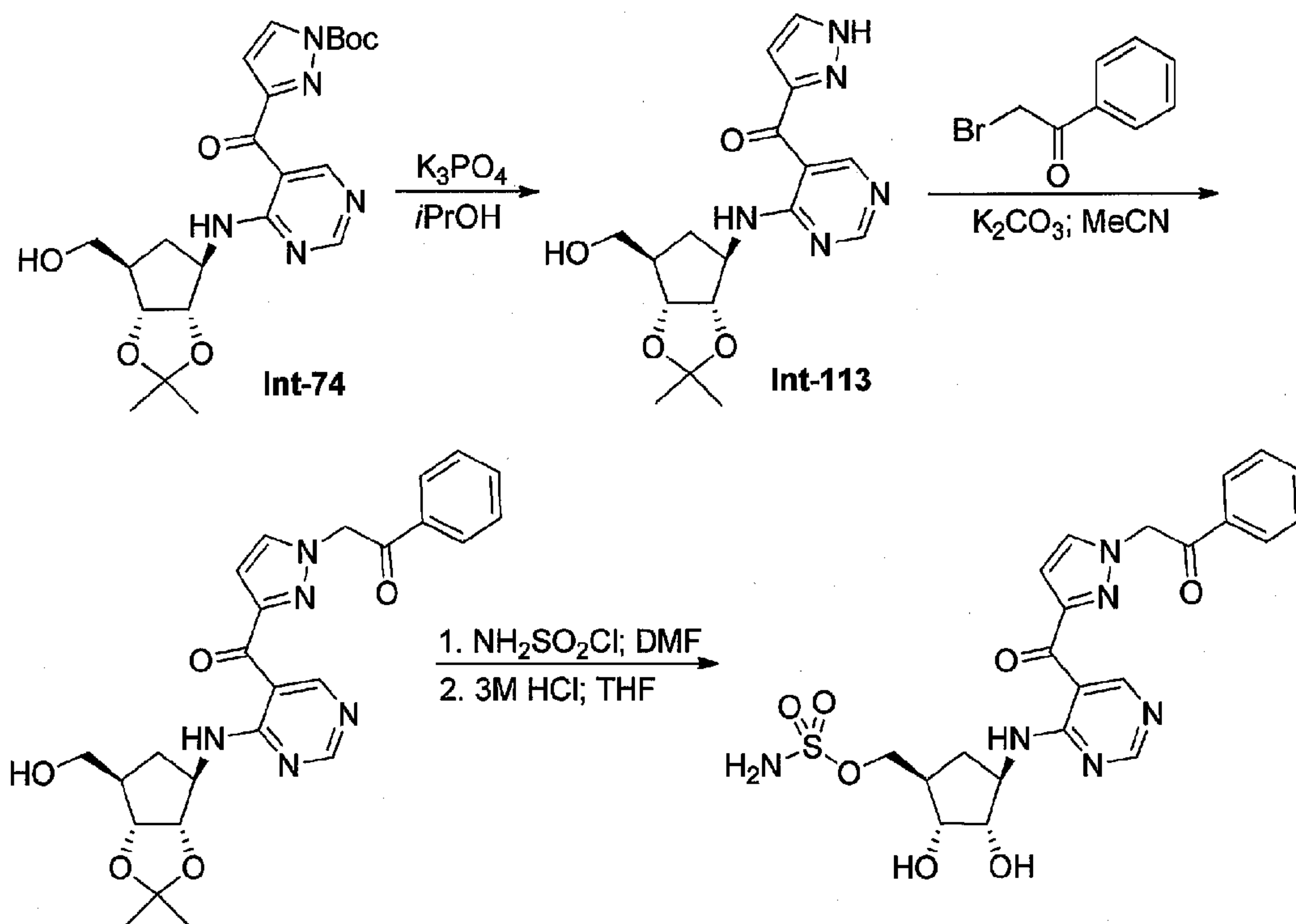
Step 5: [(1R,2R,3S,4R)-4-{[5-({1-[3-(Acryloylamino)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate I-313

[00268] To a solution of N-[3-({3-[(4-[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazol-1-yl)methyl)phenyl]acrylamide (0.015 g, 0.028 mmol) in DMF (3 mL) was added chlorosulfonamide (10 mg, 0.084 mmol) at rt, and the mixture was stirred for 2 h. To the reaction mixture was added TFA (1 mL) and water (1 mL) and allowed to stir at rt for 1 h. The reaction mixture was then quenched by addition of NaHCO₃ and water. The mixture was extracted with EtOAc (2x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The crude was purified on silica gel to afford [(1R,2R,3S,4R)-4-{[5-({1-[3-(acryloylamino)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate (7 mg, 43%). ¹H NMR (MeOD) δ 9.66 (s, 1H), 8.57 (s, 1H), 7.82 (d, J = 2.4 Hz, 1H), 7.61 (d, J = 6.7 Hz, 1H), 7.59 (s, 1H), 7.34 (t, J = 8.1 Hz, 1H), 7.08 (d, J = 7.8 Hz, 1H), 6.96 (d, J = 2.4 Hz, 1H), 6.46 – 6.29 (m, 2H), 5.75 (dd, J = 9.2, 2.7 Hz, 1H), 5.47 (s, 2H), 4.65 – 4.53 (m, 1H), 4.27 – 4.14 (m, 2H), 4.00 – 3.85 (m, 2H), 2.57 – 2.46 (m, 1H), 2.42 – 2.27 (m, 1H), 1.43 – 1.32 (m, 1H). LCMS (FA): m/z = 558.2 (M+H).

[00269] The compound listed in the table below was prepared using an analogous method to that described above starting from the listed starting material in step 3.

Starting material	Compound No.	LCMS Data
	I-67	LCMS (FA): m/z = 580.1 (M+H).

Example 43: {(1R,2R,3S,4R)-2,3-Dihydroxy-4-[(5-({1-(2-oxo-2-phenylethyl)-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate I-125



Step 1: (4-{[(3aS,4R,6R,6aR)-6-(Hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(1H-pyrazol-3-yl)methanone Int-113

[00270] *tert*-Butyl 3-[(4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate (1.3 g, 2.9 mmol) was dissolved in 2-propanol (50 mL) and a solution of potassium phosphate (1.2 g, 5.7 mmol) in water (5 mL) was added. It was allowed to stir at rt for 3 h. Then, water (20 mL) was added to the reaction and it was extracted with DCM (2x). The combined organic layers were dried over $MgSO_4$, filtered, and concentrated to yield (4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(1H-pyrazol-3-yl)methanone (0.82 g, 80%). LCMS (FA): m/z = 360.2 (M+H).

Step 2: 2-{3-[(4-{[(3aS,4R,6R,6aR)-6-(Hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazol-1-yl}-1-phenylethanone

[00271] A mixture of (4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(1H-pyrazol-3-yl)methanone (0.10 g, 0.28 mmol), 2-bromoacetophenone (68 mg, 0.34 mmol), and potassium carbonate (48 mg, 0.35 mmol) were stirred in acetonitrile (4 mL) at rt for 30 min. Water was added to the reaction mixture and it was extracted with

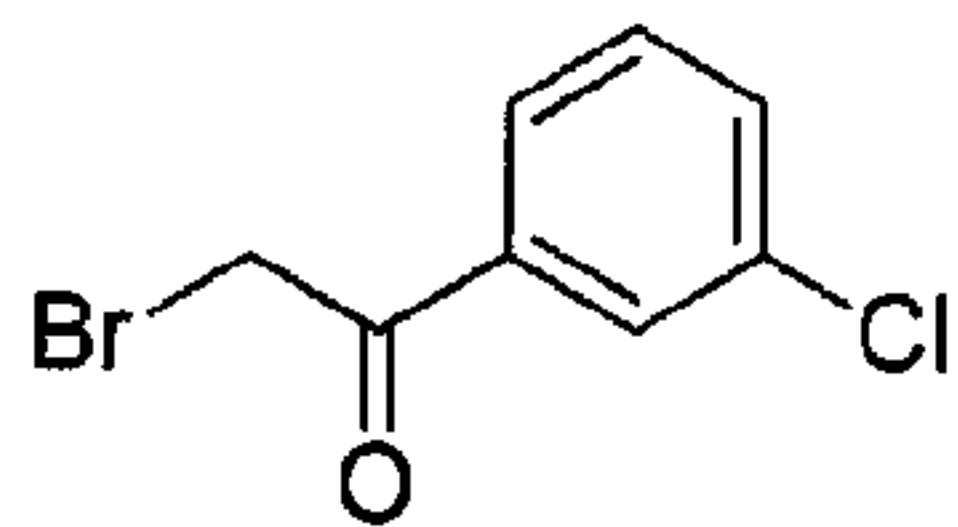
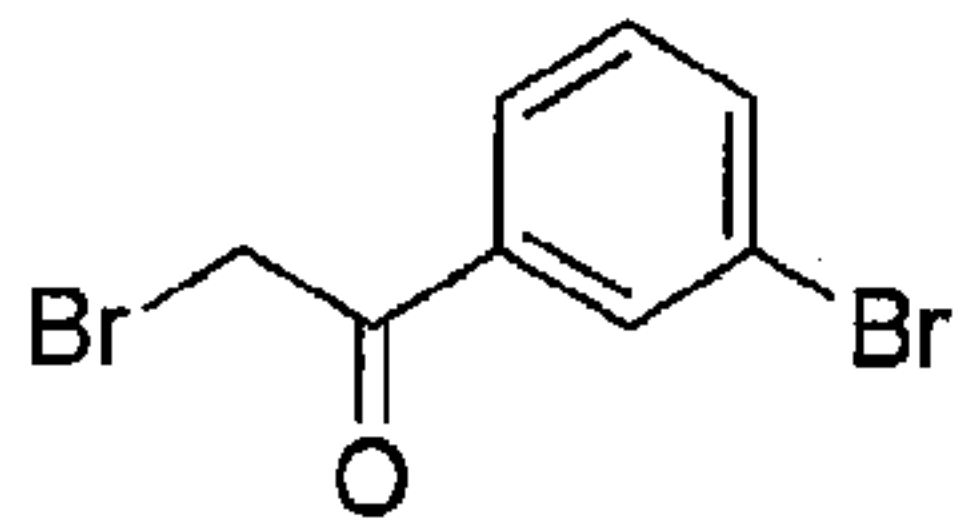
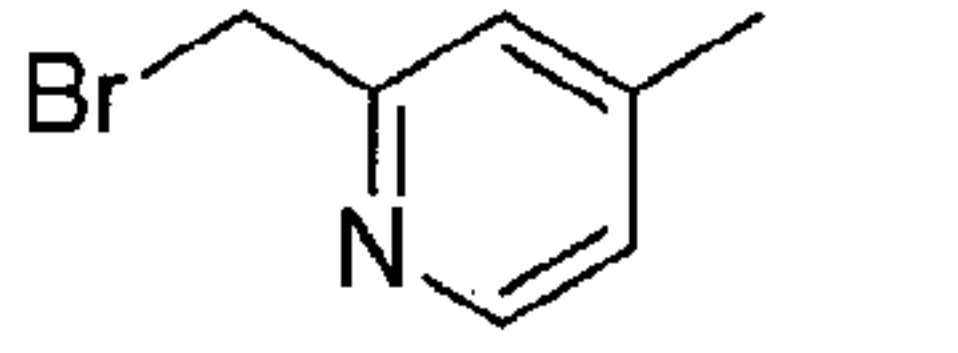
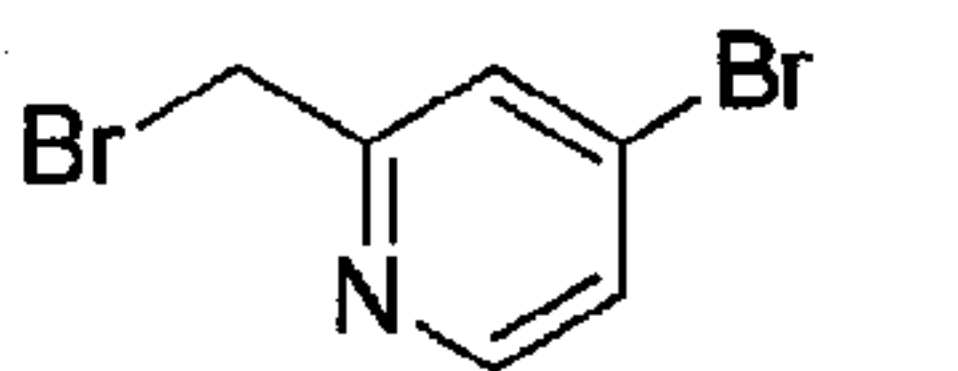
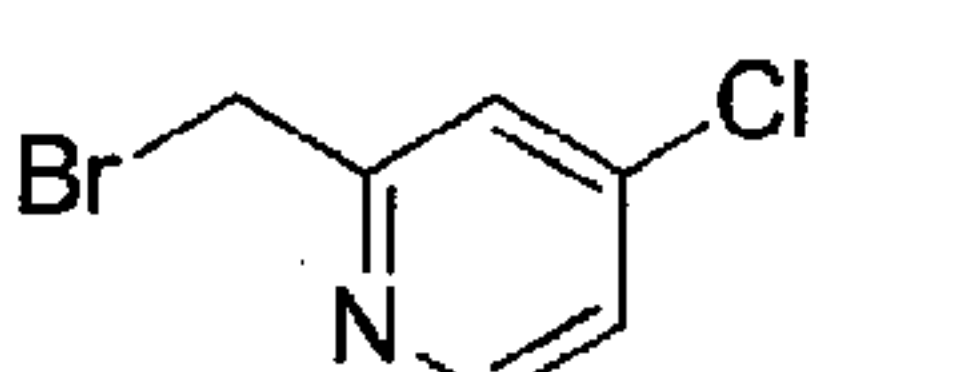
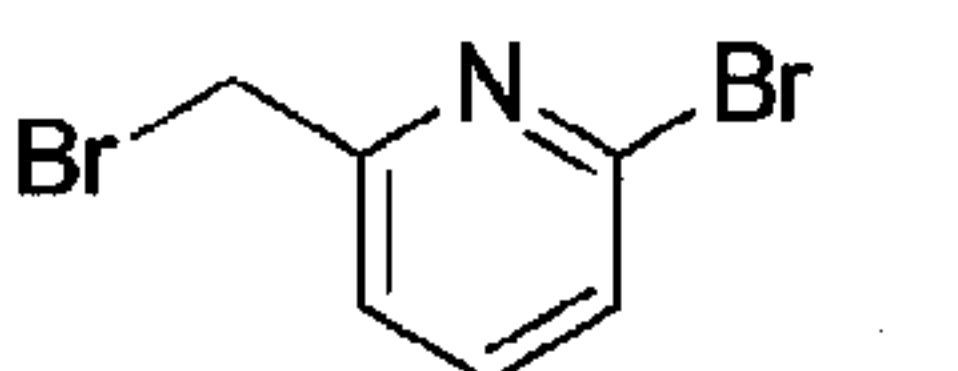
EtOAc (3x). The combined organic layers were washed with brine, dried over magnesium sulfate, filtered and concentrated. The residue was purified on silica gel to give 2-{3-[(4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazol-1-yl}-1-phenylethanone (0.075 g, 56%). LCMS (FA): m/z = 476.5 (M+H).

Step 3: {(1R,2R,3S,4R)-2,3-Dihydroxy-4-[(5-{[1-(2-oxo-2-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate I-125

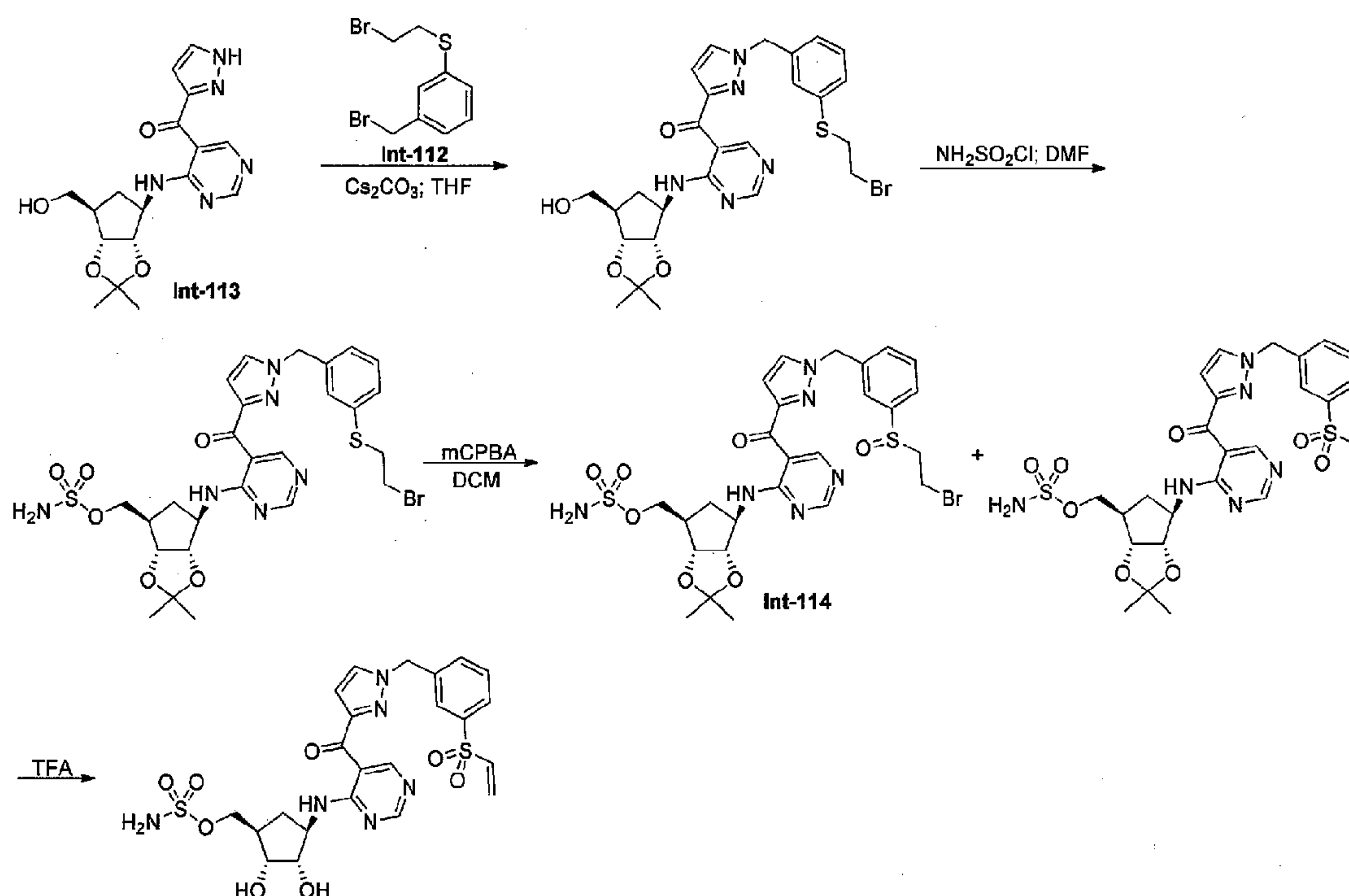
[00272] To a solution of 2-{3-[(4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazol-1-yl}-1-phenylethanone (0.075 g, 0.16 mmol) and TEA (0.066 mL, 0.47 mmol) in DMF (1.2 mL) was added chlorosulfonamide (54 mg, 0.47 mmol) at rt, and the mixture was stirred for 2 h. The reaction was quenched by addition of a saturated solution of NaHCO₃ and diluted with water. The mixture was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The crude sulfamate intermediate was dissolved in DMF (2 mL) and HCl (3.0 M in water; 2 mL, 6 mmol) was added to the solution. The reaction was stirred for 1 h at rt. The reaction was quenched by the addition of a saturated solution of NaHCO₃ and extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to afford {(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(2-oxo-2-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate (41 mg, 50%). ¹H NMR (DMSO) δ 9.49 (s, 1H), 9.11 (d, J = 7.2 Hz, 1H), 8.62 (s, 1H), 8.07 (d, J = 7.3 Hz, 2H), 7.96 (d, J = 2.4 Hz, 1H), 7.74 (t, J = 7.4 Hz, 1H), 7.62 (t, J = 7.7 Hz, 2H), 7.47 (s, 2H), 6.96 (s, 1H), 6.10 (s, 2H), 4.95 (d, J = 6.0 Hz, 1H), 4.77 – 4.71 (m, 1H), 4.52 – 4.40 (m, 1H), 4.12 – 4.05 (m, 1H), 4.04 – 3.94 (m, 1H), 3.86 – 3.77 (m, 1H), 3.77 – 3.66 (m, 1H), 2.38 – 2.31 (m, 1H), 2.27 – 2.14 (m, 1H), 1.22 – 1.11 (m, 1H); LCMS (FA): m/z = 517.2 (M+H).

[00273] The compounds listed in the table below were prepared in an analogous fashion to that described above starting from the listed starting materials used in step 2. DMF and THF are also acceptable solvents for use in step 2 instead of acetonitrile.

Starting material	Compound No.	LCMS Data

	I-283	LCMS (FA): $m/z = 551.4$ (M+H).
	I-96	LCMS (FA): $m/z = 597.1$ (M+H).
 Int-7	I-51	LCMS (FA): $m/z = 504.5$ (M+H).
 Int-110	I-324	LCMS (FA): $m/z = 570.3$ (M+H).
 Int-111	I-70	LCMS (FA): $m/z = 524.5$ (M+H).
	I-284	LCMS (FA): $m/z = 570.4$ (M+H).

Example 44: [(1R,2R,3S,4R)-2,3-Dihydroxy-4-{{5-({1-[3-(vinylsulfonyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl)methyl sulfamate I-321



Step 1: (1-{3-[(2-Bromoethyl)sulfanyl]benzyl}-1H-pyrazol-3-yl)(4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)methanone

[00274] To a round bottomed flask with stirbar was added (4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(1H-pyrazol-3-yl)methanone (0.12 g, 0.35 mmol), 1-[(2-bromoethyl)sulfanyl]-3-(bromomethyl)benzene 2-bromoethyl 3-(bromomethyl)phenyl sulfide (0.16 g, 0.52 mmol), cesium carbonate (0.23 g, 0.69 mmol), and THF (10 mL). The resulting reaction mixture was stirred 4 h at rt. The mixture was filtered to remove cesium carbonate and the filtrate concentrated. The residue was purified on silica gel to yield (1-{3-[(2-bromoethyl)sulfanyl]benzyl}-1H-pyrazol-3-yl)(4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)methanone (0.15 g, 73%). LCMS (FA): m/z = 590.5 (M+H).

Step 2: [(3aR,4R,6R,6aS)-6-({5-[(1-{3-[(2-Bromoethyl)sulfanyl]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl)methyl sulfamate

[00275] To a solution of (1-{3-[(2-bromoethyl)sulfanyl]benzyl}-1H-pyrazol-3-yl)(4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)methanone (0.081 g, 0.14 mmol) and DIEA (0.071 g, 0.55 mmol) in DMF (8

mL) was added chlorosulfonamide (0.032 g, 0.28 mmol) at 0 °C and the reaction was allowed to stir for 30 min at that temperature. The reaction mixture was purified directly on silica gel to give [(3aR,4R,6R,6aS)-6-({5-[(1-{3-[(2-bromoethyl)sulfanyl]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl)methyl sulfamate (60 mg, 66%). LCMS (FA): m/z = 669.5 (M+H).

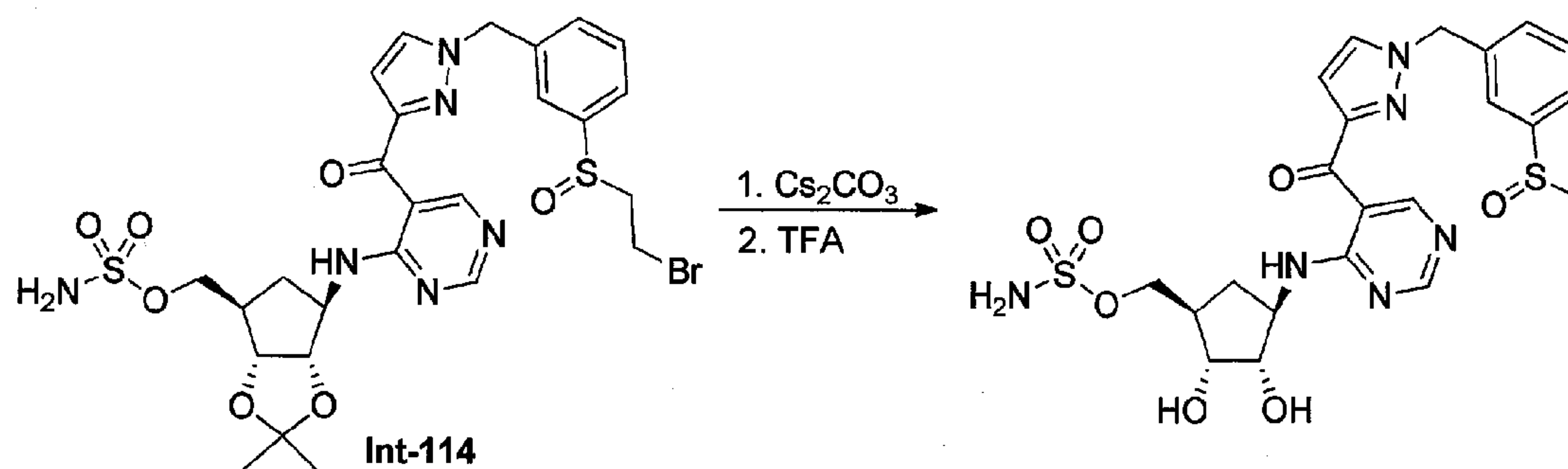
Step 3: [(3aR,4R,6R,6aS)-2,2-Dimethyl-6-{{5-[(1-{3-(vinylsulfonyl)benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino}tetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl)methyl sulfamate and [(3aR,4R,6R,6aS)-6-({5-[(1-{3-[(2-Bromoethyl)sulfinyl]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl)methyl sulfamate Int-114

[00276] m-Chloroperbenzoic acid (0.051 g, 0.30 mmol) was added to a solution of [(3aR,4R,6R,6aS)-6-({5-[(1-{3-[(2-bromoethyl)sulfanyl]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl)methyl sulfamate (0.13 g, 0.19 mmol) in DCM (10 mL) at rt. The reaction mixture was stirred at rt for 6 h. DIEA (0.098 g, 0.76 mmol) was then added to this solution and the resulting mixture was allowed to stir for 4 h. The reaction mixture was concentrated and the residue was purified on silica gel to afford [(3aR,4R,6R,6aS)-2,2-dimethyl-6-{{5-[(1-{3-(vinylsulfonyl)benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino}tetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl)methyl sulfamate (13 mg, 11%). LCMS (FA): m/z = 619.5 (M+H) and [(3aR,4R,6R,6aS)-6-({5-[(1-{3-[(2-bromoethyl)sulfinyl]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl)methyl sulfamate Int-x (29 mg, 23%). LCMS (FA): m/z = 683.3 (M+H).

Step 4: [(1R,2R,3S,4R)-2,3-Dihydroxy-4-{{5-[(1-{3-(vinylsulfonyl)benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino}cyclopentyl)methyl sulfamate I-321

[00277] A solution of [(3aR,4R,6R,6aS)-2,2-dimethyl-6-{{5-[(1-{3-(vinylsulfonyl)benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino}tetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl)methyl sulfamate (0.014 g, 0.023 mmol) in TFA (4.5 mL) and water (0.50 mL) was stirred at room temperature for 1h. The reaction mixture was concentrated and the crude product was purified by prep HPLC to afford [(1R,2R,3S,4R)-2,3-dihydroxy-4-{{5-[(1-{3-(vinylsulfonyl)benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino}cyclopentyl)methyl sulfamate I-number (6 mg, 47%). ¹H NMR (MeOD) δ 9.53 (s, 1H), 8.53 (d, J = 19.2 Hz, 1H), 7.88 (s, 1H), 7.87 – 7.82 (m, 1H), 7.82 (s, 1H), 7.64 – 7.60 (m, 1H), 6.96 (d, J = 2.4 Hz, 1H), 6.86 (m, J = 30.5, 15.3 Hz, 1H), 6.37 (d, J = 15.1 Hz, 1H), 6.09 (d, J = 10.9 Hz, 1H), 5.56 (s, 2H), 4.60 – 4.49 (m, 1H), 4.27 – 4.06 (m, 2H), 3.98 – 3.83 (m, 2H), 2.55 – 2.45 (m, 1H), 2.41 – 2.31 (m, 1H), 1.42 – 1.31 (m, 1H). LCMS (AA): m/z = 579.1 (M+H).

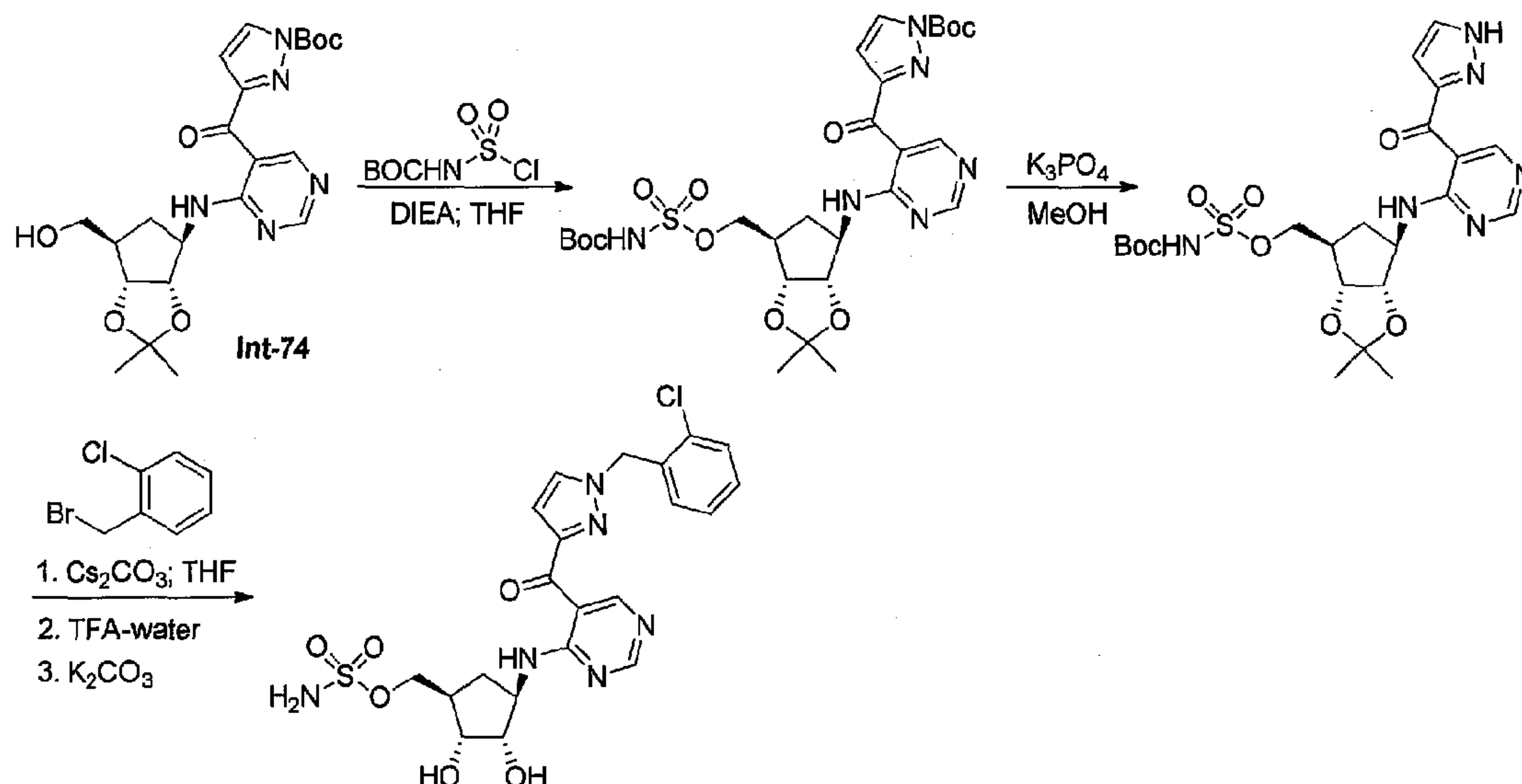
Example 45: [(1R,2R,3S,4R)-2,3-Dihydroxy-4-{{5-({1-[3-((R)-vinylsulfinyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl)methyl sulfamate and [(1R,2R,3S,4R)-2,3-dihydroxy-4-{{5-({1-[3-((S)-vinylsulfinyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl)methyl sulfamate I-74



Step 1: [(1R,2R,3S,4R)-2,3-Dihydroxy-4-{{5-({1-[3-((R)-vinylsulfinyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl)methyl sulfamate and [(1R,2R,3S,4R)-2,3-dihydroxy-4-{{5-({1-[3-((S)-vinylsulfinyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl)methyl sulfamate I-74

[00278] Cesium carbonate (0.14 g, 0.43 mmol) was added to a solution of [(3aR,4R,6R,6aS)-6-({5-[(1-{3-[(2-bromoethyl)sulfinyl]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl)methyl sulfamate (0.029 g, 0.043 mmol) in methanol (5 mL) at rt. The resulting mixture was allowed to stir at rt for 1 hr and then concentrated. Water (10 mL) was added and this mixture was then extracted with DCM (2x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The crude intermediate was dissolved in a mixture of TFA (4.5 mL) and water (0.5 mL). After stirring 1 h at rt the reaction mixture was concentrated and the crude product was purified by prep HPLC to yield [(1R,2R,3S,4R)-2,3-dihydroxy-4-{{5-({1-[3-((R)-vinylsulfinyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl)methyl sulfamate and [(1R,2R,3S,4R)-2,3-dihydroxy-4-{{5-({1-[3-((S)-vinylsulfinyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl)methyl sulfamate as a mixture of diastereomers (5 mg, 21%). ¹H NMR (MeOD) δ 9.60 (s, 1H), 8.55 (s, 1H), 7.91 – 7.83 (m, 1H), 7.68 – 7.54 (m, 3H), 7.54 – 7.45 (m, 1H), 6.97 (d, *J* = 2.4 Hz, 1H), 6.79 (dd, *J* = 16.4, 9.6 Hz, 1H), 6.16 (d, 1H), 5.97 (d, 1H), 5.56 (s, 2H), 4.63 – 4.50 (m, 1H), 4.24 – 4.12 (m, 2H), 3.97 – 3.90 (m, 2H), 2.59 – 2.44 (m, 1H), 2.42 – 2.31 (m, 1H), 1.43 – 1.33 (m, 1H). LCMS (AA): *m/z* = 563.1 (M+H).

Example 46: ((1R,2R,3S,4R)-4-((5-(1-(2-Chlorobenzyl)-1H-pyrazole-3-carbonyl)pyrimidin-4-yl)amino)-2,3-dihydroxycyclopentyl)methyl sulfamate I-193



Step 1: *tert*-Butyl 3-[(4-[(3*a*S,4*R*,6*R*,6*a*R)-6-(7,7-dimethyl-3,3-dioxido-5-oxo-2,6-dioxo-3λ⁶-thia-4-azaoc-1-yl)-2,2-dimethyltetrahydro-3*a*H-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate

[00279] To a solution of *tert*-butyl 3-[(4-[(3*a*S,4*R*,6*R*,6*a*R)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3*a*H-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate (2.8 g, 6.0 mmol) in THF (40 mL) was added DIEA (1.8 g, 14 mmol). The solution was cooled to 0 °C and *tert*-butyl (chlorosulfonyl)carbamate (1.5 g, 6.9 mmol) was added. The resulting mixture was then stirred at 0 °C for 4h. The reaction mixture was then concentrated and the crude product purified on silica gel to give *tert*-butyl 3-[(4-[(3*a*S,4*R*,6*R*,6*a*R)-6-(7,7-dimethyl-3,3-dioxido-5-oxo-2,6-dioxo-3λ⁶-thia-4-azaoc-1-yl)-2,2-dimethyltetrahydro-3*a*H-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate (2.9 g, 75%). LCMS (AA): *m/z* = 639 (M+H).

Step 2: [*tert*-Butyl ([(3*a*R,4*R*,6*R*,6*a*S)-2,2-dimethyl-6-{[5-(1H-pyrazol-3-ylcarbonyl)pyrimidin-4-yl]amino}tetrahydro-3*a*H-cyclopenta[d][1,3]dioxol-4-yl]methoxy)sulfonyl]carbamate]

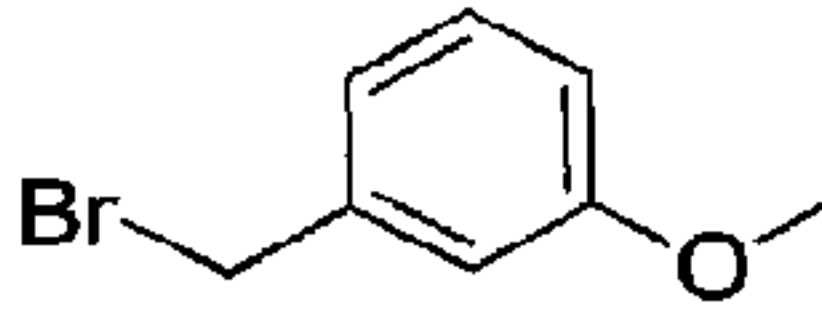
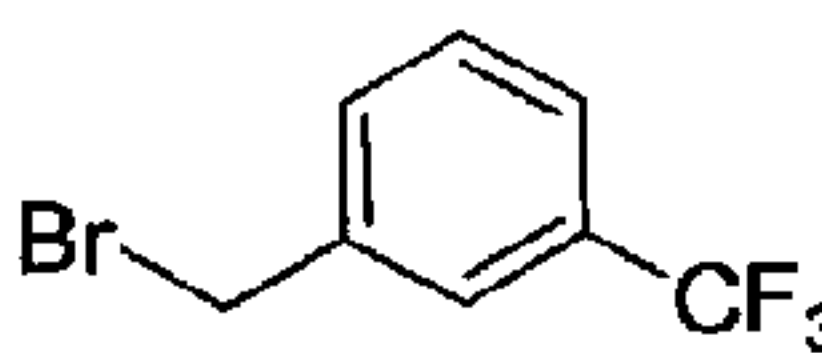
[00280] *tert*-Butyl 3-[(4-[(3*a*S,4*R*,6*R*,6*a*R)-6-(7,7-dimethyl-3,3-dioxido-5-oxo-2,6-dioxo-3λ⁶-thia-4-azaoc-1-yl)-2,2-dimethyltetrahydro-3*a*H-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate (2.9 g, 4.5 mmol) was dissolved in methanol (80 mL), and a solution of potassium phosphate (1.3 g, 6.0 mmol) in water (15 mL) was added. The reaction was allowed to stir at rt for 1 h. The reaction mixture was concentrated and purified by prep

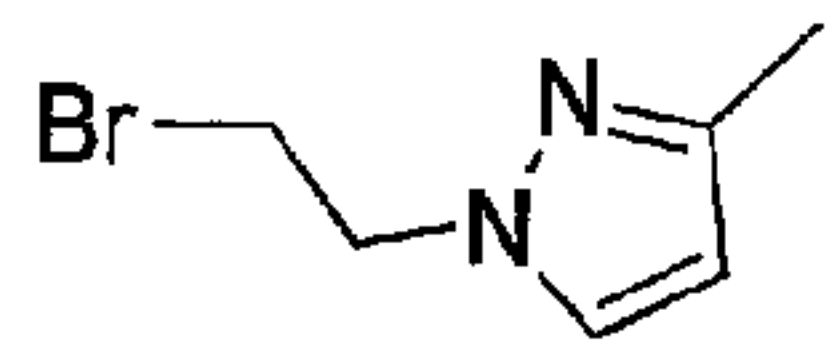
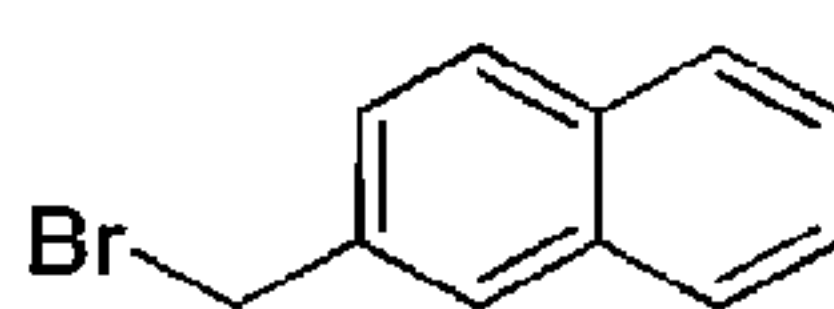
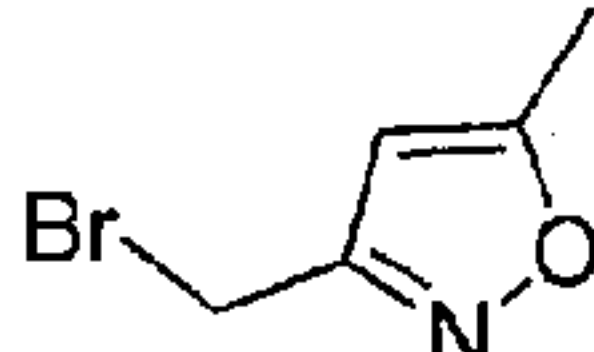
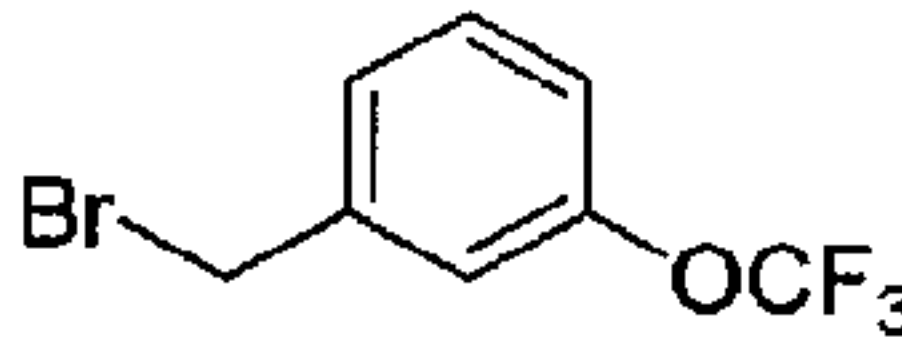
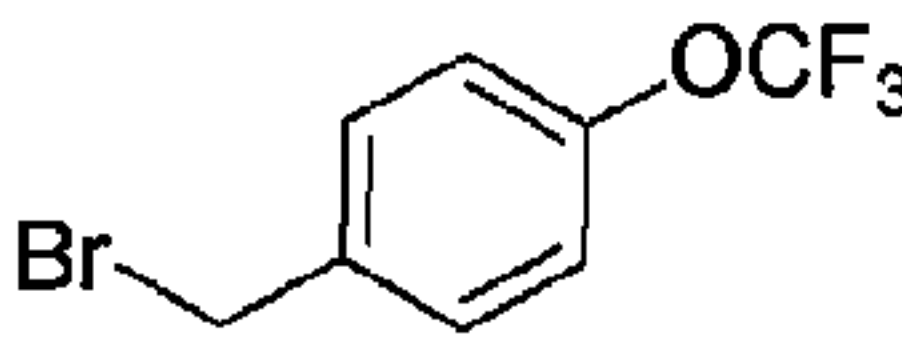
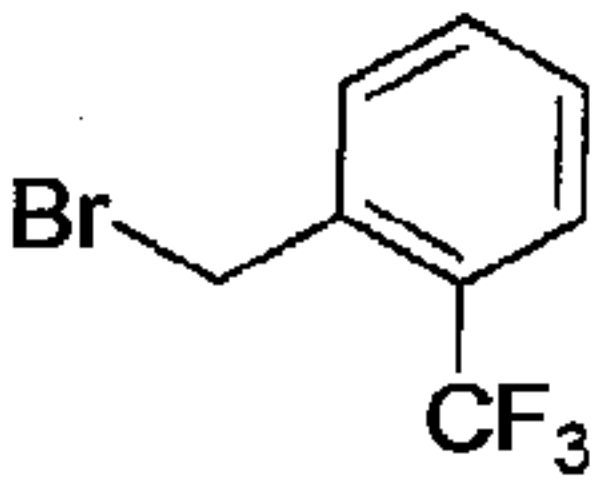
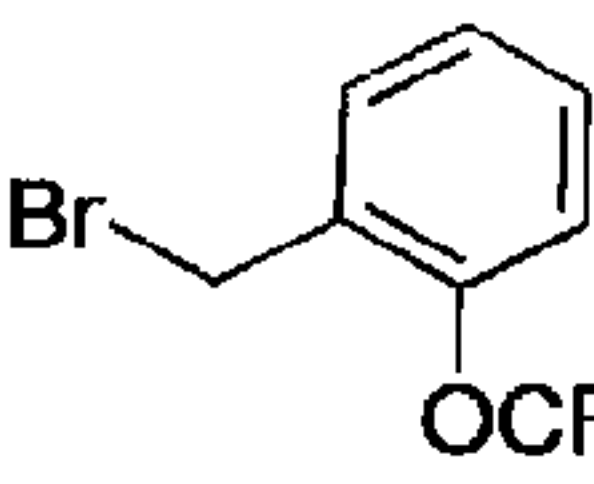
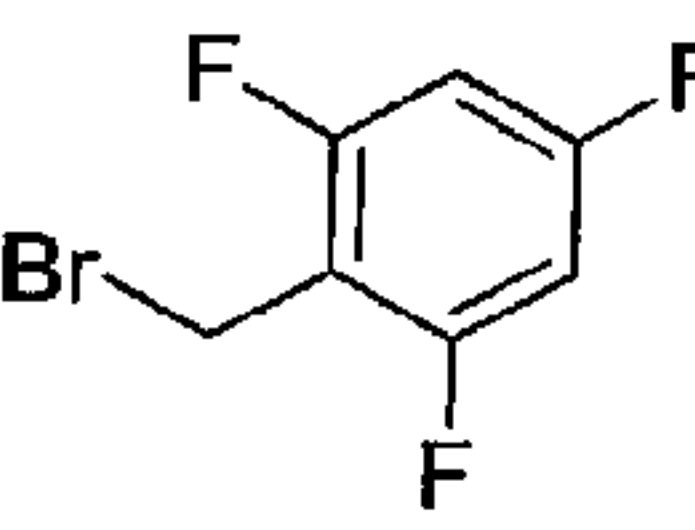
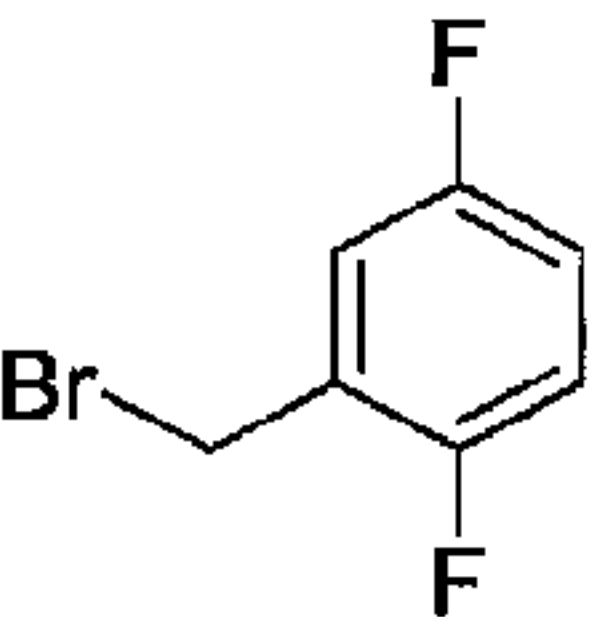
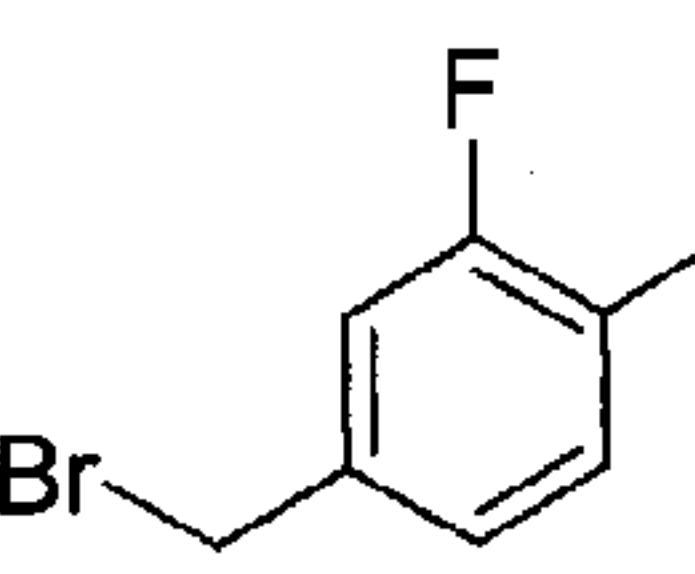
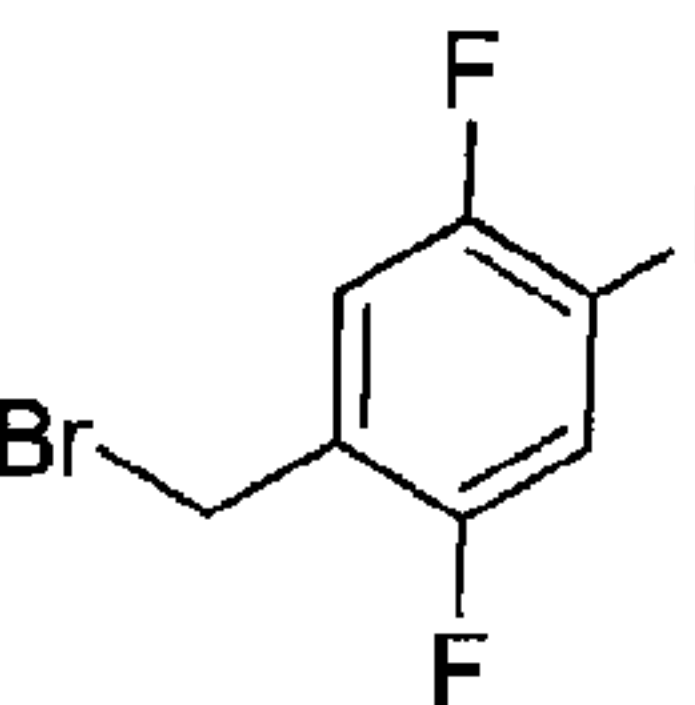
HPLC to provide *tert*-butyl ({[(3*a*R,4*R*,6*R*,6*a*S)-2,2-dimethyl-6-{[5-(1*H*-pyrazol-3-ylcarbonyl)pyrimidin-4-yl]amino}tetrahydro-3*aH*-cyclopenta[*d*][1,3]dioxol-4-yl]methoxy)sulfonyl)carbamate] (1.9 g, 77%). LCMS (AA): m/z = 539 (M+H).

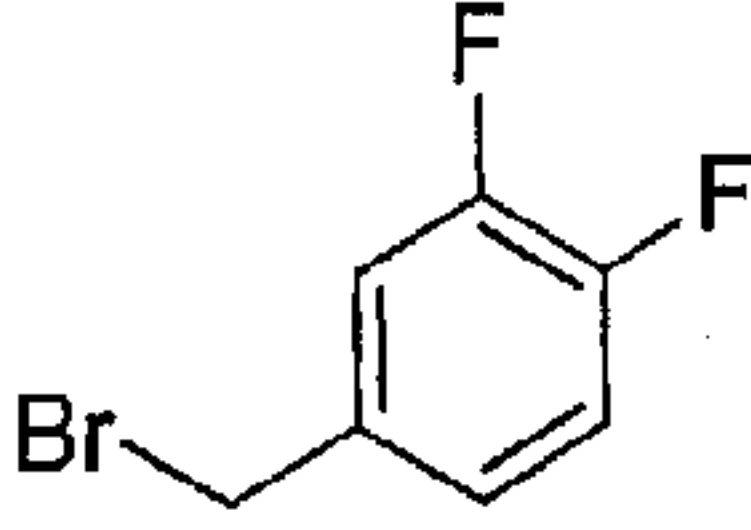
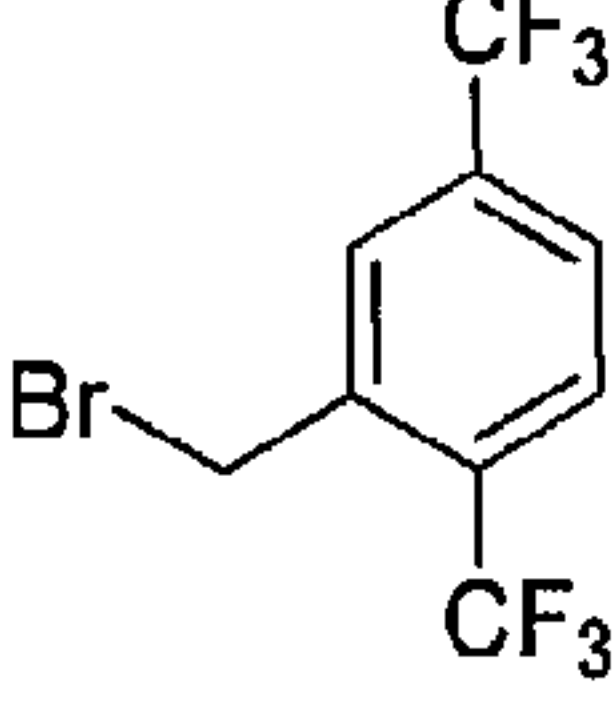
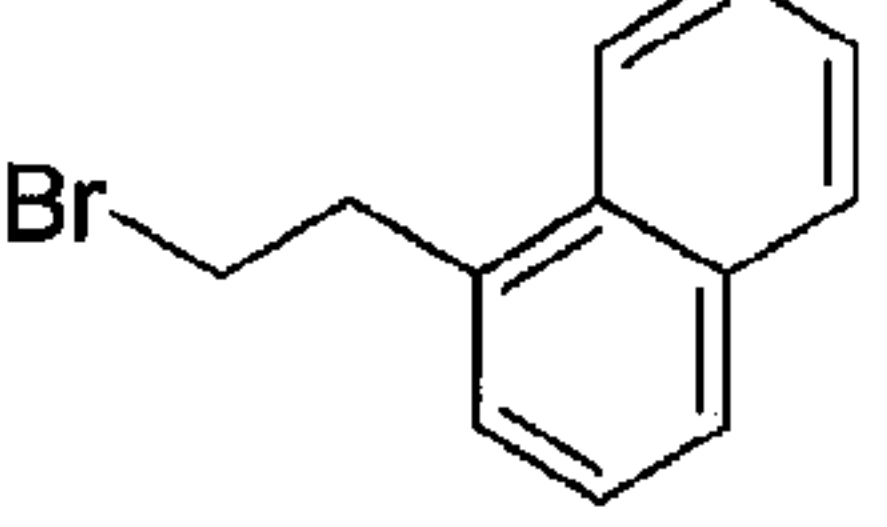
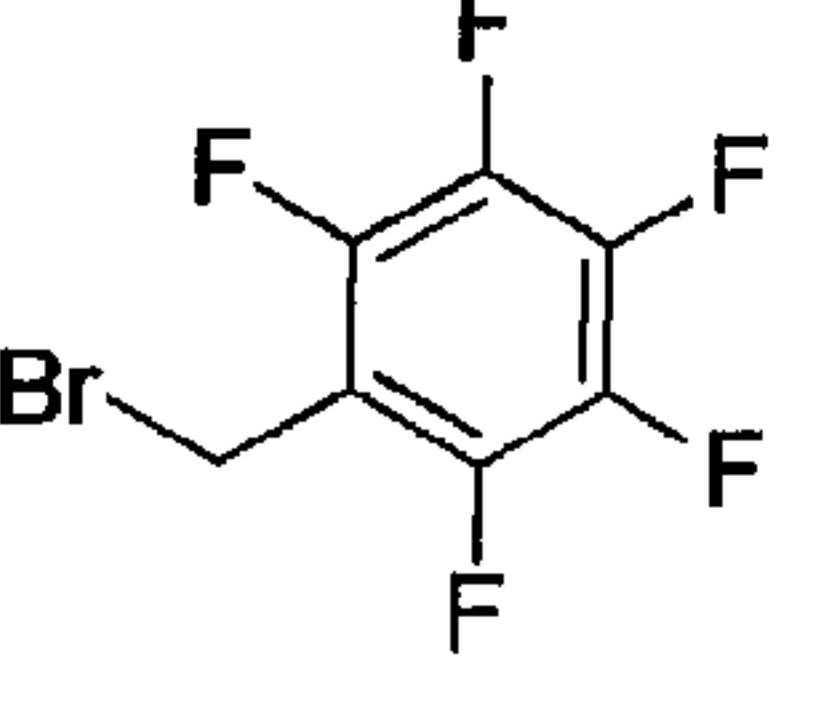
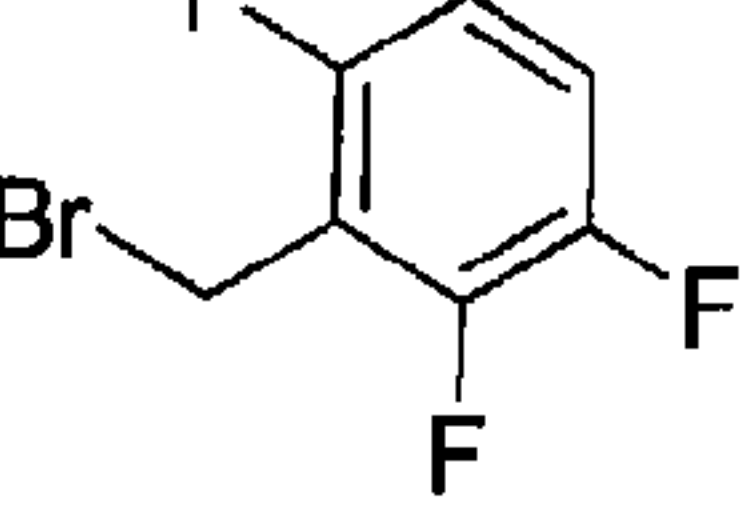
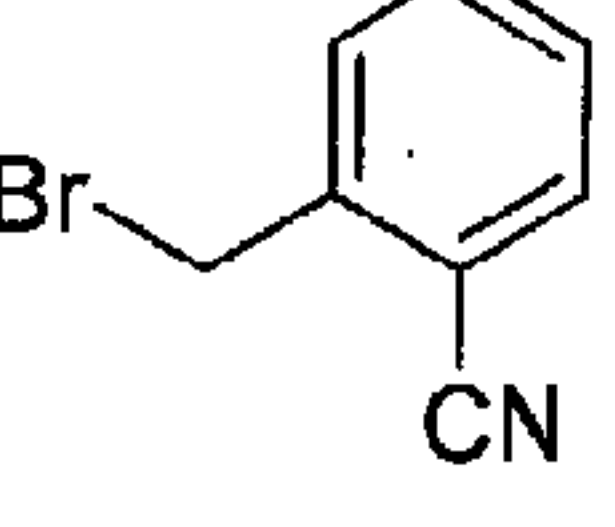
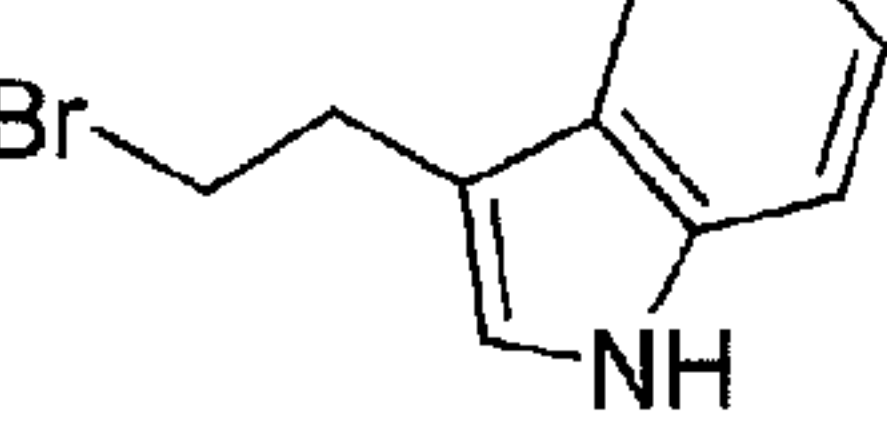
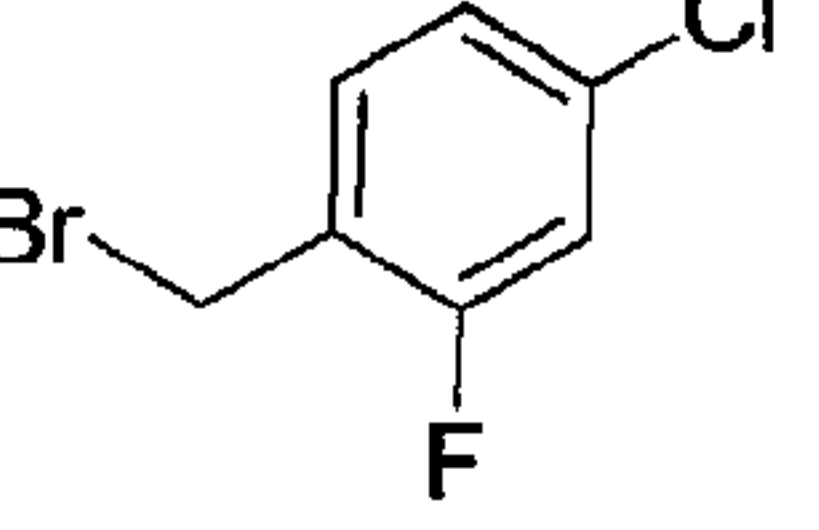
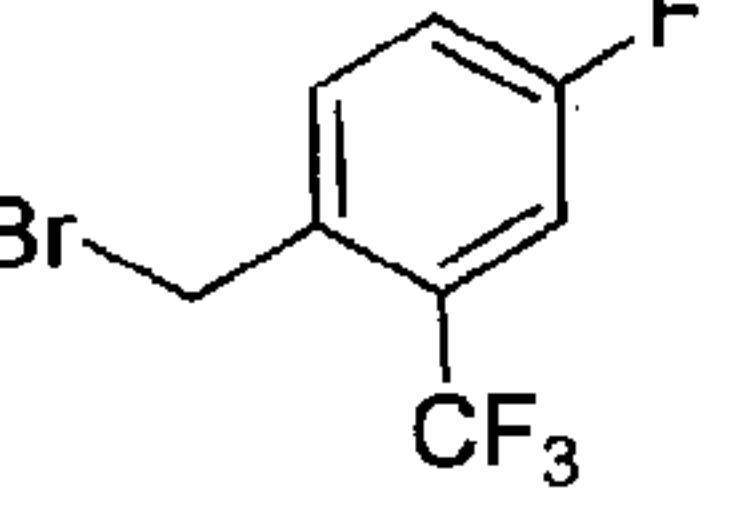
Step 3: ((1*R*,2*R*,3*S*,4*R*)-4-((5-(1-(2-chlorobenzyl)-1*H*-pyrazole-3-carbonyl)pyrimidin-4-yl)amino)-2,3-dihydroxycyclopentyl)methyl sulfamate I-193

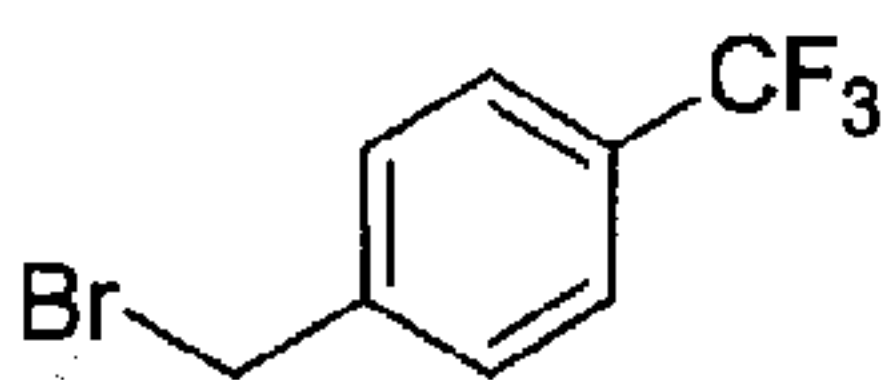
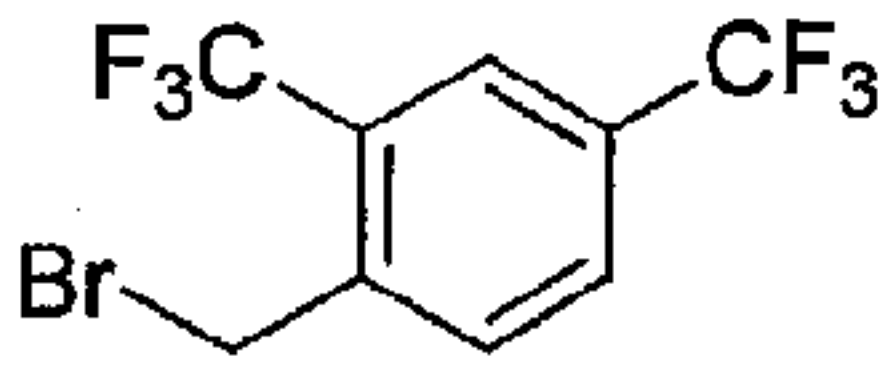
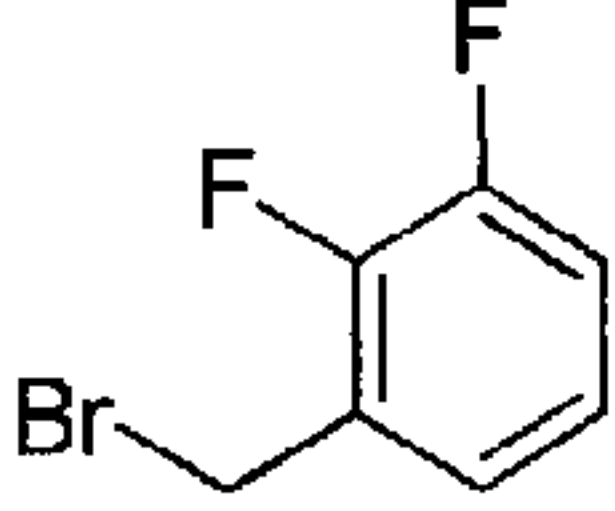
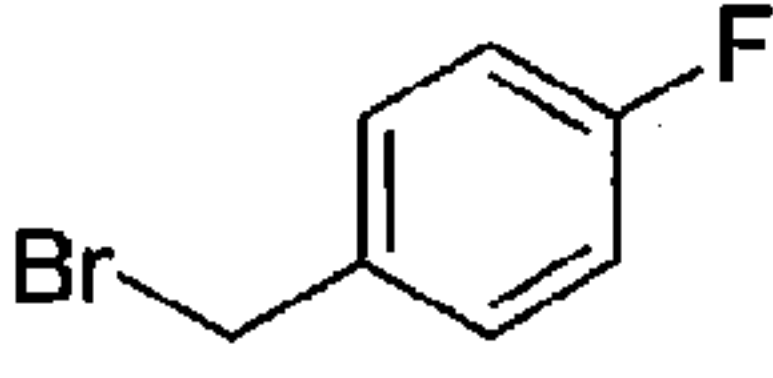
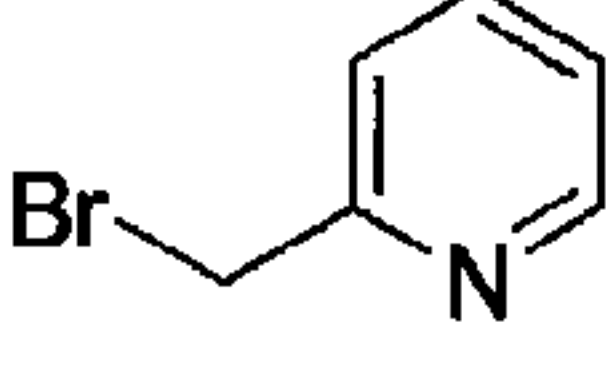
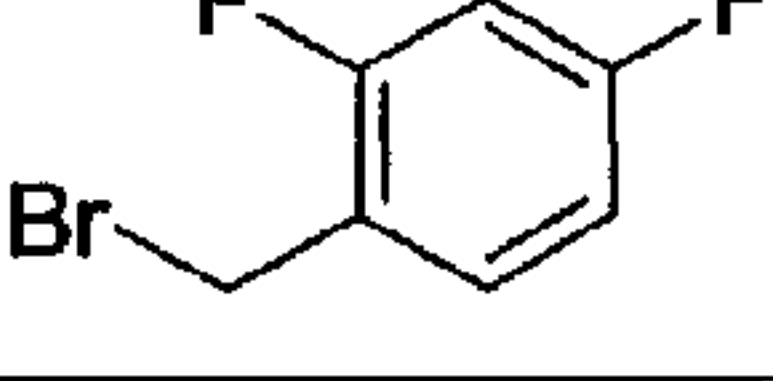
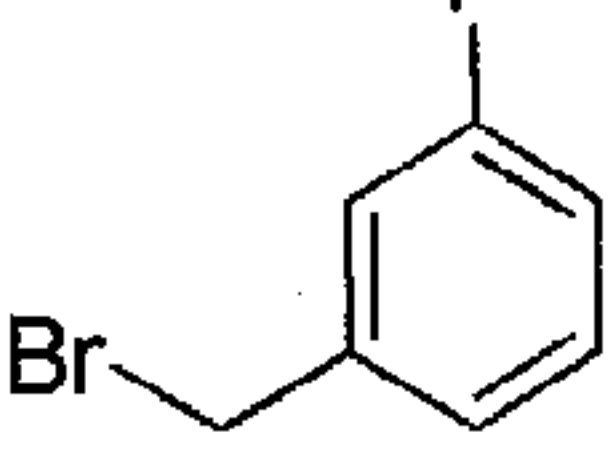
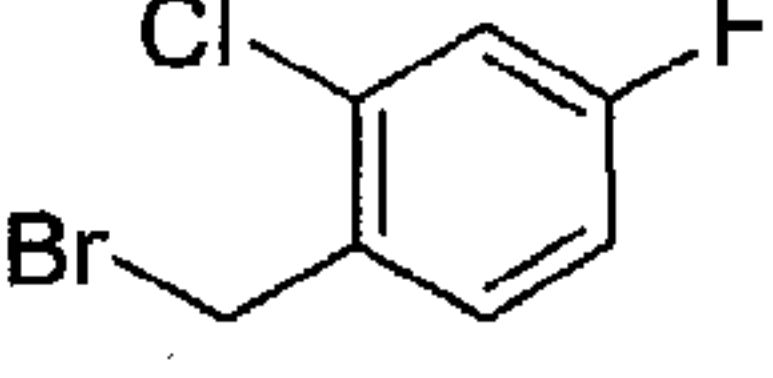
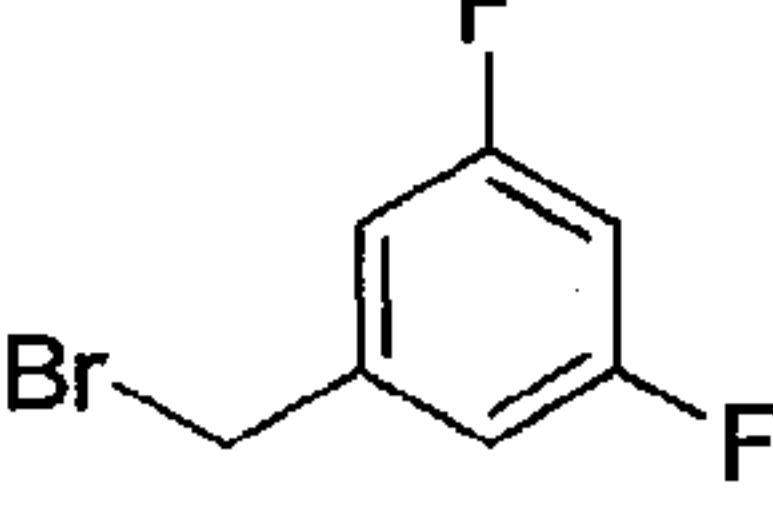
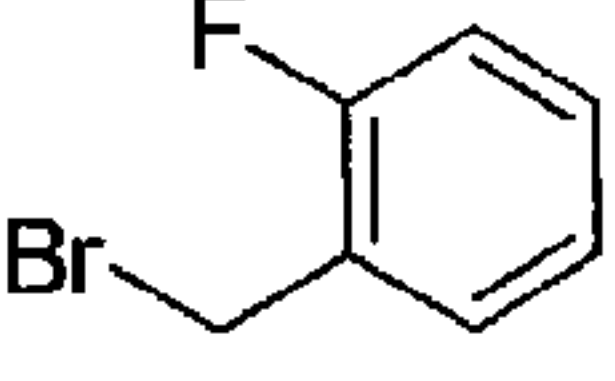
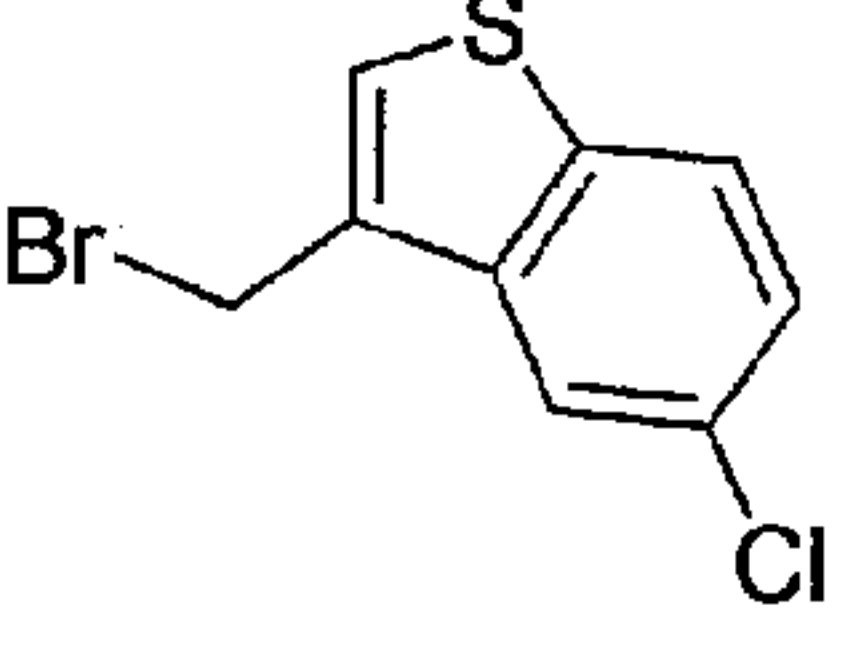
[00281] To a 3-dram vial was added *tert*-butyl ({[(3*a*R,4*R*,6*R*,6*a*S)-2,2-dimethyl-6-{[5-(1*H*-pyrazol-3-ylcarbonyl)pyrimidin-4-yl]amino}tetrahydro-3*H*-cyclopenta[1,3]dioxol-4-yl] methoxy)sulfonyl) carbamate (0.022 g, 0.041 mmol), THF (1.5 mL), 2-chlorobenzyl bromide (0.017 g, 0.082 mmol) and cesium carbonate (0.13 g, 0.41 mmol). The reaction was shaken at rt for 6 h then filtered through a syringe pad to remove solids. To the crude THF solution was added TFA (3.0 mL) and water (0.2 mL). After the reaction was then stirred at rt for 4 h, solvent was completely evaporated. To the crude product was added DMSO (1.2 mL), potassium carbonate (0.07 g, 0.50 mmol) and water (3 drops). This mixture was shaken at rt for 1 h, filtered to remove solids then purified by prep HPLC to give ((1*R*,2*R*,3*S*,4*R*)-4-((5-(1-(2-chlorobenzyl)-1*H*-pyrazole-3-carbonyl)pyrimidin-4-yl)amino)-2,3-dihydroxycyclopentyl)methyl sulfamate (6.0 mg, 27%). LCMS (AA): m/z = 523 (M+H).

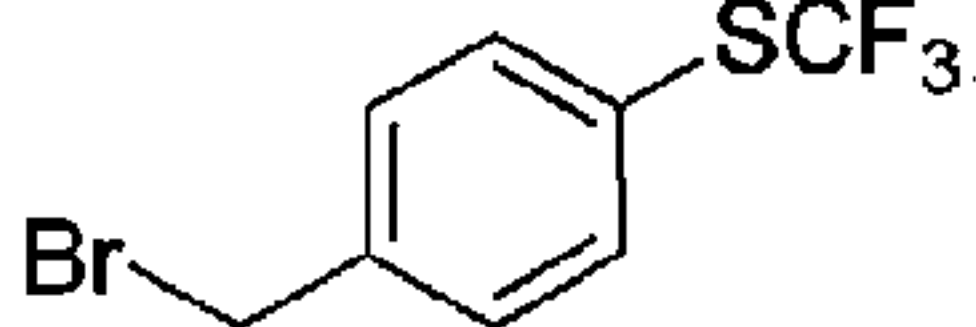
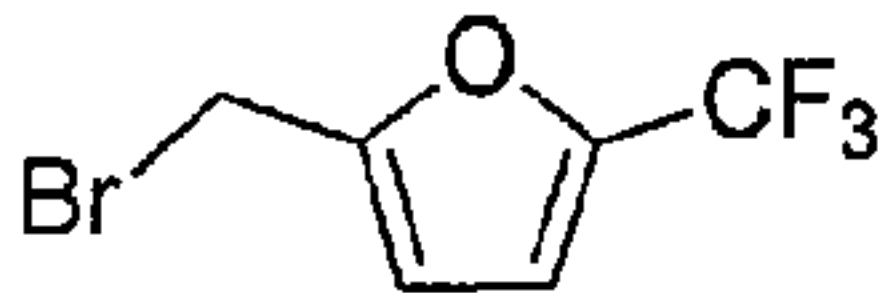
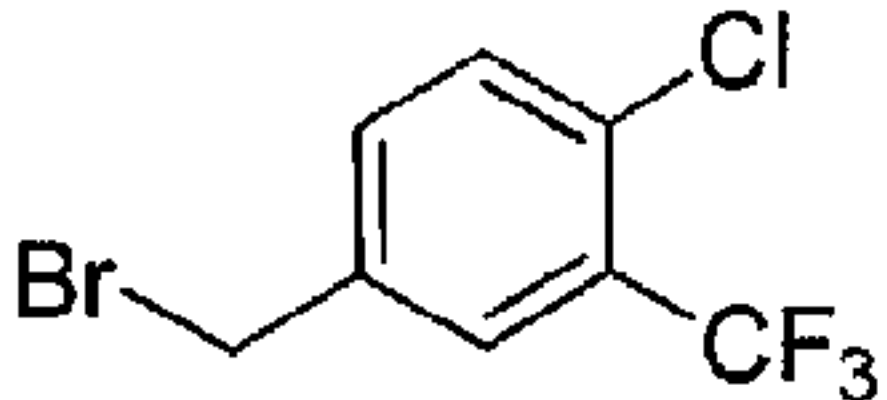
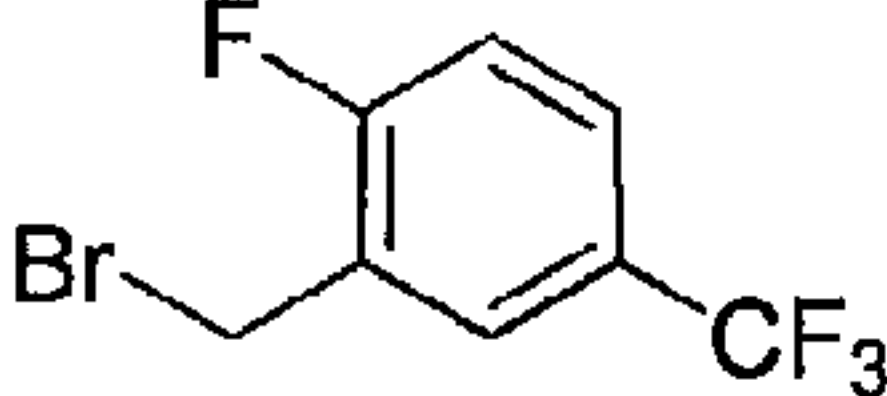
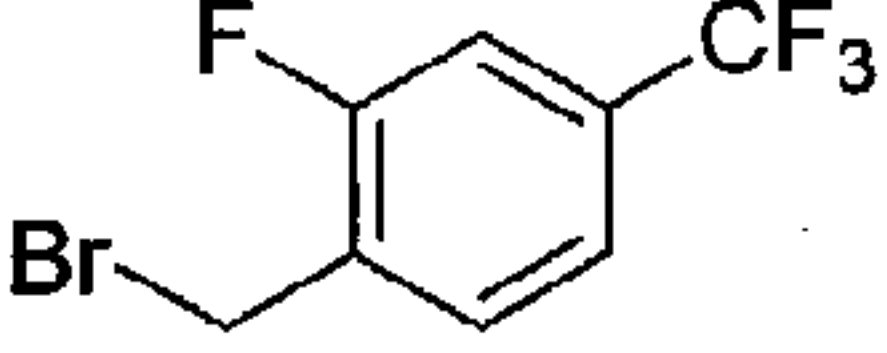
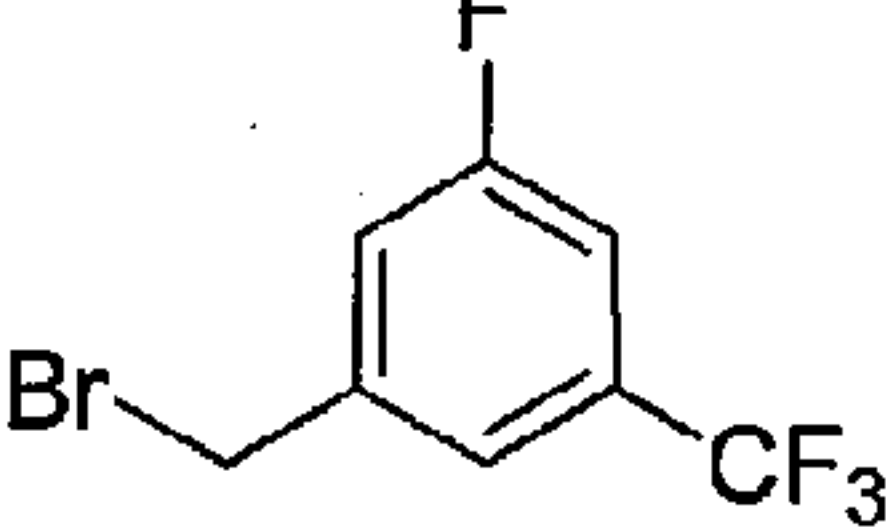
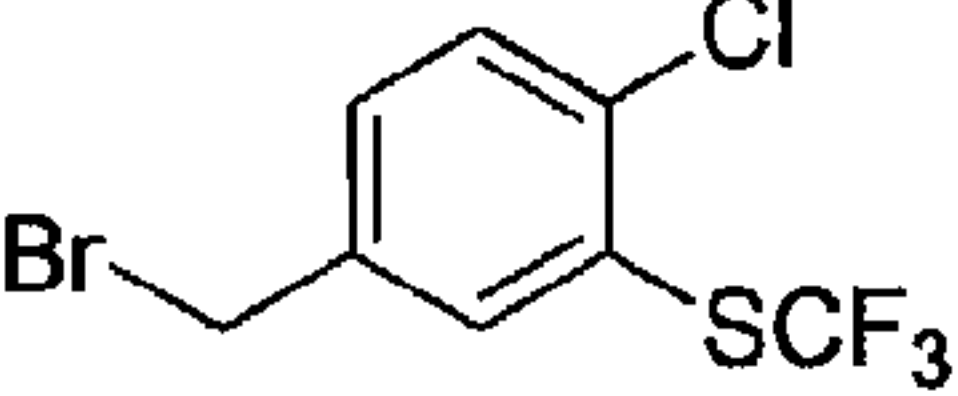
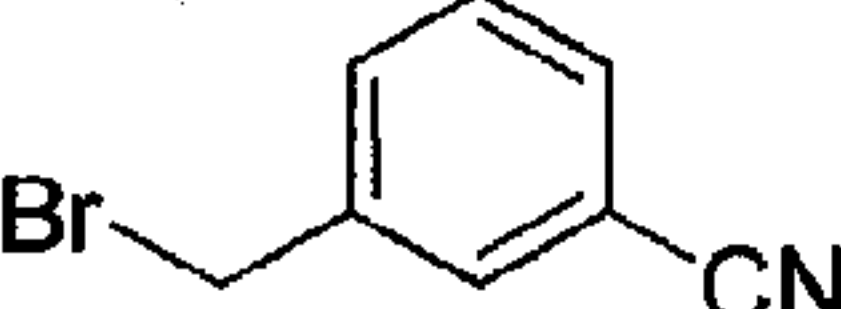
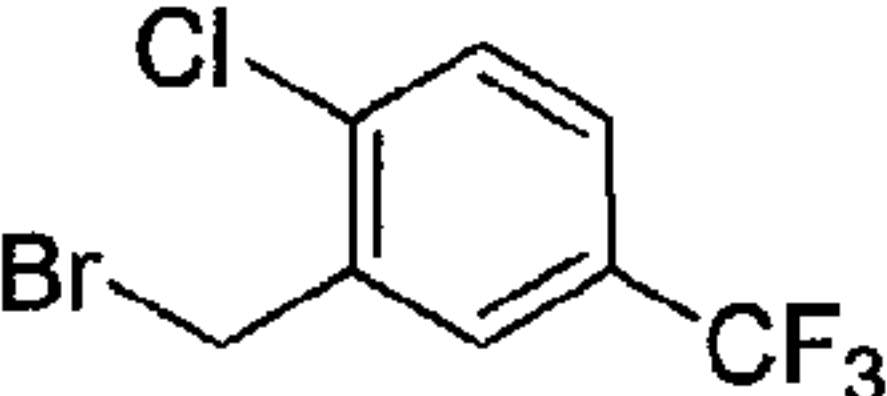
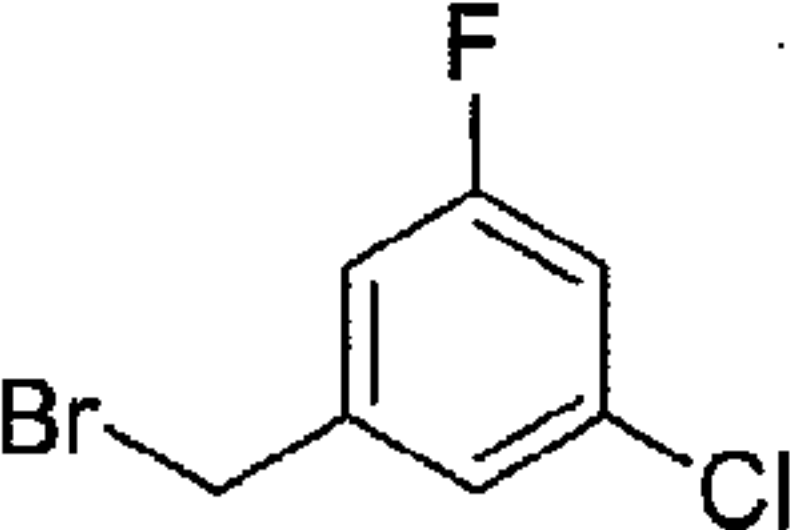
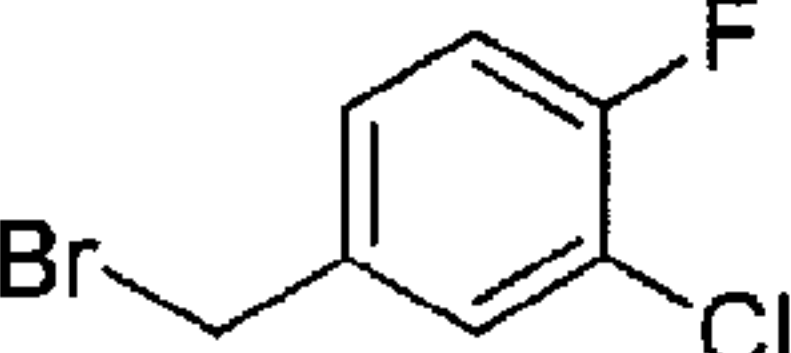
[00282] The compounds listed in the table below were prepared in a similar fashion to that described above starting from the listed starting materials used in step 3:

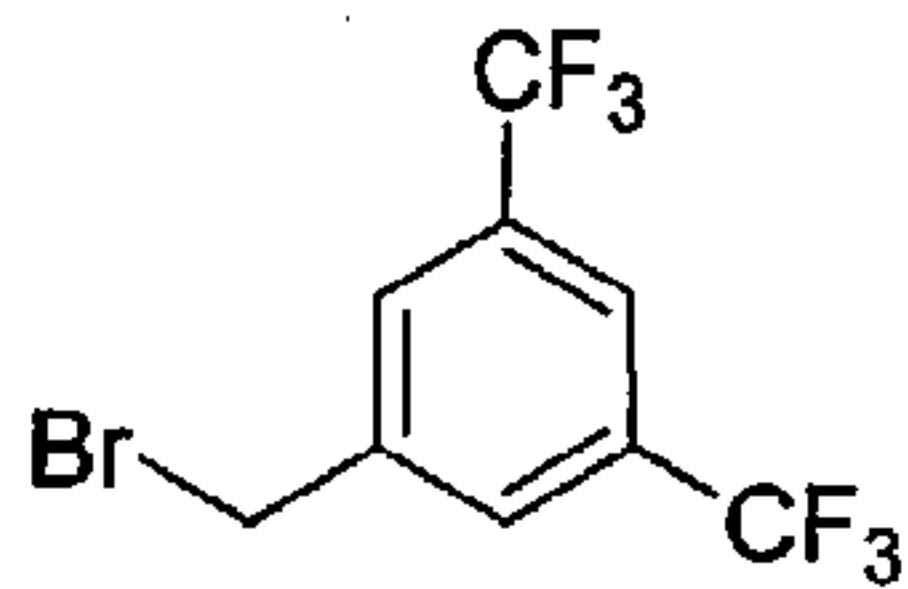
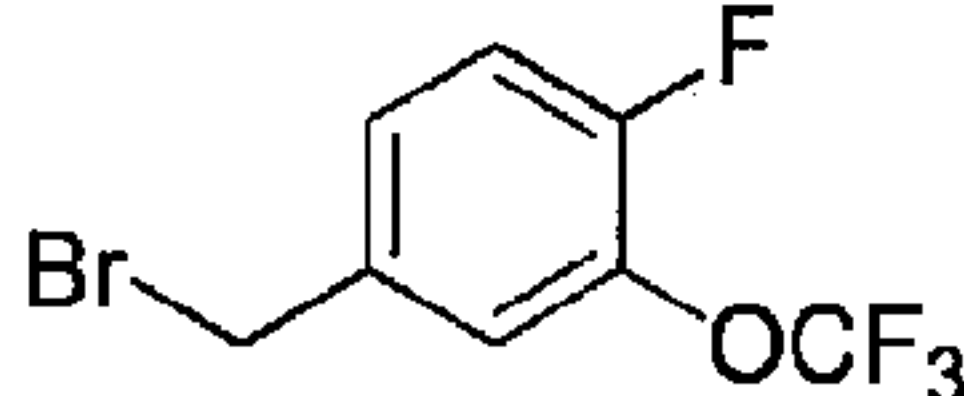
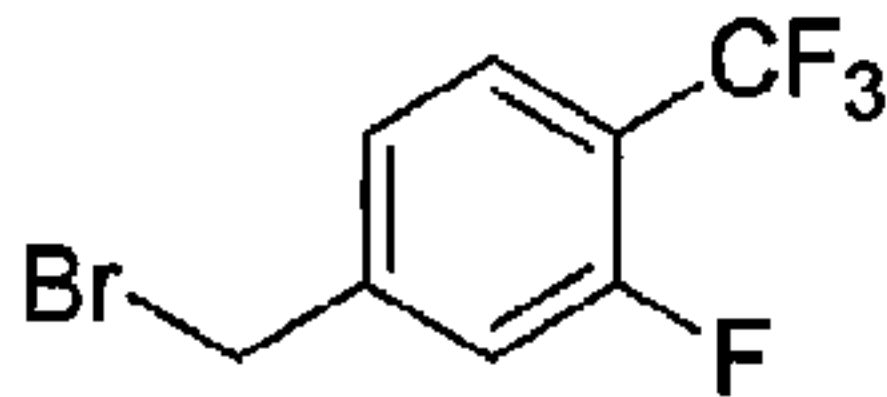
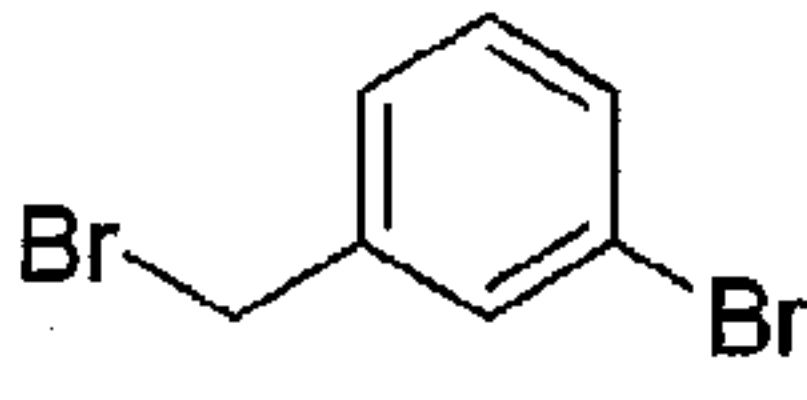
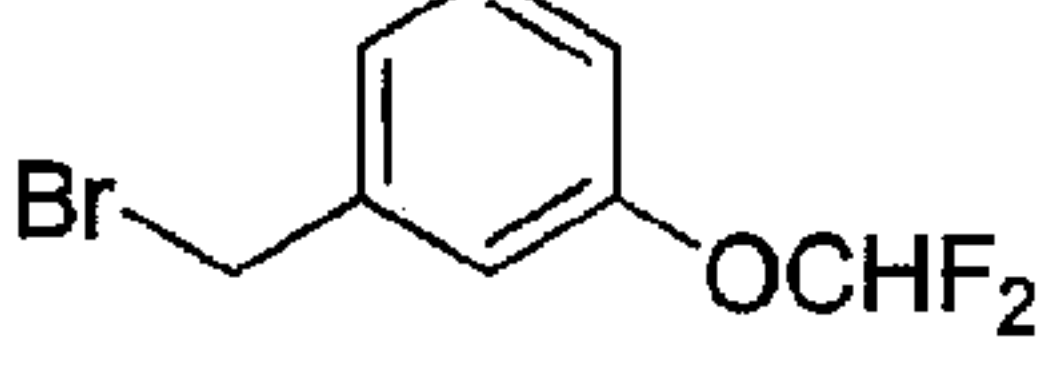
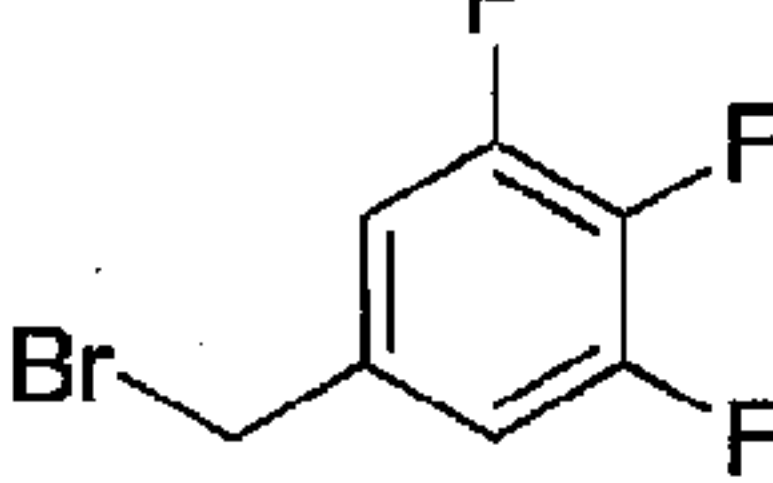
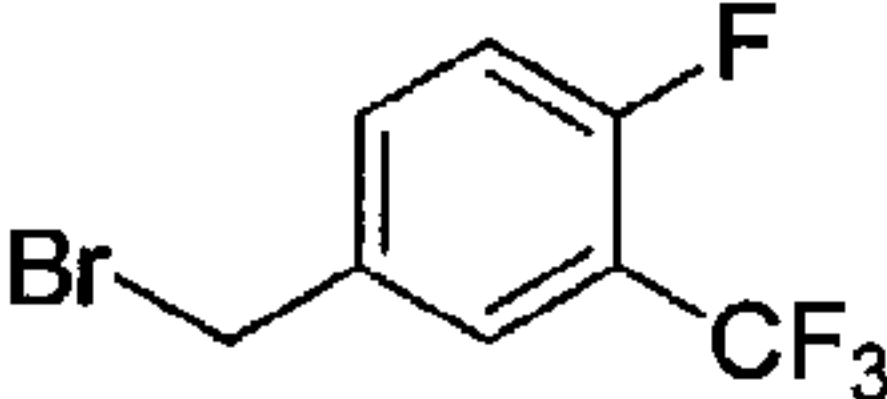
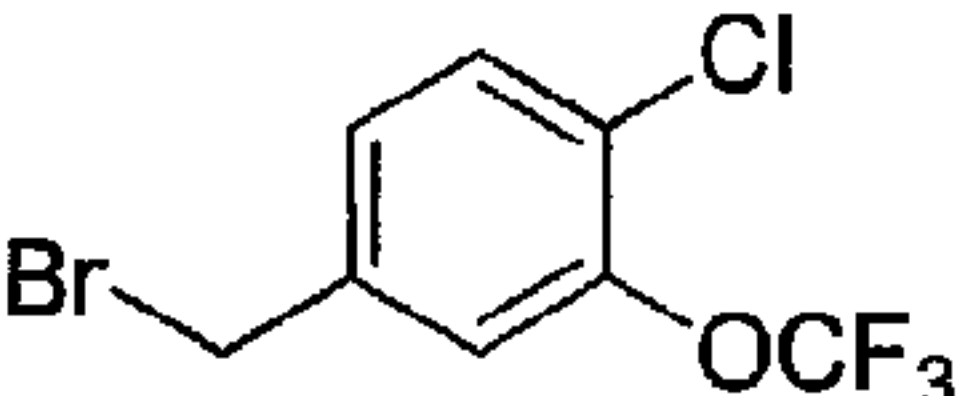
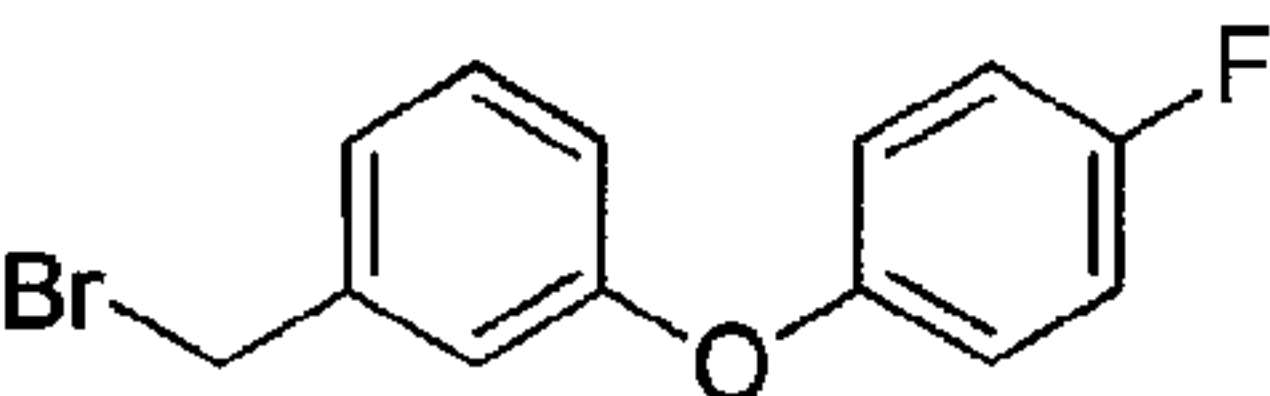
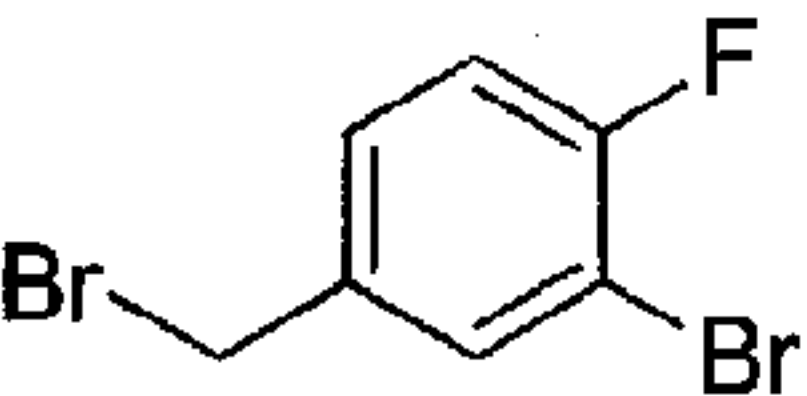
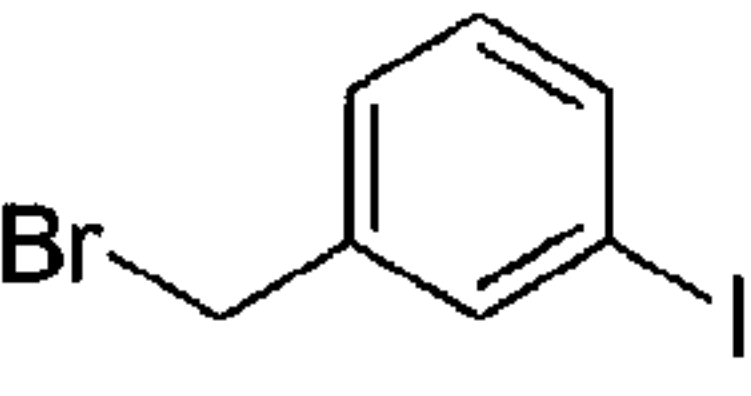
Starting material	Compound No.	LCMS Data
	I-325	LCMS (FA): m/z = 519 (M+H).
	I-119	LCMS (FA): m/z = 557.6 (M+H).
	I-28	LCMS (FA): m/z = 471.5 (M+H).
	I-30	LCMS (FA): m/z = 453.5 (M+H).

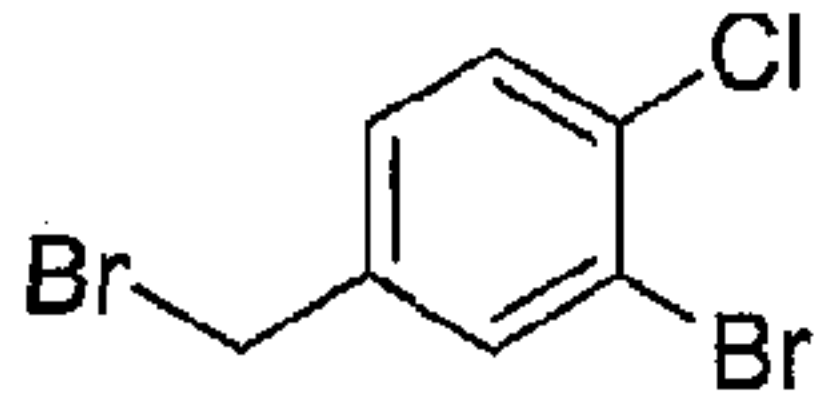
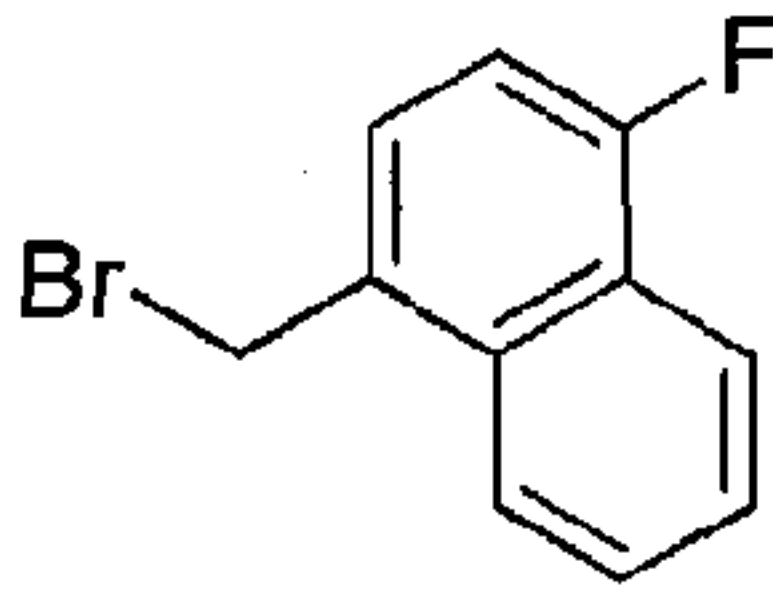
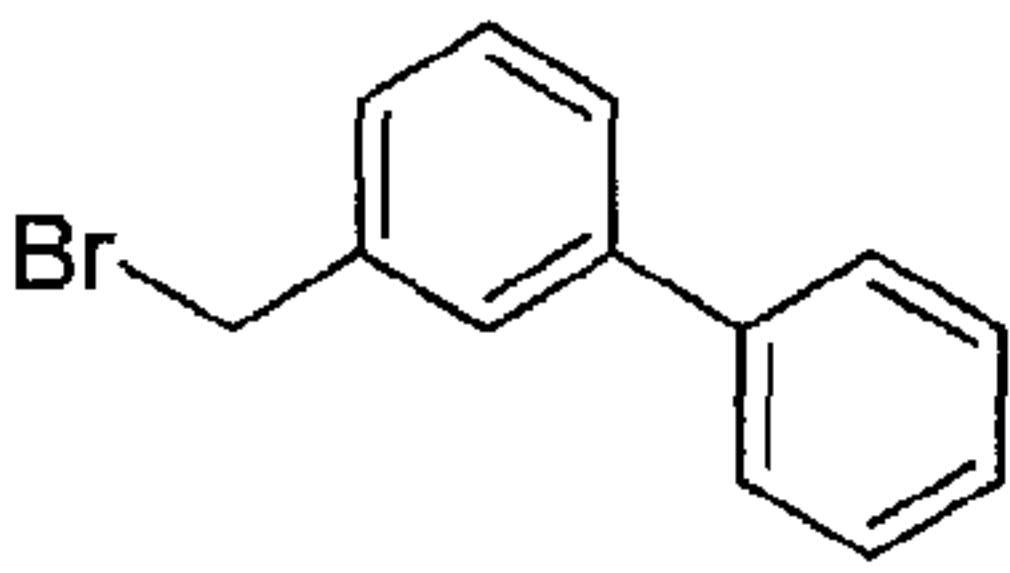
	I-4	LCMS (FA): $m/z = 507.5$ (M+H).
	I-103	LCMS (FA): $m/z = 539.6$ (M+H).
	I-169	LCMS (FA): $m/z = 494.5$ (M+H).
	I-349	LCMS (FA): $m/z = 573.5$ (M+H).
	I-265	LCMS (FA): $m/z = 573.4$ (M+H).
	I-182	LCMS (FA): $m/z = 557.5$ (M+H).
	I-98	LCMS (FA): $m/z = 573.5$ (M+H).
	I-88	LCMS (FA): $m/z = 543.6$ (M+H).
	I-91	LCMS (FA): $m/z = 525.6$ (M+H).
	I-198	LCMS (FA): $m/z = 521.6$ (M+H).
	I-314	LCMS (FA): $m/z = 543.6$ (M+H).

	I-190	LCMS (FA): $m/z = 525.6$ (M+H).
	I-267	LCMS (FA): $m/z = 625.6$ (M+H).
	I-118	LCMS (FA): $m/z = 553.6$ (M+H).
	I-318	LCMS (FA): $m/z = 579.6$ (M+H).
	I-225	LCMS (FA): $m/z = 543.6$ (M+H).
	I-249	LCMS (FA): $m/z = 514.6$ (M+H).
	I-33	LCMS (FA): $m/z = 541.5$ (M+H).
	I-146	LCMS (FA): $m/z = 541.5$ (M+H).
	I-121	LCMS (FA): $m/z = 575.6$ (M+H).

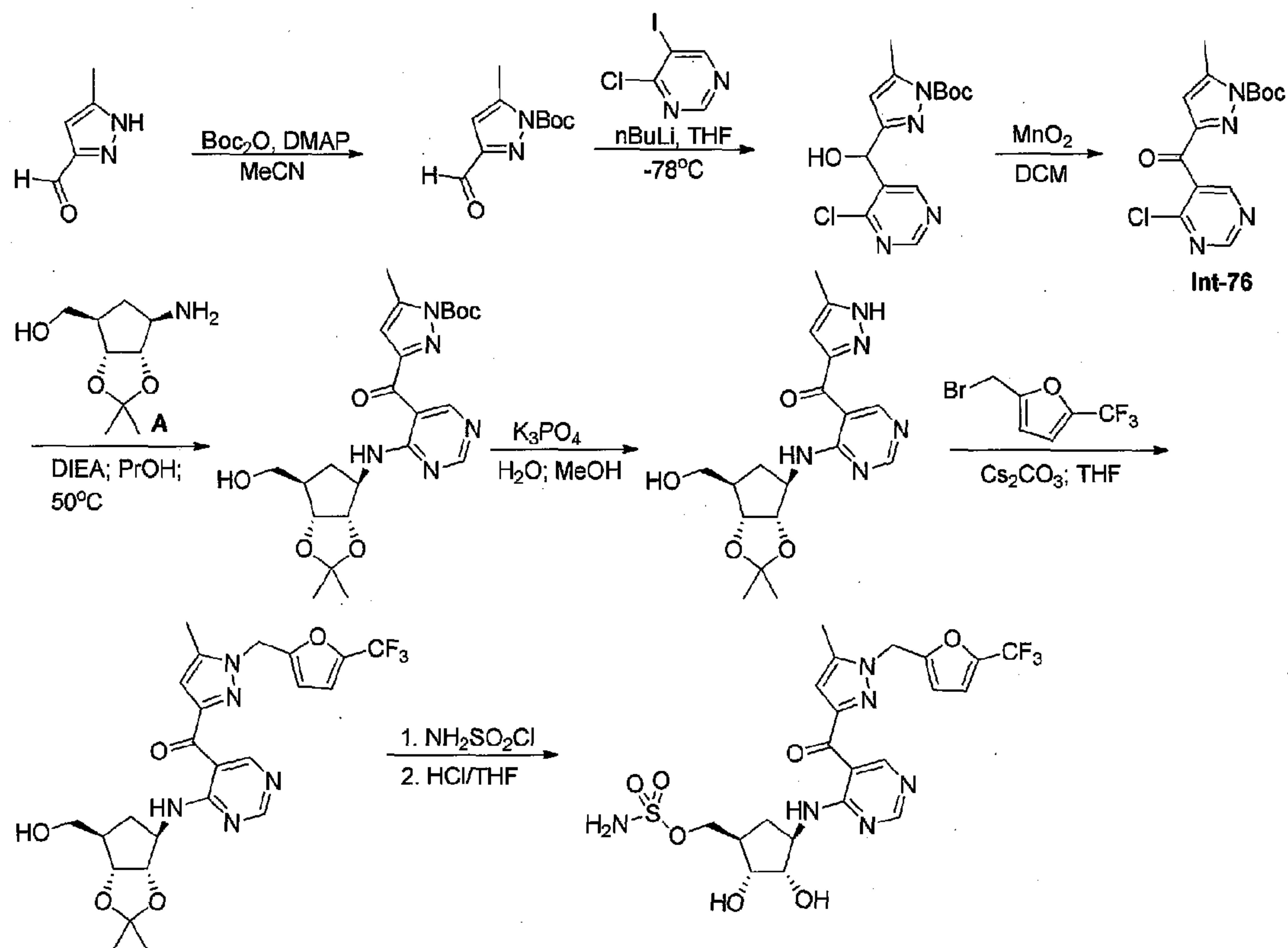
	I-167	LCMS (FA): $m/z = 557.6$ (M+H).
	I-266	LCMS (FA): $m/z = 625.6$ (M+H).
	I-327	LCMS (FA): $m/z = 525.6$ (M+H).
	I-106	LCMS (FA): $m/z = 507.6$ (M+H).
	I-150	LCMS (FA): $m/z = 490.6$ (M+H).
	I-336	LCMS (FA): $m/z = 525.6$ (M+H).
	I-123	LCMS (FA): $m/z = 507.6$ (M+H).
	I-194	LCMS (FA): $m/z = 541.5$ (M+H).
	I-269	LCMS (FA): $m/z = 525.6$ (M+H).
	I-338	LCMS (FA): $m/z = 507.6$ (M+H).
	I-285	LCMS (FA): $m/z = 579.5$ (M+H).

	I-259	LCMS (FA): $m/z = 589.5$ (M+H).
	I-130	LCMS (FA): $m/z = 547.6$ (M+H).
	I-34	LCMS (FA): $m/z = 591.6$ (M+H).
	I-230	LCMS (FA): $m/z = 575.5$ (M+H).
	I-112	LCMS (FA): $m/z = 541.5$ (M+H).
	I-258	LCMS (FA): $m/z = 575.5$ (M+H).
	I-126	LCMS (FA): $m/z = 623.5$ (M+H).
	I-25	LCMS (FA): $m/z = 514.6$ (M+H).
	I-268	LCMS (FA): $m/z = 591.5$ (M+H).
	I-334	LCMS (FA): $m/z = 541.5$ (M+H).
	I-89	LCMS (FA): $m/z = 541.5$ (M+H).

	I-155	LCMS (FA): $m/z = 625.5$ (M+H).
	I-134	LCMS (FA): $m/z = 591.6$ (M+H).
	I-46	LCMS (FA): $m/z = 575.5$ (M+H).
	I-240	LCMS (FA): $m/z = 567.5$ (M+H).
	I-256	LCMS (FA): $m/z = 555.6$ (M+H).
	I-326	LCMS (FA): $m/z = 543.5$ (M+H).
	I-343	LCMS (FA): $m/z = 575.5$ (M+H).
	I-100	LCMS (FA): $m/z = 607$ (M+H).
	I-229	LCMS (FA): $m/z = 599.4$ (M+H).
	I-290	LCMS (FA): $m/z = 585.3$ (M+H).
	I-221	LCMS (FA): $m/z = 615.3$ (M+H).

	I-204	LCMS (FA): $m/z = 601.2$ (M+H).
	I-273	LCMS (FA): $m/z = 557.3$ (M+H).
	I-278	LCMS (FA): $m/z = 566$ (M+H).

Example 47: [(1R,2R,3S,4R)-2,3-Dihydroxy-4-({5-[(5-methyl-1-[[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate I-138



Step 1: tert-Butyl 3-formyl-5-methyl-1H-pyrazole-1-carboxylate

[00283] 5-Methyl-1H-pyrazole-3-carbaldehyde (5.4 g, 49 mmol) was dissolved in acetonitrile (200 mL) and cooled to 0 °C with stirring. DMAP (0.60 g, 4.9 mmol) and di-*tert*-butyldicarbonate (12.9 g, 59.4 mmol) were added and the solution was allowed to warm to rt and stir for 16 h. The reaction was diluted with EtOAc (200 mL). Then the mixture was washed with 1N HCl (aq.) (2x100mL), saturated aq NaHCO₃ (2x100mL), dried over magnesium sulfate, filtered and concentrated. The residue was purified on silica gel to give *tert*-butyl 3-formyl-5-methyl-1H-pyrazole-1-carboxylate (3.9 g, 38%) as a clear oil. ¹H NMR (CDCl₃) δ 10.10 (s, 1H), 6.65 (s, 1H), 2.60 (s, 3H), 1.72 (s, 9H).

Step 2: *tert*-Butyl 3-[(4-chloropyrimidin-5-yl)(hydroxy)methyl]-5-methyl-1H-pyrazole-1-carboxylate

[00284] Into a flame dried RBF with stirbar was added 4-chloro-5-iodopyrimidine (4.9 g, 20 mmol) dissolved in THF (40 mL). The flask was purged with argon and cooled to -78 °C. To this solution was added dropwise *n*-butyllithium (2.5 M in hexane; 17.1 mL, 42.8 mmol) at -78 °C and the mixture was stirred for 30 min. To this mixture was added *tert*-butyl 3-formyl-5-methyl-1H-pyrazole-1-carboxylate (3.9 g, 18.6 mmol) dissolved in THF (15 mL) dropwise. The reaction was stirred at -78 °C for 2 h. The reaction was quenched with a solution of acetic acid (3.2 mL) in THF (10 mL). Water was added to the mixture and then extracted with EtOAc (3x). The combined organic layers were then washed with water and brine, dried over Na₂SO₄, filtered and concentrated. The crude product was purified on silica gel to give *tert*-butyl 3-[(4-chloropyrimidin-5-yl)(hydroxy)methyl]-5-methyl-1H-pyrazole-1-carboxylate (1.0 g, 16%). LCMS (FA): *m/z* = 325.2 (M+H).

Step 3: *tert*-Butyl 3-[(4-chloropyrimidin-5-yl)carbonyl]-5-methyl-1H-pyrazole-1-carboxylate Int-76

[00285] To a solution of *tert*-butyl 3-[(4-chloropyrimidin-5-yl)(hydroxy)methyl]-5-methyl-1H-pyrazole-1-carboxylate (1.0 g, 3.0 mmol) in DCM (20 mL) was added manganese(IV) oxide (2.6 g, 30 mmol). The suspension was stirred for 19 h at rt. The reaction was then filtered through a celite pad and the residual solid was washed with DCM several times. The filtrate was then concentrated in vacuo and the residue was purified on silica gel to afford *tert*-butyl 3-[(4-chloropyrimidin-5-yl)carbonyl]-5-methyl-1H-pyrazole-1-carboxylate (0.81 g, 83%). LCMS (FA): *m/z* = 323.3 (M+H).

Step 4: *tert*-Butyl 3-[(4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-5-methyl-1H-pyrazole-1-carboxylate

[00286] A (0.069 g, 0.31 mmol) and *tert*-butyl 3-[(4-chloropyrimidin-5-yl)carbonyl]-5-methyl-1H-pyrazole-1-carboxylate (0.090 g, 0.28 mmol) were weighed into a 20 mL reaction vessel. To this mixture was added 1-propanol (4 mL) and DIEA (0.10 mL, 0.56 mmol). The resulting mixture was sealed and the vessel allowed to stir while heating at 50 °C for 3 h. The reaction was then cooled to rt and the reaction was concentrated. The crude product was purified on silica gel to afford *tert*-butyl 3-[(4-

{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-5-methyl-1H-pyrazole-1-carboxylate (0.13 g, 98%). LCMS (FA): $m/z = 474$ (M+H).

Step 5: (4-{[(3aS,4R,6R,6aR)-6-(Hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(5-methyl-1H-pyrazol-3-yl)methanone

[00287] *tert*-Butyl 3-[(4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)carbonyl]-5-methyl-1H-pyrazole-1-carboxylate (0.13 g, 0.27 mmol) was dissolved in methanol (2 mL) and a solution of potassium phosphate (29 mg, 0.14 mmol) in water (0.20 mL) was added. It was allowed to stir at rt for 15 h. Then, the reaction was concentrated and diluted with EtOAc and water. The aqueous layer was extracted with EtOAc (3x). The combined organic layers were dried over MgSO₄, filtered, and concentrated to yield (4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(5-methyl-1H-pyrazol-3-yl)methanone (91 mg, 89%). LCMS (FA): $m/z = 374$ (M+H).

Step 6: (4-{[(3aS,4R,6R,6aR)-6-(Hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(5-methyl-1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)methanone

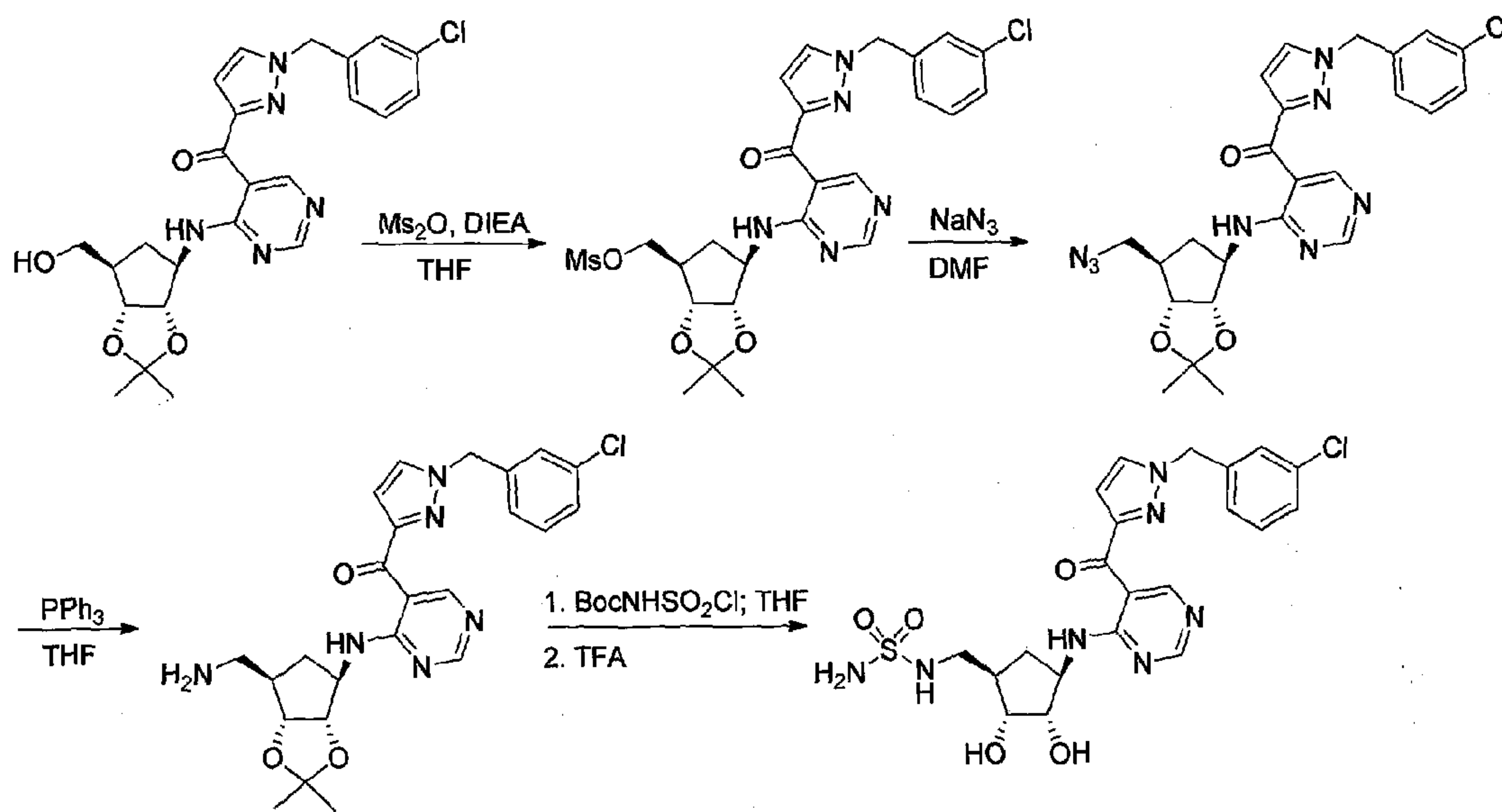
[00288] (4-{[(3aS,4R,6R,6aR)-6-(Hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(5-methyl-1H-pyrazol-3-yl)methanone (90 mg, 0.24 mmol) was dissolved in THF (10 mL). To this solution was added cesium carbonate (0.16 g, 0.48 mmol) and 2-(bromomethyl)-5-(trifluoromethyl)furan (0.063 g, 0.28 mmol) and the reaction was stirred at rt for 45 h. The reaction was then quenched by addition of water and the mixture extracted with EtOAc (3x). The combined organic layers were washed with brine, dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to give (4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(5-methyl-1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)methanone (110 mg, 88%). LCMS (FA): $m/z = 523$ (M+H).

Step 7: [(1R,2R,3S,4R)-2,3-Dihydroxy-4-({5-[(5-methyl-1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl)methyl sulfamate I-138

[00289] To a solution of (4-{[(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)(5-methyl-1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)methanone (0.11 g, 0.21 mmol) and TEA (0.09 mL, 0.63 mmol) in DMF (3.3 mL) was

added chlorosulfonamide (61 mg, 0.53 mmol) at rt, and the mixture was stirred for 1 h. The reaction was quenched by addition of a saturated solution of NaHCO₃ and diluted with water. The mixture was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The crude sulfamate intermediate was dissolved in THF (3.1 mL). Water (3.1 mL) and conc. HCl (0.54 mL, 6.5 mmol) was added to the solution. The reaction was stirred for 4 h at rt. The reaction was quenched by the addition of a saturated solution of NaHCO₃ and extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was triturated with DCM and filtered to afford [(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(5-methyl-1-[(5-(trifluoromethyl)-2-furyl)methyl]-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl)methyl sulfamate (65 mg, 54%). ¹H NMR (DMSO) δ 9.45 (s, 1H), 9.09 (d, *J* = 7.4 Hz, 1H), 8.62 (s, 1H), 7.46 (s, 2H), 7.23 (s, 1H), 6.71 (s, 2H), 5.61 (s, 2H), 4.93 (d, *J* = 5.8 Hz, 1H), 4.75 (d, *J* = 4.5 Hz, 1H), 4.53 – 4.39 (m, 1H), 4.14 – 4.04 (m, 1H), 4.04 – 3.93 (m, 1H), 3.85 – 3.76 (m, 1H), 3.76 – 3.65 (m, 1H), 2.40 (s, 3H), 2.37 – 2.26 (m, 1H), 2.26 – 2.14 (m, 1H), 1.23 – 1.05 (m, 1H); LCMS (AA): *m/z* = 561.4 (M+H).

Example 48: N-((1R,2R,3S,4R)-4-[(5-[[1-(3-Chlorobenzyl)-1H-pyrazol-3-yl]carbonyl]pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl)methyl)sulfuric diamide I-136



Step 1: {(3aR,4R,6R,6aS)-6-[(5-[[1-(3-Chlorobenzyl)-1H-pyrazol-3-yl]carbonyl]pyrimidin-4-yl)amino]-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl)methyl methanesulfonate

[00290] [1-(3-Chlorobenzyl)-1H-pyrazol-3-yl](4-[[{(3aS,4R,6R,6aR)-6-(hydroxymethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)methanone (see example

41 for synthesis) (0.26 g, 0.55 mmol) was dissolved in THF (15 mL). DIEA (0.28 g, 2.2 mmol) and methanesulfonic anhydride (0.19 g, 1.1 mmol) were then added and the reaction mixture was allowed to stir at rt for 30 min. DCM (50 mL) was added and the mixture was washed with water (2x). The organic layer was dried over MgSO₄, filtered, and concentrated to yield {(3aR,4R,6R,6aS)-6-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl}methyl methanesulfonate (0.30 g, 97%). LCMS (AA): m/z = 561 (M+H).

Step 2: (4-{[(3aS,4R,6R,6aR)-6-(Azidomethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone

[00291] {(3aR,4R,6R,6aS)-6-[(5-{[1-(3-Chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl}methyl methanesulfonate (0.30 g, 0.54 mmol) was dissolved in DMF (10 mL). Sodium azide (0.14 g, 2.1 mmol) was added and the reaction mixture was allowed to stir at 40 °C for 16 h. Water (60 mL) was added and the mixture was extracted with DCM (2x). The organic layer was concentrated and purified on silica gel to afford (4-{[(3aS,4R,6R,6aR)-6-(azidomethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone. The eluent was 40-90% EtOAc in hexane (0.17 g, 63%). LCMS (AA): m/z = 509 (M+H).

Step 3: (4-{[(3aS,4R,6R,6aR)-6-(Aminomethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone

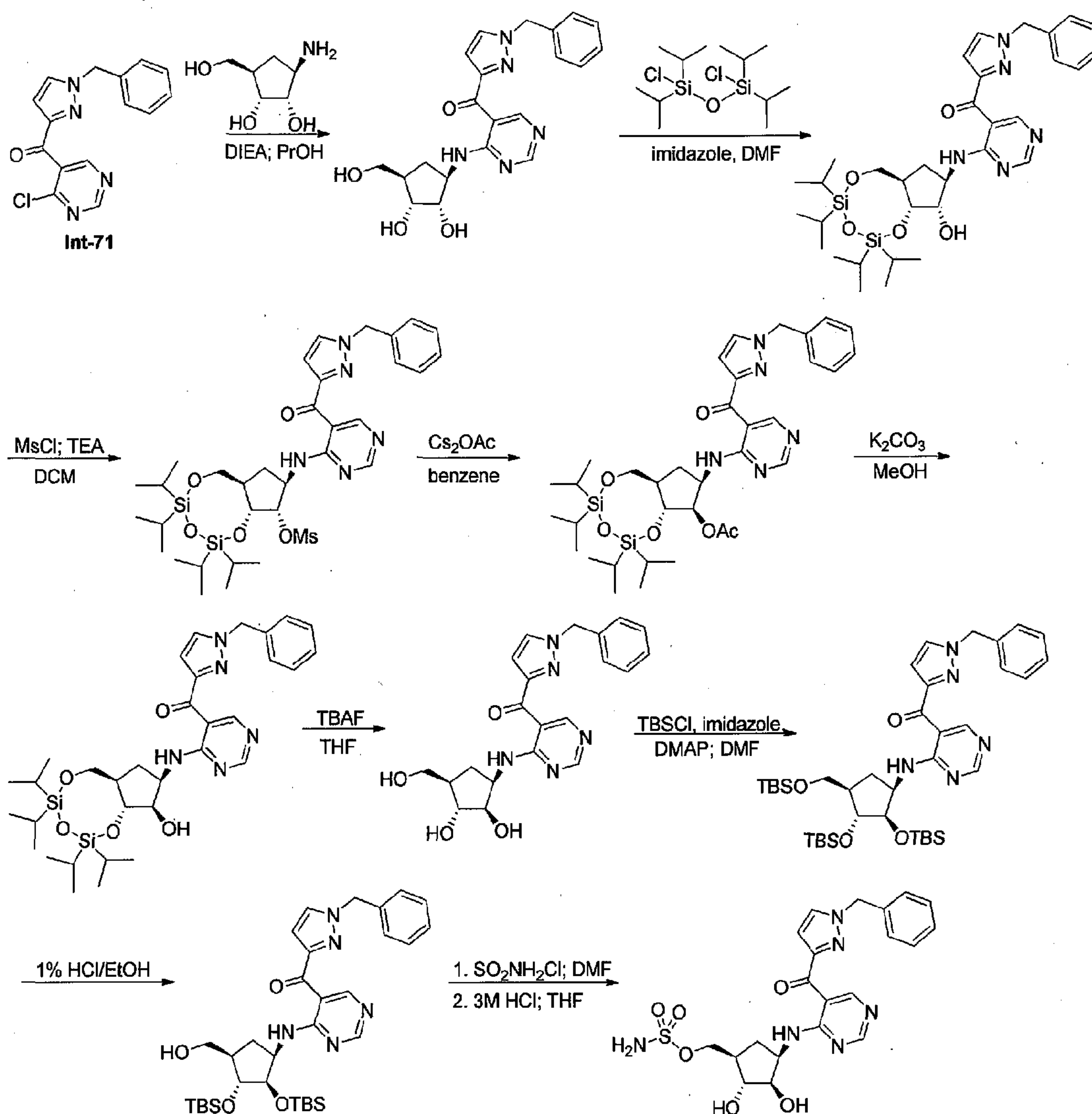
[00292] (4-{[(3aS,4R,6R,6aR)-6-(Azidomethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone (0.17 g, 0.34 mmol) was dissolved in a solution of THF (15 mL) and water (1.0 mL). Triphenylphosphine (0.18 g, 0.68 mmol) was added and the solution was stirred at rt for 3 days. The reaction solvent was evaporated in vacuo and the crude material was purified on silica gel to give (4-{[(3aS,4R,6R,6aR)-6-(azidomethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone (0.12 g, 74%). LCMS (AA): m/z = 483 (M+H).

Step 4: N-({(1R,2R,3S,4R)-4-[(5-{[1-(3-Chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl)sulfuric diamide I-136

[00293] (4-{[(3aS,4R,6R,6aR)-6-(Aminomethyl)-2,2-dimethyltetrahydro-3aH-cyclopenta[d][1,3]dioxol-4-yl]amino}pyrimidin-5-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone (0.12 g, 0.25 mmol) was dissolved in THF (20 mL). DIEA (0.10 g, 0.76 mmol) and *tert*-butyl (chlorosulfonyl)carbamate (0.11 g, 0.51 mmol) were then added to the solution at rt. The reaction mixture was allowed to stir at rt for 30 min. The reaction mixture was concentrated and purified on silica gel to

give the Boc-protected intermediate [52 mg, 66%; LCMS (AA): m/z = 662 (M+H).] which was then dissolved in a solution of TFA (7.2 mL) and water (0.80 mL). It was allowed to stir at rt for 30 min. Solvent was then evaporated and the residue was dissolved in methanol (5 mL). TEA (0.5 mL) was added to neutralize the solution and the resulting mixture was concentrated and subsequently dissolved in EtOAc (20 mL). This mixture was washed with water (2x). The organic layer was concentrated to yield N-((1R,2R,3S,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl)methyl)sulfuric diamide (0.025g, 61%). ^1H NMR (MeOD) δ 9.64 (s, 1H), 8.58 (s, 1H), 7.86 (d, J = 2.4 Hz, 1H), 7.44 – 7.29 (m, 3H), 7.29 – 7.20 (m, 1H), 6.98 (d, J = 2.4 Hz, 1H), 5.49 (s, 2H), 4.58 (dd, J = 15.3, 8.2 Hz, 1H), 4.00 – 3.93 (m, 1H), 3.90 (t, J = 5.3 Hz, 1H), 3.28 – 3.17 (m, 1H), 3.10 (dd, J = 12.8, 7.2 Hz, 1H), 2.52 (dt, J = 13.3, 8.3 Hz, 1H), 2.32 – 2.16 (m, 1H), 1.31 – 1.25 (m, 1H). LCMS (AA): m/z = 522.2 (M+H).

Example 49: [(1R,2R,3R,4R)-4-({5-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl)methyl sulfamate I-135



Step 1: (1-Benzyl-1H-pyrazol-3-yl)(4-[(1R,2S,3R,4R)-2,3-dihydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone

[00294] (1-Benzyl-1H-pyrazol-3-yl)(4-chloropyrimidin-5-yl)methanone (1.00 g, 3.35 mmol) and (1R,2S,3R,5R)-3-amino-5-(hydroxymethyl)cyclopentane-1,2-diol hydrochloride (0.68 g, 3.68 mmol) were weighed into a 250 ml RBF fitted with a reflux condenser. To this mixture was added 1-propanol (48 mL) and DIEA (1.75 mL, 10.0 mmol). The resulting mixture was stirred at 50 °C for 18 h. The reaction was allowed to cool to rt and the solution was concentrated. The residue was purified on silica gel to yield (1-benzyl-1H-pyrazol-3-yl)(4-[(1R,2S,3R,4R)-2,3-dihydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (1.3 g, 100%).

Step 2: (1-Benzyl-1H-pyrazol-3-yl)(4-[[[(6aR,8R,9S,9aR)-9-hydroxy-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-8-yl]amino}pyrimidin-5-yl)methanone

[00295] A 100 mL RBF under nitrogen was charged with (1-benzyl-1H-pyrazol-3-yl)(4-[[[(1R,2S,3R,4R)-2,3-dihydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (1.3 g, 3.2 mmol), DMF (13 mL), and imidazole (0.87 g, 12.7 mmol). A solution of 1,3-dichloro-1,1,3,3-tetraisopropylidisiloxane (1.1 mL, 3.5 mmol) in DMF (10 mL) was added dropwise over 1 h. The resulting mixture was allowed to stir at rt overnight. After 16 h reaction was poured into a saturated NaHCO₃ solution and the mixture was extracted with EtOAc (3x). The combined organic portions were washed with brine, dried over MgSO₄, filtered, and concentrated. The crude product was purified on silica gel to give (1-benzyl-1H-pyrazol-3-yl)(4-[[[(6aR,8R,9S,9aR)-9-hydroxy-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-8-yl]amino}pyrimidin-5-yl)methanone (1.9 g, 92%). LCMS (FA): m/z = 652 (M+H).

Step 3: (6aR,8R,9S,9aR)-8-({5-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-9-yl methanesulfonate

[00296] A 500 mL RBF under nitrogen was charged with (1-benzyl-1H-pyrazol-3-yl)(4-[[[(6aR,8R,9S,9aR)-9-hydroxy-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-8-yl]amino}pyrimidin-5-yl)methanone (1.8 g, 2.8 mmol), DCM (8 mL), TEA (0.42 mL, 3.0 mmol) and DMAP (0.37 g, 3.0 mmol). The reaction was cooled in an ice bath and a solution of methanesulfonyl chloride (0.24 mL, 3.0 mmol) in DCM (6 mL) was added dropwise. The reaction was then allowed to slowly warm to rt and stir overnight. After stirring 15 h, the reaction was quenched by the addition of water. The mixture was extracted with EtOAc (3x). The combined organic layers were dried over MgSO₄, filtered, and concentrated to give (6aR,8R,9S,9aR)-8-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-9-yl methanesulfonate (2 g, 100%). LCMS (FA): m/z = 731 (M+H).

Step 4: (6aR,8R,9R,9aR)-8-({5-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-9-yl acetate

[00297] A 500 mL RBF under nitrogen was charged with (6aR,8R,9S,9aR)-8-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-9-yl methanesulfonate (1.1 g, 1.5 mmol), benzene (20 mL), 1,4,7,10,13,16-hexaoxacyclooctadecane (0.21 g, 0.78 mmol), and cesium acetate (0.91

g, 4.7 mmol). The reaction was then heated at 80 °C while stirring. After 7 h, additional cesium acetate (0.91 g, 4.7 mmol) was added and the reaction continued to stir overnight at 80 °C. LCMS then showed a mixture of desired product, starting material and more polar byproducts. The reaction was subsequently quenched by the addition of water then extracted with EtOAc (3x). The combined extracts were concentrated and the crude material purified on silica gel to provide (6aR,8R,9R,9aR)-8-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-9-yl acetate (0.25 g, 24%). LCMS (FA): $m/z = 694$ (M+H).

Step 5: (1-Benzyl-1H-pyrazol-3-yl)(4-{{(6aR,8R,9R,9aR)-9-hydroxy-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-8-yl}amino}pyrimidin-5-yl)methanone

[00298] (6aR,8R,9R,9aR)-8-({5-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-9-yl acetate (0.15 g, 0.22 mmol), methanol (7 mL), and potassium carbonate (90 mg, 0.6 mmol) were stirred in a 20 mL scintillation vial at rt for 20 h. The reaction mixture was then concentrated and a solution of saturated sodium bicarbonate (aq.) (20 mL) was added. The resulting mixture was extracted with EtOAc (3x). The combined organic layers were dried over MgSO₄, filtered, and concentrated to yield (1-benzyl-1H-pyrazol-3-yl)(4-{{(6aR,8R,9R,9aR)-9-hydroxy-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-8-yl}amino}pyrimidin-5-yl)methanone (0.14 g, 99%). LCMS (FA): $m/z = 652$ (M+H).

Step 6: (1-Benzyl-1H-pyrazol-3-yl)(4-{{(1R,2R,3R,4R)-2,3-dihydroxy-4-(hydroxymethyl)cyclopentyl}amino}pyrimidin-5-yl)methanone

[00299] (1-Benzyl-1H-pyrazol-3-yl)(4-{{(6aR,8R,9R,9aR)-9-hydroxy-2,2,4,4-tetraisopropylhexahydrocyclopenta[f][1,3,5,2,4]trioxadisilocin-8-yl}amino}pyrimidin-5-yl)methanone (0.36 g, 0.55 mmol) was dissolved in THF (5 mL). TBAF (1.0 M solution in THF; 0.58 mL, 0.58 mmol) was added and the solution was allowed to stir at rt. After stirring for 1 h, additional TBAF (1.0 M solution in THF; 0.2 mL, 0.2 mmol) was added and the reaction stirred an additional 4 h. The reaction mixture was concentrated and purified on silica gel to afford (1-benzyl-1H-pyrazol-3-yl)(4-{{(1R,2R,3R,4R)-2,3-dihydroxy-4-(hydroxymethyl)cyclopentyl}amino}pyrimidin-5-yl)methanone (0.19 g, 84%). LCMS (FA): $m/z = 410$ (M+H).

Step 7: (1-Benzyl-1H-pyrazol-3-yl)(4-{{(1R,2R,3R,4R)-2,3-bis{{tert-butyl(dimethyl)silyl}oxy}-4-({tert-butyl(dimethyl)silyl}oxy)methyl}cyclopentyl}amino}pyrimidin-5-yl)methanone

[00300] To a solution of (1-benzyl-1H-pyrazol-3-yl)(4-{[(1R,2R,3R,4R)-2,3-dihydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.19 g, 0.45 mmol) in DMF (8.0 mL) was added imidazole (0.22 g, 3.2 mmol) and DMAP (0.0055 g, 0.045 mmol) followed by *tert*-butyldimethylsilyl chloride (0.34 g, 2.3 mmol) at rt, and the mixture was stirred for 3 days. Additional Imidazole (0.092 g, 1.4 mmol) and *tert*-butyldimethylsilyl chloride (0.14 g, 0.90 mmol) were added and the reaction was allowed to continue to stir at rt. After 5 h, TLC and LCMS showed no starting material, but a mixture of the bis-silylated and tris-silylated desired products. The reaction was quenched by addition of water and extracted with EtOAc (3x). The combined organic layers were dried over MgSO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give 1-benzyl-1H-pyrazol-3-yl)(4-{[(1R,2R,3R,4R)-2,3-bis{[*tert*-butyl(dimethyl)silyl]oxy}-4-([*tert*-butyl(dimethyl)silyl]oxy)methyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.090g, 26%). LCMS (FA): m/z = 752 (M+H).

Step 8: (1-Benzyl-1H-pyrazol-3-yl)(4-{[(1R,2R,3R,4R)-2,3-bis{[*tert*-butyl(dimethyl)silyl]oxy}-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone

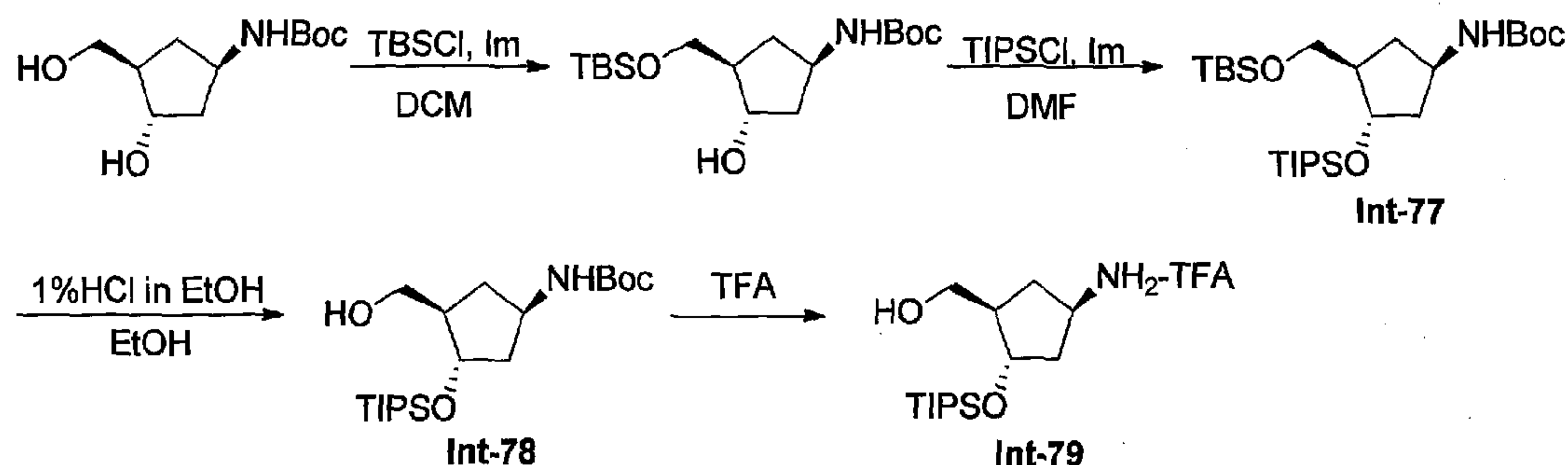
[00301] To a solution of 1-benzyl-1H-pyrazol-3-yl)(4-{[(1R,2R,3R,4R)-2,3-bis{[*tert*-butyl(dimethyl)silyl]oxy}-4-([*tert*-butyl(dimethyl)silyl]oxy)methyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.090 g, 0.12 mmol) in EtOH (3.0 mL) was added a solution of 1% HCl in EtOH (3.0 mL, 0.36 mmol) at rt. The reaction mixture was sealed and placed in a refrigerator (4°C) for 2 h then moved to a -20°C freezer for 60 h. The reaction was then quenched by the addition of aq. saturated NaHCO₃ (10 mL). To the residue was added water (20mL) and it was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to yield (1-benzyl-1H-pyrazol-3-yl)(4-{[(1R,2R,3R,4R)-2,3-bis{[*tert*-butyl(dimethyl)silyl]oxy}-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.06 g, 79%).

Step 9: [(1R,2R,3R,4R)-4-({5-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate I-135

[00302] To a solution of (1-benzyl-1H-pyrazol-3-yl)(4-{[(1R,2R,3R,4R)-2,3-bis{[*tert*-butyl(dimethyl)silyl]oxy}-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.060 g, 0.094 mmol) in DMF (1.5 mL) and TEA (0.079 mL, 0.56 mmol) was added chlorosulfonamide (0.049 g, 0.42 mmol) at rt, and the mixture was allowed to stir for 1 h. Additional chlorosulfonamide (0.025 g, 0.21 mmol) was then added and the reaction stirred at rt an additional 1 h. The reaction was quenched with sat NaHCO₃, and then extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered and concentrated to give the crude sulfamate intermediate which was immediately dissolved in THF (4 mL). HCl (3.0 M solution in water; 1 mL, 3 mmol) was added to the solution. The reaction flask

was fitted with a reflux condenser and the reaction stirred at 60 °C for 7 h. The reaction was then quenched with sat NaHCO₃, and then extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered and concentrated. The crude product was triturated with DCM and collected as a white solid to provide [(1R,2R,3R,4R)-4-(5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl)amino)-2,3-dihydroxycyclopentyl]methyl sulfamate (40 mg, 61%). ¹H NMR (DMSO) δ 9.50 (s, 1H), 9.39 (d, *J* = 7.5 Hz, 1H), 8.62 (s, 1H), 8.07 (d, *J* = 2.4 Hz, 1H), 7.43 (s, 2H), 7.41 – 7.27 (m, 5H), 6.91 (d, *J* = 2.4 Hz, 1H), 5.59 (d, *J* = 4.4 Hz, 1H), 5.51 (s, 2H), 5.12 (d, *J* = 4.7 Hz, 1H), 4.67 – 4.53 (m, 1H), 4.13 (dd, *J* = 9.4, 6.5 Hz, 1H), 4.01 – 3.92 (m, 1H), 3.87 – 3.79 (m, 1H), 3.66 (dd, *J* = 6.7, 4.4 Hz, 1H), 2.38 – 2.28 (m, 1H), 2.14 – 2.03 (m, 1H), 1.40 – 1.25 (m, 1H). LCMS (FA): *m/z* = 489 (M+H).

Example 50: {(1R,2S,4R)-4-Amino-2-[(triisopropylsilyl)oxy]cyclopentyl}methanol•CF₃CO₂H Int-79



Step 1: *tert*-Butyl [(1R,3R,4S)-3-({*tert*-butyl(dimethyl)silyl}oxy)methyl)-4-hydroxycyclopentyl]carbamate

[00303] A solution of *tert*-butyl [(1R,3S,4R)-3-hydroxy-4-(hydroxymethyl)cyclopentyl]carbamate (4.0 g, 17 mmol) (for synthesis of starting material see: Ober, M. et. al. *J. Am. Chem. Soc.* **2005**, 127, 18143-18149.) and imidazole (1.4 g, 21 mmol) in DMF (40 mL) was diluted with DCM (200 mL) and cooled in an ice/water bath. *tert*-Butyldimethylsilylchloride (2.9 g, 19 mmol) was added as a solution in DCM (40 mL). The reaction was allowed to warm to ambient temperature and stirred overnight. The reaction was quenched by addition of water (150 mL) and the mixture was transferred to separatory funnel. The organic layer was collected and the residual water layer was extracted with DCM (150 mLx2). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated. The residue was purified on silica gel to provide *tert*-butyl [(1R,3R,4S)-3-({*tert*-butyl(dimethyl)silyl}oxy)methyl)-4-hydroxycyclopentyl]carbamate (5.21 g, 87%). ¹H NMR (CDCl₃) δ 4.73 (s, 1H), 4.20 – 4.05 (m, 2H), 3.81 (dd, *J* = 9.8, 4.2 Hz, 1H), 3.54 (dd, *J* = 9.7, 7.1 Hz, 1H), 2.33 – 2.10 (m, 2H), 2.05 – 1.79 (m, 3H), 1.43 (s, 9H), 1.20 – 1.08 (m, 1H), 0.90 (s, 9H), 0.08 (s, 6H).

Step 2: *tert*-Butyl {(1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate Int-77

[00304] To a solution of *tert*-butyl [(1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-hydroxycyclopentyl]carbamate (3.8 g, 11 mmol) in DMF (57 mL) under an atmosphere of argon was added imidazole (2.25 g, 33 mmol) followed by triisopropylchlorosilane (4.7 mL, 22 mmol) at rt, and the mixture was stirred for 61 h. The reaction was quenched by addition of saturated NH₄Cl (150 mL) and extracted with EtOAc (200 mLx5). The combined organic layers were washed with brine, dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to afford *tert*-butyl {(1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate (5.13 g, 93%) as a colorless oil. ¹H NMR (CDCl₃) δ 4.90 (s, 1H), 4.35 – 4.20 (m, 1H), 4.19 – 3.99 (m, 1H), 3.75 – 3.44 (m, 2H), 2.37 – 2.17 (m, 1H), 2.03 (s, 1H), 1.96 – 1.69 (m, 2H), 1.43 (s, 9H), 1.31 – 1.13 (m, 1H), 1.04 (s, 2H), 0.90 (s, 9H), 0.06 (s, 6H).

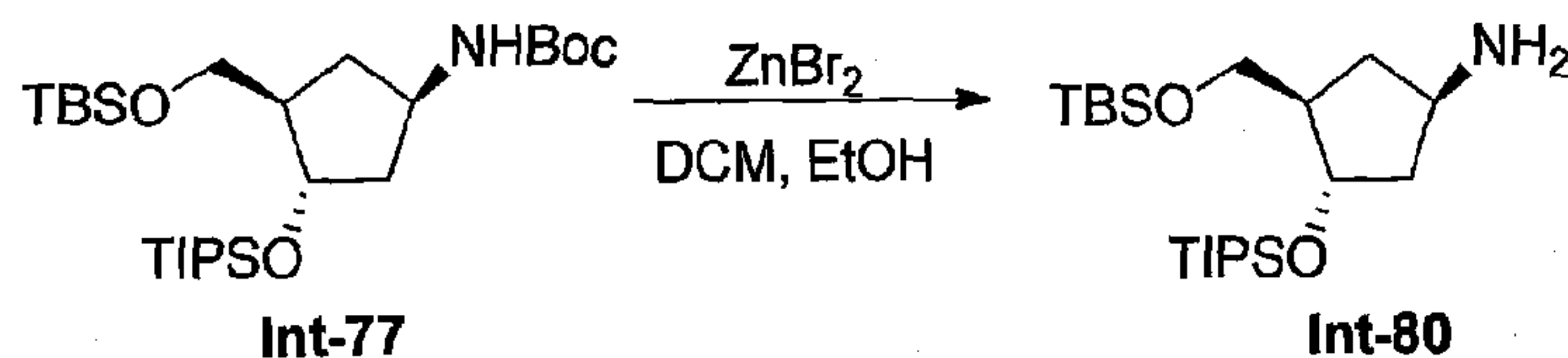
Step 3: *tert*-Butyl {(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate Int-78

[00305] To a solution of *tert*-butyl {(1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate (535 mg, 0.91 mmol) in EtOH (9.7 mL) was added 1% HCl in EtOH (9.7 mL, 1.2 mmol) at rt, and the mixture was allowed to stand at 4 °C for 13 h. The reaction was then stirred for 4 h at rt. The reaction was quenched by addition of saturated NaHCO₃ (50 mL) and extracted with DCM (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give *tert*-butyl {(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate (327 mg, 93%) as a colorless oil. ¹H NMR (CDCl₃) δ 4.65 (s, 1H), 4.22 (dd, *J* = 10.9, 5.1 Hz, 1H), 4.19 – 4.05 (m, 1H), 3.72 – 3.58 (m, 2H), 2.41 – 2.27 (m, 1H), 2.13 – 2.04 (m, 1H), 2.00 (m, 1H), 1.80 – 1.63 (m, 2H), 1.44 (s, 9H), 1.23 – 1.09 (m, 1H), 1.06 (s, 21H).

Step 4: {(1R,2S,4R)-4-Amino-2-[(triisopropylsilyl)oxy]cyclopentyl}methanol•CF₃CO₂H Int-79

[00306] A 250 mL RBF was charged with *tert*-butyl {(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate (1.0 g, 2.6 mmol). To the reaction vessel was added TFA (6.5 mL, 84 mmol) at rt, and the mixture was stirred for 5 min. To the mixture was added toluene (50 mL) and the mixture was concentrated in vacuo. This was repeated twice more to remove water and the resulting residue was dried under high vacuum to give {(1R,2S,4R)-4-amino-2-[(triisopropylsilyl)oxy]cyclopentyl}methanol•CF₃CO₂H (1.31 g, 100%) as colorless oil. LCMS (FA): *m/z* = 288.6 (M+H).

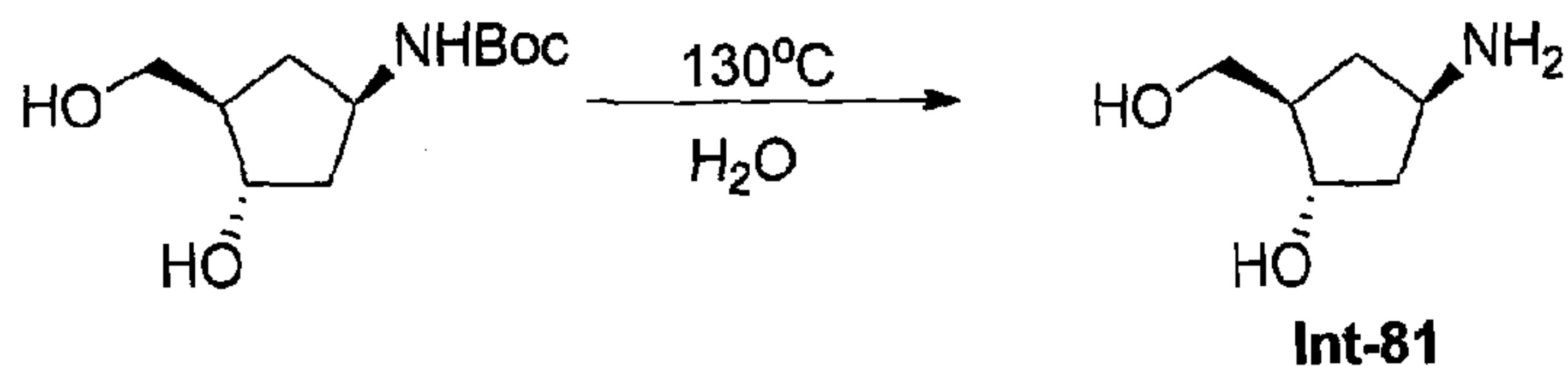
Example 51: (1R,3R,4S)-3-({[*tert*-Butyl(dimethyl)silyl]oxy}methyl)-4-[(triisopropylsilyl)oxy]cyclopentanamine Int-80



Step 1: (1R,3R,4S)-3-([*tert*-Butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentanamine

[00307] To solution of *tert*-butyl 3-((*tert*-butyl(dimethyl)silyl)oxy)methyl-4-((triisopropylsilyl)oxy)cyclopentyl carbamate (1.5 g, 3.0 mmol) in DCM (100 mL) was added EtOH (0.38 mL, 6.6 mmol) followed by zinc bromide (5.4 g, 24 mmol) at rt, and the mixture was stirred for 37 h. The reaction was quenched by addition of 1N NaOH (100 mL) and extracted with DCM (100 mLx5). The combined organic layers were washed with brine and then dried over Na₂SO₄. After filtration, the filtrate was concentrated in vacuo. The residue was purified on silica gel to give (1R,3R,4S)-3-((*tert*-butyl(dimethyl)silyl)oxy)methyl-4-((triisopropylsilyl)oxy)cyclopentanamine (1.09 g, 91%) as a colorless oil. LCMS (FA): *m/z* = 402.6 (M+H).

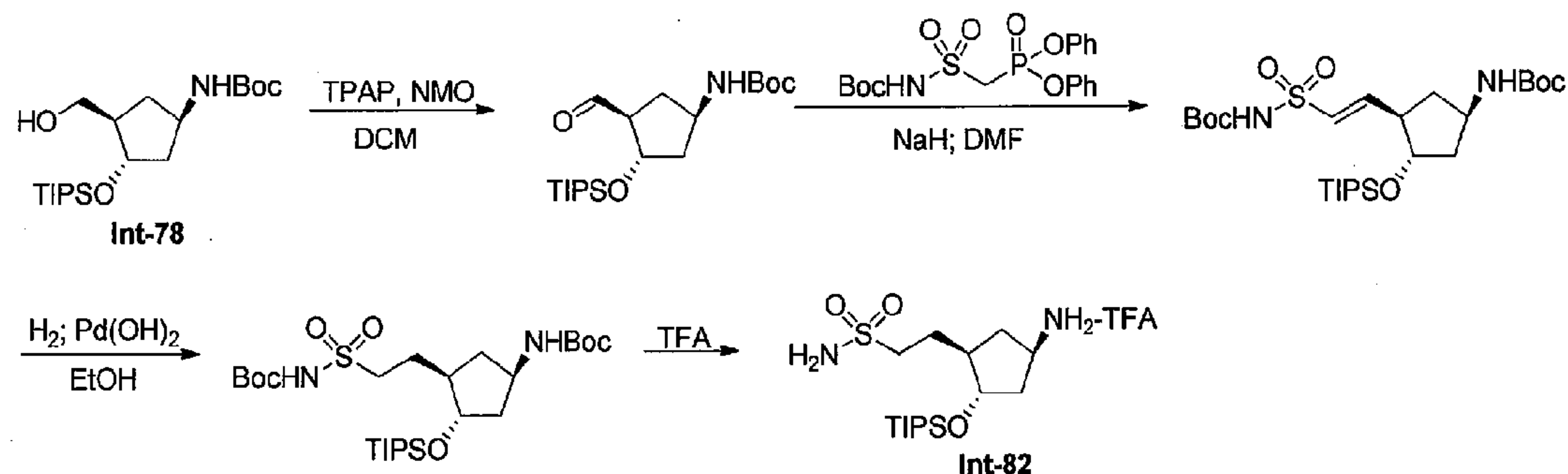
Example 52: (1S,2R,4R)-4-Amino-2-(hydroxymethyl)cyclopentanol Int-81



Step 1: (1S,2R,4R)-4-Amino-2-(hydroxymethyl)cyclopentanol Int-81

[00308] *tert*-Butyl [(1R,3S,4R)-3-hydroxy-4-(hydroxymethyl)cyclopentyl]carbamate (450 mg, 1.90 mmol) (for synthesis see: Ober, M. et al. *J. Am. Chem. Soc.* **2005**, *127*, 18143-18149.) was weighed into a 100 mL RBF and water (10 mL) was added. This mixture was stirred for 48 h at 100 °C. The reaction mixture was concentrated in vacuo and the residue was azeotroped with toluene twice. The resulting residue was dried under high vacuum for 16 h to give (1S,2R,4R)-4-amino-2-(hydroxymethyl)cyclopentanol (268 mg, 99%) as a colorless oil. LCMS (FA): m/z = 132.2 (M+H).

Example 53: 2-{{(1R,2S,4R)-4-Amino-2-[(triisopropylsilyl)oxy]cyclopentyl}ethanesulfonamide}·CF₃CO₂H Int-82



Step 1: *tert*-Butyl {(1R,3S,4S)-3-formyl-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate

[00309] A 100 mL RBF was charged with *tert*-butyl {(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate (550 mg, 1.4 mmol), N-methylmorpholine N-oxide (332 mg, 2.8 mmol), and 3 angstrom molecular sieves (activated at 220 °C under high vac for 2 h). The flask was then purged with argon. DCM (22 mL) was added and the mixture was stirred for 10 min. To this mixture was added tetrapropylammonium perruthenate (TPAP) (50 mg, 0.14 mmol), and the resulting mixture was stirred for 30 min at rt. The reaction was diluted with EtOAc and the mixture was filtered through a silica gel pad over Celite pad (two layers; Celite is bottom and silica gel on the top). The residual molecular sieves were rinsed with EtOAc several times. The organic layer was concentrated in vacuo and the residue was purified on silica gel to give *tert*-butyl {(1R,3S,4S)-3-formyl-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate (380 mg, 69%) as colorless oil. ¹H NMR (CDCl₃) δ 9.81 (s, 1H), 4.70 – 4.42 (m, 2H), 4.36 – 4.20 (m, 1H), 3.01 – 2.89 (m, 1H), 2.44 – 2.31 (m, 1H), 2.14 – 2.03 (m, 1H), 1.77 – 1.64 (m, 1H), 1.62 – 1.53 (m, 1H), 1.44 (s, 9H), 1.14 – 0.96 (m, 21H).

Step 2: *tert*-Butyl {[*(E)*]-2-{{(1R,2S,4R)-4-[(*tert*-butoxycarbonyl)amino]-2-[(triisopropylsilyl)oxy]cyclopentyl}vinyl}sulfonyl}carbamate

[00310] To a solution of *tert*-butyl {[[(diphenylphosphoryl)methyl]sulfonyl}carbamate (1.8 g, 4.5 mmol) in DMF (9.3 mL) was added NaH (60% in mineral oil) (363.0 mg, 9.1 mmol) at rt, and the mixture was stirred for 90 min. To the light yellow solution was added a solution of *tert*-butyl {(1R,3S,4S)-3-formyl-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate (700 mg, 1.82 mmol) in DMF and the resulting mixture was stirred for 1 h at rt. The reaction was cooled to 0 °C and then quenched by addition of water (150 mL). The mixture was extracted with EtOAc:Hexanes (1:1) (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give *tert*-butyl {[*(E)*]-2-{{(1R,2S,4R)-4-[(*tert*-butoxycarbonyl)amino]-2-[(triisopropylsilyl)oxy]cyclopentyl}vinyl}sulfonyl}carbamate (565 mg, 53%) as colorless oil. ¹H NMR

(CDCl₃) δ 7.06 – 6.94 (m, 1H), 6.93 (dd, J = 15.1, 8.3 Hz, 1H), 6.48 (dd, J = 15.1, 1.0 Hz, 1H), 4.60 – 4.40 (m, 1H), 4.30 – 4.14 (m, 2H), 2.75 – 2.65 (m, 1H), 2.52 – 2.39 (m, 1H), 2.16 – 2.05 (m, 1H), 1.73 (dt, J = 13.7, 7.0 Hz, 1H), 1.48 (s, 9H), 1.44 (s, 9H), 1.37 – 1.26 (m, 1H), 1.03 (m, 21H).

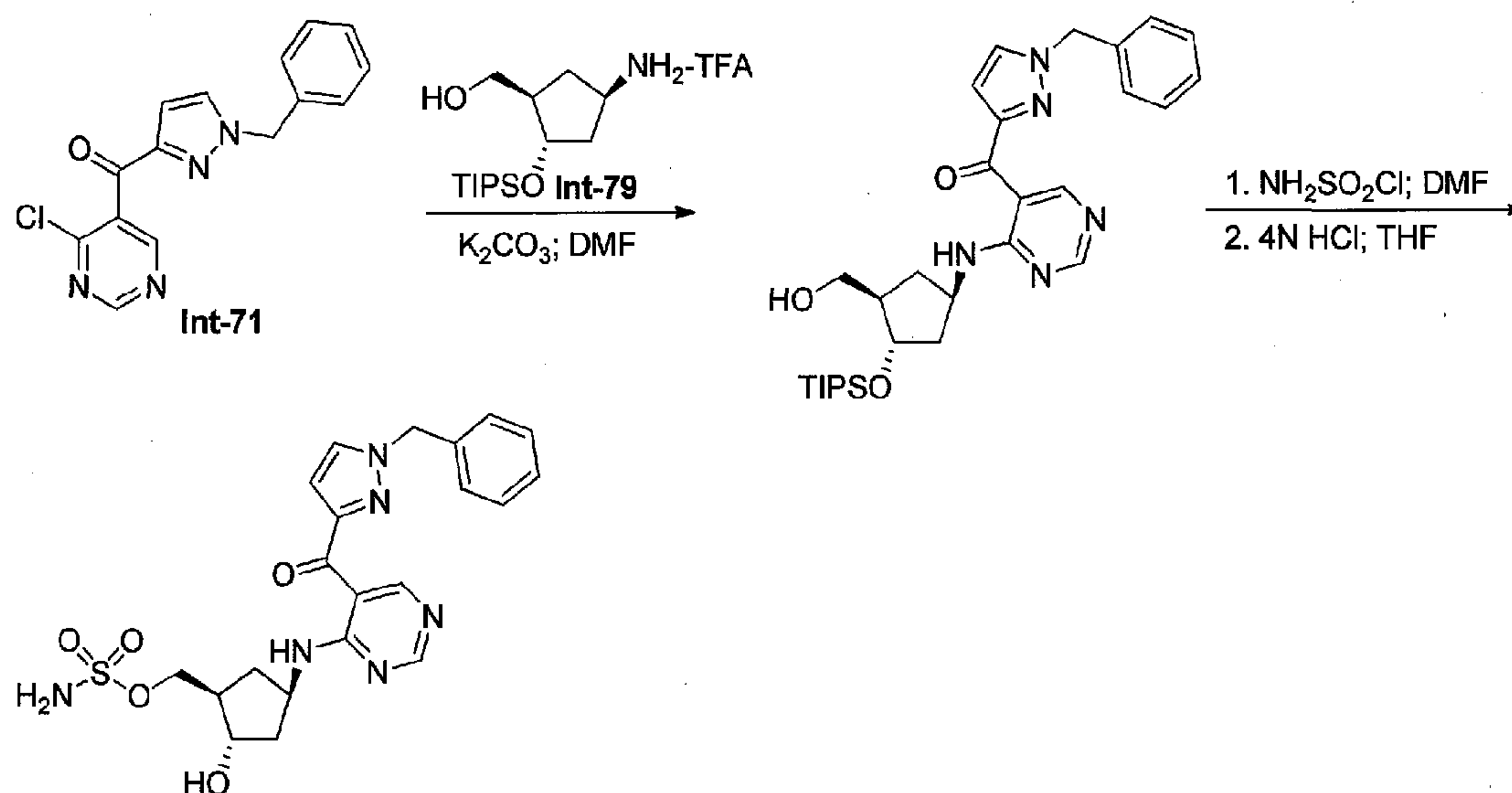
Step 3: *tert*-Butyl [(2-{(1R,2S,4R)-4-[(*tert*-butoxycarbonyl)amino]-2-[(triisopropylsilyl)oxy]cyclopentyl}ethyl)sulfonyl]carbamate

[00311] To a solution of *tert*-butyl {[(E)-2-{(1R,2S,4R)-4-[(*tert*-butoxycarbonyl)amino]-2-[(triisopropylsilyl)oxy]cyclopentyl}vinyl)sulfonyl}carbamate (520 mg, 0.92 mmol) in EtOH (50 mL) in a parr shaker flask was added 10% palladium hydroxide on carbon (50 mg, 0.36 mmol), and the mixture was stirred for 4 h under an atmosphere of hydrogen (50 psi). The reaction was filtered through a celite pad and the residual solid was rinsed with MeOH several times. The filtrate was concentrated in vacuo and the residue was purified on silica gel to give *tert*-butyl [(2-{(1R,2S,4R)-4-[(*tert*-butoxycarbonyl)amino]-2-[(triisopropylsilyl)oxy]cyclopentyl}ethyl)sulfonyl]carbamate (443 mg, 85%) as a colorless amorphous solid. LCMS (FA): m/z = 565.5 (M+H).

Step 4: 2-{(1R,2S,4R)-4-Amino-2-[(triisopropylsilyl)oxy]cyclopentyl}ethanesulfonamide.CF₃CO₂H Int-82

[00312] *tert*-Butyl [(2-{(1R,2S,4R)-4-[(*tert*-butoxycarbonyl)amino]-2-[(triisopropylsilyl)oxy]cyclopentyl}ethyl)sulfonyl]carbamate (150 mg, 0.27 mmol) was weighed into a 100 mL RBF and TFA (2.0 mL, 26 mmol) was added to the reaction vessel. The mixture was stirred for 15 min then diluted with toluene and concentrated in vacuo. The residue was azeotroped with toluene twice and then dried under high vacuum for 18 h to give 2-{(1R,2S,4R)-4-amino-2-[(triisopropylsilyl)oxy]cyclopentyl}ethanesulfonamide•CF₃CO₂H (127 mg, 100%) as a colorless oil. LCMS (FA): m/z = 365.4 (M+H).

Example 54: [(1R,2S,4R)-4-({5-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl]methyl sulfamate I-158



Step 1: (1-Benzyl-1H-pyrazol-3-yl)[4-((1R,3R,4S)-3-(hydroxymethyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino]pyrimidin-5-yl]methanone

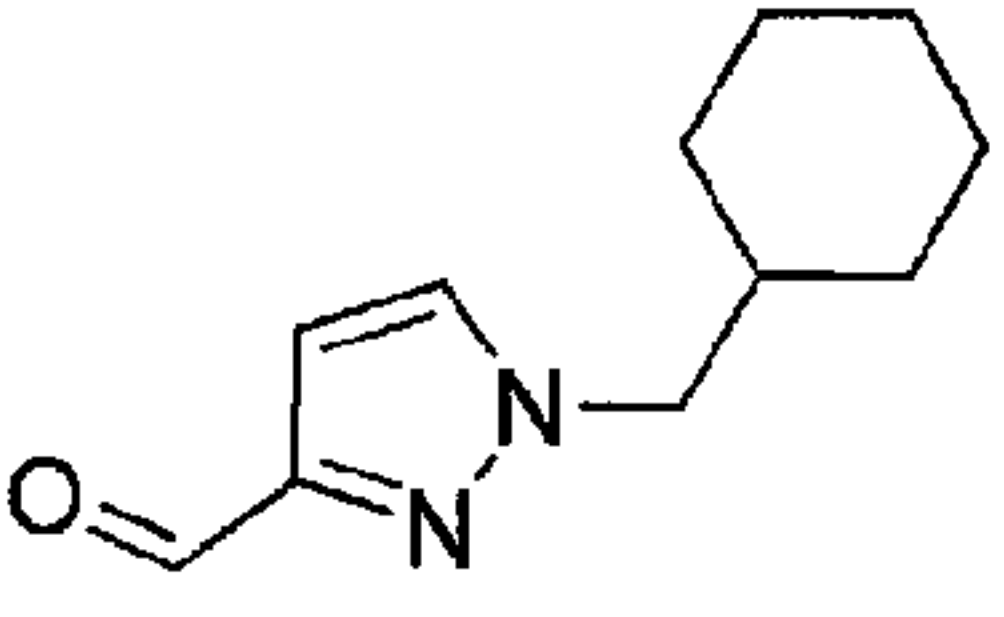
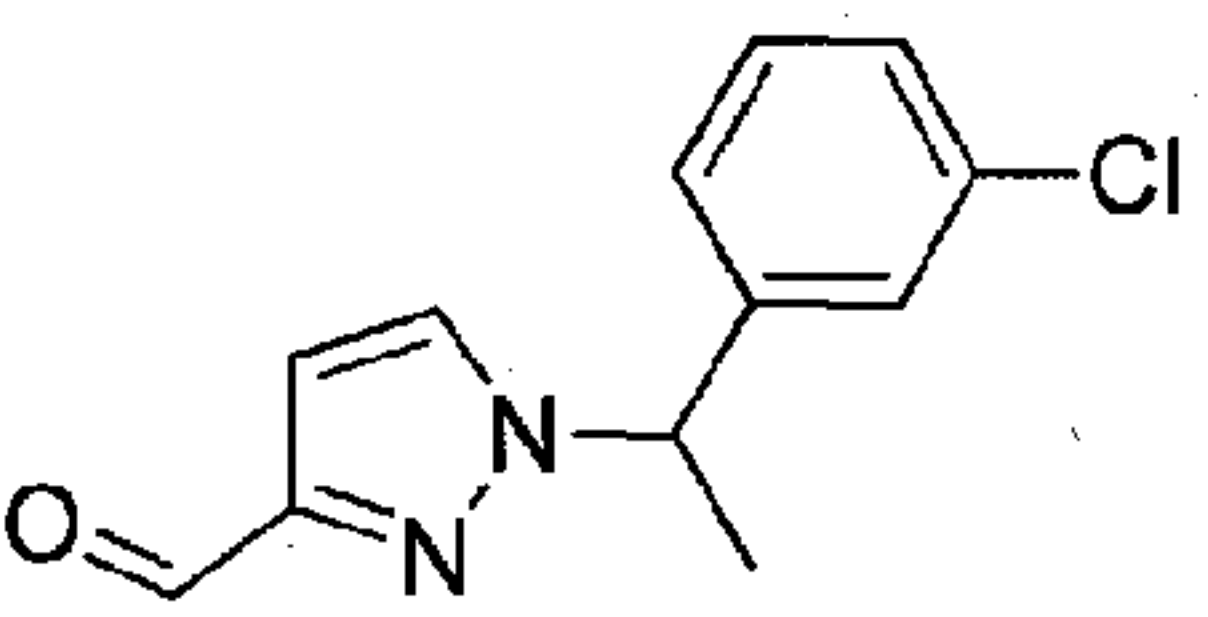
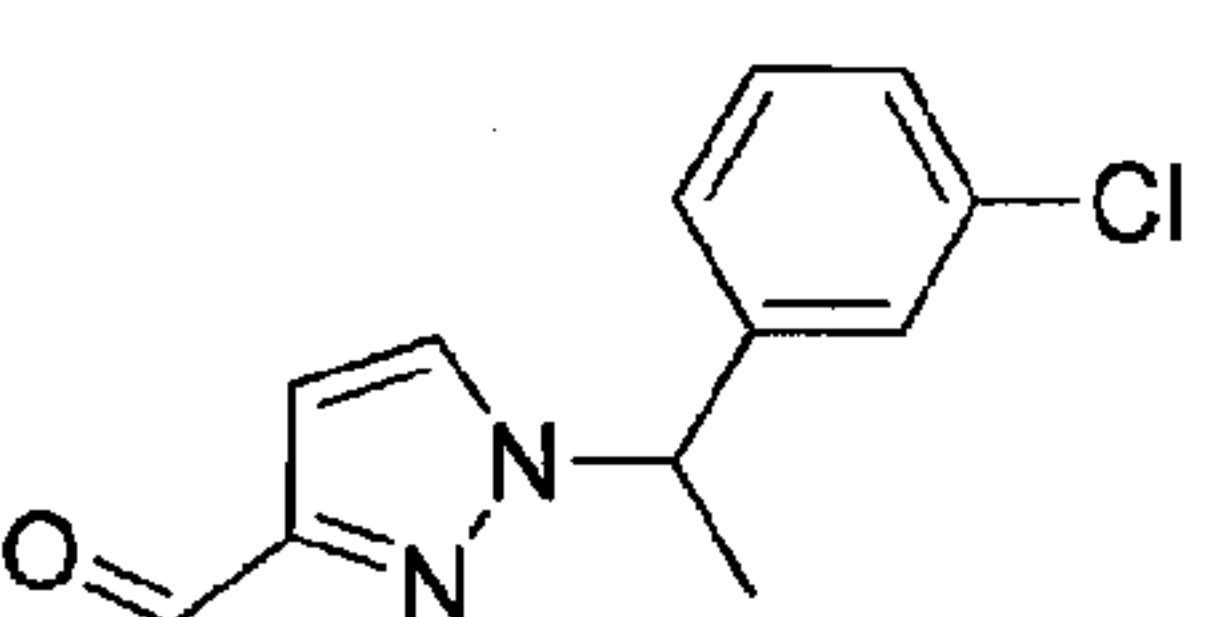
[00313] To a solution of {(1R,2S,4R)-4-amino-2-[(triisopropylsilyl)oxy]cyclopentyl}methanol•CF₃CO₂H (1.04 g, 2.58 mmol) in DMF (20 mL) was added K₂CO₃ (1.1 g, 7.7 mmol) followed by (1-benzyl-1H-pyrazol-3-yl)(4-chloropyrimidin-5-yl)methanone (0.85 g, 2.8 mmol) at rt, and the mixture was stirred for 13 h. The reaction was then concentrated in vacuo. To the residue was added water (100 mL) and then the mixture was extracted with EtOAc (100 mLx3). The combined organic layers were washed with brine, dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give (1-benzyl-1H-pyrazol-3-yl)[4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino]pyrimidin-5-yl]methanone (1.08 g, 75%) as a colorless oil. LCMS (FA): *m/z* = 550.7 (M+H).

Step 2: [(1R,2S,4R)-4-((5-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl)amino)-2-hydroxycyclopentyl]methyl sulfamate I-158

[00314] To a solution of (1-benzyl-1H-pyrazol-3-yl)[4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino]pyrimidin-5-yl]methanone (1.0 g, 1.8 mmol) in DMF (30 mL) was added chlorosulfonamide (650 mg, 5.6 mmol) at rt, and the mixture was stirred for 20 min. The reaction was quenched by addition of saturated NaHCO₃ (100 mL) and water (50 mL). The mixture was extracted with EtOAc (150 mLx3), and the combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give the sulfamate intermediate [(0.91 g, 80%); LCMS (FA): *m/z* = 629.7 (M+H).] which was then dissolved in THF (20 mL) and HCl (4 M in water; 20 mL, 80 mmol) was added at rt. This mixture was stirred for 1 h and then quenched by addition

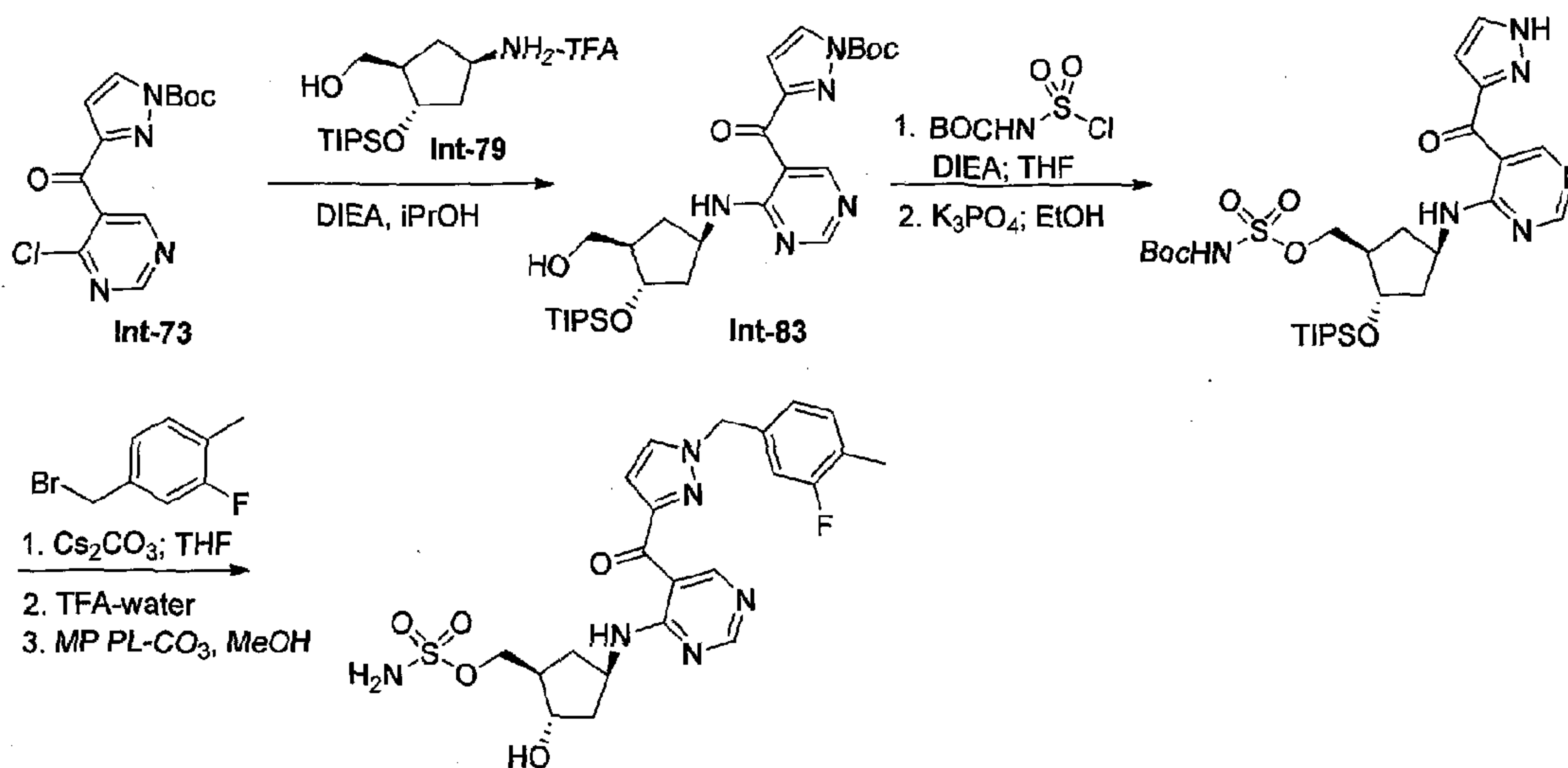
of saturated NaHCO_3 (150 mL) and extracted with EtOAc (200 mLx4). The combined organic layers were dried over Na_2SO_4 , filtered, and concentrated in vacuo. To the residue was added DCM and the resulting suspension was filtered through a glass frit funnel and the residual solid was washed with DCM twice. The filtrate was concentrated in vacuo and the residue was purified on silica gel. The purification product and solid from filtration were combined to give [(1R,2S,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl]methyl sulfamate (652 mg, 95%) as a colorless solid. ^1H NMR (DMSO) δ 9.46 (s, 1H), 9.00 (d, $J = 7.5$ Hz, 1H), 8.62 (s, 1H), 8.07 (d, $J = 2.4$ Hz, 1H), 7.45 (s, 2H), 7.41 – 7.25 (m, 5H), 6.90 (d, $J = 2.4$ Hz, 1H), 5.50 (s, 2H), 4.92 (d, $J = 4.6$ Hz, 1H), 4.76 – 4.64 (m, 1H), 4.10 (dd, $J = 9.7, 5.9$ Hz, 1H), 4.01 – 3.92 (m, 2H), 2.41 – 2.30 (m, 1H), 2.19 – 2.07 (m, 1H), 2.00 (ddd, $J = 11.7, 7.7, 3.8$ Hz, 1H), 1.83 – 1.72 (m, 1H), 1.28 (dt, $J = 12.9, 9.2$ Hz, 1H); LCMS (FA): $m/z = 473.5$ (M+H).

[00315] The compounds listed in the table below were prepared in an analogous fashion to that described above starting from the appropriate starting materials used in step 1. I-133 and I-360 were made as a diastereomeric mixture (benzylic methyl stereocenter) and then separated via HPLC (chiral column). Absolute configurations of the undefined stereocenters are unknown.

Starting material	Compound No.	LCMS Data
 Int-66	I-93	LCMS (FA): $m/z = 479.6$ (M+H).
 Int-67	I-133	LCMS (FA): $m/z = 521.0$ (M+H).
 Int-67	I-360	LCMS (FA): $m/z = 521.1$ (M+H).

Int-67

Example 55: {(1R,2S,4R)-4-[(5-{[1-(3-Fluoro-4-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-210



Step 1: *tert*-Butyl 3-[[4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino)pyrimidin-5-yl]carbonyl]-1H-pyrazole-1-carboxylate Int-83

[00316] *tert*-Butyl 3-[(4-chloropyrimidin-5-yl)carbonyl]-1H-pyrazole-1-carboxylate (2.2 g, 7.1 mmol) was dissolved in isopropyl alcohol (80 mL). DIEA (2.8 g, 21 mmol) and {(1R,2S,4R)-4-amino-2-[(triisopropylsilyl)oxy]cyclopentyl}methanol•TFA (2.9 g, 7.1 mmol) dissolved iPrOH (20 mL) was added to the solution and it was stirred at rt for 16 h. The reaction mixture was concentrated and the crude product was purified on silica gel to produce *tert*-butyl 3-[[4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino)pyrimidin-5-yl]carbonyl]-1H-pyrazole-1-carboxylate (2.5 g, 625). LCMS (AA): m/z = 560 (M+H).

Step 2: *tert*-Butyl [({(1R,2S,4R)-4-[[5-(1H-pyrazol-3-ylcarbonyl)pyrimidin-4-yl]amino]-2-[(triisopropylsilyl)oxy]cyclopentyl}methoxy)sulfonyl]carbamate

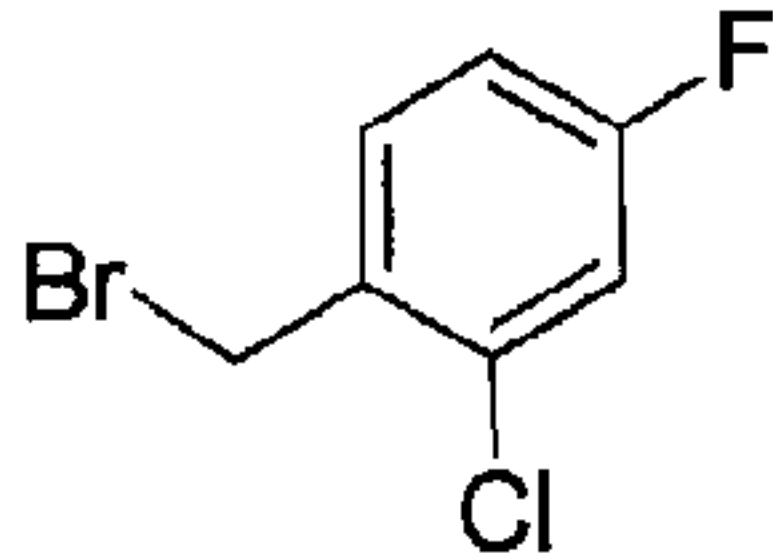
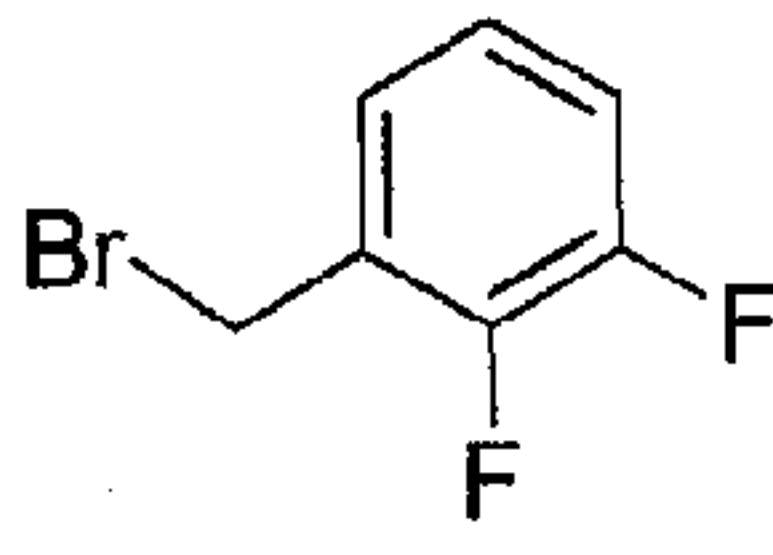
[00317] To a solution of *tert*-butyl 3-[[4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino)pyrimidin-5-yl]carbonyl]-1H-pyrazole-1-carboxylate (2.5 g, 4.4 mmol) and DIEA (2.3 g, 18 mmol) in THF (40 mL) was added *tert*-butyl (chlorosulfonyl)carbamate (1.9 g, 8.8 mmol) at 0 °C. It was then stirred at 0 °C for 4 h. The reaction solvent was evaporated and the

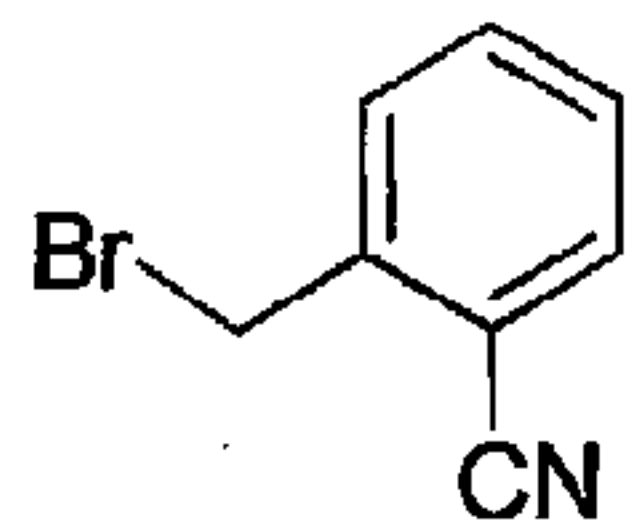
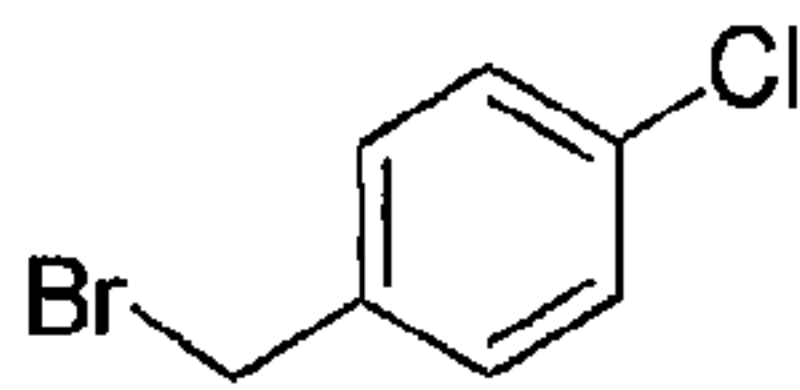
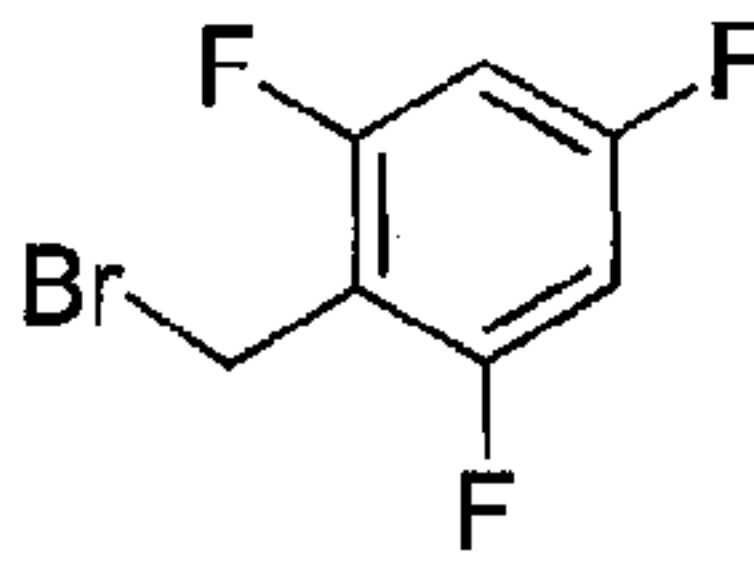
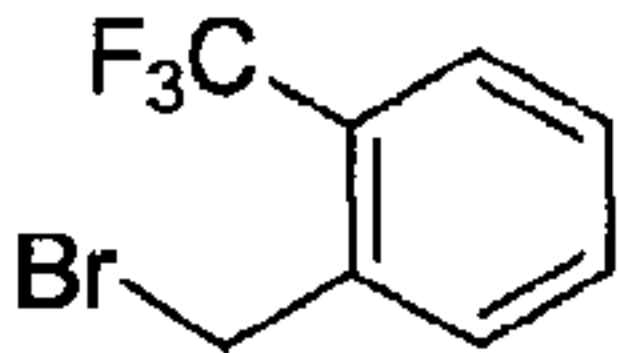
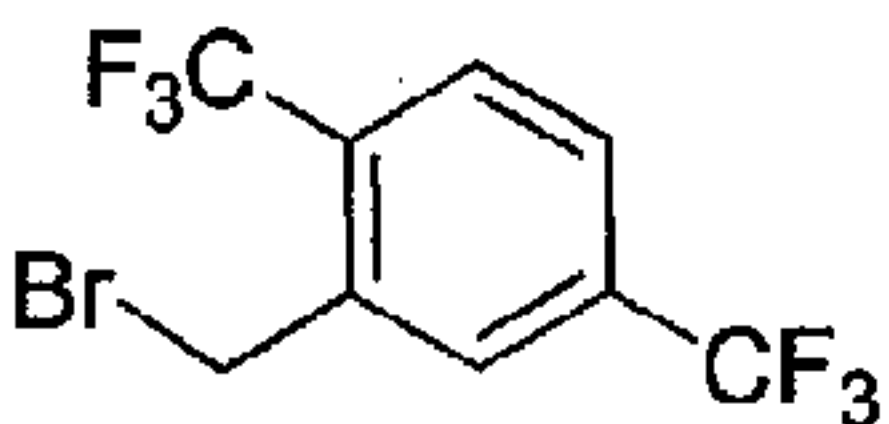
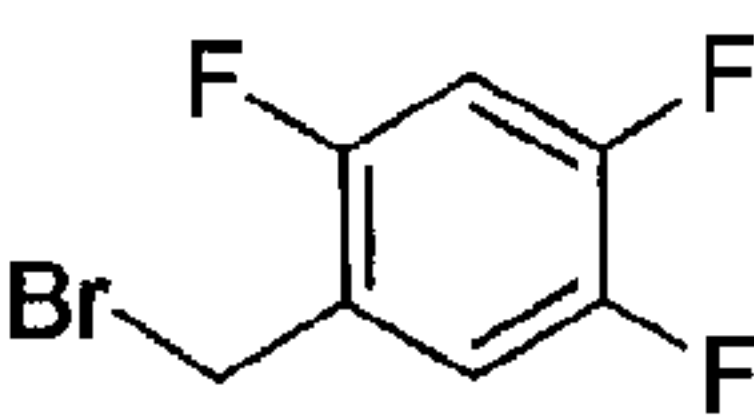
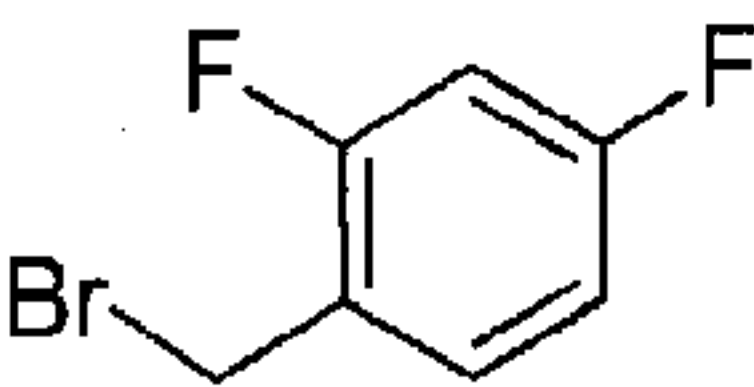
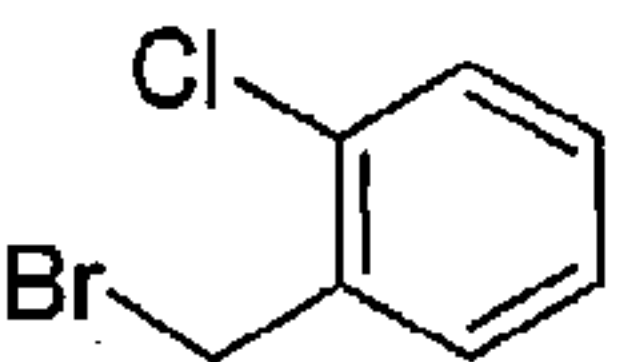
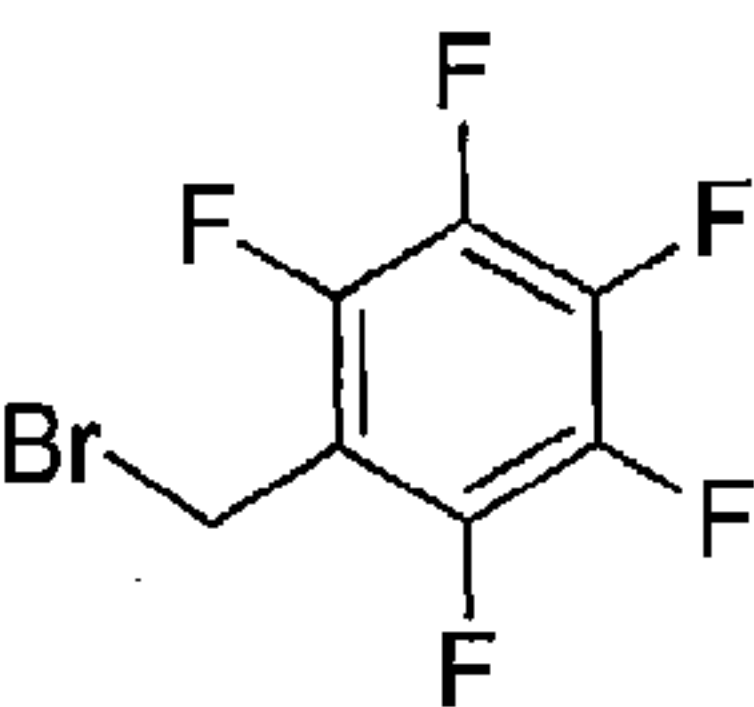
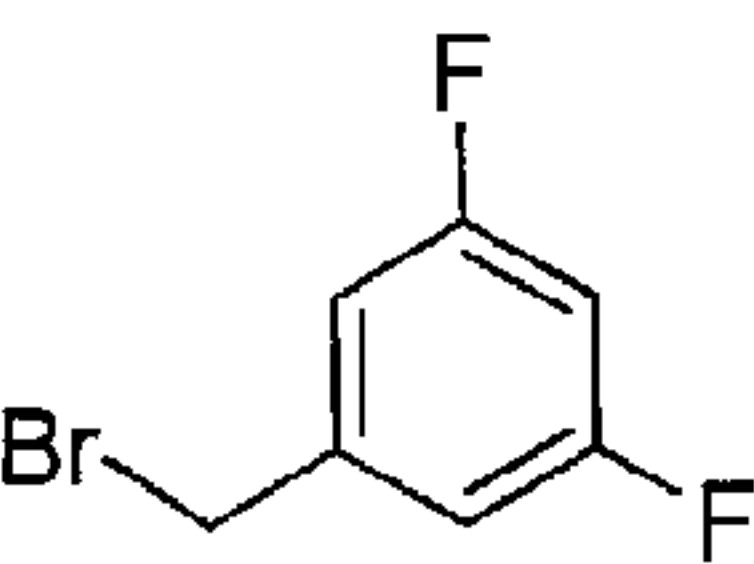
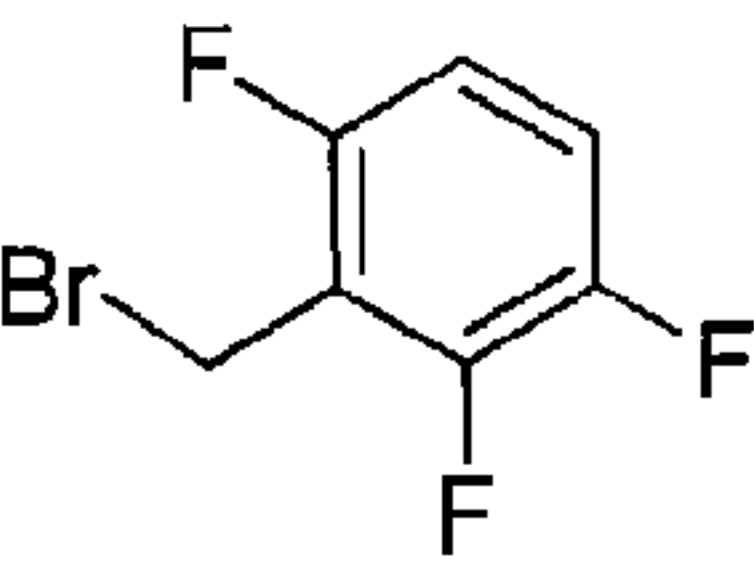
residue was dissolved in EtOH (60 mL). A solution of potassium phosphate (0.47 g, 2.2 mmol) in water (4 mL) was then added and the resulting mixture stirred at rt for 2 h. The reaction solvent was evaporated and the crude product was purified on silica gel to provide [*tert*-butyl [(1*R*,2*S*,4*R*)-4-{[5-(1*H*-pyrazol-3-ylcarbonyl)pyrimidin-4-yl]amino}-2-[(triisopropylsilyl)oxy]cyclopentyl}methoxy)sulfonyl]carbamate] (1.6 g, 56%). LCMS (AA): m/z = 639 (M+H).

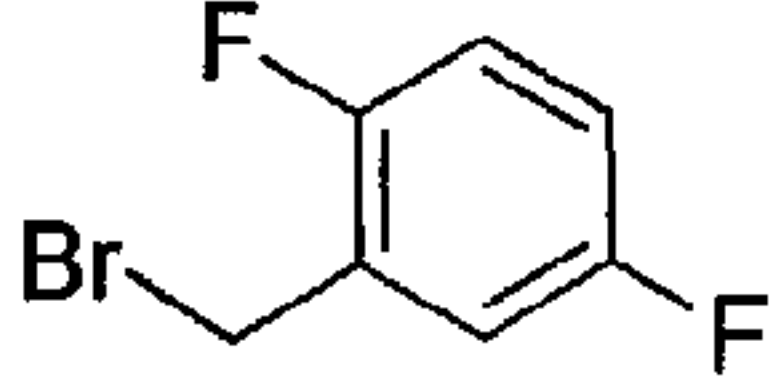
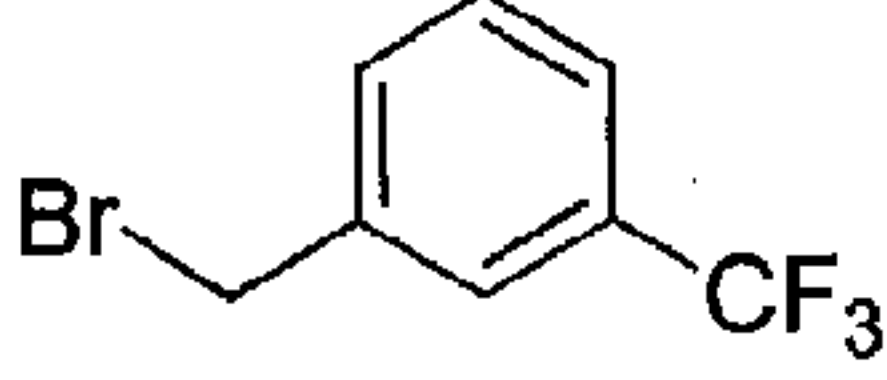
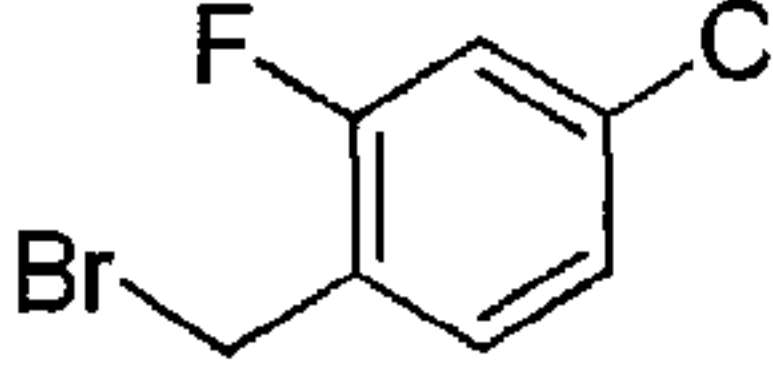
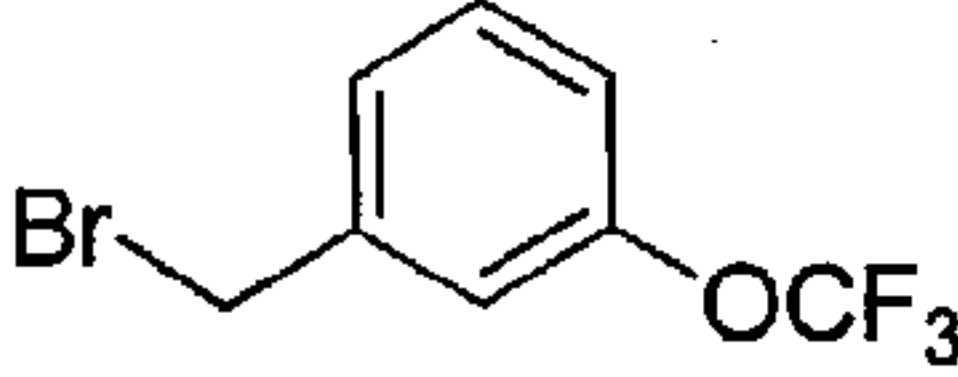
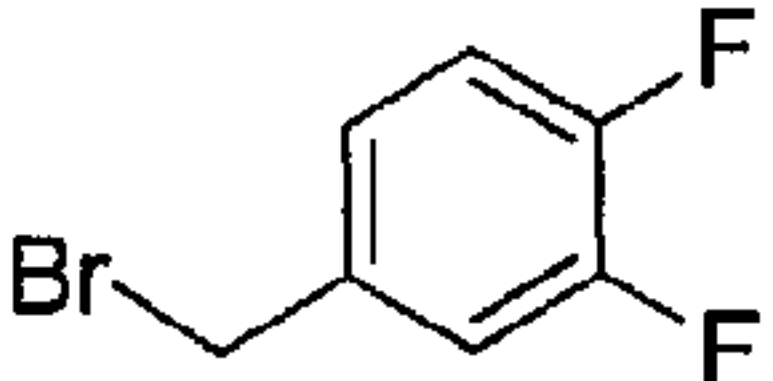
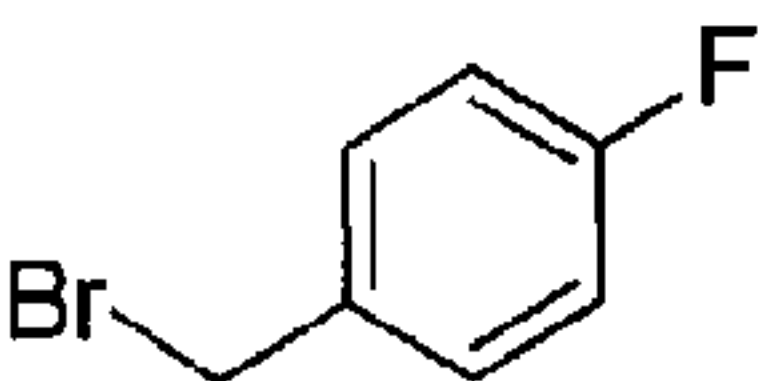
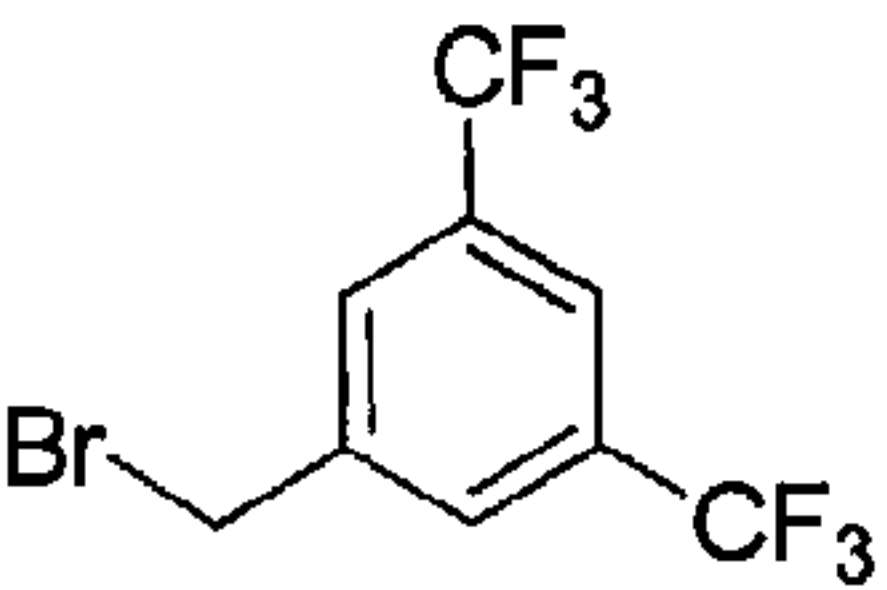
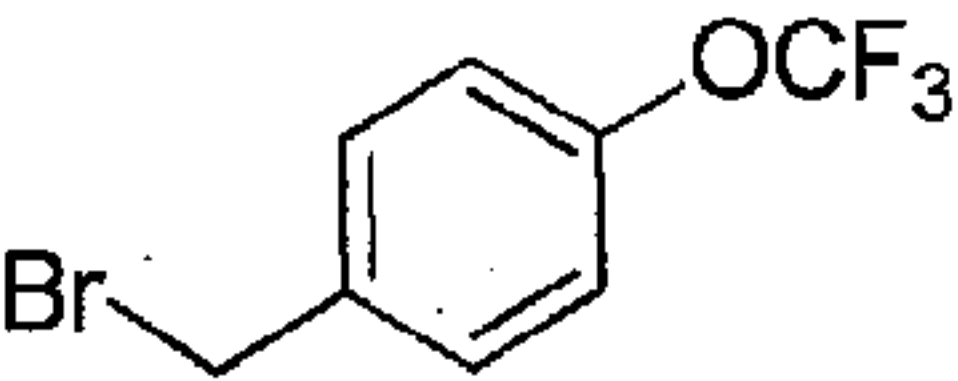
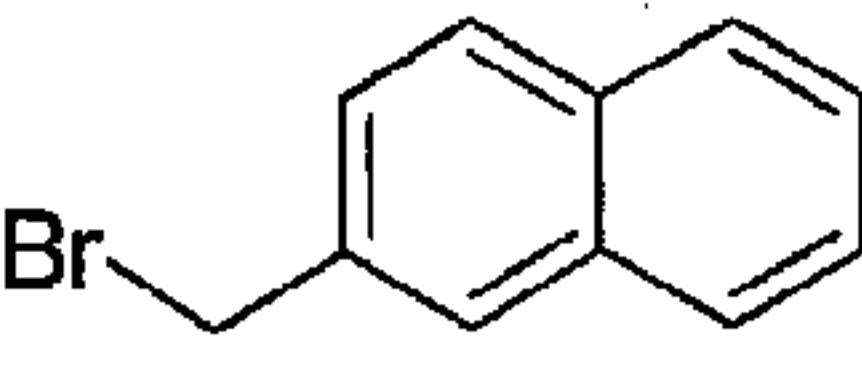
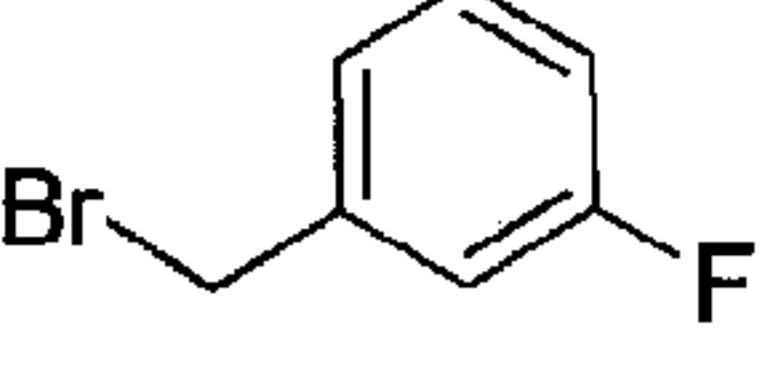
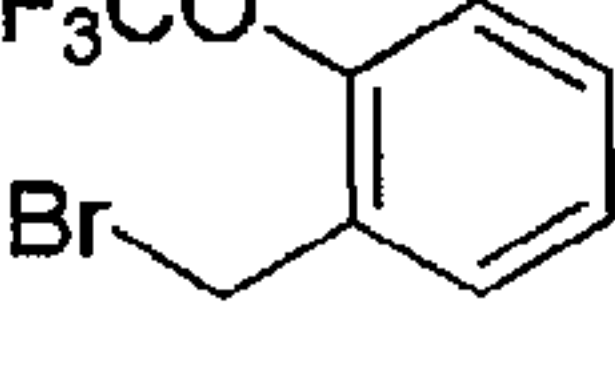
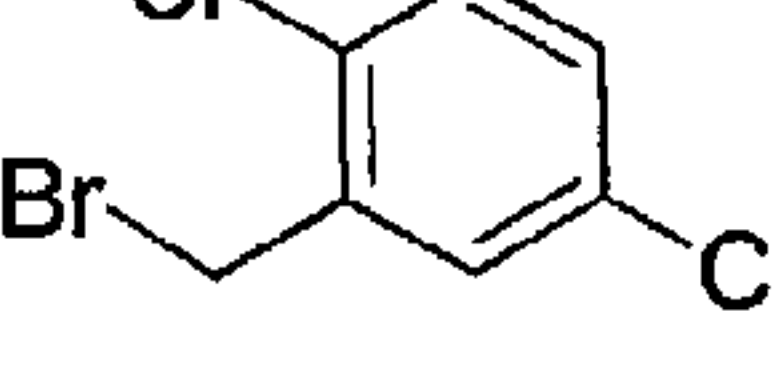
Step 3: {(1*R*,2*S*,4*R*)-4-[(5-{[1-(3-fluoro-4-methylbenzyl)-1*H*-pyrazol-3-yl]carbonyl} pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-210

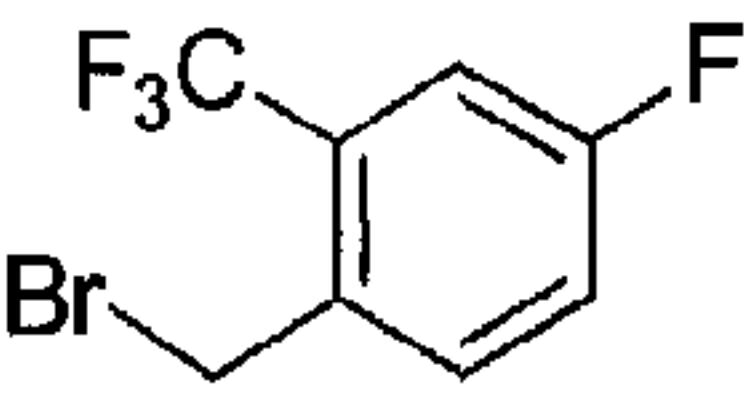
[00318] To a 3-dram vial was added 3-fluoro-4-methyl benzyl bromide (0.020 g, 0.10 mmol), *tert*-butyl [(1*R*,2*S*,4*R*)-4-{[5-(1*H*-pyrazol-3-ylcarbonyl)pyrimidin-4-yl]amino}-2-[(triisopropylsilyl) oxy]cyclopentyl}methoxy)sulfonyl]carbamate (0.032 g, 0.050 mmol) in THF (1.00 mL) followed by cesium carbonate (0.16 g, 0.50 mmol). The mixture was shaken at rt for 4 h then the mixture was filtered to remove solids. To the clear THF solution was added TFA (3.0 mL), water (0.30 mL). This mixture was then shaken at rt for 16 h. Solvent was then evaporated and to the residue was added DMSO (1.2 mL), potassium carbonate (0.069 g, 0.50 mmol) and water (3 drops). After shaking at rt for 1 h, the solution was filtered and purified by prep-HPLC to give {(1*R*,2*S*,4*R*)-4-[(5-{[1-(3-fluoro-4-methylbenzyl)-1*H*-pyrazol-3-yl]carbonyl} pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate (2.1 mg, 8%). LCMS (FA): m/z = 505.6 (M+H).

[00319] The compounds listed in the table below were prepared in an analogous fashion to that described above starting from the listed starting materials used in step 3:

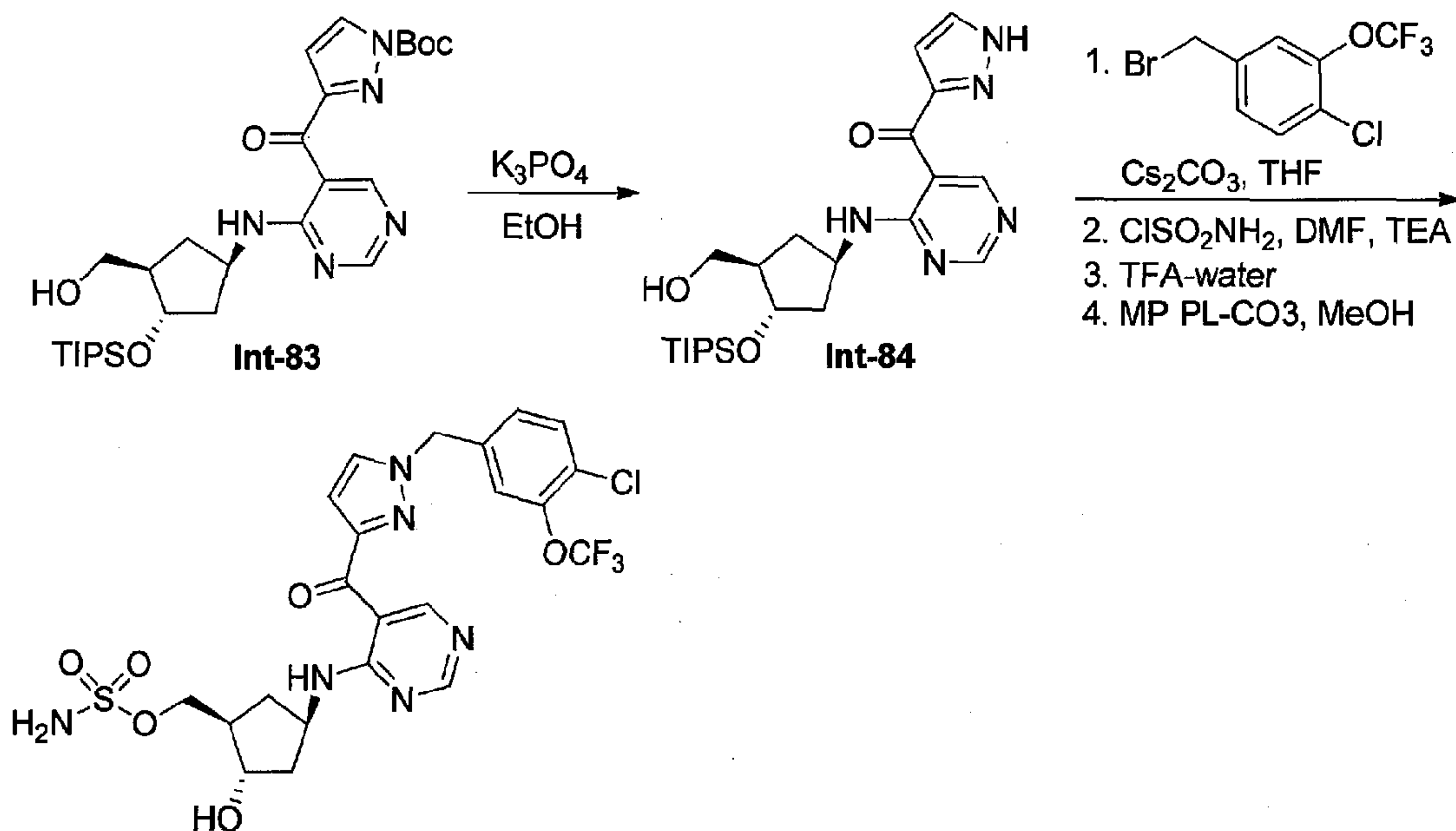
Starting material	Compound No.	LCMS Data
	I-185	LCMS (FA): m/z = 525.5 (M+H).
	I-219	LCMS (FA): m/z = 509.6 (M+H).

	I-253	LCMS (FA): $m/z = 498.6$ (M+H).
	I-47	LCMS (FA): $m/z = 507.6$ (M+H).
	I-286	LCMS (FA): $m/z = 527.6$ (M+H).
	I-226	LCMS (FA): $m/z = 541.6$ (M+H).
	I-261	LCMS (FA): $m/z = 609.6$ (M+H).
	I-329	LCMS (FA): $m/z = 527.6$ (M+H).
	I-62	LCMS (FA): $m/z = 509.5$ (M+H).
	I-206	LCMS (FA): $m/z = 507.6$ (M+H).
	I-202	LCMS (FA): $m/z = 563.5$ (M+H).
	I-260	LCMS (FA): $m/z = 509.5$ (M+H).
	I-16	LCMS (FA): $m/z = 527.5$ (M+H).

	I-35	LCMS (FA): $m/z = 509.5$ (M+H).
	I-140	LCMS (FA): $m/z = 541$ (M+H).
	I-191	LCMS (FA): $m/z = 525.5$ (M+H).
	I-20	LCMS (FA): $m/z = 557$ (M+H).
	I-212	LCMS (FA): $m/z = 509.5$ (M+H).
	I-161	LCMS (FA): $m/z = 491.5$ (M+H).
	I-69	LCMS (FA): $m/z = 609.6$ (M+H).
	I-276	LCMS (FA): $m/z = 557.6$ (M+H).
	I-48	LCMS (FA): $m/z = 523.6$ (M+H).
	I-165	LCMS (FA): $m/z = 491.5$ (M+H).
	I-39	LCMS (FA): $m/z = 557.5$ (M+H).
	I-289	LCMS (FA): $m/z = 541.5$ (M+H).

	I-328	LCMS (FA): $m/z = 559.6$ (M+H).

Example 56: [(1R,2S,4R)-4-{{5-({1-[4-Chloro-3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}-2-hydroxycyclopentyl]methyl sulfamate I-152



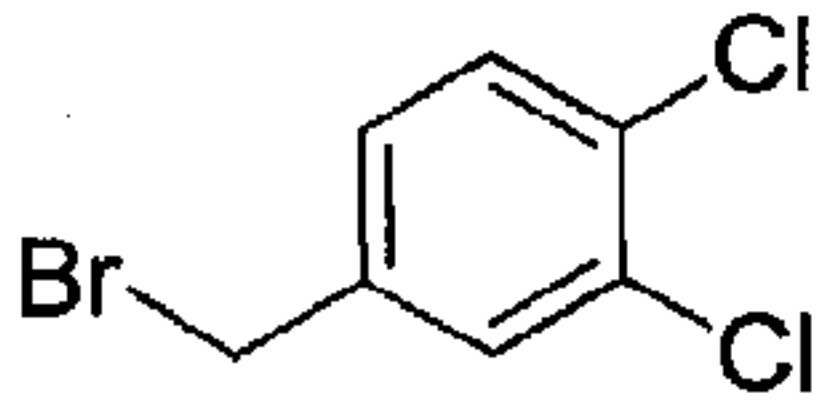
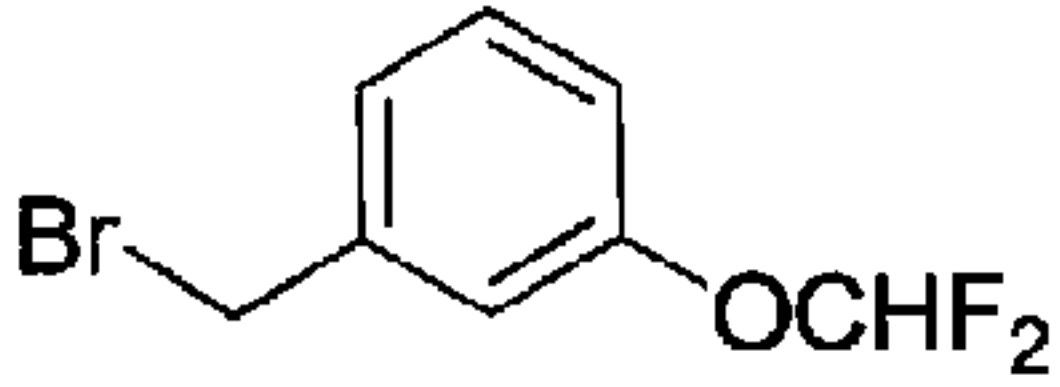
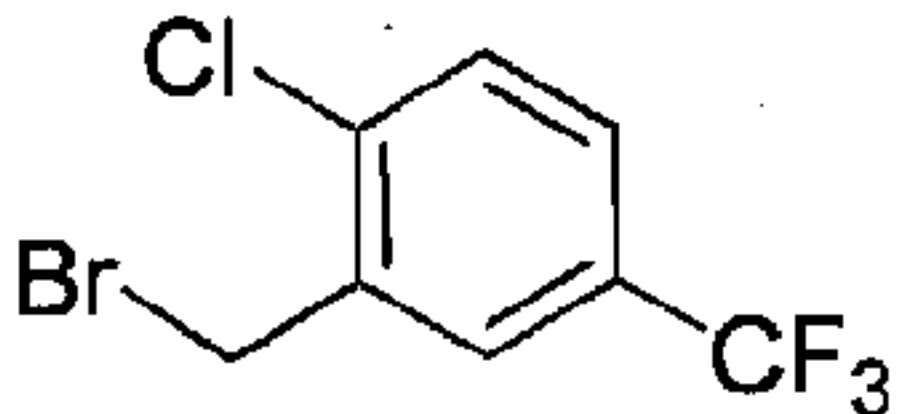
Step 1: [4-({(1R,3R,4S)-3-(Hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl](1H-pyrazol-3-yl)methanone Int-84

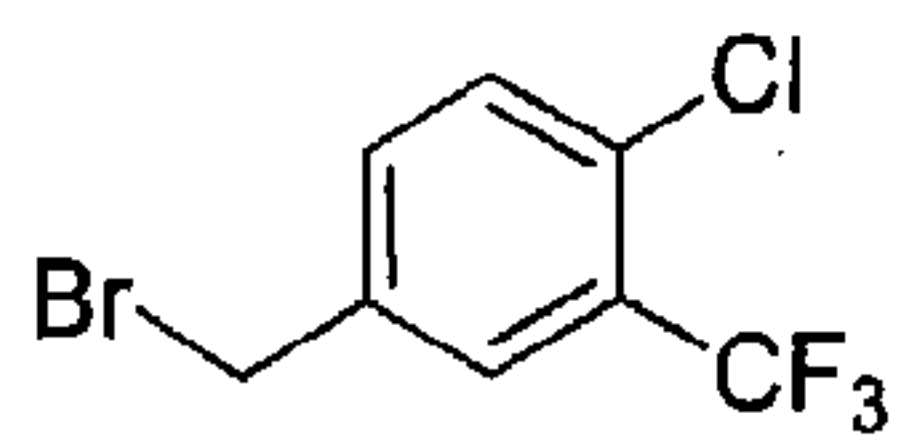
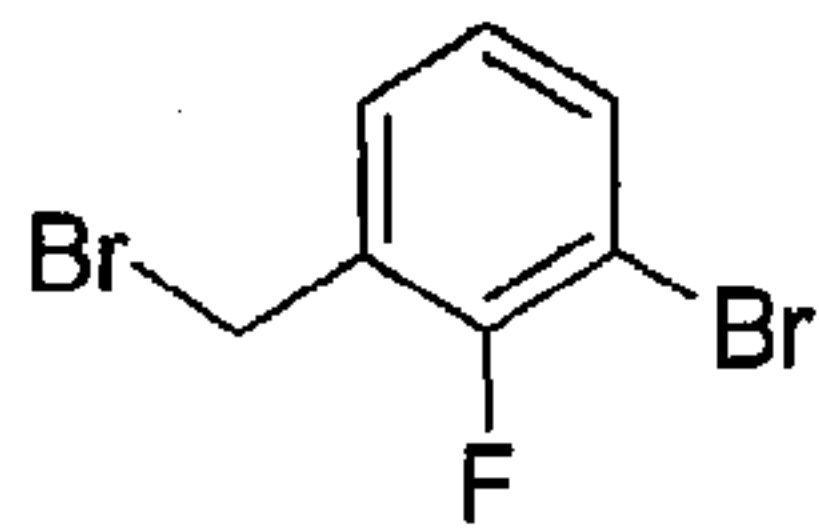
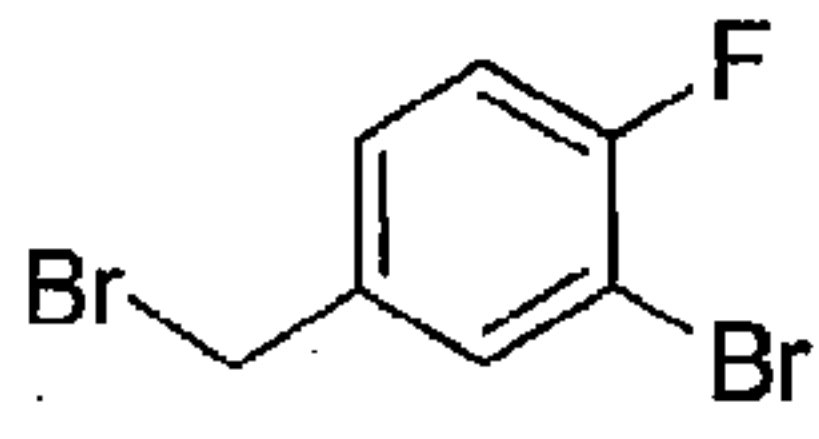
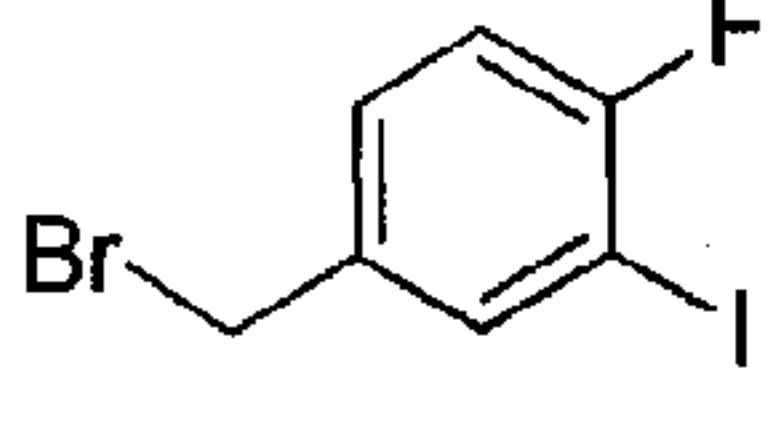
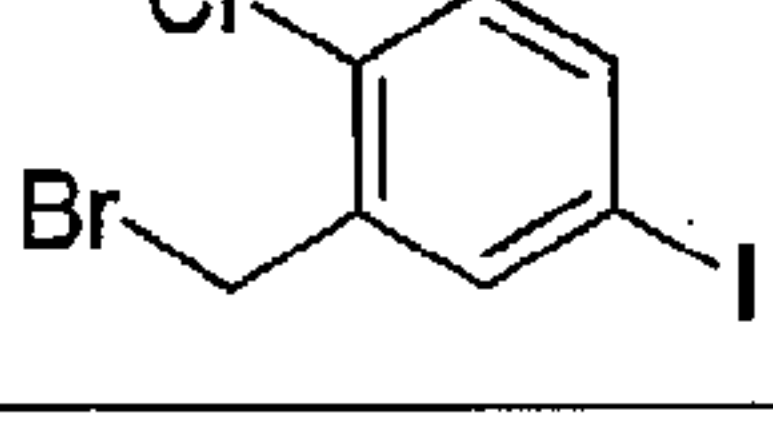
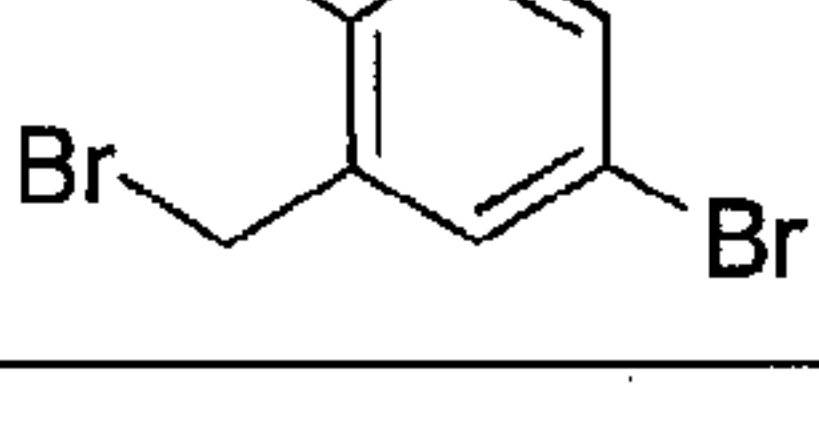
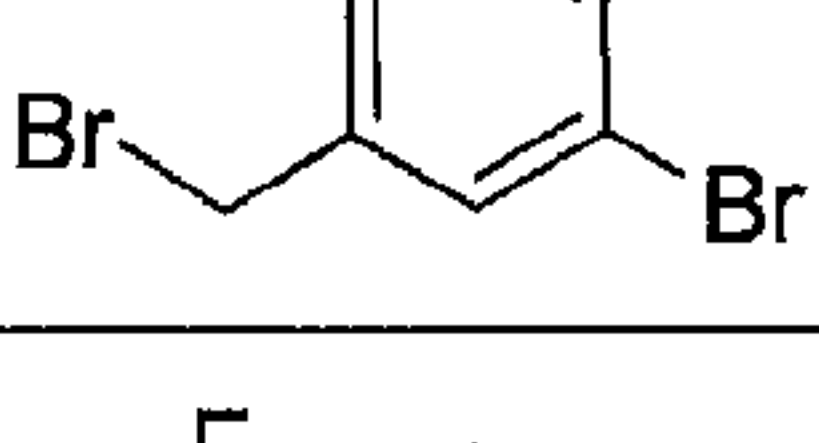
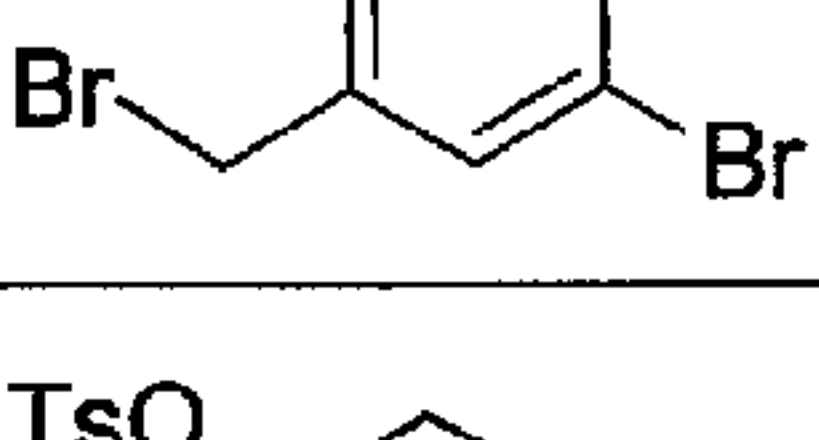
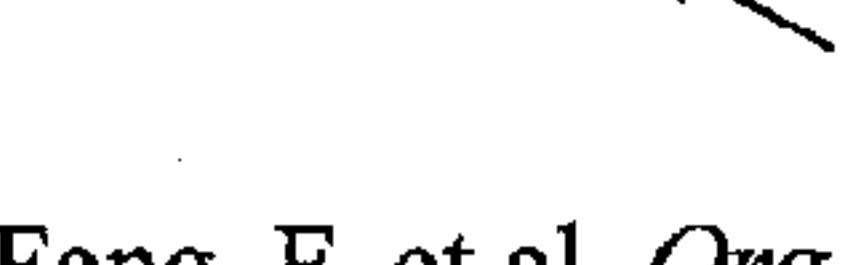
[00320] To a solution of *tert*-butyl 3-{{4-({(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl}carbonyl}-1H-pyrazole-1-carboxylate (1.7 g, 3.1 mmol) in EtOH (30 mL) was added a solution of potassium phosphate (1.4 g, 6.5 mmol) in water (4.5 mL). This mixture was stirred at rt for 2 h. Water was added to the mixture and it was extracted with DCM (2x50mL). The combined extracts were dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to give [4-({(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl](1H-pyrazol-3-yl)methanone (1.13 g, 79%).
 LCMS (FA): $m/z = 460.4$ (M+H).

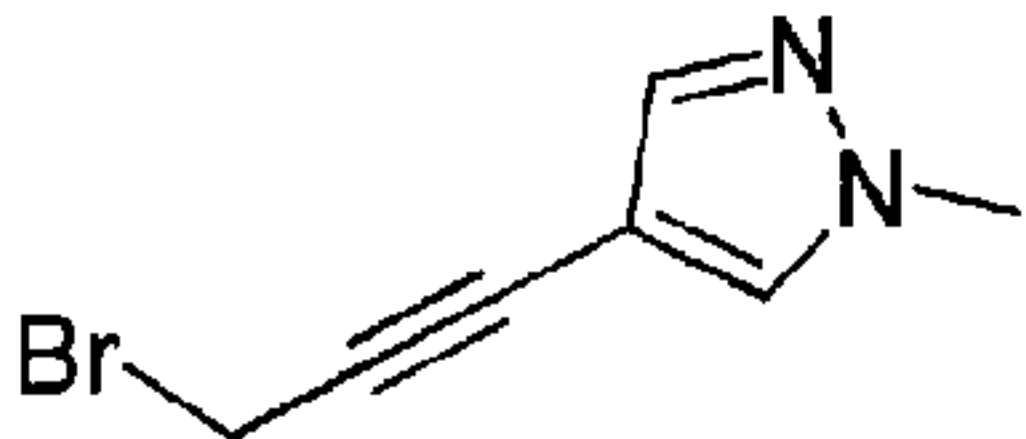
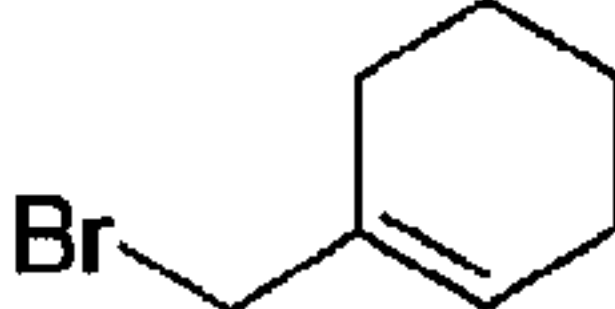
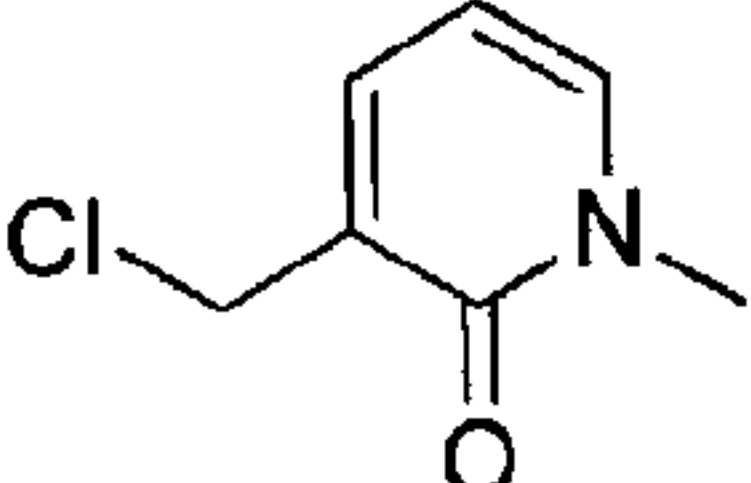
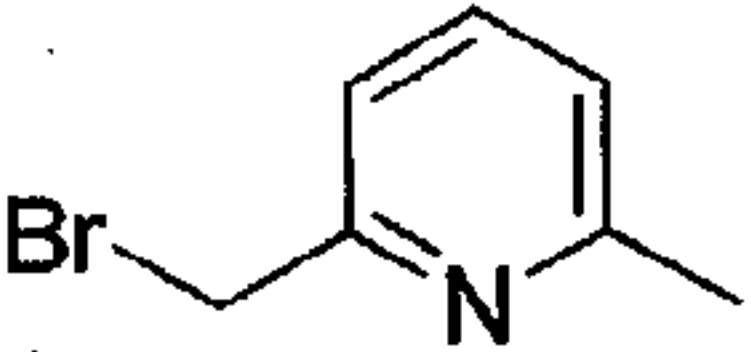
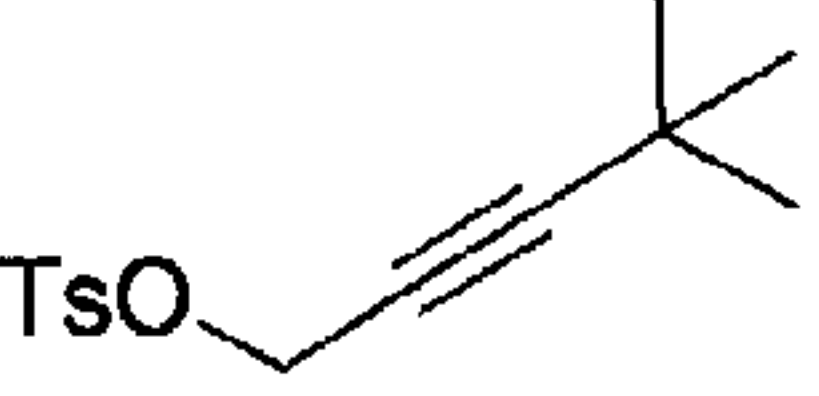
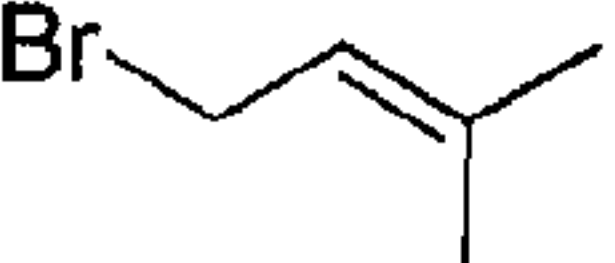
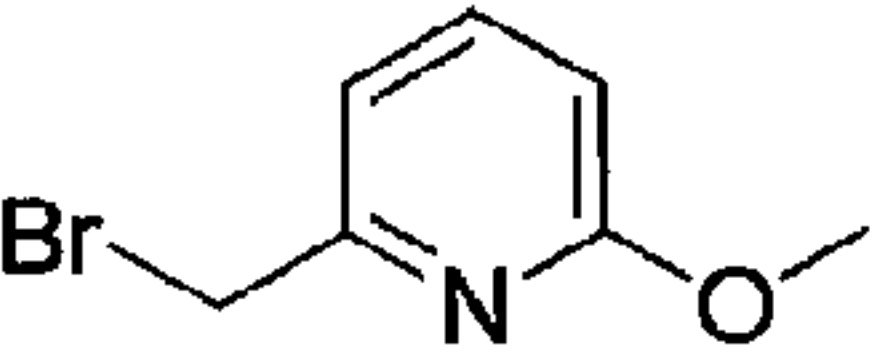
Step 2: [(1R,2S,4R)-4-{{5-({1-[4-Chloro-3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}-2-hydroxycyclopentyl]methyl sulfamate I-152

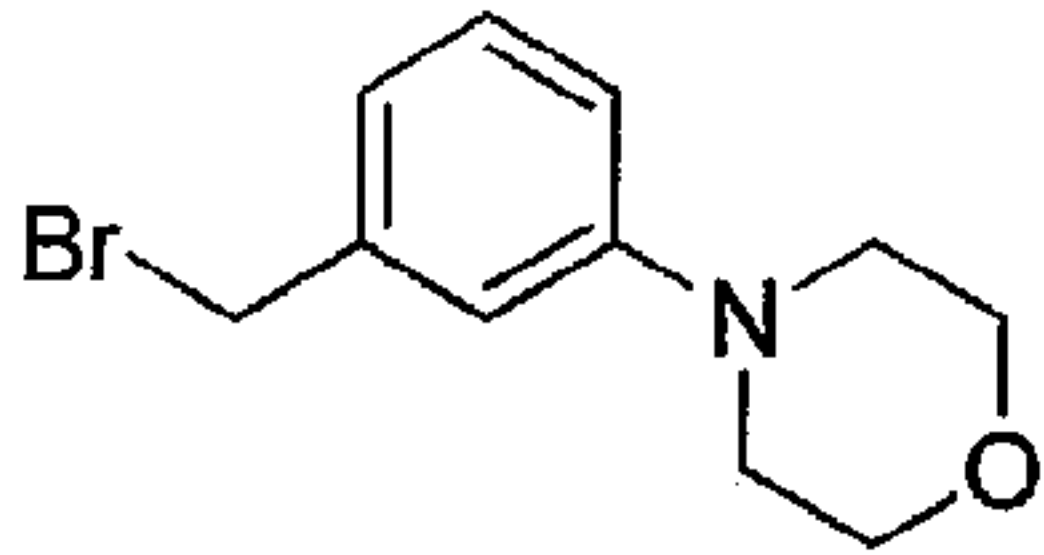
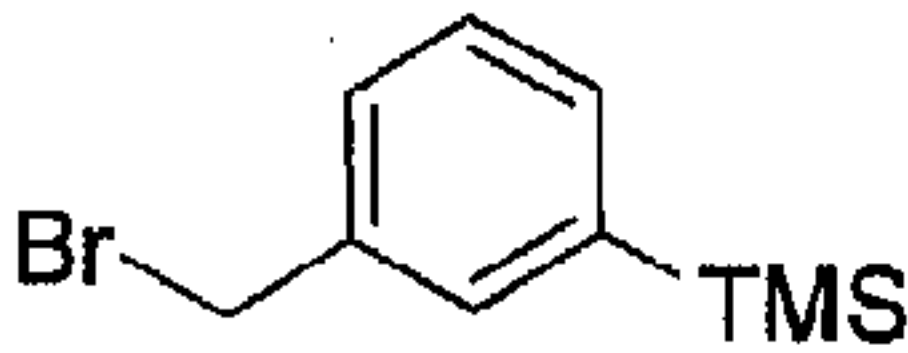
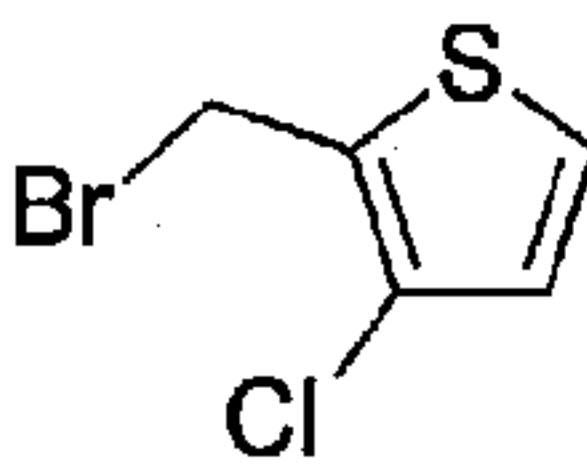
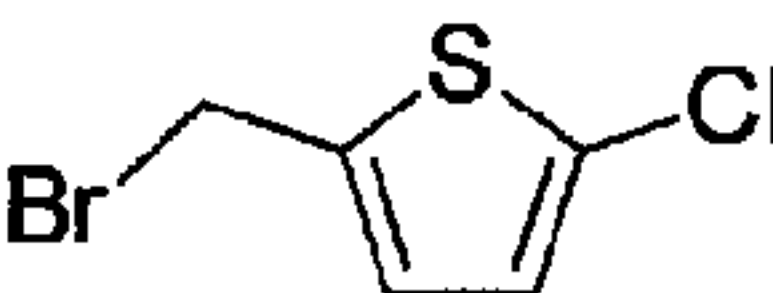
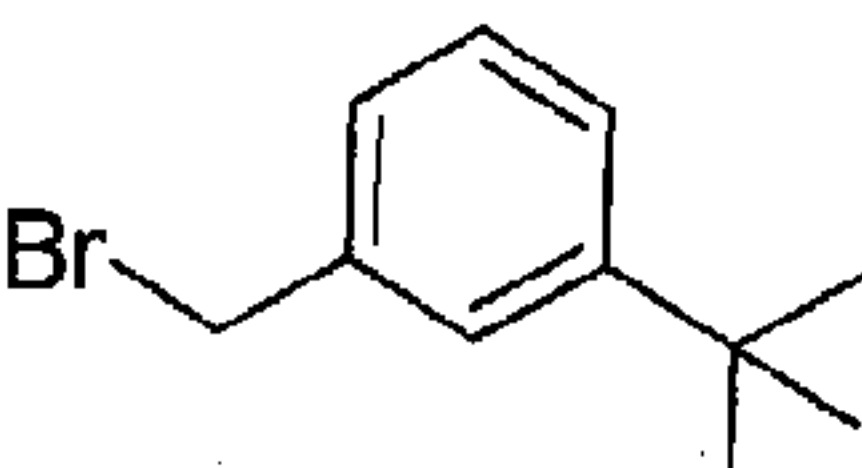
[00321] To a 50 mL reaction vial was added [4-({(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl](1H-pyrazol-3-yl)methanone (0.14 g, 0.31 mmol), 4-chloro-3-(trifluoromethoxy)benzylbromide (0.11 g, 0.39 mmol), cesium carbonate (0.41 g, 1.25 mmol), and THF (4.0 mL). The mixture was stirred at rt for 2 h. To the vial was added brine (1 mL), water (1 mL) and EtOAc (20 mL). After separation, the aqueous layer was extracted with EtOAc (5 mL). The combined organic phases were concentrated. To the vial was then added chlorosulfonamide (0.15 g, 1.25 mmol), TEA (0.17 mL, 1.25 mmol), and acetonitrile (2 mL). After the reaction stirred at rt for 1 h, saturated NaHCO₃ (2 mL) and EtOAc (20 mL) were added. After separation of the phases, the aqueous layer was extracted with EtOAc (5 mL). The combined organic phases were then concentrated. To the resulting solid in the reaction vial was added TFA (5.0 mL) and water (0.5 mL). After this mixture was stirred at rt for 16 h, solvent was completely evaporated. This residue was dissolved in MeOH (10 mL) and to it was added MP PL-CO₃ resin (3 g). After this mixture was stirred at rt for 2 h, the resin was filtered and rinsed with MeOH (10 mL). The filtrate was then evaporated and the resulting residue was purified by prep-HPLC to give [(1R,2S,4R)-4-{[5-({1-[4-chloro-3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate (0.122 g, 66%). ¹H NMR (MeOD) δ 9.61 (s, 1H), 8.57 (s, 1H), 7.88 (d, *J* = 2.4 Hz, 1H), 7.59 (d, *J* = 8.4 Hz, 1H), 7.38 (s, 1H), 7.30 (d, *J* = 8.4, 1H), 6.98 (s, 1H), 5.53 (s, 2H), 4.82 (m, 1H), 4.21 (m, 3H), 2.55 (m, 1H), 2.31 (m, 1H), 2.17 (m, 1H), 1.92 (m, 1H), 1.45 (m, 1H). LCMS (FA): *m/z* = 592 (M+H).

[00322] The compounds listed in the table below were prepared in an analogous fashion to that described above starting from the listed starting materials used in step 2:

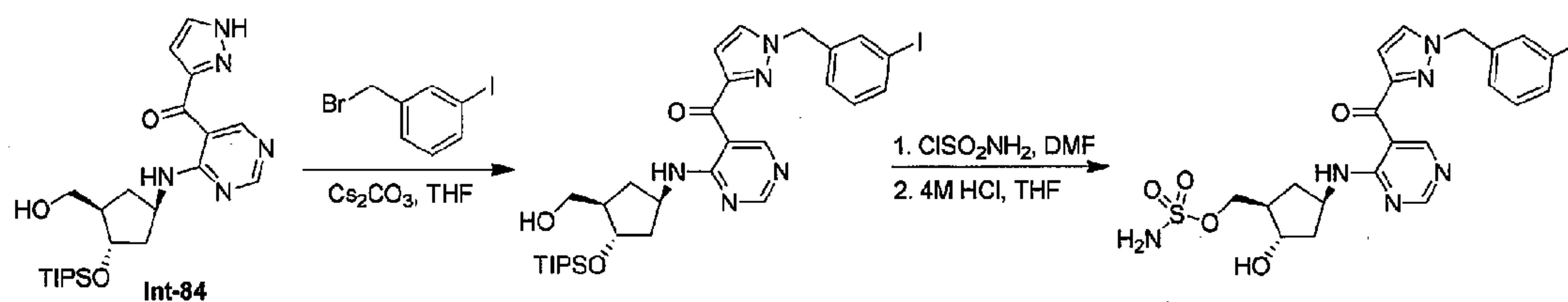
Starting material	Compound No.	LCMS Data
	I-58	LCMS (FA): <i>m/z</i> = 541.1 (M+H).
	I-117	LCMS (FA): <i>m/z</i> = 540 (M+H).
	I-50	LCMS (FA): <i>m/z</i> = 576 (M+H).

	I-288	LCMS (FA): $m/z = 575$ (M+H).
	I-282	LCMS (FA): $m/z = 570.7$ (M+H).
	I-72	LCMS (FA): $m/z = 570.8$ (M+H).
	I-245	LCMS (FA): $m/z = 616.8$ (M+H).
	I-104	LCMS (FA): $m/z = 632.8$ (M+H).
	I-239	LCMS (FA): $m/z = 584.7$ (M+H).
	I-179	LCMS (FA): $m/z = 584.8$ (M+H).
	I-346	LCMS (FA): $m/z = 569$ (M+H).
 Fang, F. et al. <i>Org. Biomol. Chem.</i> 2012 , <i>10</i> , 3080-3091.	I-115	LCMS (FA): $m/z = 449.8$ (M+H).
 Hasting, C.J. et al. <i>J. Am. Chem. Soc.</i> 2008 , <i>130</i> , 10977-10983.	I-153	LCMS (FA): $m/z = 477.3$ (M+H).

 Int-48	I-308	LCMS (FA): $m/z = 501.3$ (M+H).
 Int-60	I-252	LCMS (FA): $m/z = 477.8$ (M+H).
 Int-35	I-80	LCMS (FA): $m/z = 504.3$ (M+H).
 	I-228	LCMS (FA): $m/z = 435.2$ (M+H).
 	I-107	LCMS (FA): $m/z = 437.3$ (M+H).
 	I-298	LCMS (FA): $m/z = 488.4$ (M+H).
 Int-55	I-113	LCMS (FA): $m/z = 477.3$ (M+H).
 	I-234	LCMS (FA): $m/z = 449.3$ (M+H).
 	I-344	LCMS (FA): $m/z = 451$ (M+H).
 Int-38	I-295	LCMS (FA): $m/z = 504$ (M+H).
 	I-151	LCMS (FA): $m/z = 494$ (M+H).

Int-50		
	I-251	LCMS (FA): $m/z = 558.2$ (M+H).
Int-18		
	I-137	LCMS (FA): $m/z = 545.1$ (M+H).
Int-12		
	I-232	LCMS (FA): $m/z = 513.0$ (M+H).
Int-20		
	I-280	LCMS (FA): $m/z = 513.0$ (M+H).
Int-19		
	I-64	LCMS (FA): $m/z = 529.1$ (M+H).
Int-11		

Example 57: [{(1R,2S,4R)-2-Hydroxy-4-[(5-{[1-(3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate] I-292



Step 1: [4-({(1R,3R,4S)-3-(Hydroxymethyl)-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl][1-(3-iodobenzyl)-1H-pyrazol-3-yl]methanone

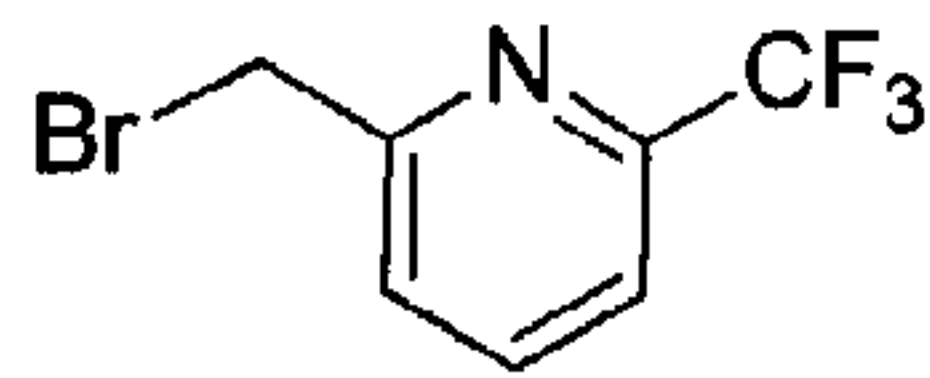
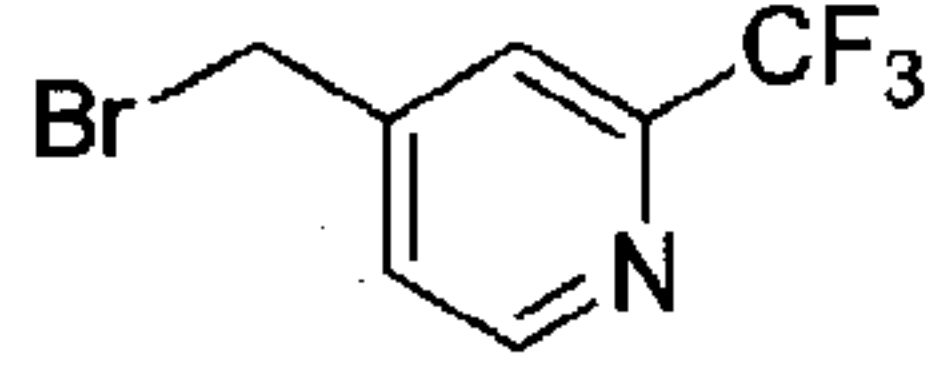
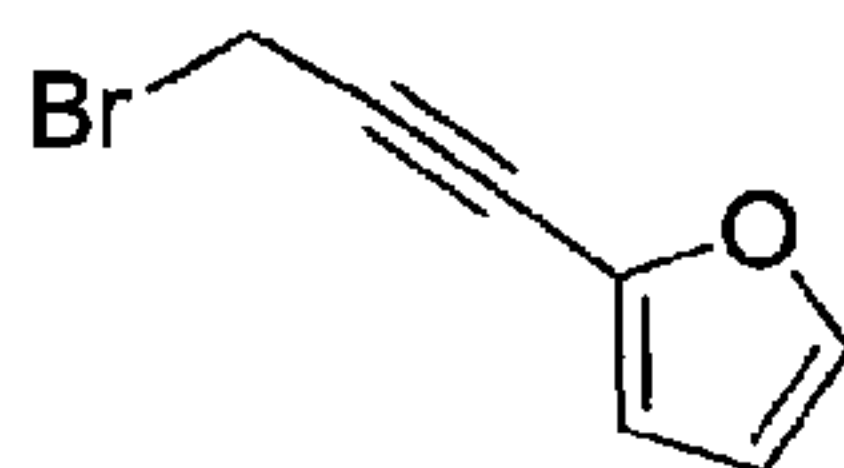
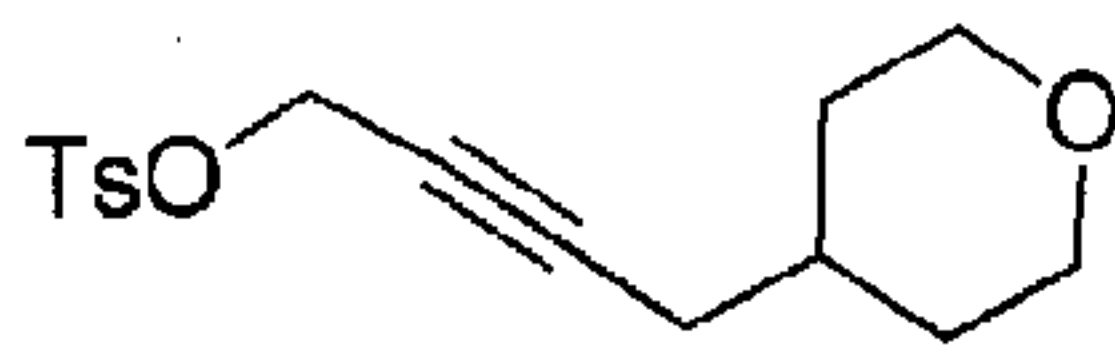
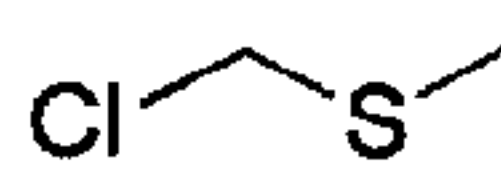
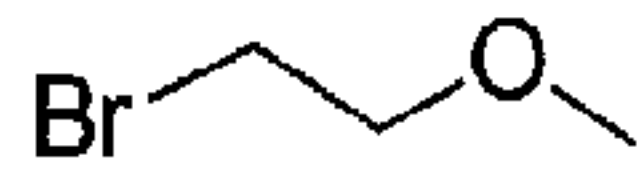
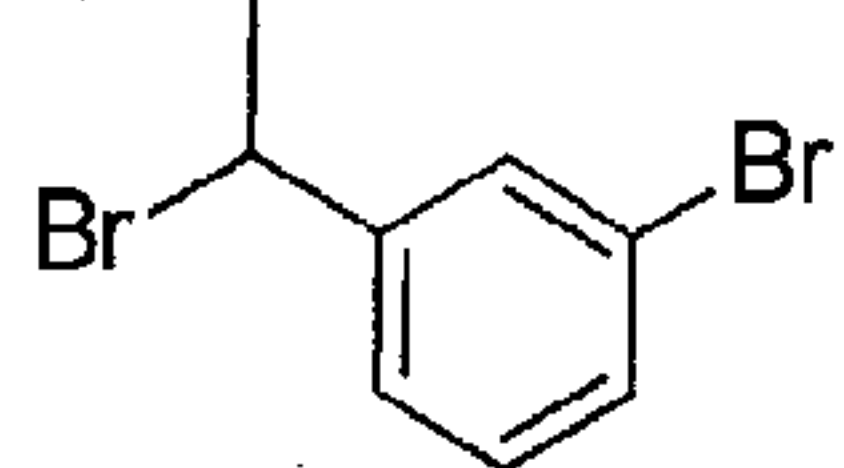
[00323] [4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino)pyrimidin-5-yl](1H-pyrazol-3-yl)methanone (0.64 g, 1.4 mmol) was dissolved in THF (25 mL). To this solution was added cesium carbonate (1.6 g, 4.9 mmol) and 3-iodobenzyl bromide (0.62 g, 2.1 mmol) and the reaction was stirred at rt for 20 h. The reaction was filtered and the filtrate concentrated. The residue was purified on silica gel to give [4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino)pyrimidin-5-yl][1-(3-iodobenzyl)-1H-pyrazol-3-yl]methanone (0.79 g, 83%). LCMS (FA): m/z = 677.3 (M+H).

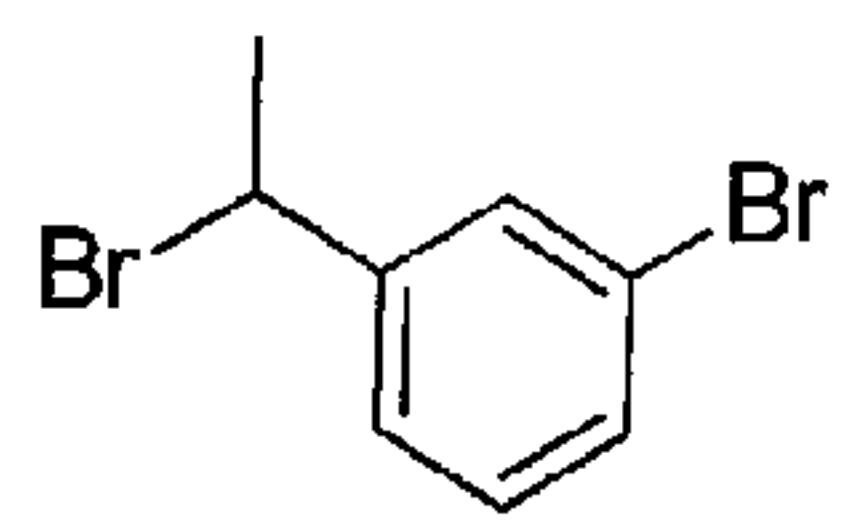
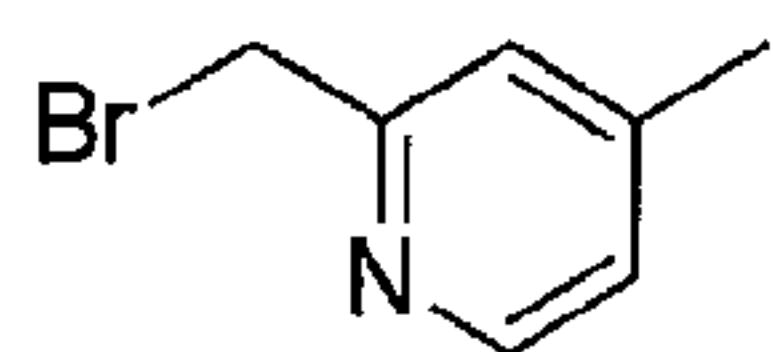
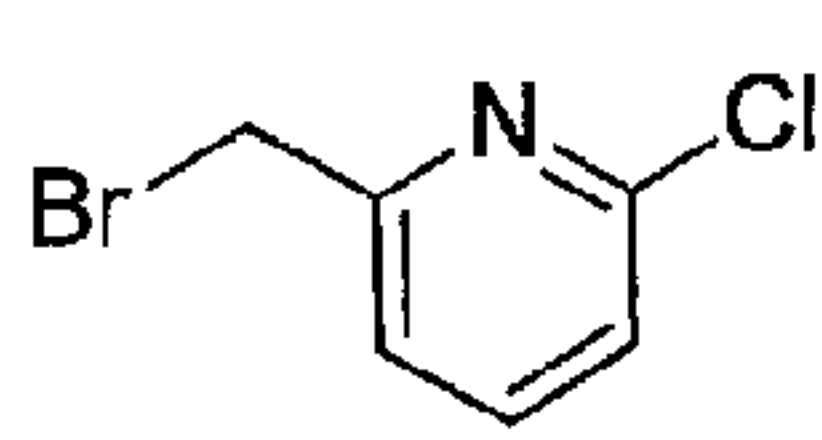
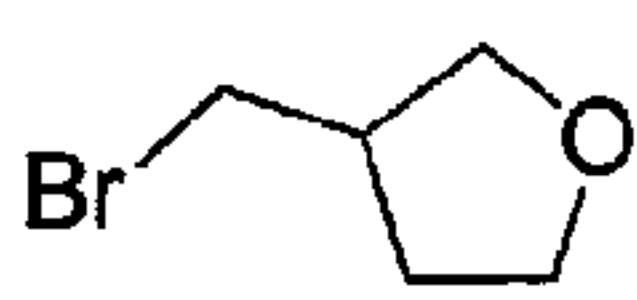
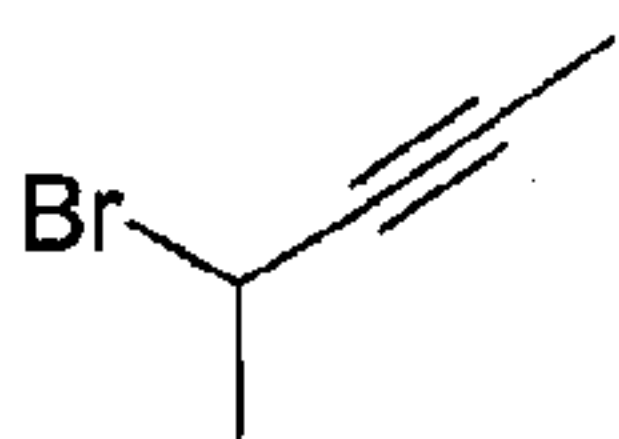
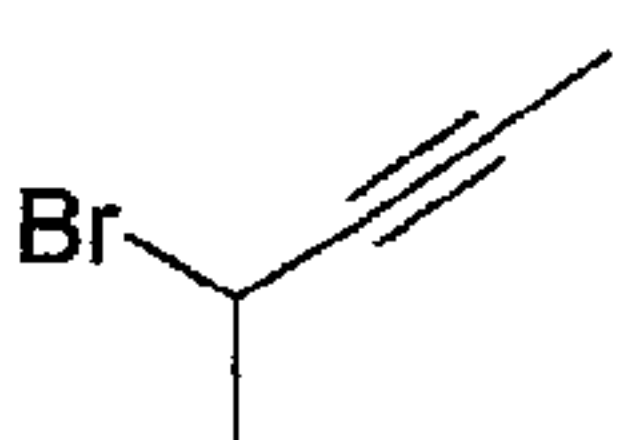
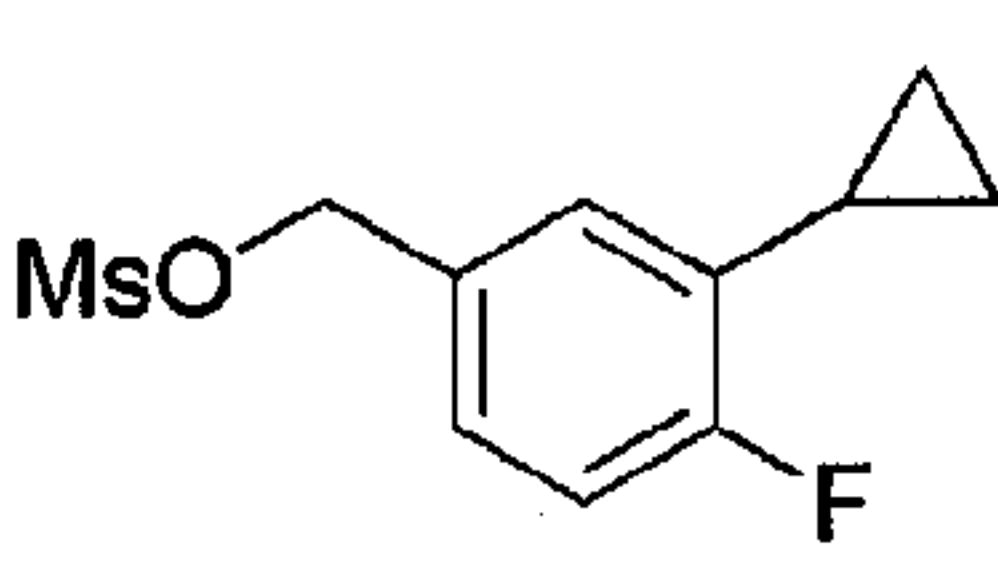
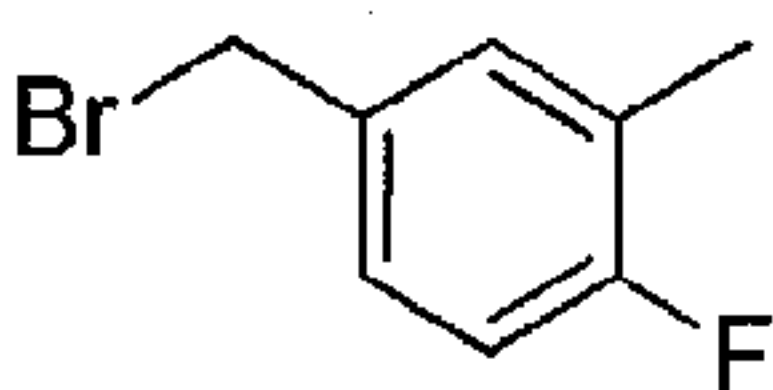
Step 2: ((1R,2S,4R)-2-Hydroxy-4-[(5-[[1-(3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl]pyrimidin-4-yl)amino]cyclopentyl)methyl sulfamate I-292

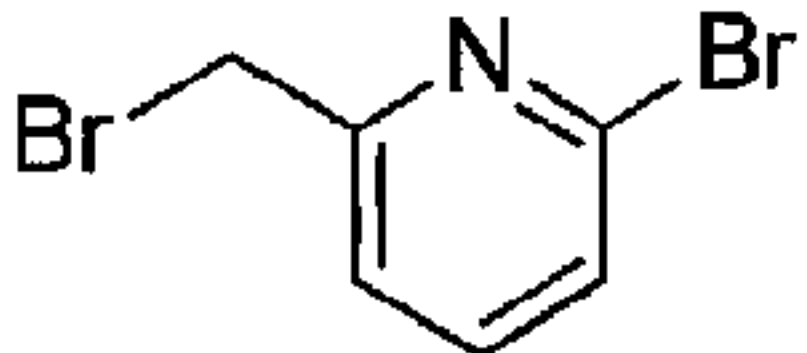
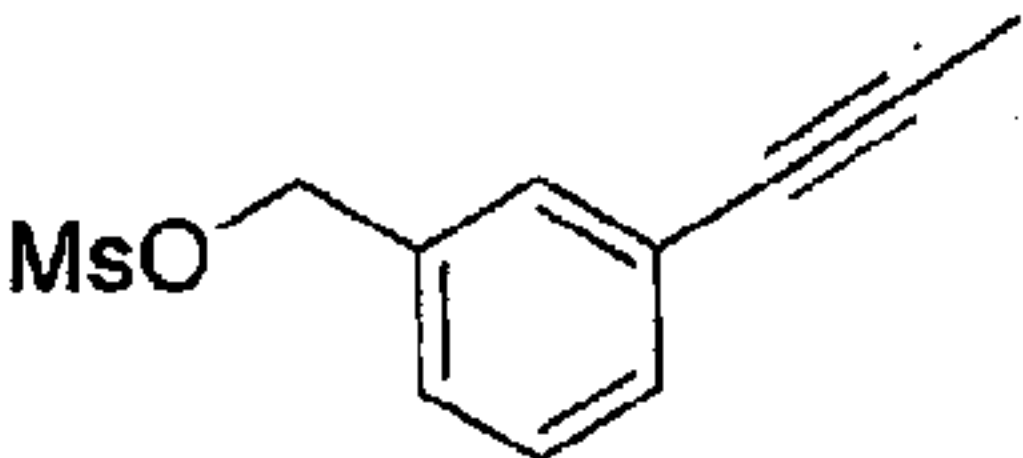
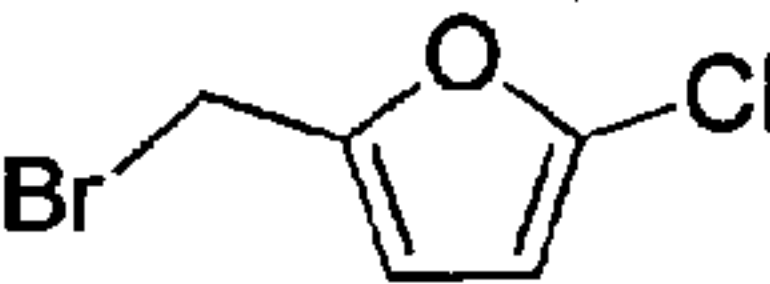
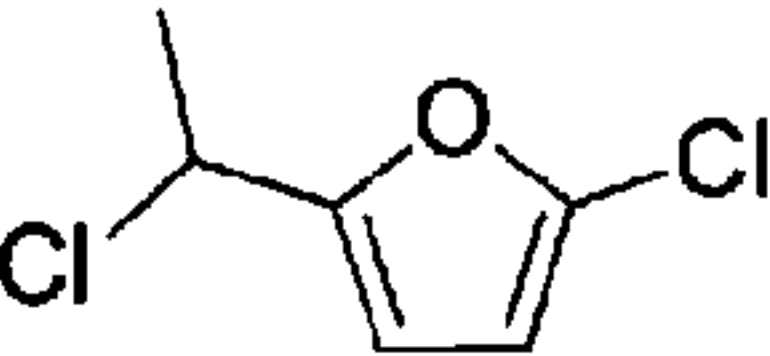
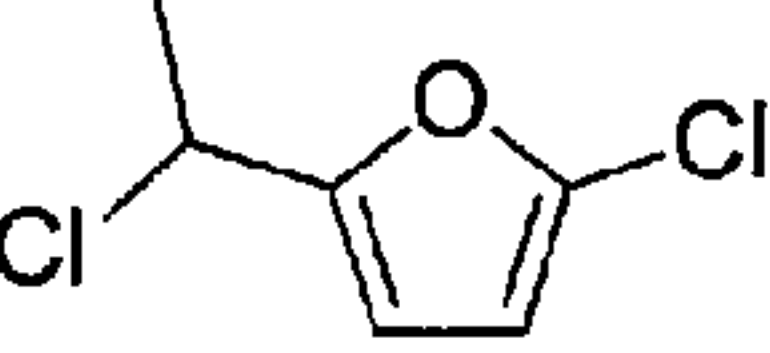
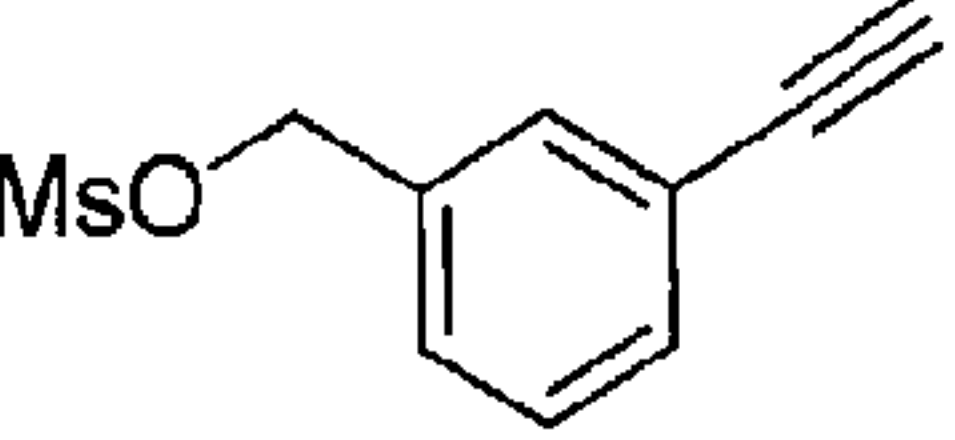
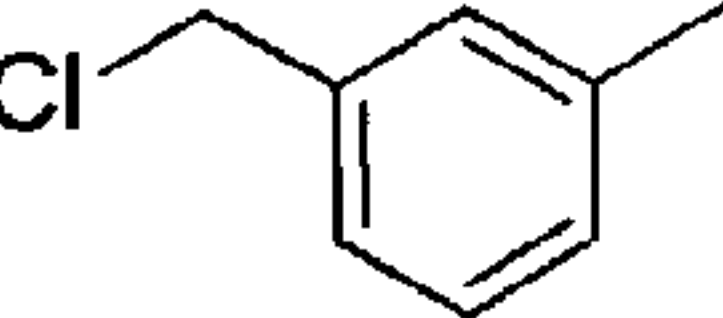
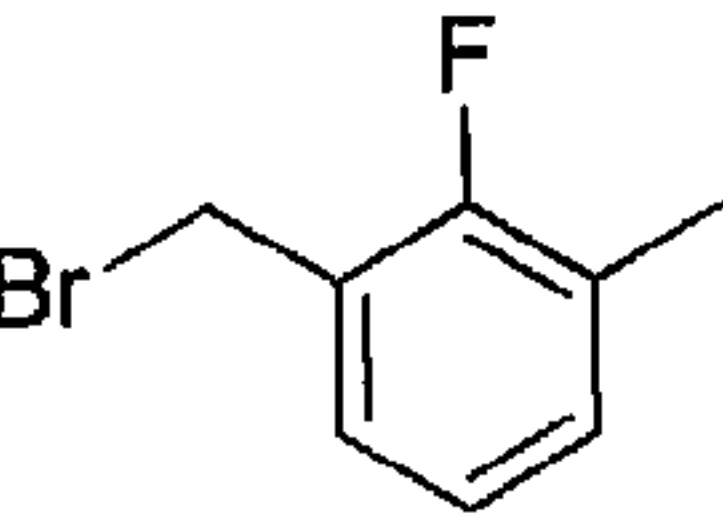
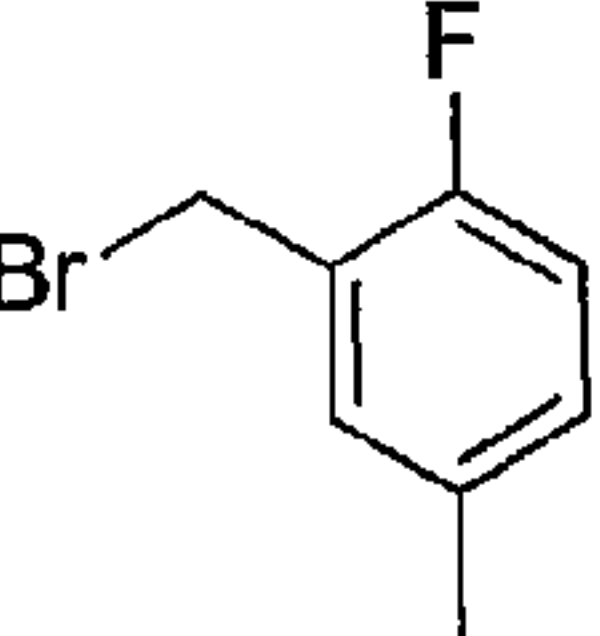
[00324] To a solution of [4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino)pyrimidin-5-yl][1-(3-iodobenzyl)-1H-pyrazol-3-yl]methanone (0.79 g, 1.16 mmol) and TEA (0.5 mL, 2.4 mmol) in DMF (10 mL) was added chlorosulfonamide (400 mg, 3.3 mmol) at rt, and the mixture was stirred for 2 h. The reaction was quenched by addition of a saturated solution of NaHCO₃ and diluted with water. The mixture was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to give the sulfamate intermediate [(830 mg, 95%); LCMS (FA): m/z = 755.2 (M+H).] which was dissolved in THF (7 mL) and HCl (4.0 M in water; 7 mL, 28 mmol) was added to the solution. The reaction was stirred for 5 h at 40 °C. The reaction was cooled to rt and quenched by the addition of a saturated solution of NaHCO₃ and extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was triturated with the addition of DCM. A white solid was collected as ((1R,2S,4R)-2-hydroxy-4-[(5-[[1-(3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl]pyrimidin-4-yl)amino]cyclopentyl)methyl sulfamate (0.40 g, 61%). ¹H NMR (DMSO) δ 9.45 (s, 1H), 9.01 (d, J = 7.4 Hz, 1H), 8.63 (s, 1H), 8.09 (d, J = 2.4 Hz, 1H), 7.73 – 7.66 (m, 2H), 7.45 (s, 2H), 7.29 (d, J = 7.7 Hz, 1H), 7.18 (t, J = 7.7 Hz, 1H), 6.91 (d, J = 2.4 Hz, 1H), 5.49 (s, 2H), 4.92 (d, J = 4.5 Hz, 1H), 4.76 – 4.63 (m, 1H), 4.14 – 4.06 (m, 1H), 4.00 – 3.93 (m, 2H), 2.42 – 2.32 (m, 1H), 2.18 – 2.09 (m, 1H), 2.06 – 1.96 (m, 1H), 1.85 – 1.73 (m, 1H), 1.34 – 1.21 (m, 1H); LCMS (FA): m/z = 599.3 (M+H).

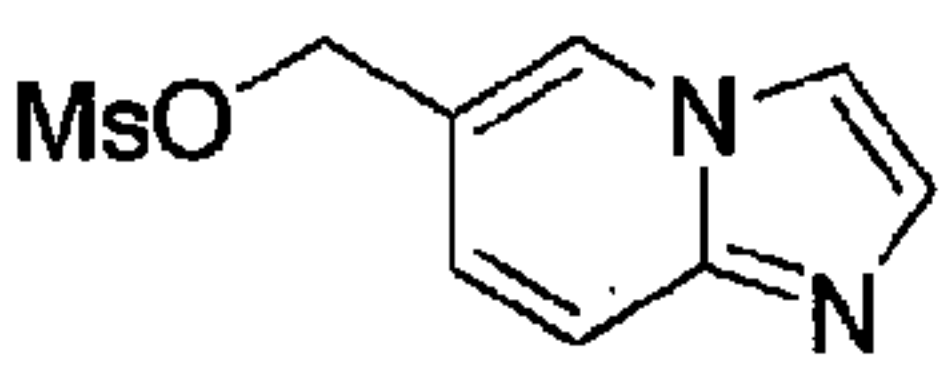
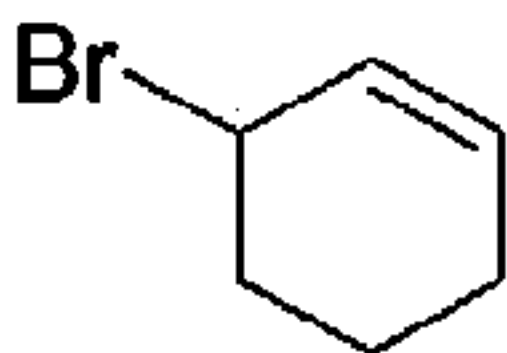
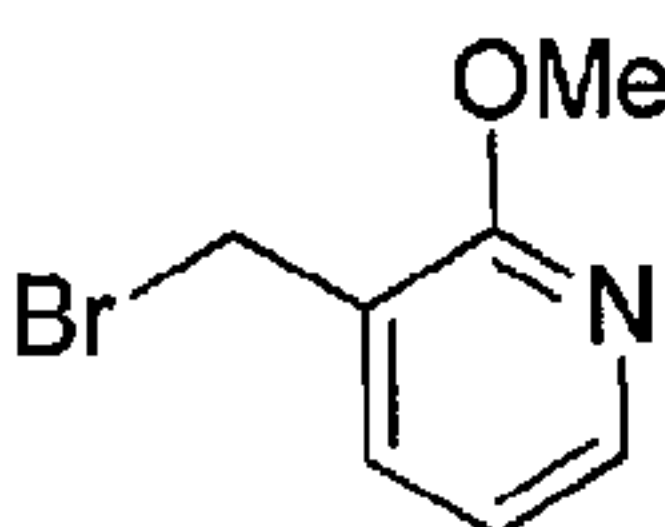
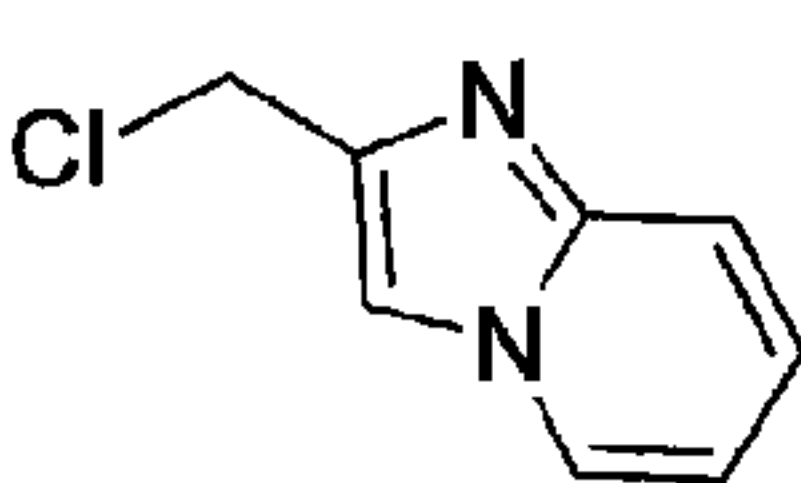
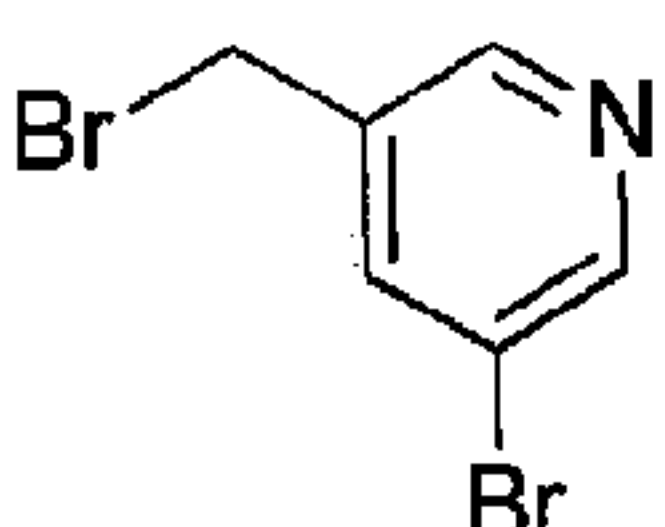
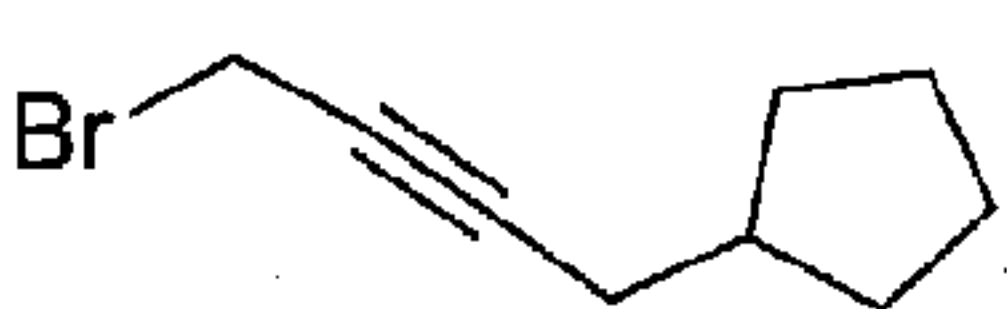
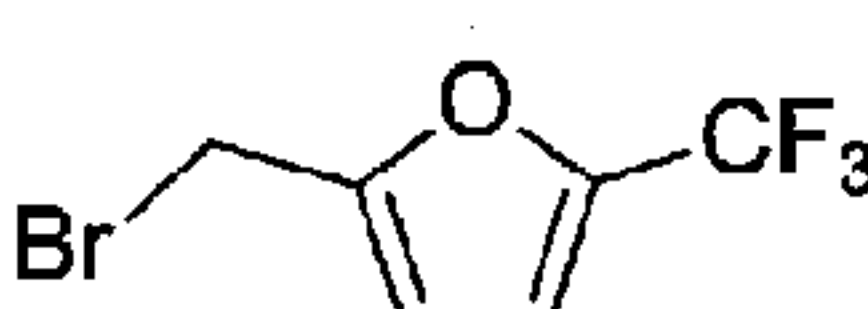
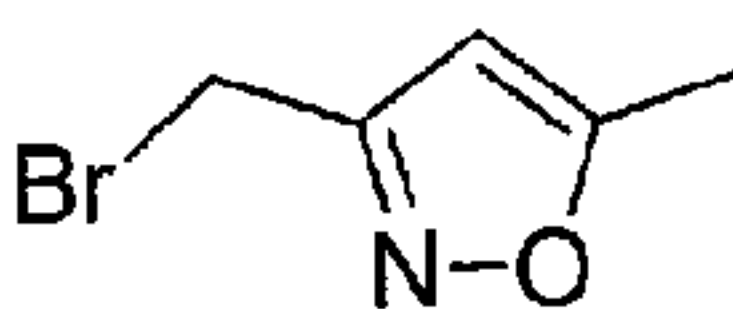
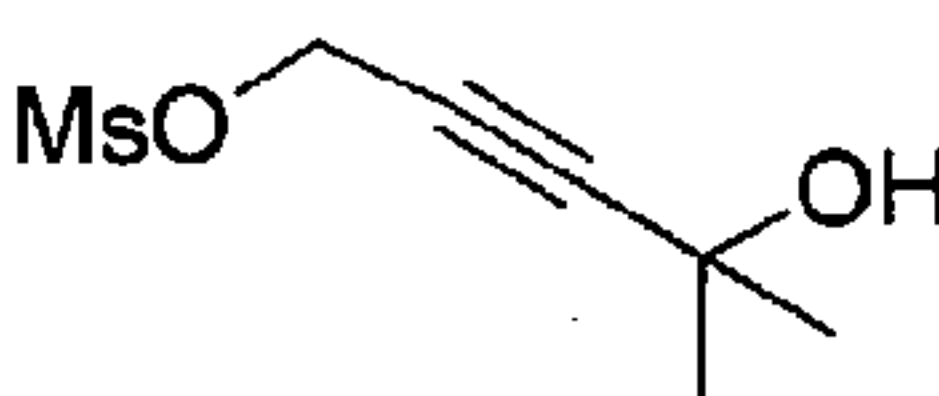
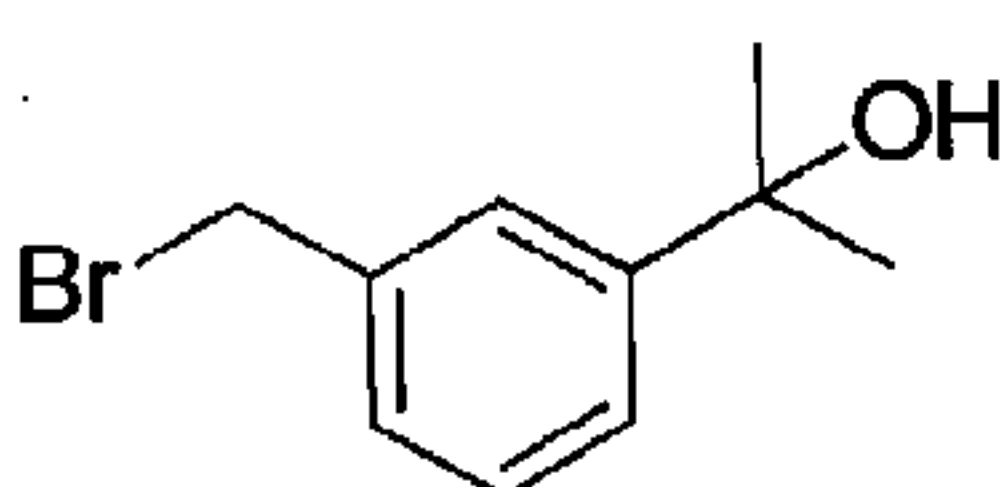
[00325] The compounds listed in the table below were prepared using a similar method to that described above starting from the listed starting materials. The following alternative conditions could be employed in the described reaction steps. Step 1: K₂CO₃ instead of Cs₂CO₃; DMF instead of THF. Step 3: aq. TFA and aq. H₃PO₄ instead of aq. HCl. I-55 was made as a diastereomeric mixture (trans cyclopropyl). The following sets were made as diastereomeric mixtures and then separated via HPLC

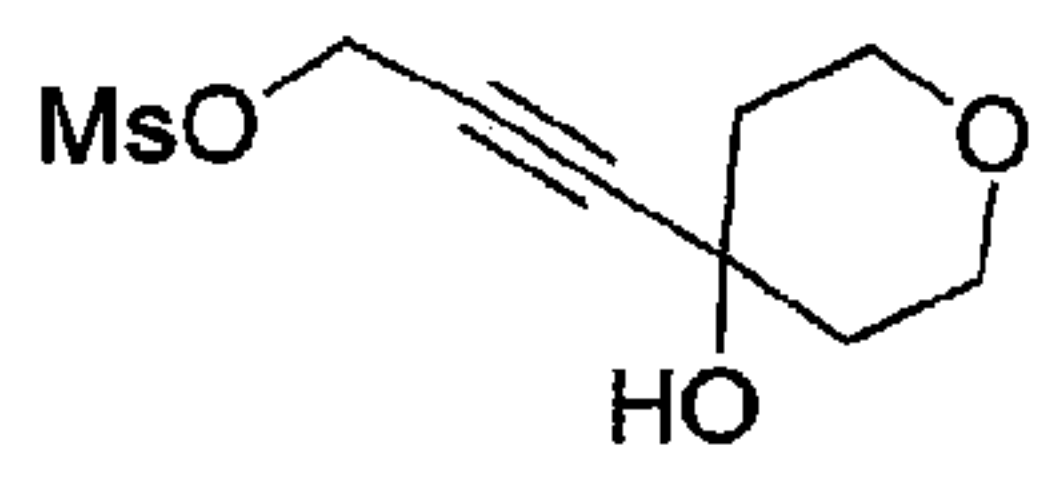
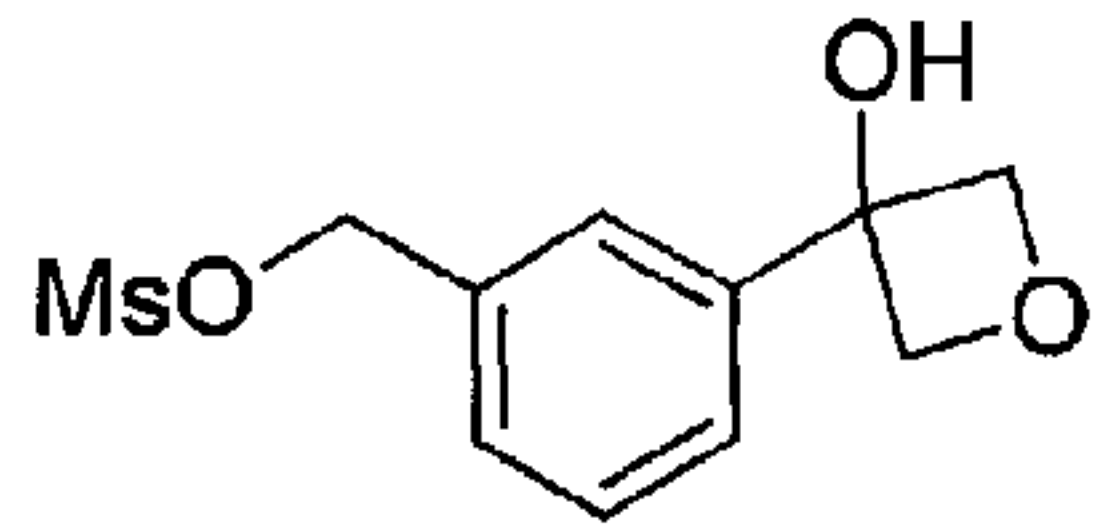
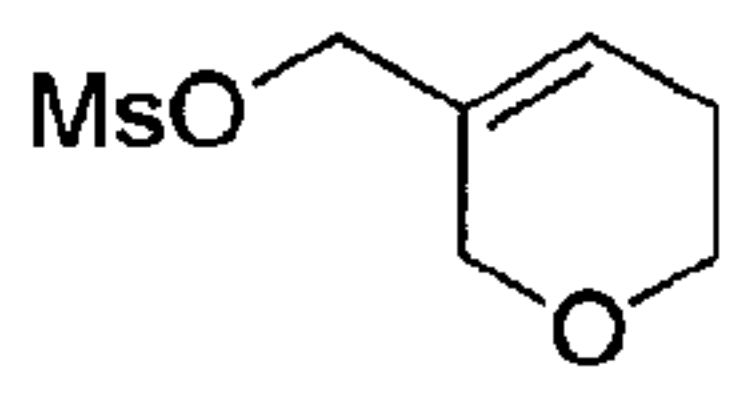
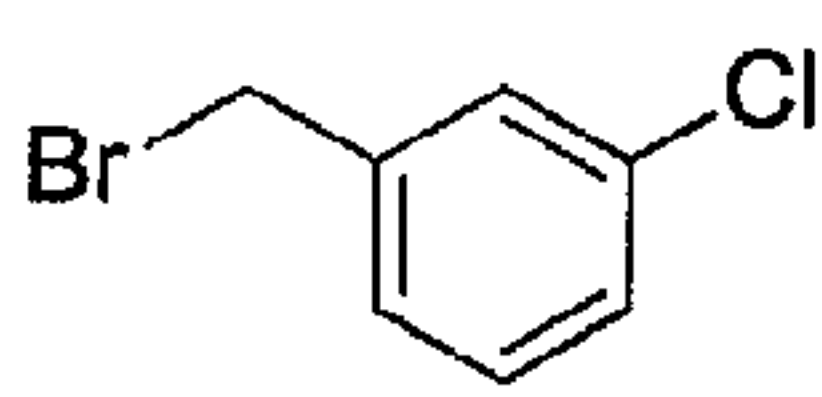
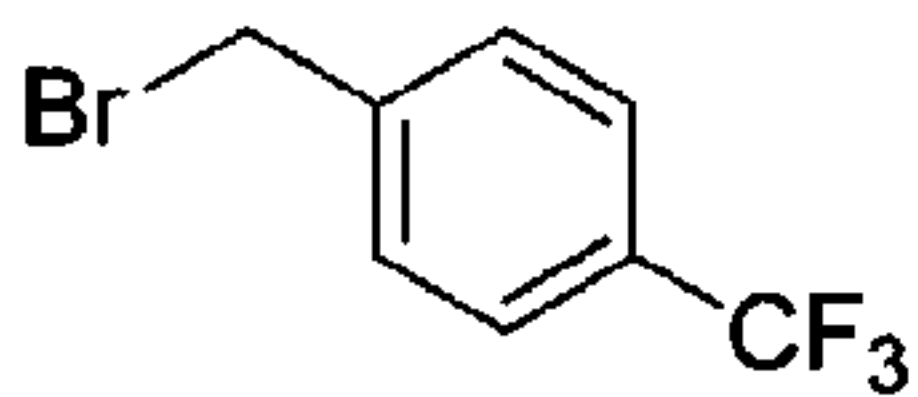
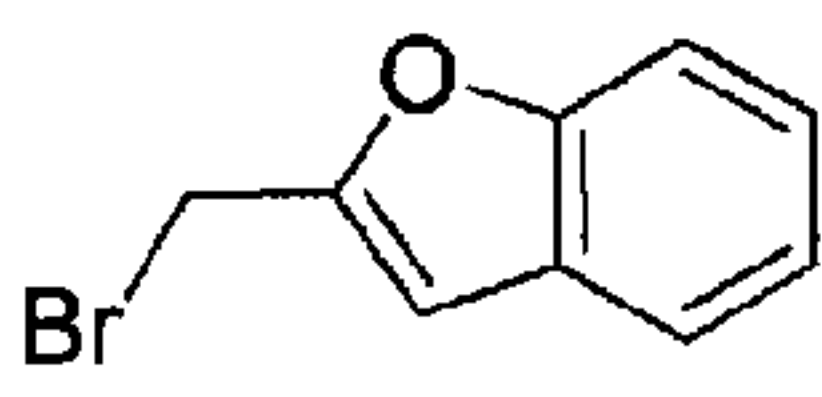
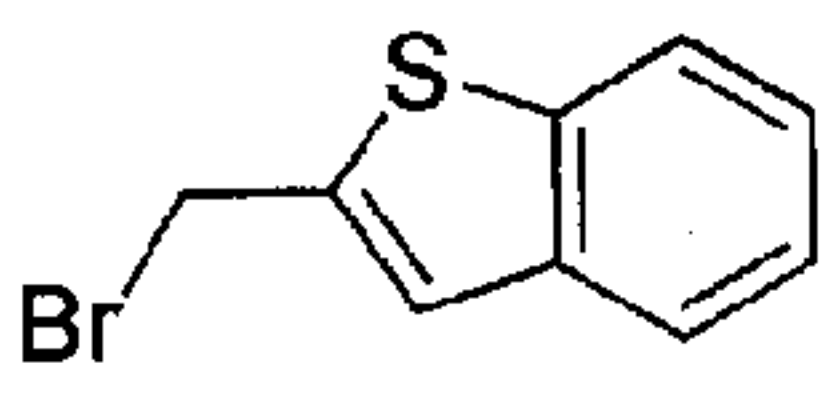
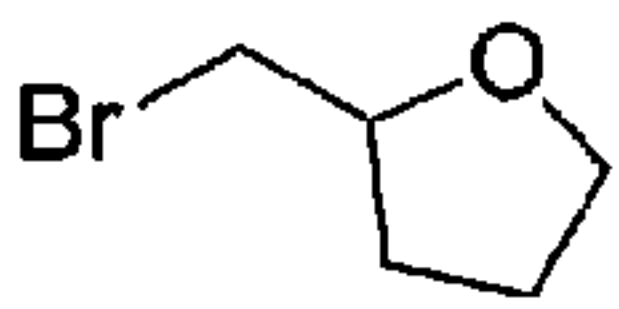
(chiral column): I-315/I-358 (benzylic methyl), I-86/I-362 (propargylic methyl); I-79/I-354 (furylic methyl); I-65/I-366 (pyridyl methyl). Absolute configurations of the undefined stereocenters are unknown.

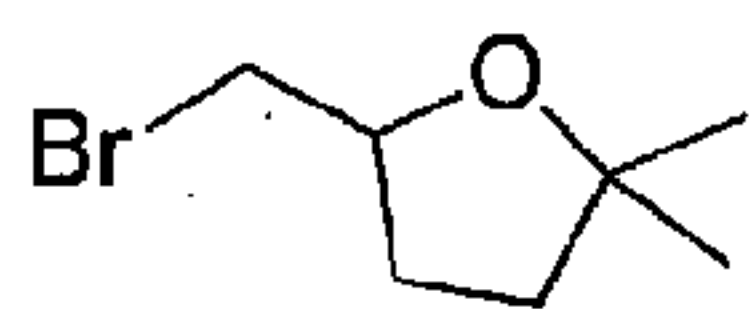
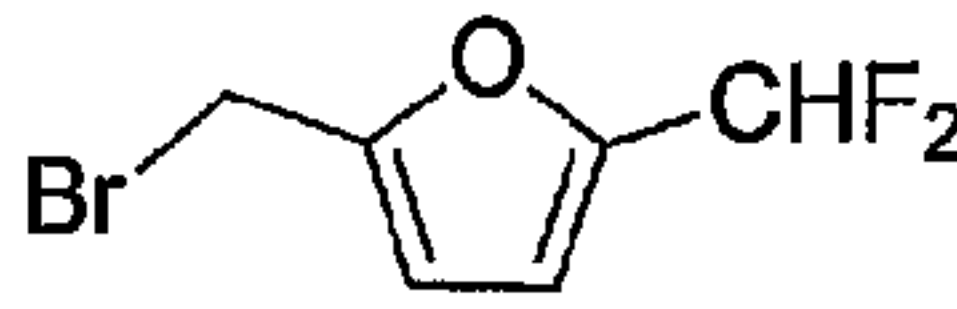
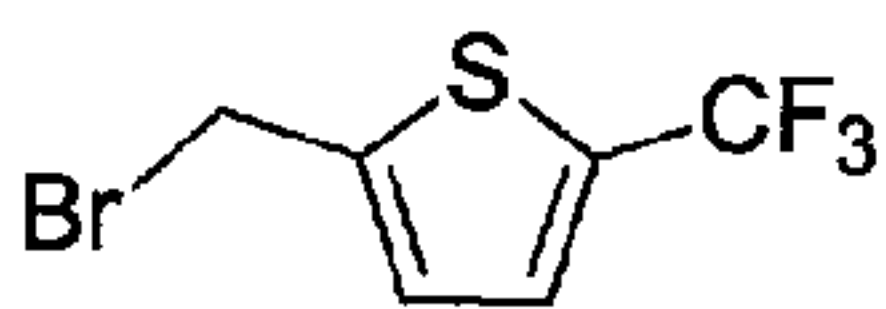
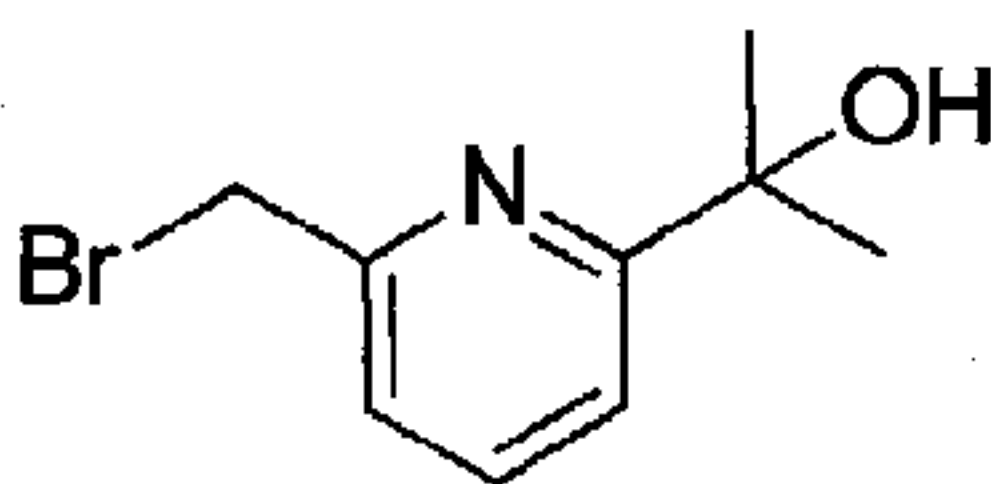
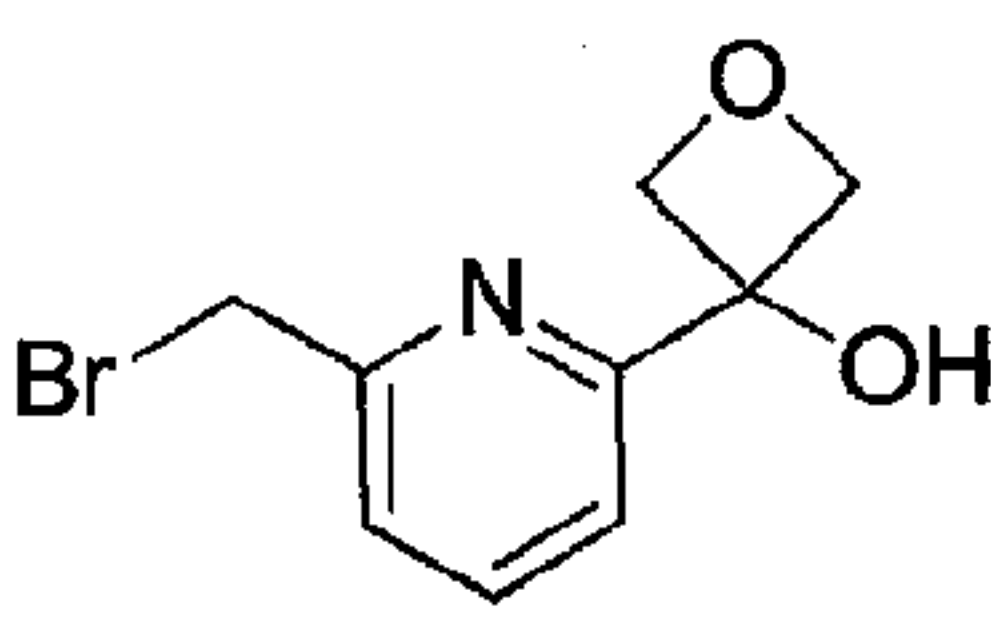
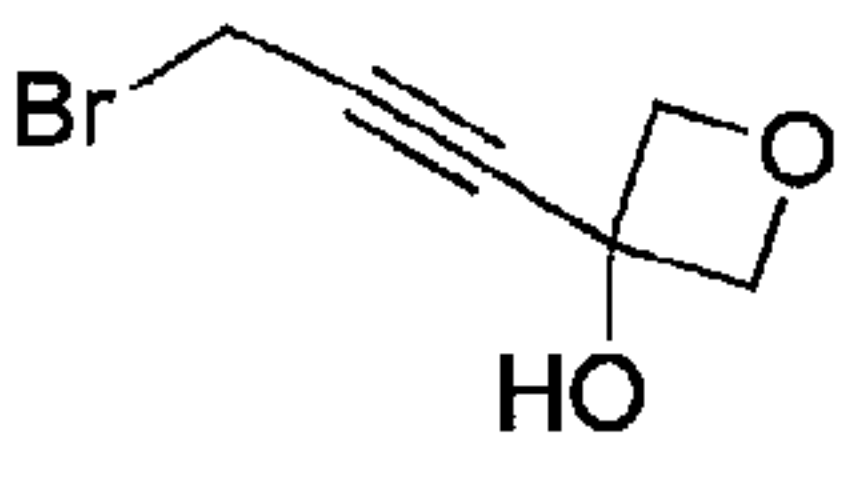
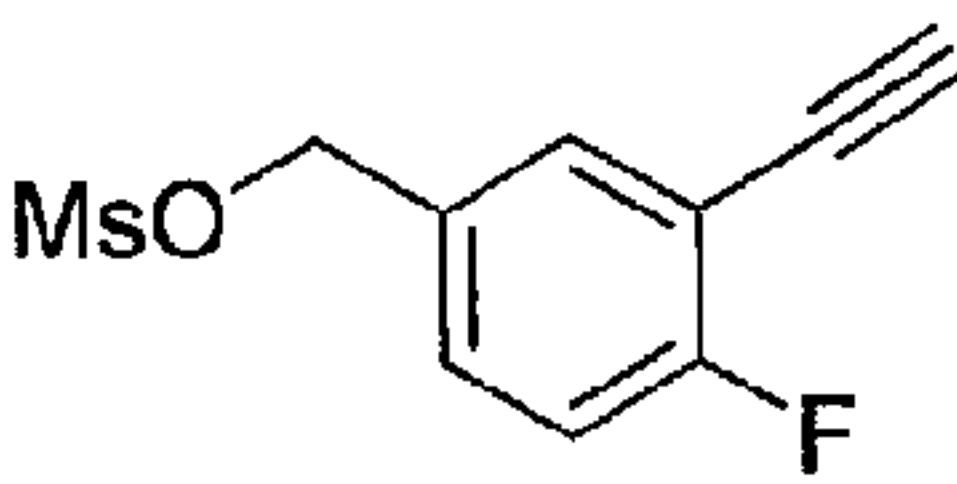
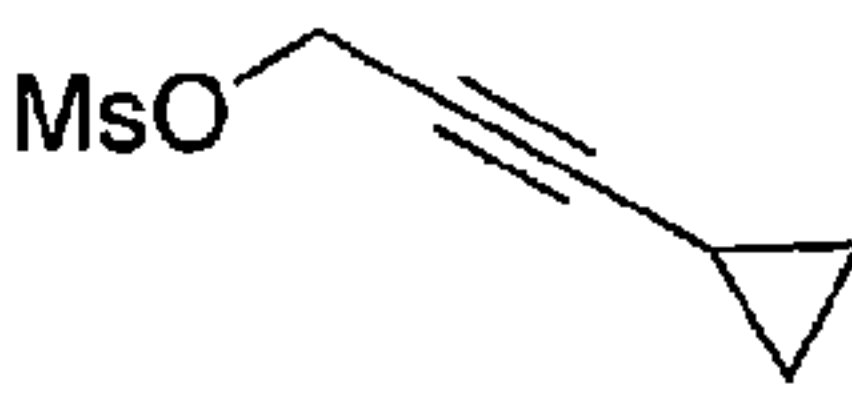
Starting material	Compound No.	LCMS Data
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	I-108	LCMS (FA): $m/z = 422.0$ (M+H).
 Int-17	I-53	LCMS (FA): $m/z = 542.5$ (M+H).
 Int-47	I-199	LCMS (FA): $m/z = 487.1$ (M+H).
 Int-4	I-55	LCMS (FA): $m/z = 451.4$ (M+H).
 Int-52	I-12	LCMS (FA): $m/z = 519.3$ (M+H).
	I-281	LCMS (FA): $m/z = 443.0$ (M+H).
	I-37	LCMS (FA): $m/z = 456.6$ (M+H).
	I-305	LCMS (FA): $m/z = 441.5$ (M+H).
	I-315	LCMS (FA): $m/z = 564.9$ (M+H).

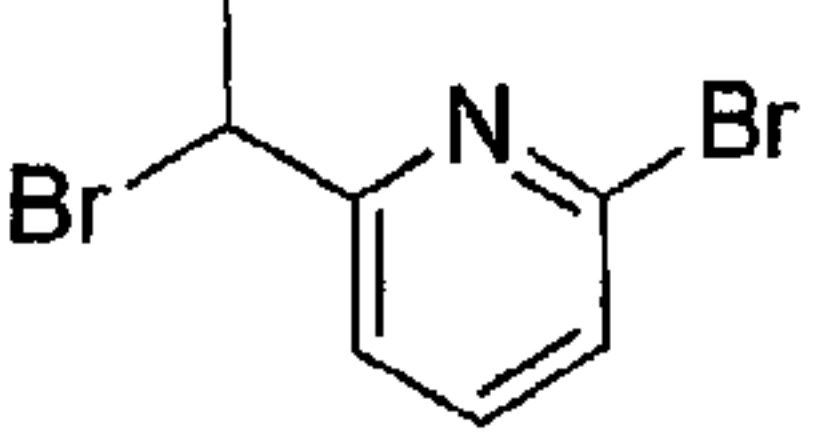
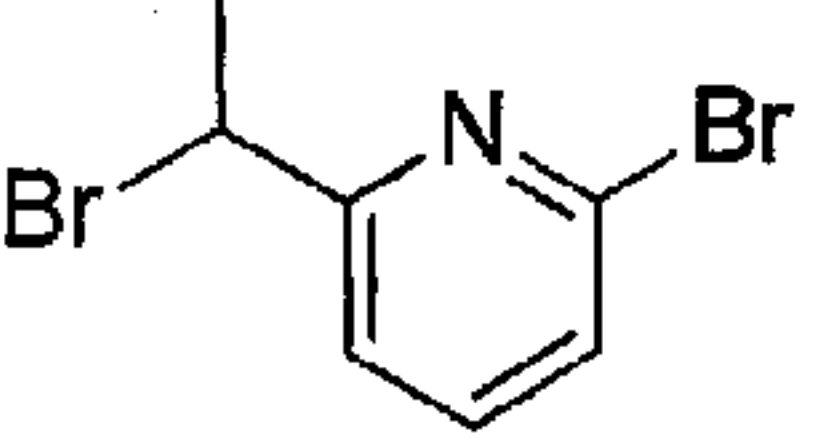
Int-3		
 Int-3	I-358	LCMS (FA): $m/z = 564.9$ (M+H).
 Int-7	I-162	LCMS (FA): $m/z = 488.0$ (M+H).
 Int-8	I-95	LCMS (FA): $m/z = 508.0$ (M+H).
 Int-5	I-332	LCMS (FA): $m/z = 467.4$ (M+H).
 Int-2	I-86	LCMS (FA): $m/z = 449.5$ (M+H).
 Int-2	I-362	LCMS (FA): $m/z = 449.5$ (M+H).
 Int-46	I-301	LCMS (FA): $m/z = 531.5$ (M+H).
 Int-14	I-14	LCMS (FA): $m/z = 505.5$ (M+H).

	I-352	LCMS (FA): $m/z = 554.4$ (M+H).
 Int-45	I-84	LCMS (FA): $m/z = 511.5$ (M+H).
 Int-23	I-180	LCMS (FA): $m/z = 497.3$ (M+H).
 Int-25	I-79	LCMS (FA): $m/z = 511.4$ (M+H).
 Int-25	I-354	LCMS (FA): $m/z = 511.4$ (M+H).
 Int-44	I-85	LCMS (FA): $m/z = 497$ (M+H).
	I-128	LCMS (FA): $m/z = 487$ (M+H).
	I-22	LCMS (FA): $m/z = 505$ (M+H).
	I-32	LCMS (FA): $m/z = 505$ (M+H).

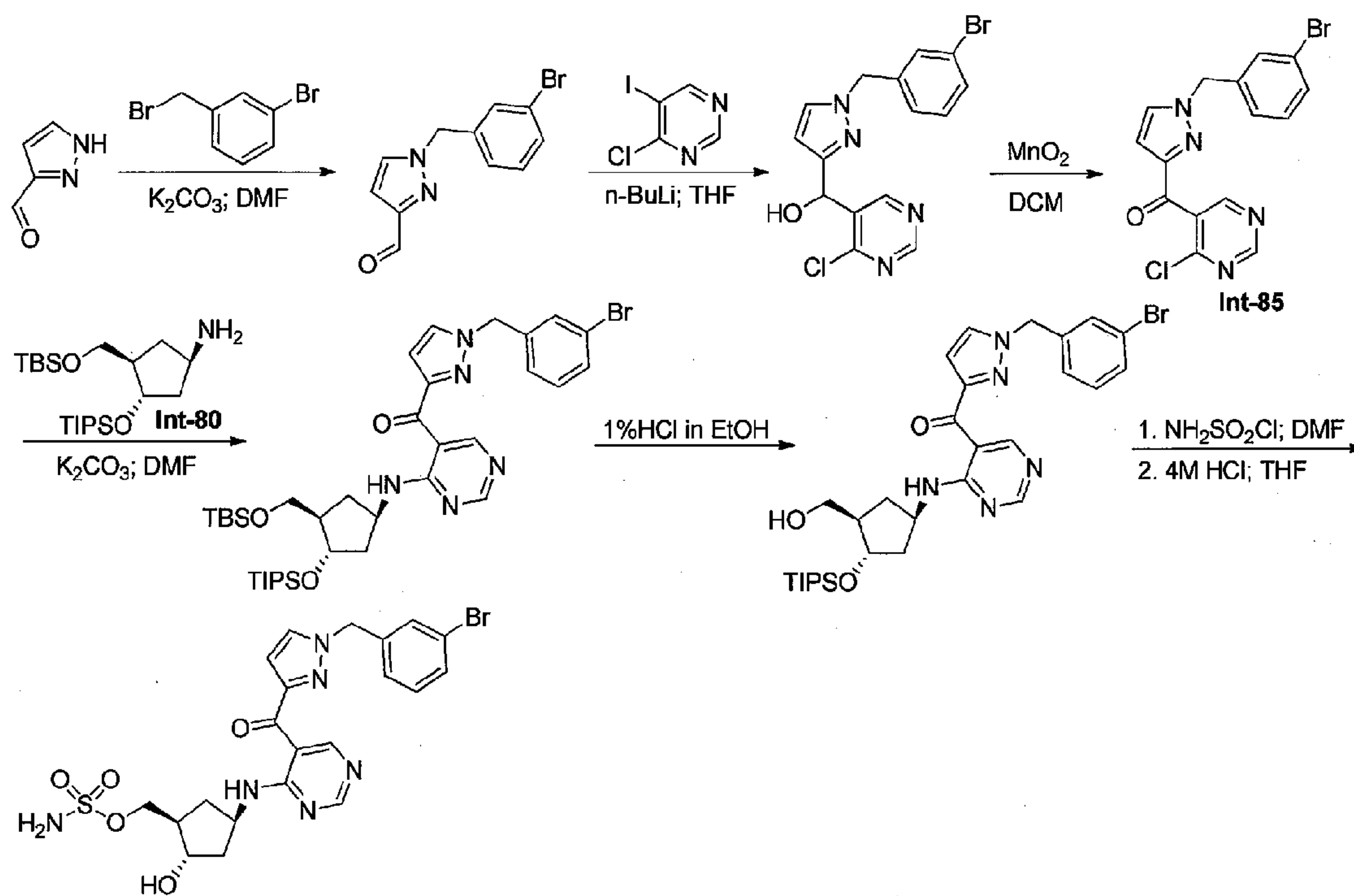
 Int-39	I-144	LCMS (FA): $m/z = 513.0$ (M+H).
 	I-302	LCMS (FA): $m/z = 463.0$ (M+H).
 Int-37	I-63	LCMS (FA): $m/z = 504.0$ (M+H).
 	I-214	LCMS (FA): $m/z = 513.0$ (M+H).
 	I-29	LCMS (FA): $m/z = 552.3$ (M+H).
 Int-53	I-59	LCMS (FA): $m/z = 503.4$ (M+H).
 	I-163	LCMS (FA): $m/z = 531.4$ (M+H).
 	I-348	LCMS (FA): $m/z = 478.4$ (M+H).
 Int-51	I-154	LCMS (FA): $m/z = 479.3$ (M+H).
 Int-13	I-60	LCMS (AA): $m/z = 531.2$ (M+H).

 Int-29	I-27	LCMS (AA): $m/z = 521.2$ (M+H).
 Int-30	I-270	LCMS (AA): $m/z = 543.2$ (M+H).
 Int-32	I-145	LCMS (AA): $m/z = 479.2$ (M+H).
 I-215	I-215	LCMS (FA): $m/z = 507.1$ (M+H).
 I-171	I-171	LCMS (FA): $m/z = 541.1$ (M+H).
 I-17 Pelcman, B. et al. PCT Application Publication WO 2008/110793	I-17	LCMS (AA): $m/z = 513.2$ (M+H).
 I-241 Kong, X. et al. PCT Application Publication WO 2006/085149	I-241	LCMS (AA): $m/z = 529.1$ (M+H).
 Int-5	I-293	LCMS (AA): $m/z = 467.2$ (M+H).

 Florjancic, A.S. et al. US Application Publication 2010/0093814	I-77	LCMS (AA): $m/z = 495.2$ (M+H).
 Int-26	I-235	LCMS (AA): $m/z = 513.1$ (M+H).
 Int-16	I-183	LCMS (AA): $m/z = 547.1$ (M+H).
 Int-14	I-109	LCMS (AA): $m/z = 532.2$ (M+H).
 Int-27	I-120	LCMS (AA): $m/z = 544.2$ (M+H).
 Int-28	I-275	LCMS (FA): $m/z = 493.1$ (M+H).
 Int-43	I-166	LCMS (FA): $m/z = 515.4$ (M+H).
	I-287	LCMS (FA): $m/z = 461.4$ (M+H).

Int-54		
	I-65	LCMS (FA): $m/z = 568.2$ (M+H).
Int-109		
	I-366	LCMS (FA): $m/z = 568.2$ (M+H).
Int-109		

Example 58: {(1R,2S,4R)-4-[(5-{[1-(3-Bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-11



Step 1: 1-(3-Bromobenzyl)-1H-pyrazole-3-carbaldehyde

[00326] To a solution of pyrazol-3-carbaldehyde (10.0 g, 104 mmol) in DMF (333 mL) was added K_2CO_3 (43 g, 312 mmol) followed by 3-bromobenzyl bromide (27.3 g, 109 mmol) at rt, and the mixture was stirred for 14 h. The reaction was filtered through a celite pad and the residual solid was rinsed with

EtOAc. The filtrate was concentrated in vacuo. To the residue was added water (200 mL) and the mixture was extracted with Hexane:EtOAc (1:1, 200 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica to provide 1-(3-bromobenzyl)-1H-pyrazole-3-carbaldehyde (21.1 g, 76%) as a colorless solid. LCMS (FA): m/z = 267.1 (M+H).

Step 2: [1-(3-Bromobenzyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol

[00327] 4-Chloro-5-iodopyrimidine (20.0 g, 83.0 mmol) was added to a 3-neck RBF, which was equipped with additional funnel, three way stop cock, septum, and internal temperature probe. The reaction vessel was purged with argon. The content was dissolved in THF (500 mL), and the solution was cooled to -78 °C with a dry ice bath. To the solution was added dropwise n-Butyllithium (2.50 M in hexane; 66.4 mL, 166 mmol), and the mixture was stirred for 30 min. A solution of 1-(3-bromobenzyl)-1H-pyrazole-3-carbaldehyde (20.0 g, 75 mmol) in THF (80 mL) was added dropwise to the mixture at -78 °C, and the reaction was stirred for 30 min at the same temperature. The reaction was quenched by addition of saturated NH₄Cl (300 mL) and extracted with EtOAc (300 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol (20.4 g, 71%) as an orange oil. LCMS (FA): m/z = 381.0 (M+H).

Step 3: [1-(3-Bromobenzyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone Int-85

[00328] To a solution of [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol (20.4 g, 53.7 mmol) in DCM (474 mL) was added manganese(IV) oxide (46.7 g, 537 mmol) and the mixture was stirred for 12 h at rt. The reaction was then filtered through a celite pad and the residual solid was washed with DCM and EtOAc several times. The filtrate was concentrated in vacuo and the residue was purified on silica gel to give [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone (16.7 g, 82%) as an off-white solid. LCMS (FA): m/z = 379.1 (M+H).

Step 4: [1-(3-Bromobenzyl)-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-((tert-butyl(dimethyl)silyl)oxy)methyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino)pyrimidin-5-yl]methanone

[00329] (1R,3R,4S)-3-((tert-Butyl(dimethyl)silyl)oxy)methyl)-4-((triisopropylsilyl)oxy)cyclopentanamine (40.0 g, 100 mmol) and [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone (34.2 g, 90.5 mmol) were weighed into a reaction vessel and the contents were dissolved in DMF (400 mL). To the solution was added K₂CO₃ (37.5 g, 271 mmol) at rt, and the resulting mixture was stirred for overnight. The reaction was concentrated in vacuo. To the

residue was added water and then the mixture was extracted with EtOAc (3x). The combined organic layers were then washed with brine, dried over Na₂SO₄, filtered and concentrated in vacuo. The residue was purified on silica gel to give [1-(3-bromobenzyl)-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl]methanone (63.2 g, 94%) as a light brown oil. LCMS (FA): m/z = 744.2 (M+H).

Step 5: [1-(3-Bromobenzyl)-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl]methanone

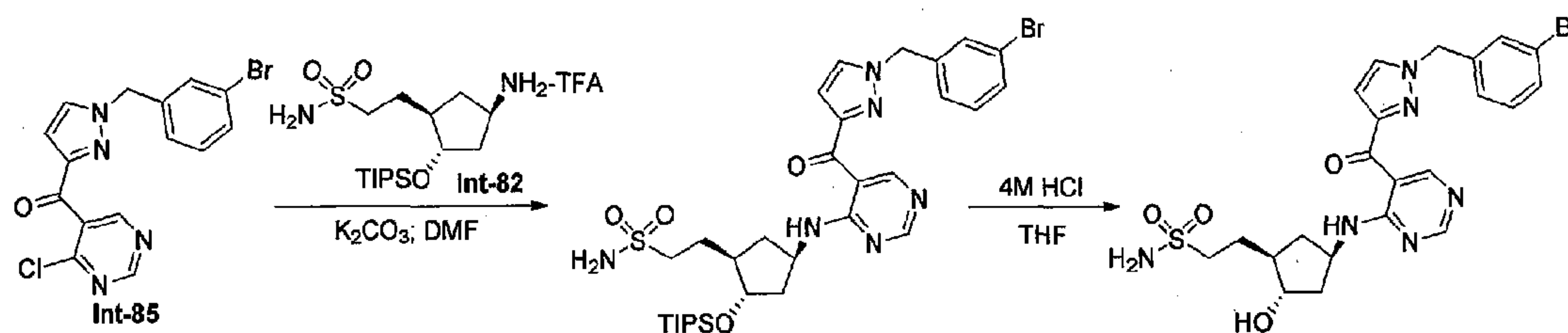
[00330] To a solution of [1-(3-bromobenzyl)-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl]methanone (63.0 g, 80.6 mmol) in EtOH (630 mL) cooled to 0 °C was added 1% HCl in EtOH (1.33 L, 161.1 mmol). The reaction was sealed and allowed to stand at rt for 6 h then at 4 °C for 14 h. The mixture was then warmed to rt and stirred for 9 h. The reaction was quenched by addition of saturated NaHCO₃ (200 mL) and the mixture was concentrated to remove EtOH. To the residue was added water (150 mL) and then the mixture was extracted with EtOAc (400 mLx4). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [1-(3-bromobenzyl)-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl]methanone (45.6 g, 90%) as a light yellow oil. LCMS (FA): m/z = 630.5 (M+H).

Step 6: {(1R,2S,4R)-4-[(5-{[1-(3-Bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-11

[00331] To a solution of [1-(3-bromobenzyl)-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl]methanone (45.5 g, 69 mmol) in DMF (396 mL) was added chlorosulfonamide (12.7 g, 110 mmol) at 0 °C, and the mixture was stirred for 20 min at the same temperature. The reaction was quenched by addition of a saturated aqueous solution of NaHCO₃ (600 mL) and the resulting mixture was extracted with EtOAc (400 mLx4). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give the sulfamate intermediate [(42.0 g, 86%); LCMS (FA): m/z = 630.5 (M+H).] which was then dissolved in THF (200 mL). To this solution was added HCl (4.0 M in water; 200 mL, 800 mmol) at rt, and the mixture was stirred for 14 h. The reaction was quenched by the addition of saturated NaHCO₃ and the mixture was extracted with EtOAc (4X). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. To the residue was added a small volume of DCM and the suspension was filtered through a glass frit funnel. The residual solid was rinsed with Et₂O and dried under high vacuum for 16 h to give {(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-

yl)amino]-2-hydroxycyclopentyl}methyl sulfamate (29.6 g, 90%). ^1H NMR (DMSO) δ 9.44 (s, 1H), 9.00 (d, $J = 7.4$ Hz, 1H), 8.63 (s, 1H), 8.09 (d, $J = 2.4$ Hz, 1H), 7.56 – 7.50 (m, 2H), 7.43 (s, 2H), 7.37 – 7.31 (m, 1H), 7.28 (d, $J = 7.7$ Hz, 1H), 6.91 (d, $J = 2.4$ Hz, 1H), 5.52 (s, 2H), 4.91 (d, $J = 4.3$ Hz, 1H), 4.77 – 4.65 (m, 1H), 4.10 (dd, $J = 9.7, 5.9$ Hz, 1H), 4.01 – 3.93 (m, 2H), 2.41 – 2.31 (m, 1H), 2.18 – 2.08 (m, 1H), 2.05 – 1.95 (m, 1H), 1.78 (ddd, $J = 13.2, 8.4, 6.9$ Hz, 1H), 1.28 (dt, $J = 12.8, 9.2$ Hz, 1H); LCMS (FA): $m/z = 553.3$ (M+H).

Example 59: 2-((1R,2S,4R)-4-[(5-[[1-(3-Bromobenzyl)-1H-pyrazol-3-yl]carbonyl]pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}ethanesulfonamide I-38



Step 1: 2-((1R,2S,4R)-4-[(5-[[1-(3-Bromobenzyl)-1H-pyrazol-3-yl]carbonyl]pyrimidin-4-yl)amino]-2-[(triisopropylsilyl)oxy]cyclopentyl}ethanesulfonamide

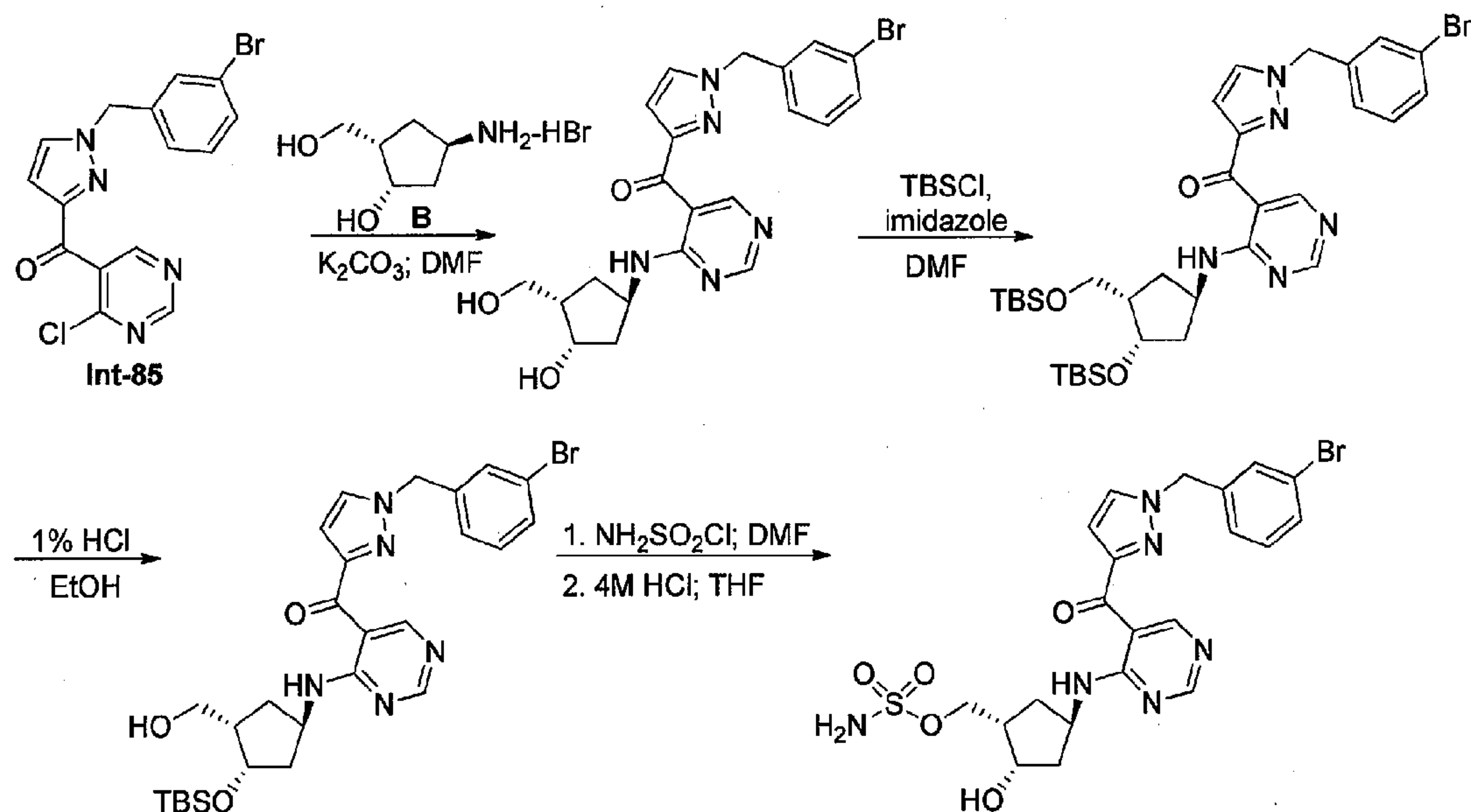
[00332] To a flask containing 2-((1R,2S,4R)-4-amino-2-[(triisopropylsilyl)oxy]cyclopentyl}ethanesulfonamide•CF₃CO₂H (127 mg, 0.27 mmol) was added DMF (2 mL), K₂CO₃ (110 mg, 0.80 mmol) and [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone (120 mg, 0.32 mmol) at rt. The mixture was stirred for 1 h and then quenched by addition of water (50 mL). The mixture was then extracted with EtOAc (60 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated. The residue was purified on silica gel to give 2-((1R,2S,4R)-4-[(5-[[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl]pyrimidin-4-yl)amino]-2-[(triisopropylsilyl)oxy]cyclopentyl}ethanesulfonamide (164 mg, 83%) as a colorless solid. LCMS (AA): $m/z = 707.4$ (M+H).

Step 2: 2-((1R,2S,4R)-4-[(5-[[1-(3-Bromobenzyl)-1H-pyrazol-3-yl]carbonyl]pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}ethanesulfonamide I-38

[00333] To a solution of 2-((1R,2S,4R)-4-[(5-[[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl]pyrimidin-4-yl)amino]-2-[(triisopropylsilyl)oxy]cyclopentyl}ethanesulfonamide (155 mg, 0.22 mmol) in THF (2.0 mL) was added HCl (4 M solution in water; 2.0 mL, 8.9 mmol) at rt, and the mixture was stirred for 1 h at 45 °C. The reaction was quenched by addition of saturated NaHCO₃ and extracted with EtOAc (x3). The combined organic layers were dried over Na₂SO₄, filtered, and

concentrated in vacuo. To the residual solid was added Et₂O and the resulting suspension was filtered through a glass frit funnel. The residual white solid was rinsed with Et₂O and dried under high vacuum to give 2-((1R,2S,4R)-4-((5-([1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl)pyrimidin-4-yl)amino)-2-hydroxycyclopentyl)ethanesulfonamide (114 mg, 95%) as a colorless solid. ¹H NMR (DMSO) δ 9.44 (s, 1H), 9.00 (d, *J* = 7.4 Hz, 1H), 8.62 (s, 1H), 8.09 (d, *J* = 2.4 Hz, 1H), 7.55 – 7.49 (m, 2H), 7.37 – 7.31 (m, 1H), 7.30 – 7.25 (m, 1H), 6.91 (d, *J* = 2.4 Hz, 1H), 6.73 (s, 2H), 5.52 (s, 2H), 4.83 (d, *J* = 5.0 Hz, 1H), 4.69 – 4.57 (m, 1H), 3.84 – 3.76 (m, 1H), 3.10 – 2.91 (m, 2H), 2.39 – 2.29 (m, 1H), 2.00 – 1.89 (m, 2H), 1.85 – 1.61 (m, 3H), 1.20 – 1.10 (m, 1H); LCMS (FA): *m/z* = 551.3 (M+H).

Example 60: ((1S,2S,4R)-4-((5-([1-(3-Bromobenzyl)-1H-pyrazol-3-yl]carbonyl)pyrimidin-4-yl)amino)-2-hydroxycyclopentyl)methyl sulfamate I-2



Step 1: [1-(3-Bromobenzyl)-1H-pyrazol-3-yl]((4-((1R,3S,4S)-3-hydroxy-4-(hydroxymethyl)cyclopentyl)amino)pyrimidin-5-yl)methanone

[00334] A RBF was charged with [1-(3-bromobenzyl)-1H-pyrazol-3-yl]((4-chloropyrimidin-5-yl)methanone (200 mg, 0.53 mmol), (1S,2S,4R)-4-amino-2-(hydroxymethyl)cyclopentanol hydrobromide (**B**) (135 mg, 0.64 mmol) (for synthesis see: Armitage, I. et al. US Application Publication 2009/0036678), and K₂CO₃ (183 mg, 1.32 mmol). The contents were dissolved in DMF (4 mL) and the mixture was stirred for 1 h at 80 °C. The reaction was then cooled to rt and diluted with EtOAc. The suspension was filtered through a celite pad and the residual solid was rinsed with EtOAc several times. The filtrate was concentrated in vacuo and the residue was dissolved in EtOAc (80 mL) which was then

washed with water (30 mL) followed by brine. The organic layer was dried over Na₂SO₄, filtered, and concentrated. The residue was purified on silica gel to give [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-{{[(1R,3S,4S)-3-hydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (167 mg, 60%) as a colorless solid. LCMS (FA): m/z = 474.3 (M+H).

Step 2: [1-(3-Bromobenzyl)-1H-pyrazol-3-yl](4-{{[(1R,3S,4S)-3-{{tert-butyl(dimethyl)silyl}oxy}-4-{{tert-butyl(dimethyl)silyl}oxy}methyl)cyclopentyl]amino}pyrimidin-5-yl)methanone

[00335] To a solution of [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-{{[(1R,3S,4S)-3-hydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (144 mg, 0.31 mmol) in DMF (5 mL) was added DMAP (1.9 mg, 0.02 mmol), imidazole (100 mg, 1.5 mmol), and TBSCl (115 mg, 0.76 mmol) at rt. The resulting mixture was stirred for 12 h. The reaction was then concentrated in vacuo. To the residue was added water (40 mL) and the mixture was extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-{{[(1R,3S,4S)-3-{{tert-butyl(dimethyl)silyl}oxy}-4-{{tert-butyl(dimethyl)silyl}oxy}methyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (168 mg, 79%) as a colorless oil. LCMS (FA): m/z = 702.4 (M+H).

Step 3: [1-(3-Bromobenzyl)-1H-pyrazol-3-yl](4-{{[(1R,3S,4S)-3-{{tert-butyl(dimethyl)silyl}oxy}-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone

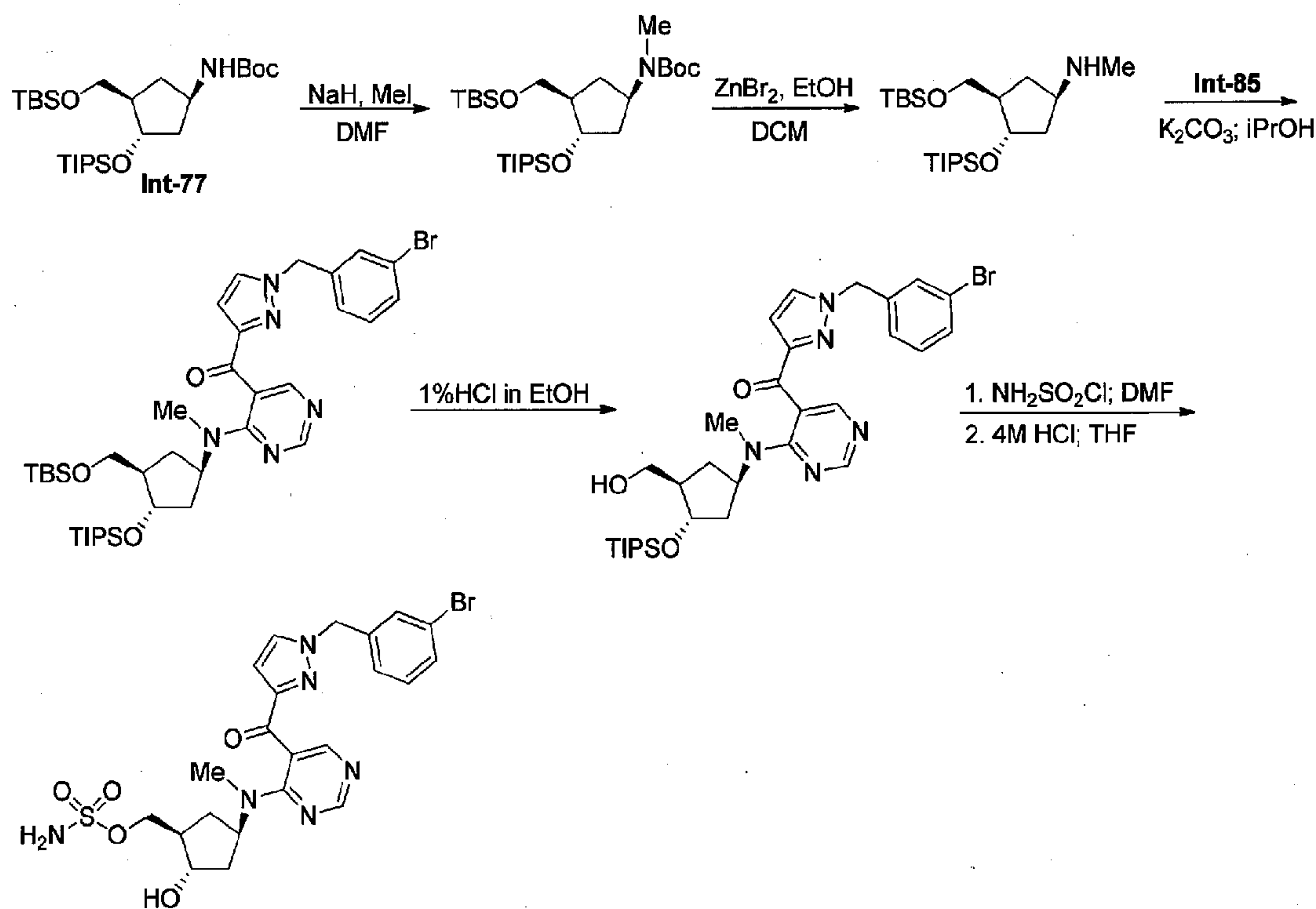
[00336] To a solution of [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-{{[(1R,3S,4S)-3-{{tert-butyl(dimethyl)silyl}oxy}-4-{{tert-butyl(dimethyl)silyl}oxy}methyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (160 mg, 0.23 mmol) in EtOH (3.0 mL) was added 1% HCl in EtOH (3.0 mL, 0.36 mmol) and the mixture was stirred for 2 h at rt. The reaction was quenched by addition of saturated NaHCO₃ (30 mL) and the mixture was concentrated to remove EtOH. To the residue was added water (20 mL) and the mixture was extracted with EtOAc (50 mLx4). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-{{[(1R,3S,4S)-3-{{tert-butyl(dimethyl)silyl}oxy}-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (113 mg, 84%). LCMS (FA): m/z = 588.4 (M+H).

Step 4: {{(1S,2S,4R)-4-[(5-{{[1-(3-Bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-2

[00337] To a solution of [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-{{[(1R,3S,4S)-3-{{tert-butyl(dimethyl)silyl}oxy}-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (105 mg,

0.18 mmol) in DMF (2.0 mL) was added chlorosulfonamide (41 mg, 0.36 mmol) at rt, and the mixture was stirred for 20 min. The reaction mixture was quenched by addition of saturated NaHCO_3 and then the mixture extracted with EtOAc (x3). The combined organic layers were dried over Na_2SO_4 , filtered, and concentrated. The residue was purified on silica gel to give the sulfamate intermediate [(91 mg, 76%); LCMS (FA): $m/z = 667.4$ (M+H).] which was dissolved in THF (2.0 mL). To this solution was added HCl (4 M solution in water; 2.0 mL, 8.9 mmol), and the mixture was stirred for 14 h at rt. The reaction was quenched by addition of saturated NaHCO_3 (30 mL) and the resulting mixture extracted with EtOAc (50 mLx4). The combined organic layers were dried over Na_2SO_4 , filtered, and concentrated in vacuo. The residue was purified on silica gel to afford {(1S,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate (69 mg, 94%). ^1H NMR (DMSO) δ 9.45 (s, 1H), 9.05 (d, $J = 6.9$ Hz, 1H), 8.63 (s, 1H), 8.10 (s, 1H), 7.53 (s, 2H), 7.48 – 7.19 (m, 4H), 6.92 (s, 1H), 5.53 (s, 2H), 4.97 – 4.56 (m, 2H), 4.29 – 4.15 (m, 2H), 4.05 – 3.95 (m, 1H), 2.47 – 2.37 (m, 1H), 2.23 – 2.10 (m, 1H), 2.06 – 1.93 (m, 1H), 1.85 – 1.61 (m, 2H); LCMS (FA): $m/z = 553.3$ (M+H).

Example 61: {(1R,2S,4R)-4-[(5-{[1-(3-Bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)(methyl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-157



Step 1: *tert*-Butyl {(1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}methylcarbamate

[00338] To a solution of *tert*-butyl {(1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate (150 mg, 0.30 mmol) in DMF (2.0 mL) was added NaH (60% in mineral oil) (35.9 mg, 0.90 mmol) followed by MeI (55.8 μ L, 0.90 mmol) at rt, and the mixture was stirred for 14 h. The reaction was quenched by addition of water (40 mL) and extracted with hexane (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified by ISCO silica gel column chromatography to give *tert*-butyl {(1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}methylcarbamate (145 mg, 80%). ¹H NMR (CDCl₃) δ 4.87 – 4.66 (m, 1H), 4.23 – 4.15 (m, 1H), 3.62 (dd, *J* = 9.9, 4.8 Hz, 1H), 3.57 – 3.49 (m, 1H), 2.71 (s, 3H), 2.07 – 1.86 (m, 2H), 1.79 – 1.70 (m, 2H), 1.46 (s, 9H), 1.41 – 1.31 (m, 1H), 1.10 – 0.99 (m, 21H), 0.89 (s, 9H), 0.03 (s, 6H).

Step 2: (1R,3R,4S)-3-([*tert*-Butyl(dimethyl)silyl]oxy)methyl)-N-methyl-4-[(triisopropylsilyl)oxy]cyclopentanamine

[00339] To a solution of *tert*-butyl {(1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}methylcarbamate (123 mg, 0.24 mmol) in DCM (5.0 mL) was added EtOH (0.07 mL, 1.19 mmol) followed by ZnBr₂ (538 mg, 2.39 mmol) at rt, and the mixture was stirred for 63 h. The reaction was quenched by addition of saturated 1 M NaOH and extracted with DCM (x3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified by silica gel column chromatography to give (1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-N-methyl-4-[(triisopropylsilyl)oxy]cyclopentanamine (82 mg, 82%) as light brown oil. LCMS (FA): *m/z* = 416.6 (M+H).

Step 3: [1-(3-Bromobenzyl)-1H-pyrazol-3-yl]{4-[(1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}(methylamino)pyrimidin-5-yl}methanone

[00340] To a solution of (1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-N-methyl-4-[(triisopropylsilyl)oxy]cyclopentanamine (80 mg, 0.19 mmol) in DMF (2.0 mL) was added K₂CO₃ (80 mg, 0.58 mmol) followed by [1-(3-bromobenzyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone (73 mg, 0.19 mmol) at rt, and the mixture was stirred for 1 h. The reaction was quenched by addition of water (50 mL) and extracted with EtOAc:Hexane (1:1) (50 mLx4). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [1-(3-bromobenzyl)-1H-pyrazol-3-yl]{4-[(1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}(methylamino)pyrimidin-5-yl}methanone.

[(triisopropylsilyl)oxy]cyclopentyl}(methyl)amino]pyrimidin-5-yl}methanone (121 mg, 83%) as a colorless oil. LCMS (FA): m/z = 758.6 (M+H).

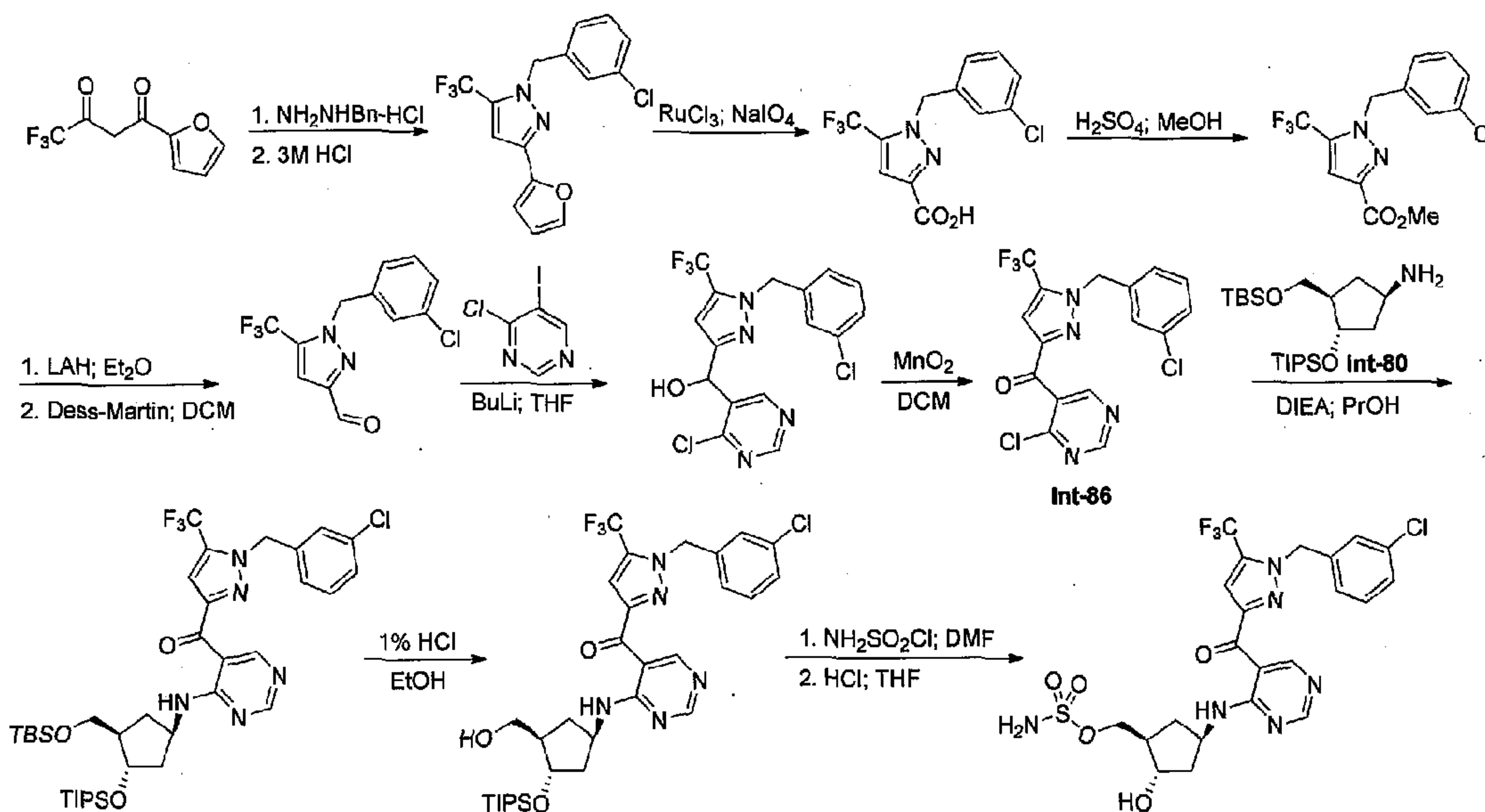
Step 4: [1-(3-Bromobenzyl)-1H-pyrazol-3-yl]{4-[(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}(methyl)amino]pyrimidin-5-yl}methanone

[00341] To a solution of [1-(3-bromobenzyl)-1H-pyrazol-3-yl]{4-[(1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}(methyl)amino]pyrimidin-5-yl}methanone (115 mg, 0.15 mmol) in EtOH (4 mL) was added 1% HCl in EtOH (4.0 mL, 0.32 mmol) at rt, and the mixture was allowed to stand at 4°C for 16 h. The reaction was quenched by addition of saturated NaHCO₃ (50 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [1-(3-bromobenzyl)-1H-pyrazol-3-yl]{4-[(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}(methyl)amino]pyrimidin-5-yl}methanone (91 mg, 93%). LCMS (FA): m/z = 644.6 (M+H).

Step 5: {(1R,2S,4R)-4-[(5-{[1-(3-Bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)(methyl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-157

[00342] To a solution of [1-(3-bromobenzyl)-1H-pyrazol-3-yl]{4-[(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}(methyl)amino]pyrimidin-5-yl}methanone (88.0 mg, 0.14 mmol) in DMF (2.0 mL) was added chlorosulfonamide (31.6 mg, 0.27 mmol) at rt, and the mixture was stirred for 10 min. The reaction was quenched by addition of saturated NaHCO₃ (40 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give the sulfamate intermediate [(95 mg, 91%); LCMS (FA): m/z = 723.6 (M+H).] which was dissolved in THF (2 mL). To this solution was added HCl (4.0 M solution in water; 2.0 mL, 8.0 mmol) at rt, and the mixture was allowed to stand at 4°C for 14 h and then warmed to room temp for 4 h. The reaction was quenched by addition of saturated NaHCO₃ (60 mL) and the mixture was extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give {(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)(methyl)amino]-2-hydroxycyclopentyl}methyl sulfamate (59 mg, 86%). ¹H NMR (DMSO) δ 8.57 (s, 1H), 8.39 (s, 1H), 8.09 (d, J = 2.4 Hz, 1H), 7.52 (d, J = 7.9 Hz, 1H), 7.48 (s, 1H), 7.43 (s, 2H), 7.33 (t, J = 7.8 Hz, 1H), 7.22 (d, J = 7.7 Hz, 1H), 6.94 (d, J = 2.4 Hz, 1H), 5.47 (s, 2H), 5.23 – 5.09 (m, 1H), 4.88 (d, J = 4.5 Hz, 1H), 4.12 – 4.04 (m, 1H), 3.99 – 3.85 (m, 2H), 2.09 – 1.98 (m, 1H), 1.96 – 1.75 (m, 3H), 1.70 – 1.59 (m, 1H), 1.35 – 1.22 (m, 1H); LCMS (FA): m/z = 567.3 (M+H).

Example 62: {(1R,2S,4R)-4-[(5-{[1-(3-Chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-170



Step 1: 1-(3-Chlorobenzyl)-3-(2-furyl)-5-(trifluoromethyl)-1H-pyrazole

[00343] DIEA (0.90 mL, 5.2 mmol) was added to a solution of 2-furoyltrifluoroacetone (0.71 g, 3.4 mmol) in EtOH (6 mL) at rt. (3-Chlorobenzyl)hydrazine hydrochloride (1.0 g, 5.2 mmol) was then added in portions. The resulting light orange solution was allowed to stir at rt for 14 h. The reaction mixture was then concentrated and the residue dissolved in EtOAc. This solution was then washed with water and brine. The organic layer was dried over MgSO_4 , filtered, and concentrated. The crude product was purified on silica gel to give the pyrazolinol intermediate (0.90 g, 76%). LCMS (FA): $m/z = 345$ (M+H). The pyrazolinol intermediate was dissolved in THF (11 mL) and HCl (3.0 M solution in water; 2.6 mL, 7.8 mmol) was added. The resulting solution was heated to reflux with stirring. After 45 min LCMS showed the reaction to be complete. The reaction was allowed to cool to rt and quenched by the addition of a saturated NaHCO_3 solution. The mixture was extracted with EtOAc (2x). The combined organic extracts were dried over MgSO_4 , filtered, and concentrated to give 1-(3-chlorobenzyl)-3-(2-furyl)-5-(trifluoromethyl)-1H-pyrazole (0.76 g, 89%). LCMS (FA): $m/z = 327$ (M+H).

Step 2: 1-(3-Chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazole-3-carboxylic acid

[00344] To a solution of 1-(3-chlorobenzyl)-3-(2-furyl)-5-(trifluoromethyl)-1H-pyrazole (0.75 g, 2.3 mmol) in acetonitrile (7 mL) was added carbon tetrachloride (7 mL) and water (9.8 mL). Sodium metaperiodate (2.7 g, 12 mmol) and ruthenium(III) chloride hydrate (0.052 g, 0.23 mmol) were added to this mixture. After stirring 20 min at rt TLC showed the reaction was complete. 1N NaOH (10 mL) was added to the reaction mixture which was extracted with EtOAc (2x). The organic extracts were discarded. The aqueous layer was acidified and extracted with EtOAc (3x). The combined organic extracts were

dried over MgSO_4 , filtered, and concentrated to yield 1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazole-3-carboxylic acid (0.37 g, 53%). LCMS (FA): $m/z = 182$ (M+H).

Step 3: Methyl 1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazole-3-carboxylate

[00345] Concentrated sulfuric acid (0.1 mL, 2 mmol) was added to a solution of 1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazole-3-carboxylic acid (0.36 g, 1.2 mmol) in methanol (10 mL). The resulting solution was heated at 60 °C with stirring for 3 h. The reaction mixture was then concentrated and purified on silica gel to afford methyl 1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazole-3-carboxylate (0.30 g, 80%). LCMS (FA): $m/z = 319$ (M+H).

Step 4: 1-(3-Chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazole-3-carbaldehyde

[00346] Lithium aluminum hydride (1.0 M solution in THF; 0.94 mL, 0.94 mmol) was added to an ice-bath cooled solution of 1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazole-3-carboxylate (0.30 g, 0.94 mmol) in ether (4.9 mL). The resulting solution was stirred at 0 °C for 30 min. The reaction was quenched with water (~1 mL) at 0 °C. Na_2SO_4 dodecahydrate (~2g) was added along with EtOAc (15 mL) and the mixture was allowed to warm to rt and stir 18 h. The mixture was filtered and the solid washed with EtOAc. The filtrate was concentrated to give the alcohol intermediate [LCMS (FA): $m/z = 291$ (M+H).] which was then dissolved in DCM (15 mL). Dess-Martin periodinane (0.73 g, 1.72 mmol) was added and the reaction was allowed to stir at rt for 1 h. The reaction mixture was then concentrated and the crude material purified on silica gel to provide 1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazole-3-carbaldehyde (226 mg, 83%). LCMS (FA): $m/z = 289$ (M+H).

Step 5: [1-(3-Chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol

[00347] 4-Chloro-5-iodopyrimidine (167 mg, 0.69 mmol) was weighed into a 100 mL flame dried RBF under argon. The solid was dissolved in THF (4.9 mL) and the solution was cooled to -78 °C in a dry ice-acetone bath. To this solution was added dropwise n-butyllithium (2.5 M solution in hexanes; 0.55 mL, 1.39 mmol) and the resulting mixture was stirred for 45 min at -78 °C. To the mixture was added dropwise a solution of 1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazole-3-carbaldehyde (0.22 g, 0.76 mmol) in THF (2.4 mL) at -78 °C, and the resulting mixture was stirred for 30 min. The reaction was warmed to rt and subsequently quenched by the addition of saturated NH_4Cl (10 mL). After dilution with water, the mixture was extracted with EtOAc (3x). The combined organic layers were dried over MgSO_4 , filtered, and concentrated. The residue was purified on silica gel to yield [1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol (240 mg, 86%). LCMS (FA): $m/z = 403$ (M+H).

Step 6: [1-(3-Chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone

[00348] To a solution of [1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol (0.24 g, 0.60 mmol) in DCM (7.2 mL) was added manganese(IV) oxide (0.62 g, 7.1 mmol), and the mixture was stirred at rt for 16 h. Additional manganese(IV) oxide (0.21 g, 2.4 mmol) was then added and the mixture continued to stir at rt an additional 24 h. The reaction mixture was then filtered through a celite pad and the residual solid was washed with DCM and EtOAc several times. The filtrate was concentrated to give [1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone (220 mg, 92%). LCMS (FA): m/z = 401 (M+H).

Step 7: [4-((1R,3R,4S)-3-([tert-Butyl(dimethyl)silyl]oxy)methyl)-4-

[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl][1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl]methanone Int-86

[00349] [1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone (110 mg, 0.27 mmol) and (1R,3R,4S)-3-([tert-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentanamine (0.13 g, 0.33 mmol) were weighed into a reaction vessel with stirbar. To this mixture was added 1-propanol (3.3 mL) and DIEA (0.14 mL, 0.82 mmol). The resulting mixture was sealed and the vessel allowed to stir while heating at 35 °C. After 16 h the reaction was cooled to rt and the reaction was concentrated. The crude product was purified on silica gel to afford [4-((1R,3R,4S)-3-([tert-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl][1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl]methanone (0.15 g, 73%).

Step 8: [1-(3-Chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl]methanone

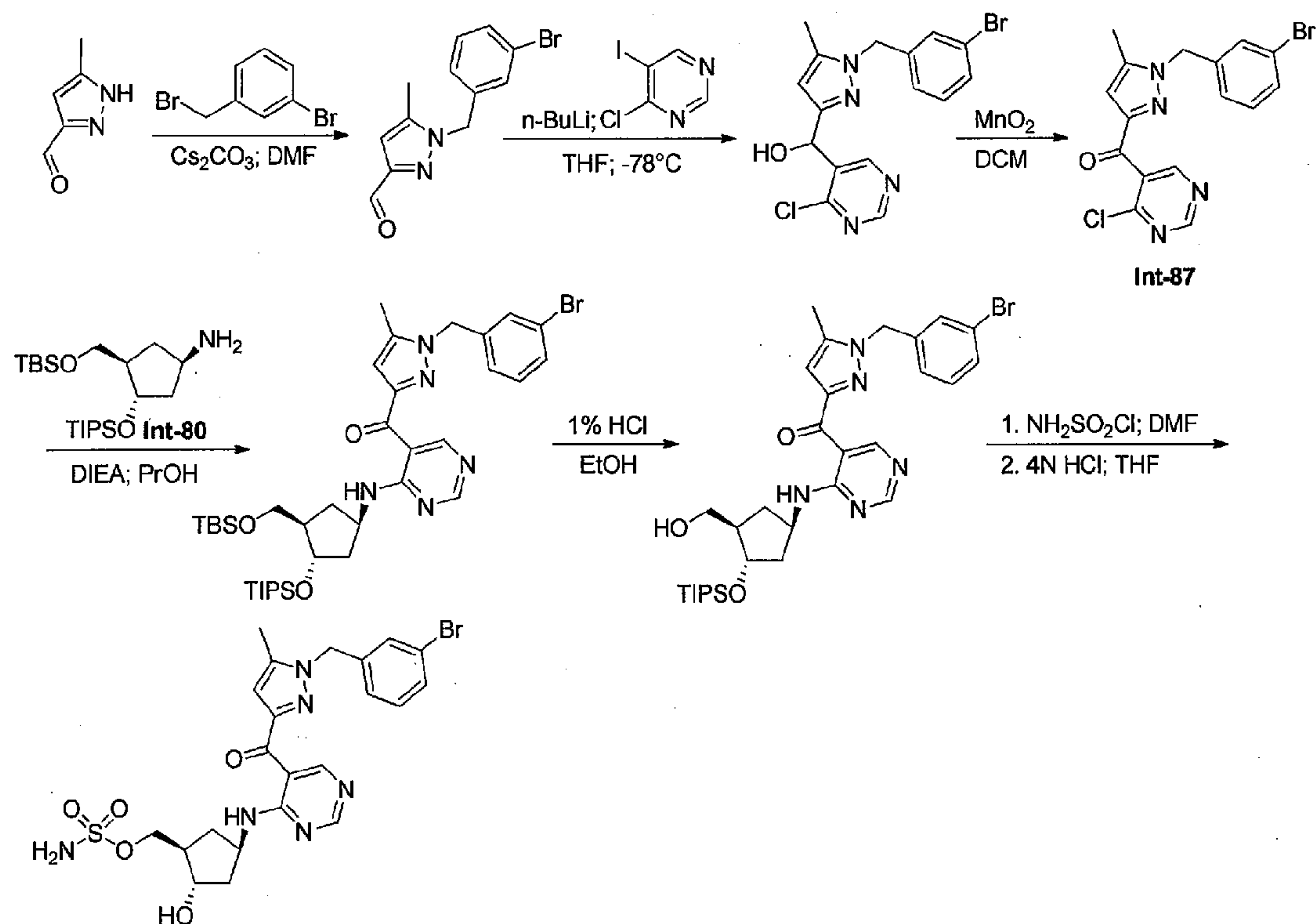
[00350] To a solution of [4-((1R,3R,4S)-3-([tert-butyl(dimethyl)silyl]oxy)methyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl][1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl]methanone (0.15 g, 0.20 mmol) in EtOH (4.7 mL) was added 1% HCl in EtOH (4.9 mL, 0.59 mmol) at rt. The reaction vessel was sealed and placed in a refrigerator (4 °C) for 22 h. The reaction was quenched by addition of a saturated aq. solution of NaHCO₃. To the residue was added water which was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to give [1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl]methanone (0.12 g, 94%). LCMS (FA): m/z = 653 (M+H).

Step 9: {(1R,2S,4R)-4-[(5-{[1-(3-Chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-170

[00351] To a solution of [1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyrimidin-5-yl]methanone (0.11 g, 0.17

mmol) in DMF (2.6 mL) and TEA (0.071 mL, 0.51 mmol) was added chlorosulfonamide (0.049 g, 0.42 mmol) at rt, and the mixture was allowed to stir for 10 min. The reaction was quenched with sat NaHCO_3 , and then extracted with EtOAc (4x). The combined organic layers were dried over MgSO_4 , filtered and concentrated to give the crude sulfamate intermediate which was immediately dissolved in THF (5.5 mL). HCl (3.0 M solution in water; 1.1 mL, 3.2 mmol) was added to the solution. The reaction was allowed to stir for 15 h at rt then at 40-45 °C for 6 h. The reaction was then quenched with sat NaHCO_3 , and extracted with EtOAc (4x). The combined organic layers were dried over MgSO_4 , filtered and concentrated. The crude product was purified on silica gel to afford {(1R,2S,4R)-4-[(5-{[1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-number (68 mg, 72%). ^1H NMR (DMSO) δ 9.36 (d, J = 4.9 Hz, 1H), 8.96 (d, J = 7.4 Hz, 1H), 8.67 (s, 1H), 7.54 (s, 1H), 7.45 (s, 2H), 7.43 – 7.40 (m, 2H), 7.34 (s, 1H), 7.18 – 7.08 (m, 1H), 5.70 (s, 2H), 4.93 (d, J = 4.5 Hz, 1H), 4.82 – 4.67 (m, 1H), 4.12 (dd, J = 9.7, 5.9 Hz, 1H), 4.04 – 3.93 (m, 2H), 2.43 – 2.31 (m, 1H), 2.20 – 2.09 (m, 1H), 2.08 – 1.99 (m, 1H), 1.86 – 1.72 (m, 1H), 1.37 – 1.25 (m, 1H); LCMS (FA): m/z = 575.5 (M+H).

Example 63: {(1R,2S,4R)-4-[(5-{[1-(3-Bromobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-309



Step 1: 1-(3-Bromobenzyl)-5-methyl-1H-pyrazole-3-carbaldehyde

[00352] 5-Methyl-2H-pyrazole-3-carbaldehyde (0.99 g, 9.0 mmol) was dissolved in DMF (35 mL). To this solution was added cesium carbonate (7.3 g, 22.5 mmol) and 3-bromobenzyl bromide (2.5 g, 9.9 mmol) and the reaction was stirred at rt for 1 h. The reaction was quenched by addition of water. This mixture was then extracted with EtOAc (3x). The combined organic layers were dried over MgSO₄, filtered and concentrated. The residue was purified on silica gel to give 1-(3-bromobenzyl)-5-methyl-1H-pyrazole-3-carbaldehyde (1.7 g, 68%). LCMS (FA): $m/z = 281.0$ (M+H).

Step 2: [1-(3-Bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol

[00353] Into a flame dried RBF with stirbar was added 4-chloro-5-iodopyrimidine (1.6 g, 6.7 mmol) dissolved in THF (23 mL). The flask was purged with argon and cooled to -78 °C. To this solution was added dropwise n-butyllithium (2.5 M in hexane; 5.6 mL, 14.0 mmol) at -78 °C and the mixture was stirred for 30 min. To this mixture was added 1-(3-bromobenzyl)-5-methyl-1H-pyrazole-3-carbaldehyde (1.7 g, 6.1 mmol) dissolved in THF (4.3 mL) dropwise. The reaction was stirred at -78 °C for 2 h. The reaction was quenched with a saturated solution of NH₄Cl and then extracted with EtOAc (3x). The combined organic layers were then washed with water and brine, dried over Na₂SO₄, filtered and concentrated. The crude product was purified on silica gel to give [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol (2.0 g, 82%). LCMS (FA): $m/z = 395.2$ (M+H).

Step 3: [1-(3-Bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone Int-87

[00354] To a solution of [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol (2.0 g, 5.0 mmol) in DCM (32 mL) was added manganese(IV) oxide (4.34 g, 50 mmol). The suspension was stirred for 19 h at rt. The reaction was then filtered through a celite pad and the residual solid was washed with DCM several times. The filtrate was then concentrated in vacuo and the residue was purified on silica gel to afford [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone (1.44 g, 74%). LCMS (FA): $m/z = 393.1$ (M+H).

Step 4: [1-(3-Bromobenzyl)-5-methyl-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-((tert-butyl(dimethyl)silyl)oxy)methyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino]pyrimidin-5-yl)methanone

[00355] [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone (0.77 g, 2.0 mmol) and (1R,3R,4S)-3-((tert-butyl(dimethyl)silyl)oxy)methyl)-4-((triisopropylsilyl)oxy)cyclopentanamine (0.79 g, 2.0 mmol) were stirred as a mixture in 2-propanol (22 mL) and DIEA (1.0 mL, 5.9 mmol) at rt for 18 h. The reaction was then concentrated and the crude product was purified on silica gel to afford [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-((tert-butyl(dimethyl)silyl)oxy)methyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino]pyrimidin-5-yl)methanone (1.17 g, 78%).

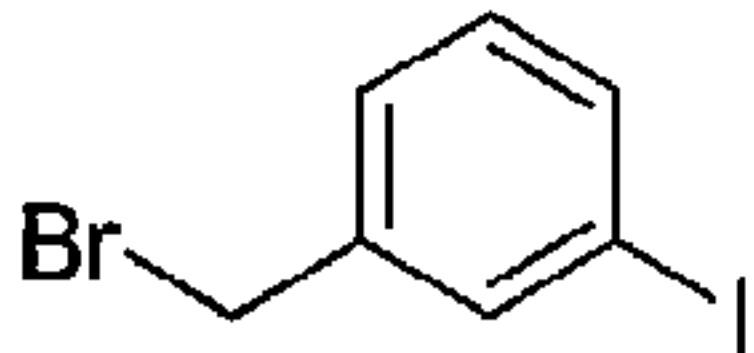
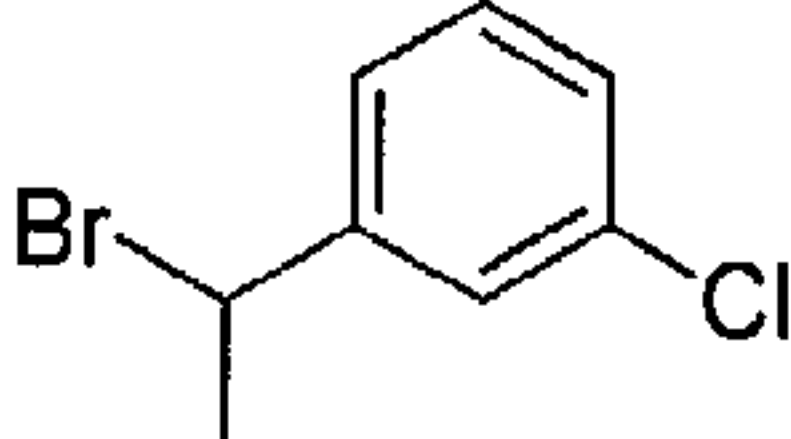
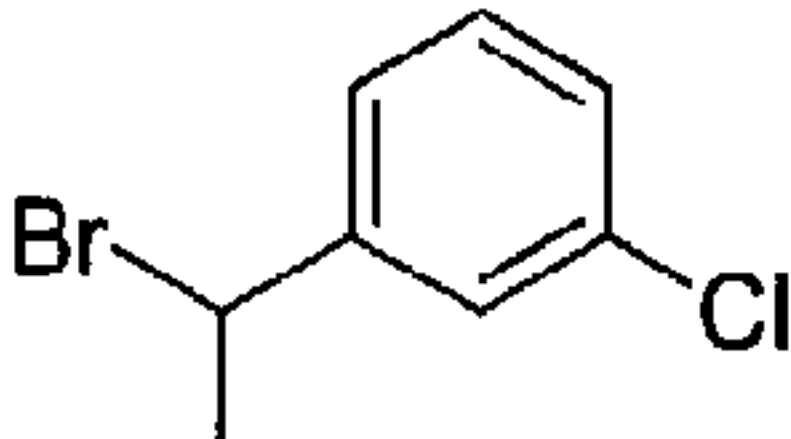
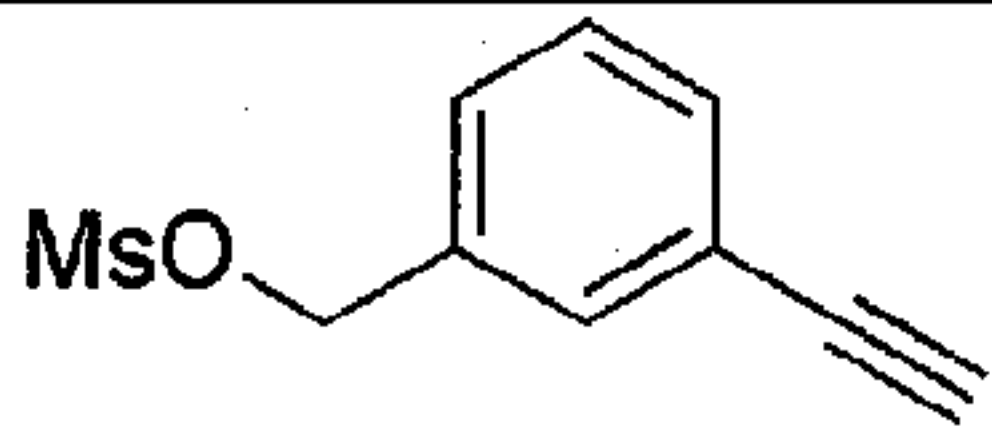
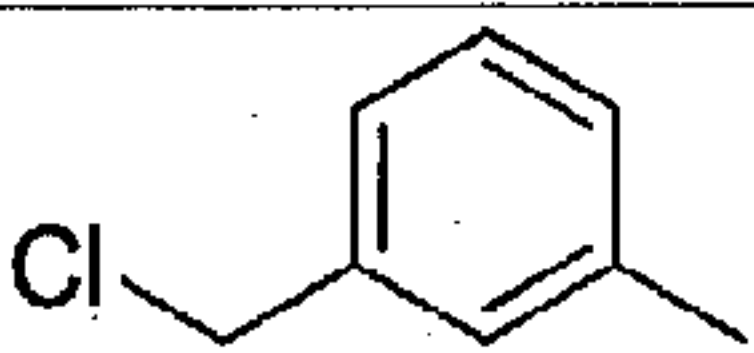
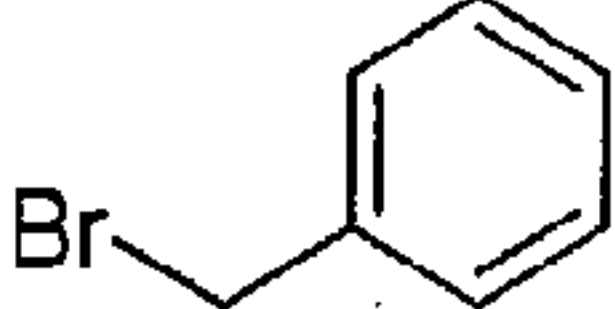
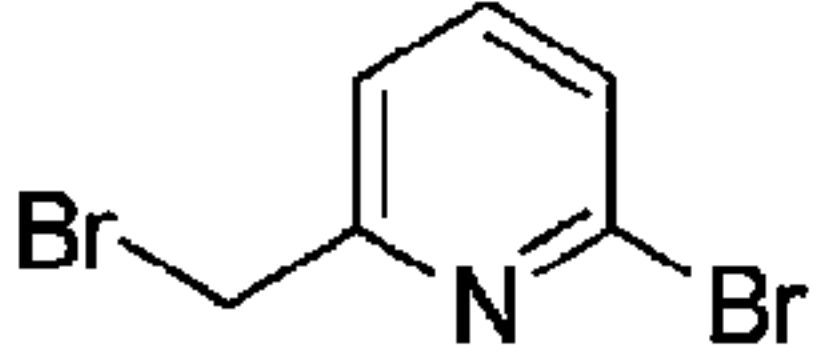
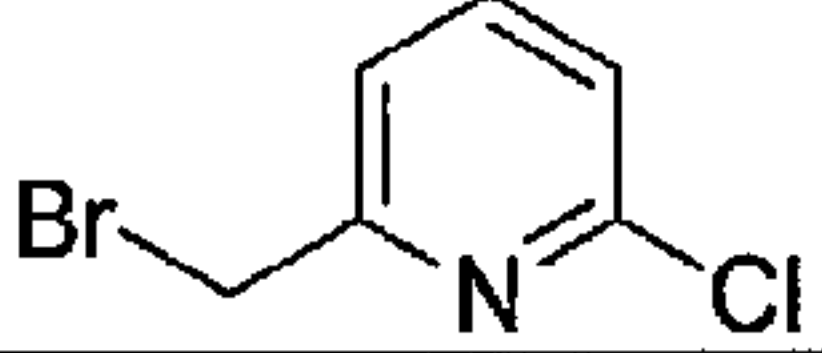
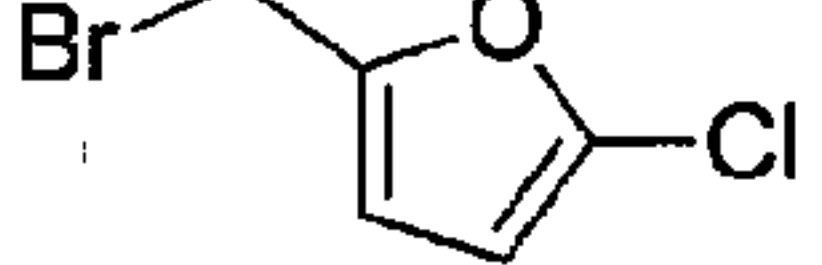
Step 5: [1-(3-Bromobenzyl)-5-methyl-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino]pyrimidin-5-yl]methanone

[00356] To a solution of [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino]pyrimidin-5-yl]methanone (1.17 g, 1.5 mmol) in EtOH (11 mL) was added 1% HCl in EtOH (15.3 mL, 1.9 mmol) at rt. The solution was stirred at rt for 3 h. The reaction was quenched by addition of a saturated aq. solution of NaHCO₃. To the residue was added water which was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to give [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino]pyrimidin-5-yl]methanone (0.68 g, 69%). LCMS (FA): *m/z* = 644.5 (M+H).

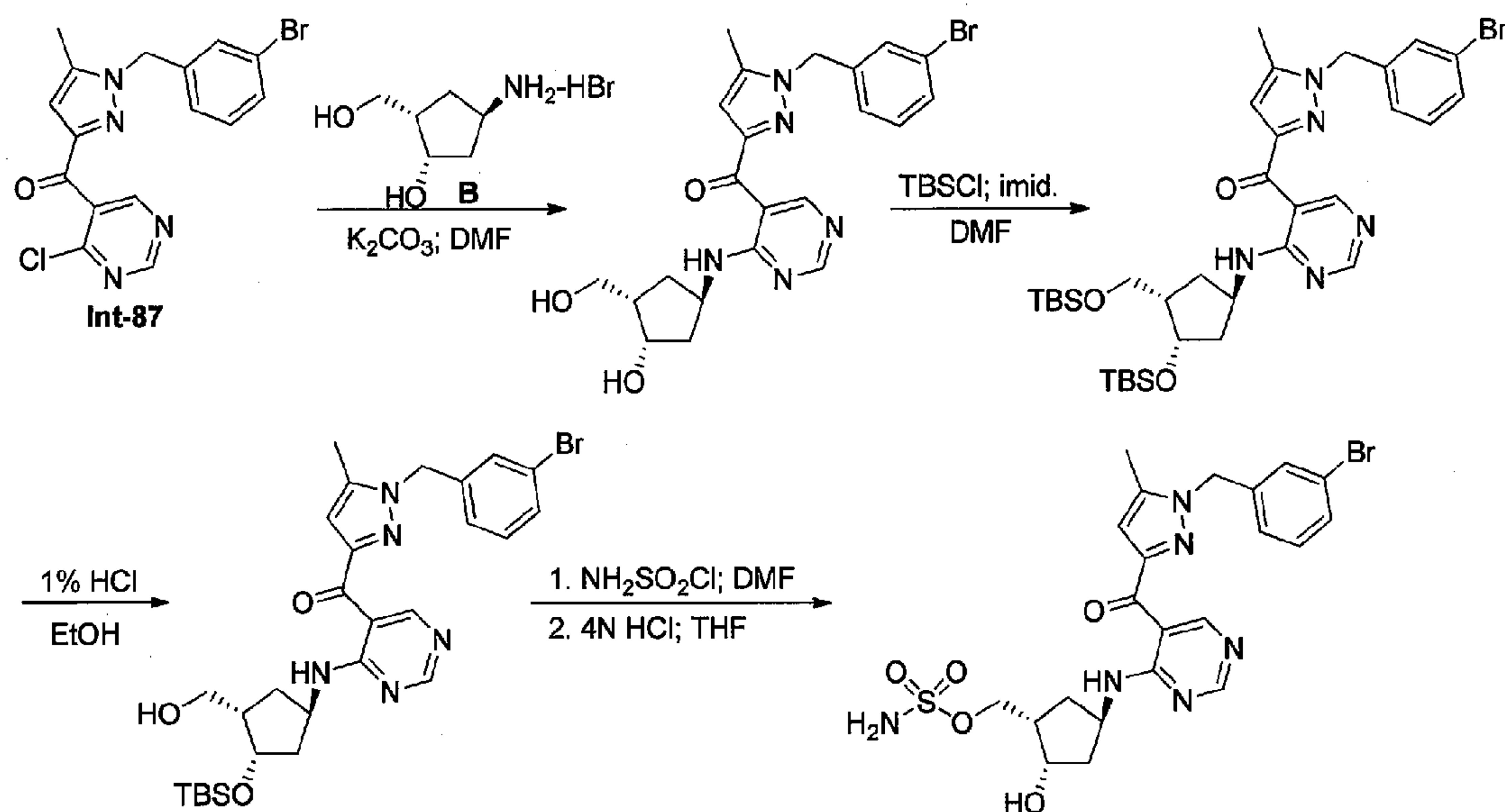
Step 6: {(1R,2S,4R)-4-[(5-{[1-(3-Bromobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-309

[00357] To a solution of [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino]pyrimidin-5-yl]methanone (0.68 g, 1.1 mmol) and TEA (0.44 mL, 3.2 mmol) in DMF (8 mL) was added chlorosulfonamide (0.36 g, 3.2 mmol) at rt, and the mixture was stirred for 2 h. HCl (3.0 M in water; 10 mL, 30 mmol) was then added to the solution. The reaction was stirred for 30 min at rt and then quenched by the addition of a saturated solution of NaHCO₃ and extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to afford {(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate (0.35 g, 59%). ¹H NMR (DMSO) δ 9.48 (s, 1H), 9.02 (d, *J* = 7.3 Hz, 1H), 8.63 (s, 1H), 7.52 (d, *J* = 8.0 Hz, 1H), 7.45 (s, 2H), 7.41 (s, 1H), 7.34 (t, *J* = 7.9 Hz, 1H), 7.13 (d, *J* = 8.2 Hz, 1H), 6.73 (d, *J* = 0.7 Hz, 1H), 5.50 (s, 2H), 4.92 (d, *J* = 4.6 Hz, 1H), 4.78 – 4.63 (m, 1H), 4.14 – 4.05 (m, 1H), 4.04 – 3.91 (m, 2H), 2.42 – 2.33 (m, 1H), 2.30 (s, 3H), 2.18 – 2.06 (m, 1H), 2.04 – 1.94 (m, 1H), 1.86 – 1.71 (m, 1H), 1.34 – 1.24 (m, 1H); LCMS (FA): *m/z* = 568.1 (M+H).

[00358] The compounds listed in the table below were prepared using a similar method to that described above starting from the appropriate starting materials. The following alternative conditions could be employed in the described reaction steps. Step 1: K₂CO₃ instead of Cs₂CO₃; THF instead of DMF. Step 3: Dess-Martin oxidation instead of manganese dioxide. Step 4: K₂CO₃/DMF; DIEA/2-propanol instead of DIEA/1-propanol. Step 5: aq. TFA and aq. H₃PO₄ instead of aq. HCl. I-172 and I-365 were made as a mixture of diastereomers (benzylic methyl) then separated via HPLC (chiral column). Absolute configuration of the undefined stereocenter is unknown.

Starting material	Compound No.	LCMS Data
	I-347	LCMS (FA): $m/z = 613.4$ (M+H).
 Int-1	I-172	LCMS (FA): $m/z = 535.0$ (M+H).
 Int-1	I-365	LCMS (FA): $m/z = 535.0$ (M+H).
 Int-44	I-164	LCMS (FA): $m/z = 511$ (M+H).
	I-248	LCMS (FA): $m/z = 501$ (M+H).
	I-66	LCMS (FA): $m/z = 487.5$ (M+H).
	I-238	LCMS (FA): $m/z = 568.4$ (M+H).
	I-99	LCMS (FA): $m/z = 522.3$ (M+H).
	I-101	LCMS (FA): $m/z = 511.4$ (M+H).

Example 64: [(1S,2S,4R)-4-[(5-{[1-(3-Bromobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-{{*tert*-butyl(dimethyl)silyl}oxy}cyclopentyl]methyl sulfamate
I-6



Step 1: [1-(3-Bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-[[[(1R,3S,4S)-3-hydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone

[00359] **B** (0.14 g, 0.68 mmol) and [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone (0.22 g, 0.56 mmol) were weighed into a round bottomed flask with stirbar. The mixture was dissolved in DMF (4 mL). Potassium carbonate (0.2 g, 1.4 mmol) was added to the reaction vessel at rt and the resulting mixture was stirred at 80 °C for 1 h. The reaction was then diluted with EtOAc and filtered through a pad of celite. The filtrate was concentrated. The resulting residue was dissolved in EtOAc and the mixture was washed with water and brine, dried over Na_2SO_4 , filtered and concentrated. The crude product was purified on silica gel to provide [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-[[[(1R,3S,4S)-3-hydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.17 g, 63%). LCMS (FA): m/z = 488 (M+H).

Step 2: [1-(3-Bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-[[[(1R,3S,4S)-3-[[tert-butyl(dimethyl)silyl]oxy}-4-([tert-butyl(dimethyl)silyl]oxy)methyl]cyclopentyl]amino}pyrimidin-5-yl)methanone

[00360] To a solution of [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-[[[(1R,3S,4S)-3-hydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (170 mg, 0.35 mmol) in DMF (6 mL) was added DMAP (2.2 mg, 0.02 mmol), imidazole (0.12 g, 1.8 mmol) followed by *tert*-butyldimethylsilyl chloride (0.13 g, 0.88 mmol) at rt, and the mixture was stirred for 12 h. The reaction was then quenched by addition of water and extracted with EtOAc (3x). The combined organic layers were washed with brine, dried over $MgSO_4$, filtered, and concentrated. The residue was purified on silica gel to give [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-[[[(1R,3S,4S)-3-[[tert-

butyl(dimethyl)silyl]oxy}-4-([*tert*-butyl(dimethyl)silyl]oxy)methyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.20 g, 79%). LCMS (FA): m/z = 716 (M+H).

Step 3: [1-(3-Bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-[(1R,3S,4S)-3-{*tert*-butyl(dimethyl)silyl]oxy}-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone

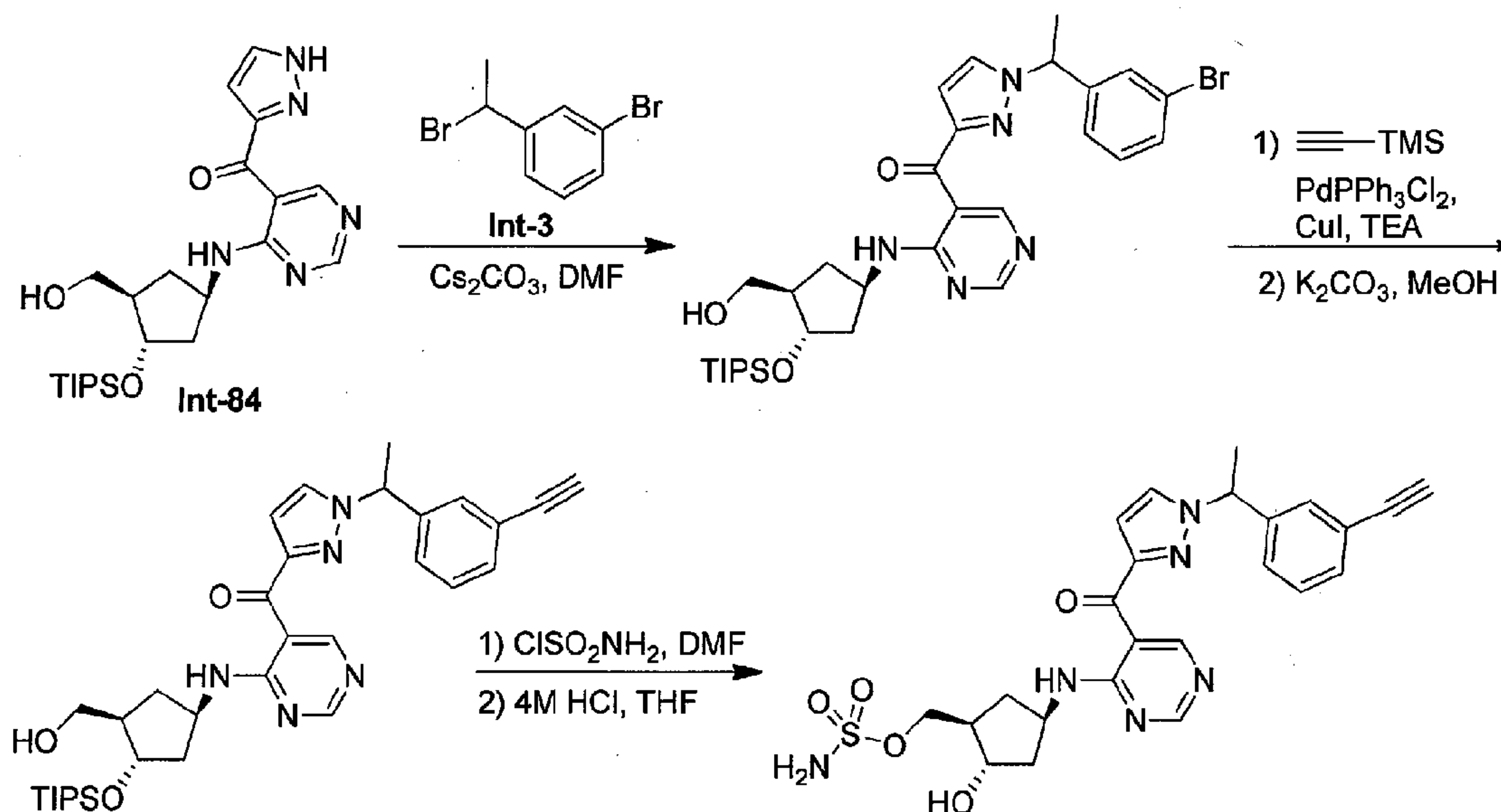
[00361] To a solution of [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-[(1R,3S,4S)-3-{*tert*-butyl(dimethyl)silyl]oxy}-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.20 g, 0.28 mmol) in EtOH (3.5 mL) was added 1% HCl in EtOH (4.6 mL, 0.56 mmol) at rt. The reaction vessel was sealed and allowed to stand in a refrigerator (4°C) for 16 h. The reaction was quenched by addition of a saturated aq. solution of NaHCO₃. To the residue was added water which was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to give [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-[(1R,3S,4S)-3-{*tert*-butyl(dimethyl)silyl]oxy}-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (136 mg, 81%). LCMS (FA): m/z = 602 (M+H).

Step 4: {(1S,2S,4R)-4-[(5-{[1-(3-Bromobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-6

[00362] To a solution of [1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl](4-[(1R,3S,4S)-3-{*tert*-butyl(dimethyl)silyl]oxy}-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (136 mg, 0.23 mmol) in DMF (2 mL) was added chlorosulfonamide (39 mg, 0.34 mmol) at rt, and the mixture was stirred for 30 min. The reaction was quenched by addition of a saturated solution of NaHCO₃ and diluted with water. The mixture was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The crude sulfamate intermediate was dissolved in THF (4 mL) and HCl (4.0 M in water; 1 mL, 4 mmol) was added to the solution. The reaction was stirred for 16 h at rt. The reaction was quenched by the addition of a saturated solution of NaHCO₃ and extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified by prep HPLC to afford {(1S,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate (89 mg, 74%). ¹H NMR (MeOD) δ 9.63 (s, 1H), 8.57 (s, 1H), 7.48 (d, J = 8.0 Hz, 1H), 7.37 (s, 1H), 7.30 (t, J = 7.9 Hz, 1H), 7.17 (d, J = 7.7 Hz, 1H), 6.77 (d, J = 0.7 Hz, 1H), 5.47 (s, 2H), 4.46 – 4.39 (m, 1H), 4.35 (dd, J = 9.7, 7.7 Hz, 1H), 4.18 (dd, J = 9.7, 7.3 Hz, 1H), 2.69 – 2.50 (m, 1H), 2.41 – 2.34 (m, 1H), 2.33 (s, 3H), 2.23 – 2.08 (m, 1H), 1.96 – 1.75 (m, 2H). LCMS (FA): m/z = 567.1 (M+H).

Example 65: [(1R,2S,4R)-4-{[5-({[1-(1-(3-Ethynylphenyl)ethyl]-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate and [(1R,2S,4R)-4-{[5-

((1-[1-(3-Ethynylphenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl)methyl sulfamate I-10/I-355



Step 1: {1-[1-(3-Bromophenyl)ethyl]-1H-pyrazol-3-yl}[4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino]pyrimidin-5-yl]methanone

[00363] Into a flask was added [4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino]pyrimidin-5-yl](1H-pyrazol-3-yl)methanone (0.32 g, 0.70 mmol) and DMF (12 mL). To this solution was added cesium carbonate (0.68 g, 2.1 mmol) followed by 1-bromo-3-(1-bromoethyl)benzene (0.28 g, 1.04 mmol). The reaction was allowed to stir at rt for 18 h. The reaction was quenched with water and extracted with EtOAc (3X). The combined organic layers were then washed with water and brine, dried over Na_2SO_4 , filtered and concentrated. The crude product was purified on silica gel to give {1-[1-(3-bromophenyl)ethyl]-1H-pyrazol-3-yl}[4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino]pyrimidin-5-yl]methanone (467 mg, 100%). LCMS (FA): $m/z = 644.3$ (M+H).

Step 2: {1-[1-(3-Ethynylphenyl)ethyl]-1H-pyrazol-3-yl}[4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino]pyrimidin-5-yl]methanone

[00364] To a solution of rel-{1-[1-(3-bromophenyl)ethyl]-1H-pyrazol-3-yl}[4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino]pyrimidin-5-yl]methanone (500 mg, 0.78 mmol) in TEA (2.0 mL) was added bis(triphenylphosphine)palladium(II) chloride (27 mg, 0.039 mmol) and copper(I) iodide (59 mg, 0.31 mmol), followed by (trimethylsilyl)acetylene (660 μL , 4.7 mmol). The reaction was heated at 100°C for 3 h. Bis(triphenylphosphine)palladium(II) chloride (27 mg, 0.039 mmol), copper(I) iodide (59 mg, 0.31 mmol), and (trimethylsilyl)acetylene (660 μL , 4.7 mmol) were each added again and the reaction heated 18 h at 100°C . Bis(triphenylphosphine)palladium(II) chloride (27 mg,

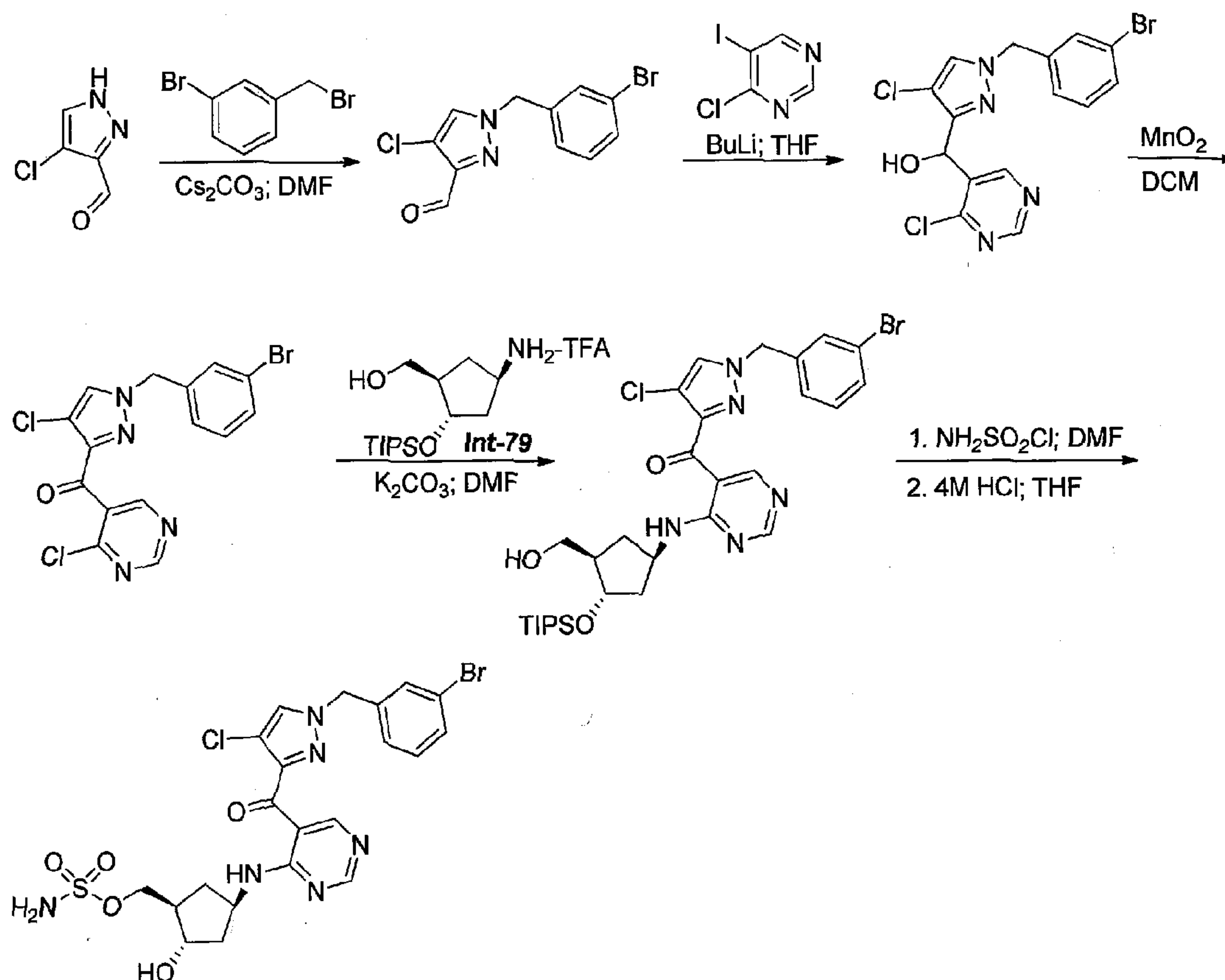
0.039 mmol), copper(I) iodide (59 mg, 0.31 mmol), and (trimethylsilyl)acetylene (660 μ L, 4.7 mmol) were each added a third time and the reaction heated an additional 24 h at 100°C. The reaction mixture was allowed to cool and filtered through celite, washing with EtOAc. This filtrate was washed with 0.1N HCl (aq.) and brine. The organic layer was dried over Na₂SO₄, filtered and concentrated. The crude product was purified on silica gel to afford the silyl intermediate (150 mg, 29%) [LCMS (FA): m/z = 660.6 (M+H).] which was next dissolved in methanol (1.0 mL). Potassium carbonate (150 mg, 1.1 mmol) was added and the reaction stirred for 15 min. The reaction was filtered and the filtrate concentrated. Purification on silica gel gave {1-[1-(3-Ethynylphenyl)ethyl]-1H-pyrazol-3-yl}[4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino]pyrimidin-5-yl]methanone (100 mg, 77%). LCMS (FA): m/z = 588.6 (M+H).

Step 3: [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-Ethynylphenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate and [(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate I-10/I-355

[00365] To a solution of rel-{1-[1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl}[4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino]pyrimidin-5-yl]methanone (100 mg, 0.17 mmol) in DMF (1.5 mL) was added chlorosulfonamide (39 mg, 0.34 mmol) and the reaction stirred for 30 min at rt. The reaction was quenched with a satd. sodium bicarbonate solution (2 mL) and then the mixture was extracted with EtOAc. The organic layers were dried (Na₂SO₄), filtered, and evaporated [LCMS (FA): m/z = 667.2 (M+H).]. The crude sulfamate intermediate was next dissolved in THF (1.0 mL). Water (1.0 mL) was added followed by conc. HCl (0.4 mL, 5 mmol) and the reaction was allowed to stir for 3 h. It was then quenched with satd. sodium bicarbonate solution and the resulting mixture was extracted with EtOAc. The combined organic layers were washed with water then concentrated. The crude product was purified using prep HPLC (chiral column) to separate diastereomers and give [(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate and [(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate as equal amounts of each diastereomer (20 mg, 20%). Absolute configuration of the benzylic methyl group for each particular isolated diastereomer is unknown. First eluting peak: ¹H NMR (MeOD) δ 9.56 (s, 1H), 8.46 (s, 1H), 7.75 (d, J = 2.4 Hz, 1H), 7.35 – 7.14 (m, 4H), 6.85 (d, J = 2.4 Hz, 1H), 5.63 (q, J = 7.0 Hz, 1H), 4.76 – 4.65 (m, 1H), 4.16 – 4.00 (m, 3H), 3.40 (s, 1H), 2.49 – 2.37 (m, 1H), 2.24 – 2.12 (m, 1H), 2.12 – 2.02 (m, 1H), 1.84 (d, J = 7.1 Hz, 3H), 1.82 – 1.75 (m, 1H), 1.41 – 1.27 (m, 1H). LCMS (FA): m/z = 511.2 (M+H).; Second eluting peak: ¹H NMR (MeOD) δ 9.56 (s, 1H), 8.46 (s, 1H), 7.75 (d, J = 2.4 Hz, 1H), 7.35 – 7.16 (m, 4H), 6.85 (d, J = 2.4 Hz, 1H), 5.63 (q, J = 7.0 Hz, 1H), 4.74 –

4.65 (m, 1H), 4.17 – 3.95 (m, 3H), 3.40 (s, 1H), 2.49 – 2.35 (m, 1H), 2.23 – 2.13 (m, 1H), 2.13 – 2.03 (m, 1H), 1.84 (d, $J = 7.1$ Hz, 3H), 1.82 – 1.76 (m, 1H), 1.41 – 1.25 (m, 1H). LCMS (FA): $m/z = 511.2$ (M+H).

Example 66: {(1R,2S,4R)-4-[(5-{[1-(3-Bromobenzyl)-4-chloro-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-[(triisopropylsilyl)oxy]cyclopentyl)methyl sulfamate I-111



Step 1: 1-(3-Bromobenzyl)-4-chloro-1H-pyrazole-3-carbaldehyde

[00366] To a solution of 4-chloro-3-formylpyrazole (300 mg, 2.3 mmol) in DMF (20 mL) was added Cs_2CO_3 (1.9 g, 5.8 mmol) followed by 3-bromobenzyl bromide (630 mg, 2.5 mmol) at rt, and the mixture was stirred for 15 h. The reaction was quenched by addition of water (100 mL) and extracted with 1:1 EtOAc:hexanes (100 mLx3). The combined organic layers were dried over Na_2SO_4 , filtered, and concentrated in vacuo. The residue was purified on silica gel to give 1-(3-bromobenzyl)-4-chloro-1H-pyrazole-3-carbaldehyde (314 mg, 46%) as a colorless solid. ^1H NMR (CDCl_3) δ 10.00 (s, 1H), 7.56 – 7.47 (m, 1H), 7.46 – 7.38 (m, 2H), 7.31 – 7.22 (m, 1H), 7.20 (d, $J = 7.7$ Hz, 1H), 5.30 (s, 2H).

Step 2: [1-(3-Bromobenzyl)-4-chloro-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol

[00367] A 100 mL 2-necked RBF, equipped with septum and 3-way stopcock with an argon balloon, was charged with 4-chloro-5-iodopyrimidine (279 mg, 1.16 mmol), and the reaction vessel was purged

with argon. The contents were dissolved in THF (8 mL) and the solution was cooled to -78 °C. To the solution was added dropwise n-Butyllithium (2.50 M solution in hexane; 0.93 mL, 2.3 mmol), and the mixture was stirred for 30 min. To the mixture was added dropwise a solution of 1-(3-bromobenzyl)-4-chloro-1H-pyrazole-3-carbaldehyde (290 mg, 0.97 mmol) in THF (4 mL) at -78 °C and the resulting mixture was stirred for 30 min. The reaction was quenched by addition of saturated NH₄Cl (40 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [1-(3-bromobenzyl)-4-chloro-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol (175 mg, 44%). LCMS (FA): *m/z* = 414.8 (M+H).

Step 3: [1-(3-Bromobenzyl)-4-chloro-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone

[00368] To a solution of [1-(3-bromobenzyl)-4-chloro-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanol (170 mg, 0.41 mmol) in DCM (10 mL) was added manganese(IV) oxide (360 mg, 4.1 mmol), and the mixture was stirred for 16 h at rt. The reaction was filtered through a Celite pad and the residual solid was rinsed with DCM several times. The filtrate was concentrated in vacuo and the residue was purified on silica gel to give [1-(3-bromobenzyl)-4-chloro-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone (135 mg, 76%) as a colorless solid. LCMS (FA): *m/z* = 412.8 (M+H).

Step 4: [1-(3-Bromobenzyl)-4-chloro-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino]pyrimidin-5-yl]methanone

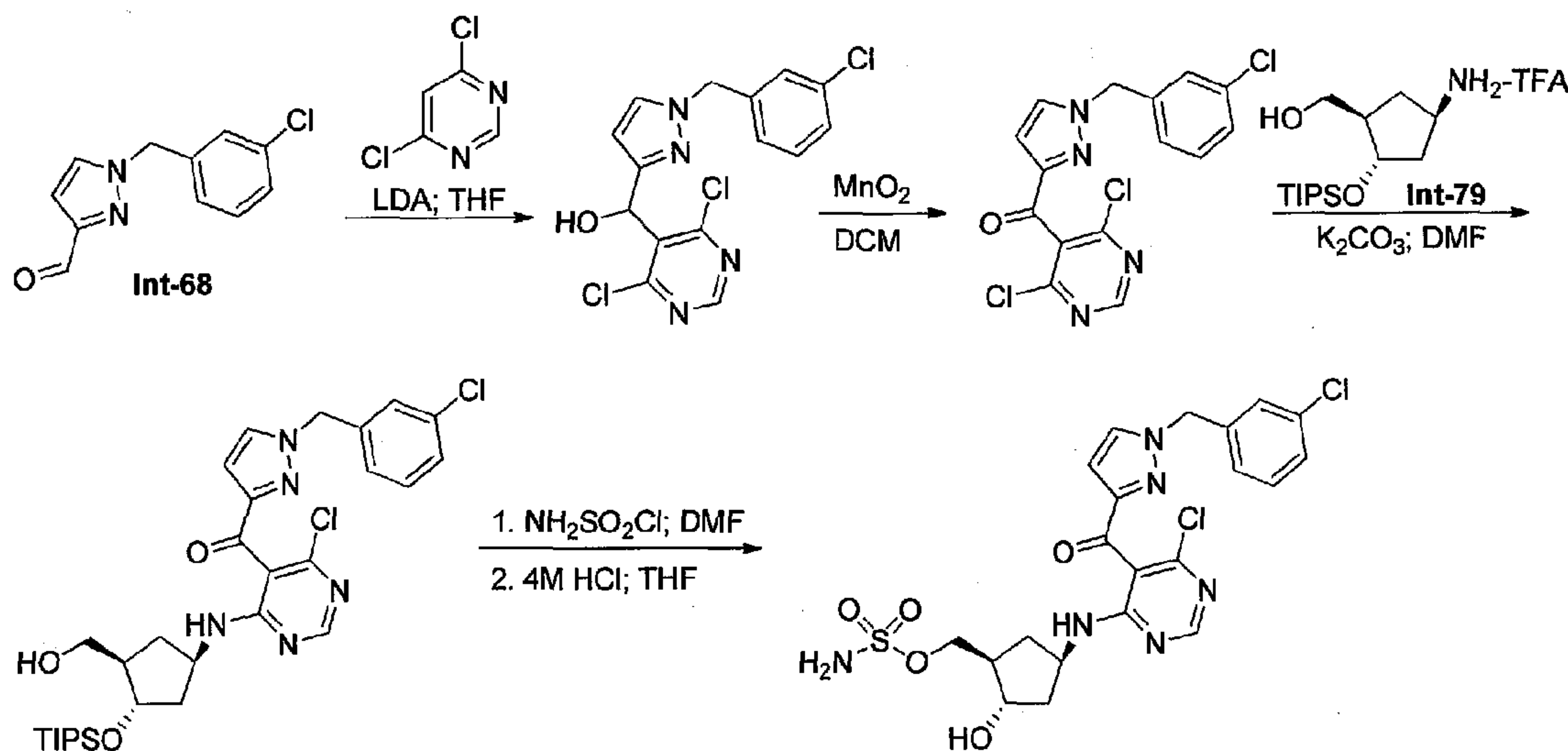
[00369] A 100mL reaction vessel was charged with {(1R,2S,4R)-4-amino-2-((triisopropylsilyl)oxy)cyclopentyl}methanol•CF₃CO₂H (150 mg, 0.38 mmol) and K₂CO₃ (130 mg, 0.95 mmol). To the mixture was added a solution of [1-(3-bromobenzyl)-4-chloro-1H-pyrazol-3-yl](4-chloropyrimidin-5-yl)methanone (130 mg, 0.32 mmol) in DMF (3 mL) at rt and the resulting mixture was stirred for 18 h at rt. The reaction was quenched by addition of water (50 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [1-(3-bromobenzyl)-4-chloro-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino]pyrimidin-5-yl]methanone (185 mg, 88%). LCMS (FA): *m/z* = 664.1 (M+H).

Step 5: {(1R,2S,4R)-4-[(5-[[1-(3-Bromobenzyl)-4-chloro-1H-pyrazol-3-yl]carbonyl]pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-111

[00370] To a solution of [1-(3-bromobenzyl)-4-chloro-1H-pyrazol-3-yl][4-((1R,3R,4S)-3-(hydroxymethyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino]pyrimidin-5-yl]methanone (130 mg, 0.20 mmol) in DMF (3.00 mL) was added chlorosulfonamide (45.3 mg, 0.39 mmol) at rt, and the mixture was stirred for 15 min. The reaction was quenched by addition of saturated NaHCO₃ (50 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give the sulfamate intermediate [(155 mg, 96%);

LCMS (FA): $m/z = 743.0$ (M+H).] which was dissolved in THF (2 mL). To this solution was added HCl (4.0 M in H₂O; 3.0 mL, 12 mmol) at rt, and the mixture was stirred for 3 h. The reaction was quenched by addition of saturated NaHCO₃ (50 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified by ISCO silica gel column chromatography to give {(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-4-chloro-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate (102 mg, 93%). ¹H NMR (DMSO) δ 9.00 (s, 1H), 8.90 (d, $J = 7.4$ Hz, 1H), 8.63 (s, 1H), 8.38 (s, 1H), 7.60 – 7.50 (m, 2H), 7.43 (s, 2H), 7.35 (t, $J = 7.7$ Hz, 1H), 7.29 (d, $J = 7.7$ Hz, 1H), 5.46 (s, 2H), 4.91 (d, $J = 4.5$ Hz, 1H), 4.79 – 4.67 (m, 1H), 4.10 (dt, $J = 8.3, 5.7$ Hz, 1H), 4.03 – 3.93 (m, 2H), 2.41 – 2.28 (m, 1H), 2.20 – 2.07 (m, 1H), 2.06 – 1.93 (m, 1H), 1.87 – 1.73 (m, 1H), 1.30 (dt, $J = 12.5, 9.3$ Hz, 1H); LCMS (FA): $m/z = 587.2$ (M+H).

Example 67: {(1R,2S,4R)-4-[(6-Chloro-5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-54



Step 1: [1-(3-Chlorobenzyl)-1H-pyrazol-3-yl](4,6-dichloropyrimidin-5-yl)methanol

[00371] A solution of N,N-diisopropylamine (0.36 mL, 2.6 mmol) in THF (10 mL) was cooled to -78 °C under an atmosphere of argon. To this solution was added dropwise n-butyllithium (2.50 M solution in hexane; 1.0 mL, 2.5 mmol), and the mixture was stirred for 30 min at 0 °C. This LDA solution was cooled to -78 °C and then a solution of 4,6-dichloropyrimidine (350 mg, 2.35 mmol) in THF (3 mL) was added dropwise to the LDA solution. The dark red brown solution was stirred for 30 min. To this mixture was added a solution of 1-(3-chlorobenzyl)-1H-pyrazole-3-carbaldehyde (518 mg, 2.35 mmol) in THF (3 mL) at -78 °C, and the resulting mixture was stirred for 30 min. The reaction was quenched by addition of saturated NH₄Cl (50 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried

over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [1-(3-chlorobenzyl)-1H-pyrazol-3-yl](4,6-dichloropyrimidin-5-yl)methanol (174 mg, 16%). ¹H NMR (CDCl₃) δ 8.72 (s, 1H), 7.38 (d, *J* = 2.3 Hz, 1H), 7.31 – 7.22 (m, 2H), 7.12 (s, 1H), 7.06 – 7.03 (m, 1H), 6.54 (d, *J* = 8.4 Hz, 1H), 6.17 (d, *J* = 2.1 Hz, 1H), 5.25 (s, 2H), 3.71 (d, *J* = 8.4 Hz, 1H).

Step 2: [1-(3-Chlorobenzyl)-1H-pyrazol-3-yl](4,6-dichloropyrimidin-5-yl)methanone

[00372] To a solution of [1-(3-chlorobenzyl)-1H-pyrazol-3-yl](4,6-dichloropyrimidin-5-yl)methanol (140 mg, 0.37 mmol) in DCM (4.4 mL) was added manganese(IV) oxide (0.32 g, 3.7 mmol) and the mixture was stirred for 12 h at rt. The reaction was filtered through a celite pad and the residual solid was rinsed with DCM several times. The filtrate was concentrated in vacuo and the residue was purified on silica gel to give [1-(3-chlorobenzyl)-1H-pyrazol-3-yl](4,6-dichloropyrimidin-5-yl)methanone (86 mg, 64%) as a colorless solid. LCMS (FA): *m/z* = 368.9 (M+H).

Step 3: [1-(3-Chlorobenzyl)-1H-pyrazol-3-yl][4-chloro-6-((1R,3R,4S)-3-(hydroxymethyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino)pyrimidin-5-yl]methanone

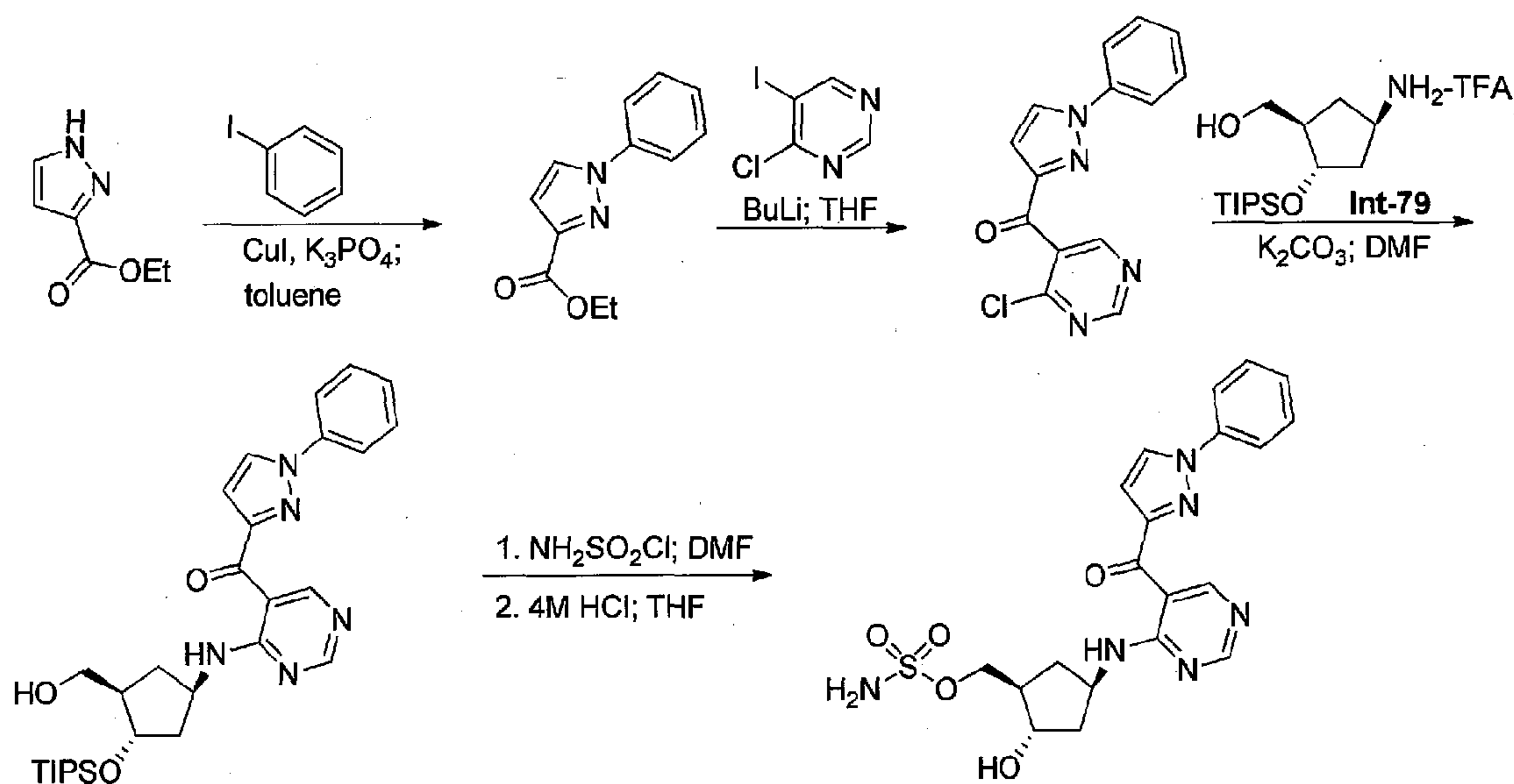
[00373] A 100mL reaction vessel was charged with ((1R,2S,4R)-4-amino-2-((triisopropylsilyl)oxy)cyclopentyl)methanol•CF₃CO₂H (96 mg, 0.24 mmol) and K₂CO₃ (0.10 g, 0.69 mmol). To the mixture was added a solution of [1-(3-chlorobenzyl)-1H-pyrazol-3-yl](4,6-dichloropyrimidin-5-yl)methanone (85 mg, 0.23 mmol) in DMF (3 mL) and the resulting mixture was stirred for 2 h at rt. The reaction was quenched by the addition of water (40 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [1-(3-chlorobenzyl)-1H-pyrazol-3-yl][4-chloro-6-((1R,3R,4S)-3-(hydroxymethyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino)pyrimidin-5-yl]methanone (132 mg, 88%) as a colorless solid. LCMS (FA): *m/z* = 618.1 (M+H).

Step 4: ((1R,2S,4R)-4-[(6-Chloro-5-[[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl]pyrimidin-4-yl)amino]-2-hydroxycyclopentyl)methyl sulfamate I-54

[00374] To a solution of [1-(3-chlorobenzyl)-1H-pyrazol-3-yl][4-chloro-6-((1R,3R,4S)-3-(hydroxymethyl)-4-((triisopropylsilyl)oxy)cyclopentyl)amino)pyrimidin-5-yl]methanone (120 mg, 0.20 mmol) in DMF (2 mL) was added chlorosulfonamide (45 mg, 0.39 mmol) at rt, and the mixture was stirred for 10 min. The reaction was quenched by addition of saturated NaHCO₃ (50 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give the sulfamate intermediate [(116 mg, 80%); LCMS (FA): *m/z* = 697.5 (M+H).] which was dissolved in THF (2 mL). To this solution was added HCl (4.0 M solution in water; 2.0 mL, 8.0 mmol) at rt, and the mixture was stirred for 5 h. The reaction was quenched by addition of saturated NaHCO₃ (50 mL) and extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified by

ISCO silica gel column chromatography to give {(1R,2S,4R)-4-[(6-chloro-5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate (65 mg, 77%) as a colorless solid. ¹H NMR (DMSO) δ 8.34 (s, 1H), 8.05 (d, J = 2.3 Hz, 1H), 7.45 – 7.38 (m, 2H), 7.38 – 7.30 (m, 3H), 7.22 (s, 1H), 7.17 – 7.10 (m, 1H), 6.94 (d, J = 2.3 Hz, 1H), 5.48 (s, 2H), 4.78 (d, J = 4.5 Hz, 1H), 4.71 – 4.59 (m, 1H), 4.02 (dd, J = 9.6, 5.9 Hz, 1H), 3.92 – 3.80 (m, 2H), 2.14 – 1.96 (m, 2H), 1.81 – 1.71 (m, 1H), 1.70 – 1.60 (m, 1H), 1.20 (m, 1H); LCMS (FA): m/z = 541.2 (M+H).

Example 68: [(1R,2S,4R)-2-Hydroxy-4-({5-[(1-phenyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate I-205



Step 1: Ethyl 1-phenyl-1H-pyrazole-3-carboxylate

[00375] A large sealable reaction vessel was charged with ethyl 1H-pyrazole-3-carboxylate (300 mg, 2.1 mmol), iodobenzene (0.57 g, 2.8 mmol), copper(I) iodide (20 mg, 0.10 mmol), trans-1,2-bis(methylamino)cyclohexane (0.06 g, 0.42 mmol), and potassium phosphate (0.96 g, 4.5 mmol). To the reaction vessel was added toluene (10 mL) and the mixture was purged with nitrogen for 5 min. The vessel was sealed and heated at 110 °C for 16 h. The reaction was cooled to rt and filtered through a celite pad. The residual solid was rinsed with EtOAc several times. The filtrate was concentrated in vacuo and the residue was purified on silica gel to give ethyl 1-phenyl-1H-pyrazole-3-carboxylate (320 mg, 69%) as colorless oil. LCMS (FA): m/z = 217.1 (M+H).

Step 2: (4-Chloropyrimidin-5-yl)(1-phenyl-1H-pyrazol-3-yl)methanone

[00376] A round bottomed flask was charged with 4-chloro-5-iodopyrimidine (360 mg, 1.5 mmol) and the reaction vessel was purged with argon. The content was dissolved in THF (12 mL) and the solution was cooled to -78 °C. To the solution was added dropwise n-butyllithium (2.50 M solution in

hexane; 1.2 mL, 3.0 mmol), and the mixture was stirred for 30 min at -78 °C. To this mixture was added dropwise a solution of ethyl 1-phenyl-1H-pyrazole-3-carboxylate (300 mg, 1.4 mmol) in THF (6 mL), and the resulting mixture was stirred for 30 min. The reaction was quenched by addition of saturated NH₄Cl (50 mL) and extracted with EtOAc (50 mLx4). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give (4-chloropyrimidin-5-yl)(1-phenyl-1H-pyrazol-3-yl)methanone (210 mg, 54%) as a colorless solid. LCMS (FA): *m/z* = 285.1 (M+H).

Step 3: [4-((1R,3R,4S)-3-(Hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino)pyrimidin-5-yl](1-phenyl-1H-pyrazol-3-yl)methanone

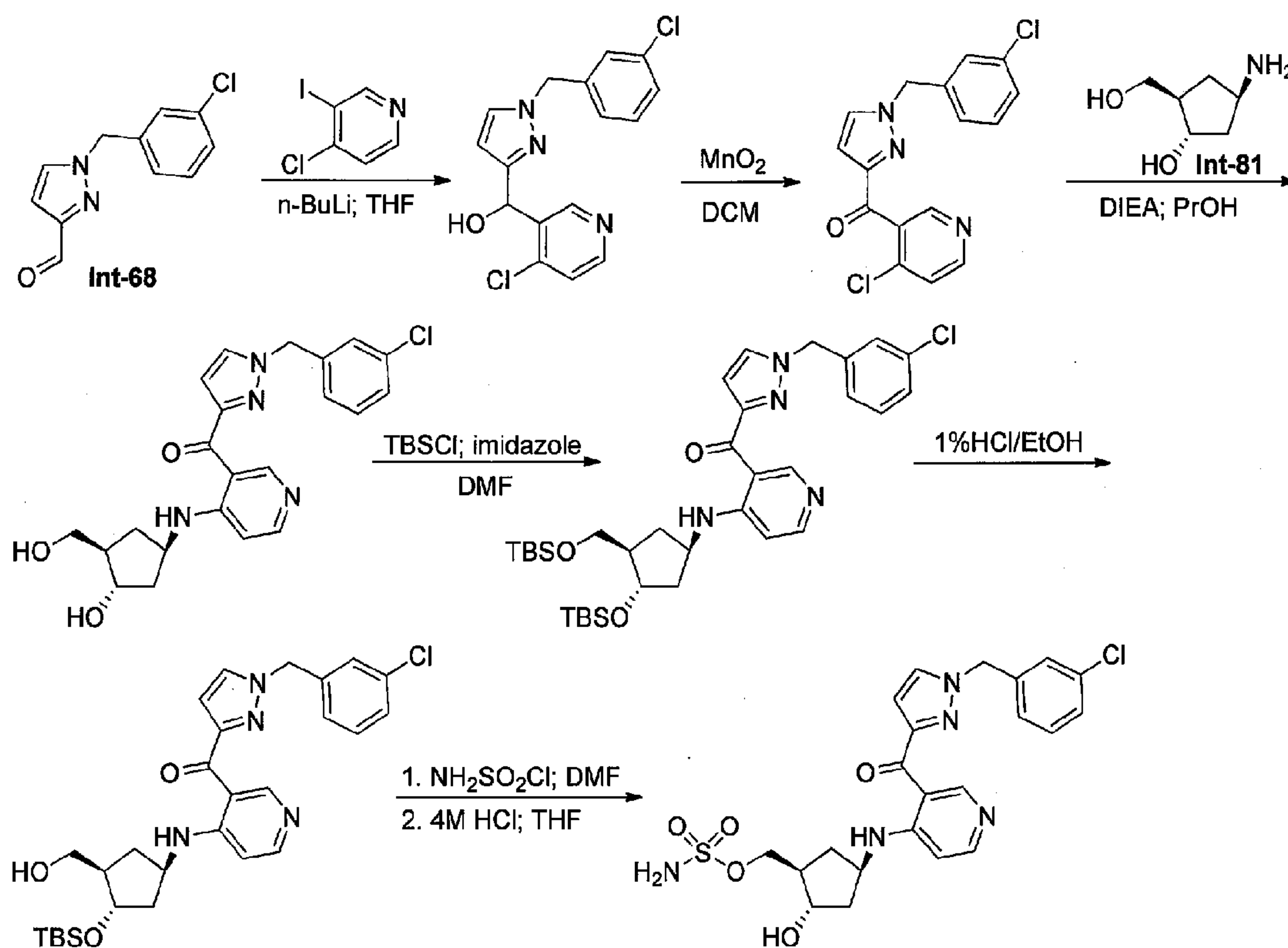
[00377] A reaction vessel was charged with {(1R,2S,4R)-4-amino-2-[(triisopropylsilyl)oxy]cyclopentyl}methanol•CF₃CO₂H (293 mg, 0.73 mmol) and K₂CO₃ (277 mg, 2.00 mmol). To the mixture was added a solution of (4-chloropyrimidin-5-yl)(1-phenyl-1H-pyrazol-3-yl)methanone (190 mg, 0.67 mmol) in DMF (6 mL), and the resulting mixture was stirred for 2 h at rt. The reaction was concentrated in vacuo. To the residue was added water (40 mL) and the mixture was extracted with EtOAc (50 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give [4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino)pyrimidin-5-yl](1-phenyl-1H-pyrazol-3-yl)methanone (311 mg, 83%) as a yellow sticky oil. LCMS (FA): *m/z* = 536.4 (M+H).

Step 4: [(1R,2S,4R)-2-Hydroxy-4-({5-[(1-phenyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate I-205

[00378] To a solution of [4-((1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino)pyrimidin-5-yl](1-phenyl-1H-pyrazol-3-yl)methanone (300 mg, 0.56 mmol) in DMF (2.0 mL) was added chlorosulfonamide (129 mg, 1.12 mmol) at rt, and the mixture was stirred for 30 min. LC/MS showed reaction completed. The reaction was quenched by addition of saturated NaHCO₃ (50 mL) and extracted with EtOAc (60 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. The residue was purified on silica gel to give the sulfamate intermediate [(267 mg, 78%); LCMS (FA): *m/z* = 615.2 (M+H).] which was dissolved in THF (2 mL). To this solution was added HCl (4.0 M solution in water; 2.0 mL, 8.0 mmol) at rt and the mixture was stirred for 5 h at rt. The reaction was quenched by addition of saturated NaHCO₃ and solid NaCl. The mixture was extracted with a 9:1 EtOAc:MeOH solution (60 mLx3). The combined organic layers were dried over Na₂SO₄, filtered, and concentrated in vacuo. To the residue was added a small amount of DCM and the resulting suspension was filtered through a glass frit funnel. The residual solid was rinsed with DCM twice and dried under high vacuum overnight to give [(1R,2S,4R)-2-hydroxy-4-({5-[(1-phenyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate (168

mg, 88%) as a colorless solid. ^1H NMR (DMSO) δ 9.61 (s, 1H), 9.05 (d, $J = 7.3$ Hz, 1H), 8.69 (m, 2H), 7.98 – 7.89 (m, 2H), 7.63 – 7.54 (m, 2H), 7.47 – 7.39 (m, 3H), 7.14 (s, 1H), 4.91 (d, $J = 4.5$ Hz, 1H), 4.81 – 4.69 (m, 1H), 4.12 (dd, $J = 9.5, 6.0$ Hz, 1H), 4.03 – 3.95 (m, 2H), 2.44 – 2.34 (m, 1H), 2.21 – 2.10 (m, 1H), 2.08 – 1.99 (m, 1H), 1.86 – 1.76 (m, 1H), 1.32 (dd, $J = 21.8, 9.3$ Hz, 1H); LCMS (FA): $m/z = 459.2$ (M+H).

Example 69: {(1R,2S,4R)-4-[(3-{[1-(3-Chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-52



Step 1: [1-(3-Chlorobenzyl)-1H-pyrazol-3-yl](4-chloropyridin-3-yl)methanol

[00379] Into a flame dried RBF with stirbar was added 4-chloro-5-iodopyrimidine (0.72 g, 3.0 mmol) dissolved in THF (15 mL). The flask was purged with argon and cooled to -78°C . To this solution was added dropwise n-butyllithium (2.5 M in hexane; 2.39 mL, 5.78 mmol) at -78°C and the mixture was stirred for 30 min. To this mixture was added 1-(3-chlorobenzyl)-1H-pyrazole-3-carbaldehyde (0.60 g, 2.7 mmol) dissolved in THF (6 mL) dropwise. The reaction was stirred at -78°C for 2 h then allowed to warm slowly to rt and stir an additional 12 h. The reaction was quenched with a saturated solution of NH_4Cl and then extracted with EtOAc (3x). The combined organic layers were then washed with water

and brine, dried over Na₂SO₄, filtered and concentrated. The crude product was purified on silica gel to give [1-(3-chlorobenzyl)-1H-pyrazol-3-yl](4-chloropyridin-3-yl)methanol (0.44 g, 46%); LCMS (FA): m/z = 334.4 (M+H).

Step 2: [1-(3-Chlorobenzyl)-1H-pyrazol-3-yl](4-chloropyridin-3-yl)methanone

[00380] To a solution of [1-(3-chlorobenzyl)-1H-pyrazol-3-yl](4-chloropyridin-3-yl)methanol (0.42 g, 1.3 mmol) in DCM (12 mL) was added manganese(IV) oxide (1.1 g, 12.6 mmol). The suspension was stirred for 19 h at rt. The reaction was then filtered through a celite pad and the residual solid was washed with DCM several times. The filtrate was then concentrated in vacuo and the residue was purified on silica gel to afford [1-(3-chlorobenzyl)-1H-pyrazol-3-yl](4-chloropyridin-3-yl)methanone (0.39 g, 91%). LCMS (FA): m/z = 332.4 (M+H).

Step 3: [1-(3-Chlorobenzyl)-1H-pyrazol-3-yl](4-[(1R,3S,4R)-3-hydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyridin-3-yl)methanone

[00381] [1-(3-Chlorobenzyl)-1H-pyrazol-3-yl](4-chloropyridin-3-yl)methanone (0.38 g, 1.1 mmol) and (1S,2R,4R)-4-amino-2-(hydroxymethyl)cyclopentanol (0.18 g, 1.4 mmol) were weighed into a 20 mL reaction vessel. To this mixture was added 1-propanol (5 mL) and DIEA (0.40 mL, 2.3 mmol). The resulting mixture was sealed and the vessel heated at 180 °C for 2 h in a microwave reactor. It was then cooled to rt and quenched with water. The reaction was then extracted with EtOAc (3x). The combined organic layers were washed with brine, dried over Na₂SO₄, filtered, and concentrated in vacuo. The crude product was purified on silica gel to afford [1-(3-chlorobenzyl)-1H-pyrazol-3-yl](4-[(1R,3S,4R)-3-hydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyridin-3-yl)methanone (0.18 g, 39%). LCMS (FA): m/z = 427.5 (M+H).

Step 4: (4-[(1R,3S,4R)-3-[(*tert*-Butyl(dimethyl)silyl]oxy}-4-[(*tert*-butyl(dimethyl)silyl]oxy)methyl]cyclopentyl]amino}pyridin-3-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone

[00382] To a solution of [1-(3-chlorobenzyl)-1H-pyrazol-3-yl](4-[(1R,3S,4R)-3-hydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyridin-3-yl)methanone (0.18 g, 0.43 mmol) in DMF (7 mL) was added imidazole (0.12 g, 1.7 mmol) followed by *tert*-butyldimethylsilyl chloride (0.16 g, 1.1 mmol) at rt, and the mixture was stirred for 2 days. The reaction was then quenched by addition of water and extracted with EtOAc (3x). The combined organic layers were washed with brine, dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel column to give (4-[(1R,3S,4R)-3-[(*tert*-butyl(dimethyl)silyl]oxy}-4-[(*tert*-butyl(dimethyl)silyl]oxy)methyl]cyclopentyl]amino}pyridin-3-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone (0.23 g, 81%). LCMS (FA): m/z = 655.7 (M+H).

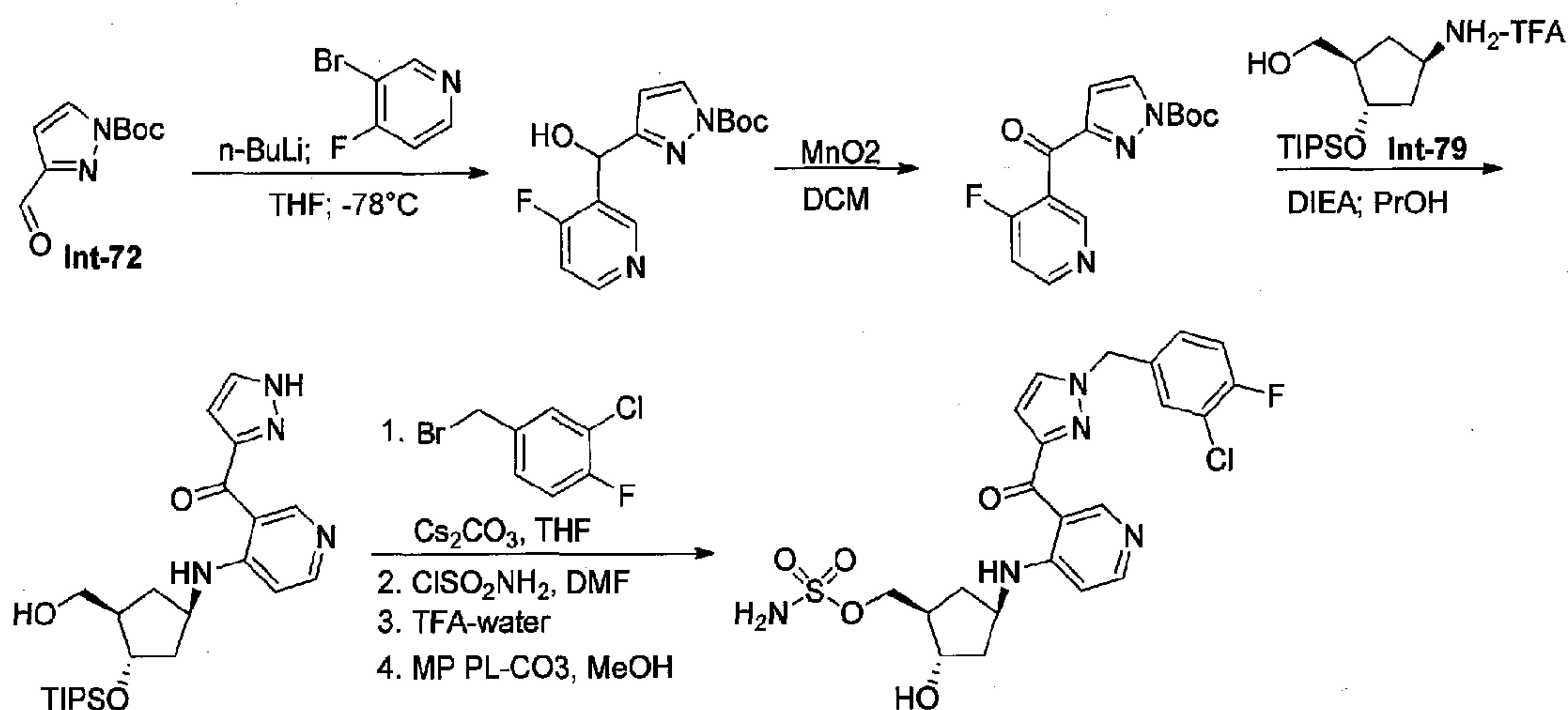
Step 5: (4-[(1R,3S,4R)-3-[(*tert*-Butyl(dimethyl)silyl]oxy}-4-(hydroxymethyl)cyclopentyl]amino}pyridin-3-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone

[00383] To a solution of (4-{{(1R,3S,4R)-3-{{*tert*-butyl(dimethyl)silyl}oxy}-4-{{*tert*-butyl(dimethyl)silyl}oxy}methyl)cyclopentyl}amino}pyridin-3-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone (0.23 g, 0.35 mmol) in EtOH (16 mL) was added 1% HCl in EtOH (11.5 mL, 1.4 mmol) at rt. The reaction vessel was sealed and placed in a refrigerator (4°C) for 5 h and then allowed to stand at -20°C for 16 h. The reaction was quenched by addition of a saturated aq. solution of NaHCO₃. To the residue was added water which was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to give (4-{{(1R,3S,4R)-3-{{*tert*-butyl(dimethyl)silyl}oxy}-4-(hydroxymethyl)cyclopentyl}amino}pyridin-3-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone (0.072 g, 38%). LCMS (FA): *m/z* = 541.6 (M+H).

Step 6: {(1R,2S,4R)-4-[(3-{{[1-(3-Chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl}amino]-2-hydroxycyclopentyl}methyl sulfamate I-52

[00384] To a solution of (4-{{(1R,3S,4R)-3-{{*tert*-Butyl(dimethyl)silyl}oxy}-4-(hydroxymethyl)cyclopentyl}amino}pyridin-3-yl)[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]methanone (0.072 g, 0.13 mmol) in DMF (2 mL) was added chlorosulfonamide (31 mg, 0.27 mmol) at rt, and the mixture was stirred for 1 h. The reaction was quenched by addition of a saturated solution of NaHCO₃ and diluted with water. The mixture was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The crude sulfamate intermediate was dissolved in THF (3 mL) and HCl (3.0 M in water; 1.5 mL, 4.5 mmol) was added to the solution. The reaction was stirred for 2 h at rt. The reaction was quenched by the addition of a saturated solution of NaHCO₃ and extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified by prep HPLC to afford {(1R,2S,4R)-4-[(3-{{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl}amino]-2-hydroxycyclopentyl}methyl sulfamate (0.018 g, 27%). ¹H NMR (DMSO) δ 9.31 (s, 1H), 8.89 (d, *J* = 6.9 Hz, 1H), 8.20 (d, *J* = 6.1 Hz, 1H), 8.16 (s, 1H), 8.06 (d, *J* = 2.3 Hz, 1H), 7.45 – 7.34 (m, 4H), 7.26 – 7.19 (m, 1H), 6.87 (d, *J* = 2.3 Hz, 1H), 6.78 (d, *J* = 6.2 Hz, 1H), 5.51 (s, 2H), 4.97 (s, 1H), 4.20 – 4.08 (m, 2H), 4.02 – 3.93 (m, 2H), 2.49 – 2.41 (m, 1H), 2.21 – 2.10 (m, 1H), 2.11 – 2.01 (m, 1H), 1.81 – 1.70 (m, 1H), 1.31 – 1.17 (m, 1H); LCMS (FA): *m/z* = 506.5 (M+H).

Example 70: {(1R,2S,4R)-4-[(3-{{[1-(3-Chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl}amino]-2-hydroxycyclopentyl}methyl sulfamate I-97



Step 1: *tert*-Butyl 3-[(4-fluoropyridin-3-yl)(hydroxy)methyl]-1H-pyrazole-1-carboxylate

[00385] Into a flame dried RBF with stirbar was added 3-bromo-4-fluoropyridine (4.5 g, 25 mmol) dissolved in THF (200 mL). The flask was purged with argon and cooled to -95 °C. To this solution was added dropwise *n*-butyllithium (2.5 M in hexane; 23 mL, 58 mmol) at -95 °C and the mixture was stirred for 15 min. To this mixture was added *tert*-butyl 3-formyl-1H-pyrazole-1-carboxylate (4.8 g, 25 mmol) dissolved in THF (35 mL) dropwise at -90 °C. The reaction was stirred at -90 °C for 30 min then allowed to warm to -60 °C. The reaction was then quenched with a solution of acetic acid (4.3 mL) in THF (20 mL) and allowed to warm to rt. The mixture was concentrated and the crude product was purified on silica gel to give *tert*-butyl 3-[(4-fluoropyridin-3-yl)(hydroxy)methyl]-1H-pyrazole-1-carboxylate (2.1 g, 29%). LCMS (AA): m/z = 294 (M+H).

Step 2: *tert*-Butyl 3-[(4-fluoropyridin-3-yl)carbonyl]-1H-pyrazole-1-carboxylate

[00386] To a solution of *tert*-butyl 3-[(4-fluoropyridin-3-yl)(hydroxy)methyl]-1H-pyrazole-1-carboxylate (0.48 g, 1.6 mmol) in DCM (20 mL) was added manganese(IV) oxide (2.0 g, 23 mmol). The suspension was stirred for 3 h at rt. The reaction was then filtered through a celite pad and the residual solid was washed with DCM several times. The filtrate was then concentrated in vacuo and the residue was purified on silica gel to afford *tert*-butyl 3-[(4-fluoropyridin-3-yl)carbonyl]-1H-pyrazole-1-carboxylate (0.36 g, 76%). LCMS (AA): m/z = 292 (M+H).

Step3: [4-((1R,3R,4S)-3-(Hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl)amino)pyridin-3-yl](1H-pyrazol-3-yl)methanone

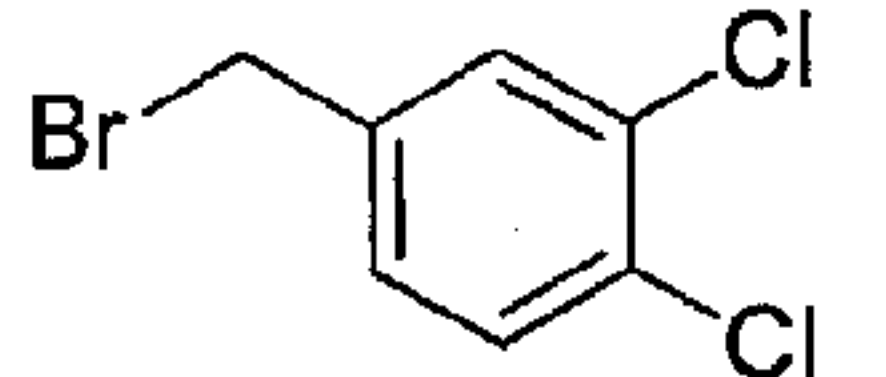
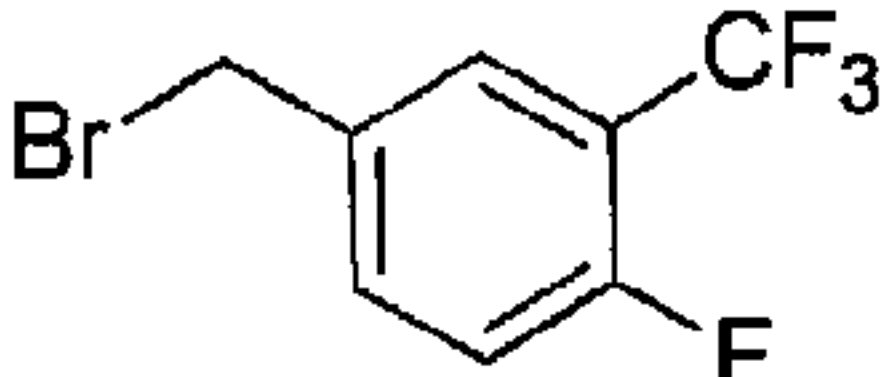
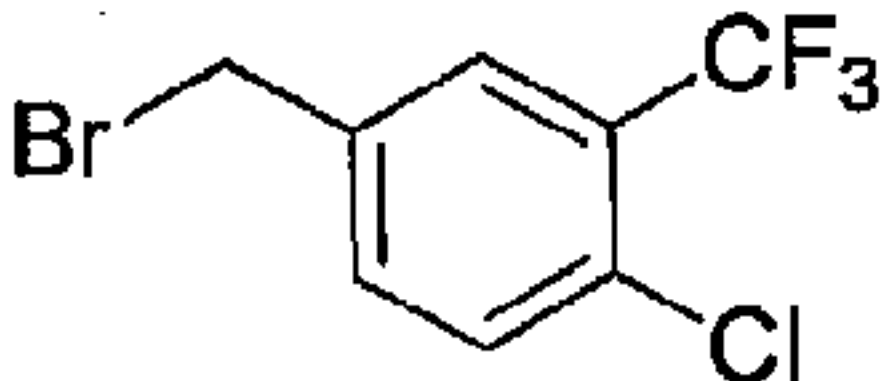
[00387] *tert*-Butyl {(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}carbamate (0.48 g, 1.2 mmol) was dissolved in TFA (10.0 mL) and then the mixture was immediately concentrated. A solution of DIEA (1.7 mL, 9.9 mmol) in 1-propanol (10.0 mL) was then added and the solution was transferred to a microwave reaction vessel. *tert*-Butyl 3-[(4-fluoropyridin-3-yl)carbonyl]-1H-pyrazole-1-carboxylate (0.36 g, 1.2 mmol) was added to the reaction mixture and it was heated at 120 °C for 90 min

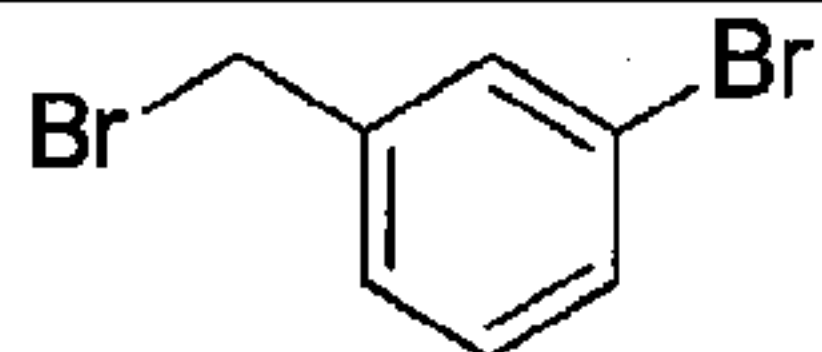
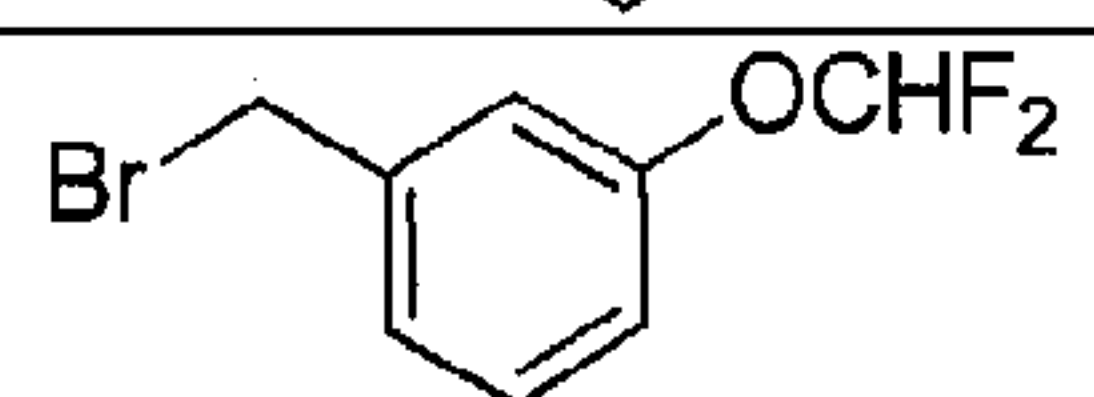
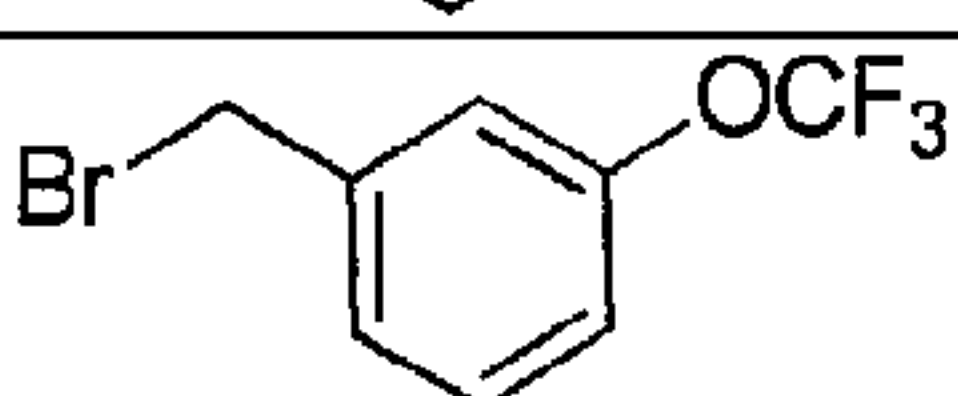
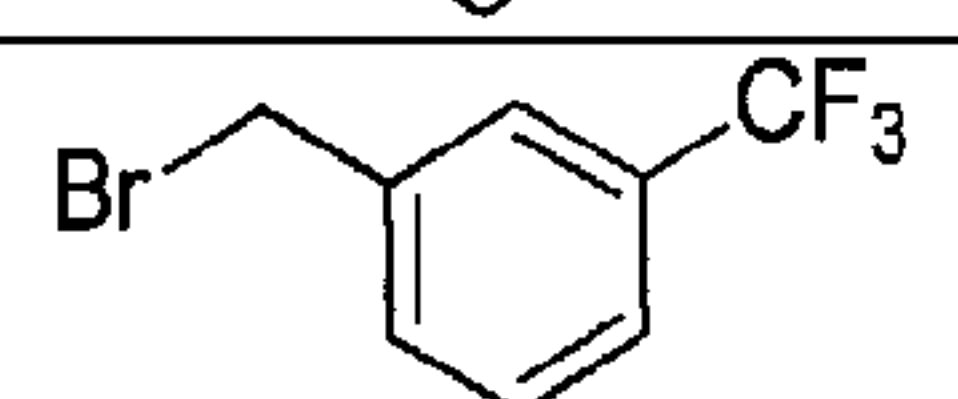
in a microwave reactor. The reaction mixture was concentrated and the crude product was purified on silica gel to give [4-({(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyridin-3-yl](1H-pyrazol-3-yl)methanone (0.17 g, 31%). LCMS (AA): m/z = 459 (M+H).

Step 4: {(1R,2S,4R)-4-[(3-{[1-(3-Chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate I-97

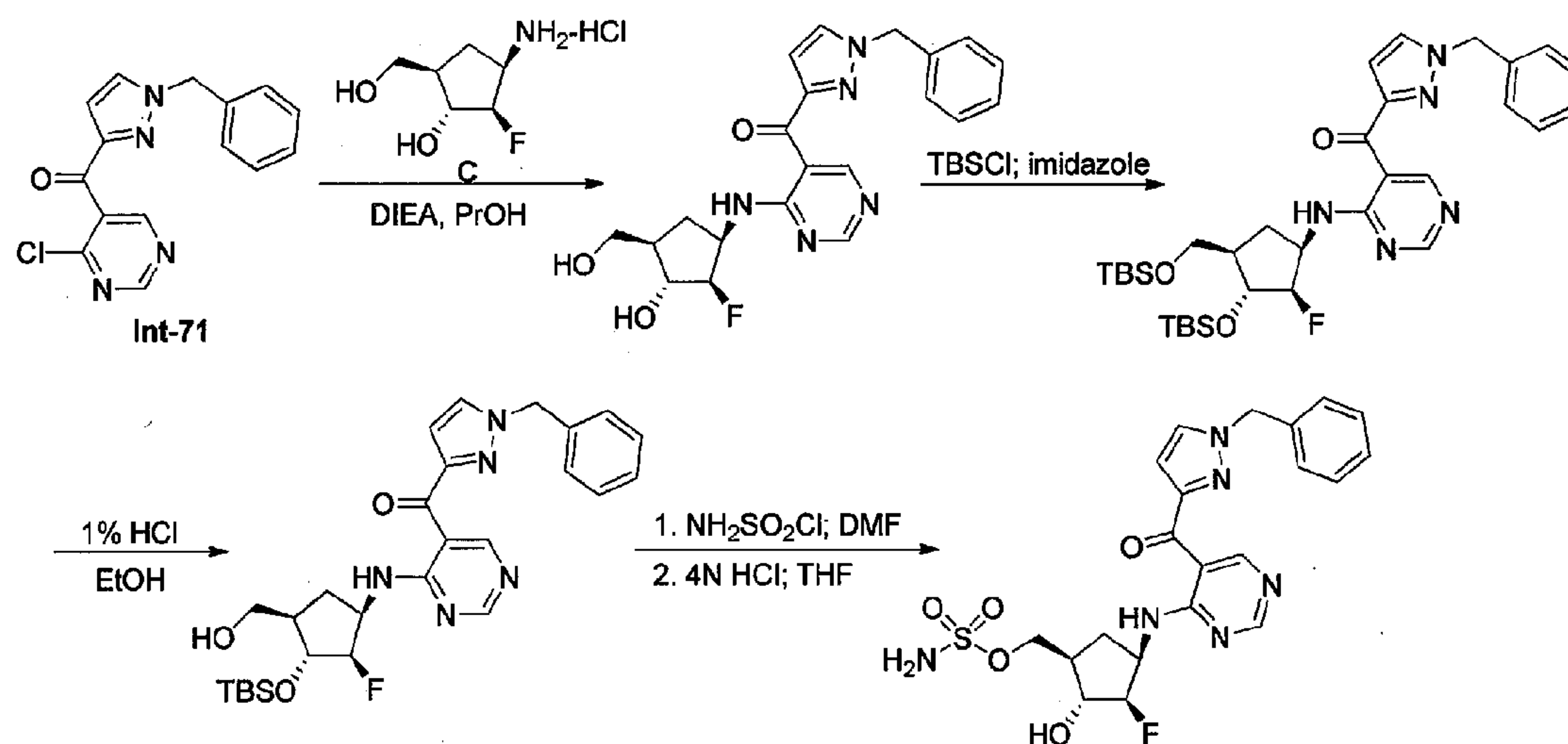
[00388] To a 3-dram vial was added 3-chloro-4-fluorobenzylbromide (0.024 g, 0.11 mmol) and cesium carbonate (0.17 g, 0.52 mmol), followed by [4-({(1R,3R,4S)-3-(hydroxymethyl)-4-[(triisopropylsilyl)oxy]cyclopentyl}amino)pyridin-3-yl](1H-pyrazol-3-yl)methanone (0.04 g, 0.087 mmol) in THF (1.0 mL). The solution was shaken at rt for 1 h. The solid carbonate was filtered and rinsed with THF (1 mL). To the combined THF clear solution (~2 mL) in another 3-dram vial was added DMF (0.50 mL) followed by chlorosulfonamide (0.040 g, 0.35 mmol). The solution was shaken at rt for 1 h, then saturated NaHCO₃ solution (0.5 mL), water (1 mL), and EtOAc (3 mL) were added. After the layers were separated, the aqueous layer was extracted with EtOAc (3 mL). The combined organic phases were concentrated to a solid residue. To the residue in a 20-mL vial was added TFA (2.0 mL) and water (0.2 mL). The mixture was shaken at rt for 2 h and then the solvent was evaporated. To the residue was added methanol (2.0 mL) and MP PL-CO₃ resin (0.5 g). After shaking at rt for 1 h, the solid was filtered and the resin was rinsed with MeOH (5 mL). The MeOH solution was concentrated to a solid residue which was purified by prep HPLC to provide {(1R,2S,4R)-4-[(3-{[1-(3-chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4yl)amino]-2-hydroxycyclopentyl}methyl sulfamate (7 mg, 15%). LCMS (FA): m/z = 524.4 (M+H).

[00389] The compounds listed in the table below were prepared in an analogous fashion to that described above starting from the listed starting materials used in step 4:

Starting material	Compound No.	LCMS Data
	I-78	LCMS (FA): m/z = 540.4 (M+H).
	I-263	LCMS (FA): m/z = 558.4 (M+H).
	I-174	LCMS (FA): m/z = 574.4 (M+H).

	I-223	LCMS (FA): $m/z = 550.4$ (M+H).
	I-246	LCMS (FA): $m/z = 538.4$ (M+H).
	I-18	LCMS (FA): $m/z = 556.9$ (M+H).
	I-262	LCMS (FA): $m/z = 540$ (M+H).

Example 71: [(1R,2R,3R,4R)-4-({5-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl)methyl sulfamate I-317



Step 1: (1-Benzyl-1H-pyrazol-3-yl)(4-{{[(1R,2R,3R,4R)-2-fluoro-3-hydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone

[00390] (1-Benzyl-1H-pyrazol-3-yl)(4-chloropyrimidin-5-yl)methanone (0.30 g, 1.0 mmol) and (1R,2R,3R,5R)-3-amino-2-fluoro-5-(hydroxymethyl)cyclopentanol hydrochloride (C) (0.21 g, 1.11 mmol) (for synthesis see: Biggadike, K. et al. *J. Chem. Soc. Perkin Trans.* **1988**, 3, 549-554; Borthwick, A.D. et al. *J. Med. Chem.* **1990**, 33, 179-186.) were weighed into a 20 mL reaction vessel. To this mixture was added 1-propanol (14 mL) and DIEA (0.52 mL, 3.0 mmol). The resulting mixture was sealed and the vessel allowed to stir while heating at 50 °C for 2 h. The reaction was then cooled to rt and the reaction was concentrated. The crude product was purified on silica gel to afford (1-benzyl-1H-pyrazol-3-yl)(4-{{[(1R,2R,3R,4R)-2-fluoro-3-hydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.38 g, 94%). LCMS (FA): $m/z = 412$ (M+H).

Step 2: (1-Benzyl-1H-pyrazol-3-yl)(4-([(1R,2R,3R,4R)-3-([*tert*-butyl(dimethyl)silyl]oxy)-4-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-2-fluorocyclopentyl]amino}pyrimidin-5-yl)methanone

[00391] To a solution of (1-benzyl-1H-pyrazol-3-yl)(4-([(1R,2R,3R,4R)-2-fluoro-3-hydroxy-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.37 g, 0.90 mmol) in DMF (14.8 mL) was added imidazole (0.24 g, 3.6 mmol) followed by *tert*-butyldimethylsilyl chloride (0.34 g, 2.2 mmol) at rt, and the mixture was stirred for 3 days. The reaction was then quenched by addition of water and extracted with EtOAc (3x). The combined organic layers were washed with brine, dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel column to give (1-benzyl-1H-pyrazol-3-yl)(4-([(1R,2R,3R,4R)-3-([*tert*-butyl(dimethyl)silyl]oxy)-4-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-2-fluorocyclopentyl]amino}pyrimidin-5-yl)methanone (0.53 g, 92%).

Step 3: (1-Benzyl-1H-pyrazol-3-yl)(4-([(1R,2R,3R,4R)-3-([*tert*-butyl(dimethyl)silyl]oxy)-2-fluoro-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone

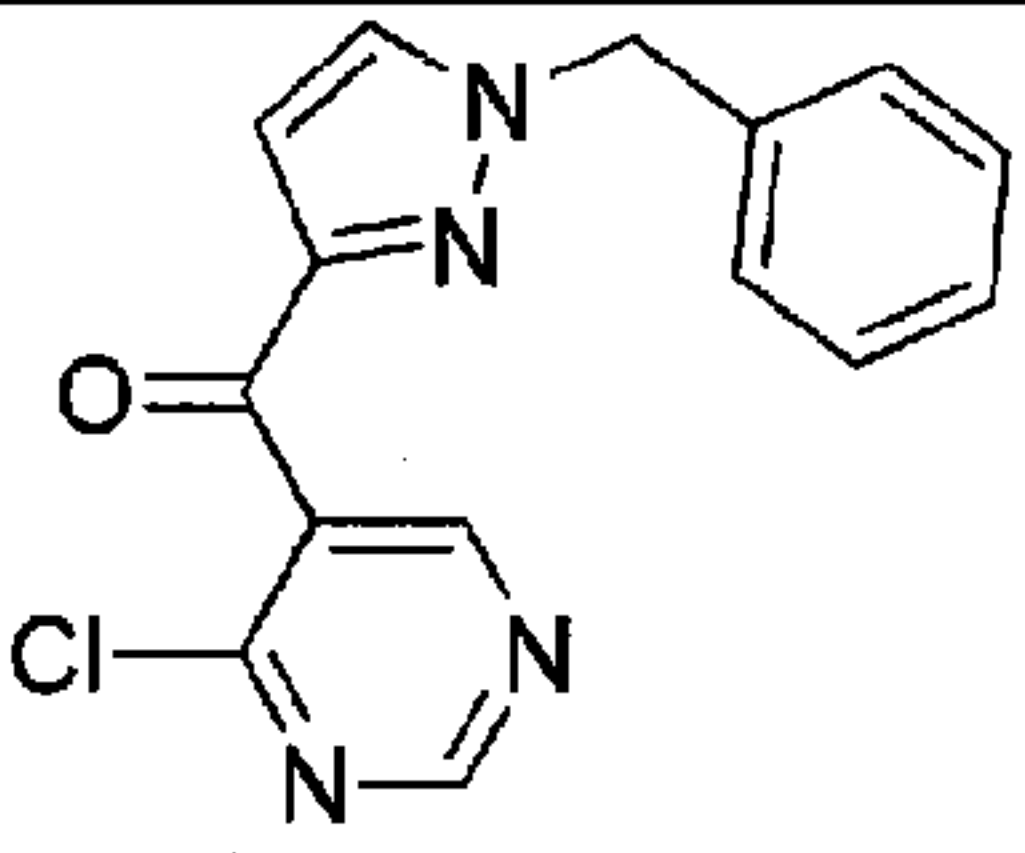
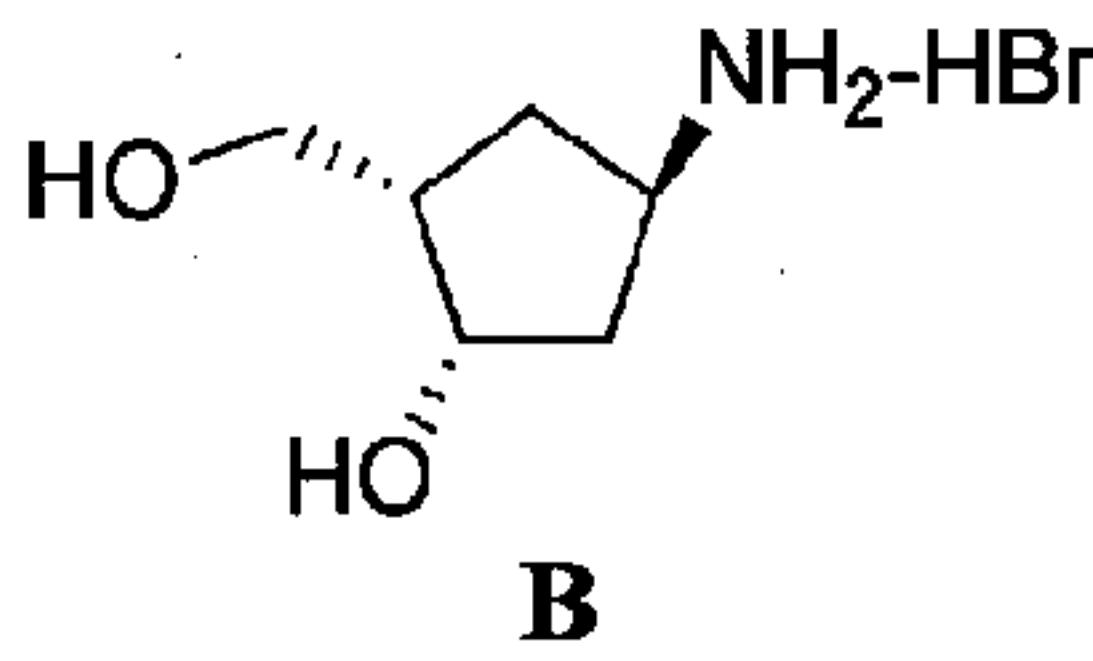
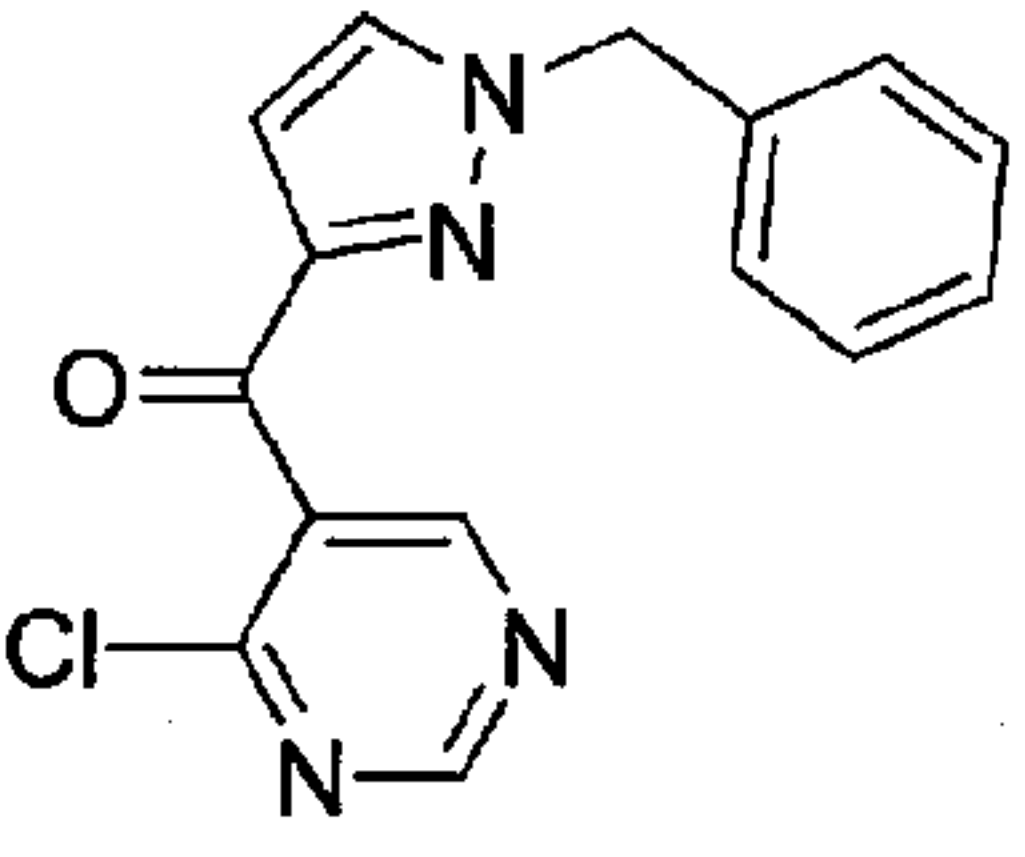
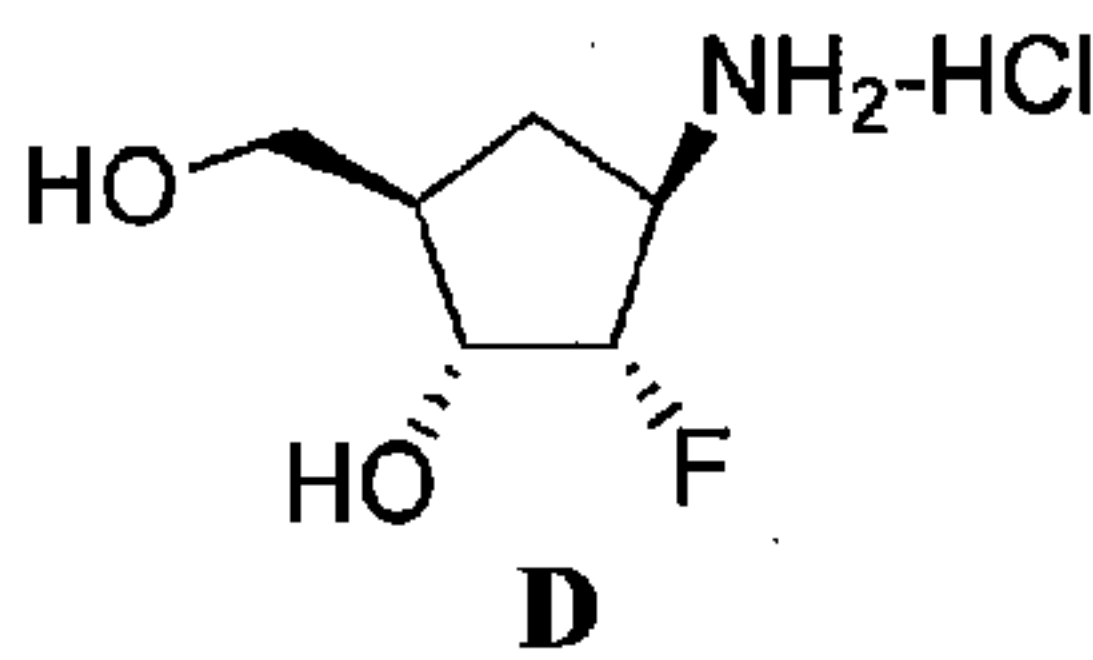
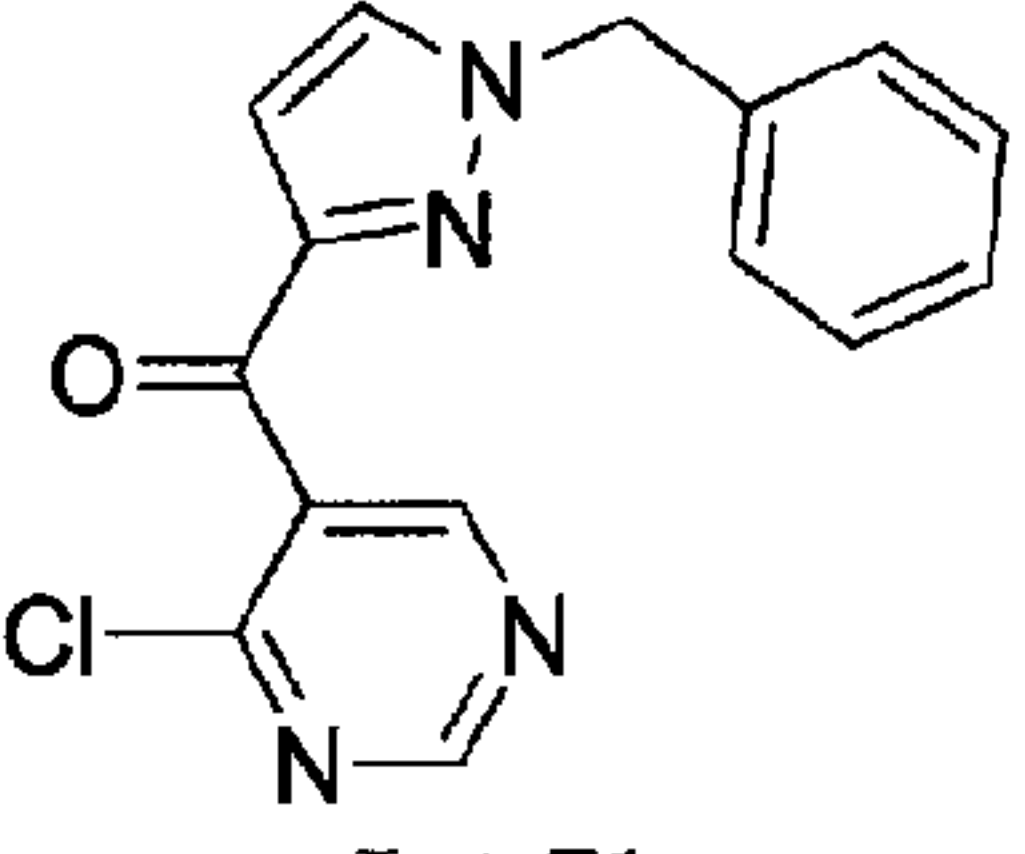
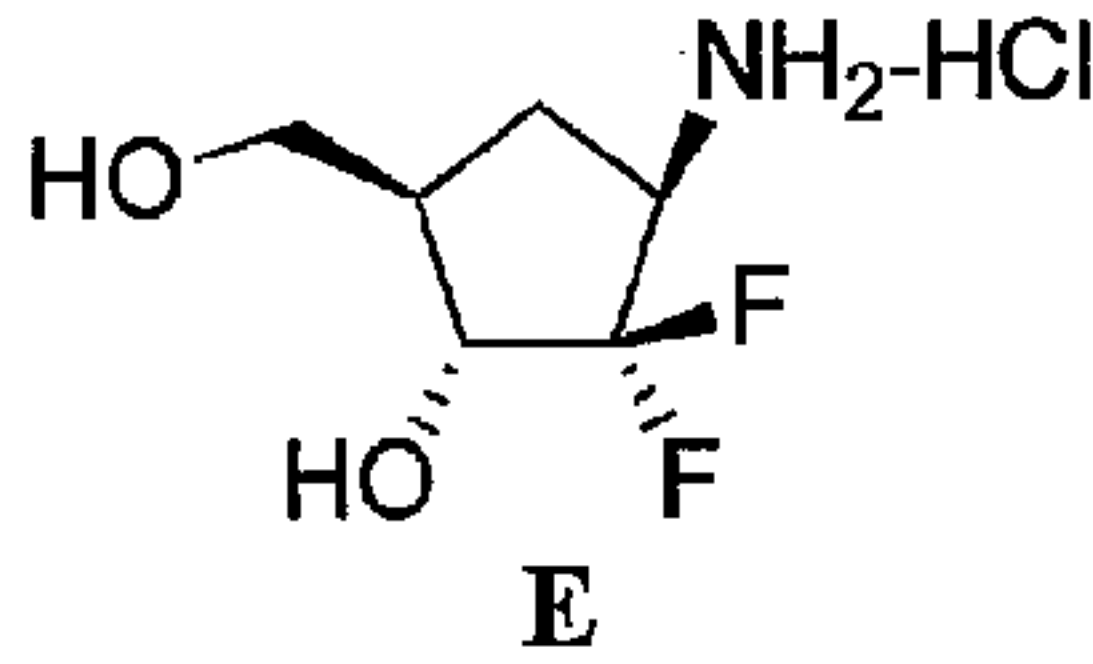
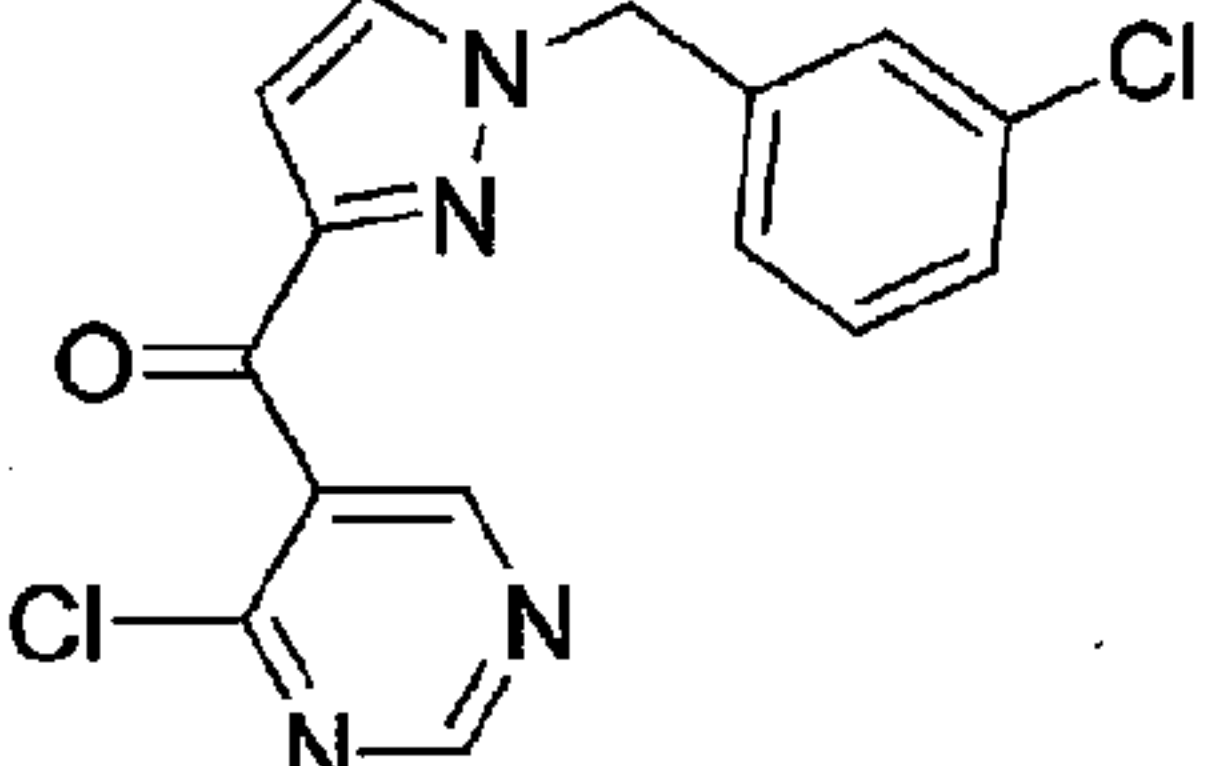
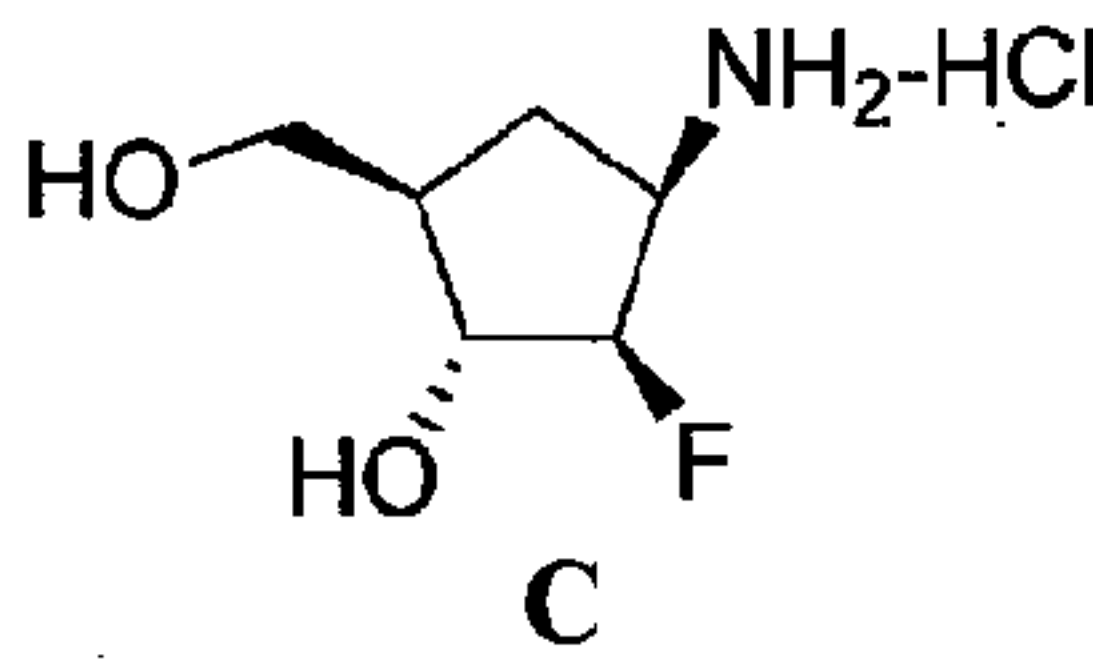
[00392] To a solution of [A] (1-benzyl-1H-pyrazol-3-yl)(4-([(1R,2R,3R,4R)-3-([*tert*-butyl(dimethyl)silyl]oxy)-4-([*tert*-butyl(dimethyl)silyl]oxy)methyl)-2-fluorocyclopentyl]amino}pyrimidin-5-yl)methanone (0.50 g, 0.78 mmol) in EtOH (51 mL) was added 1% HCl in EtOH (25.9 mL, 3.12 mmol) at rt. The reaction vessel was sealed and placed in a refrigerator (4°C) for 22 h. The reaction was quenched by addition of a saturated aq. solution of NaHCO₃. To the residue was added water which was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified on silica gel to give (1-benzyl-1H-pyrazol-3-yl)(4-([(1R,2R,3R,4R)-3-([*tert*-butyl(dimethyl)silyl]oxy)-2-fluoro-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.29 g, 71%). LCMS (FA): *m/z* = 412 (M+H).

Step 4: [(1R,2R,3R,4R)-4-({5-[(1-Benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate I-317

[00393] To a solution of (1-benzyl-1H-pyrazol-3-yl)(4-([(1R,2R,3R,4R)-3-([*tert*-butyl(dimethyl)silyl]oxy)-2-fluoro-4-(hydroxymethyl)cyclopentyl]amino}pyrimidin-5-yl)methanone (0.28 g, 0.53 mmol) in DMF (4.1 mL) was added chlorosulfonamide (123 mg, 1.1 mmol) at rt, and the mixture was stirred for 1 h. The reaction was quenched by addition of a saturated solution of NaHCO₃ and diluted with water. The mixture was extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The crude sulfamate intermediate was dissolved in THF (11 mL) and HCl (3.0 M in water; 5.50 mL, 16.5 mmol) was added to the solution. The reaction was stirred for 3 h at rt. The reaction was quenched by the addition of a saturated solution of NaHCO₃ (30 mL) and extracted with EtOAc (4x). The combined organic layers were dried over MgSO₄, filtered, and concentrated. The residue was purified by prep HPLC to afford [(1R,2R,3R,4R)-4-({5-[(1-benzyl-1H-

pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate (115 mg, 44%). ^1H NMR (DMSO) δ 9.56 (d, $J = 1.1$ Hz, 1H), 9.23 (d, $J = 7.6$ Hz, 1H), 8.68 (s, 1H), 8.07 (dd, $J = 2.3, 1.2$ Hz, 1H), 7.50 (s, 2H), 7.43 – 7.22 (m, 5H), 6.93 (d, $J = 2.4$ Hz, 1H), 5.57 (s, 1H), 5.51 (s, 2H), 4.93 – 4.70 (m, 2H), 4.12 (dd, $J = 9.8, 6.0$ Hz, 1H), 4.03 (dd, $J = 9.8, 6.9$ Hz, 1H), 3.94 (dd, $J = 21.9, 4.7$ Hz, 1H), 2.41 – 2.28 (m, 1H), 2.25 – 2.12 (m, 1H), 1.47 (dd, $J = 22.4, 11.4$ Hz, 1H); LCMS (FA): $m/z = 491.5$ (M+H).

[00394] The compounds listed in the table below were prepared in an analogous fashion to that described above starting from the listed starting materials: (for synthesis of **C**, **D**, and **E** in this table see Biggadike, K. et al. *J. Chem. Soc. Perkin Trans.* **1988**, 3, 549-554.; Borthwick, A.D. et al. *J. Med. Chem.* **1990**, 33, 179-186 respectively)

Starting material	Starting material	Compound No.	LCMS Data
 Int-71	 B	I-342	LCMS (FA): $m/z = 471$ (M+H).
 Int-71	 D	I-227	LCMS (FA): $m/z = 491$ (M+H).
 Int-71	 E	I-203	LCMS (FA): $m/z = 509.4$ (M+H).
 See Ex. 38; prepared in a similar manner to Int-71	 C	I-242	LCMS (FA): $m/z = 524$ (M+H).

DEMANDES OU BREVETS VOLUMINEUX

**LA PRÉSENTE PARTIE DE CETTE DEMANDE OU CE BREVETS
COMPREND PLUS D'UN TOME.**

CECI EST LE TOME __1__ DE __2__

NOTE: Pour les tomes additionels, veuillez contacter le Bureau Canadien des Brevets.

JUMBO APPLICATIONS / PATENTS

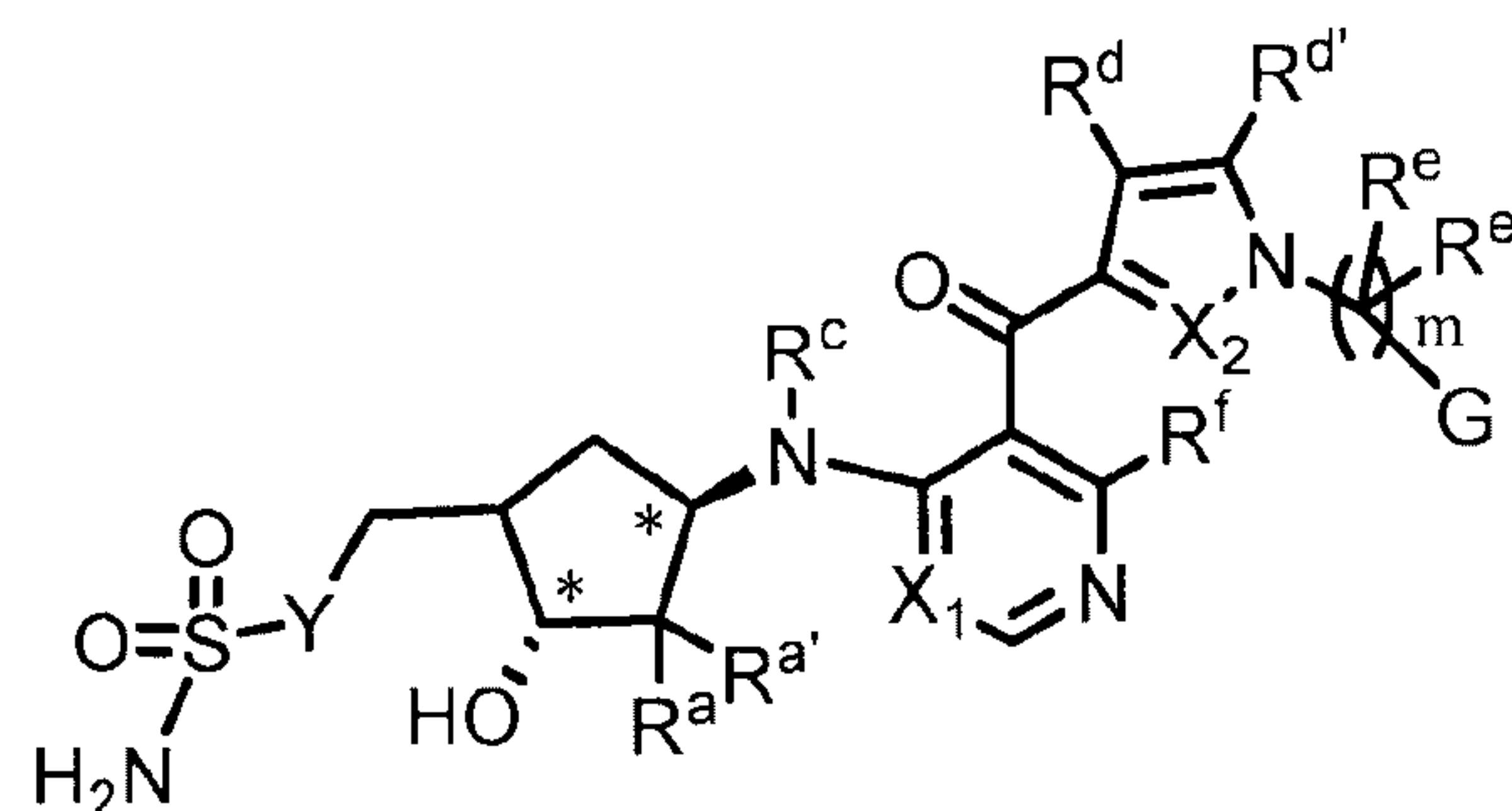
**THIS SECTION OF THE APPLICATION / PATENT CONTAINS MORE
THAN ONE VOLUME.**

THIS IS VOLUME __1__ OF __2__

NOTE: For additional volumes please contact the Canadian Patent Office.

CLAIMS:

1. A compound of formula (I):



(I);

or a pharmaceutically acceptable salt thereof;

wherein:

stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry;

Y is -O-, -CH₂-, or -N(H)-;

R^a is hydrogen, fluoro, -NH₂, or -OH;

R^{a'} is hydrogen, or fluoro; provided that when R^a is -NH₂ or -OH, R^{a'} is hydrogen;

R^c is hydrogen or C₁₋₄ alkyl;

X₁ is C(H), C(F) or N;

X₂ is C(R^d) or N;

each occurrence of R^d is independently hydrogen, halogen, cyano, C₁₋₄ aliphatic, or C₁₋₄ fluoroaliphatic;

R^{d'} is hydrogen, halogen, cyano, C₁₋₄ aliphatic, C₁₋₄ fluoroaliphatic, or -T₂-R³;

T₂ is a C₁.C₂ alkylene chain optionally substituted with 0-3 independent occurrences of R^{3c};

R³ is -CN, -NO₂, -N(R^{3a})₂, -OR^{3a}, -C(O)R^{3b}, -C(O)OR^{3a}, -C(O)N(R^{3a})₂, or -S(O)₂N(R^{3a})₂;

each occurrence of R^{3a} is independently hydrogen or C₁₋₄ alkyl;

R^{3b} is C₁₋₄ alkyl;

each occurrence of R^{3c} is independently C₁₋₄ alkyl;

R^e is hydrogen or C₁₋₄ alkyl;

R^{e'} is hydrogen or C₁₋₄ alkyl; or R^e is taken together with R^{e'} to form a 3-6 membered cycloaliphatic ring;

m is 0-2;

R^f is hydrogen, chloro or C₁₋₄ alkyl;

G is R¹ or -L₁-R¹;

L_1 is , $-C(O)-$, or $-SO_2-$; provided that when L_1 is $-SO_2-$, m is zero;

R^1 is an optionally substituted group selected from C_{1-6} aliphatic, 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^1 is optionally substituted with n occurrences of R^2 ; wherein each occurrence of R^2 is independently $-R^{2a}$, $-T_1-R^{2d}$, $-T_1-R^{2a}$, or $-V_1-T_1-R^{2d}$;

n is 1-5;

each occurrence of R^{2a} is independently halogen, $-CN$, $-NO_2$, $-R^{2c}$, $-N(R^{2b})_2$, $-OR^{2b}$, $-SR^{2c}$, $-S(O)R^{2c}$, $-S(O)_2R^{2c}$, $-C(O)R^{2b}$, $-C(O)OR^{2b}$, $-C(O)N(R^{2b})_2$, $-S(O)_2N(R^{2b})_2$, $-OC(O)N(R^{2b})_2$, $-N(R^{2e})C(O)R^{2b}$, $-N(R^{2e})SO_2R^{2c}$, $-N(R^{2e})C(O)OR^{2b}$, $-N(R^{2e})C(O)N(R^{2b})_2$, $-N(R^{2e})SO_2N(R^{2b})_2$, or $Si(R^{2c})_3$, or an optionally substituted C_1 - C_6 aliphatic or C_1 - C_6 haloaliphatic;

each occurrence of R^{2b} is independently hydrogen or an optionally substituted group selected from C_1 - C_6 aliphatic, C_1 - C_6 haloaliphatic, 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, or two occurrences of R^{2b} , taken together with a nitrogen atom to which they are bound, form an optionally substituted 4- to 7-membered heterocyclyl ring having 0-1 additional heteroatoms selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{2c} is independently an optionally substituted group selected from C_1 - C_6 aliphatic, C_1 - C_6 haloaliphatic, 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{2d} is independently hydrogen or an optionally substituted group selected from 3- to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur;

each occurrence of R^{2e} is independently hydrogen or an optionally substituted C_{1-6} aliphatic group;

each occurrence of V_1 is independently $-N(R^{2e})-$, $-O-$, $-S-$, $-S(O)-$, $-S(O)_2-$, $-C(O)-$, $-C(O)O-$, $-C(O)N(R^{2e})-$, $-S(O)_2N(R^{2e})-$, $-OC(O)N(R^{2e})-$, $-N(R^{2e})C(O)-$, $-N(R^{2e})SO_2-$, $-N(R^{2e})C(O)O-$, $-N(R^{2e})C(O)N(R^{2e})-$, $-N(R^{2e})SO_2N(R^{2e})-$, $-OC(O)-$, or $-C(O)N(R^{2e})O-$; and

T_1 is an optionally substituted C_1-C_6 alkylene chain wherein the alkylene chain optionally is interrupted by $-N(R^4)-$, $-O-$, $-S-$, $-S(O)-$, $-S(O)_2-$, $-C(O)-$, $-C(O)O-$, $-C(O)N(R^4)-$, $-S(O)_2N(R^4)-$, $-OC(O)N(R^4)-$, $-N(R^4)C(O)-$, $-N(R^4)SO_2-$, $-N(R^4)C(O)O-$, $-N(R^4)C(O)N(R^4)-$, $-N(R^4)S(O)_2N(R^4)-$, $-OC(O)-$, or $-C(O)N(R^4)O-$ or wherein one or more atoms of T_1 optionally forms part of an optionally substituted 3- to 7 membered cycloaliphatic or heterocyclyl ring, wherein R^4 is hydrogen or an optionally substituted C_{1-4} aliphatic group.

2. The compound of claim 1, wherein Y is $-O-$.

3. The compound of claim 1, wherein X_1 is N .

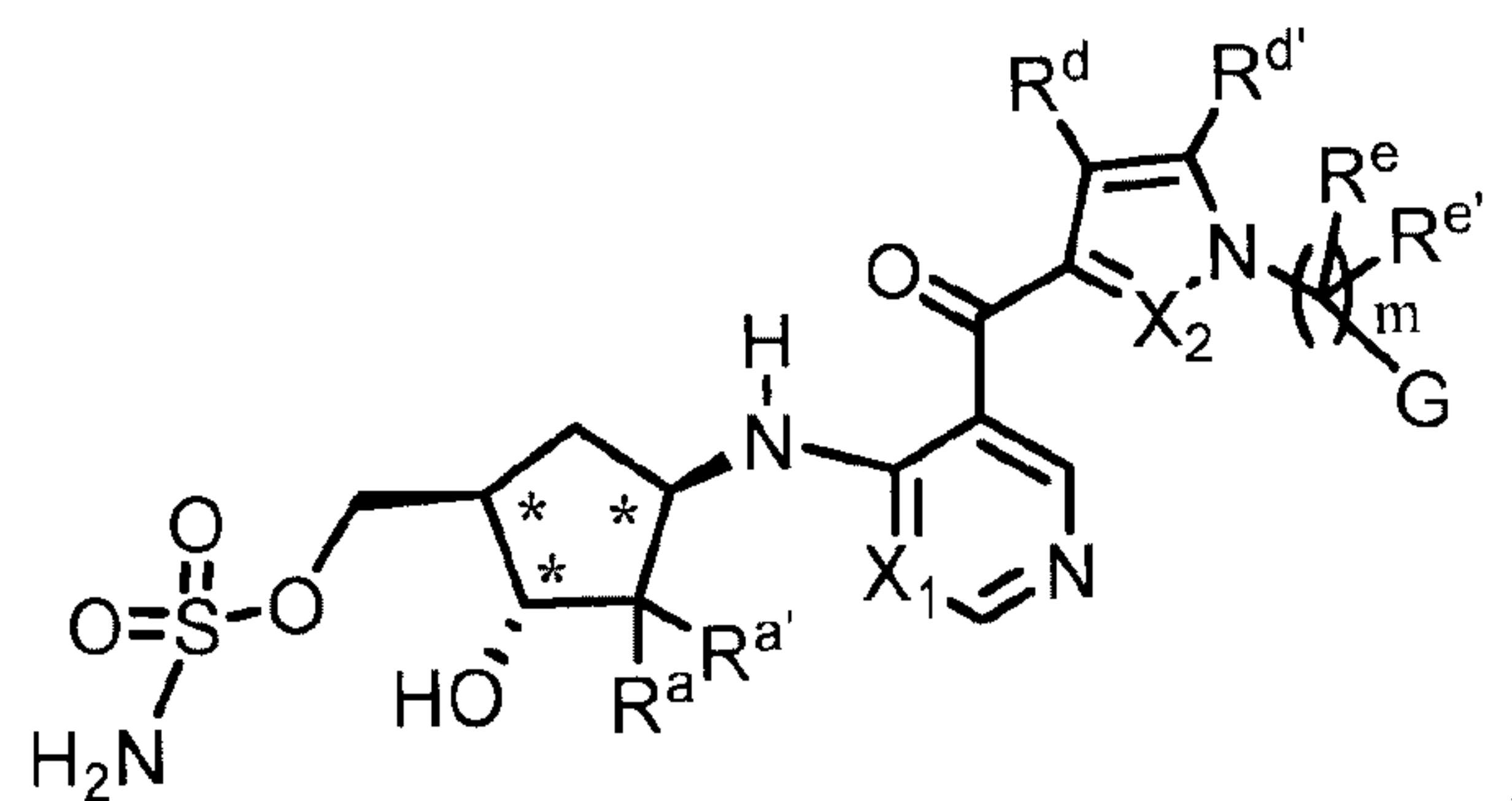
4. The compound of claim 1, wherein:

m is 1 or 2;

R^e is hydrogen, methyl, or ethyl; and

$R^{e'}$ is hydrogen.

5. The compound of any one of claims 1-4, represented by formula (III):



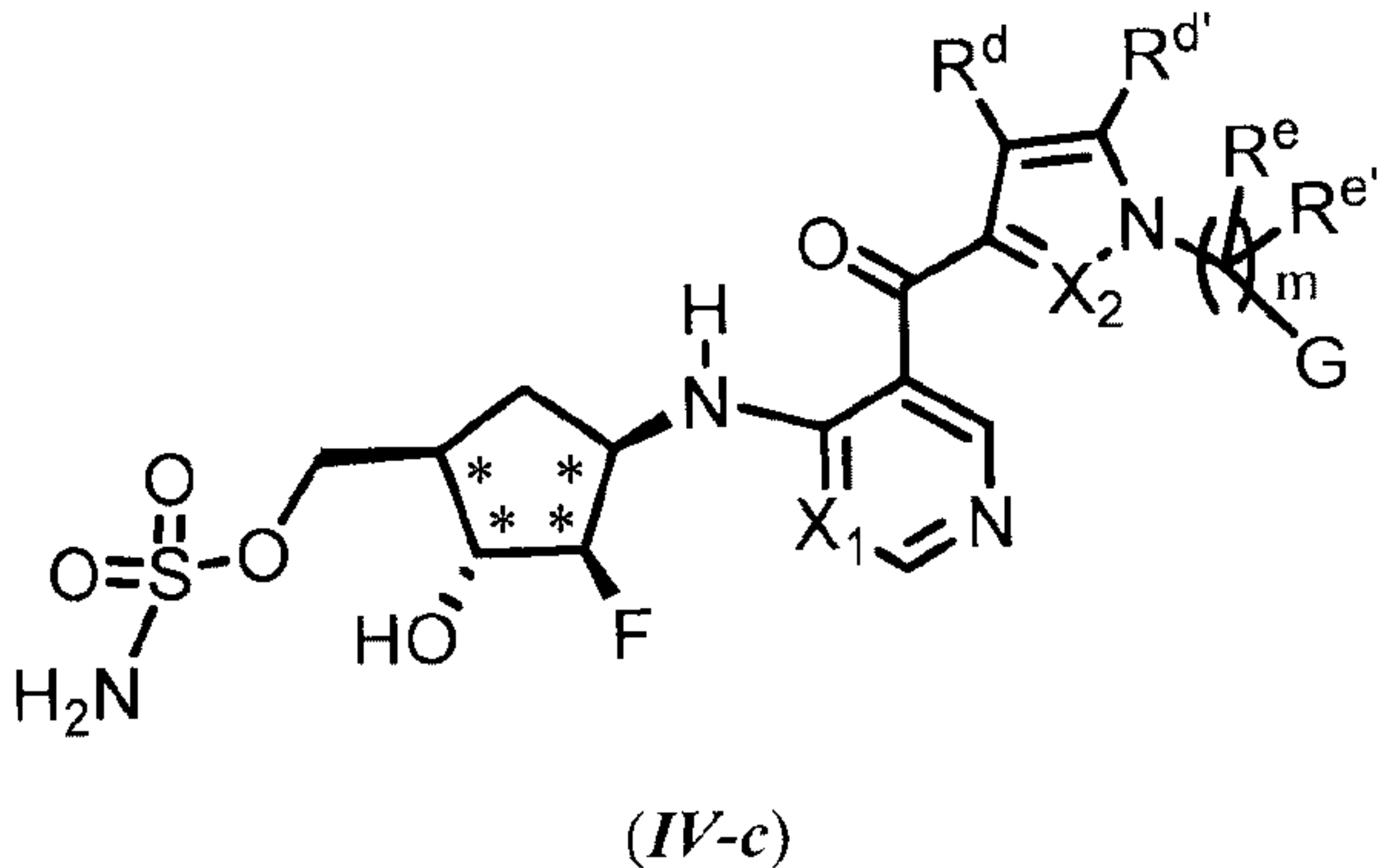
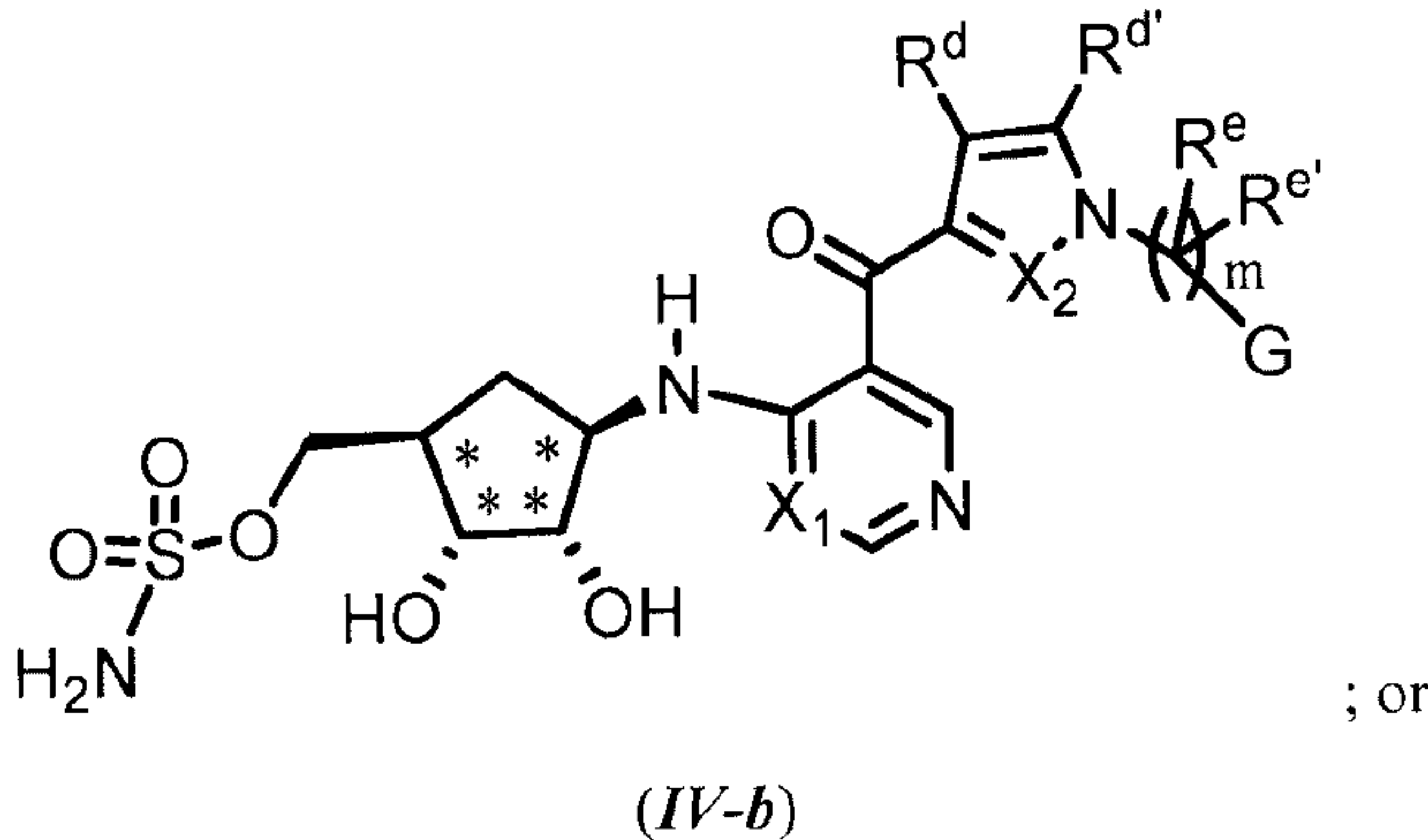
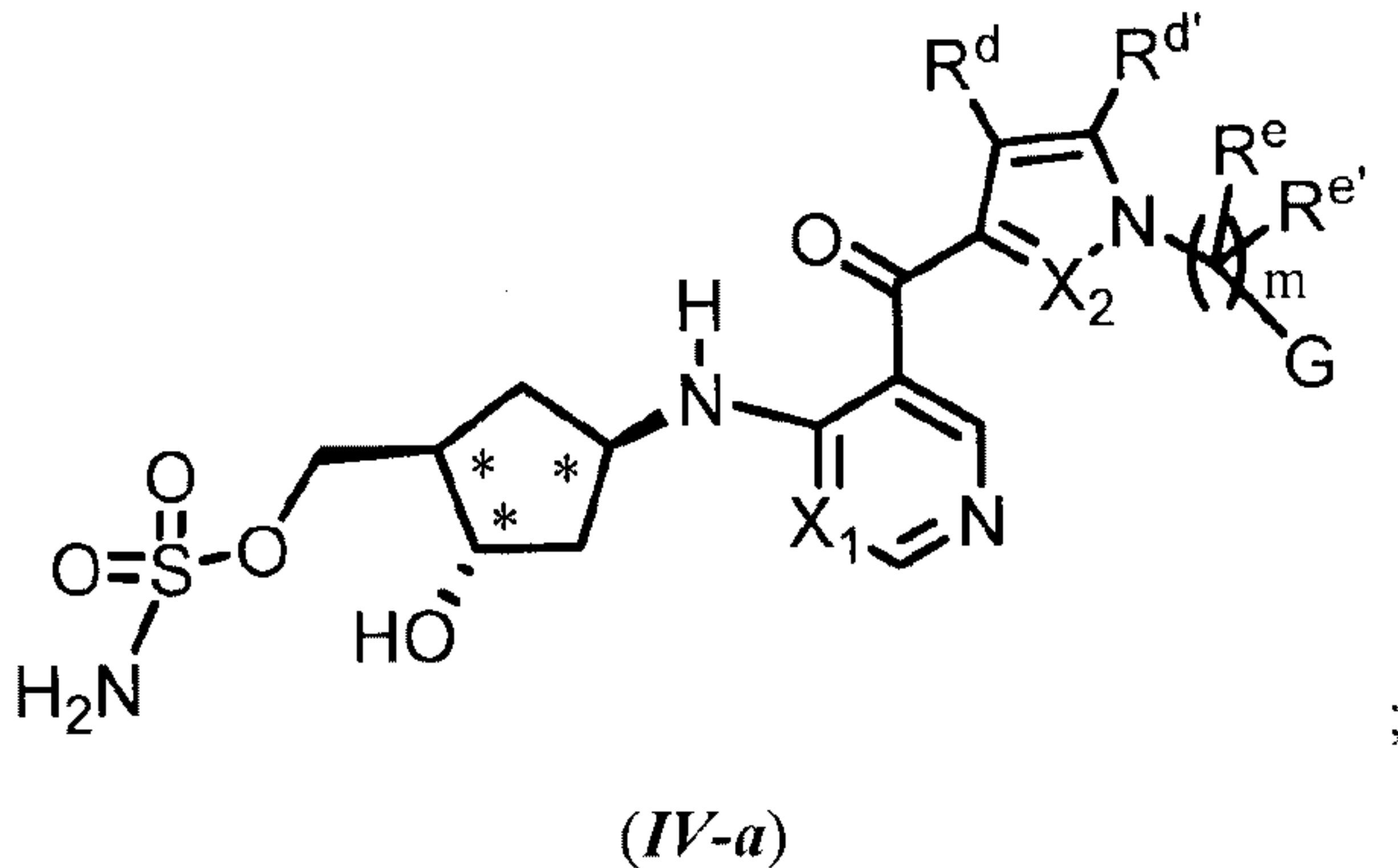
(III)

or a pharmaceutically acceptable salt thereof;

wherein:

stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry.

6. The compound of claim 5, represented by formulas (IV-a)-(IV-c):



or a pharmaceutically acceptable salt thereof;

wherein:

stereochemical configurations depicted at asterisked positions indicate absolute stereochemistry.

7. The compound of claim 5 or 6, wherein X_1 is N.
8. The compound of claim 5 or 6, wherein X_2 is N.
9. The compound of claim 5 or 6, wherein X_2 is $C(R^d)$.
10. The compound of any one of claims 5-9, wherein m is 1 or 2.
11. The compound of claim 10, wherein m is 1.
12. The compound of any one of claims 5-9, wherein:
 R^e is hydrogen, methyl, or ethyl; and
 $R^{e'}$ is hydrogen.
13. The compound of claim 12, wherein R^e is hydrogen.
14. The compound of any one of claims 5-13, wherein each occurrence of R^d is independently hydrogen, chloro, bromo, fluoro, methyl, ethyl, or trifluoromethyl.
15. The compound of claim 14, wherein R^d is hydrogen.
16. The compound of any one of claims 5-15, wherein R^d is hydrogen, chloro, bromo, fluoro, methyl, ethyl, or trifluoromethyl.
17. The compound of claim 16, wherein R^d is hydrogen or methyl.
18. The compound of any one of claims 1-17, wherein G is R^1 .
19. The compound of claim 18, wherein R^1 is 3 to 10-membered cycloaliphatic, 4- to 10-membered heterocyclyl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, 6- to 10-membered aryl, or 5- to 10-membered heteroaryl having 1-5 heteroatoms independently selected from nitrogen, oxygen, and sulfur, wherein R^1 is unsubstituted or substituted with n occurrences of R^2 .

20. The compound of claim 18, wherein R^1 is furanyl, thienyl, pyrrolyl, oxazolyl, thiazolyl, imidazolyl, pyrazolyl, isoxazolyl, isothiazolyl, oxadiazolyl, triazolyl, thiadiazolyl, phenyl, naphthyl, pyranyl, pyridyl, pyridazinyl, pyrimidinyl, pyrazinyl, triazinyl, indolizinyl, imidazopyridyl, indolyl, isoindolyl, indazolyl, benzimidazolyl, benzthiazolyl, benzothienyl, benzofuranyl, benzoxazolyl, benzodioxolyl, benzthiadiazolyl, 2,3-dihydrobenzofuranyl, 4H-furo[3,2-b]pyrrolyl, pyrazolopyrimidinyl, purinyl, quinolyl, isoquinolyl, tetrahydroquinolinyl, tetrahydronaphthyridinyl, tetrahydroisoquinolinyl, cinnolyl, phthalazinyl, quinazolinyl, quinoxalinyl, naphthyridinyl, pteridinyl, tetrahydrofuranyl, tetrahydropyranyl, dihydropyranyl, tetrahydrothienyl, indanyl, tetrahydroindazolyl, pyrrolidinyl, pyrrolidonyl, piperidinyl, pyrrolinyl, decahydroquinolinyl, oxazolidinyl, piperazinyl, dioxanyl, diazepinyl, oxazepinyl, thiazepinyl, morpholinyl, thiomorpholinyl, quinuclidinyl, phenanthridinyl, tetrahydronaphthyl, oxodihydropyridyl, indolinyl, benzodioxanyl, chromanyl, oxetanyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, cyclopentenyl, cyclohexenyl, cycloheptenyl, cyclooctenyl, bicycloheptanyl, azabicyclooctanyl, oxabicyclooctanyl, bicyclononyl, bicyclooctanyl, or adamantyl, wherein R^1 is unsubstituted or substituted with n occurrences of R^2 .

21. The compound of claim 20, wherein R^1 is furanyl, thienyl, phenyl, naphthyl, pyridyl, benzothienyl, benzofuranyl, cyclohexyl, or cyclohexenyl, wherein R^1 is unsubstituted or substituted with n occurrences of R^2 .

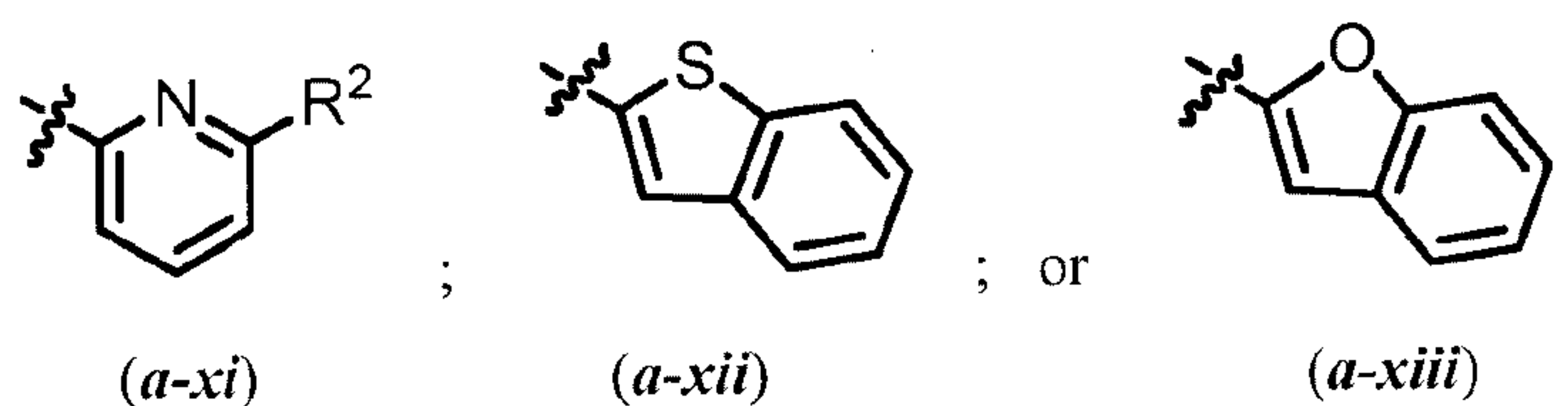
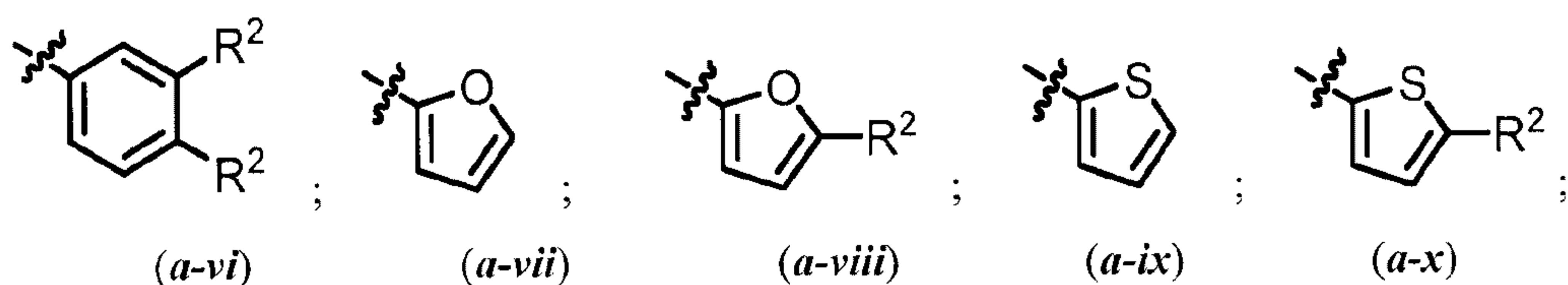
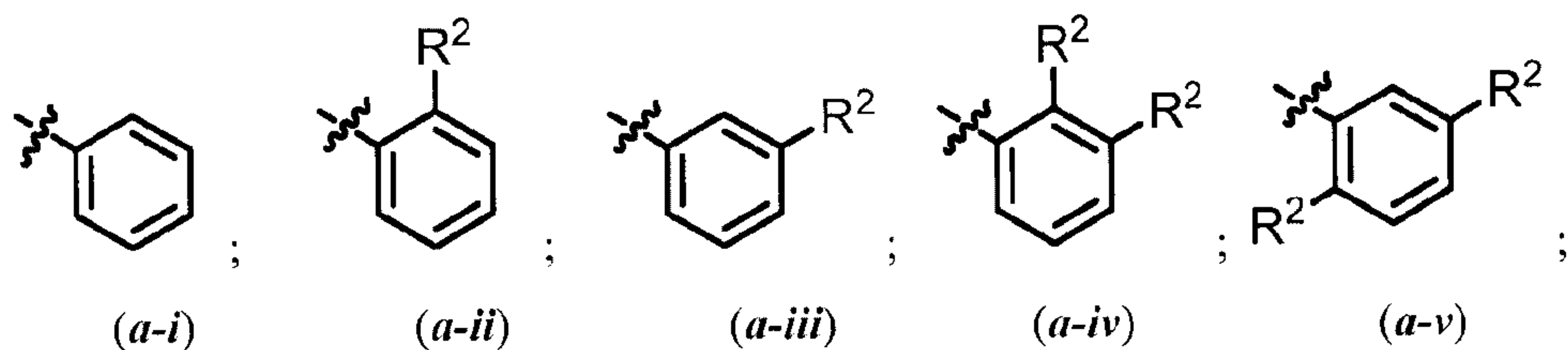
22. The compound of any one of claims 18-21, wherein R^1 is optionally substituted with 1-3 occurrences of R^2 , wherein each occurrence of R^2 is independently $-R^{2a}$ or T_1-R^{2a} .

23. The compound of claim 22, wherein:
 each occurrence of R^2 is independently halogen, $-R^{2c}$, $-N(R^{2b})_2$, $-OR^{2b}$, $-SR^{2c}$, C_{1-6} aliphatic or C_{1-6} fluoroaliphatic; and
 each occurrence of R^{2b} is independently C_{1-6} aliphatic or C_{1-6} fluoroaliphatic.

24. The compound of claim 23, wherein R^1 is optionally substituted with 1-2 occurrences of R^2 , wherein each occurrence of R^2 is independently chloro, bromo, fluoro, iodo, methyl, ethyl, propyl, tert-butyl, methoxy, ethoxy, isopropoxy, tert-butoxy, difluoromethyl, trifluoromethyl, difluoromethoxy, trifluoromethoxy, trifluoromethylthio, dimethylamino, diethylamino, ethyne, cyclopropyl, or phenyl.

25. The compound of claim 23, wherein each occurrence of R^2 is independently chloro, bromo, fluoro, iodo, methyl, ethyl, difluoromethoxy, trifluoromethoxy, ethyne, cyclopropyl, or phenyl.

26. The compound of any one of claims 18-25, wherein R^1 is:



27. The compound of claim 26, wherein R^1 is (a-i), (a-iii), (a-iv), (a-v), (a-viii), or (a-xi).

28. The compound of claim 26 or 27, wherein each occurrence of R^2 is independently chloro, bromo, iodo, or methyl.

29. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[(3-bromophenyl)sulfonyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

30. The compound of claim 1, wherein the compound is:

{(1S,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

31. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[6-(trifluoromethyl)pyridin-2-yl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl} amino)cyclopentyl]methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

32. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{{5-({1-[2-(3-methyl-1H-pyrazol-1-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

33. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3,6-dihydro-2H-pyran-4-yl)methyl]-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

34. The compound of claim 1, wherein the compound is:

{(1S,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

35. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[3-(trifluoromethyl)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

36. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(6-chloropyridin-2-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

37. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(1R,2R)-(2-phenylcyclopropyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

38. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(1S,2S)-(2-phenylcyclopropyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

39. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

40. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

41. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

42. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[4-(tetrahydro-2H-pyran-4-yl)but-2-yn-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

43. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(3-iodobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

44. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(4-fluoro-3-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

45. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

46. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2,3,6-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

47. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(1-benzofuran-2-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

48. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[3-(1-[3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl]carbonyl)pyridin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

49. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-(1-[2-oxo-2-(pyrrolidin-1-yl)ethyl]-1H-pyrazol-3-yl]carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

50. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-(1-[3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl]carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

51. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-(1-[4-fluoro-3-(trifluoromethyl)benzyl]-1H-pyrrol-3-yl]carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

52. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(2-fluoro-3-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

53. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

54. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(5-bromo-2-furyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

55. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(3-cyanobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

56. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(4,4-dimethylpent-2-yn-1-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

57. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(4-hydroxytetrahydro-2H-pyran-4-yl)prop-2-yn-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

58. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(2-ethoxyethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

59. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(5-bromopyridin-3-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

60. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(cyclopropylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

61. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-({5-[(1-benzyl-5-methyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

62. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(2-fluoro-5-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

63. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[2-(1H-indol-3-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

64. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[4-chloro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

65. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(2,5-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

66. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-({5-[(5-chloro-1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

67. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[2-(methylsulfanyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

68. The compound of claim 1, wherein the compound is:

2-{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}ethanesulfonamide;
or a pharmaceutically acceptable salt thereof.

69. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[2-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

70. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

71. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(1-{[5-(methoxymethyl)-2-furyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

72. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

73. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromo-4-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

74. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-5-fluoro-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

75. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[1-methyl-3-(trifluoromethyl)-1H-pyrazol-5-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl} amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

76. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{{5-({1-[3-fluoro-4-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

77. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(4-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

78. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2-naphthylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

79. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(3-chloro-1-benzothiophen-2-yl)methyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

80. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[2-chloro-5-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

81. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[(4-methylpyridin-2-yl)methyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

82. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(3-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

83. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[2-(trifluoromethyl)pyridin-4-yl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl} amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

84. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(6-chloro-5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

85. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{{5-({1-[(1S,2S)-2-methylcyclopropyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

86. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{{5-({1-[(1R,2R)-2-methylcyclopropyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

87. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-({3-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyridin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

88. The compound of claim 1, wherein the compound is:

{{(1R,2R,3R,4R)-3-fluoro-4-[(5-{[1-(4-fluoro-3-methoxybenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

89. The compound of claim 1, wherein the compound is:

{{(1R,2S,4R)-4-[(5-{[1-(3,4-dichlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

90. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(4-cyclopentylbut-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

91. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(2-hydroxypropan-2-yl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

92. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[5-chloro-1-(3-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

93. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(2,4-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

94. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(2-methoxypyridin-3-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

95. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-tert-butylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

96. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(6-bromopyridin-2-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

97. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(6-bromopyridin-2-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

98. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-({5-[(1-benzyl-5-methyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

99. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-({5-[(1-{3-[(chloroacetyl)amino]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

100. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(3-iodobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

101. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[2,4-bis(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

102. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[(4-chloropyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

103. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-5-methyl-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

104. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromo-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

105. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[2-(trifluoromethyl)-1,3-thiazol-5-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

106. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[3-((R)-vinylsulfinyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

107. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[3-((S)-vinylsulfinyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

108. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(4-methoxy-4-methylpent-2-yn-1-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

109. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2-phenylpropan-2-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

110. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-({5-[(1-{{(2R)-5,5-dimethyltetrahydrofuran-2-yl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl} amino)-2-hydroxycyclopentyl]methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

111. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-({5-[(1-{{(2S)-5,5-dimethyltetrahydrofuran-2-yl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl} amino)-2-hydroxycyclopentyl]methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

112. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(3-{[1-(3,4-dichlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

113. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(5-chloro-2-furyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

114. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(5-chloro-2-furyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

115. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(1-methyl-2-oxo-1,2-dihydropyridin-3-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

116. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(3-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

117. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(cyclohexylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

118. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[3-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrrol-3-yl}carbonyl)pyridin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

119. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(prop-1-yn-1-yl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

120. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-ethynylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

121. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2S)-(pent-3-yn-2-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

122. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2R)-(pent-3-yn-2-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

123. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-({5-[(1-{[5-(difluoromethyl)-2-furyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

124. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(2,4,6-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

125. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(3-chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

126. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-5-(hydroxymethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

127. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(2,5-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

128. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

129. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(cyclohexylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

130. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-benzyl-5-(trifluoromethyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

131. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(6-chloropyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

132. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[2-(3-bromophenyl)-2-oxoethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

133. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(3-{[1-(3-chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

134. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[2-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

135. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(6-chloropyridin-2-yl)methyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

136. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[4-chloro-3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

137. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(5-chloro-2-furyl)methyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

138. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

139. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(2-naphthylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

140. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(2-chloro-5-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

141. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-2,5-dichloro-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

142. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

143. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(2E)-but-2-en-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

144. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(cyanomethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

145. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[6-(2-hydroxypropan-2-yl)pyridin-2-yl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

146. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(1-benzofuran-2-ylmethyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

147. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-4-chloro-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

148. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(4-chloro-3-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

149. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(4,4-dimethylpent-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

150. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(1-{[4-(trifluoromethyl)-2-furyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

151. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(pent-3-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

152. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-({5-[(1-{3-[acryloyl(methyl)amino]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

153. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[3-(difluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;

154. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-({1-[2-(1-naphthyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

155. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

156. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[6-(3-hydroxyoxetan-3-yl)pyridin-2-yl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

157. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[4-fluoro-2-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

158. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

159. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(3-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

160. The compound of claim 1, wherein the compound is:

{{(1R,2R,3R,4R)-4-[(3-{[1-(3-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyridin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

161. The compound of claim 1, wherein the compound is:

{{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(2-oxo-2-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

162. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-({5-[(1-{4-chloro-3-[(trifluoromethyl)sulfanyl]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

163. The compound of claim 1, wherein the compound is:

{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-4-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

164. The compound of claim 1, wherein the compound is:

{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(3-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

165. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(trifluoromethyl)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

166. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

167. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

168. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[3-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrrol-3-yl}carbonyl)pyridin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

169. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-chlorophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

170. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-chlorophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

171. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[4-fluoro-3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

172. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

173. The compound of claim 1, wherein the compound is:

N-({(1R,2R,3S,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl)sulfuric diamide;
or a pharmaceutically acceptable salt thereof.

174. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(trimethylsilyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

175. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(5-methyl-1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

176. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-({5-[(1-benzyl-4-chloro-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

177. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{{5-({1-[3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

178. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-chloro-4-fluorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

179. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

180. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-4-fluorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

181. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(imidazo[1,2-a]pyridin-6-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

182. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(5,6-dihydro-2H-pyran-3-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

183. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(4-chloro-2-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

184. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

185. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-({5-[(5-chloro-1-{[5-(trifluoromethyl)isoxazol-3-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

186. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-4-methyl-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

187. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(pyridin-2-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

188. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(4-methoxy-4-methylpent-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

189. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[4-chloro-3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

190. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(5-methylhex-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

191. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(4-hydroxy-4-methylpent-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

192. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({[1-[3,5-bis(trifluoromethyl)benzyl]-1H-pyrazol-3-yl]carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

193. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({[1-[4-chloro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl]carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

194. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)(methyl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

195. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-(5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl)amino)-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

196. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(3,4-dichlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

197. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(pyridin-4-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

198. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

199. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({[1-[(4-methylpyridin-2-yl)methyl]-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

200. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

201. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-ethynylbenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

202. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

203. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-ethynyl-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

204. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[4-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

205. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({ 1-[3,5-bis(trifluoromethyl)benzyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

206. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({ 1-[(5-methylisoxazol-3-yl)methyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

207. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[5-{[1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

208. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({ 1-[4-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

209. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({ 1-[(1R)-1-(3-chlorophenyl)ethyl]-5-methyl-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

210. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-chlorophenyl)ethyl]-5-methyl-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

211. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(1-isobutyl-1H-pyrazol-3-yl) carbonyl]pyrimidin-4-yl} amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

212. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[3-({1-[4-chloro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl} carbonyl)pyridin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

213. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(1S)-1-(3-bromophenyl)propyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

214. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(1R)-1-(3-bromophenyl)propyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

215. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

216. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-2-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

217. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-3-fluoro-4-[(5-{[1-(4-fluoro-3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

218. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromo-4-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

219. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(5-chloro-2-furyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

220. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[2-chloro-5-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

221. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[2-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

222. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[5-(trifluoromethyl)-2-thienyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

223. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({5-chloro-1-[3-(trifluoromethyl)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

224. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(2-chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

225. The compound of claim 1, wherein the compound is:

{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

226. The compound of claim 1, wherein the compound is:

{{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-5-ethyl-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

227. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(6-methoxypyridin-2-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

228. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(5-chloro-2-thienyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

229. The compound of claim 1, wherein the compound is:

{{(1R,2R,3S,4R)-4-[(5-{[1-(3,4-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

230. The compound of claim 1, wherein the compound is:

{{(1R,2S,4R)-4-[(5-{[1-(4-chloro-2-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

231. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(1S)-1-(3-bromophenyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

232. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(1R)-1-(3-bromophenyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

233. The compound of claim 1, wherein the compound is:

{{(1R,2R,3S,4R)-4-[(5-{[1-(2-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

234. The compound of claim 1, wherein the compound is:

{{(1R,2R,3S,4R)-4-[(5-{[1-(2-chloro-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

235. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(but-2-yn-1-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

236. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(phenylethynyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

237. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(5-methyl-1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

238. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(3-fluoro-4-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

239. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[3-(2-furyl)prop-2-yn-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

240. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(Z)-2-phenylvinyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

241. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(3-{[1-(3-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

242. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(pentafluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

243. The compound of claim 1, wherein the compound is:

[(1R,2R,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3,3-difluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

244. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(3-bromo-4-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

245. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-({5-[(1-phenyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

246. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(2-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

247. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(5-bromo-2-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

248. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(3-methylisoxazol-5-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

249. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

250. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-fluoro-4-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

251. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[4-fluoro-3-(trifluoromethoxy)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

252. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3,4-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

253. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[3-fluoro-5-(trifluoromethyl)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate; or a pharmaceutically acceptable salt thereof.

254. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(imidazo[1,2-a]pyridin-2-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

255. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

256. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(1-methyl-2-oxo-1,2-dihydropyridin-3-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

257. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-({5-[(1-benzyl-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

258. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[4-chloro-3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

259. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(2,3-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

260. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(1-isopropyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

261. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

262. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(tetrahydro-2H-pyran-4-ylmethyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

263. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(3-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

264. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[3-(difluoromethoxy)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

265. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(2,3,6-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

266. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[2-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

267. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

268. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(but-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

269. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[3-(4-fluorophenoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

270. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[2-fluoro-5-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

271. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-4-{[5-({1-[(5-fluoro-2-furyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

272. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(3-chloro-2-thienyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

273. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(3-{[1-(3,4-dichlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

274. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(pent-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

275. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-({5-[(1-{[5-(difluoromethyl)-2-furyl]methyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

276. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(4-methoxybut-2-yn-1-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

277. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-{[1-(imidazo[1,2-a]pyridin-5-yl)methyl]-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

278. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(6-bromopyridin-2-yl)methyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

279. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(5-bromo-2-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

280. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

281. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(1-benzothiophen-2-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

282. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(3-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

283. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[2-(3-bromophenyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

284. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-5-chloro-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

285. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(4-fluoro-3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

286. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[3-({1-[3-(difluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyridin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

287. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(pyridin-3-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

288. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[5-methyl-1-(3-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

289. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(2-cyanobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

290. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-({5-[(1-{[(2R)-5,5-dimethyltetrahydrofuran-2-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl} amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

291. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-({5-[(1-{[(2S)-5,5-dimethyltetrahydrofuran-2-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl} amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

292. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(morpholin-4-yl)benzyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

293. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(cyclohex-1-en-1-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

294. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(2-cyanobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

295. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({5-chloro-1-[(5-chloro-2-furyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

296. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(3-bromophenyl)sulfonyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

297. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[3-(difluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

298. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({5-[(1-{[5-(trifluoromethyl)-2-thienyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

299. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[3-fluoro-5-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

300. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(1-{4-[(trifluoromethyl)sulfanyl]benzyl}-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

301. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3,5-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

302. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[2,5-bis(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

303. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[3-({1-[3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyridin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

304. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[3-({1-[4-fluoro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyridin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

305. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[1-(3-chlorophenyl)cyclopropyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

306. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[4-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

307. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[2,4-bis(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

308. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[2,5-bis(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

309. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[2-chloro-5-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

310. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(3,5-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

311. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(3-hydroxyoxetan-3-yl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

312. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

313. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[5-bromo-1-(3-bromobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

314. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[(4-fluoro-1-naphthyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

315. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[5-(trifluoromethyl)-2-furyl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

316. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(3-hydroxyoxetan-3-yl)prop-2-yn-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

317. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[4-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

318. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(5-methyl-2-furyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

319. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(biphenyl-3-ylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

320. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromo-4-fluorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

321. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(5-chloro-2-thienyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

322. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(methylsulfanyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

323. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromo-2-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

324. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[2-(3-chlorophenyl)-2-oxoethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

325. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[(6-bromopyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

326. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[(5-chloro-1-benzothiophen-3-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

327. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2,4,6-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

328. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-cyclopropylprop-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

329. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[4-chloro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

330. The compound of claim 1, wherein the compound is:

{{(1R,2S,4R)-4-[(5-{[1-(2,5-dichlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

331. The compound of claim 1, wherein the compound is:

{{(1R,2R,3S,4R)-4-[(5-{[1-(3-bromo-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

332. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-({5-[(1-allyl-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

333. The compound of claim 1, wherein the compound is:

{{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(3-iodobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

334. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(2R)-tetrahydrofuran-2-ylmethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

335. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(2S)-tetrahydrofuran-2-ylmethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

336. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-[(5-({1-(3-iodobenzyl)-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

337. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(6-methoxypyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

338. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(5-chloro-2-furyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

339. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(5-methylisoxazol-3-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

340. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(6-methylpyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

341. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(5-bromopyridin-3-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

342. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-({5-[(1-benzyl-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

343. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-cyclopropyl-4-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

344. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1R)-cyclohex-2-en-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

345. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-(1-[(1S)-cyclohex-2-en-1-yl]-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino]-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

346. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-(1-[3-(difluoromethoxy)benzyl]-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino]-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

347. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-(5-[(1-[(1S)-1-[5-(trifluoromethyl)-2-furyl]ethyl)-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

348. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-(5-[(1-[(1R)-1-[5-(trifluoromethyl)-2-furyl]ethyl)-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

349. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2-methoxyethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

350. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-({5-[(1-{[1-methyl-5-(trifluoromethyl)-1H-pyrazol-3-yl]methyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

351. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(2,5-dichlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

352. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(1-methyl-1H-pyrazol-4-yl)prop-2-yn-1-yl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

353. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

354. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[5-chloro-1-(3-iodobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

355. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3,4-dichlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;

or a pharmaceutically acceptable salt thereof.

356. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

357. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[3-(acryloylamino)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

358. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(2,4,5-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl} methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

359. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-bromophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

360. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-bromophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

361. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-chlorobenzyl)-5-(trifluoromethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

362. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

363. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(pentafluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

364. The compound of claim 1, wherein the compound is:

{(1S,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

365. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-4-fluorobenzyl)-5-chloro-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

366. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[3-(vinylsulfonyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

367. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(1-benzothiophen-2-ylmethyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

368. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-((1R)-2,3-dihydro-1H-inden-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

369. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-((1S)-2,3-dihydro-1H-inden-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

370. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[(4-bromopyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

371. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(3-methoxybenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

372. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-(3,4,5-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

373. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(2,3-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

374. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[4-fluoro-2-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

375. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(2,4,5-trifluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

376. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(prop-2-yn-1-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

377. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3,4-dichlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

378. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(3R)-tetrahydrofuran-3-ylmethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

379. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(3S)-tetrahydrofuran-3-ylmethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

380. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

381. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(3-chloro-5-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

382. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-benzyl-5-(hydroxymethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

383. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(2,4-difluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

384. The compound of claim 1, wherein the compound is:

{(1R,2R,3R,4R)-4-[(5-{[1-(3-bromo-4-chlorobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-3-fluoro-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

385. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-(2-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

386. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(1S,2S)-(2-phenylcyclopropyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

387. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(1R,2R)-(2-phenylcyclopropyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

388. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(but-2-yn-1-yl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

389. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(5-chloro-1-benzothiophen-3-yl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

390. The compound of claim 1, wherein the compound is:

[(1S,2S,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

391. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-4-{[5-({1-[4-fluoro-3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2,3-dihydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

392. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(3-methylbut-2-en-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

393. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-({5-[(1-methyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

394. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(5-bromo-2-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

395. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(3-iodobenzyl)-5-methyl-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

396. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-2-hydroxy-4-{[5-({1-[(5-methylisoxazol-3-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

397. The compound of claim 1, wherein the compound is:

[(1R,2R,3S,4R)-2,3-dihydroxy-4-{[5-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

398. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(1S)-1-(5-chloro-2-furyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

399. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(1R)-1-(5-chloro-2-furyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

400. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-((1S)-1-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

401. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-((1R)-1-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

402. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(6-bromopyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

403. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-((1R)-2,3-dihydro-1H-inden-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

404. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-4-[(5-{[1-((1S)-2,3-dihydro-1H-inden-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2,3-dihydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

405. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(5-chloro-2-furyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

406. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(5-chloro-2-furyl)ethyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

407. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

408. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-ethynylphenyl)ethyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

409. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(1S)-1-(3-bromophenyl)propyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

410. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(1R)-1-(3-bromophenyl)propyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

411. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({ 5-[(1-{(1S)-1-[5-(trifluoromethyl)-2-furyl]ethyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl} amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

412. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-({ 5-[(1-{(1R)-1-[5-(trifluoromethyl)-2-furyl]ethyl}-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl} amino)cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

413. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{ [5-({ 1-[(1S)-1-(3-bromophenyl)ethyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

414. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{ [5-({ 1-[(1R)-1-(3-bromophenyl)ethyl]-1H-pyrazol-3-yl} carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

415. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{ [5-({ 1-[(1R,2R)-(2-phenylcyclopropyl)methyl]-1H-pyrrol-3-yl} carbonyl)pyrimidin-4-yl]amino} cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

416. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-3-fluoro-2-hydroxy-4-{[5-({1-[(1S,2S)-(2-phenylcyclopropyl)methyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

417. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-chlorophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

418. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-chlorophenyl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

419. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-((1S)-1-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

420. The compound of claim 1, wherein the compound is:

{(1R,2R,3S,4R)-2,3-dihydroxy-4-[(5-{[1-((1R)-1-phenylethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

421. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[(1S)-1-(pent-3-yn-2-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

422. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-2-hydroxy-4-[(5-{[(1R)-1-(pent-3-yn-2-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

423. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-(1-[(1S)-1-(3-bromophenyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

424. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-(1-[(1R)-1-(3-bromophenyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

425. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-(1-[(1S)-1-(5-chloro-2-furyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

426. The compound of claim 1, wherein the compound is:

[(1R,2R,3R,4R)-4-{[5-({1-[(1R)-1-(5-chloro-2-furyl)ethyl]-1H-pyrrol-3-yl}carbonyl)pyrimidin-4-yl]amino}-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

427. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(3-chlorophenyl)ethyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

428. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(3-chlorophenyl)ethyl]-5-methyl-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

429. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1S)-1-(6-bromopyridin-2-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

430. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-[(1R)-1-(6-bromopyridin-2-yl)ethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

431. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-5-(2-hydroxypropan-2-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

432. The compound of claim 1, wherein the compound is:

{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-5-(methoxymethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

433. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{[5-({1-(3-bromobenzyl)-5-[(1S)-1-methoxyethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

434. The compound of claim 1, wherein the compound is:

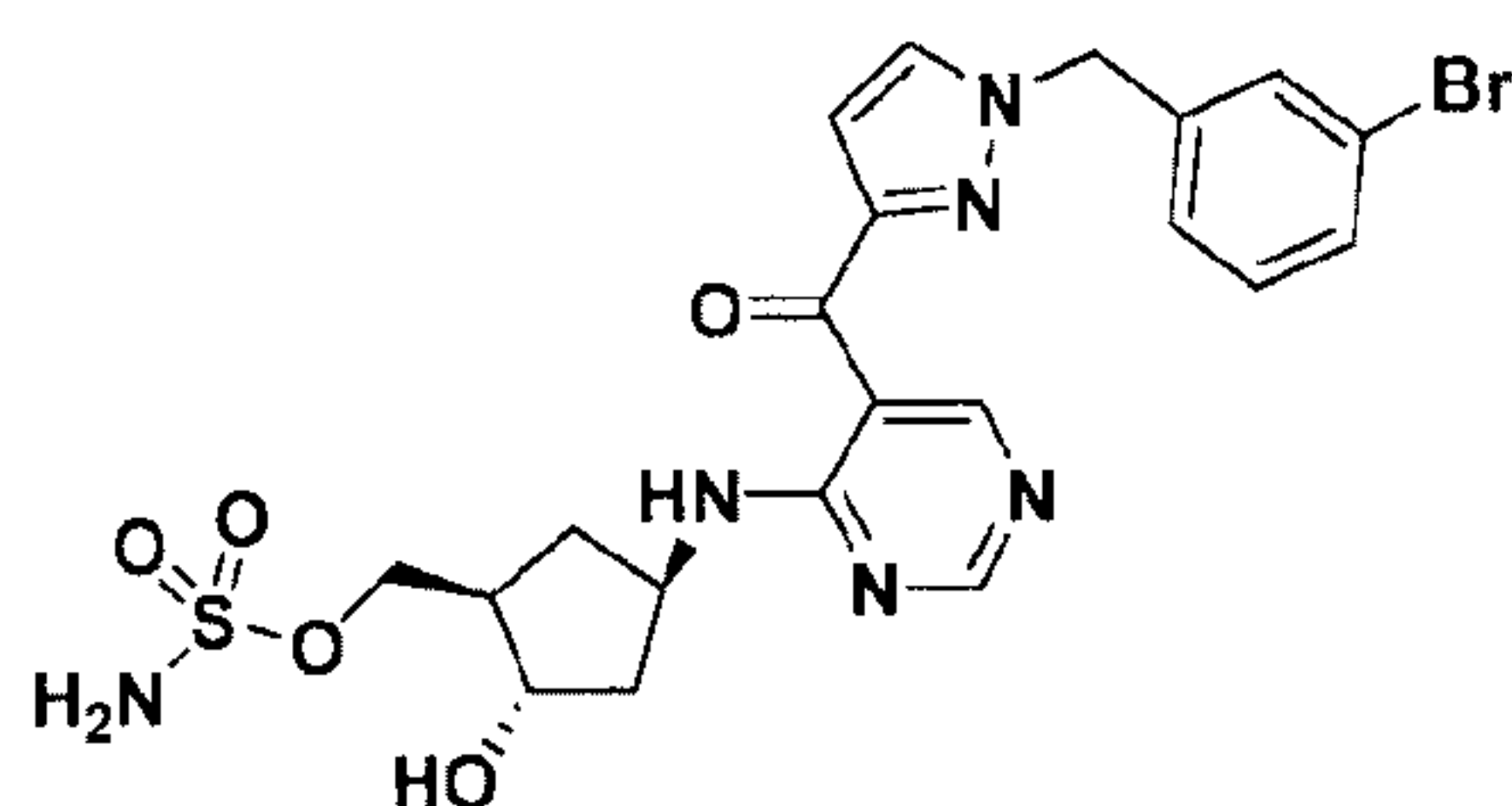
[(1R,2S,4R)-4-{[5-({1-(3-bromobenzyl)-5-[(1R)-1-methoxyethyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

435. The compound of claim 1, wherein the compound is:

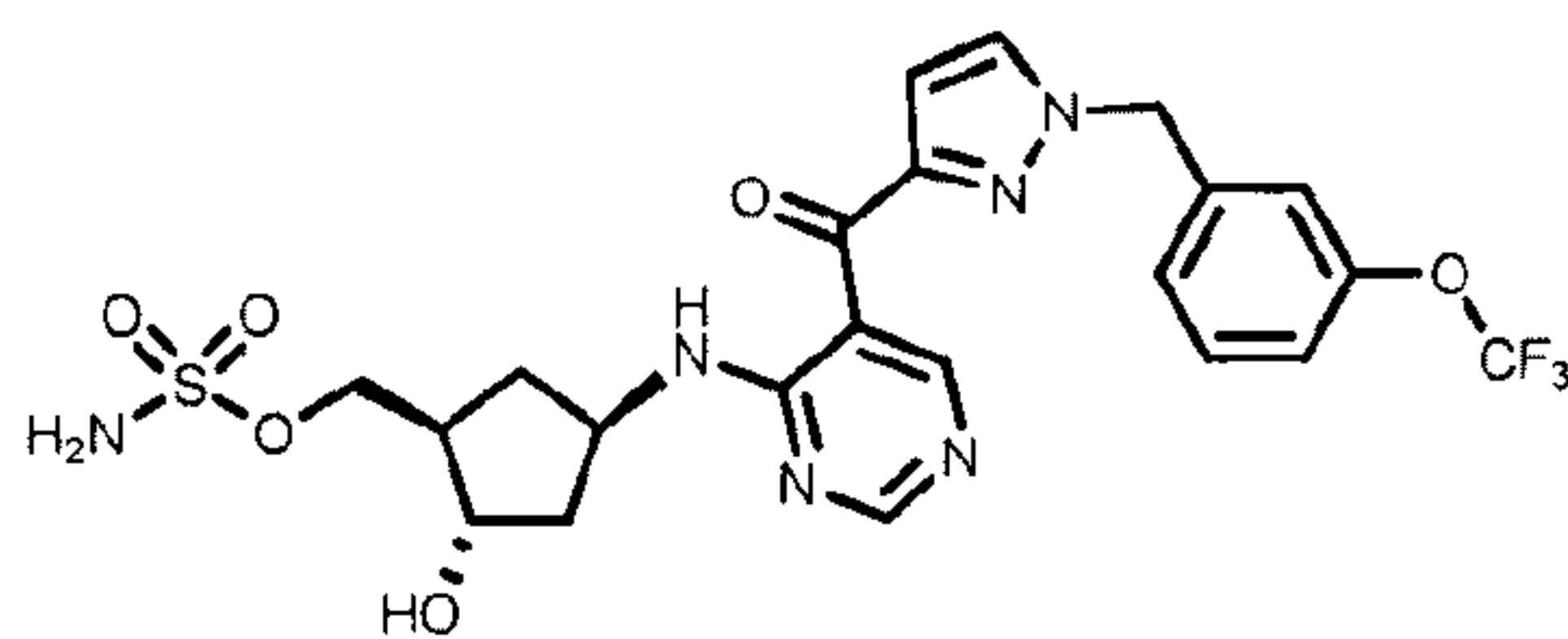
{(1R,2R,3S,4R)-3-amino-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate;
or a pharmaceutically acceptable salt thereof.

436. A pharmaceutical composition comprising the compound of any one of claims 1-435 or a pharmaceutically acceptable salt thereof and a pharmaceutically acceptable carrier.
437. The compound of any one of claims 1-435 or a pharmaceutically acceptable salt thereof for use in treating cancer.
438. Use of a compound of any one of claims 1-435 or a pharmaceutically acceptable salt thereof for the treatment of cancer.
439. Use of a compound of any one of claims 1-435 or a pharmaceutically acceptable salt thereof in the manufacture of a medicament for the treatment of cancer.
440. A pharmaceutical composition for the treatment of cancer in a patient in need thereof, comprising a compound of any one of claims 1-435 or a pharmaceutically acceptable salt thereof and a pharmaceutically acceptable carrier.
441. The compound of claim 437, wherein the cancer is lung cancer, ovarian cancer, colon cancer, breast cancer or lymphoma.
442. The compound of claim 441, wherein the cancer is lung cancer.
443. The compound of claim 441, wherein the cancer is ovarian cancer.
444. The compound of claim 441, wherein the cancer is colon cancer.
445. The compound of claim 441, wherein the cancer is breast cancer.
446. The compound of claim 441, wherein the cancer is lymphoma.
447. The use of of claim 438 or 439, wherein the cancer is lung cancer, ovarian cancer, colon cancer, breast cancer or lymphoma.
448. The use of claim 447, wherein the cancer is lung cancer.

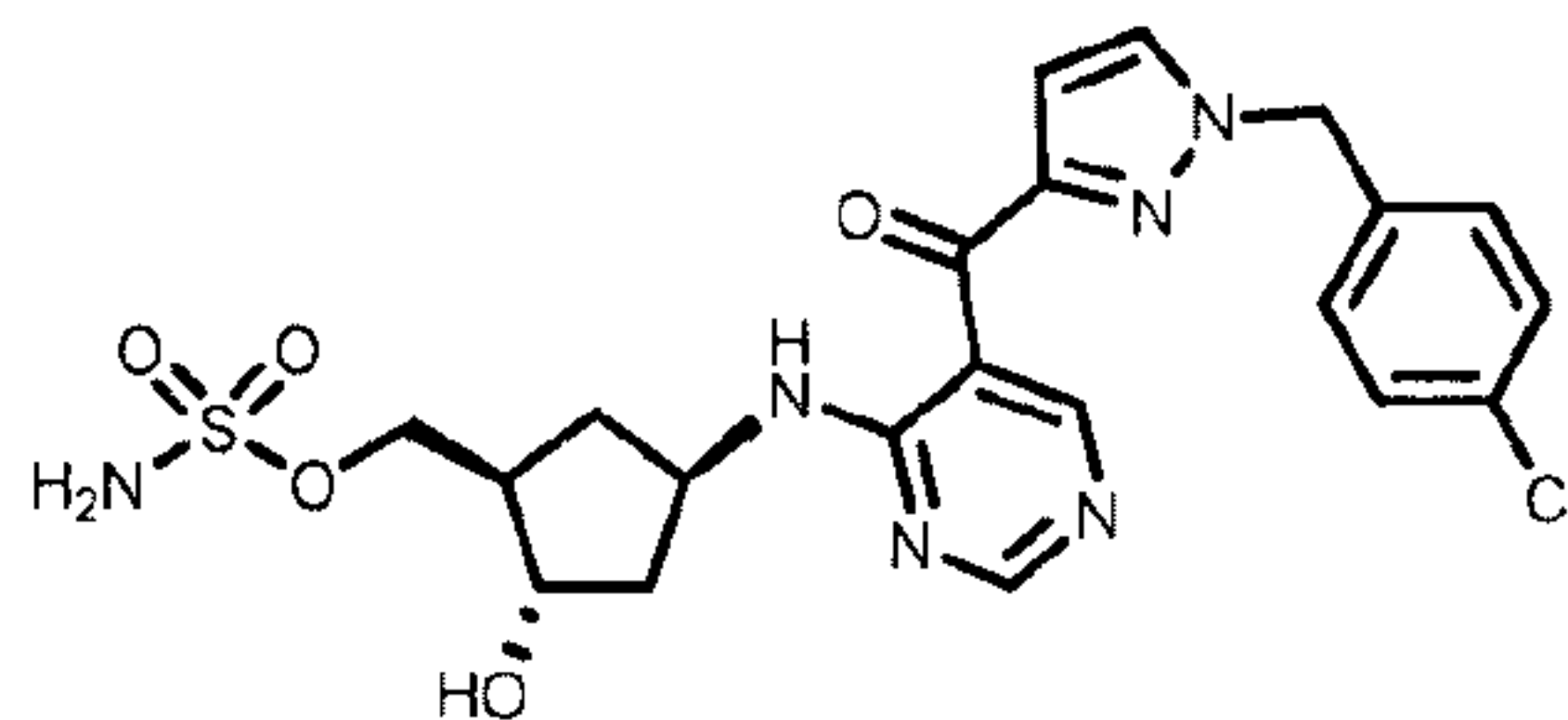
449. The use of claim 447, wherein the cancer is ovarian cancer.
450. The use of claim 447, wherein the cancer is colon cancer.
451. The use of claim 447, wherein the cancer is breast cancer.
452. The use of claim 447, wherein the cancer is lymphoma.
453. The compound of claim 1, wherein the compound is:
 {(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate of formula I-11:

**I-11.**

454. The compound of claim 1, wherein the compound is:
 [(1R,2S,4R)-2-hydroxy-4-{[5-({1-[3-(trifluoromethoxy)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}cyclopentyl]methyl sulfamate of formula I-20:

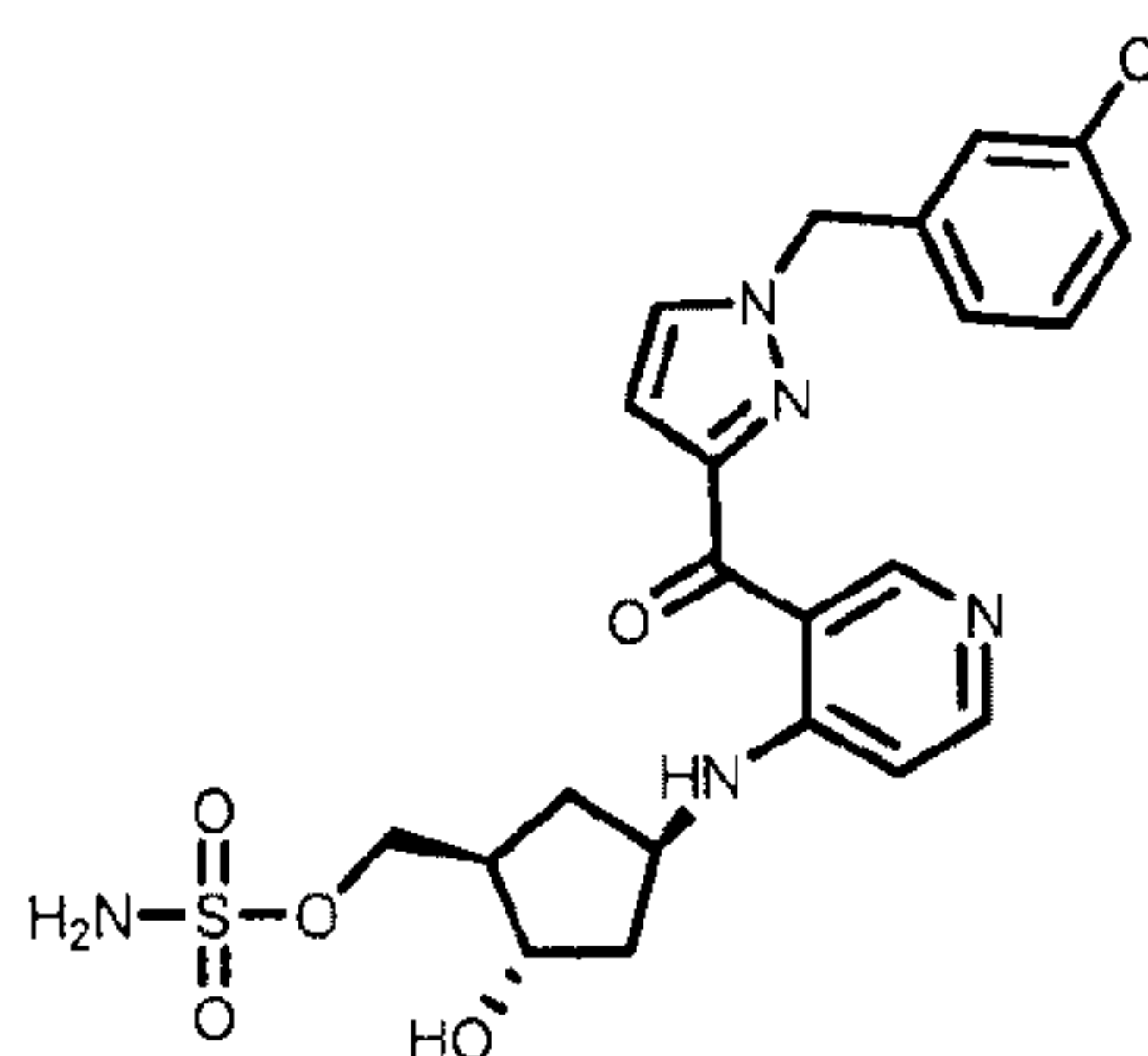
**I-20.**

455. The compound of claim 1, wherein the compound is:
 {(1R,2S,4R)-4-[(5-{[1-(4-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate of formula I-47:



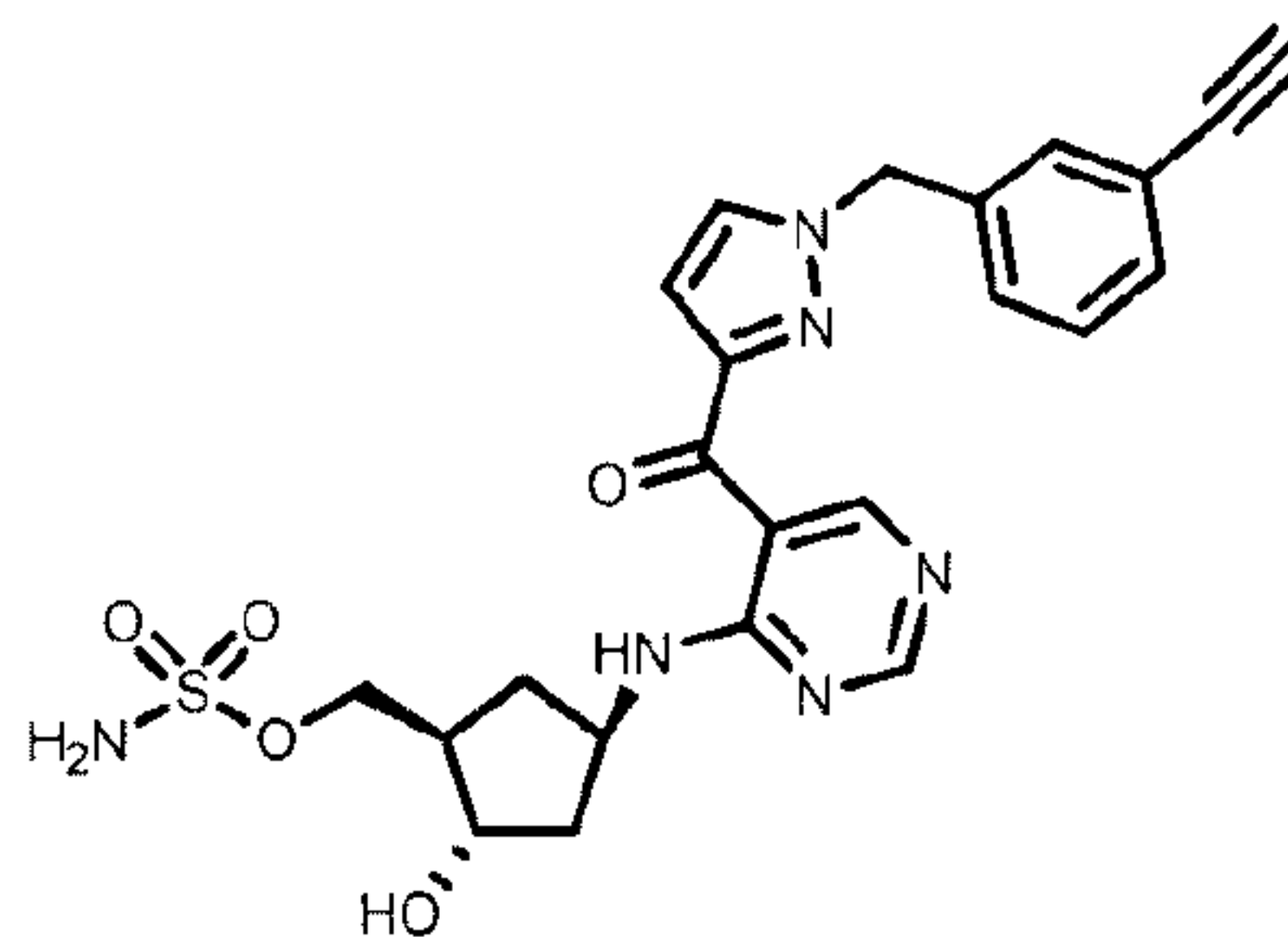
I-47.

456. The compound of claim 1, wherein the compound is:
 {(1R,2S,4R)-4-[(3-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyridin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate of formula I-52:



I-52.

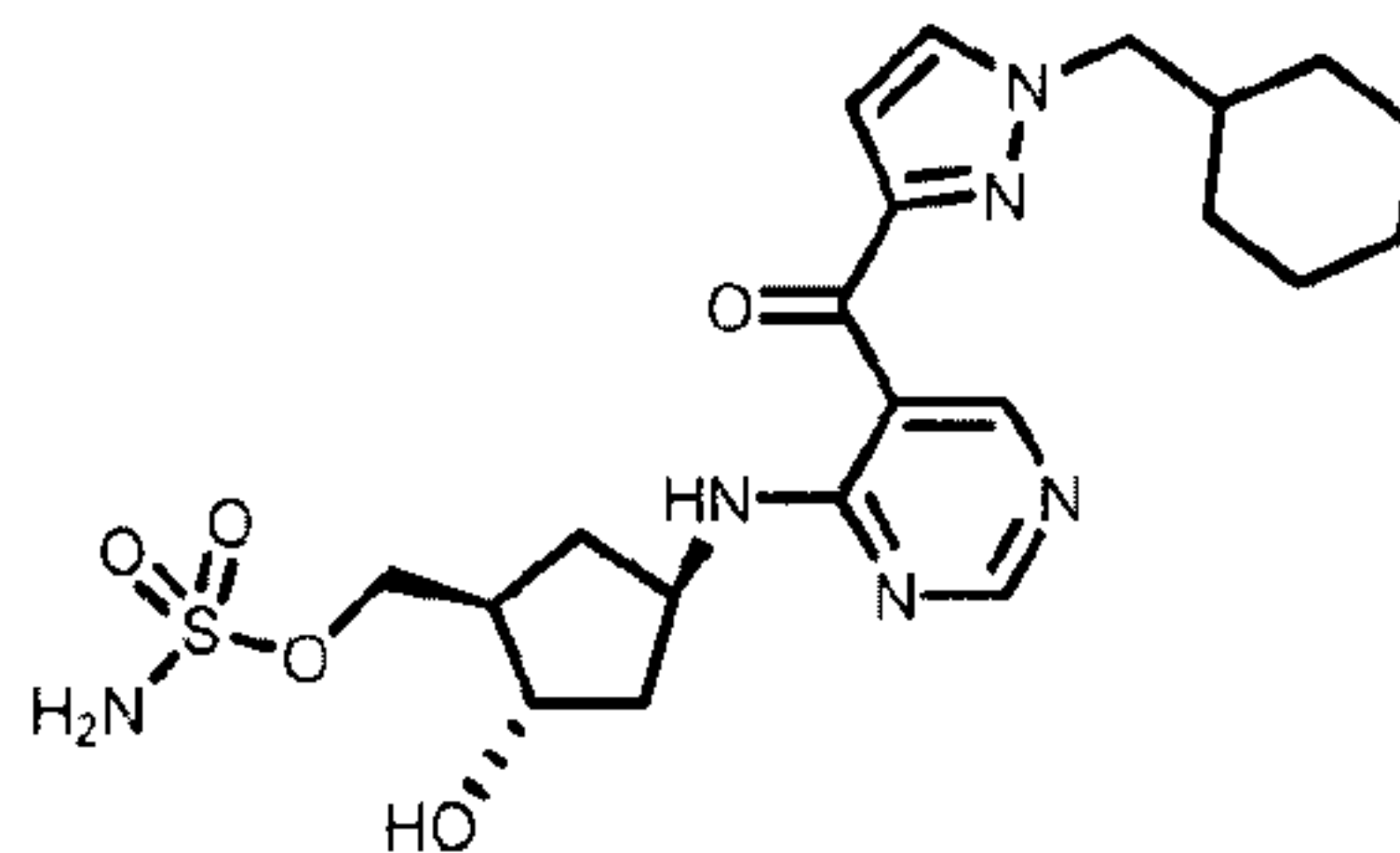
457. The compound of claim 1, wherein the compound is:
 {(1R,2S,4R)-4-[(5-{[1-(3-ethynylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate of formula I-85:



I-85.

458. The compound of claim 1, wherein the compound is:

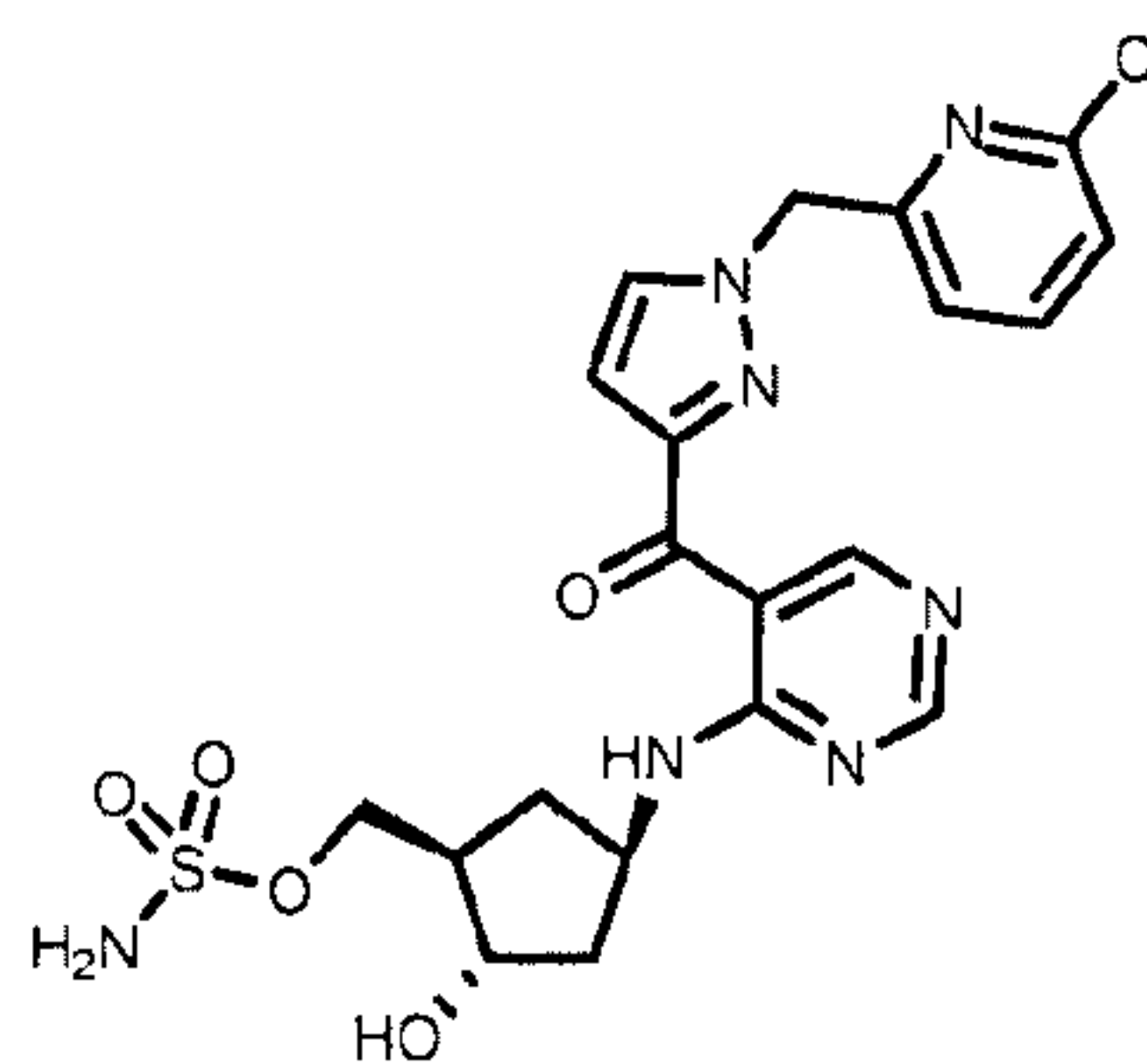
{(1R,2S,4R)-4-[(5-{[1-(cyclohexylmethyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate of formula I-93:



I-93.

459. The compound of claim 1, wherein the compound is:

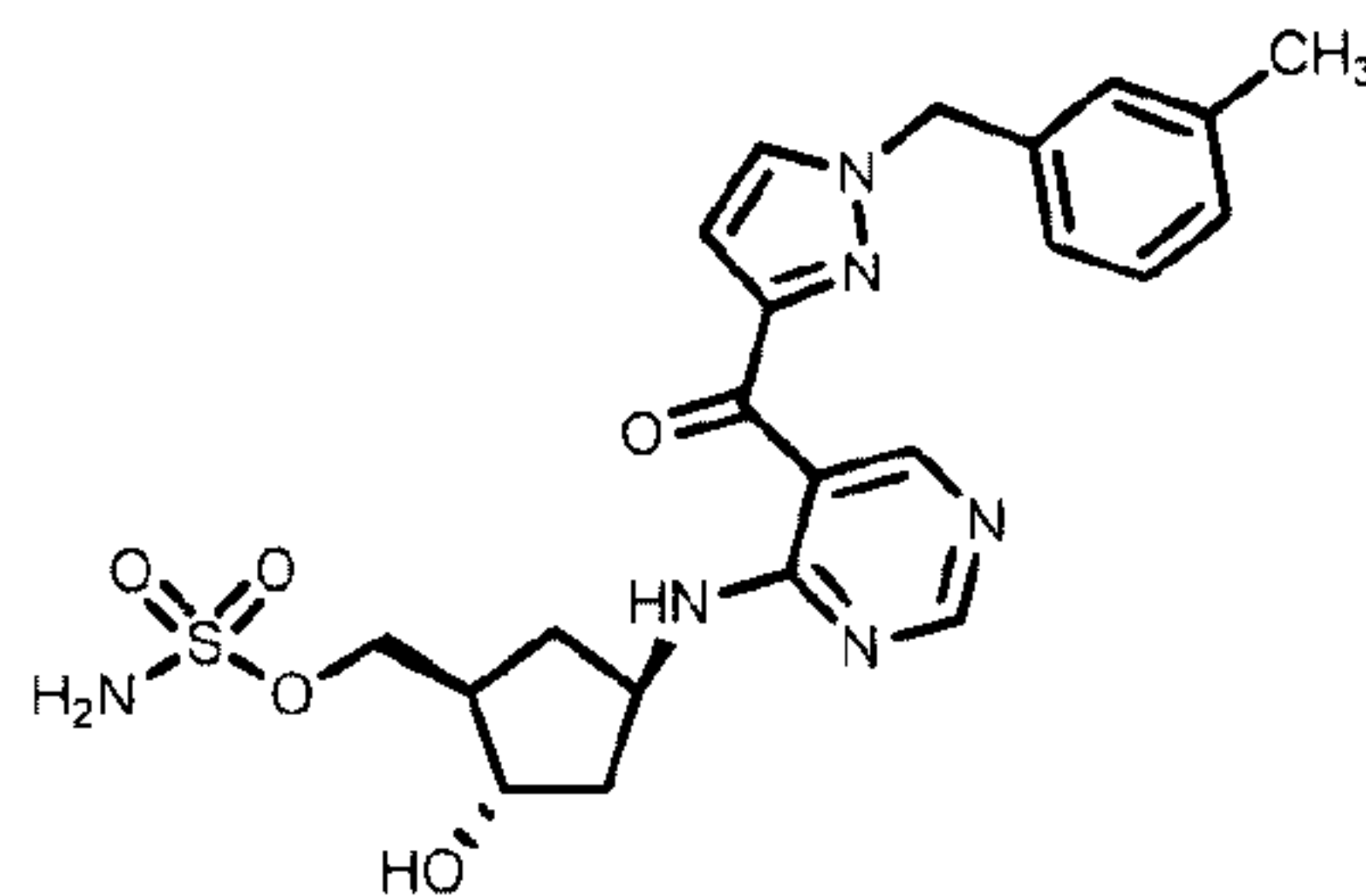
[(1R,2S,4R)-4-{[5-({1-[(6-chloropyridin-2-yl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate of formula I-95:



I-95.

460. The compound of claim 1, wherein the compound is:

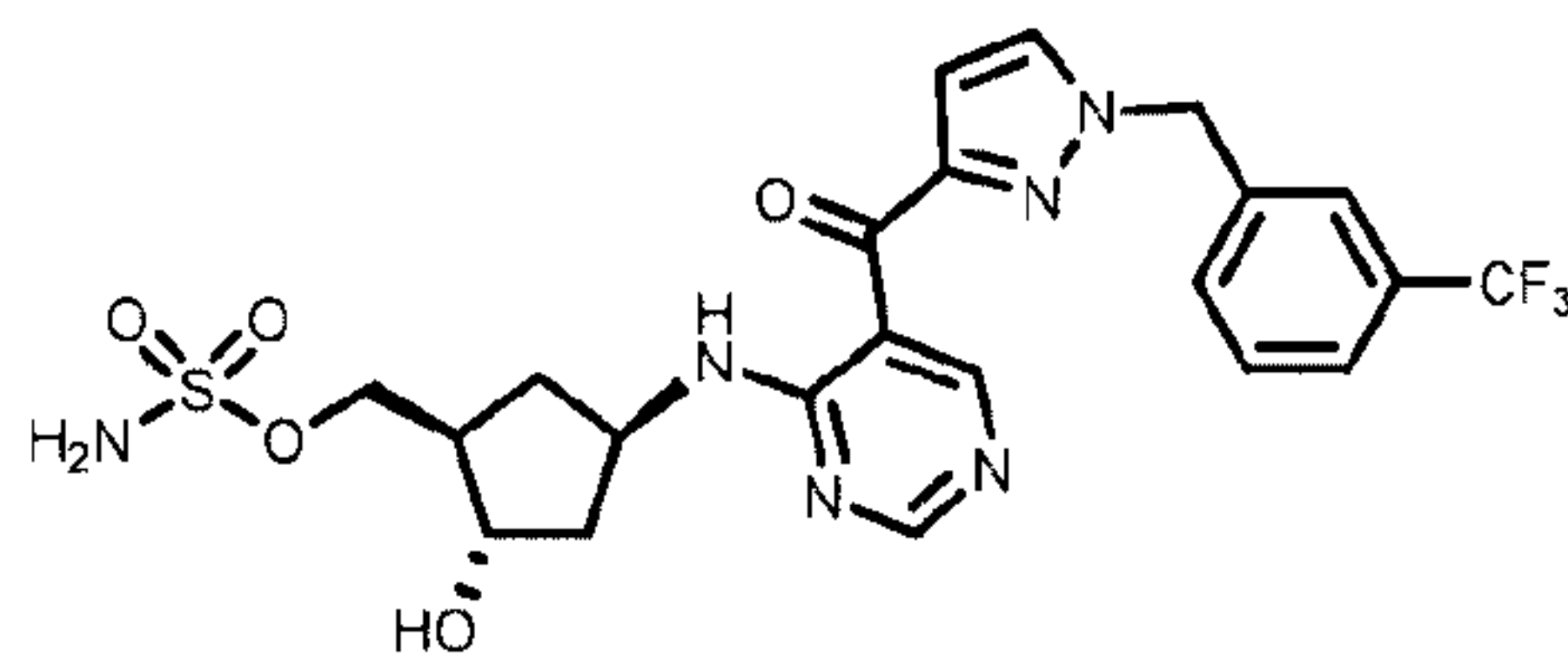
{(1R,2S,4R)-2-hydroxy-4-[(5-{[1-(3-methylbenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]cyclopentyl}methyl sulfamate of formula I-128:



I-128.

461. The compound of claim 1, wherein the compound is:

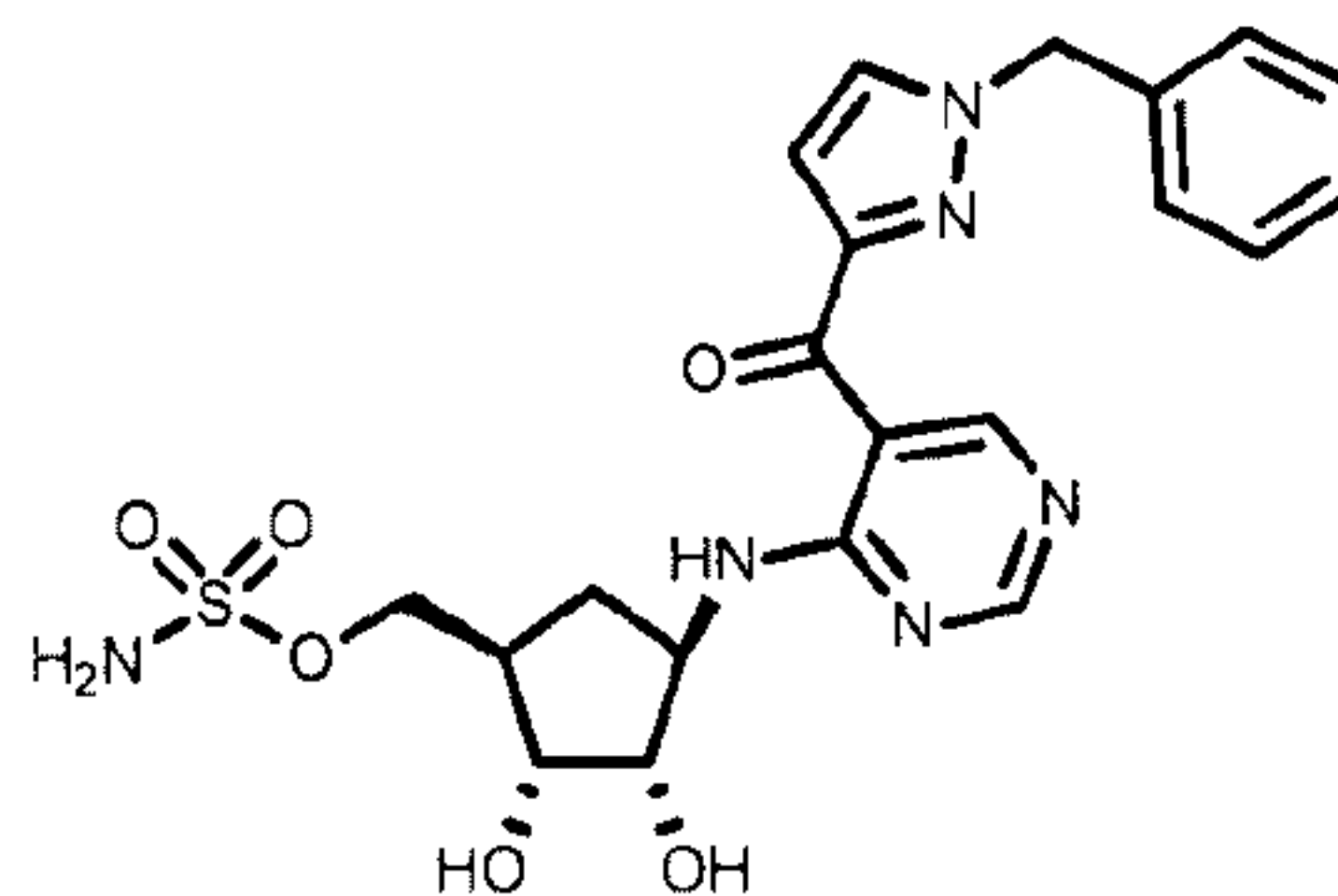
[(1R,2S,4R)-2-hydroxy-4-{{5-({1-[3-(trifluoromethyl)benzyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl}amino}cyclopentyl]methyl sulfamate of formula I-140:



I-140.

462. The compound of claim 1, wherein the compound is:

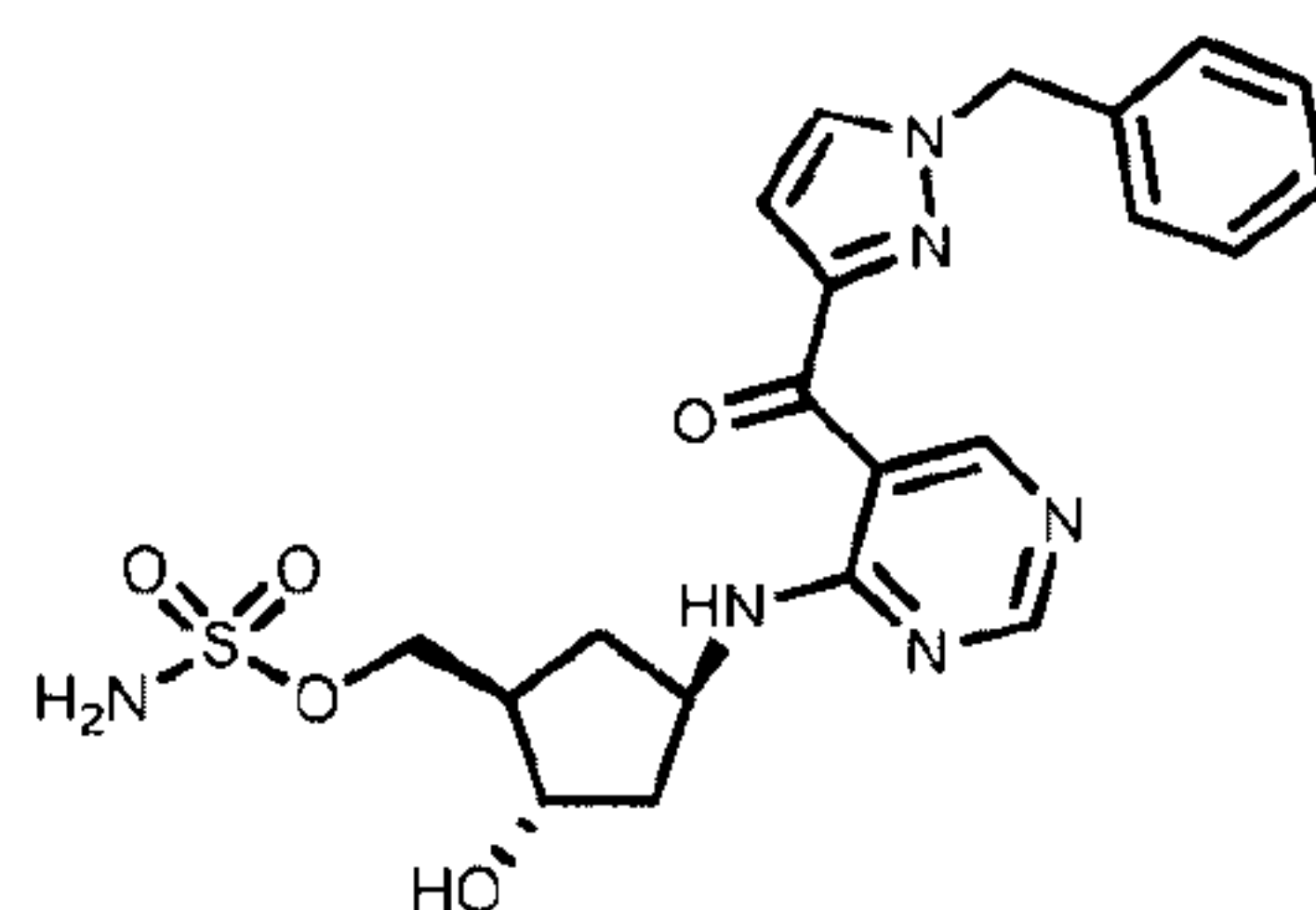
[(1R,2R,3S,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2,3-dihydroxycyclopentyl]methyl sulfamate of formula I-142:



I-142.

463. The compound of claim 1, wherein the compound is:

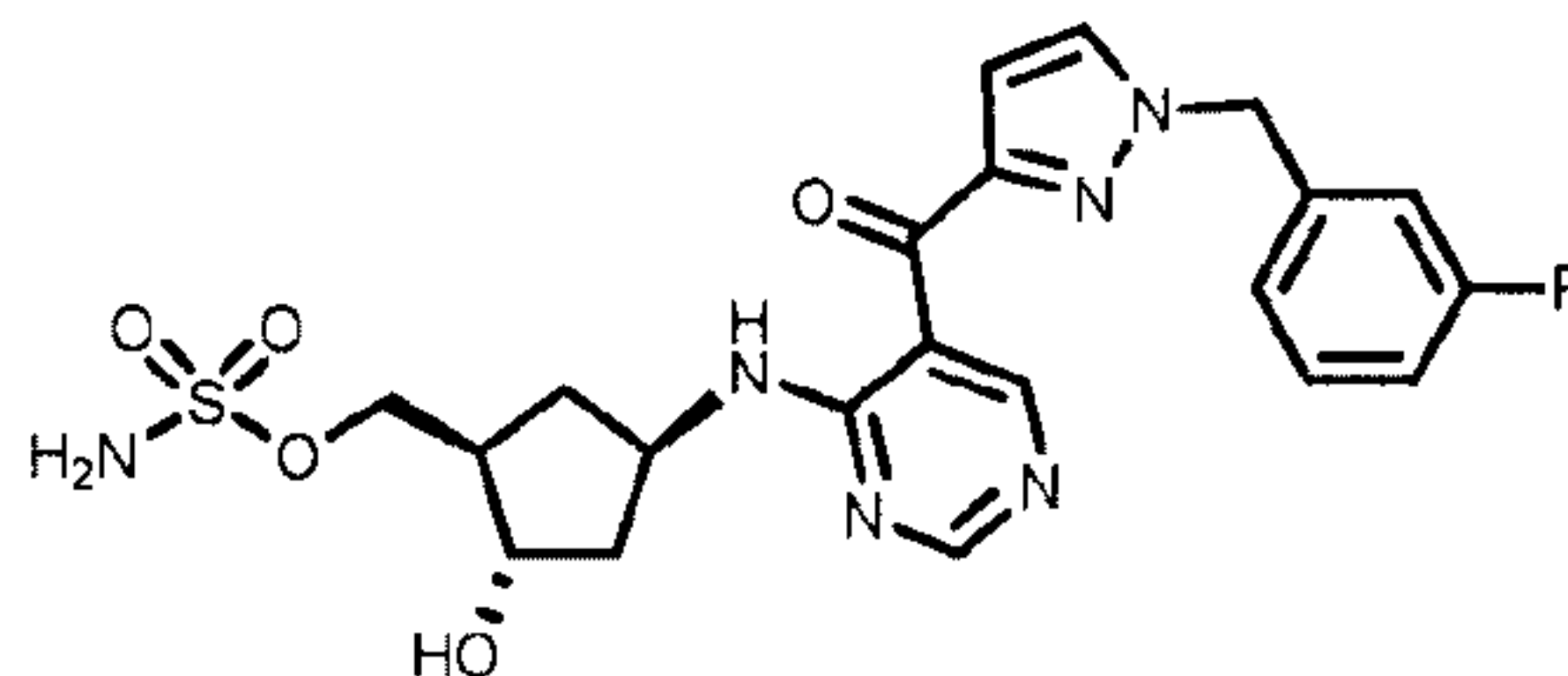
[(1R,2S,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-2-hydroxycyclopentyl]methyl sulfamate of formula I-158:



I-158.

464. The compound of claim 1, wherein the compound is:

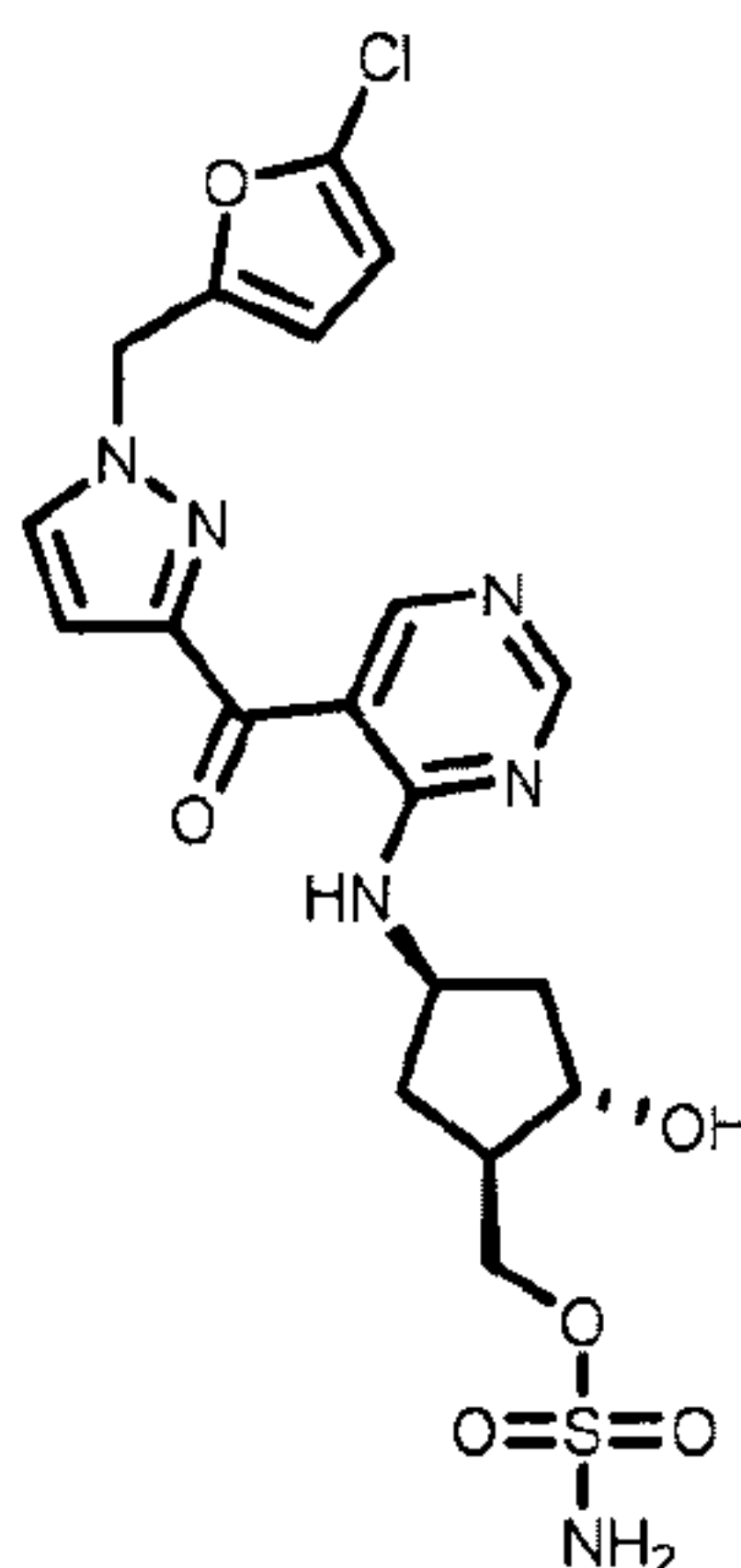
{(1R,2S,4R)-4-[(5-{[1-(3-fluorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate of formula I-165:



I-165.

465. The compound of claim 1, wherein the compound is:

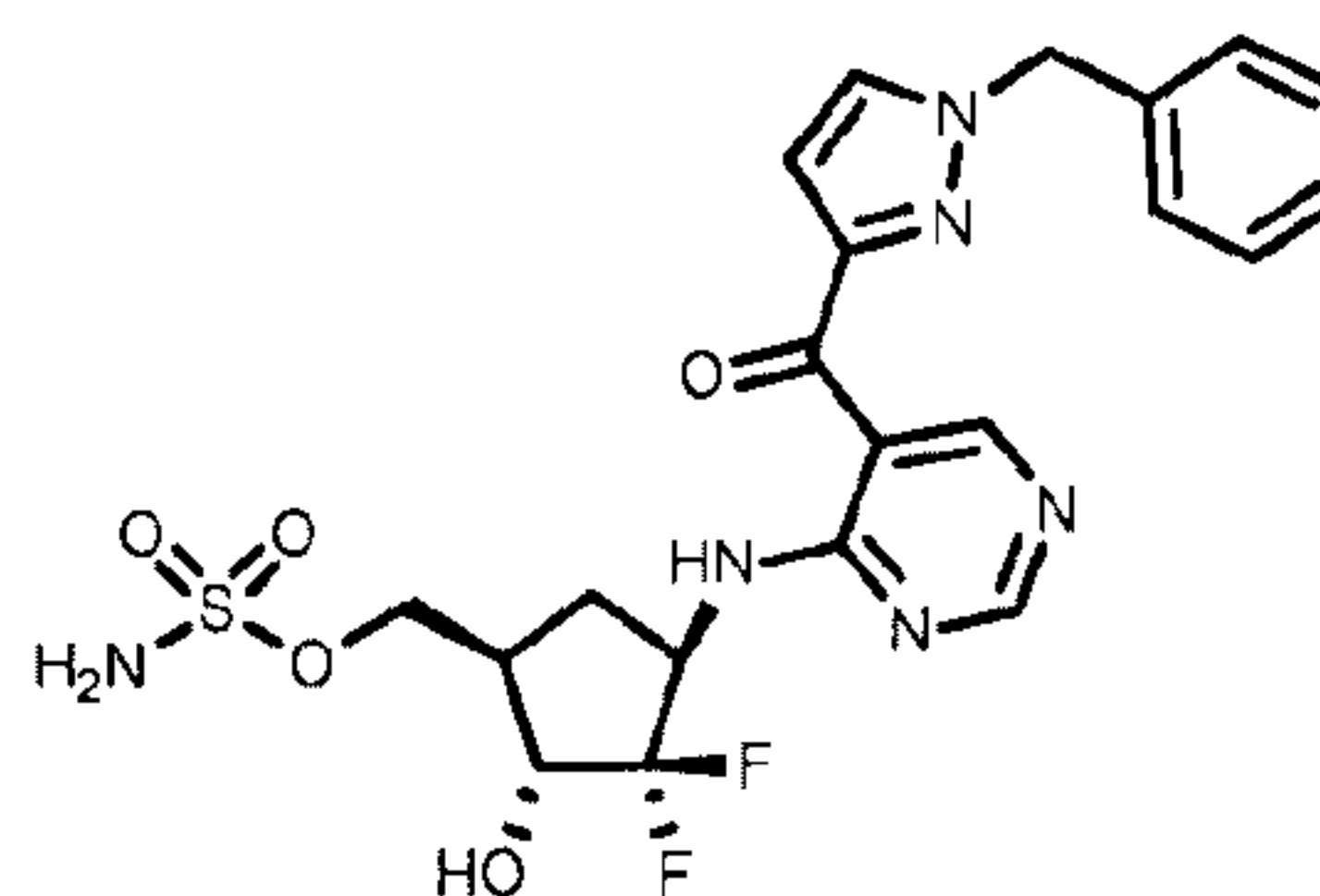
[(1R,2S,4R)-4-{[5-({1-[(5-chloro-2-furyl)methyl]-1H-pyrazol-3-yl}carbonyl)pyrimidin-4-yl]amino}-2-hydroxycyclopentyl]methyl sulfamate of formula I-180:



I-180.

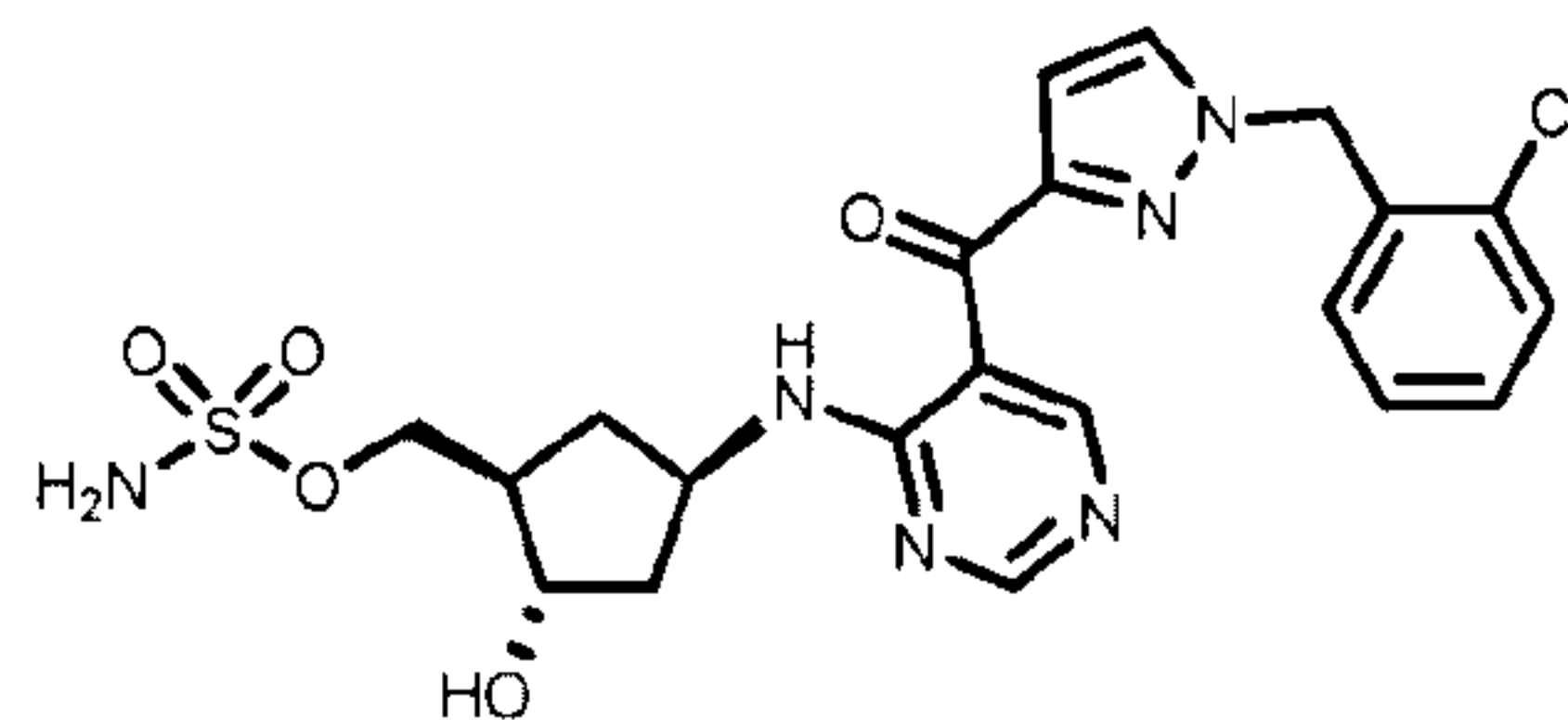
466. The compound of claim 1, wherein the compound is:

[(1R,2R,4R)-4-({5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino)-3,3-difluoro-2-hydroxycyclopentyl]methyl sulfamate of formula I-203:



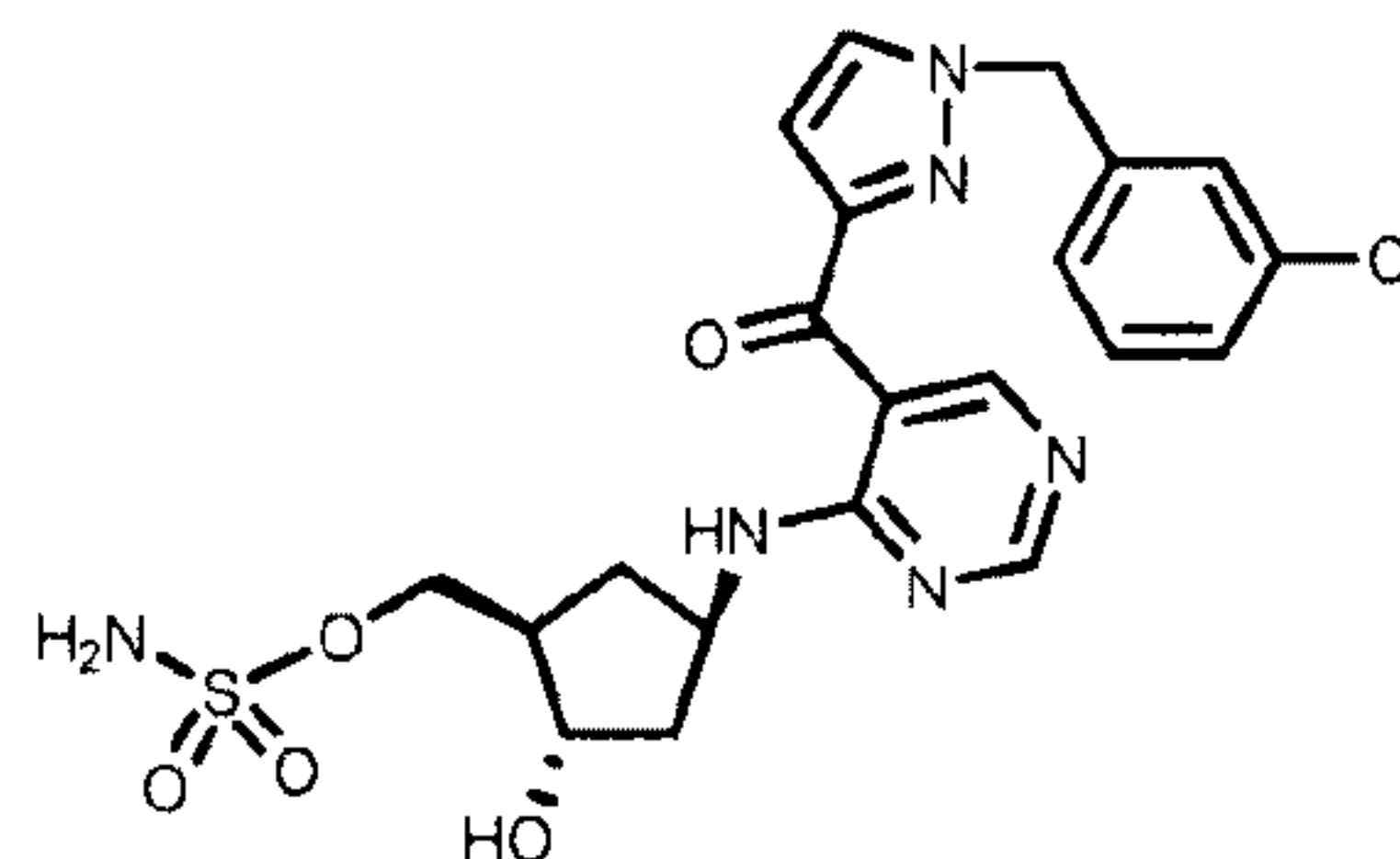
I-203.

467. The compound of claim 1, wherein the compound is:
 {(1R,2S,4R)-4-[(5-{[1-(2-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate of formula I-206:



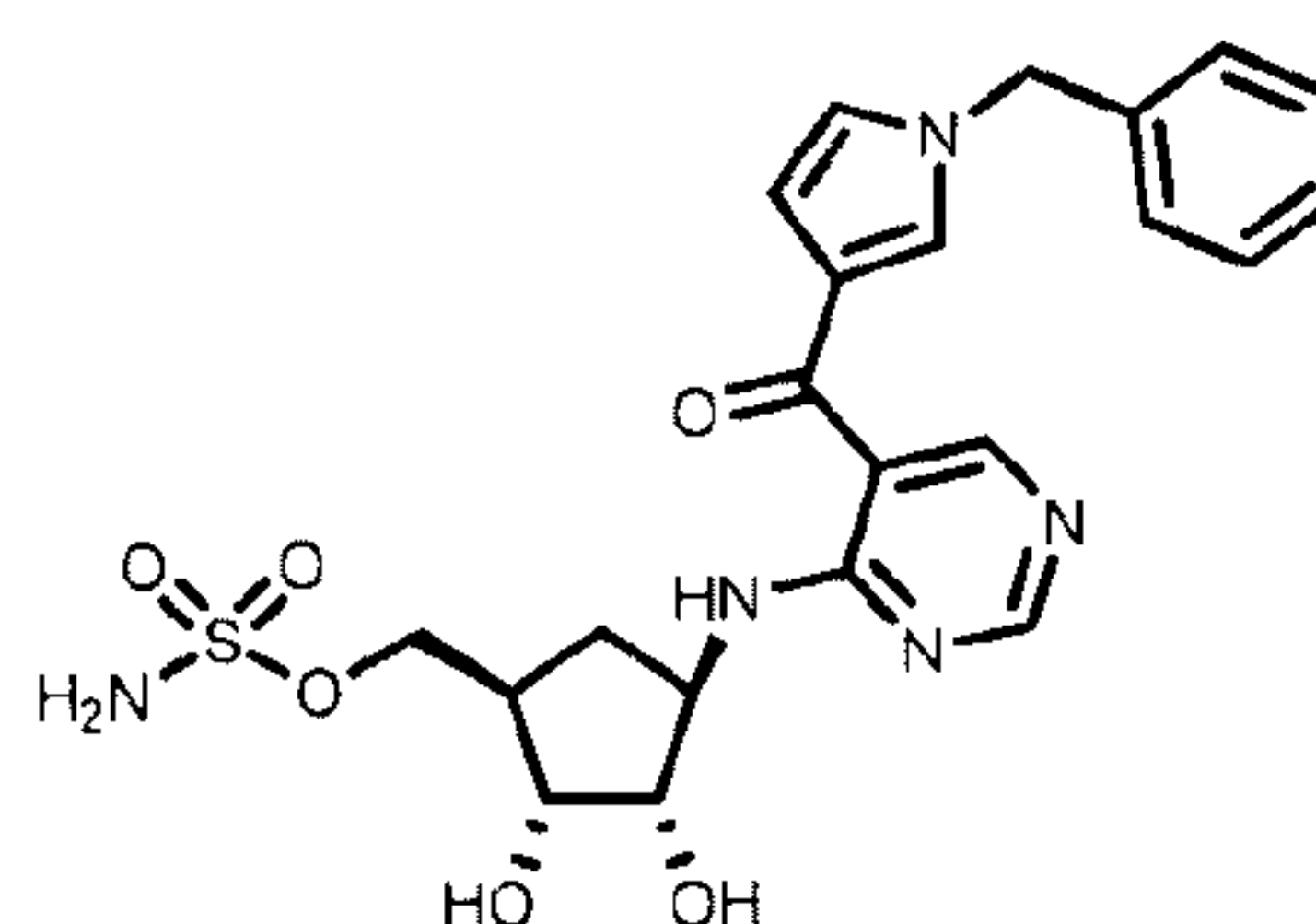
I-206.

468. The compound of claim 1, wherein the compound is:
 {(1R,2S,4R)-4-[(5-{[1-(3-chlorobenzyl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate of formula I-215:



I-215.

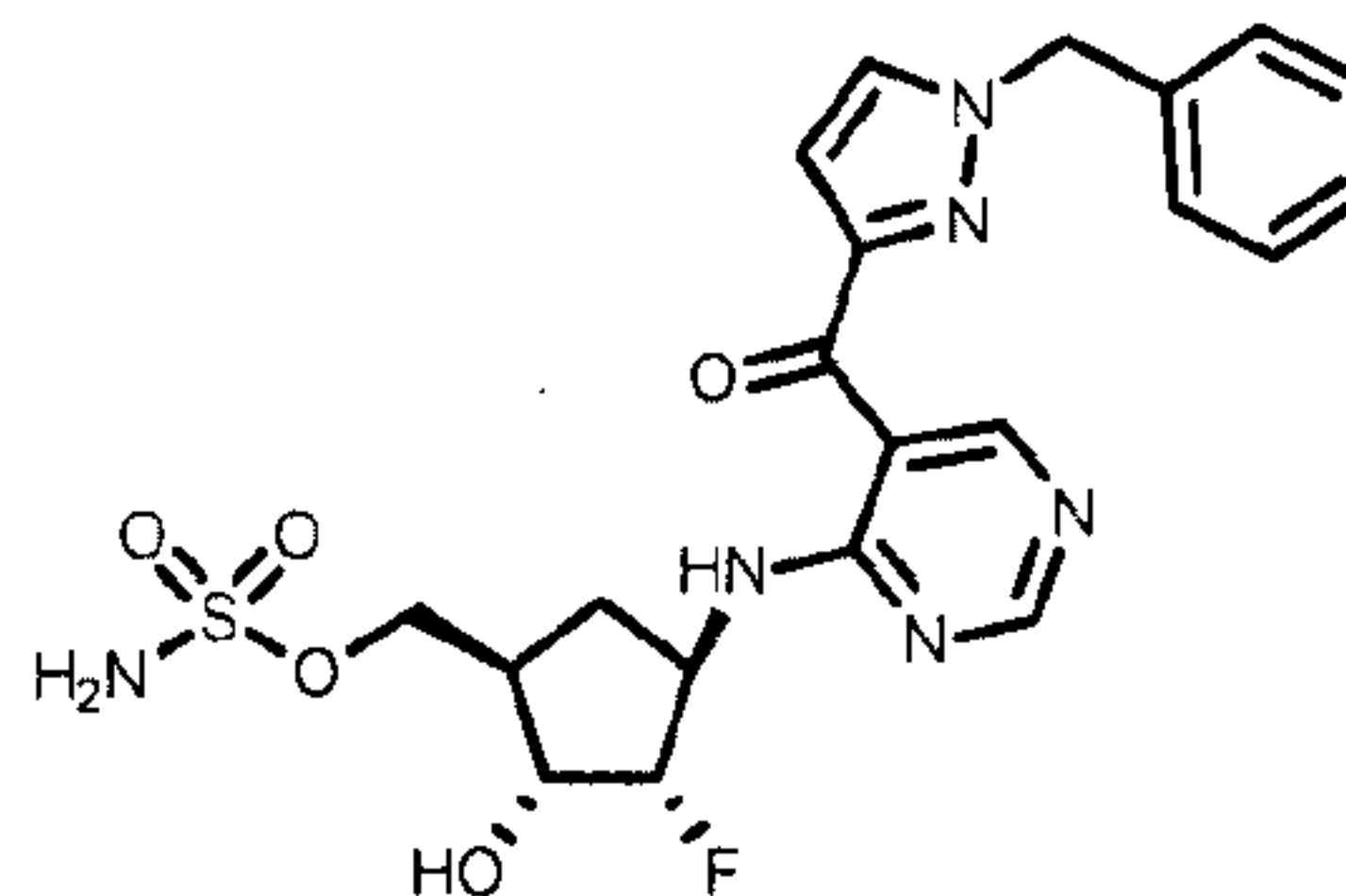
469. The compound of claim 1, wherein the compound is:
 [(1R,2R,3S,4R)-4-(5-{[1-(benzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino)-2,3-dihydroxycyclopentyl]methyl sulfamate of formula I-217:



I-217.

470. The compound of claim 1, wherein the compound is:

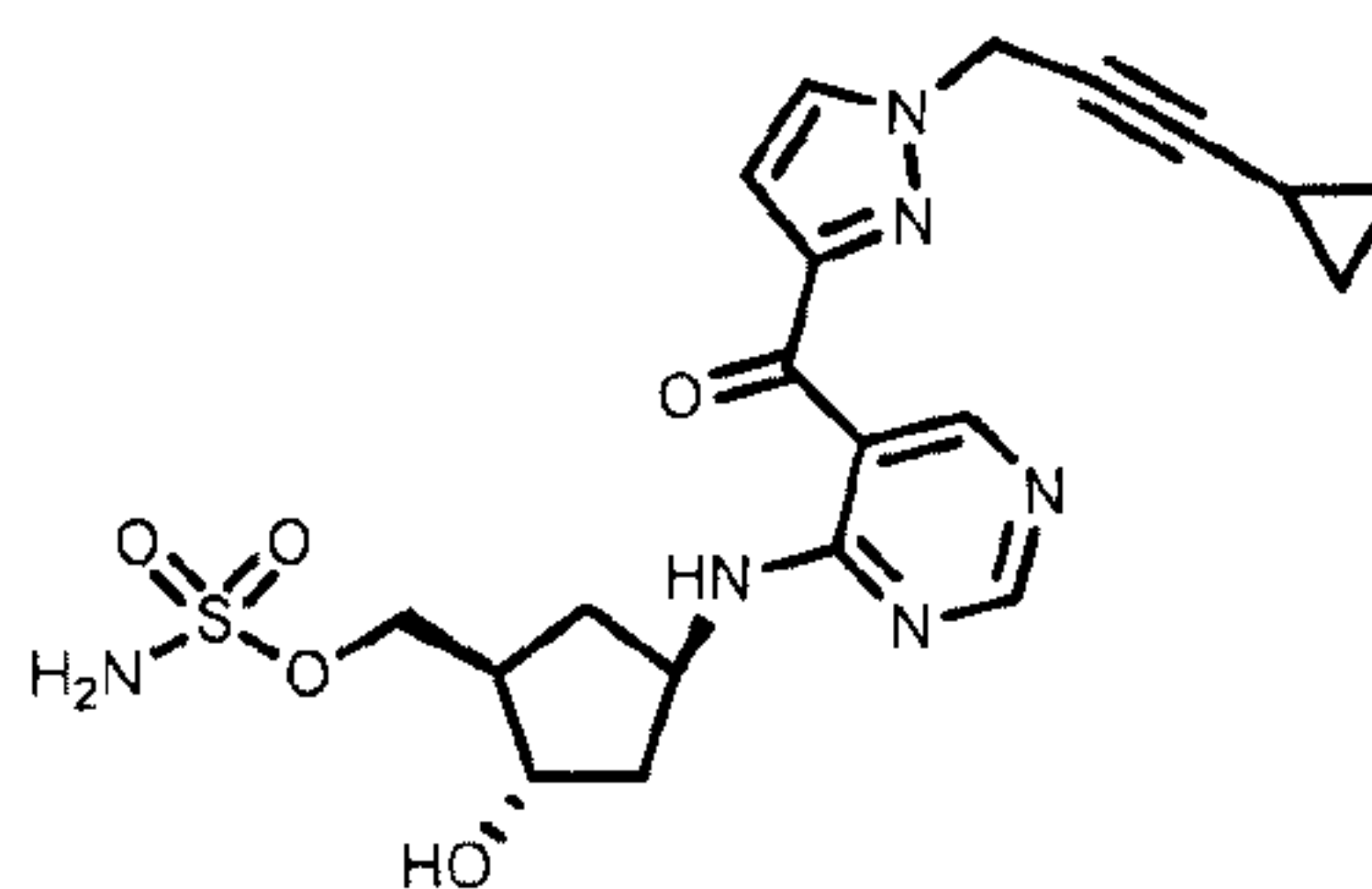
[(1R,2R,3S,4R)-4-(5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl)amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate of formula I-227:



I-227.

471. The compound of claim 1, wherein the compound is:

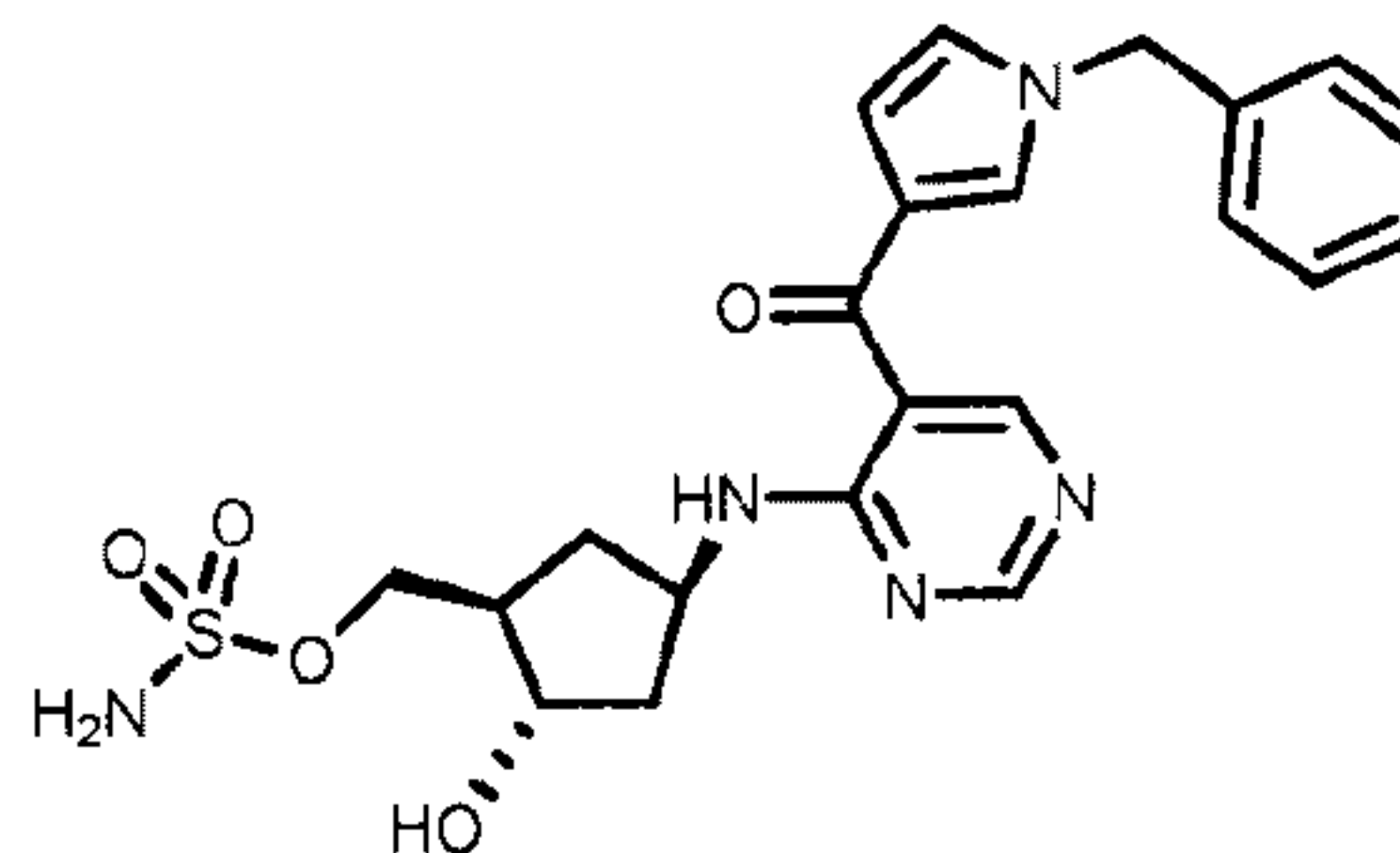
{(1R,2S,4R)-4-[(5-{[1-(3-cyclopropylprop-2-yn-1-yl)-1H-pyrazol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl}methyl sulfamate of formula I-287:



I-287.

472. The compound of claim 1, wherein the compound is:

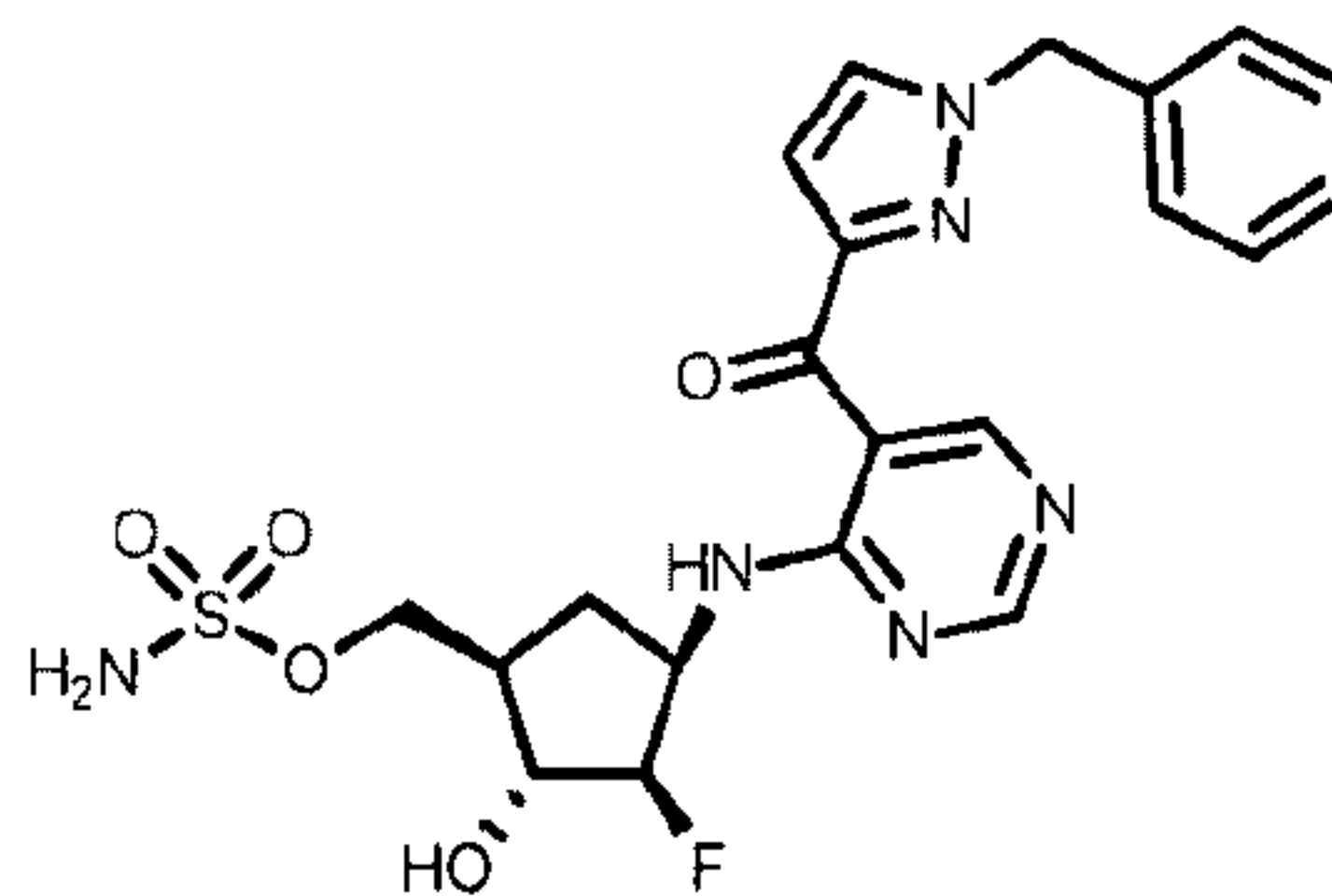
[(1R,2S,4R)-4-(5-[(1-benzyl-1H-pyrrol-3-yl)carbonyl]pyrimidin-4-yl)amino)-2-hydroxycyclopentyl]methyl sulfamate of formula I-300:



I-300.

473. The compound of claim 1, wherein the compound is:

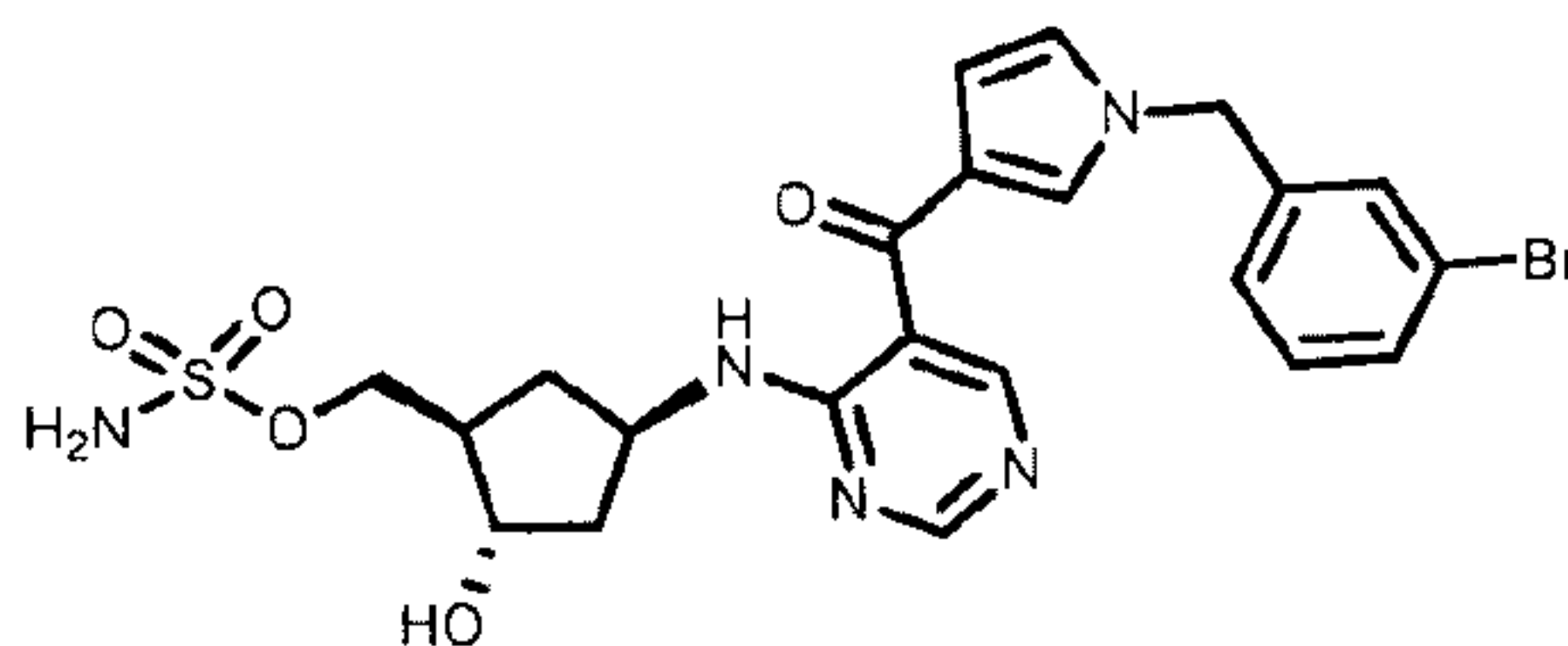
[(1R,2R,3R,4R)-4-(5-[(1-benzyl-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl)amino)-3-fluoro-2-hydroxycyclopentyl]methyl sulfamate of formula I-317:



I-317.

474. The compound of claim 1, wherein the compound is:

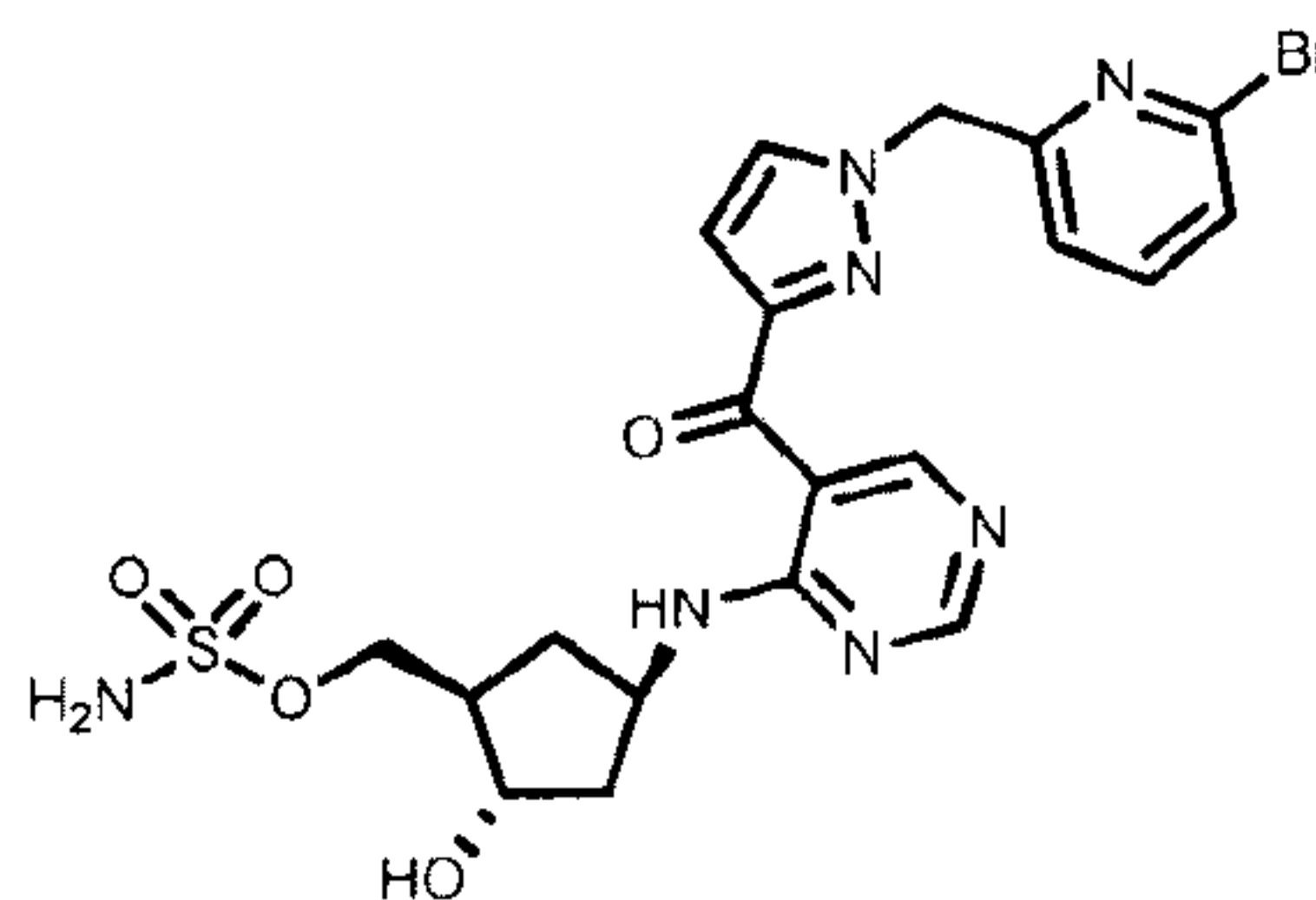
{(1R,2S,4R)-4-[(5-{[1-(3-bromobenzyl)-1H-pyrrol-3-yl]carbonyl}pyrimidin-4-yl)amino]-2-hydroxycyclopentyl]methyl sulfamate of formula I-333:



I-333.

475. The compound of claim 1, wherein the compound is:

[(1R,2S,4R)-4-{5-[(1-[(6-bromopyridin-2-yl)methyl]-1H-pyrazol-3-yl)carbonyl]pyrimidin-4-yl}amino}-2-hydroxycyclopentyl]methyl sulfamate of formula I-352:

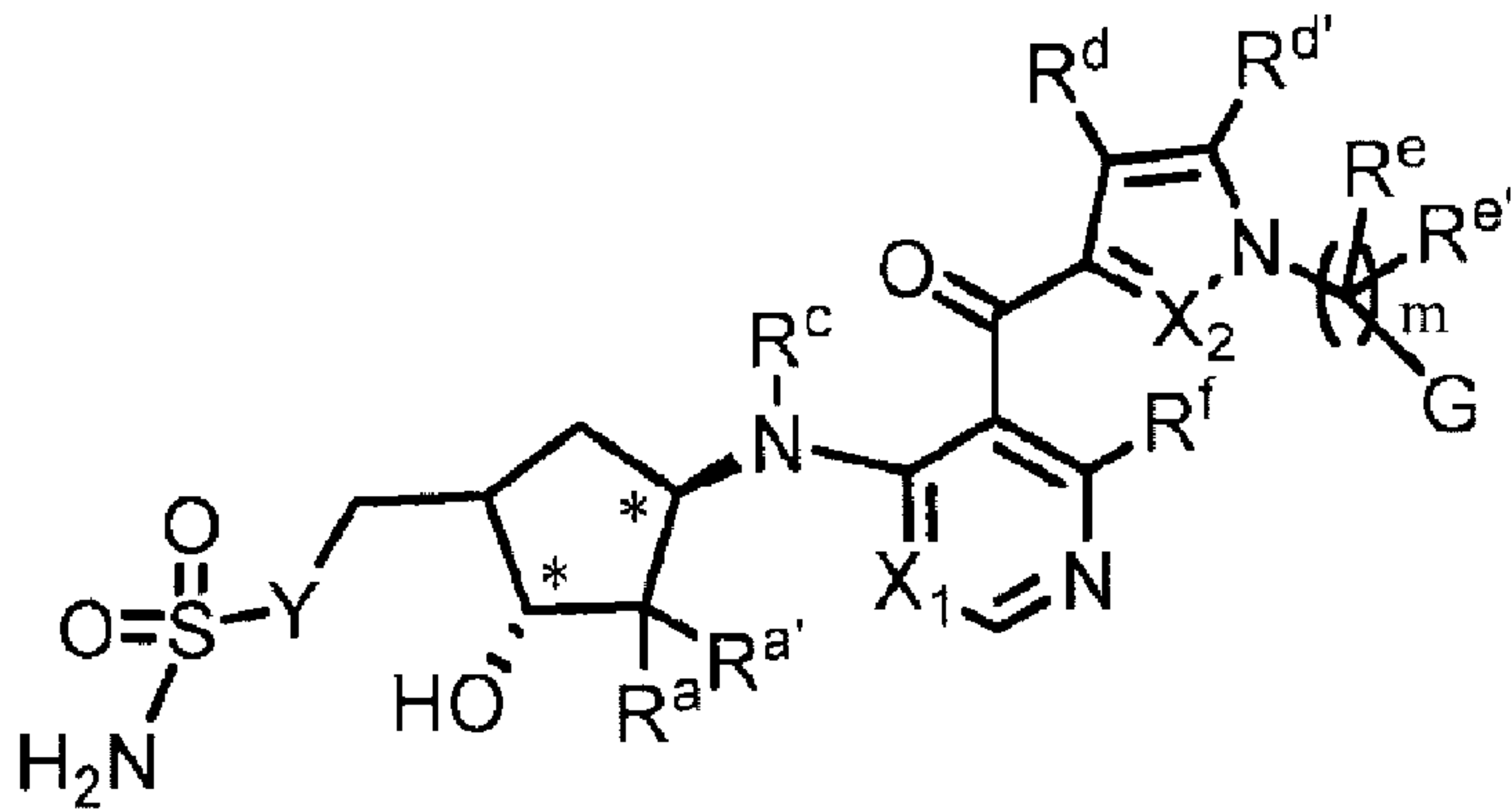


I-352.

476. The compound of any one of claims 1-435 and 453-475 for use in inhibiting Sumo Activating Enzyme (SAE).

477. The compound of claim 476 for use in inhibiting SAE *in vitro*.

478. The compound of claim 476 for use in inhibiting SAE *in vivo*.



(I)