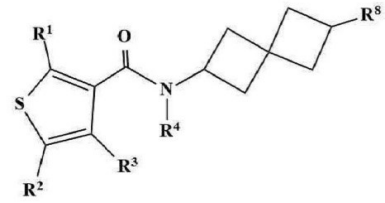
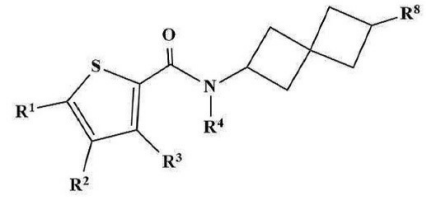
Claims

[Claim 1] A compound of Formula IA-3 or Formula 1A-4, or a solvate, stereoisomer or pharmaceutically acceptable salt thereof:



[Formula IA-3]

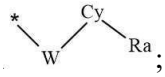


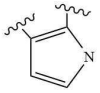
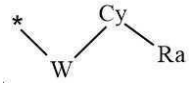
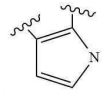
[Formula IA-4]

in which,

R^1 is selected from hydrogen, halogen, hydroxy, C_1-C_3 alkyl, C_1-C_3 alkoxy, C_1-C_3 haloalkyl, and C_1-C_3 haloalkoxyl;

R^2 is selected from hydrogen, halogen, C_1-C_3 alkyl, C_1-C_3 haloalkyl, cyclopropyl, cyclobutyl, and phenyl;

R^3 is ; or

R^2 and R^3 together with the carbon atom to which they are attached form , wherein  is bonded to the nitrogen atom of , and either or both of the carbon atoms of  may be optionally substituted with halogen, C_1-C_3 alkyl, or C_1-C_3 haloalkyl;

W is $-(CH_2)_o-$, $-(CH_2)_o-C\equiv C-$, $-C(O)-$, $-O-$, NH-, or $-N(C_1$-C_6 alkyl)-, wherein H of said CH_2 may be optionally substituted with one or more halogen, hydroxy, C_1-C_3alkoxy, or C_1-C_3 haloalkoxy;

Cy is selected from the group consisting of, phenyl, 5- to 10-membered heteroaryl containing 1 or 2 nitrogen atoms, and 4- or 7-membered heterocycloalkyl containg 1 or 2 nitrogen atom, and may be optionally substituted with one or more R';

R_a is hydrogen, halogen, C_1-C_3 alkyl, C_1-C_3 haloalkyl, or -V-Cy_2,

wherein V is absent, $-CH_2-$ or -O-,

Cy_2 is selected from the group consisting of C_6-C_{10} aryl, 5- to 10-

membered heteroaryl containing 1 to 3 heteroatoms selected from N, O and S, 4- to 10-membered heterocycloalkyl containg 1 to 3 heteroatoms selected from N, O and S, C_3-C_8 cycloalkyl and C_3-C_8 cycloalkenyl, and may be optionally substituted with one or more R";

R' is each independently selected from the group consisting of halogen, amino, C_1-C_3alkyl, C_1-C_3haloalkyl;

R" is selected from the group consisting of halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 alkoxy, -S-(C_1-C_6 alkyl), -SO_2-(C_1-C_6 alkyl), -CO-(C_1-C_6 alkyl), -C(O)H, -COO-(C_1-C_6 alkyl), -COOH, -$CONH_2$, -CONH-(C_1-C_6 alkyl), -CON(C_1-C_6 alkyl)$_2$, -$(CH_2)_p$-NH_2, -$(CH_2)_p$-NH-(C_1-C_6 alkyl), -$(CH_2)_p$-N(C_1-C_6 alkyl)$_2$, -$(CH_2)_p$-NH-CO-(C_1-C_6 alkyl), -$(CH_2)_p$-NH-COO-(C_1-C_6 alkyl), -$(CH_2)_p$-OH, 3- to 7-membered heterocycloalkyl, C_3-C_8 cycloalkyl, and -$(CH_2)_p$-(C_3-C_8 cycloalkyl), wherein said C_1-C_6 alkyl and C_1-C_6 alkoxy may be optionally substituted with one or more halogen, hydroxy, cyano or amino, and said 3- to 7-membered heterocycloalkyl and C_3-C_8 cycloalkyl may be optionally substituted with one or more halogen, hydroxy, cyano, oxo or amino;

R^4 is hydrogen, or C_1-C_6 alkyl;

R^8 is C(=O)$R^{8'}$, and $R^{8'}$ is hydroxy, or C_1-C_6 alkoxy; and

o and p are each independently an integer of 0 to 3.

[Claim 2] The compound or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 1, wherein R^1 is selected from the group consisting of hydrogen, halogen, C_1-C_3 alkyl and C_1-C_3haloalkyl.

[Claim 3] The compound or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to claim 1 or claim 2, wherein

Cy_2 is selected from the group consisting of phenyl, 5- to 10-membered heteroaryl containing 1 to 2 heteroatoms selected from N or O, 4- to 7-membered heterocycloalkyl containing 1 to 2 heteroatoms selected from N or O, C_4-C_7 cycloalkyl, and C_4-C_7 cycloalkenyl, and may be optionally substituted with one or more R"; and

R" is selected from the group consisting of halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_1-C_6 alkoxy, C_1-C_6 haloalkoxy, -S-(C_1-C_6 alkyl), -SO_2-(C_1-C_6 alkyl), -COO-(C_1-C_6 alkyl), -COOH, -$CONH_2$, -$(CH_2)_p$-NH_2, -$(CH_2)_p$-NH-(C_1-C_6 alkyl), -$(CH_2)_p$-N(C_1-C_6 alkyl)$_2$, -$(CH_2)_p$-NH-COO-(C_1-C_6 alkyl), -$(CH_2)_p$-OH, azetidinyl or oxetanyl, optionally substituted with hydroxy or oxo; and cyclopropyl or cyclopropylmethyl, optionally substituted with hydroxy or oxo

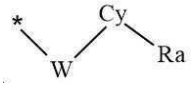
[Claim 4] The compound of or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to any one of claims 1-3, wherein

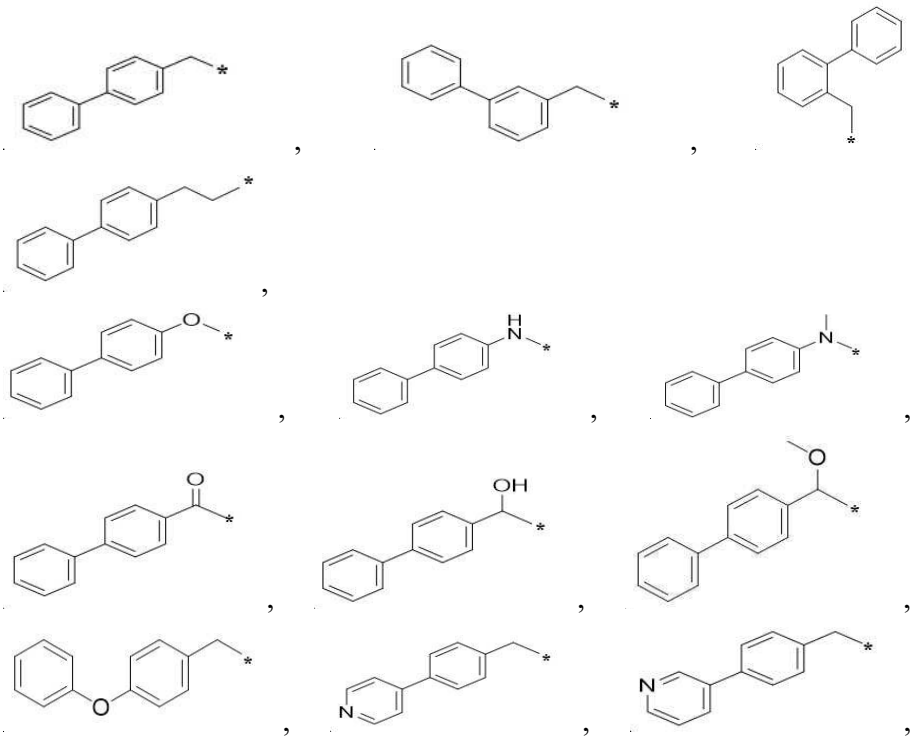
Cy is phenyl; heteroaryl selected from pyrrolyl, furanyl, thiophenyl,

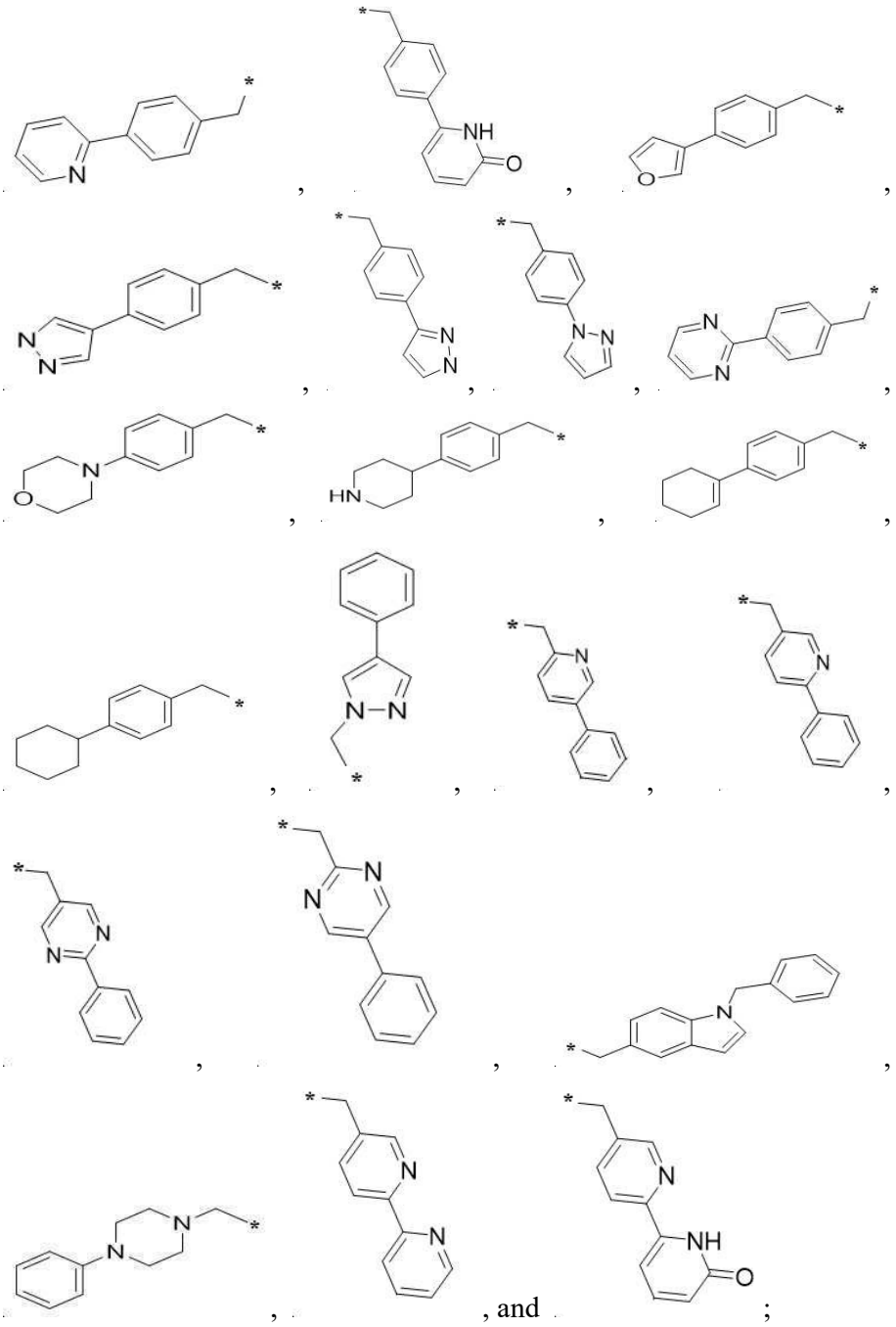
pyrazolyl, imidazolyl, oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, triazolyl, oxadiazolyl, thiadiazolyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, indolyl, benzimidazolyl, benzothiazolyl, quinolinyl and isoquinolinyl; or heterocycloalkyl selected from azetidinyl, oxetanyl, pyrrolidinyl, pyrazolidinyl, imidazolidinyl, thiazolidinyl, oxazolidinyl, isoxazolidinyl, piperidinyl, piperazinyl and morpholinyl; and

Cy_2 is phenyl; heteroaryl selected from pyrrolyl, furanyl, thiophenyl, pyrazolyl, imidazolyl, oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, triazolyl, oxadiazolyl, thiadiazolyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, indolyl, benzimidazolyl, benzofuranyl, benzothiazolyl, quinolinyl and isoquinolinyl; heterocycloalkyl selected from azetidinyl, oxetanyl, pyrrolidinyl, tetrahydrofuranyl, pyrazolidinyl, imidazolidinyl, thiazolidinyl, oxazolidinyl, isoxazolidinyl, piperidinyl, piperazinyl and morpholinyl; cyclobutyl, cyclopentyl, cyclohexyl or cycloheptyl; or cyclobutenyl, cyclopentenyl, cyclohexenyl or cycloheptenyl.

[Claim 5] The compound or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to any one of claims 1-4, wherein

R_a is -V-Cy_2, and  has a structure selected from:



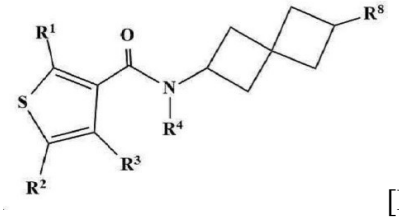


, and ;

wherein Cy is optionally substituted with R' and Cy_2 is optionally substituted with R".

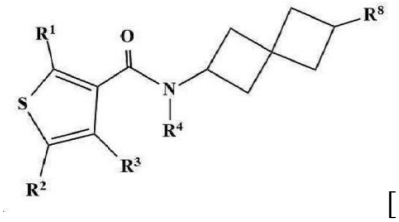
[Claim 6] The compound of formula I or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to any one of claims 1-5, wherein $R^{8'}$ is hydroxy.

[Claim 7] The compound or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to any one of claims 1-6, wherein the compound is of the Formula 1A-3:



[Formula IA-3].

[Claim 8] The compound or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to any one of claims 1-7, wherein the compound is of the Formula 1A-3:



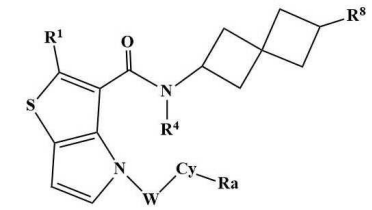
[Formula IA-3],

wherein

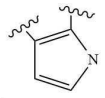
Cy is phenyl, pyrazolyl, or piperazinyl; and

Cy_2 is phenyl, furanyl, pyrazolyl, pyridinyl, morpholinyl, piperidinyl, cyclohexyl, or cyclohexenyl.

[Claim 9] The compound or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to any one of claims 1-6, wherein the compound is of the [Formula IB-5]



wherein

either or both of the carbon atoms of  may be optionally substituted with C_1-C_3 alkyl;

W is $-(CH_2)_o-$ or $-(CH_2)_o-C\equiv C-$, wherein H of said CH_2 may be optionally substituted with one or more halogen, hydroxy or C_1-C_3 alkoxy;

Cy is selected from the group consisting of phenyl, and 5- to 10-membered heteroaryl containing 1 or 2 nitrogen atoms, and may be optionally substituted with one or more R';

R^a is hydrogen, halogen, C_1-C_3 alkyl, C_1-C_3 haloalkyl or $-V-Cy_2$,

wherein V is absent or $-CH_2-$, and Cy_2 is selected from the group consisting of phenyl, and 5- to 10-membered heteroaryl containing 1 or 2 nitrogen atoms, and may be optionally substituted with one or more R'';

R'' is selected from the group consisting of halogen, hydroxy, cyano, amino, oxo, C_1-C_6 alkyl, C_1-C_6 haloalkyl, C_1-C_6 alkoxy, C_1-C_6 haloalkoxy, $-(CH_2)_p-NH_2$, $-(CH_2)_p-NH-(C_1-C_6alkyl)$, $-(CH_2)_p-N(C_1-C_6alkyl)_2$; azetidinyl or oxetanyl, optionally substituted with hydroxy or oxo; and cyclopropyl or cyclopropylmethyl, optionally substituted with hydroxy or oxo; and

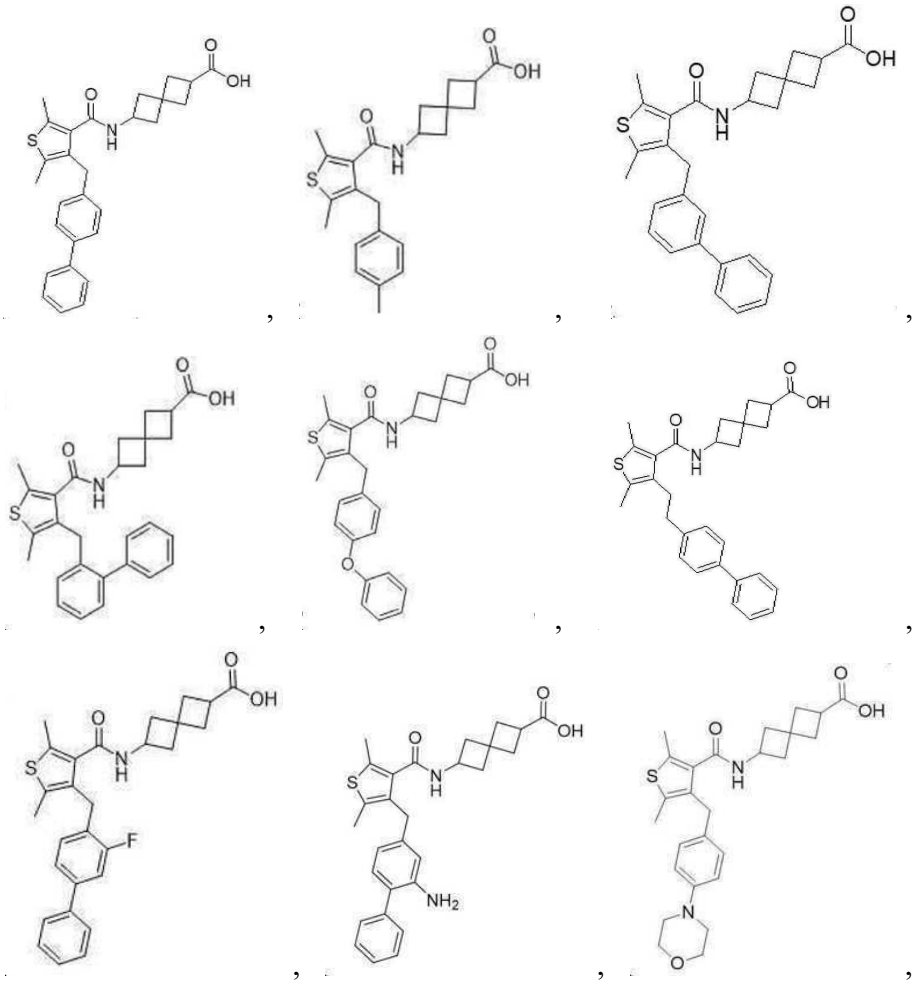
R^1, R^4, R^8, R', o and p are as defined in claim 1.

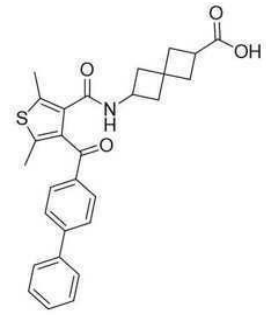
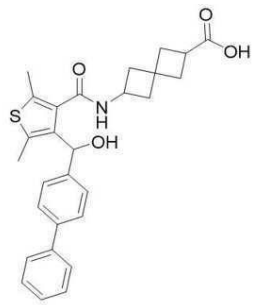
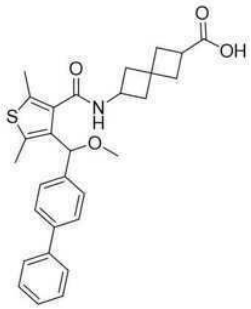
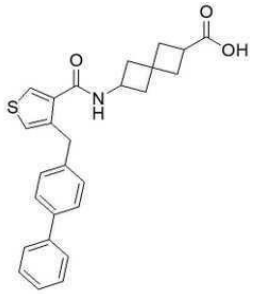
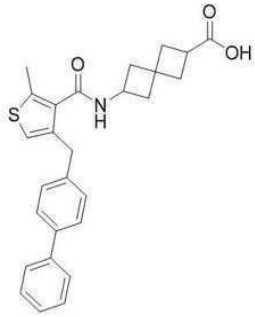
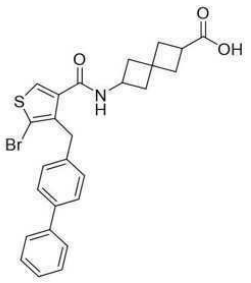
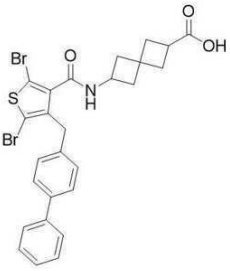
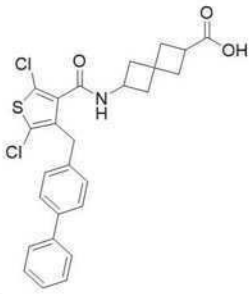
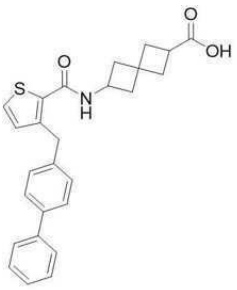
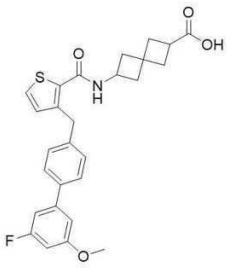
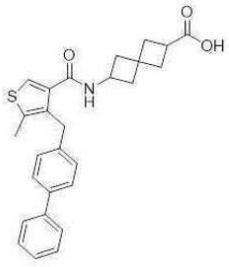
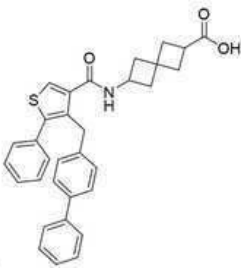
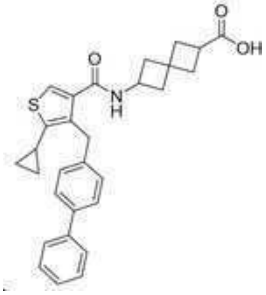
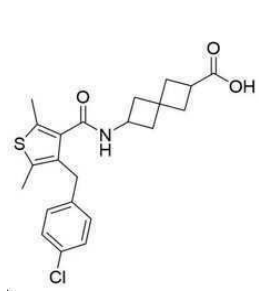
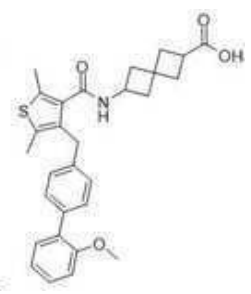
[Claim 10] The compound or solvate, steroisomer or pharmaceutically acceptable salt thereof according to any one of claim 1 to 9 wherein:

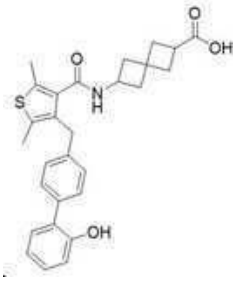
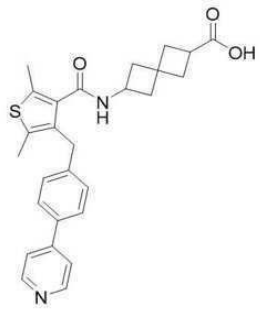
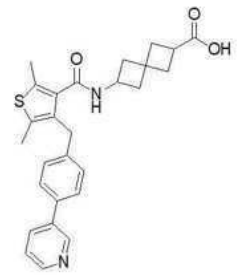
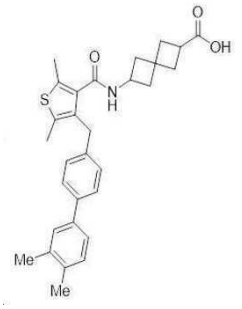
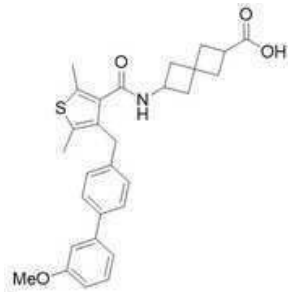
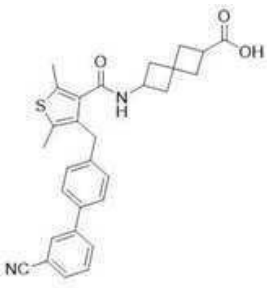
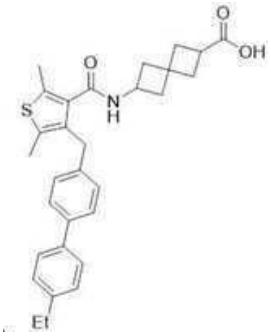
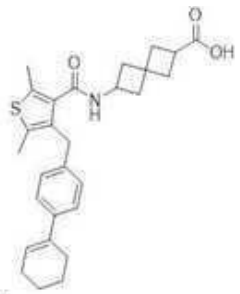
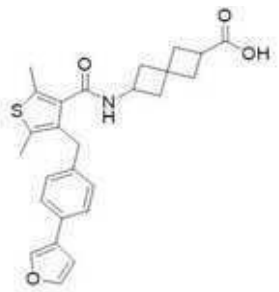
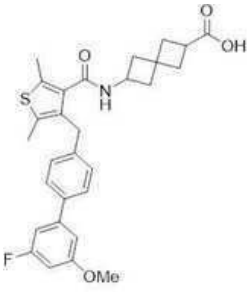
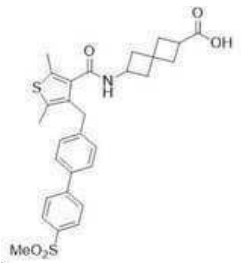
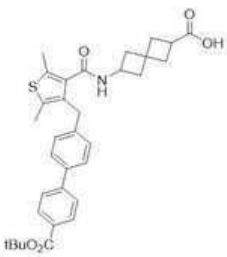
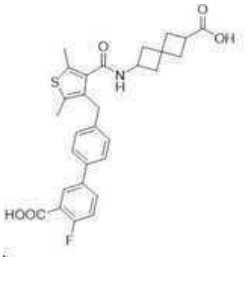
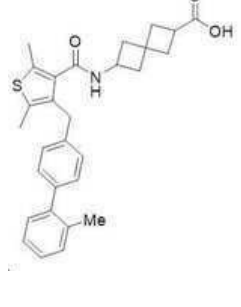
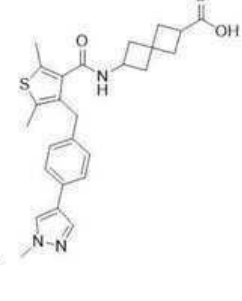
(i) R^4 is hydrogen or C_1-C_3 alkyl; and/or

(ii) o and p are each independently an integer of 0 to 2.

[Claim 11] The compound or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to any one of claims 1-10, wherein the compound is selected from the group consisting of the following compounds:



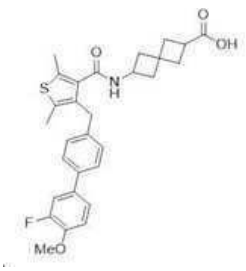
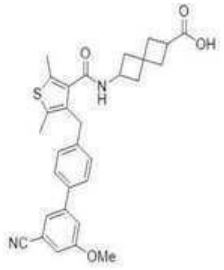
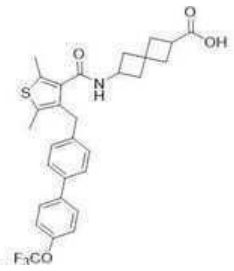
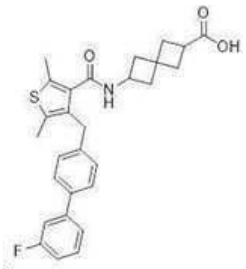
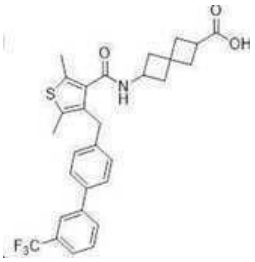
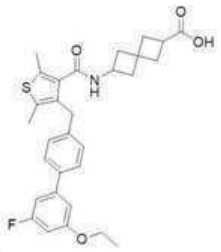
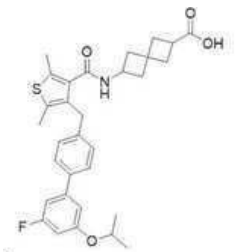
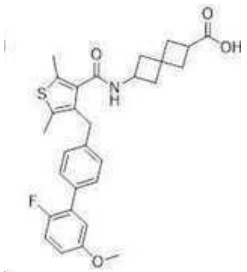
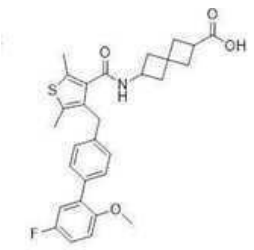
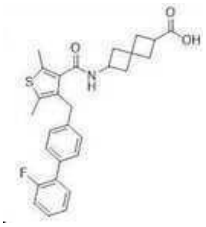
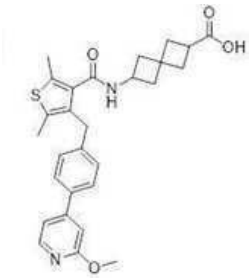
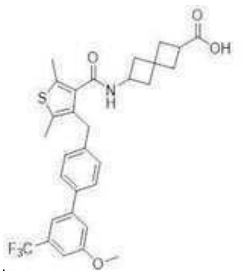
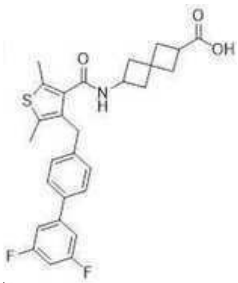
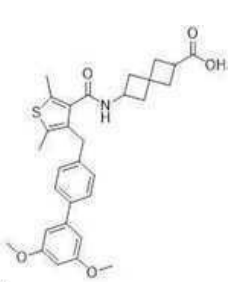
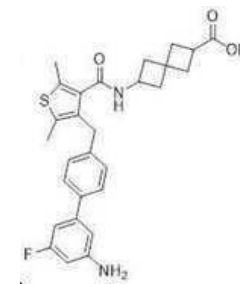
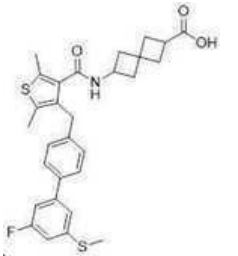
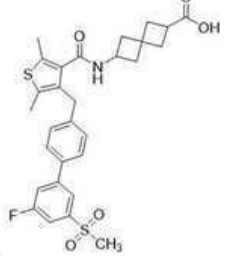
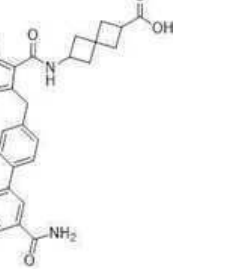

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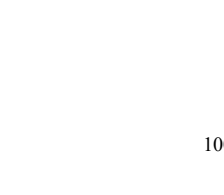

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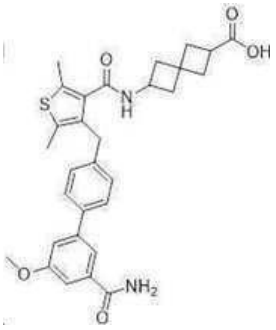
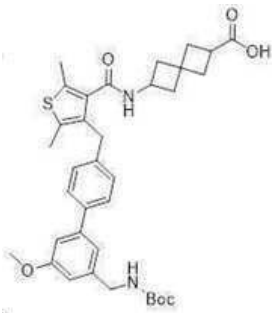
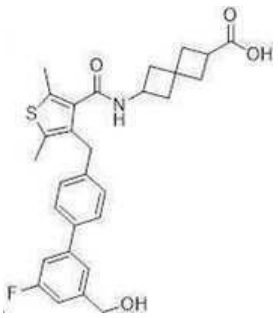
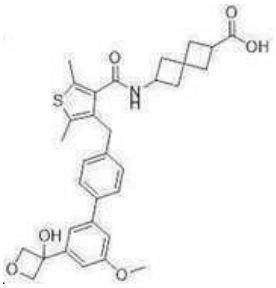
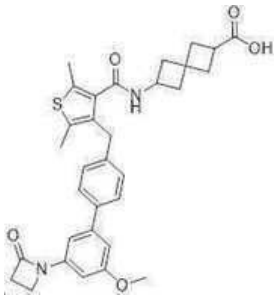
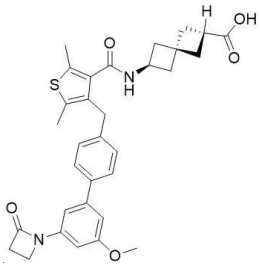
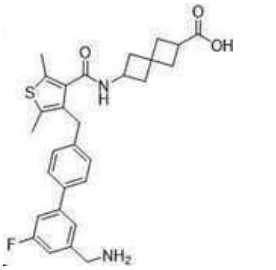
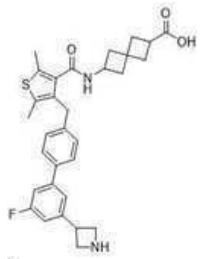
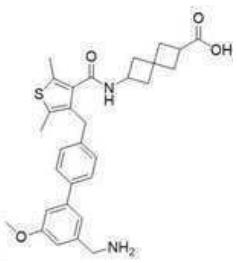
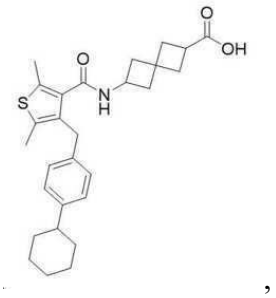
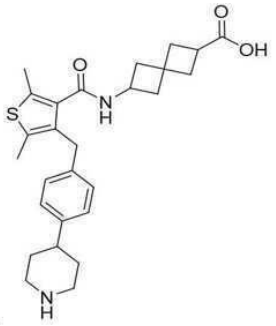
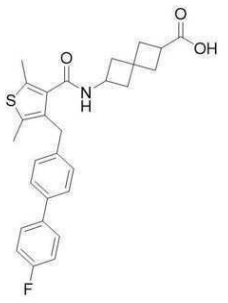
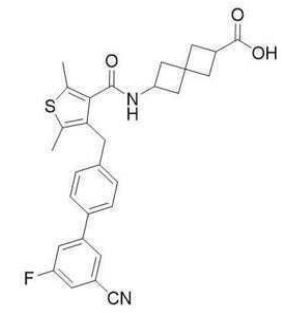
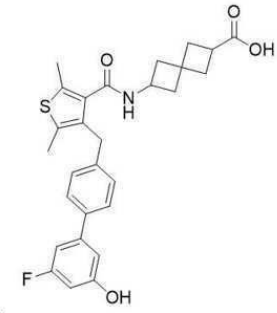
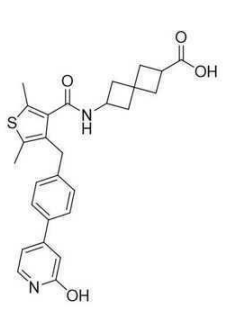
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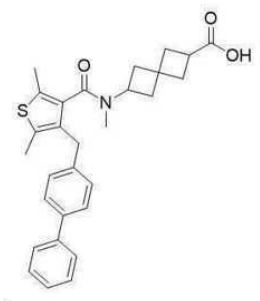
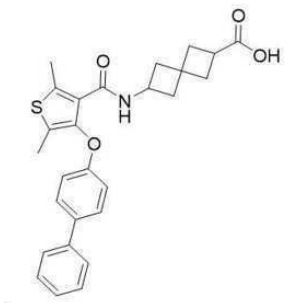
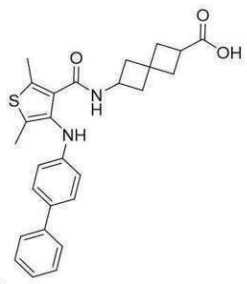
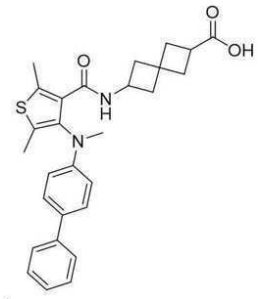
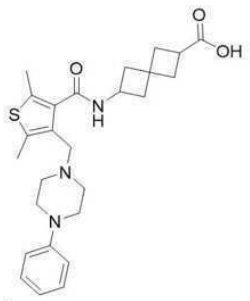
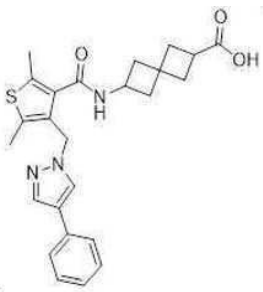
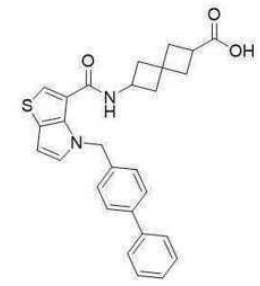
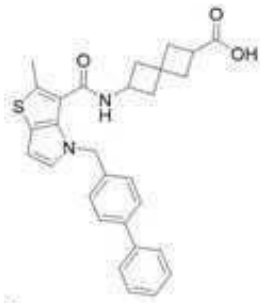
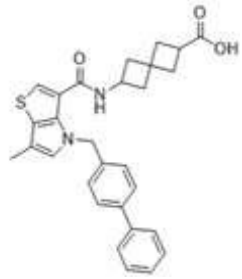
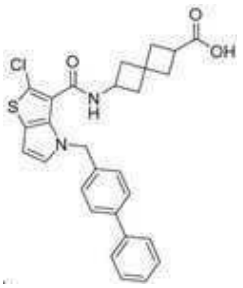
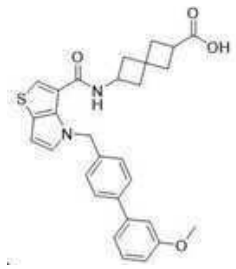
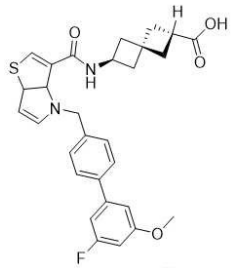
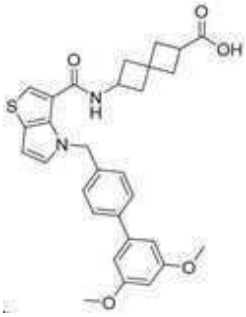
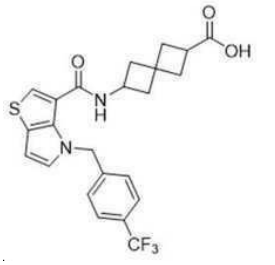
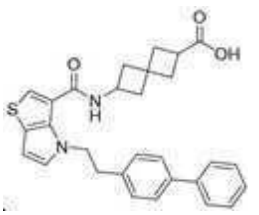
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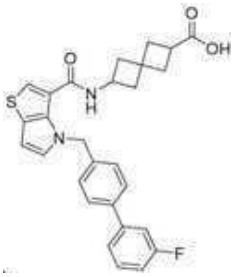
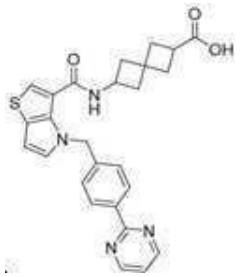
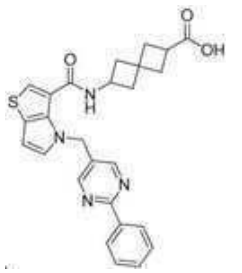
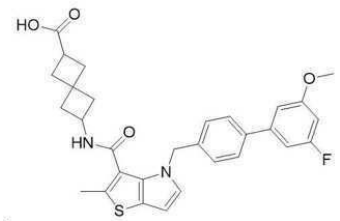
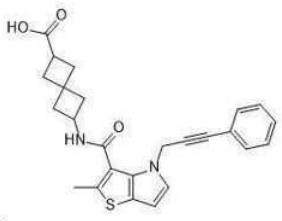
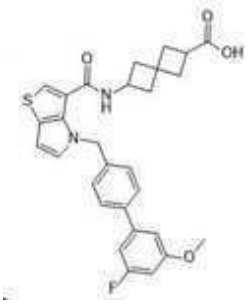
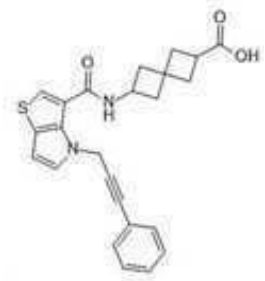
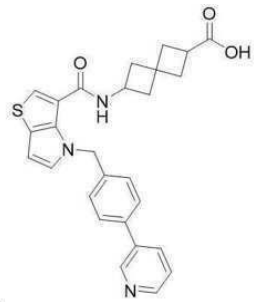
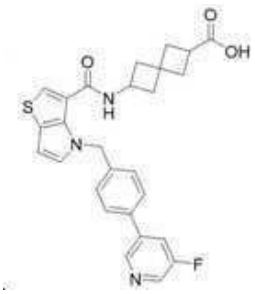
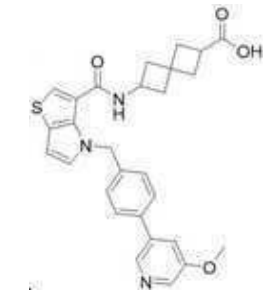
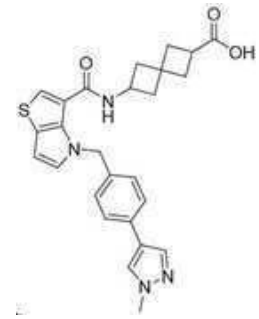
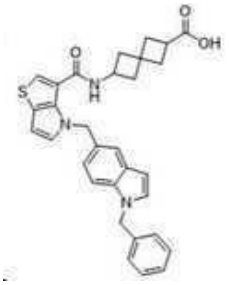
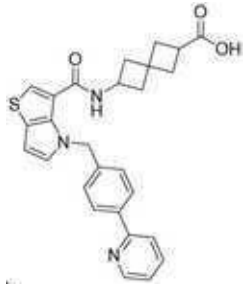
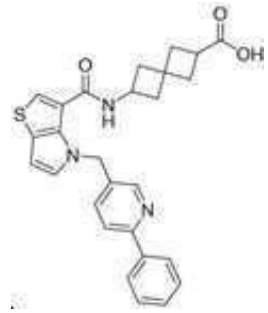
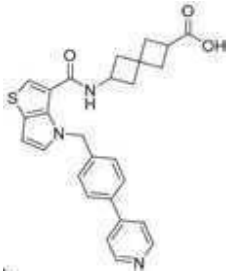
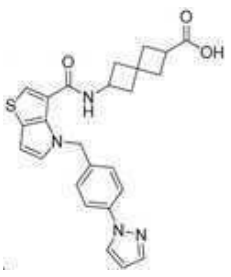
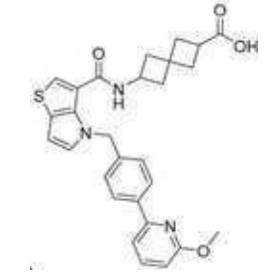

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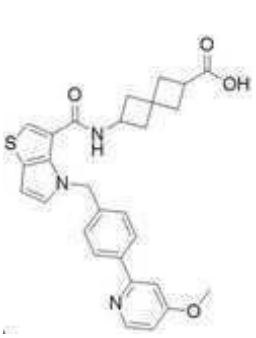
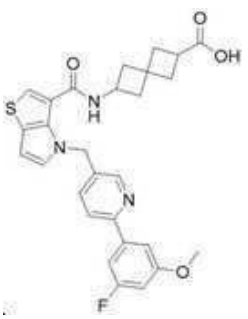
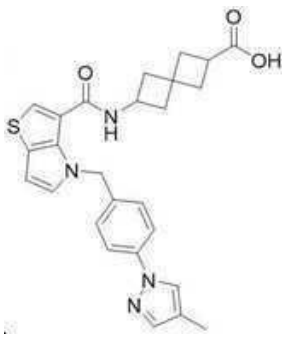
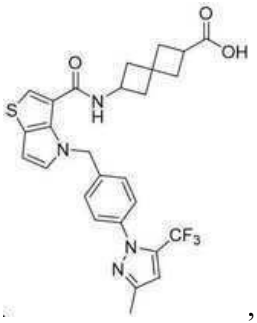
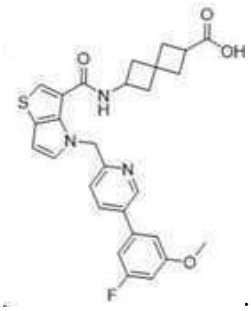
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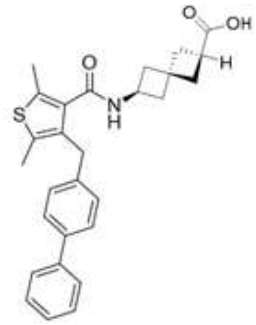
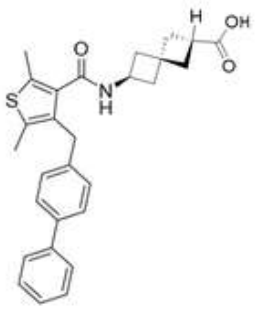
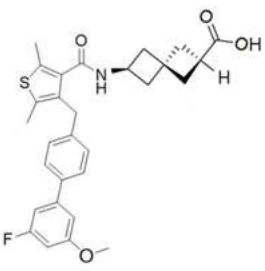
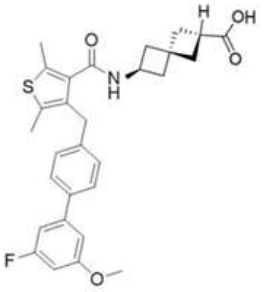
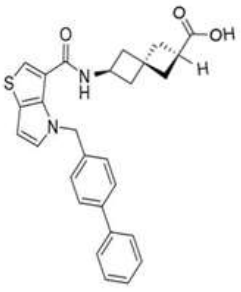
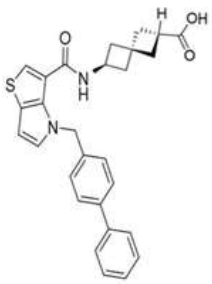
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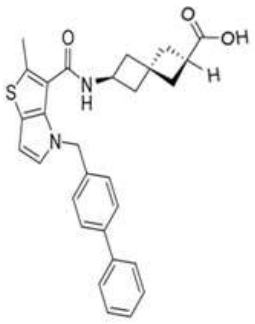
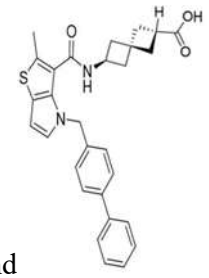
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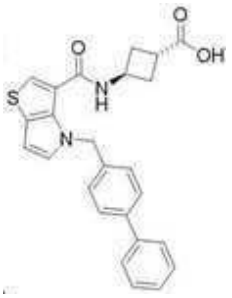
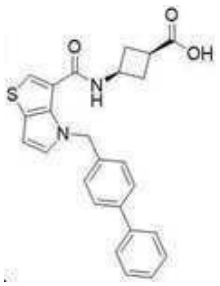
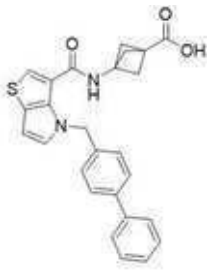
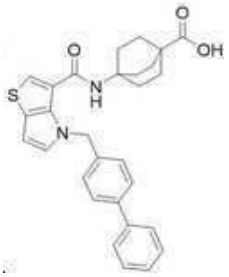

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[Claim 12] The compound or solvate, stereoisomer or pharmaceutically acceptable salt thereof according to any one of claims 11, wherein the compound is selected from the group consisting of the following compounds:


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[Claim 13] A compound or a solvate, stereoisomer or pharmaceutically acceptable salt thereof wherein the compound is selected from the group consisting of the following compounds:


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[Claim 14] A pharmaceutical composition comprising the compound, solvate, stereoisomer or pharmaceutically acceptable salt thereof according to any one of claims 1 to 13 as an active ingredient.

[Claim 15] Use of the pharmaceutical composition according to claim 13, in the preparation of a medicament for the prevention or treatment of a disease associated with prostaglandin E_2 overexpression and/or prostaglandin E_2 receptor overexpression.

[Claim 16] The use according to claim 15, wherein the disease associated with prostaglandin E_2 overexpression and/or prostaglandin E_2 receptor overexpression is cancer, a neurodegenerative disease or an inflammatory disease.

[Claim 17] The use according to claim 16, wherein the cancer is selected from the group consisting of squamous cell cancer, basal cell cancer, glioblastoma, bone cancer, stomach cancer, kidney cancer, lung cancer, bladder cancer, prostate cancer, breast cancer, ovarian cancer, endometrial cancer, cervical cancer, bladder cancer, head and neck cancer, renal cell carcinoma, esophageal

cancer, pancreatic cancer, brain cancer, gastrointestinal cancer, liver cancer, leukemia, lymphoma, melanoma, multiple myeloma, osteosarcoma, colorectal cancer, cholangiocarcinoma, choriocarcinoma, oral cancer, neuroblastoma, skin cancer, testis cancer, stromal tumor, germ cell tumor and thyroid cancer.

[Claim 18] The use according to claim 16, wherein the neurodegenerative disease is selected from the group consisting of epilepsy, Alzheimer's disease, Parkinson's disease, amyotrophic lateral sclerosis and traumatic brain injury.

[Claim 19] The use according to claim 16, wherein the inflammatory disease is selected from the group consisting of edema, allergy, asthma, conjunctivitis, periodontitis, rhinitis, otitis media, pharyngolaryngitis, tonsillitis, pneumonia, gastric ulcer, gastritis, Crohn's disease, colitis, hemorrhoid, gout, ankylosing spondylitis, rheumatic fever, lupus, fibromyalgia, psoriatic arthritis, osteoarthritis, rheumatoid arthritis, periarthritis of shoulder, tendinitis, tenosynovitis, myositis, hepatitis, cystitis, nephritis, Sjogren's syndrome and multiple sclerosis.