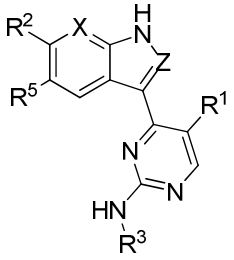
1. A compound as represented by formula I-A, a stereoisomer thereof, a diastereoisomer thereof, or a pharmaceutically acceptable salt of any one of the described substances, or a crystalline form or a solvate



I-A

of any one of the described substances:

R^1 is H, CF_3, CHF_2, F, Cl, Br, C_1-C_6 alkyl, -C(=O)NH_2, or CN; preferably CF_3, CHF_2, F, Cl, Br; more preferably CF_3;

R^5 is H, halogen, C_1-C_6 alkyl, or C_1-C_6 alkoxy; preferably H;

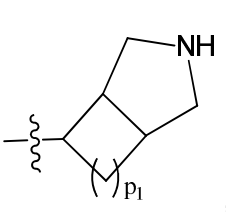
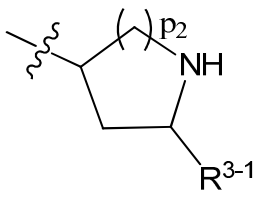
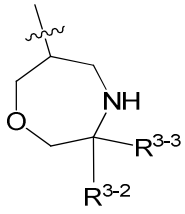
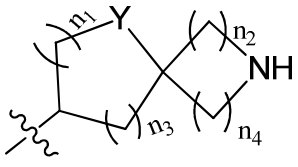
X is N or C(R^4), and R^4 is -P(=O)Me_2;

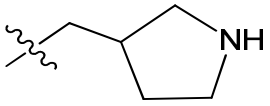
Z is N or CH;

R^2 is H, halogen, "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S," "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-1}, "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S," "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-2}, "4- to 12-membered heterocycloalkenyl having 1–4 heteroatoms selected from one or more of N, O, and S," "4- to 12-membered heterocycloalkenyl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-3}, C_2-C_6 alkynyl, C_1-C_6 alkyl, C_1-C_6 alkoxy, or CN;

R^{a-1}, R^{a-2}, and R^{a-3} are independently CN, oxo, C_1-C_6 alkyl substituted with one or more R^{a-1-1}, NH_2, OH, or C_1-C_6 alkyl; R^{a-1-1} is independently CN, OH, or halogen;

R^3 is C_3-C_8 cycloalkyl substituted with one or more R^{b-1}, C_1-C_6 alkyl substituted with one or more R^{b-2},


,

,

,

, "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O" and substituted with one or more R^{b-3},


, or "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S";

R^{b-1} is independently halogen, OH, -N$R^{b-1-1}R^{b-1-2}$, C_1-C_6 alkyl, or "C_1-C_6 alkyl substituted with one or more R^{b-1-3}";

R^{b-1-1} and R^{b-1-2} are independently H or C_1-C_6 alkyl (for example, methyl);

R^{b-1-3} is independently OH or $NR^{b-1-4}R^{b-1-5}$; R^{b-1-4} and R^{b-1-5} are independently H or C_1-C_6 alkyl (for example, methyl);

R^{b-2} is independently OH, halogen, C_3-C_8 cycloalkyl, C_3-C_8 cycloalkyl substituted with one or more R^{b-2-1}, 4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O, or "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O and substituted with one or more R^{b-2-2}";

R^{b-2-1} and R^{b-2-2} are independently OH, C_1-C_6 alkyl (for example, methyl), or "C_1-C_6 alkyl (for example, methyl) substituted with one or more OH";

p_1 is 0, 1, 2, or 3 (preferably 0 or 3);

p_2 is 2 or 3, R^{3-1} is H or C_1-C_6 alkyl (for example, methyl);

R^{3-2} and R^{3-3} are independently H, C_1-C_6 alkyl (for example, methyl), or "C_1-C_6 alkyl substituted with one or more halogens";

Y is O or CH_2, n_1 is 1 or 2, n_2, n_3, and n_4 are independently 0, 1, 2, or 3, and n_2 and n_4 are not 0 at the same time;

R^{b-3} is independently halogen, OH, C_1-C_6 alkyl (for example, methyl), or "C_1-C_6 alkyl (for example, methyl) substituted with one or more OH";

or R^3 represents $-(CR^{M1}R^{M2})_m-(L)_s-(CR^{N1}R^{N2})_t-M$;

wherein R^{M1}, R^{M2}, R^{N1}, and R^{N2} each independently represent hydrogen, and C_1-C_6 alkyl, and C_3-C_6 cycloalkyl substituted with 0, 1, 2 selected from hydroxyl, C_1-C_6 alkyl, and halogen; or R^{M1}, R^{M2}, R^{N1}, and R^{N2} each independently form a 3- to 6-membered ring together with carbon atoms to which they are jointly attached, and the ring optionally contains 0, 1, 2 heteroatoms selected from O, N, and S; further, the ring can be furthermore optionally substituted with 0, 1, 2 substituents selected from halogen, C_1-C_6 alkyl, and hydroxyl;

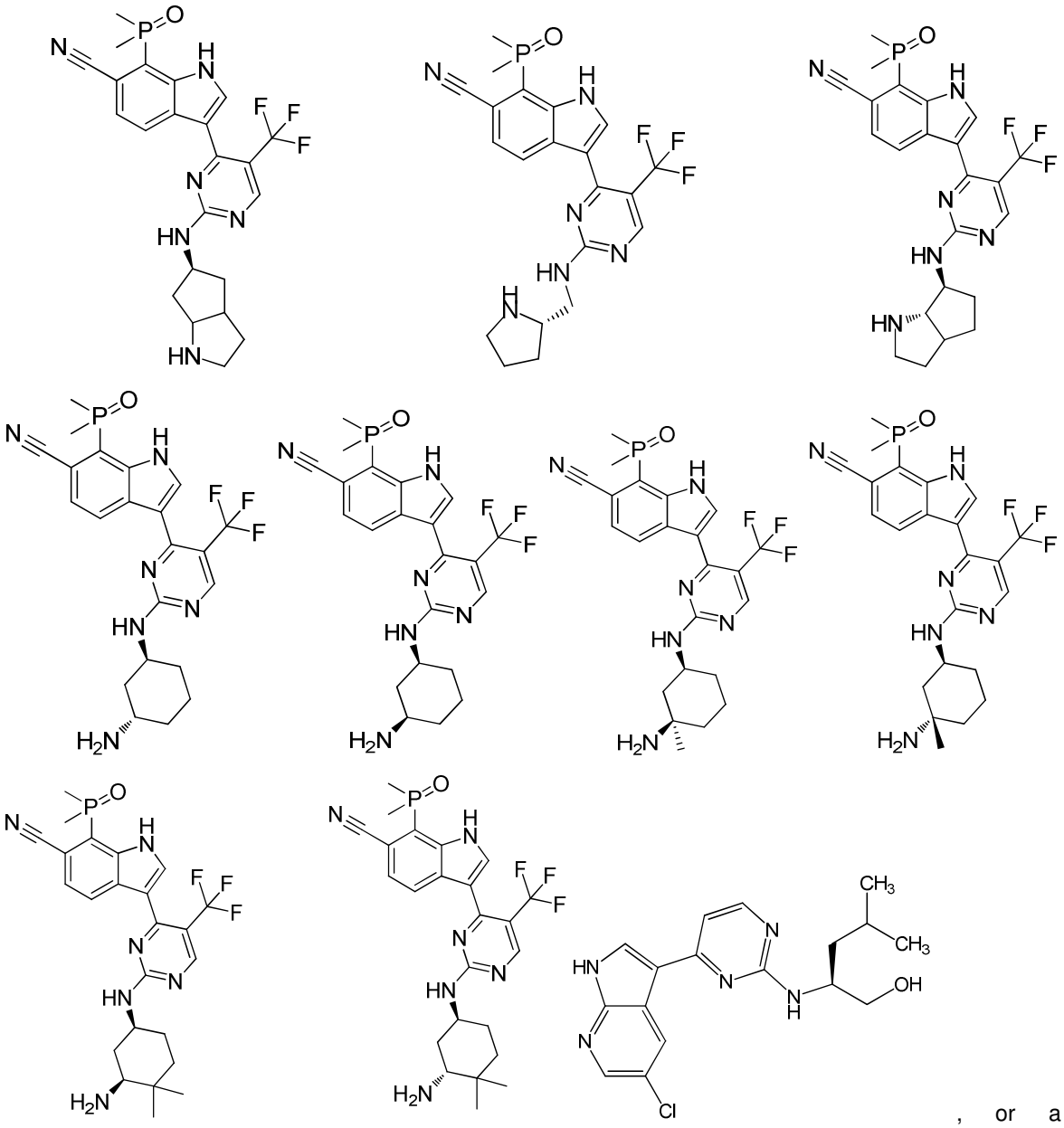
wherein L represents $-CR^{Q1}R^{Q2}-$ or -C_3-C_6 cycloalkyl-; wherein R^{Q1} and R^{Q2} each independently represent hydrogen, and C_1-C_6 alkyl, and C_3-C_6 cycloalkyl substituted with 0, 1, 2 selected from hydroxyl, C_1-C_6 alkyl, and halogen; or R^{Q1} and R^{Q2} each independently form a 3- to 6-membered ring together with carbon atoms to which they are jointly attached, and the ring optionally contains 0, 1, 2 heteroatoms selected from O, N, and S; further, the ring can be furthermore optionally substituted with 0, 1, 2 substituents selected from halogen, C_1-C_6 alkyl, and hydroxyl;

wherein M represents hydrogen, hydroxyl, or C_1-C_6 alkyl and C_3-C_6 cycloalkyl substituted with 0, 1, 2 selected from hydroxyl, C_1-C_6 alkyl, and halogen;

wherein m, s, and t each independently represent 0, 1, 2, 3;

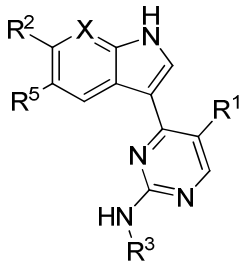
wherein at least one group in $-(CR^{M1}R^{M2})_m-(L)_s-(CR^{N1}R^{N2})_t-M$ is substituted with hydroxyl;

the premise is that the compound as represented by formula I-A does not include:



, or a pharmaceutically acceptable salt, a stereoisomer, a tautomer, a hydrate, a solvate, an isotopic compound, or a prodrug of any one of the above-mentioned substances.

2. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to Claim 1, characterized in that the compound as represented by formula I-A is



I

wherein,

R^1 is CF_3, F, Cl, Br, or CN;

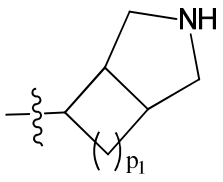
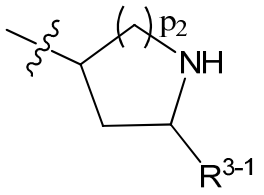
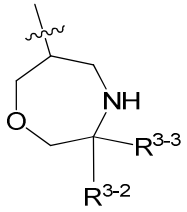
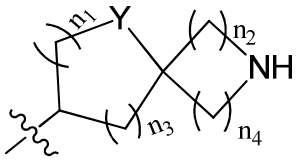
R^5 is H or halogen;

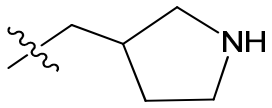
X is N or C(R^4), and R^4 is -P(=O)Me_2;

R^2 is H, halogen, "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S," "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-1}, "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S," "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-2}, C_2-C_6 alkynyl, or CN;

R^{a-1} and R^{a-2} are independently CN, oxo, C_1-C_6 alkyl substituted with one or more R^{a-1-1}, NH_2, OH, or C_1-C_6 alkyl; R^{a-1-1} is independently CN, OH, or halogen;

R^3 is C_3-C_8 cycloalkyl substituted with one or more R^{b-1}, C_1-C_6 alkyl substituted with one or more R^{b-2},


,

,

,

, "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O" and substituted with one or more OH,


, or "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S";

R^{b-1} is independently halogen, OH, -$NR^{b-1-1}R^{b-1-2}$, or "C_1-C_6 alkyl substituted with one or more R^{b-1-3}";

R^{b-1-1} and R^{b-1-2} are independently H or C_1-C_6 alkyl;

R^{b-1-3} is independently OH or $NR^{b-1-4}R^{b-1-5}$; R^{b-1-4} and R^{b-1-5} are independently H or C_1-C_6 alkyl;

R^{b-2} is independently OH, halogen, or "C_3-C_8 cycloalkyl substituted with one or more OH";

p_1 is 0, 1, 2, or 3;

p_2 is 2 or 3, and R^{3-1} is H or C_1-C_6 alkyl;

R^{3-2} and R^{3-3} are independently H, C_1-C_6 alkyl, or "C_1-C_6 alkyl substituted with one or more halogens";

Y is O or CH_2, n_1 is 1 or 2, n_2, n_3, and n_4 are independently 0, 1, 2, or 3, and n_2 and n_4 are not 0 at the same time.

3. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof,

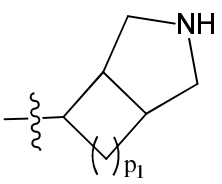
or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–2, characterized in that

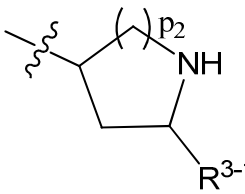
-R^1 is CF_3, CHF_2, F, Cl, Br, C_1-C_3 alkyl (for example, methyl), -C(=O)NH_2, or CN; and/or.

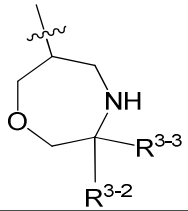
~~4. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–3, characterized in that the~~ R^5 represents H, F, Cl, Br, I, C_1-C_3 alkyl (for example, methyl), or C_1-C_3 alkoxy (for example, methoxy).

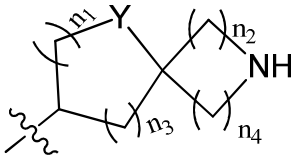
45. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–34, characterized in that

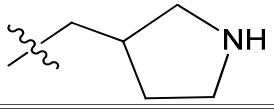
-the R^2 each independently represents H, F, Cl, Br, I, 5- to 6-membered heteroaryl having 1–4 heteroatoms selected from one or more of N and O, "5- to 6-membered heteroaryl having 1–4 heteroatoms selected from one or more of N and O" and substituted with one or 2 R^{a-1}, 4- to 12-membered heterocycloalkyl having 1–4 heteroatoms (preferably 1–2 heteroatoms) selected from one or more of N, O, and S, "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms (preferably 1–2 heteroatoms) selected from one or more of N, O, and S" and substituted with 1 or 2 R^{a-2}, 4- to -12-membered heterocycloalkenyl having 1–2 heteroatoms selected from one or more of N, O, and S, "4- to -12-membered heterocycloalkenyl having 1–2 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-3}, C_2-C_6 alkynyl, C_1-C_3 alkyl (for example, methyl), C_1-C_3 alkoxy (for example, methoxy), or CN, wherein the 4- to 12-membered heterocycloalkyl is a monocyclic ring, a bicyclic ring, or a bridged ring, and the bicyclic ring includes a spiro ring or a fused ring; and/or

R^3 is C_3-C_6 cycloalkyl substituted with 1, 2, or 3 R^{b-1}, methyl substituted with one or more R^{b-2}, ethyl substituted with one or more R^{b-2}, n-propyl substituted with one or more R^{b-2}, isopropyl substituted with one or more R^{b-2}, n-butyl substituted with one or more R^{b-2}, isobutyl substituted with one or more R^{b-2}, sec-butyl substituted with one or more R^{b-2}, 

, 

, 

, 

, "4- to 6-membered heterocycloalkyl having 1–2 heteroatoms being O" and substituted with 1 or 2 R^{b-3}, 

, or "5- to 6-membered heteroaryl having 1–4

heteroatoms selected from one or more of N.".

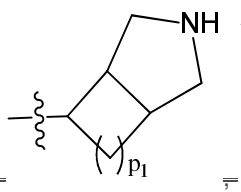
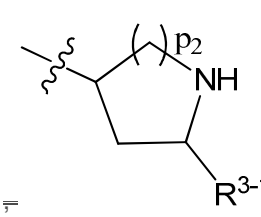
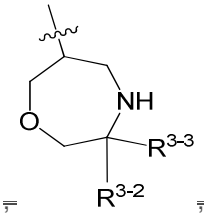
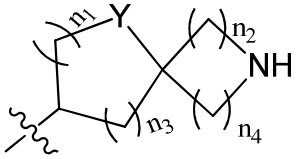
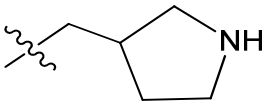
56. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–45, characterized in that

R^{a-1}, R^{a-2}, and R^{a-3} are independently CN, oxo, C_1-C_3 alkyl (for example, methyl) substituted with one or more R^{a-1-1}, NH_2, OH, or C_1-C_3 alkyl (for example, methyl); wherein the R^{a-1-1} is independently CN, OH, F, Cl, Br, or I; and/or

R^{b-1} is independently F, Cl, Br, I, OH, $-NR^{b-1-1}R^{b-1-2}$, C_1-C_3 alkyl (for example, methyl), or "C_1-C_3 alkyl (for example, methyl) substituted with one or more R^{b-1-3}"; and/or

R^{b-2} is independently OH, F, Cl, Br, I, C_3-C_7 cycloalkyl or C_3-C_7 cycloalkyl substituted with 1 or 2 R^{b-2-1}, 4- to 6-membered heterocycloalkyl having 1 heteroatom being O, or 4- to 6-membered heterocycloalkyl having 1 heteroatom being O and substituted with 1 or 2 R^{b-2-2}; wherein R^{b-2-1} and R^{b-2-2} are independently OH, C_1-C_3 alkyl, or C_1-C_3 alkyl substituted with one or more OH; and/or

R^{b-3} is independently F, Cl, Br, I, OH, C_1-C_3 alkyl, or C_1-C_3 alkyl substituted with one or more OH.

~~7. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–6, characterized in that the R^3 is C_3-C_6 cycloalkyl substituted with 1, 2, or 3 R^{b-1}, methyl substituted with one or more R^{b-2}, ethyl substituted with one or more R^{b-2}, n-propyl substituted with one or more R^{b-2}, isopropyl substituted with one or more R^{b-2}, n-butyl substituted with one or more R^{b-2}, isobutyl substituted with one or more R^{b-2}, sec-butyl substituted with one or more R^{b-2},~~     ~~, "4- to 6-membered heterocycloalkyl having 1–2 heteroatoms being O" and substituted with 1 or 2 R^{b-3},~~  ~~, or "5- to 6-membered heteroaryl having 1–4 heteroatoms selected from one or more of N."~~

~~8. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–7, characterized in that R^{b-1} is independently F, Cl, Br, I, OH, $-NR^{b-1-1}R^{b-1-2}$, C_1-C_3 alkyl (for example, methyl), or "C_1-C_3 alkyl (for example, methyl) substituted with one or more R^{b-1-3}."~~ R^{b-2} ~~is independently OH, F, Cl, Br, I, C_3-C_7~~

~~cycloalkyl or C_3-C_7 cycloalkyl substituted with 1 or 2 R^{b-2-1}, 4- to 6-membered heterocycloalkyl having 1 heteroatom being O, or 4- to 6-membered heterocycloalkyl having 1 heteroatom being O and substituted with 1 or 2 R^{b-2-2};~~

~~wherein R^{b-2-1} and R^{b-2-2} are independently OH, C_1-C_3 alkyl, or C_1-C_3 alkyl substituted with one or more OH.~~

69. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–58, characterized in that R^{b-1-1} and R^{b-1-2} are independently H or C_1-C_3 alkyl;

R^{b-1-4} and R^{b-1-5} are independently H or C_1-C_3 alkyl.

~~10. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–9, characterized in that R^{b-2} is independently OH, F, Cl, Br, I, C_3-C_7 cycloalkyl or C_3-C_7 cycloalkyl substituted with 1 or 2 R^{b-2-1}, 4- to 6-membered heterocycloalkyl having 1 heteroatom being O, or 4- to 6-membered heterocycloalkyl having 1 heteroatom being O and substituted with 1 or 2 R^{b-2-2};~~

~~wherein R^{b-2-1} and R^{b-2-2} are independently OH, C_1-C_3 alkyl, or C_1-C_3 alkyl substituted with one or more OH.~~

711. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–610, characterized in that

R^{3-1} is H or C_1-C_3 alkyl; and/or

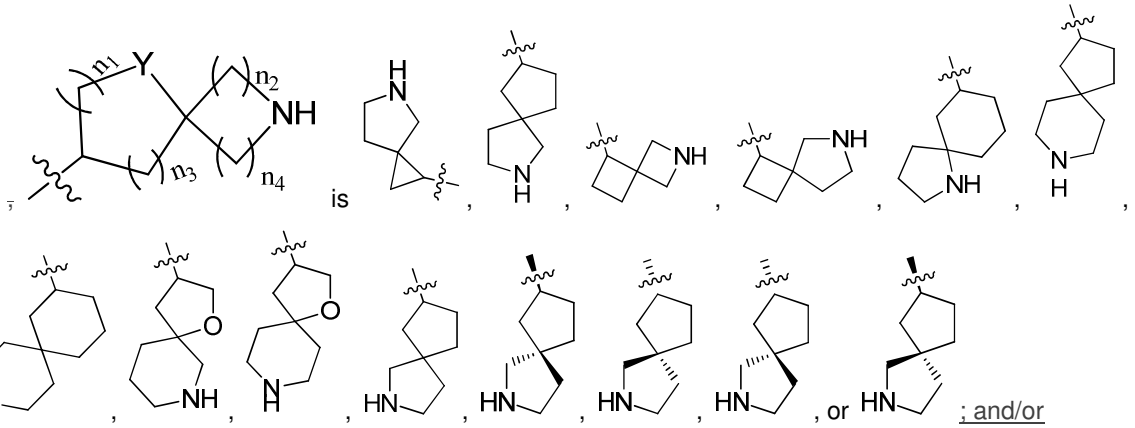
~~,~~

~~12. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–11, characterized in that~~ R^{3-2} and R^{3-3} are independently H, C_1-C_3 alkyl, or "C_1-C_3 alkyl substituted with one or more halogens."

~~13. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–12, characterized in that R^{b-3} is independently F, Cl, Br, I, OH, C_1-C_3 alkyl, or C_1-C_3 alkyl substituted with one or more OH.~~

814. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline

form or the solvate of any one of the described substances according to at least one of Claims 1–7~~13~~, characterized in that, in R^3:

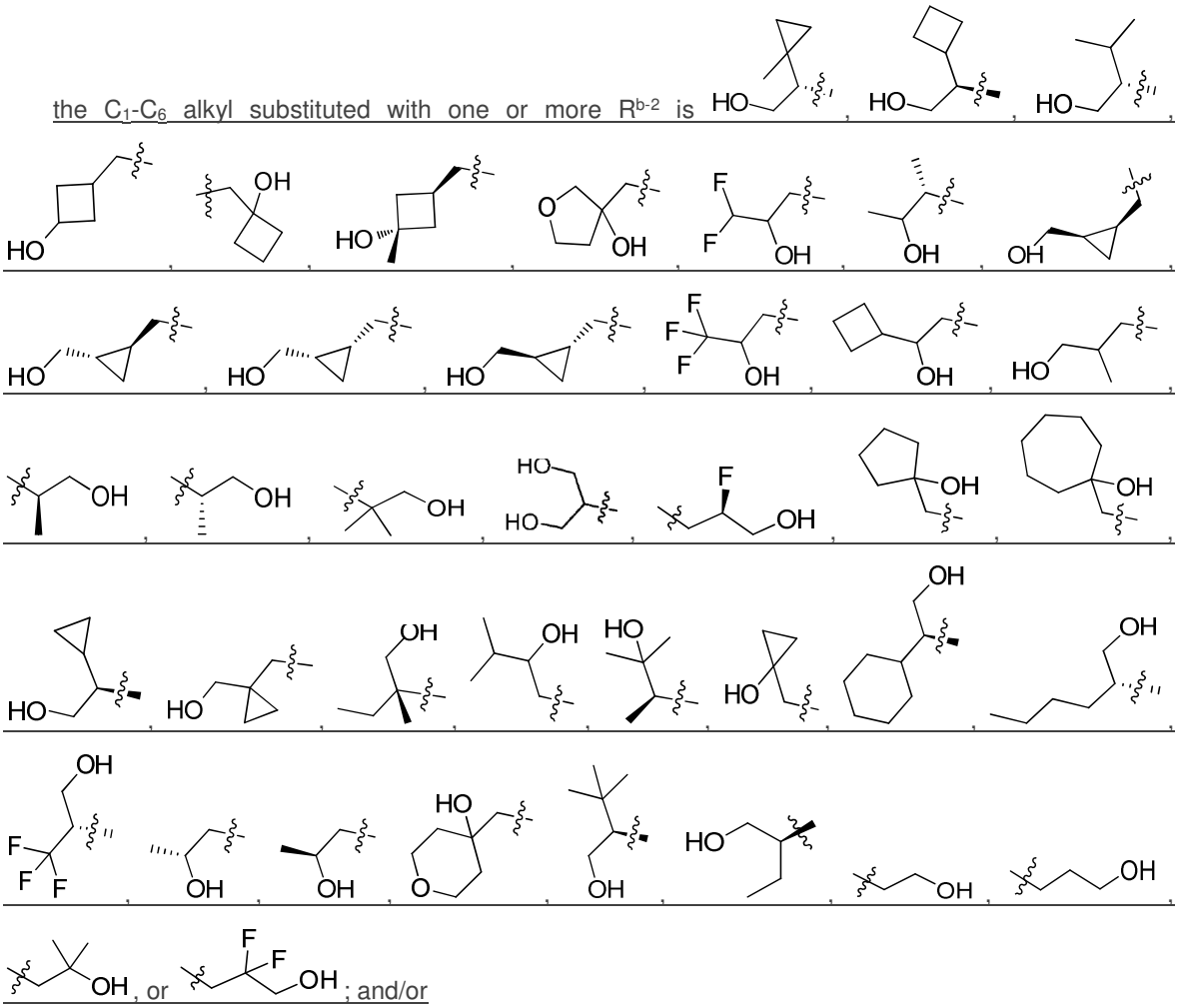


, or ; and/or

the C_3-C_8 cycloalkyl substituted with one or more R^{b-1} is cyclopropyl substituted with 1, 2, or 3 R^{b-1}, cyclobutyl substituted with 1, 2, or 3 R^{b-1}, cyclopentyl substituted with 1, 2, or 3 R^{b-1}; and

in R^{b-1}, the halogen is F, the C_1-C_6 alkyl is methyl, ethyl, n-propyl, or isopropyl, and the "C_1-C_6 alkyl substituted with one or more R^{b-1-3}" is methyl, ethyl, n-propyl, or isopropyl substituted with one or more R^{b-1-3}; and/or

the C_1-C_6 alkyl substituted with one or more R^{b-2} is



, or ; and/or

the “4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O” and substituted with one or

more R^{b-3} is oxetanyl substituted with 1 or 2 R^{b-3}, tetrahydrofuranyl substituted with 1 or 2 R^{b-3}, or "tetrahydropyranyl substituted with 1 or 2 R^{b-3}"; and wherein, in R^{b-3}, the C_1-C_6 alkyl substituted with one or more OH is methyl, ethyl, n-propyl, or isopropyl substituted with one or more OH; and/or

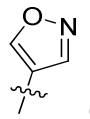
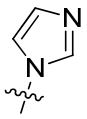
the "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S" is pyrazolyl

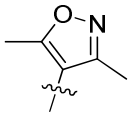
.

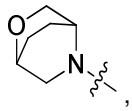
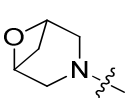
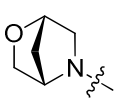
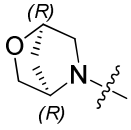
9~~15~~. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–8~~14~~, characterized in that, in R^2,

~~-~~the C_1-C_3 alkyl is methyl, ethyl, n-propyl, or isopropyl;

the C_1-C_3 alkoxy is methoxy, ethoxy, n-propoxy, or isopropoxy;

the "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S" is  or ;

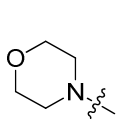
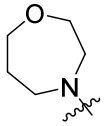
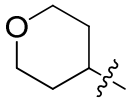
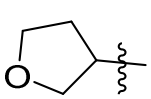
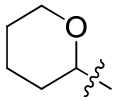
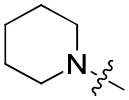
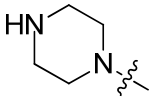
the "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-1} is ;

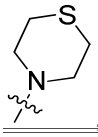
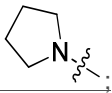
the "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S" is , , , , azetidinyl, oxazepanyl, tetrahydrofuranyl, tetrahydropyranyl, piperidyl, pyrrolidinyl, piperazinyl, thiomorpholinyl, or morpholinyl;

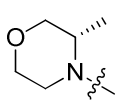
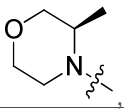
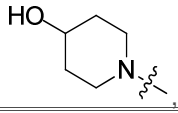
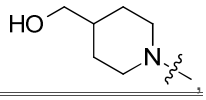
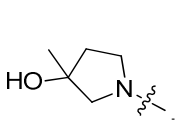
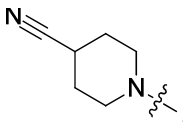
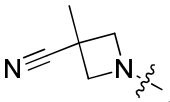
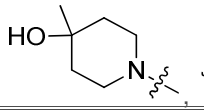
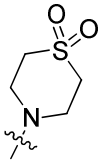
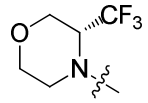
the "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-2} is morpholinyl substituted with 1 or 2 R^{a-2}, azetidinyl substituted with 1 or 2 R^{a-2}, tetrahydrofuranyl substituted with 1 or 2 R^{a-2}, tetrahydropyranyl substituted with 1 or 2 R^{a-2}, piperidyl substituted with 1 or 2 R^{a-2}, pyrrolidinyl substituted with 1 or 2 R^{a-2}, piperazinyl substituted with 1 or 2 R^{a-2}, thiomorpholinyl substituted with 1 or 2 R^{a-2};

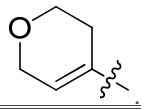
the "4- to 12-membered heterocycloalkenyl having 1–4 heteroatoms selected from one or more of N, O, and S" is dihydrofuranyl~~-~~;

or

the "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S" is , , , , , , ,

, , or ;

The "4– to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-2} is , , , , , , , , , or ;

the "4- to 12-membered heterocycloalkenyl having 1–4 heteroatoms selected from one or more of N, O, and S" is .

106. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–915, characterized in that, in R^{a-1}, R^{a-2}, and R^{a-3}, the C_1-C_6 alkyl is independently methyl, ethyl, n-propyl, or isopropyl;

the C_1-C_6 alkyl substituted with one or more R^{a-1-1} is independently methyl, ethyl, n-propyl, or isopropyl substituted with one or more R^{a-1-1};

in R^{a-1-1}, the halogen is F.

~~17. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–16, characterized in that, in R^3, the C_3-C_6 cycloalkyl substituted with one or more R^{b-1} is cyclopropyl substituted with 1, 2, or 3 R^{b-1}, cyclobutyl substituted with 1, 2, or 3 R^{b-1}, cyclopentyl substituted with 1, 2, or 3 R^{b-1};~~

~~in R^{b-1}, the halogen is F, the C_1-C_6 alkyl is methyl, ethyl, n-propyl, or isopropyl, and the "C_1-C_6 alkyl substituted with one or more R^{b-1-3}" is methyl, ethyl, n-propyl, or isopropyl substituted with one or more R^{b-1-3}.~~

118. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–107, characterized in that, in R^{b-1-1} and R^{b-1-2}, the C_1-C_6 alkyl is independently methyl, ethyl, n-propyl, or isopropyl;

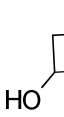
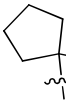
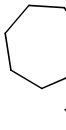
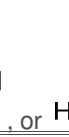
in R^{b-1-4} and R^{b-1-5}, the C_1-C_6 alkyl is independently methyl, ethyl, n-propyl, or isopropyl.

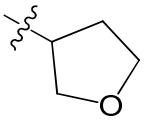
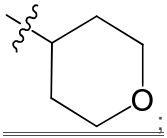
129. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer

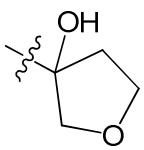
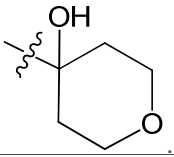
thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–118, characterized in that,

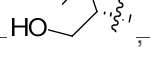
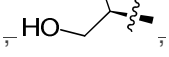
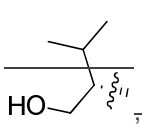
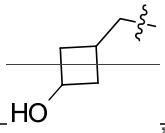
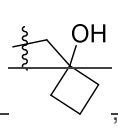
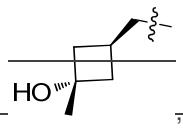
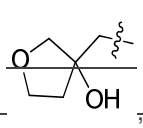
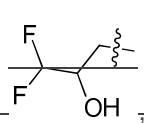
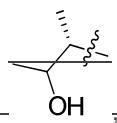
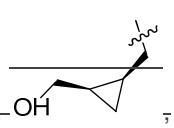
i~~i~~n R^{b-2}, the halogen is F; the C_3-C_8 cycloalkyl is cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, or cycloheptyl; the C_3-C_8 cycloalkyl substituted with one or more R^{b-2-1} is cyclopropyl substituted with 1 or 2 R^{b-2-1}, cyclobutyl substituted with 1 or 2 R^{b-2-1}, cyclopentyl substituted with 1 or 2 R^{b-2-1}, cyclohexyl substituted with 1 or 2 R^{b-2-1}, or cycloheptyl substituted with 1 or 2 R^{b-2-1}; the ""4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O"" is tetrahydrofuranyl or tetrahydropyranyl; the ""4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O and substituted with one or more R^{b-2-2}"" is ""tetrahydrofuranyl substituted with 1 or 2 R^{b-2-2}"" or ""tetrahydropyranyl substituted with 1 or 2 R^{b-2-2}""; and

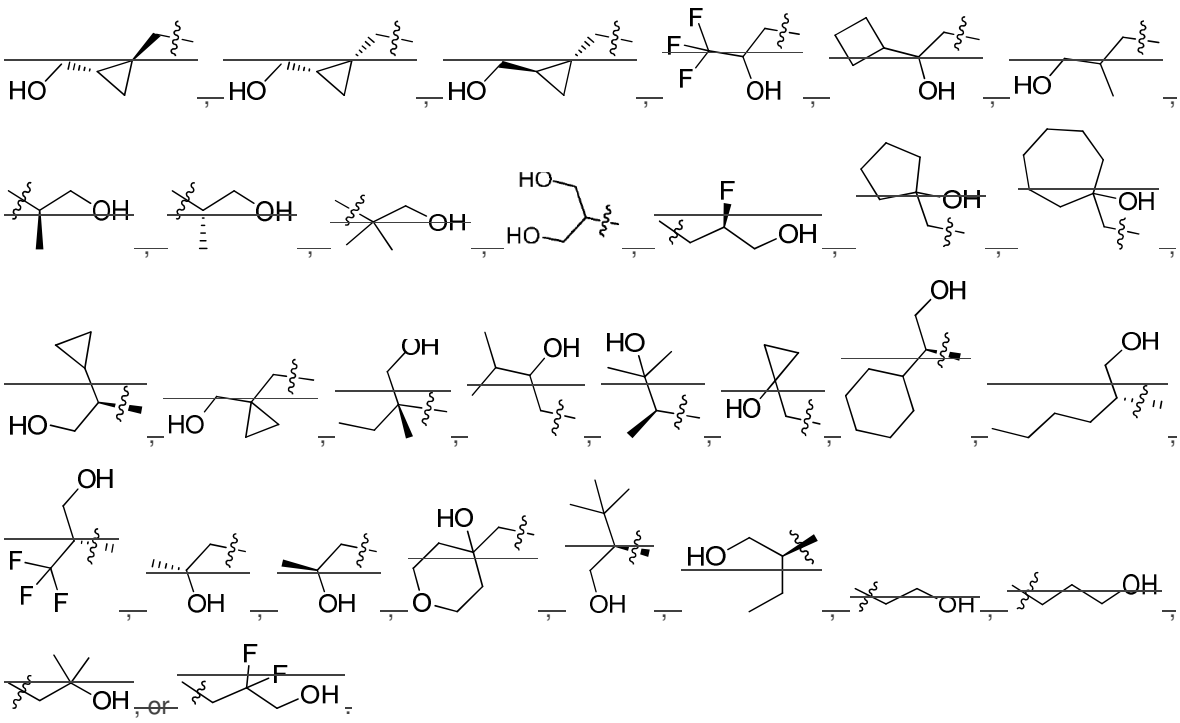
in R^{b-2-1} and R^{b-2-2}, the C_1-C_6 alkyl is independently methyl, ethyl, n-propyl, or isopropyl; the "C_1-C_6 alkyl substituted with one or more OH" is independently "methyl, ethyl, n-propyl, or isopropyl substituted with one or more OH~~.~~";

preferably wherein in R^{b-2}, the C_3-C_8 cycloalkyl substituted with one or more R^{b-2-1} is , , , , , , , , , , or ;

the "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O" is  or ;

the "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O and substituted with one or more R^{b-2-2}" is  or .

~~20. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–19, characterized in that, in R^3, the C_1-C_6 alkyl substituted with one or more R^{b-2} is~~ , , , , , , , , , ,



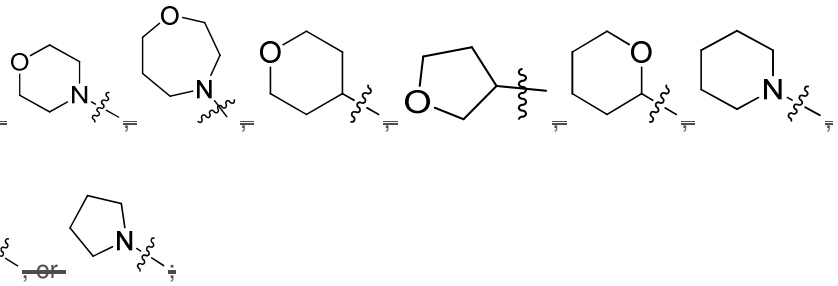
1321. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–1220, characterized in that, in R^{3-1}, R^{3-2} and R^{3-3}, the C_1-C_6 alkyl is independently methyl, ethyl, n-propyl, or isopropyl.

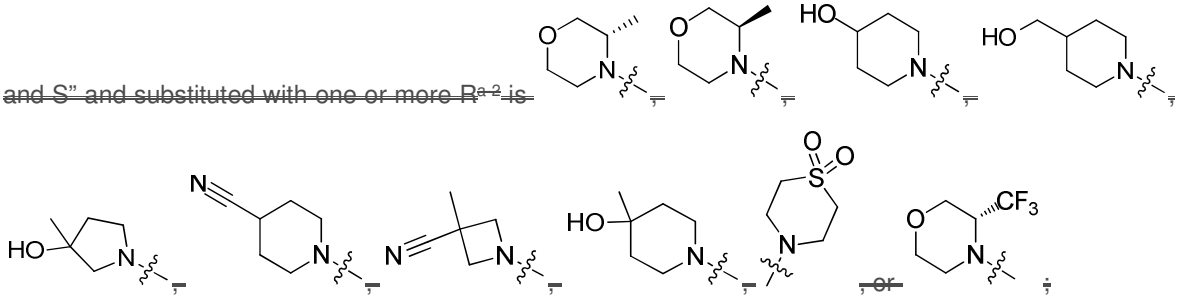
22. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–21, characterized in that, in R^3, the "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O" and substituted with one or more R^{b-3} is oxetanyl substituted with 1 or 2 R^{b-3}, tetrahydrofuranyl substituted with 1 or 2 R^{b-3}, or "tetrahydropyranyl substituted with 1 or 2 R^{b-3}";

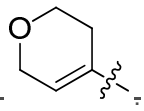
wherein, in R^{b-3}, the C_1-C_6 alkyl substituted with one or more OH is methyl, ethyl, n-propyl, or isopropyl substituted with one or more OH.

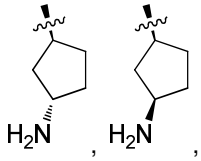
23. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–22, characterized in that, in R^3, the "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S" is pyrazolyl.

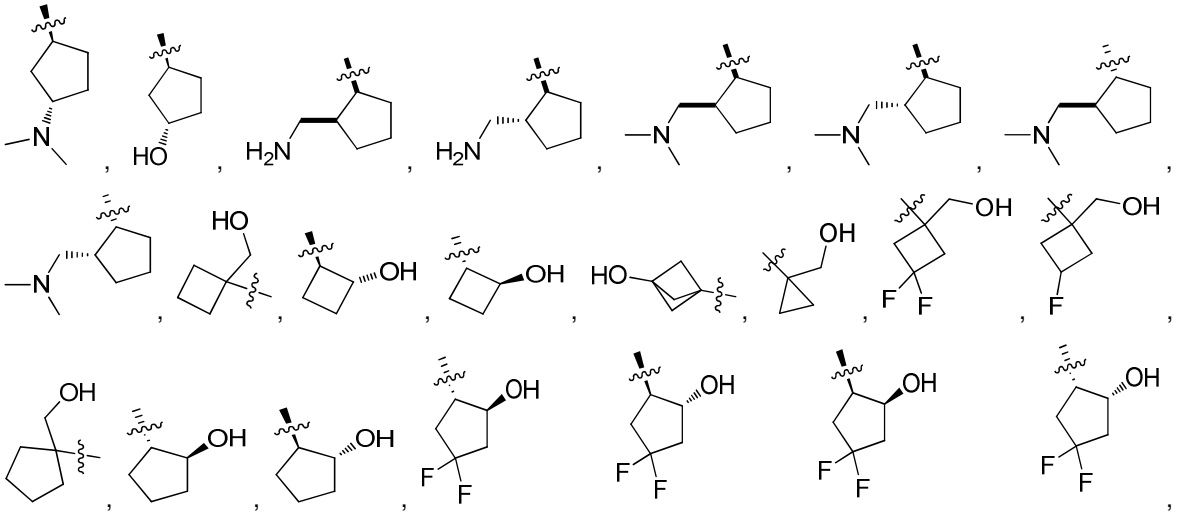
24. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–23,

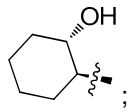
~~characterized in that, in R^2, the "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S" is~~ 

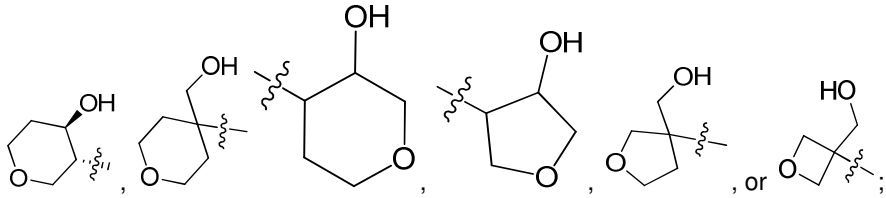
~~The "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-2} is~~ 

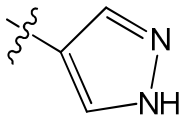
~~the "4- to 12-membered heterocycloalkenyl having 1–4 heteroatoms selected from one or more of N, O, and S" is~~ 

1425. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–1324, characterized in that, in R^3, the C_3-C_8 cycloalkyl substituted with one or more R^{b-1} is 

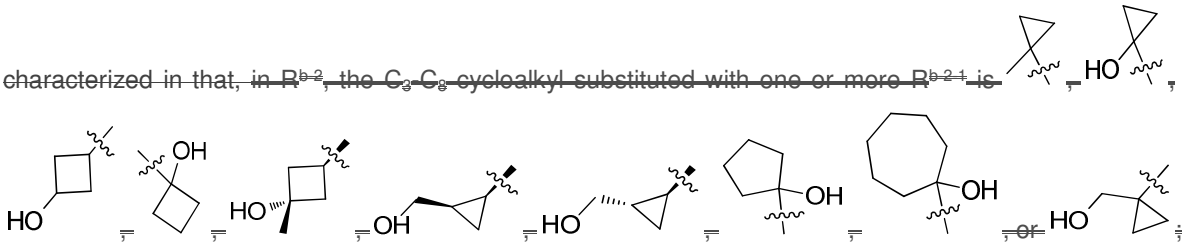


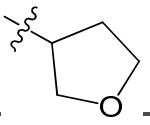
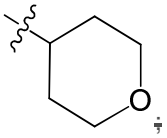
or ;

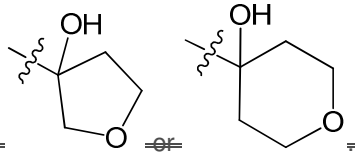
the "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O" and substituted with one or more R^{b-3} is , or ;

the "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S" is .

~~26. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–25,~~

~~characterized in that, in R^{b-2}, the C_3-C_8-cycloalkyl substituted with one or more R^{b-2-1} is~~ , ~~or~~ ;

~~the "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O" is~~  ~~or~~ ;

~~the "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O and substituted with one or more R^{b-2-2}" is~~  ~~or~~ .

1527. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–1426, characterized in that

-R^1 is CF_3, Cl, Br or CN~~.~~; and/or

~~28. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–27, characterized in that~~ X is C(R^4), and R^4 is -P(=O)Me_2~~,~~; and/or

~~29. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–28, characterized in that~~ Z is CH~~.~~; and/or

~~30. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–29, characterized in that,~~ when Y is O, n_1 is 1, and n_3 is 0 or 1.

16~~31~~. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–15~~30~~, characterized in that

~~,~~when the number of R^{b-1} is one, R^{b-1} is OH, -$NR^{b-1-1}R^{b-1-2}$, or "C_1-C_6 alkyl substituted with one or more R^{b-1-3}"; when the number of R^{b-1} is plural, at least one R^{b-1} is OH or "C_1-C_6 alkyl substituted with one or more OH~~.~~";; and/or

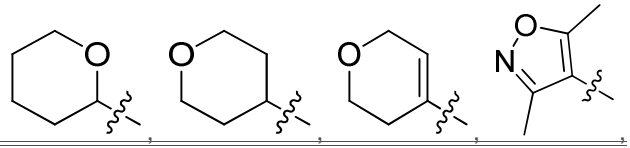
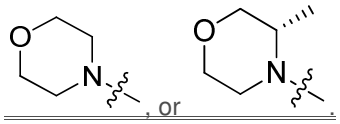
~~32. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–31, characterized in that,~~ when the number of R^{b-2} is one, R^{b-2} is OH, C_3-C_8 cycloalkyl substituted with one or more R^{b-2-1}, or "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O and substituted with one or more R^{b-2-2}"; when the number of R^{b-2} is plural, at least one R^{b-2} is OH, C_3-C_8 cycloalkyl substituted with one or more R^{b-2-1}, or "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O and substituted with one or more R^{b-2-2}"; wherein, when the number of R^{b-2-1} is one, R^{b-2-1} is OH or "C_1-C_6 alkyl substituted with one or more OH"; when the number of R^{b-2-1} is plural, at least one R^{b-2-1} is OH or "C_1-C_6 alkyl substituted with one or more OH"; when the number of R^{b-2-2} is one, R^{b-2-2} is OH or "C_1-C_6 alkyl substituted with one or more OH"; when the number of R^{b-2-2} is plural, at least one R^{b-2-2} is OH or "C_1-C_6 alkyl substituted with one or more OH~~.~~";; and/or

~~33. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–32, characterized in that,~~ when the number of R^{b-3} is one, R^{b-3} is OH or "C_1-C_6 alkyl substituted with one or

more OH; when the number of R^{b-3} is plural, at least one R^{b-3} is OH or "C_1-C_6 alkyl substituted with one or more OH."

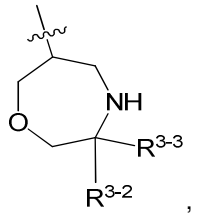
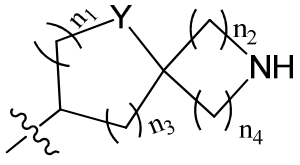
1734. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–1633, characterized in that

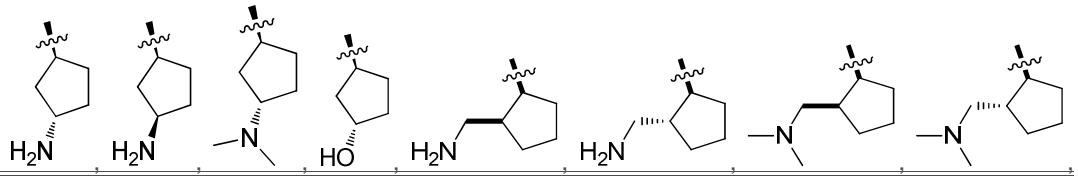
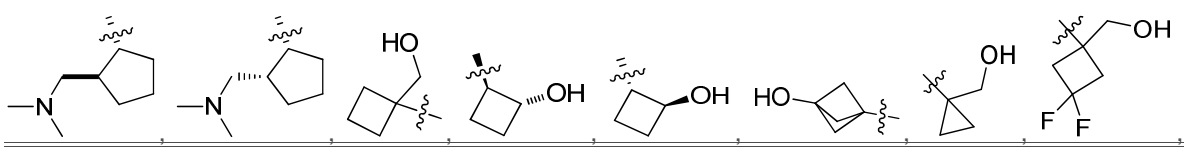
-R^2 is H, halogen, "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-1}, "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S," "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-2}, "4- to 12-membered heterocycloalkenyl having 1–4 heteroatoms selected from one or more of N, O, and S," C_1-C_6 alkoxy, or CN; wherein R^{a-1} and R^{a-2} are as defined in Claim 1 or 2;

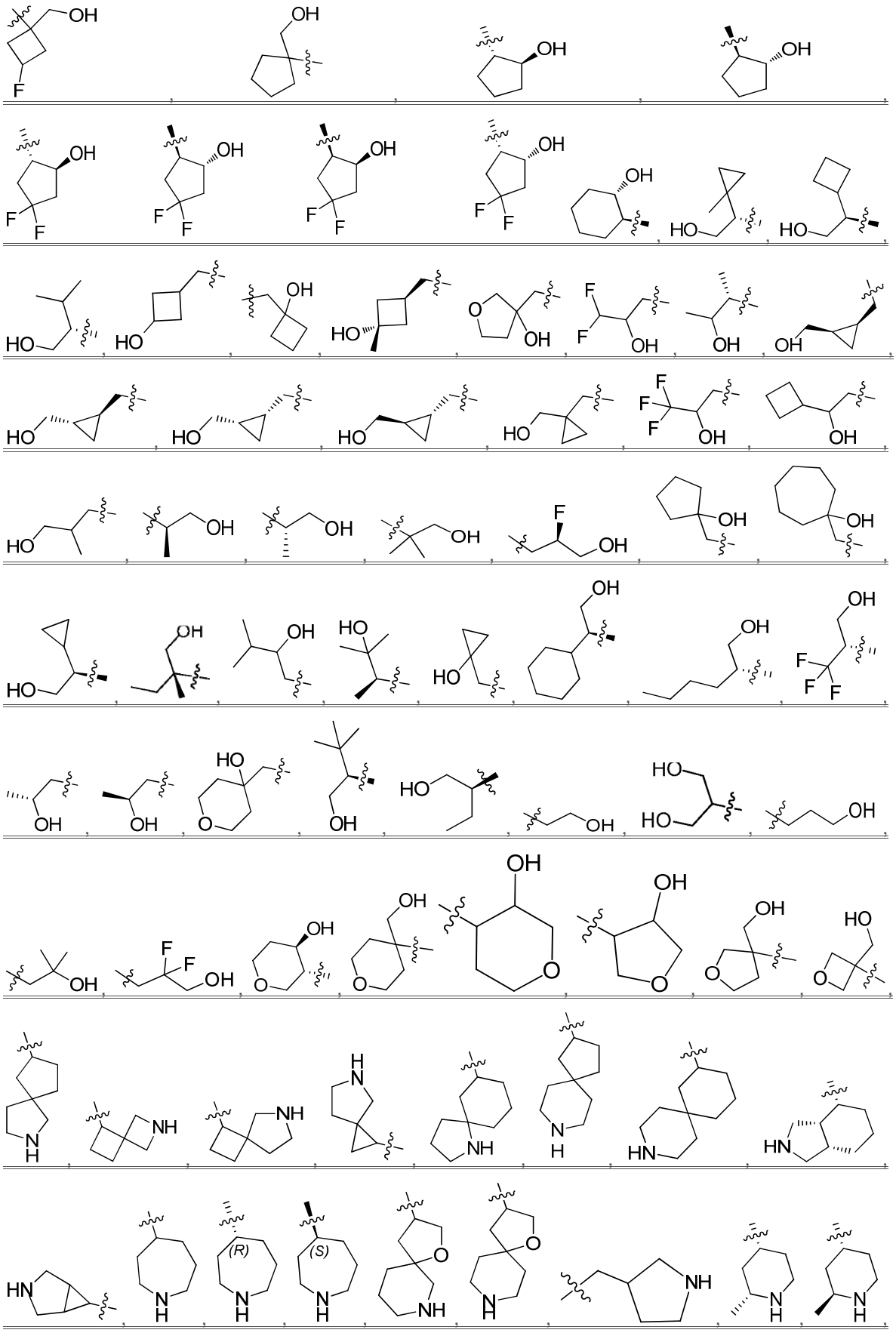
preferably wherein R^2 is H, F, CN, -OCH_3, , , or .

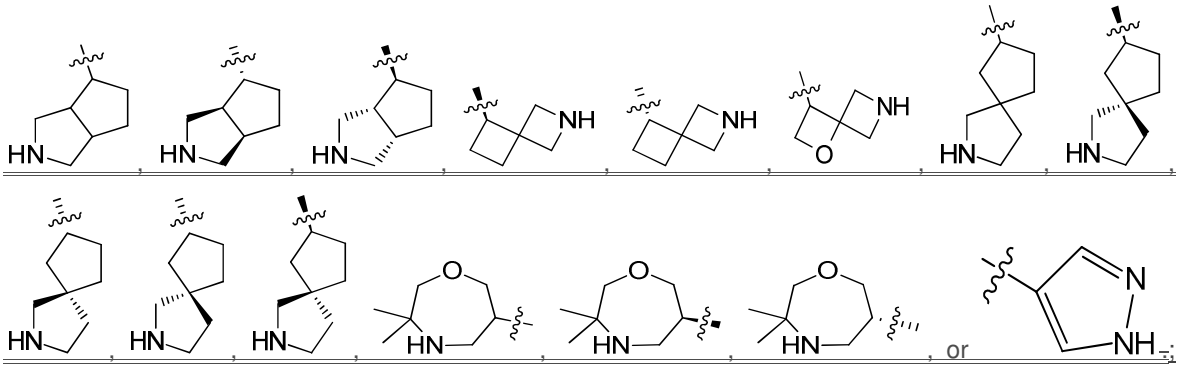
-

1835. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–1734, characterized in that

-R^3 is C_1-C_6 alkyl substituted with one or more R^{b-2}, , , or "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms being O" and substituted with one or more R^{b-3}, wherein n_1, n_2, n_3, n_4, Y, R^{3-2}, R^{3-3}, R^{b-2}, and R^{b-3} are as defined in Claim 1 or 2; and/or-

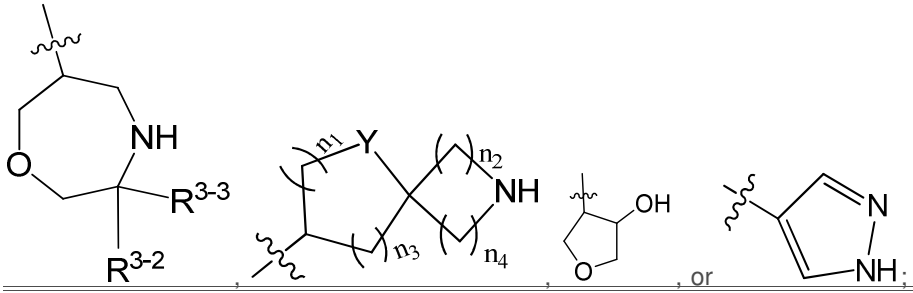
R^3 is , .





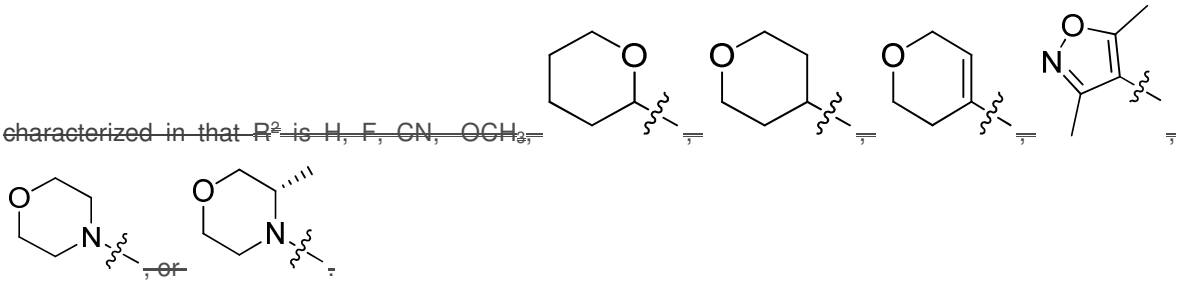
and/or

R^3 is C_3-C_8 cycloalkyl substituted with one or more R^{b-1}, C_1-C_6 alkyl substituted with one or more R^{b-2},

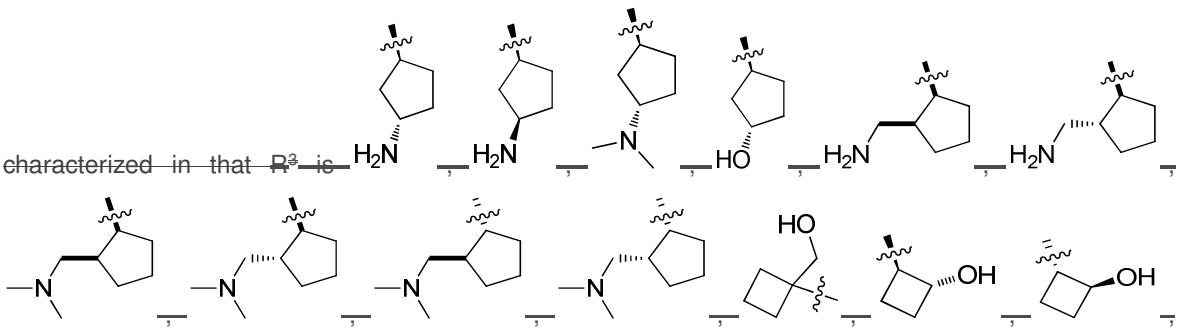


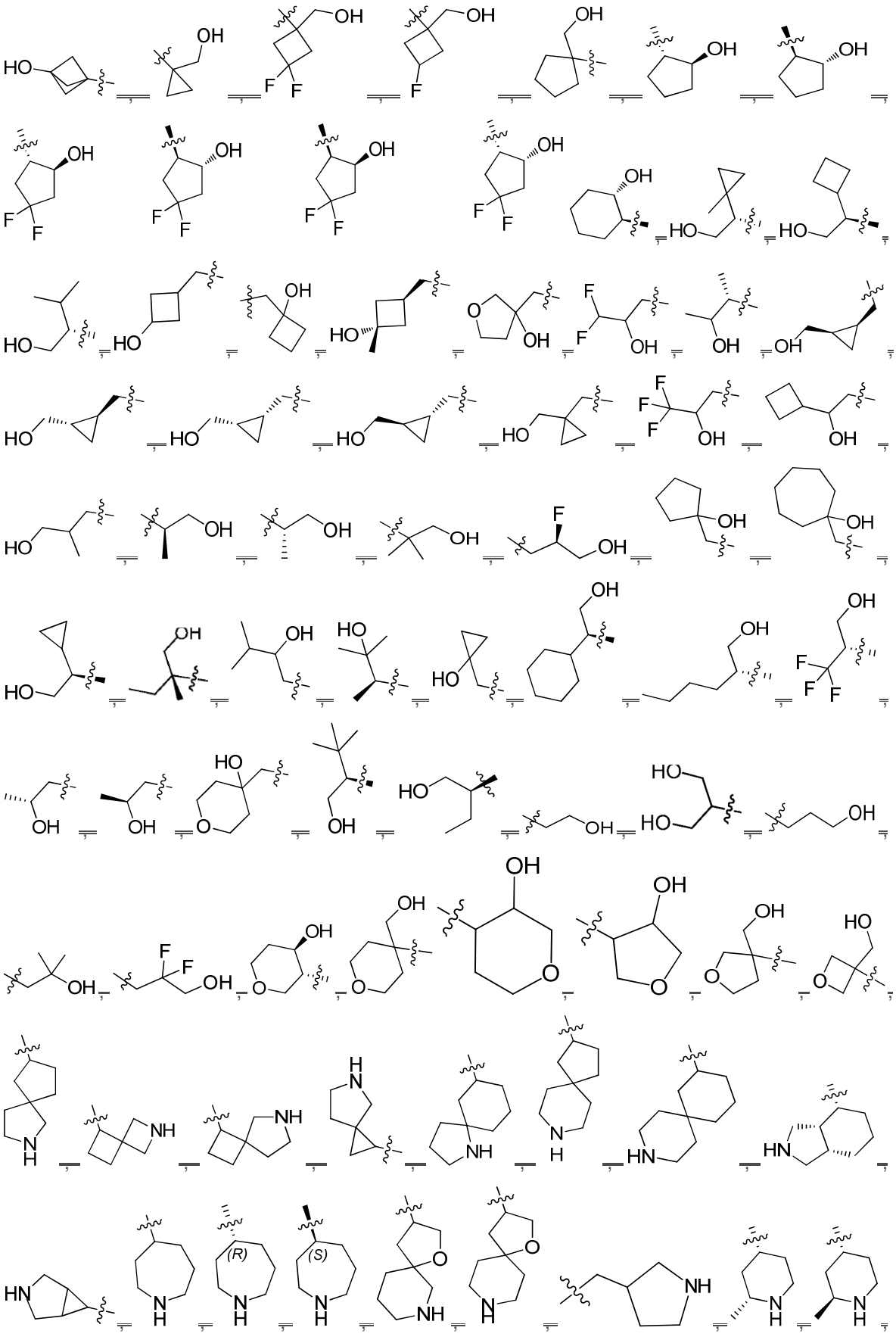
; wherein R^{b-1}, R^{b-2}, R^{3-2}, R^{3-3}, Y, n_1, n_2, n_3, and n_4 are as defined in Claim 1 or 2; when Y is O, n_1 is 1, and n_3 is 0.

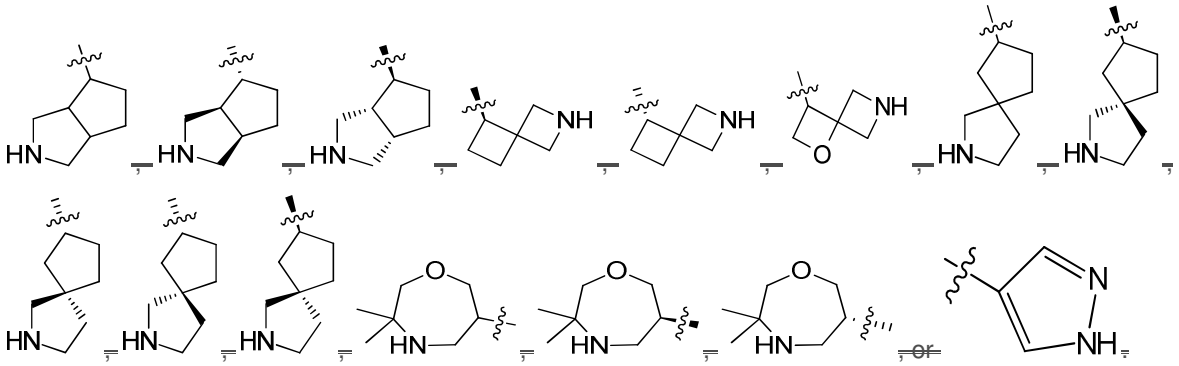
~~36. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–35,~~

~~characterized in that R^2 is H, F, CN, OCH_3,~~ 

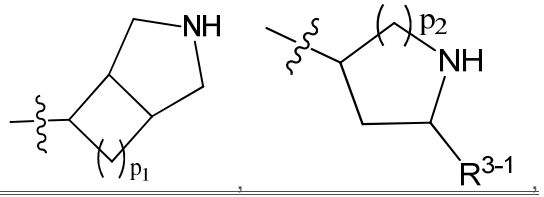
~~37. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–36,~~

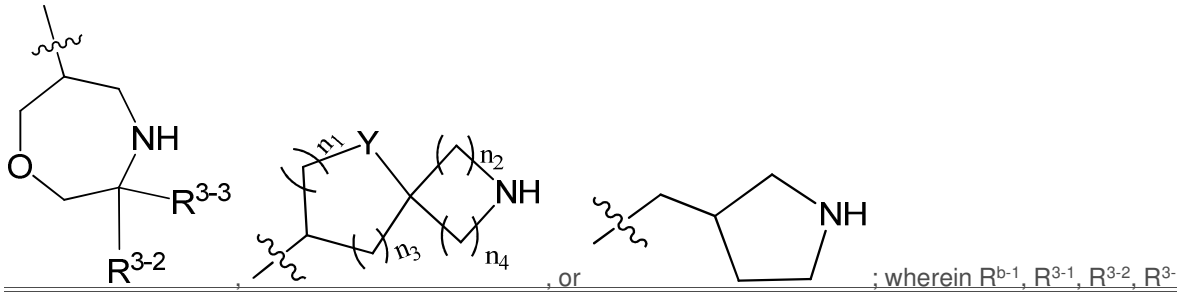
~~characterized in that R^3 is~~ 





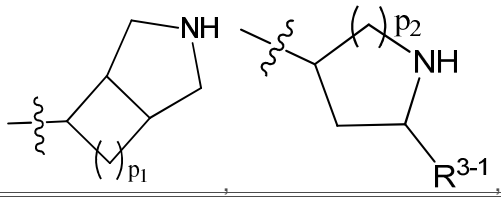
1938. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–1837, characterized in that,

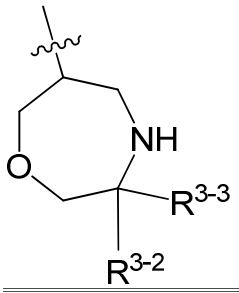
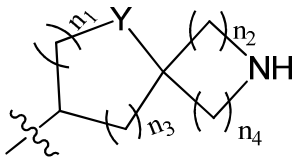
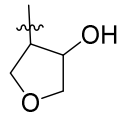
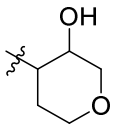
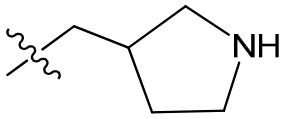
-when X is C(R^4) and R^4 is -P(=O)Me_2, R^2 is H, halogen, C_1-C_6 alkoxy, or CN, and optionally R^3 is C_3-C_8 cycloalkyl substituted with one or more R^{b-1}, 

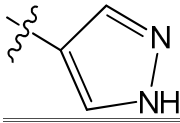


; wherein R^{b-1}, R^{3-1}, R^{3-2}, R^{3-3}, Y, p_1, n_1, n_2, n_3, and n_4 are as defined in Claim 1 or 2.

;

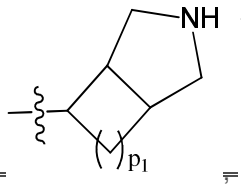
-when X is N, R^2 is "5- to 10-membered heteroaryl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-1}, "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S," "4- to 12-membered heterocycloalkyl having 1–4 heteroatoms selected from one or more of N, O, and S" and substituted with one or more R^{a-2}, "4- to 12-membered heterocycloalkenyl having 1–4 heteroatoms selected from one or more of N, O, and S," or CN, wherein R^{a-1} and R^{a-2} are as defined in Claim 1 or 2, and optionally R^3 is C_3-C_8 cycloalkyl substituted with one or more R^{b-1}, C_1-C_6 alkyl substituted with one or more R^{b-2}, 

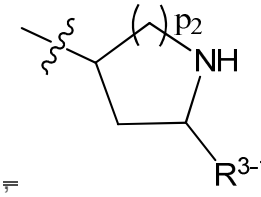





, or

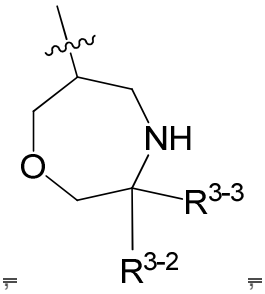

; wherein R^{b-1}, R^{3-1}, R^{3-2}, R^{3-3}, Y, p_1, p_2, n_1, n_2, n_3, and n_4 are as defined in Claim 1 or 2.

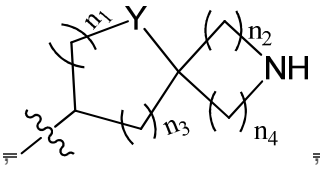
.

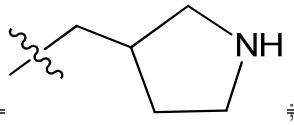
~~39. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–38, characterized in that, when X is C(R^4) and R^4 is -P(=O)Me_2, R^3 is C_3-C_8 cycloalkyl substituted with one or more R^{b-1},~~


,

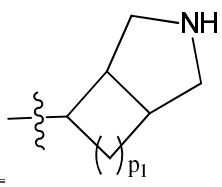

,

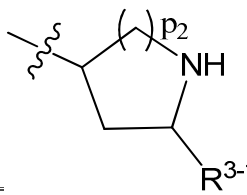

,

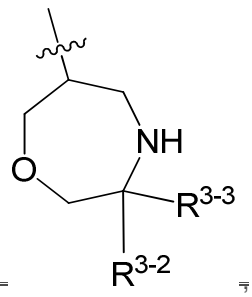

,

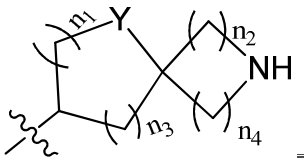
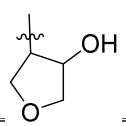
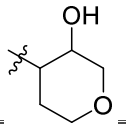
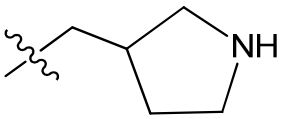
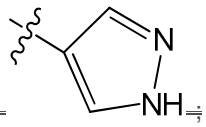

~~; wherein R^{b-1}, R^{3-1}, R^{3-2}, R^{3-3}, Y, p_1, n_1, n_2, n_3, and n_4 are as defined in Claim 1 or 2.~~

~~40. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–39, characterized in that, when X is N, R^3 is C_3-C_8 cycloalkyl substituted with one or more R^{b-1}, C_1-C_6 alkyl substituted with one or more R^{b-2},~~

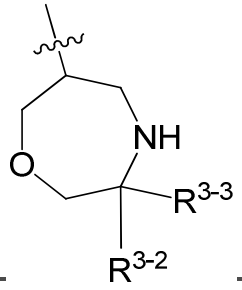
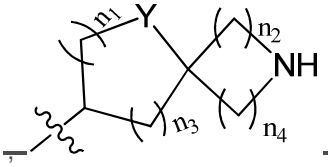
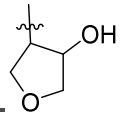
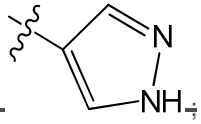

,


,


,

~~~~ ~~,~~ ~~~~ ~~,~~ ~~~~ ~~,~~ ~~~~ ~~, or~~ ~~~~ ~~;~~

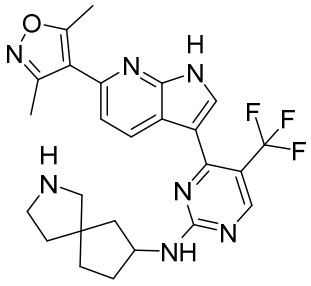
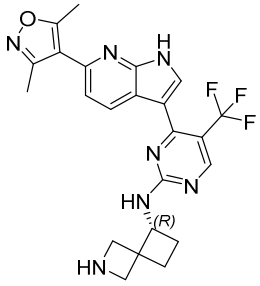
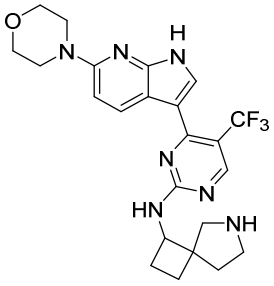
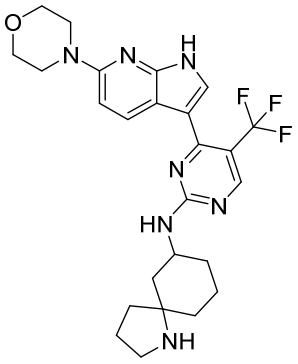
~~wherein R^{b-1}, R^{3-1}, R^{3-2}, R^{3-3}, Y, p_1, p_2, n_1, n_2, n_3, and n_4 are as defined in Claim 1 or 2.~~

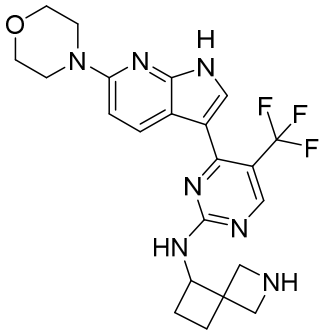
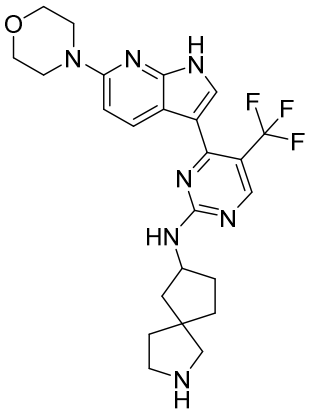
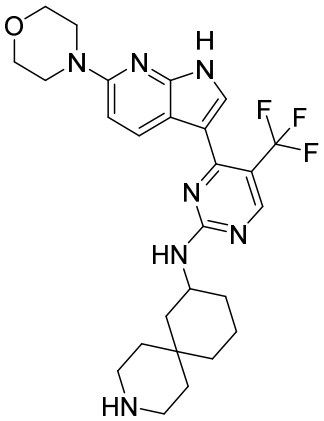
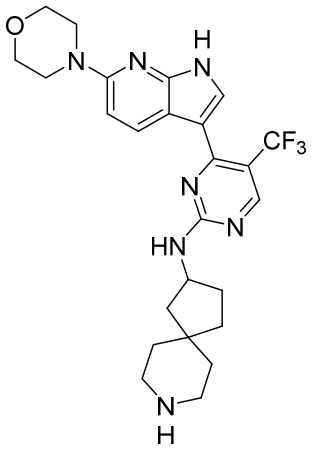
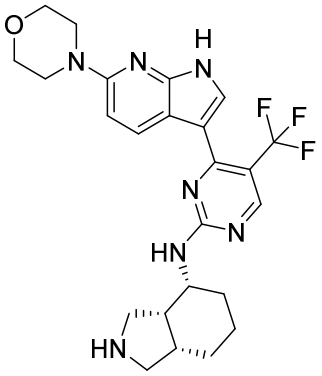
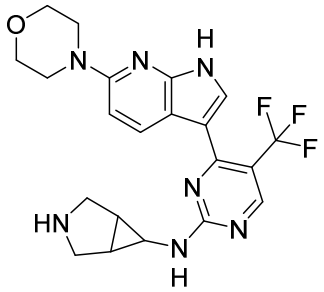
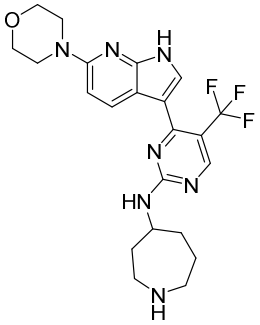
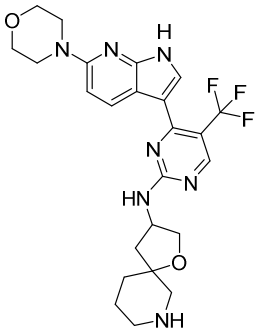
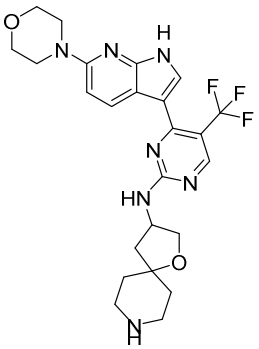
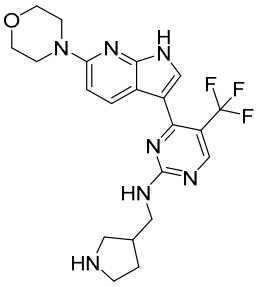
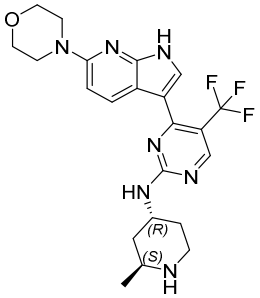
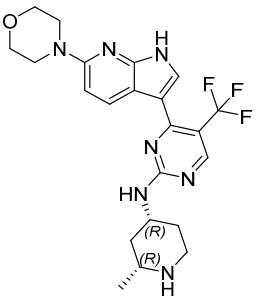
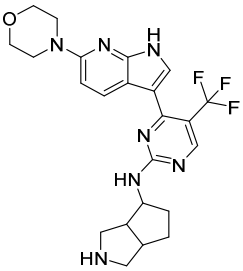
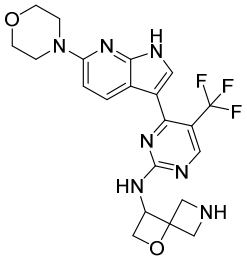
~~41. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–40, characterized in that, R^3 is C_3-C_8-cycloalkyl substituted with one or more R^{b-1}, C_1-C_6-alkyl substituted with~~ ~~~~ ~~,~~ ~~~~ ~~,~~ ~~~~ ~~, or~~ ~~~~ ~~;~~

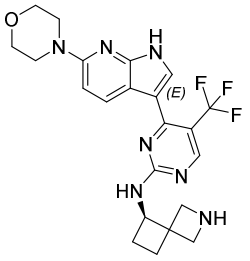
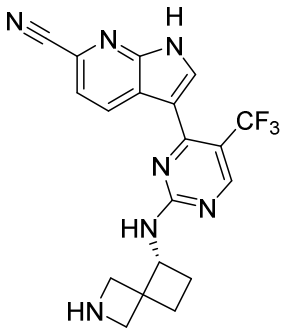
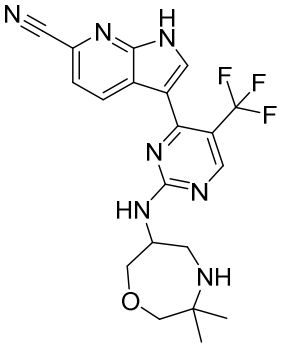
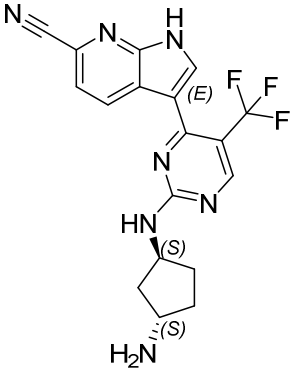
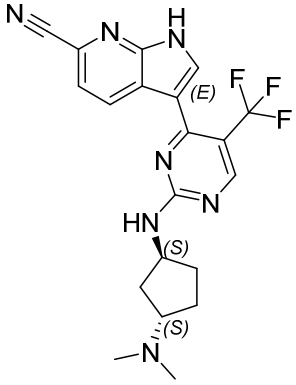
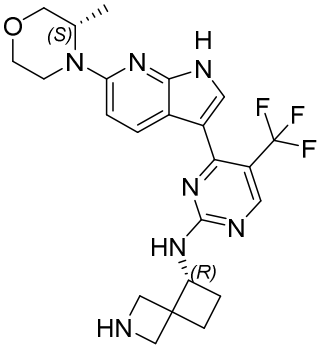
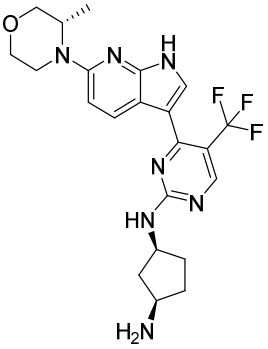
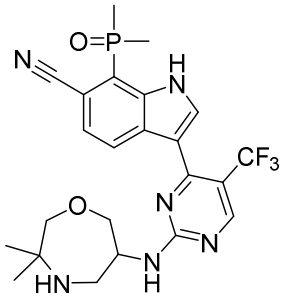
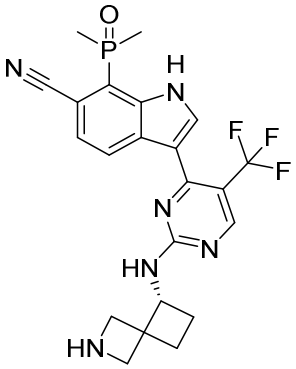
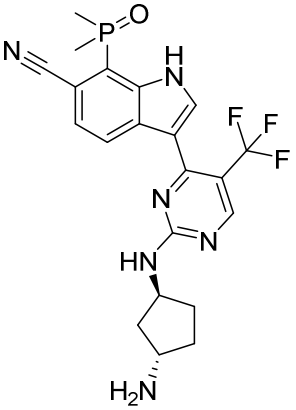
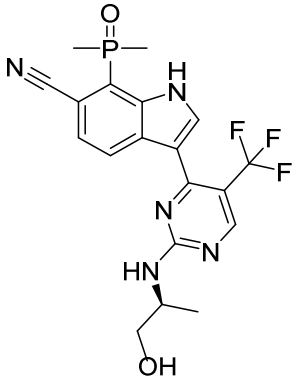
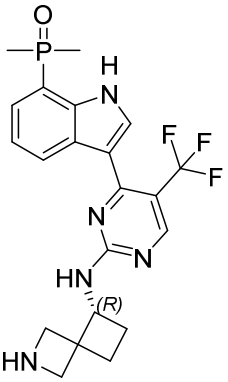
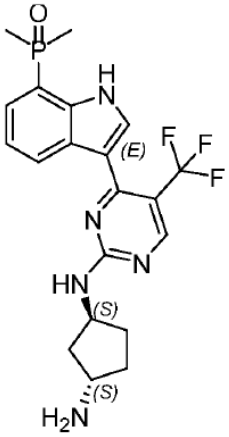
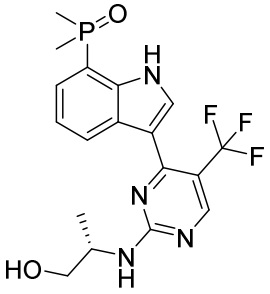
~~one or more R^{b-2},~~

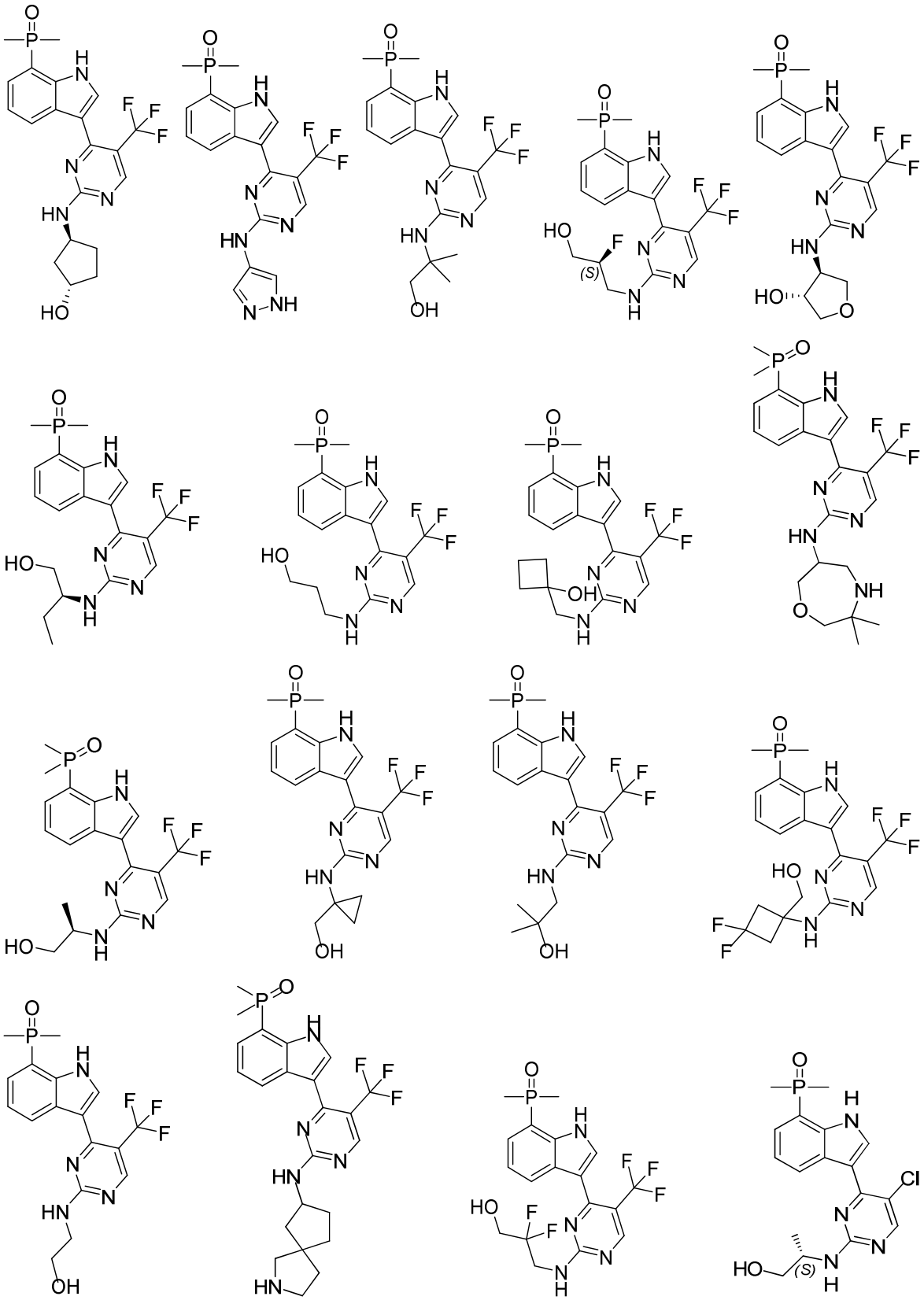
~~wherein R^{b-1}, R^{b-2}, R^{3-2}, R^{3-3}, Y, n_1, n_2, n_3, and n_4 are as defined in Claim 1 or 2; when Y is O, n_1 is 1, and n_3 is 0.~~

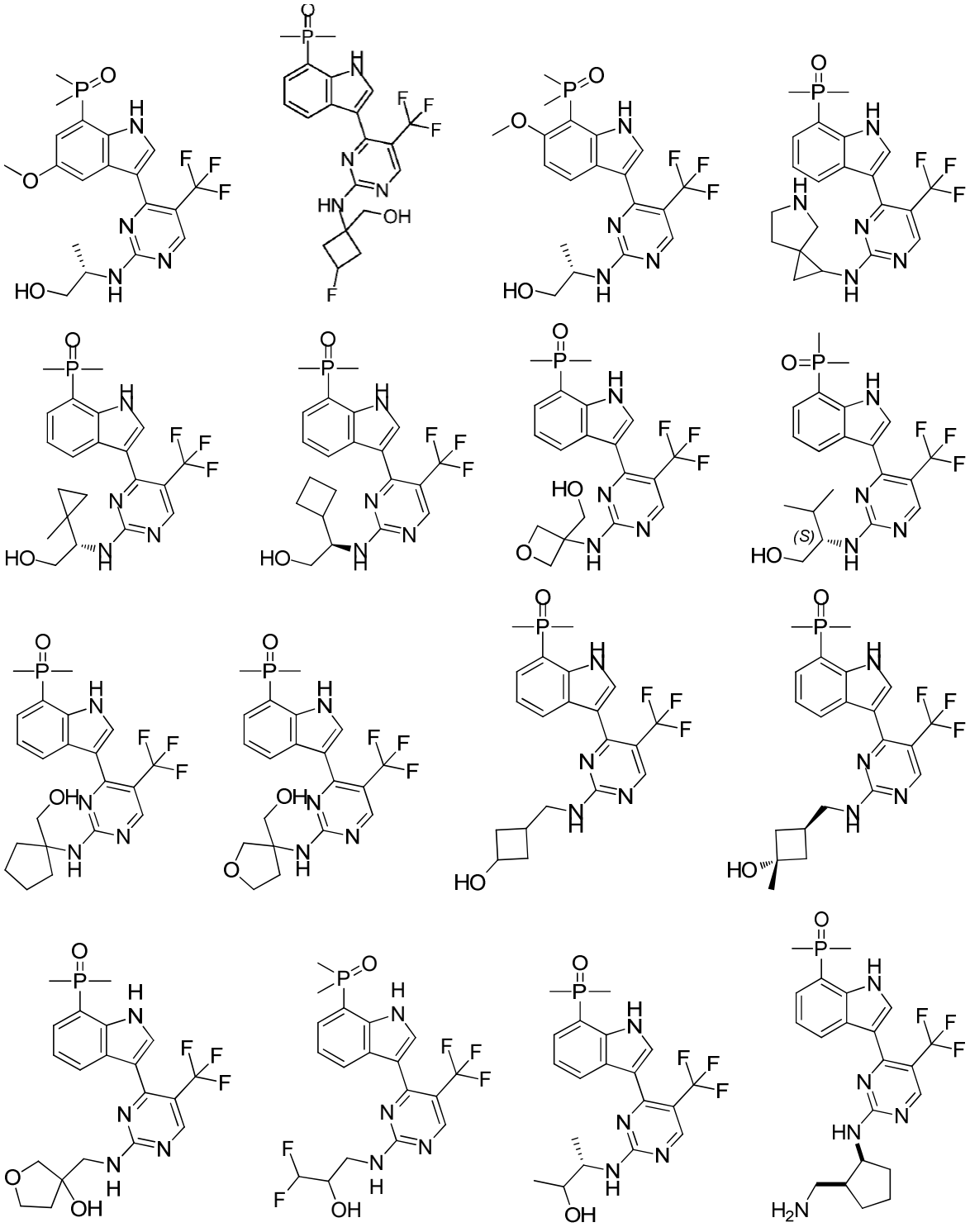
20~~42~~. The compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to Claims 1- 19~~41~~, characterized in that the compound as represented by formula I-A is any one of the following compounds:

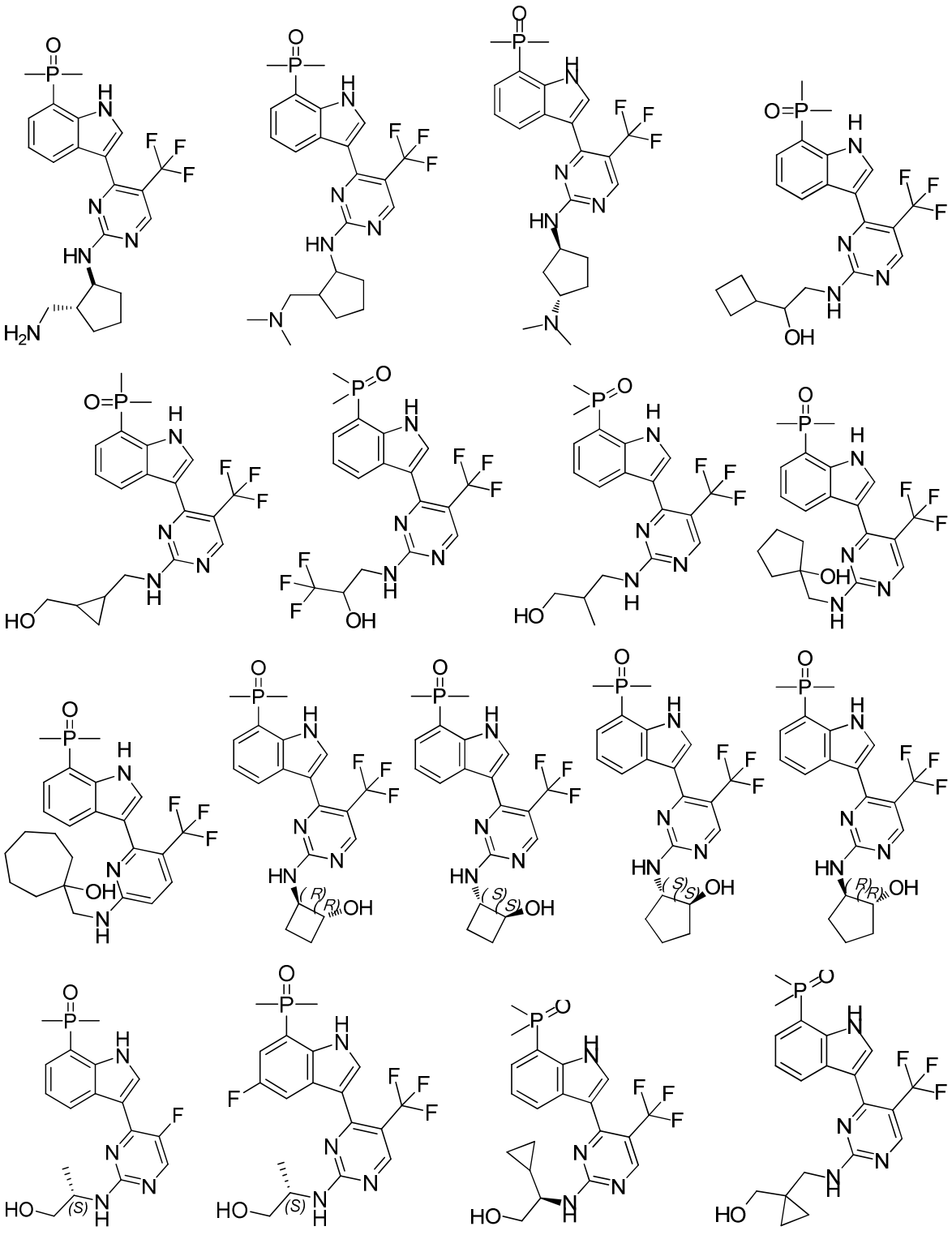





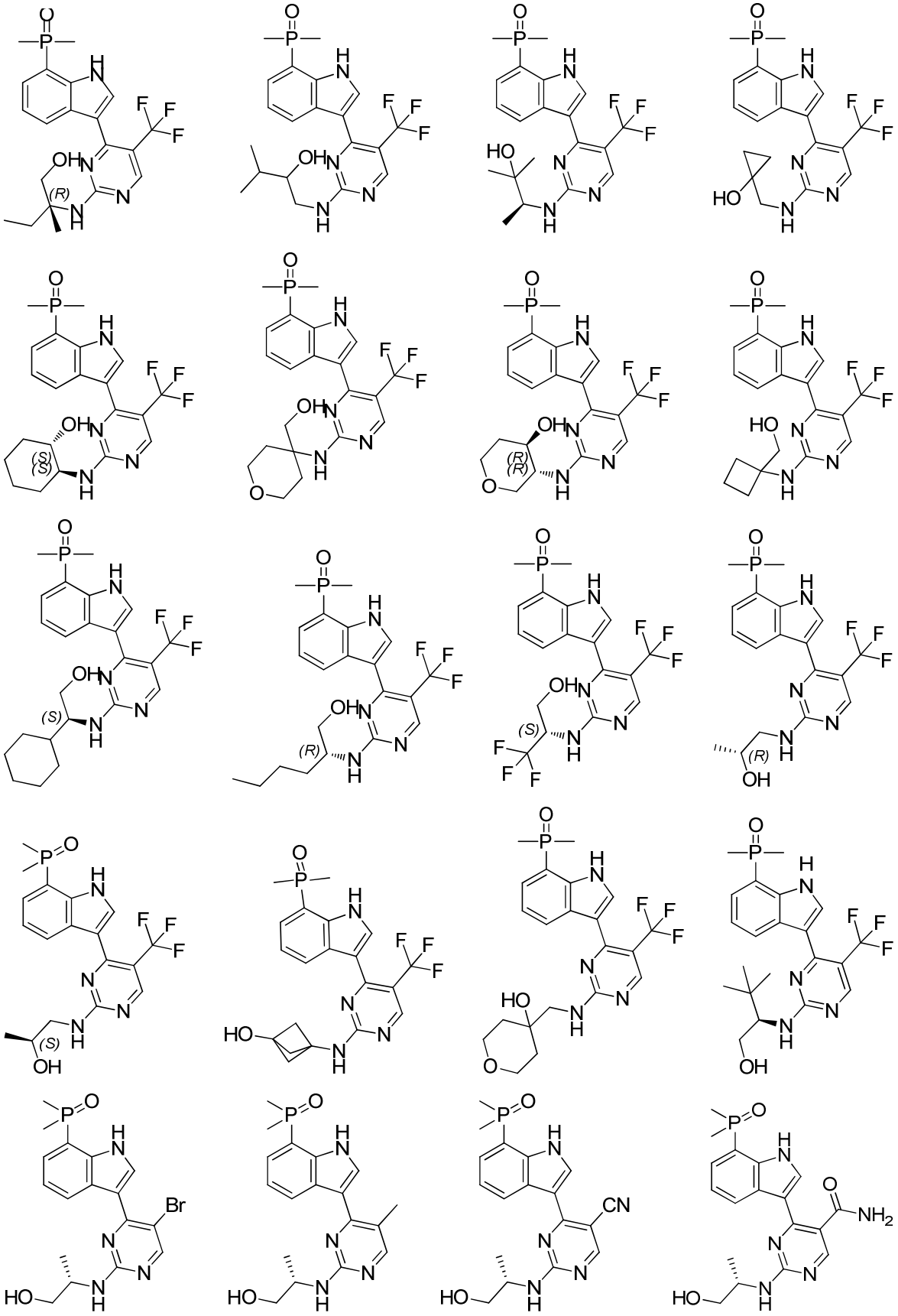















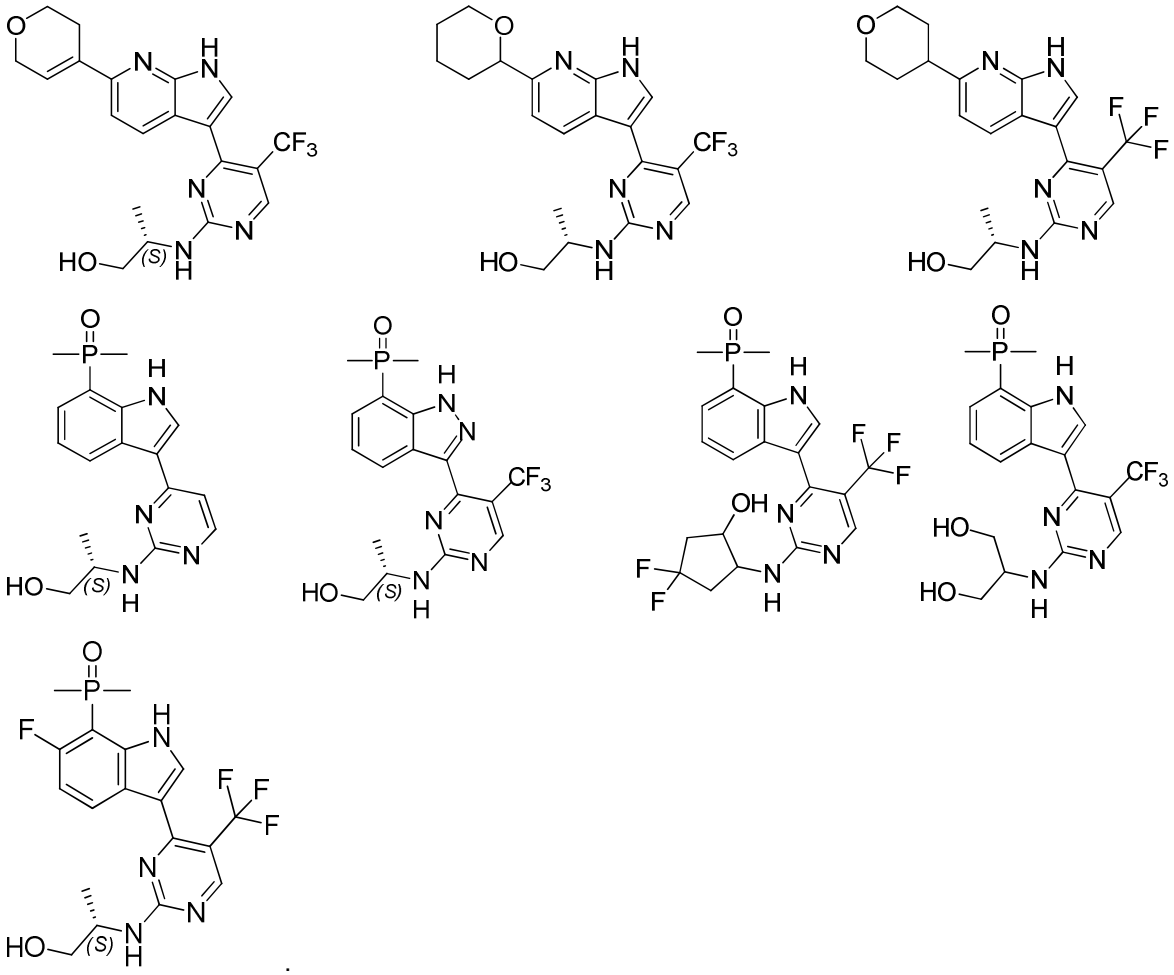

























2143. A pharmaceutical composition, comprising a compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–2042, and a pharmaceutical excipient.

4422. Use of a compound as represented by formula I-A, the stereoisomer thereof, the diastereoisomer thereof, or the pharmaceutically acceptable salt of any one of the described substances, or the crystalline form or the solvate of any one of the described substances according to at least one of Claims 1–2142, or the pharmaceutical composition according to Claim 43 for the manufacture of a medicament for preventing and/or treating proliferative diseases; preferably, the proliferative diseases being cancers (for example, leukemia, acute myeloid leukemia, acute lymphoblastic leukemia, breast cancer, ovarian cancer, brain cancer, lung cancer, liver cancer, small cell lung cancer, melanoma, bladder cancer, colon cancer, esophageal cancer, bone cancer, neuroblastoma, ovarian cancer, pancreatic cancer, prostate cancer, testicular cancer epithelial sarcoma, soft tissue sarcoma, multiple myeloma), benign neoplasms, angiogenesis, inflammatory diseases, autoinflammatory diseases, and autoimmune disease.