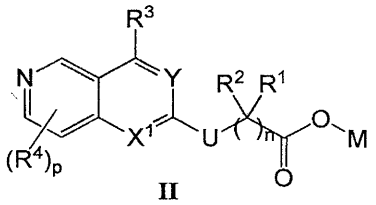
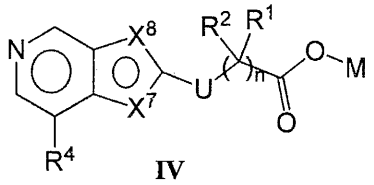
Claims

1. A condensed ring derivative having a structure of formula II or IV, a tautomer, a mesomer, a racemate, an enantiomer, a diastereoisomer, or a pharmaceutically acceptable salt thereof,



II



IV

M is H, D or a pharmaceutically acceptable cation;

U is , or ;

X^1 is CH or N,

Y is  or N;

each of X^7 and X^8 is independently CH or S;

each of R^1 and R^2 is independently H, D, a halogen, CN, an alkyl, an alkoxy, a cycloalkyl, an alkenyl, a alkynyl or a heterocycloalkyl; or, R^1, R^2 together with the carbon atom attached form a cycloalkyl or a heterocyclic group; the alkyl, the alkoxy, the cycloalkyl, the alkenyl, the alkynyl, the heterocycloalkyl, the cycloalkyl formed by R^1, R^2 and the carbon atom attached, or the heteroalkyl formed by R^1, R^2 and the carbon atom attached can further be substituted by a substituent selected from the group consisting of D, a halogen, CN, an alkyl, an alkoxy, a cycloalkyl, an alkenyl, an alkynyl, a heterocycloalkyl or an aryl;

R^3 is H, D, a halogen, an alkyl, an alkoxy, an aryl, a heteroaryl, a heterocycloalkyl or an amino; wherein the alkyl, the alkoxy, the aryl, the heteroaryl, the heterocycloalkyl or the amino can be further substituted by a substituent selected from the group consisting of D, a halogen, CN, an alkyl, an aryl, an aryl substituted by halogen, a benzyl, a benzyl which is substituted by halogen in the phenyl, a benzoyl or a benzoyl which is substituted by halogen in the phenyl; when the substituents are more than one, the substituents are the same or different;

R^4 is H, D, a halogen, CN, NH_2, OH, an alkyl, an alkoxy, a cycloalkyl, an alkenyl, an alkynyl, a heterocycloalkyl, an aryl or a heteroaryl; wherein NH_2, OH, the alkyl, the alkoxy, the cycloalkyl, the alkenyl, the alkynyl, the heterocyclic group, the aryl or the heteroaryl can further be substituted by a substituent selected from the group consisting of D, a halogen, CN, an alkyl, an alkoxy, a cycloalkyl, an alkenyl, an alkynyl, a heterocycloalkyl, an aryl, an aryl substituted by a halogen and/or CN, a heteroaryl or a heteroaryl substituted by CN;

each of R^5 and R^6 is independently H, D, OH, a halogen, CN, an alkyl, an alkoxy, a cycloalkyl, an alkenyl, an alkynyl or a heterocycloalkyl; or R^5, R^6 together with the carbon atom attached form a cycloalkyl or a heterocyclic group; the alkyl, the alkoxy, the cycloalkyl, the alkenyl, the alkynyl, the heterocycloalkyl, the cycloalkyl formed by R^5, R^6 together with the carbon atom attached or the heterocyclic group formed by R^5, R^6 together with the carbon atom attached can further be substituted by a substituent selected from the group consisting of D, a halogen, CN, an alkyl, an alkoxy, a cycloalkyl, an alkenyl, an alkynyl, a heterocycloalkyl

or an aryl;

n is 0, 1 or 2;

p is 1, 2, 3 or 4.

2. The condensed ring derivative having a structure of formula II or IV, the tautomer, the mesomer, the racemate, the enantiomer, the diastereoisomer, or the pharmaceutically acceptable salt thereof according to claim 1, wherein,

M is H or a pharmaceutically acceptable cation;

each of R^1 and R^2 is independently H, D or an alkyl; or R^1 and R^2, together with the carbon atom attached form a cycloalkyl;

R^3 is H, a halogen, an alkyl or an aryl;

R^4 is H, a halogen, an alkyl, an aryl or a heteroaryl;

each of R^5 and R^6 is independently H, OH, a halogen or an alkyl;

p is 1.

3. The condensed ring derivative having a structure of formula II or IV, the tautomer, the mesomer, the racemate, the enantiomer, the diastereoisomer, or the pharmaceutically acceptable salt thereof according to claim 1, wherein,

M is Na ion, K ion or Ca ion;

and/or, each of R^1 and R^2 is independently F, Cl, Br or I, C_{1-4} alkyl, C_{1-4} alkoxy, C_{3-6} cycloalkyl, C_{2-4} alkenyl, C_{2-4} alkynyl, or a C_{2-10} heterocycloalkyl having 1-2 heteroatom(s) selected from O, S or N, or R^1 and R^2 together with the carbon atom attached form a C_{3-6} cycloalkyl, or, R^1 and R^2 together with the carbon atom attached form a C_{2-5} heterocyclic group having 1-2 heteroatom(s) selected from O or S;

and/or, R^3 is F, Cl, Br or I, C_{1-4} alkyl, C_{1-4} alkoxy, C_{6-10} aryl, or, a C_{2-5} heteroaryl having 1-3 heteroatom(s) selected from N, or, a C_{2-10} heterocycloalkyl having 1-3 heteroatom(s) selected from N, O or S;

and/or, R^4 is F, Cl, Br or I, a C_{1-4} alkyl, a C_{1-4} alkoxy, a C_{3-6} cycloalkyl, a C_{2-4} alkenyl, a C_{2-4} alkynyl, or, a C_{2-10} heterocycloalkyl having 1-3 heteroatom(s) selected from N, O or S, a C_{6-10} aryl, or a C_{2-10} heteroaryl having 1-2 heteroatom(s) selected from O;

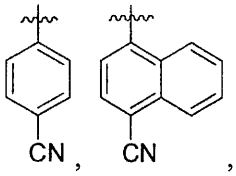
and/or, each of R^5 and R^6 is independently F, Cl, Br or I, a C_{1-4} alkyl, C_{1-4} alkoxy, a C_{3-6} cycloalkyl, a C_{2-4} alkenyl, a C_{2-4} alkynyl, or a C_{2-10} heterocycloalkyl having 1-2 heteroatom(s) selected from O, S or N, or, R^5 and R^6 together with the carbon atom form a C_{3-6} cycloalkyl, or, R^5, R^6 together with the carbon atom attached form a C_{2-10} heterocycloalkyl having 1-2 heteroatom(s) selected from O or S.

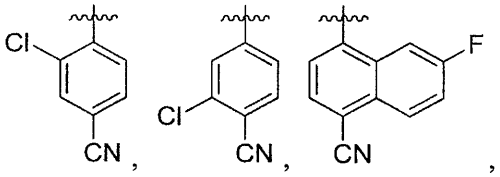
4. The condensed ring derivative having a structure of formula II or IV, the tautomer, the mesomer, the racemate, the enantiomer, the diastereoisomer, or the pharmaceutically acceptable salt thereof according to claim 1, wherein,

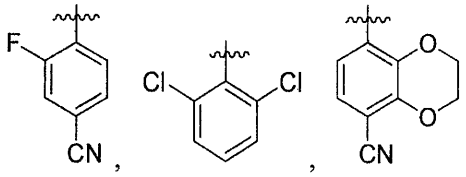
the cycloalkyl formed by R^1 and R^2 together with the carbon atom attached, or the heterocyclic group formed by R^1, R^2 together with the carbon atom attached, is substituted by a substituent selected from the group consisting of F, Cl, Br, I, a C_{1-4} alkyl, a C_{1-4} alkoxy, a C_{3-6} cycloalkyl, a C_{2-4} alkenyl, a C_{2-4} alkynyl, a C_{6-10} aryl, a C_{2-10} heterocycloalkyl having 1-2 heteroatom(s) selected from O, S or N;

and/or, the cycloalkyl formed by R^5, R^6 together with the carbon atom attached or the heterocyclic group formed by R^5, R^6 together with the carbon atom attached is substituted by a substituent selected from the group consisting of F, Cl, Br, I, a C_{1-4} alkyl, a C_{1-4} alkoxy, a C_{3-6} cycloalkyl, a C_{2-4} alkenyl, a C_{2-4} alkynyl, a C_{6-10} aryl, a C_{2-10} heterocycloalkyl having 1-2 heteroatom(s) selected from O, S or N;

and/or, the alkyl, the alkoxy, the aryl, the heteroaryl, the heterocycloalkyl or the amino defined in R^3 is substituted by a substituent selected from the group consisting of F, Cl, Br, I, a C_{1-4} alkyl, a C_{6-10} aryl, 2,6-dichlorophenyl, 2,6-dichlorobenzyl and 2,6-dichlorobenzoyl;

and/or, NH_2, OH, the alkyl, the alkoxy, the cycloalkyl, the alkenyl, the alkynyl, the heterocycloalkyl, the aryl or the heteroaryl defined in R^4 is substituted by a substituent selected from the group consisting of F, Cl, Br, I, a C_{1-4} alkyl, a C_{1-4} alkoxy, a C_{3-6} cycloalkyl, a C_{2-4} alkenyl, a C_{2-4} alkynyl, a C_{6-10} aryl, a C_{2-10} heterocycloalkyl having 1-2 heteroatom(s) selected from O, S or N, 

, 

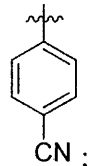
, 

and a C_{2-10} heteroaryl having 1-2 heteroatom(s) selected from O.

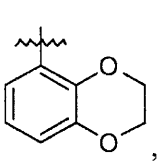
5. The condensed ring derivative having a structure of formula II or IV, the tautomer, the mesomer, the racemate, the enantiomer, the diastereoisomer, or the pharmaceutically acceptable salt thereof according to claim 3, wherein,

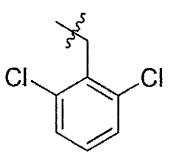
each of R^1 and R^2 is independently methyl, ethyl, *n*-propyl, *iso*-propyl, *n*-butyl, *iso*-butyl or *tert*-butyl;

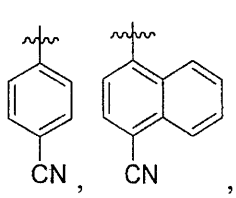
or, R^1 and R^2 together with the carbon atom attached form a cyclobutyl;

and/or, R^3 is methyl, ethyl, *n*-propyl, *iso*-propyl, *n*-butyl, *iso*-butyl, *tert*-butyl, a phenyl, a pyridyl or 

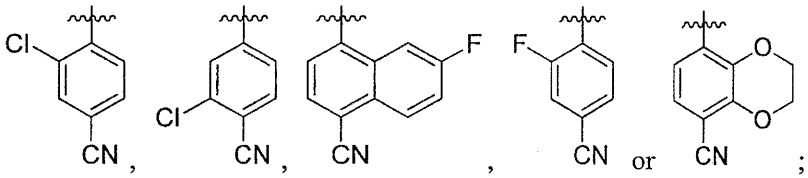
;

and/or, R^4 is a phenyl, a naphthyl, 

, 

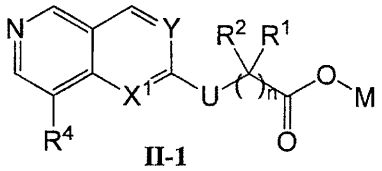
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and/or, each of R^5 and R^6 is independently methyl, ethyl, *n*-propyl, *iso*-propyl, *n*-butyl, *iso*-butyl or *tert*-butyl.

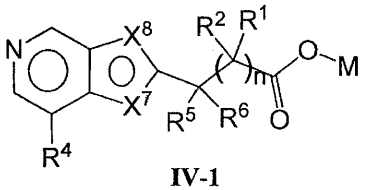
6. The condensed ring derivative having a structure of formula II or IV, the tautomer, the mesomer, the racemate, the enantiomer, the diastereoisomer, or the pharmaceutically acceptable salt thereof according to any one of claims 1-5, wherein, the compound having a structure of formula II has a structure of formula II-1:



II-1

in the formula II-1, the definitions of X^1, Y, R^1, R^2, R^4, U, M and n refer to those in any one of claims 1-5;

the compound having a structure of formula IV has a structure of formula IV-1:



IV-1

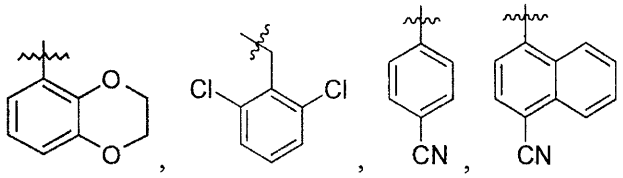
wherein, the definitions of X^7, X^8, R^1, R^2, R^4, R^5, R^6, M and n refer to those in any one of claims 1-5.

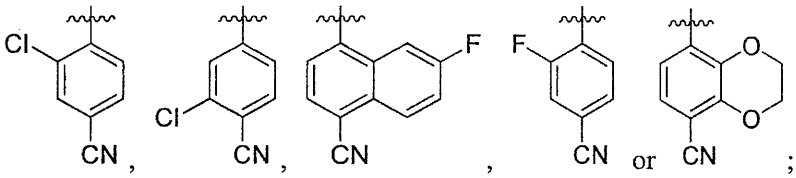
7. The condensed ring derivative having a structure of formula II or IV, the tautomer, the mesomer, the racemate, the enantiomer, the diastereoisomer, or the pharmaceutically acceptable salt thereof according to claim 6, wherein,

in the compound of general formula II-1,

each of R^1 and R^2 is independently H, methyl, ethyl, n-propyl, iso-propyl, n-butyl, iso-butyl or tert-butyl; or R^1, R^2 together with the carbon atom attached form a cyclobutyl;

M is H;

R^4 is a phenyl, a naphthyl, 



U is  or ;

each of R^5 and R^6 is independently H, methyl, ethyl, n-propyl, iso-propyl, n-butyl, iso-butyl or tert-butyl;

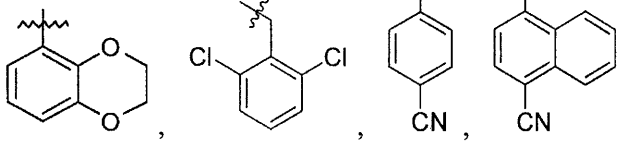
n is 1;

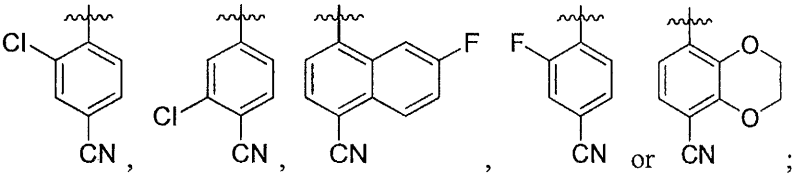
preferably, in the compound of formula II-1, where U is  and R^5 and R^6 are H, R^1 and R^2 are not H at the same time;

in the compound of formula IV-1,

each of X^7 and X^8 is independently CH or S;

each of R^1 and R^2 is independently H, methyl, ethyl, n-propyl, iso-propyl, n-butyl, iso-butyl or tert-butyl;

R^4 is a phenyl, a naphthyl, 



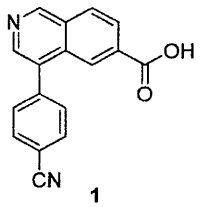
each of R^5 and R^6 is independently H, methyl, ethyl, n-propyl, iso-propyl, n-butyl, iso-butyl or tert-butyl;

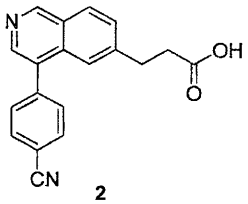
n is 0 or 1;

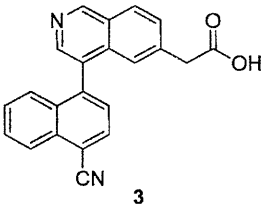
preferably, in the compound of formula IV-1, X^7 is CH; X^8 is S;

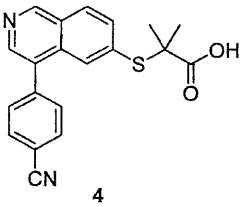
preferably, in the compound of general formula IV-1, where R^1 and/or R^2 is an alkyl, R^5 and R^6 are H; where R^5 and/or R^6 is an alkyl, R^1 and R^2 are H; where X^7 is S, X^8 is CH, R^1 and R^2 are alkyl, R^5 and R^6 are H, R^4 is a phenyl.

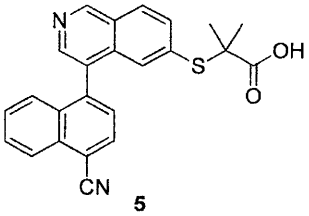
8. A condensed ring derivative, the tautomer, the mesomer, the racemate, the enantiomer, the diastereoisomer, or the pharmaceutically acceptable salt thereof,

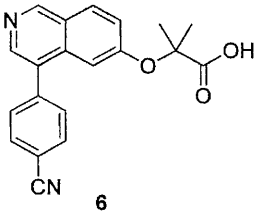

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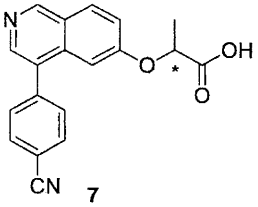

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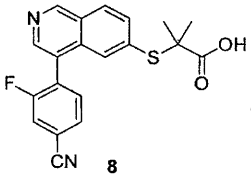

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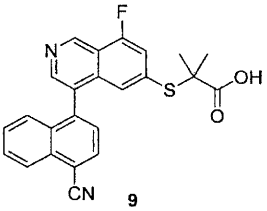

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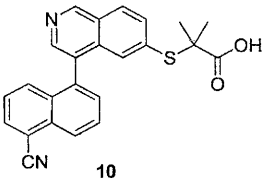

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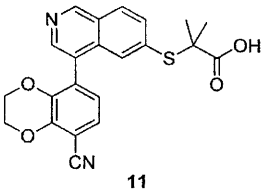

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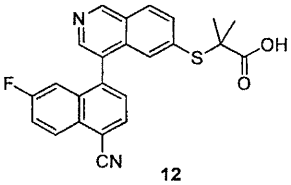

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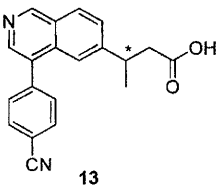

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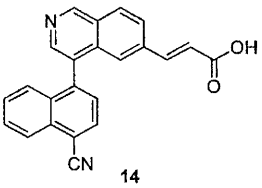

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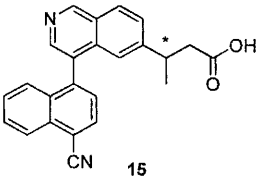

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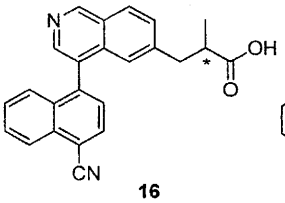

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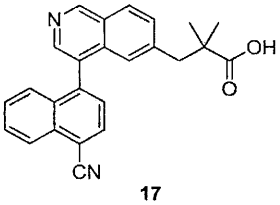

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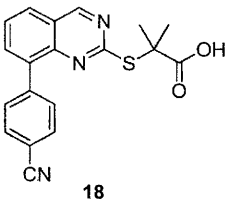

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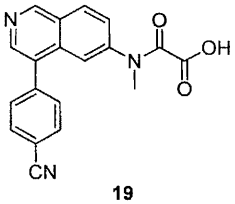

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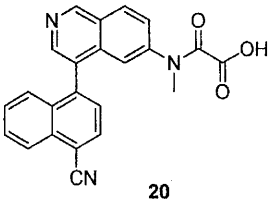

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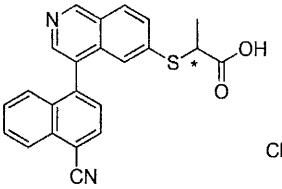

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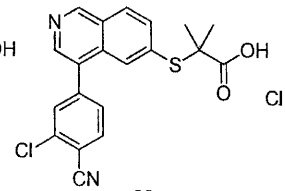

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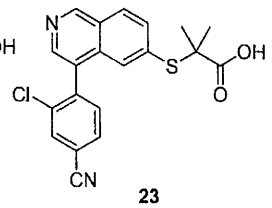

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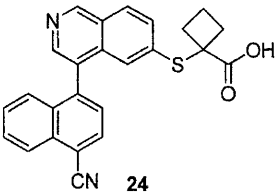

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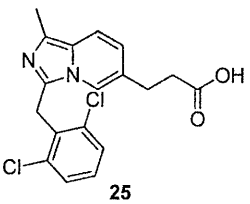

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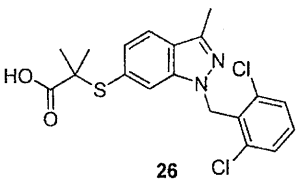

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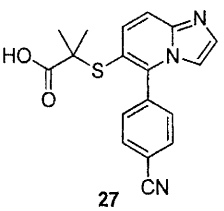

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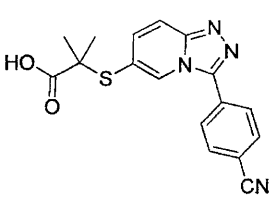

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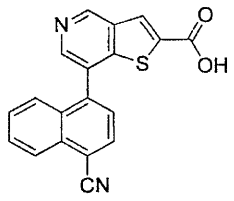

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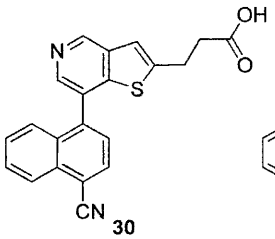

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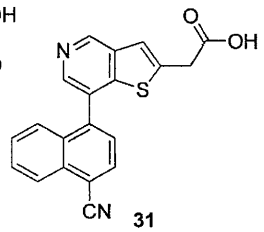
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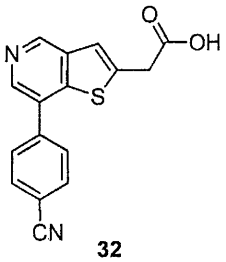
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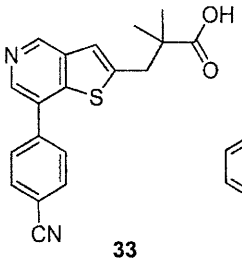
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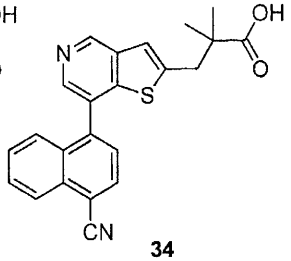
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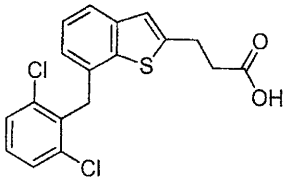
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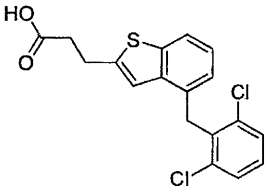
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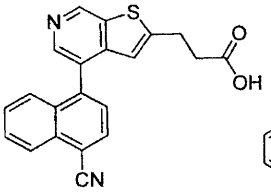
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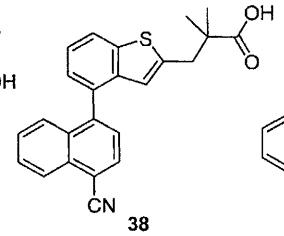
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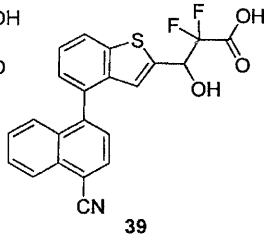
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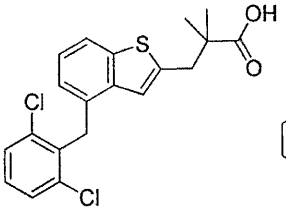
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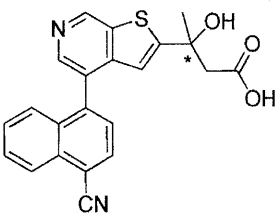
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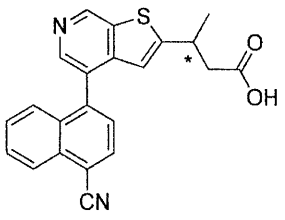
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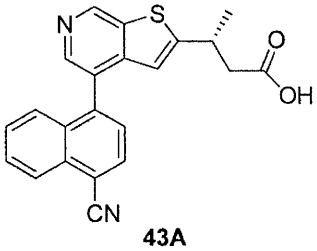
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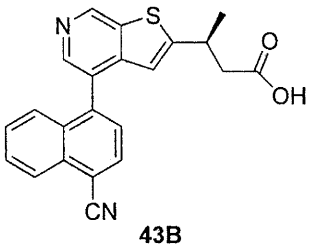
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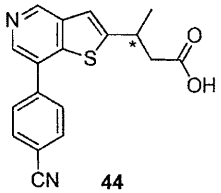
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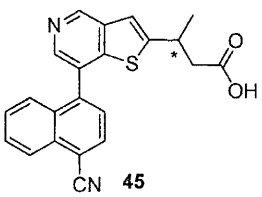
43A



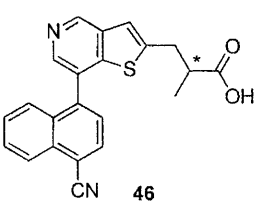
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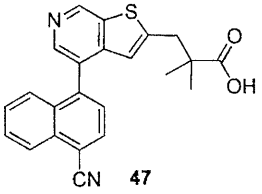
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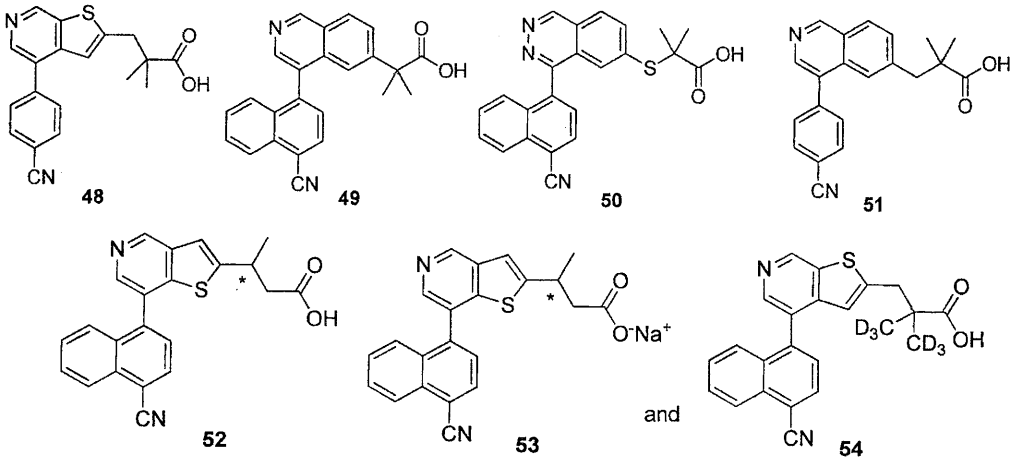
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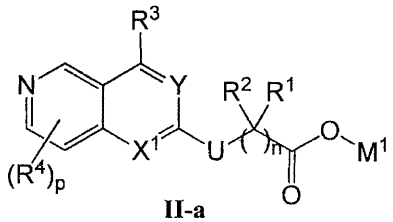


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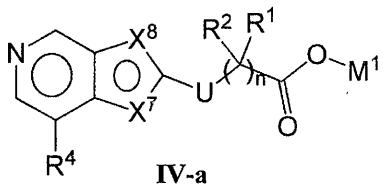


in the above compounds, the carbon atom marked with * refers to a chiral carbon atom or a non-chiral carbon atom, when it is a chiral carbon atom, it is of S-configuration or R-configuration, when it is a non-chiral carbon atom, it refers to racemate.

9. The compound of formula II-a or IV-a:



II-a



IV-a

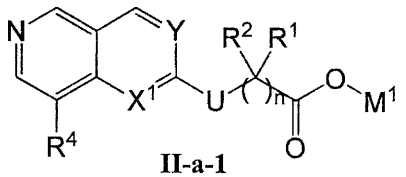
M^1 is an alkyl;

in the compound of formula II-a, X^1 is CH or N; Y is CH or N; the definitions of R^1, R^2, R^3, R^4, U, n and p refer to those in any one of claims 1-8;

in the compound of formula IV-a, each of X^7 and X^8 is independently CH or S; the definitions of R^1, R^2, R^4, U and n refer to those in any one of claims 1-8.

10. The compound of formula II-a or IV-a according to claim 9, wherein,

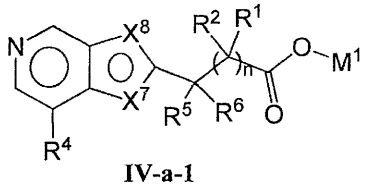
the compound of formula II-a has a structure of formula II-a-1:



II-a-1

wherein, the definitions of X^1, Y, R^1, R^2, R^4, U, M^1 and n refer to those in claim 9;

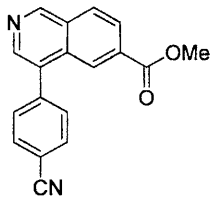
the compound of formula IV-a has a structure of formula IV-a-1:



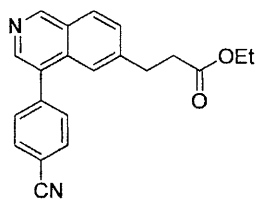
IV-a-1

wherein, the definitions of X^7, X^8, R^1, R^2, R^4, R^5, R^6, M^1 and n refer to those in claim 9.

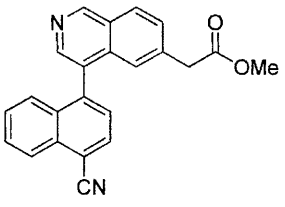
11. The compound of formula II-a or IV-a according to claim 9, wherein, the compound is selected from the group consisting of



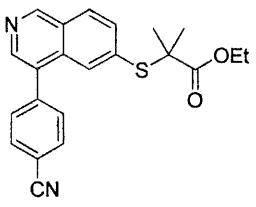
1-a



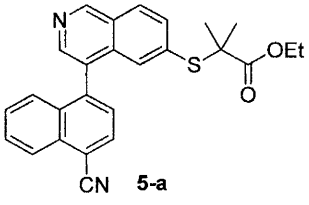
2-a



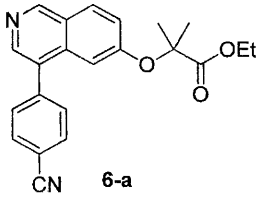
3-a



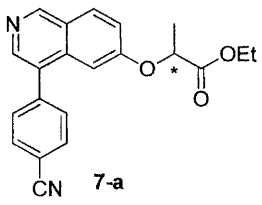
4-a



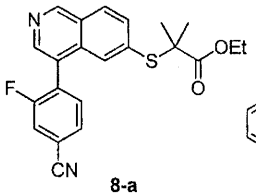
5-a



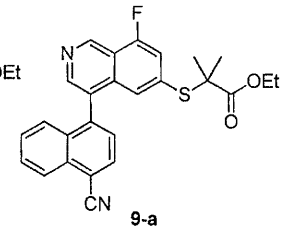
6-a



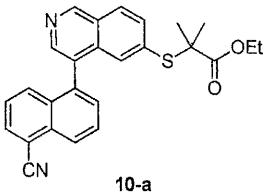
7-a



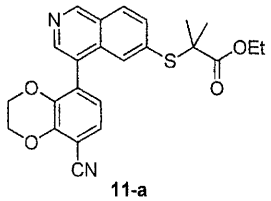
8-a



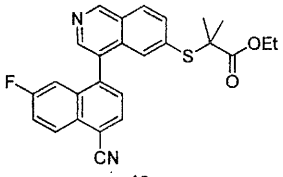
9-a



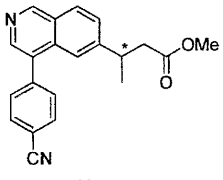
10-a



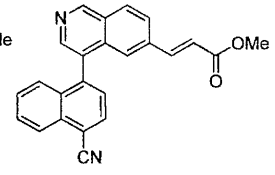
11-a



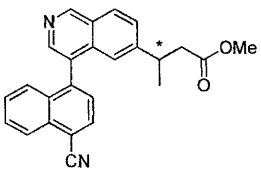
12-a



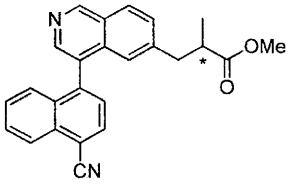
13-a



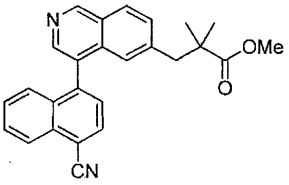
14-a



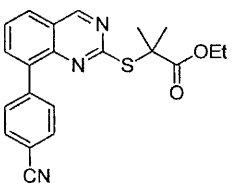
15-a



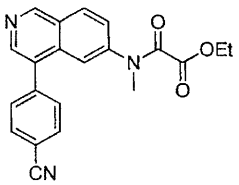
16-a



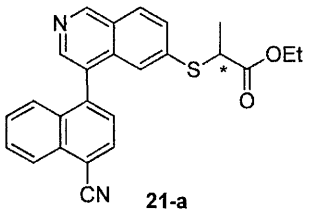
17-a



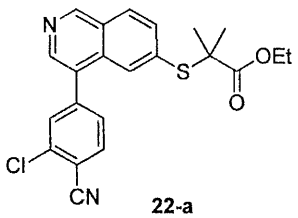
18-a



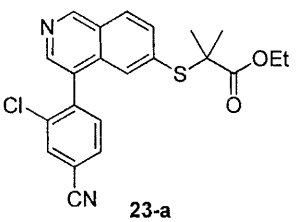
19-a



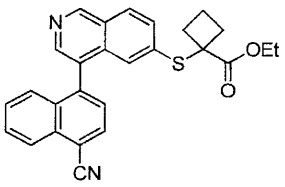
21-a



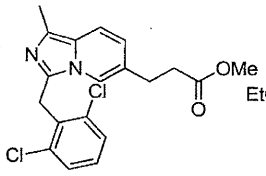
22-a



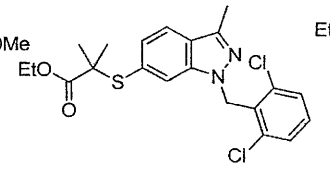
23-a



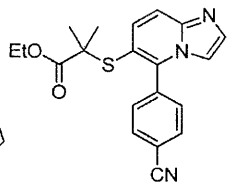
24-a



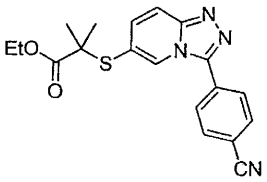
25-a



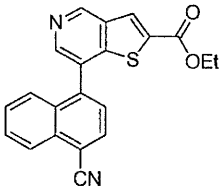
26-a



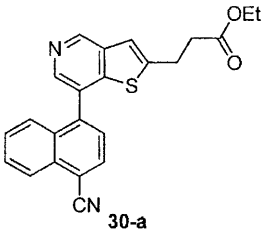
27-a



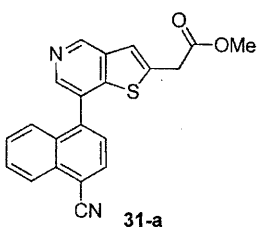
28-a



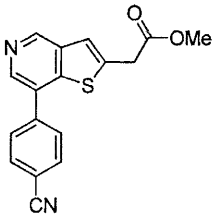
29-a



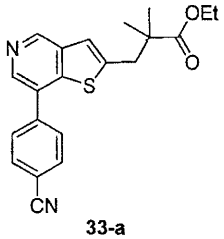
30-a



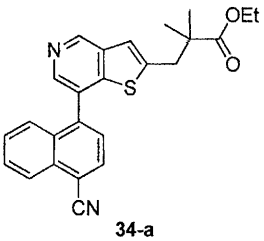
31-a



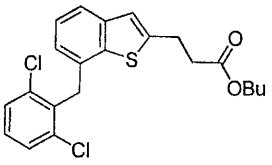
32-a



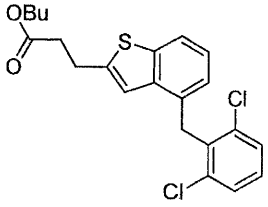
33-a



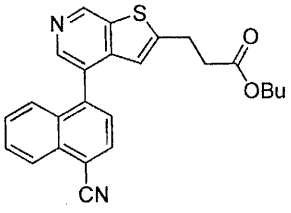
34-a



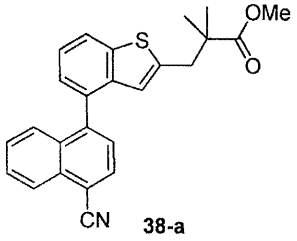
35-a



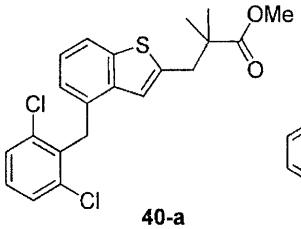
36-a



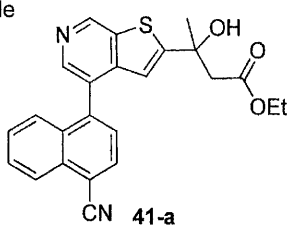
37-a



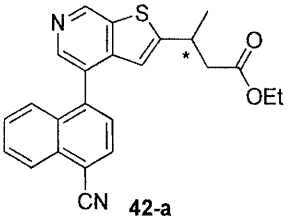
38-a



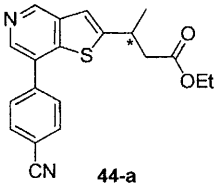
40-a



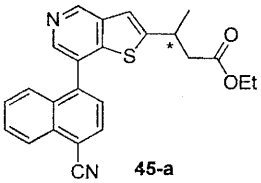
41-a



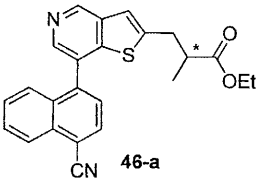
42-a



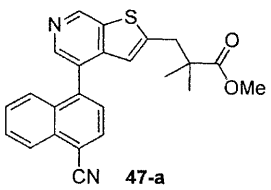
44-a



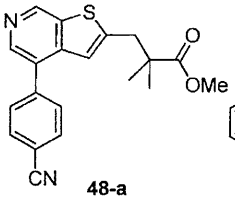
45-a



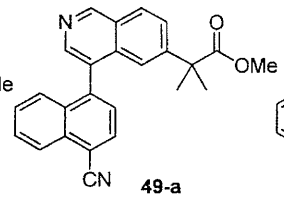
46-a



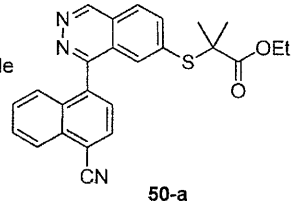
47-a



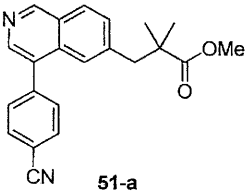
48-a



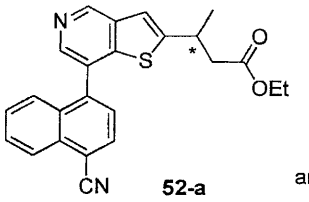
49-a



50-a

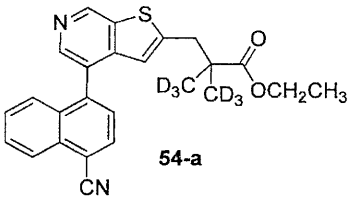


51-a



52-a

and



54-a

in the above compounds, the carbon atom marked with * is a chiral carbon atom or a non-chiral carbon atom, when it is a chiral carbon atom, it is of S-configuration or R-configuration, when it is a non-chiral carbon atom, it refers to racemate.

12. Use of the condensed ring derivative having a structure of formula II or IV, the tautomer, the mesomer, the racemate, the enantiomer, the diastereoisomer, or the pharmaceutically acceptable salt thereof according to at least one of claims 1-8 in manufacturing a medicament in preventing and/or treating hyperuricemia or the disease related to hyperuricemia.

13. The use according to claim 12, wherein, the disease related to hyperuricemia is selected from the group consisting of gout, hypertension, diabetes, hypertriglyceridemia, metabolic syndrome, coronary heart disease and kidney damage.

14. A pharmaceutical composition, which contains a pharmaceutically effective amount of the condensed ring derivative having a structure of formula II or IV, the tautomer, the mesomer, the racemate, the enantiomer, the diastereoisomer, or the pharmaceutically acceptable salt thereof according to at least one of claims 1-8, and one or more than one pharmaceutically acceptable carrier and/or diluent.

15. The pharmaceutical composition according to claim 14, wherein, the composition further contains other uric acid-lowering drugs; the uric acid-lowering drugs being selected from the group consisting of uric acid transporter 1 inhibitor, xanthine oxidase inhibitor, xanthine oxidoreductase and xanthine dehydrogenase inhibitor, preferably purine alcohol and/or Febuxostat.