ANTI-VIRAL COMPOUNDS

INCORPORATION BY REFERENCE TO ANY PRIORITY APPLICATIONS

[0001] Any and all applications for which a foreign or domestic priority claim is identified, for example, in the Application Data Sheet or Request as filed with the present application, are hereby incorporated by reference under 37 CFR 1.57, and Rules 4.18 and 20.6, including U.S. Provisional Application Nos. 63/203,135, filed July 9, 2021, 63/261,480, filed September 22, 2021, 63/264,212, filed November 17, 2021, 63/265,479, filed December 15, 2021 and 63/268,052, filed February 15, 2022, each of which is incorporated by reference in there entireties.

BACKGROUND

Field

[0002] The present application relates to the fields of chemistry, biochemistry and medicine. Disclosed herein are compounds of Formula (I), or pharmaceutically acceptable salt thereof, pharmaceutical compositions that include a compound described herein (including pharmaceutically acceptable salts of a compound described herein) and methods of synthesizing the same. Also disclosed herein are methods of treating diseases and/or conditions with a compound of Formula (I), or a pharmaceutically acceptable salt thereof.

Description

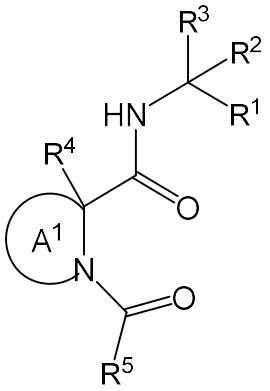
[0003] A positive-sense single-stranded RNA virus ((+)ssRNA virus) is a virus that uses positive sense, single stranded, RNA as its genetic material. Positive-sense single-stranded RNA viruses can be enveloped or non-enveloped. Coronaviridae, Picornaviridae and Norviruses are each a (+)ssRNA virus. Each of the aforementioned viruses are known to infect mammals, including humans.

SUMMARY

[0004] The disclosure herein relates to a compound of Formula (I), or a pharmaceutically acceptable salt thereof.

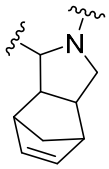
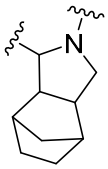
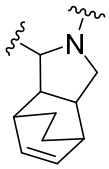
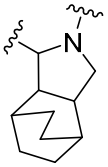
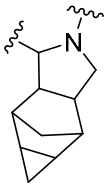
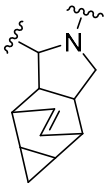
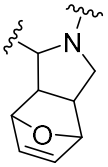
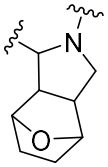
[0004a] In one aspect, there is provided a compound of Formula (I), or a

pharmaceutically acceptable salt thereof, having the structure:



(I)

wherein:

Ring A^1 is selected from the group consisting of , , , , , , , and , and wherein Ring A^1 is optionally substituted with one or more moieties independently selected from the group consisting of =O, $=CH_2$, deuterium, halogen, hydroxy, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted C_{2-4} alkenyl and an unsubstituted or a substituted C_{3-6} monocyclic cycloalkyl;

R^1 is selected from the group consisting of cyano, an unsubstituted or a substituted C_{2-5} alkynyl, an unsubstituted or a substituted acyl, an unsubstituted or a substituted ketoamide, –CH(OH)-($S(=O)_2$-O^-), –CH(OH)(($P=O)(OR^6)_2$) and –$C(=O)CH_2$-O-(($P=O)(OR^7)_2$);

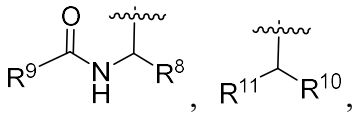
each R^6 and each R^7 are independently hydrogen, an unsubstituted C_{1-6} alkyl, an unsubstituted C_{2-6} alkenyl, an unsubstituted C_{1-6} haloalkyl, an unsubstituted or a substituted aryl or an unsubstituted or a substituted aryl(C_{1-4} alkyl);

R^2 is hydrogen, deuterium or halogen;

R^3 is an unsubstituted or a substituted monocyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl), an unsubstituted or a substituted bicyclic nitrogen-containing

heterocyclyl(C_{1-4} alkyl) or an unsubstituted or a substituted monocyclic nitrogen-containing heteroaryl(C_{1-4} alkyl);

R^4 is hydrogen, deuterium or halogen;

R^5 is , a substituted monocyclic C_{3-6} cycloalkyl or a substituted 4- to 6-membered monocyclic heterocyclyl;

R^8 and R^{10} are independently selected from the group consisting of an unsubstituted or a substituted C_{2-6} alkyl, an unsubstituted or a substituted C_{2-6} alkenyl, an unsubstituted or a substituted C_{2-6} alkynyl, an unsubstituted or a substituted monocyclic C_{3-6} cycloalkyl, an unsubstituted or a substituted bicyclic C_{5-8} cycloalkyl, an unsubstituted or a substituted monocyclic 4- to 6-membered heterocyclyl and an unsubstituted monocyclic C_{3-6} cycloalkyl(CH_2)–,

wherein when the C_{2-6} alkyl is substituted, the C_{2-6} alkyl is substituted 1, 2, 3 or 4 times with a substituent independently selected from the group consisting of halogen, cyano, an unsubstituted or a substituted monocyclic C_{3-6} cycloalkyl, an unsubstituted C_{1-4} alkoxy and an unsubstituted C_{1-4} haloalkoxy, or the C_{2-6} alkyl is substituted 1 to 13 times with deuterium;

wherein when the C_{2-6} alkenyl, the C_{2-6} alkynyl, the monocyclic C_{3-6} cycloalkyl, the bicyclic C_{5-8} cycloalkyl and the monocyclic 4- to 6-membered heterocyclyl are substituted, the C_{2-6} alkenyl, the C_{2-6} alkynyl, the monocyclic C_{3-6} cycloalkyl, the bicyclic C_{5-8} cycloalkyl and the monocyclic 4- to 6-membered heterocyclyl are substituted 1, 2, 3 or 4 times with a substituent independently selected from the group consisting of halogen, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{2-4} alkenyl, an unsubstituted C_{2-4} alkynyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted or a substituted monocyclic C_{3-6} cycloalkyl and an unsubstituted C_{1-4} alkoxy; and

R^9 is selected from the group consisting of an unsubstituted or a substituted C_{1-6} alkyl, an unsubstituted or a substituted C_{1-6} haloalkyl, a substituted monocyclic C_{3-6} cycloalkyl, an unsubstituted or a substituted bicyclic C_{5-6} cycloalkyl, an unsubstituted or a substituted monocyclic heteroaryl and an unsubstituted or a substituted monocyclic heterocyclyl, wherein the substituted C_{1-6} alkyl is substituted 1 or 2 times with an unsubstituted C_{1-4}

alkoxy, wherein the substituted monocyclic C_{3-6} cycloalkyl is substituted 1, 2, 3 or 4 times with a substituent independently selected from the group consisting of halogen, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} alkoxy, an unsubstituted C_{1-4} haloalkyl and an unsubstituted monocyclic C_{3-6} cycloalkyl, and wherein the substituted C_{1-6} haloalkyl is substituted 1 or 2 times with an unsubstituted C_{1-4} alkoxy; and

R^{11} is selected from the group consisting of an optionally substituted monocyclic 4- to 6-membered heterocyclyl, $–(NH)_m–$an optionally substituted 5- to 6-membered monocyclic heteroaryl, –O–an optionally substituted C_{1-6} alkyl, –O–an optionally substituted C_{3-8} cycloalkyl and –O–an optionally substituted C_{3-8} cycloalkyl(C_{1-4} alkyl), wherein m is 0 or 1.

[0005] The disclosure herein also relates to a pharmaceutical

composition that can contain an effective amount of a compound of Formula (I), or a pharmaceutically acceptable salt thereof.

[0005a] In another aspect, there is provided a pharmaceutical composition comprising an effective amount of a compound as described herein, or a pharmaceutically acceptable salt thereof, and excipient.

[0006] The disclosure herein also relates to a method of treating a coronavirus infection that can include administering to a subject identified as suffering from the coronavirus infection an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein. The disclosure herein also relates to a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein for the use of treating a coronavirus infection.

[0007] The disclosure herein also relates to a method of inhibiting replication of a coronavirus that can include contacting a cell infected with the coronavirus with an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein. The disclosure herein also relates to a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein for the use of inhibiting the replication a coronavirus.

[0008] The disclosure herein also relates to a method of treating a picornavirus infection that can include administering to a subject identified as suffering from the picornavirus infection an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein. The disclosure

herein also relates to a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein for the use of treating a picornavirus infection.

[0009] The disclosure herein also relates to a method of inhibiting replication of a picornavirus that can include contacting a cell infected with the picornavirus

with an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein. The disclosure herein also relates to a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein for the use of inhibiting the replication a picornavirus.

[0010] The disclosure herein also relates to a method of treating a norovirus infection that can include administering to a subject identified as suffering from the norovirus infection an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein. The disclosure herein also relates to a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein for the use of treating a norovirus infection.

[0011] The disclosure herein also relates to a method of inhibiting replication of a norovirus that can include contacting a cell infected with the norovirus with an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein. The disclosure herein also relates to a compound, or a pharmaceutically acceptable salt thereof, as described herein, or a pharmaceutical composition that includes an effective amount of a compound, or a pharmaceutically acceptable salt thereof, as described herein for the use of inhibiting the replication a norovirus.

[0011a] In another aspect, there is provided use of the compound as described herein, or a pharmaceutically acceptable salt thereof, in the preparation of a medicament for the treatment of a coronavirus infection

[0011b] In another aspect, there is provided use of the compound as described herein, or a pharmaceutically acceptable salt thereof, in the preparation of a medicament for the treatment of a picornavirus infection.

[0011c] In another aspect, there is provided use of the compound as described herein, or a pharmaceutically acceptable salt thereof, in the preparation of a medicament for the treatment of a norovirus infection.

[0011d] In another aspect, there is provided use of the compound as described herein, or a pharmaceutically acceptable salt thereof, in the preparation of a medicament that selectively inhibits a coronavirus protease compared to a host protease.

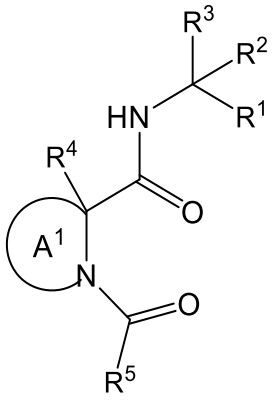
[0012] The examples are described in greater detail below.

DETAILED DESCRIPTION

[0013] Coronaviridae viruses are a family of enveloped, positive-stranded, single-stranded, spherical RNA viruses. Coronaviruses are named for the crown-like spikes on their surface. The Coronaviridae family includes two sub-families, Coronavirus and Torovirus.

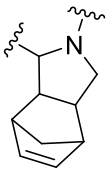
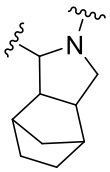
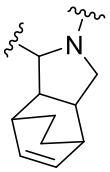
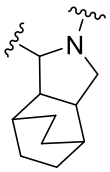
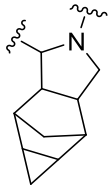
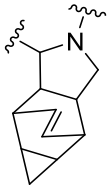
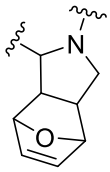
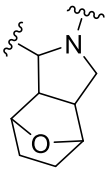
WHAT IS CLAIMED IS:

1. A compound of Formula (I), or a pharmaceutically acceptable salt thereof, having the structure:



(I)

wherein:

Ring A^1 is selected from the group consisting of , , , , , , , and , and wherein Ring A^1 is optionally substituted with one or more moieties independently selected from the group consisting of =O, $=CH_2$, deuterium, halogen, hydroxy, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted C_{2-4} alkenyl and an unsubstituted or a substituted C_{3-6} monocyclic cycloalkyl;

R^1 is selected from the group consisting of cyano, an unsubstituted or a substituted C_{2-5} alkynyl, an unsubstituted or a substituted acyl, an unsubstituted or a substituted ketoamide, $–CH(OH)-(S(=O)_2-O^-)$, $–CH(OH)((P=O)(OR^6)_2)$ and $–C(=O)CH_2-O-((P=O)(OR^7)_2)$;

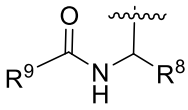
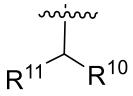
each R^6 and each R^7 are independently hydrogen, an unsubstituted C_{1-6} alkyl, an unsubstituted C_{2-6} alkenyl, an unsubstituted C_{1-6} haloalkyl, an unsubstituted or a substituted aryl or an unsubstituted or a substituted aryl(C_{1-4} alkyl);

R^2 is hydrogen, deuterium or halogen;

R^3 is an unsubstituted or a substituted monocyclic nitrogen-containing heterocyclyl(C_{1-4}

alkyl), an unsubstituted or a substituted bicyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl) or an unsubstituted or a substituted monocyclic nitrogen-containing heteroaryl(C_{1-4} alkyl);

R^4 is hydrogen, deuterium or halogen;

R^5 is , , a substituted monocyclic C_{3-6} cycloalkyl or a substituted 4- to 6-membered monocyclic heterocyclyl;

R^8 and R^{10} are independently selected from the group consisting of an unsubstituted or a substituted C_{2-6} alkyl, an unsubstituted or a substituted C_{2-6} alkenyl, an unsubstituted or a substituted C_{2-6} alkynyl, an unsubstituted or a substituted monocyclic C_{3-6} cycloalkyl, an unsubstituted or a substituted bicyclic C_{5-8} cycloalkyl, an unsubstituted or a substituted monocyclic 4- to 6-membered heterocyclyl and an unsubstituted monocyclic C_{3-6} cycloalkyl(CH_2)–,

wherein when the C_{2-6} alkyl is substituted, the C_{2-6} alkyl is substituted 1, 2, 3 or 4 times with a substituent independently selected from the group consisting of halogen, cyano, an unsubstituted or a substituted monocyclic C_{3-6} cycloalkyl, an unsubstituted C_{1-4} alkoxy and an unsubstituted C_{1-4} haloalkoxy, or the C_{2-6} alkyl is substituted 1 to 13 times with deuterium;

wherein when the C_{2-6} alkenyl, the C_{2-6} alkynyl, the monocyclic C_{3-6} cycloalkyl, the bicyclic C_{5-8} cycloalkyl and the monocyclic 4- to 6-membered heterocyclyl are substituted, the C_{2-6} alkenyl, the C_{2-6} alkynyl, the monocyclic C_{3-6} cycloalkyl, the bicyclic C_{5-8} cycloalkyl and the monocyclic 4- to 6-membered heterocyclyl are substituted 1, 2, 3 or 4 times with a substituent independently selected from the group consisting of halogen, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{2-4} alkenyl, an unsubstituted C_{2-4} alkynyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted or a substituted monocyclic C_{3-6} cycloalkyl and an unsubstituted C_{1-4} alkoxy; and

R^9 is selected from the group consisting of an unsubstituted or a substituted C_{1-6} alkyl, an unsubstituted or a substituted C_{1-6} haloalkyl, a substituted monocyclic C_{3-6} cycloalkyl, an unsubstituted or a substituted bicyclic C_{5-6} cycloalkyl, an unsubstituted or a substituted monocyclic heteroaryl and an unsubstituted or a substituted monocyclic heterocyclyl, wherein the substituted C_{1-6} alkyl is substituted 1 or 2 times with an unsubstituted C_{1-4} alkoxy, wherein the substituted

monocyclic C_{3-6} cycloalkyl is substituted 1, 2, 3 or 4 times with a substituent independently selected from the group consisting of halogen, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} alkoxy, an unsubstituted C_{1-4} haloalkyl and an unsubstituted monocyclic C_{3-6} cycloalkyl, and wherein the substituted C_{1-6} haloalkyl is substituted 1 or 2 times with an unsubstituted C_{1-4} alkoxy; and

R^{11} is selected from the group consisting of an optionally substituted monocyclic 4- to 6-membered heterocyclyl, $–(NH)_m–$an optionally substituted 5- to 6-membered monocyclic heteroaryl, –O–an optionally substituted C_{1-6} alkyl, –O–an optionally substituted C_{3-8} cycloalkyl and –O–an optionally substituted C_{3-8} cycloalkyl(C_{1-4} alkyl), wherein m is 0 or 1.

2. The compound of Claim 1, wherein R^1 is an unsubstituted or a substituted ketoamide.

3. The compound of Claim 1, wherein R^1 is an unsubstituted or a substituted acyl.

4. The compound of Claim 1, wherein R^1 is $–CH(OH)-(S(=O)_2-O^-)$.

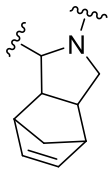
5. The compound of Claim 1, wherein R^1 is $–CH(OH)((P=O)(OR^6)_2)$, wherein each R^6 are independently hydrogen, an unsubstituted C_{1-6} alkyl, an unsubstituted C_{2-6} alkenyl, an unsubstituted C_{1-6} haloalkyl, an unsubstituted or a substituted aryl or an unsubstituted or a substituted aryl(C_{1-4} alkyl).

6. The compound of Claim 1, wherein R^1 is $–C(=O)CH_2-O-((P=O)(OR^7)_2)$, wherein each R^7 are independently hydrogen, an unsubstituted C_{1-6} alkyl, an unsubstituted C_{2-6} alkenyl, an unsubstituted C_{1-6} haloalkyl, an unsubstituted or a substituted aryl or an unsubstituted or a substituted aryl(C_{1-4} alkyl).

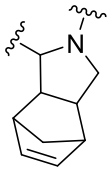
7. The compound of Claim 1, wherein R^1 is cyano.

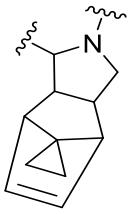
8. The compound of Claim 1, wherein R^1 is an unsubstituted or a substituted C_{2-5} alkynyl.

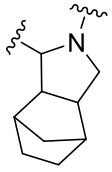
9. The compound of any one of Claims 1-8, wherein Ring A^1 is an unsubstituted

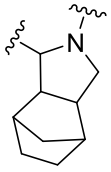


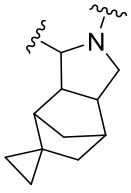
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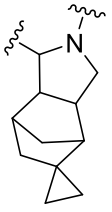
10. The compound of any one of Claims 1-8, wherein Ring A^1 is a substituted  substituted with one or more moieties independently selected from the group consisting of =O, $=CH_2$, deuterium, halogen, hydroxy, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted C_{2-4} alkenyl and an unsubstituted or a substituted C_{3-6} monocyclic cycloalkyl.

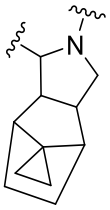
11. The compound of Claim 10, wherein Ring A^1 is .

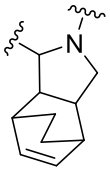
12. The compound of any one of Claims 1-8, wherein Ring A^1 is an unsubstituted .

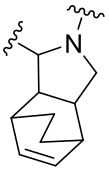
13. The compound of any one of Claims 1-8, wherein Ring A^1 is a substituted  substituted with one or more moieties independently selected from the group consisting of =O, $=CH_2$, deuterium, halogen, hydroxy, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted C_{2-4} alkenyl and an unsubstituted or a substituted C_{3-6} monocyclic cycloalkyl.

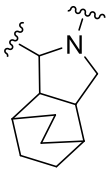
14. The compound of Claim 13, wherein Ring A^1 is .

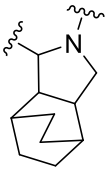
15. The compound of Claim 13, wherein Ring A^1 is .

16. The compound of Claim 13, wherein Ring A^1 is .

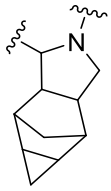
17. The compound of any one of Claims 1-8, wherein Ring A^1 is an unsubstituted .

18. The compound of any one of Claims 1-8, wherein Ring A^1 is a substituted  substituted with one or more moieties independently selected from the group consisting of =O, $=CH_2$, deuterium, halogen, hydroxy, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted C_{2-4} alkenyl and an unsubstituted or a substituted C_{3-6} monocyclic cycloalkyl.

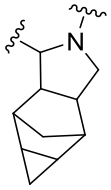
19. The compound of any one of Claims 1-8, wherein Ring A^1 is an unsubstituted .

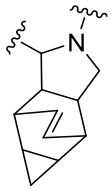
20. The compound of any one of Claims 1-8, wherein Ring A^1 is a substituted  substituted with one or more moieties independently selected from the group consisting of =O, $=CH_2$, deuterium, halogen, hydroxy, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted C_{2-4} alkenyl and an unsubstituted or a substituted C_{3-6} monocyclic cycloalkyl.

21. The compound of any one of Claims 1-8, wherein Ring A^1 is an unsubstituted

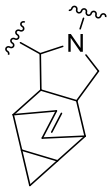


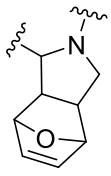
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22. The compound of any one of Claims 1-8, wherein Ring A^1 is a substituted  substituted with one or more moieties independently selected from the group consisting of =O, $=CH_2$, deuterium, halogen, hydroxy, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted C_{2-4} alkenyl and an unsubstituted or a substituted C_{3-6} monocyclic cycloalkyl.

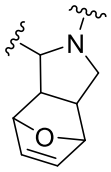
23. The compound of any one of Claims 1-8, wherein Ring A^1 is an unsubstituted 

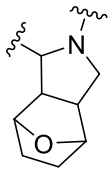
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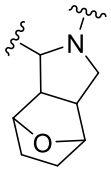
24. The compound of any one of Claims 1-8, wherein Ring A^1 is a substituted  substituted with one or more moieties independently selected from the group consisting of =O, $=CH_2$, deuterium, halogen, hydroxy, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted C_{2-4} alkenyl and an unsubstituted or a substituted C_{3-6} monocyclic cycloalkyl.

25. The compound of any one of Claims 1-8, wherein Ring A^1 is an unsubstituted 

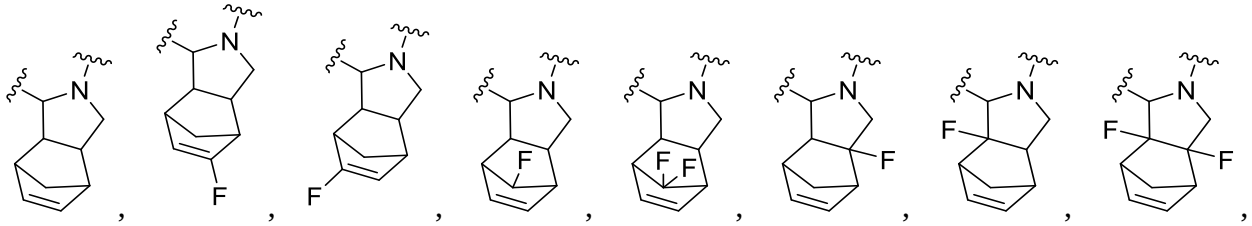
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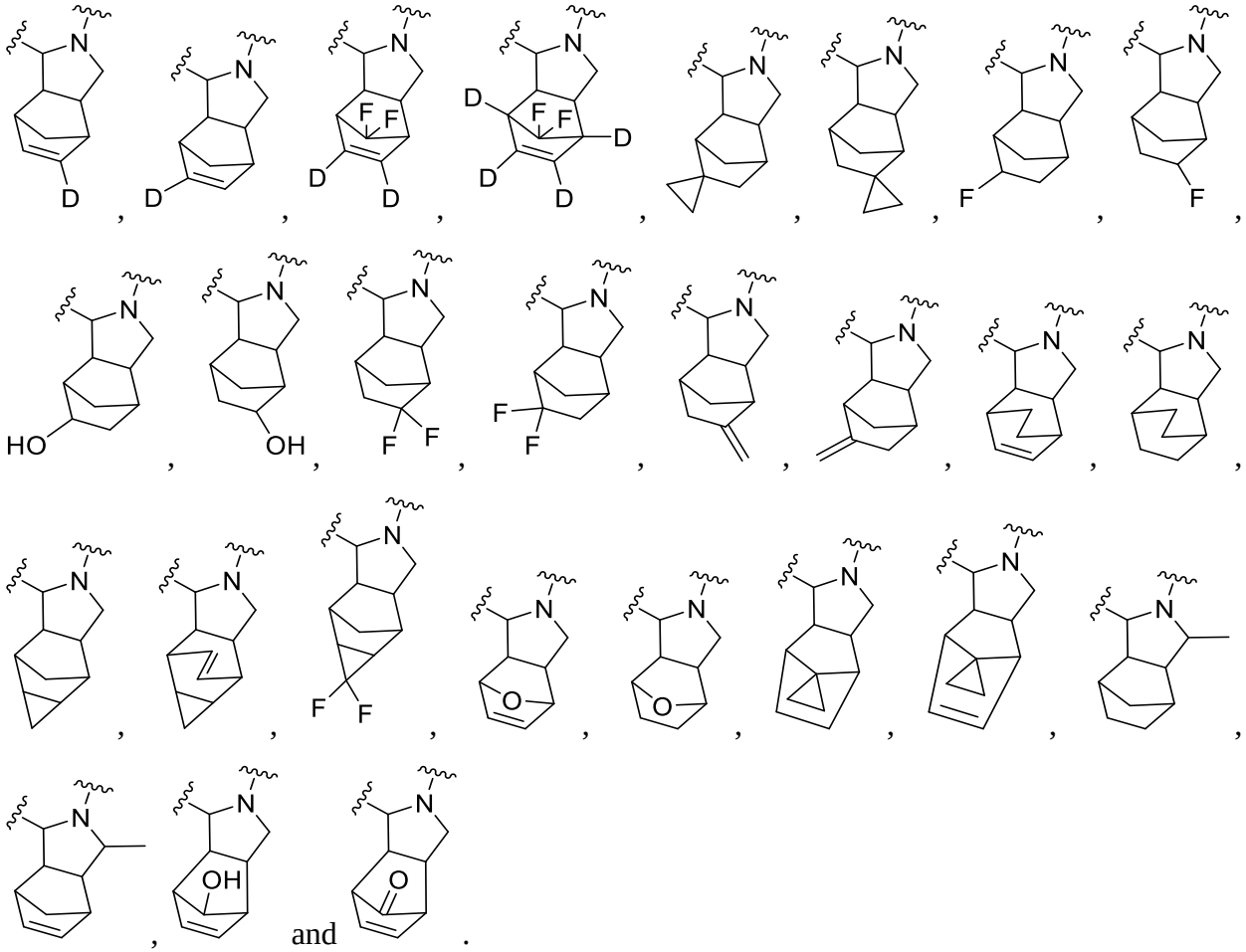
26. The compound of any one of Claims 1-8, wherein Ring A^1 is a substituted  substituted with one or more moieties independently selected from the group consisting of =O, $=CH_2$, deuterium, halogen, hydroxy, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted C_{2-4} alkenyl and an unsubstituted or a substituted C_{3-6} monocyclic cycloalkyl.

27. The compound of any one of Claims 1-8, wherein Ring A^1 is an unsubstituted .

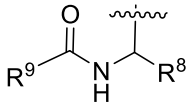
28. The compound of any one of Claims 1-8, wherein Ring A^1 is a substituted  substituted with one or more moieties independently selected from the group consisting of =O, $=CH_2$, deuterium, halogen, hydroxy, an unsubstituted C_{1-4} alkyl, an unsubstituted C_{1-4} haloalkyl, an unsubstituted C_{2-4} alkenyl and an unsubstituted or a substituted C_{3-6} monocyclic cycloalkyl.

29. The compound of any one of Claims 1-8, wherein Ring A^1 is selected from the group consisting of:





and .

30. The compound of any one of Claims 1-29, wherein R^5 is .

31. The compound of Claim 30, wherein R^8 is an unsubstituted C_{2-6} alkyl.

32. The compound of Claim 30, wherein R^8 is a substituted C_{2-6} alkyl.

33. The compound of Claim 30, wherein R^8 is an unsubstituted C_{2-6} alkenyl.

34. The compound of Claim 30, wherein R^8 is a substituted C_{2-6} alkenyl.

35. The compound of Claim 30, wherein R^8 is an unsubstituted C_{2-6} alkynyl.

36. The compound of Claim 30, wherein R^8 is a substituted C_{2-6} alkynyl.

37. The compound of Claim 30, wherein R^8 is an unsubstituted monocyclic C_{3-6} cycloalkyl.

38. The compound of Claim 30, wherein R^8 is a substituted monocyclic C_{3-6} cycloalkyl.

39. The compound of Claim 30, wherein R^8 is an unsubstituted bicyclic C_{5-8} cycloalkyl.

40. The compound of Claim 30, wherein R^8 is a substituted bicyclic C_{5-8} cycloalkyl.

41. The compound of Claim 30, wherein R^8 is an unsubstituted monocyclic 4- to 6-membered heterocyclyl.

42. The compound of Claim 30, wherein R^8 is a substituted monocyclic 4- to 6-membered heterocyclyl.

43. The compound of Claim 30, wherein R^8 is an unsubstituted monocyclic C_{3-6} cycloalkyl(CH_2)–.

44. The compound of any one of Claims 30-43, wherein R^9 is an unsubstituted C_{1-6} alkyl.

45. The compound of any one of Claims 30-43, wherein R^9 is a substituted C_{1-6} alkyl.

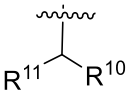
46. The compound of any one of Claims 30-43, wherein R^9 is an unsubstituted C_{1-6} haloalkyl.

47. The compound of any one of Claims 30-43, wherein R^9 is a substituted C_{1-6} haloalkyl.

48. The compound of any one of Claims 30-43, wherein R^9 is an unsubstituted or substituted monocyclic C_{3-6} cycloalkyl.

49. The compound of any one of Claims 30-43, wherein R^9 is an unsubstituted or a substituted bicyclic C_{5-6} cycloalkyl.

50. The compound of any one of Claims 30-43, wherein R^9 is an unsubstituted or a substituted monocyclic heteroaryl or an unsubstituted or a substituted monocyclic heterocyclyl.

51. The compound of any one of Claims 1-29, wherein R^5 is .

52. The compound of Claim 51, wherein R^{10} is an unsubstituted C_{2-6} alkyl.

53. The compound of Claim 51, wherein R^{10} is a substituted C_{2-6} alkyl.

54. The compound of Claim 51, wherein R^{10} is an unsubstituted C_{2-6} alkenyl.

55. The compound of Claim 51, wherein R^{10} is a substituted C_{2-6} alkenyl.

56. The compound of Claim 51, wherein R^{10} is an unsubstituted C_{2-6} alkynyl.

57. The compound of Claim 51, wherein R^{10} is a substituted C_{2-6} alkynyl.

58. The compound of Claim 51, wherein R^{10} is an unsubstituted monocyclic C_{3-6} cycloalkyl.

59. The compound of Claim 51, wherein R^{10} is a substituted monocyclic C_{3-6} cycloalkyl.

60. The compound of Claim 51, wherein R^{10} is an unsubstituted bicyclic C_{5-8} cycloalkyl.

61. The compound of Claim 51, wherein R^{10} is a substituted bicyclic C_{5-8} cycloalkyl.

62. The compound of Claim 51, wherein R^{10} is an unsubstituted monocyclic 4- to 6-membered heterocyclyl.

63. The compound of Claim 51, wherein R^{10} is a substituted monocyclic 4- to 6-membered heterocyclyl.

64. The compound of Claim 51, wherein R^{8} is an unsubstituted monocyclic C_{3-6} cycloalkyl(CH_2)–.

65. The compound of any one of Claims 51-64, wherein R^{11} is –an optionally substituted 5- to 6-membered monocyclic heteroaryl.

66. The compound of any one of Claims 51-64, wherein R^{11} is –(NH)–an optionally substituted 5- to 6-membered monocyclic heteroaryl.

67. The compound of any one of Claims 51-64, wherein R^{11} is an optionally substituted monocyclic heterocyclyl.

68. The compound of any one of Claims 51-64, wherein R^{11} is –O–an optionally substituted alkyl.

69. The compound of any one of Claims 51-64, wherein R^{11} is –O–an optionally substituted cycloalkyl.

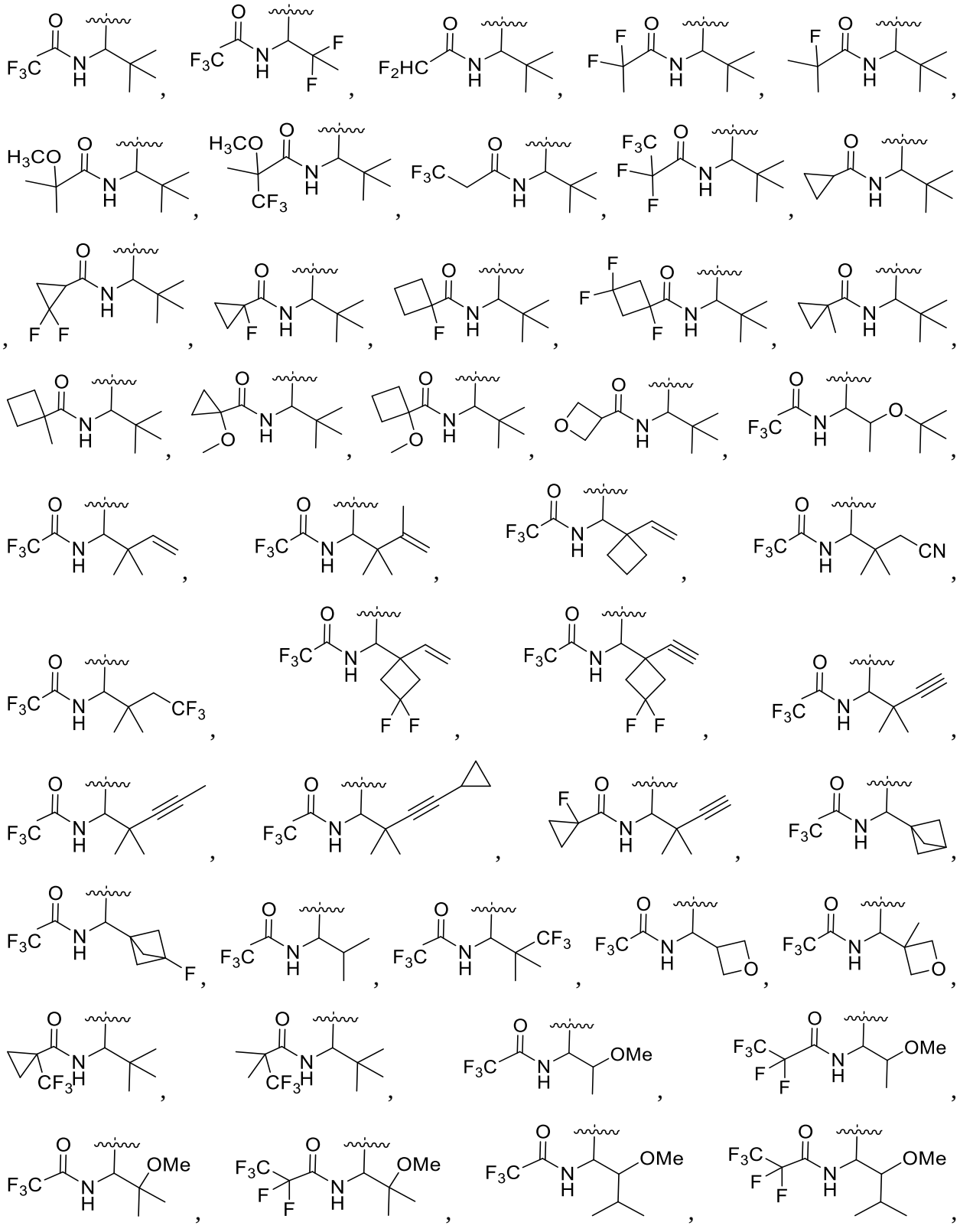
70. The compound of any one of Claims 51-64, wherein R^{11} is –O–an optionally substituted cycloalkyl(C_{1-4} alkyl).

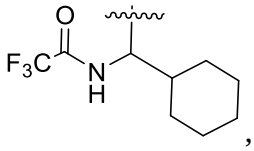
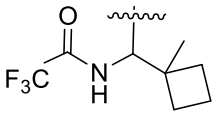
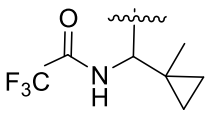
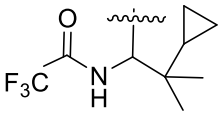
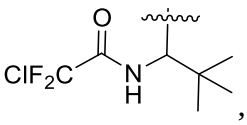
71. The compound of any one of Claims 1-29, wherein R^{5} is a substituted monocyclic C_{3-6} cycloalkyl.

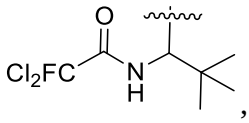
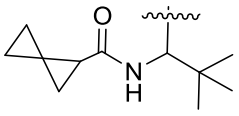
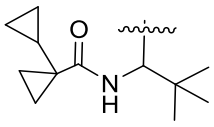
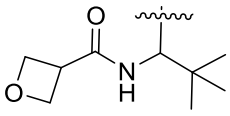
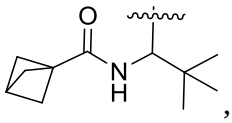
72. The compound of any one of Claims 1-29, wherein R^{5} is a substituted 4- to 6-membered monocyclic heterocyclyl.

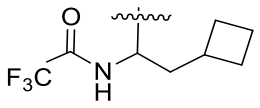
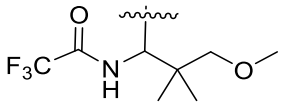
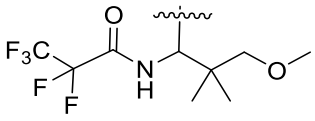
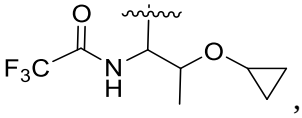
73. The compound of any one of Claims 1-29, wherein R^{5} is selected from the group

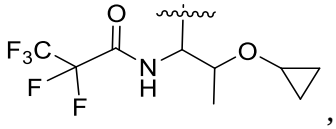
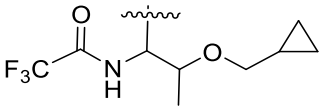
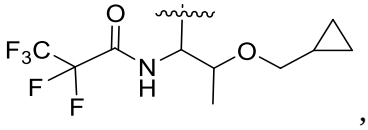
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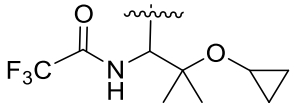
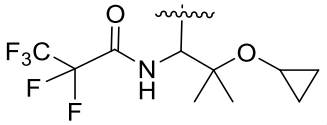
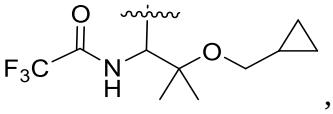


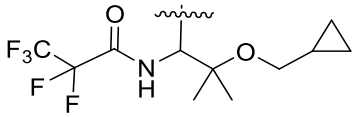
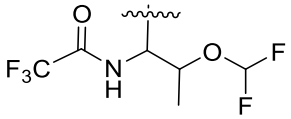
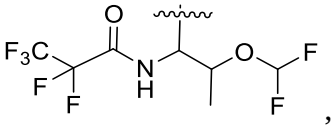
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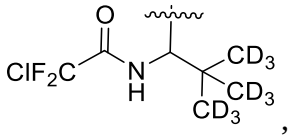
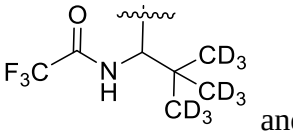
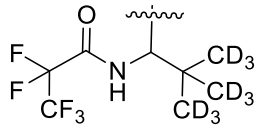
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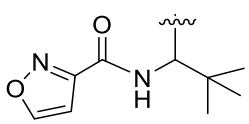
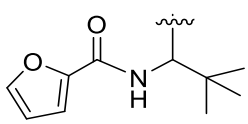
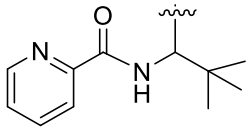
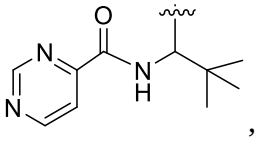
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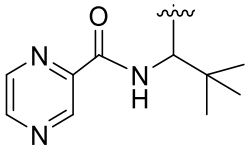
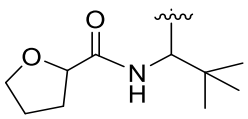
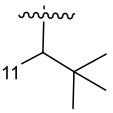
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,  and .

74. The compound of any one of Claims 1-29, wherein R^5 is selected from the group consisting of:

, , , ,

,  and , wherein each moiety is unsubstituted or substituted.

75. The compound of any one of Claims 1-74, wherein R^3 is an unsubstituted

monocyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl).

76. The compound of any one of Claims 1-74, wherein R^3 is a substituted monocyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl).

77. The compound of Claim 75 or 76, wherein the monocyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl) is a 5-membered monocyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl).

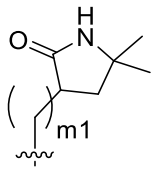
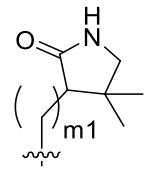
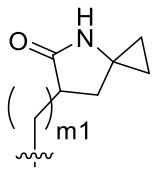
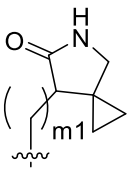
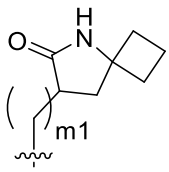
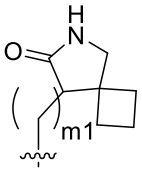
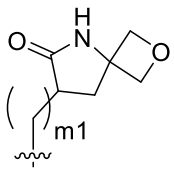
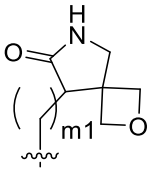
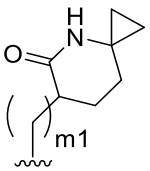
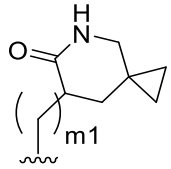
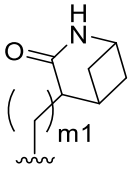
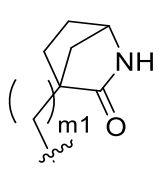
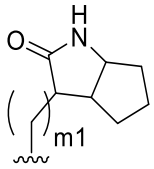
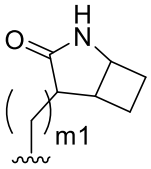
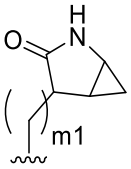
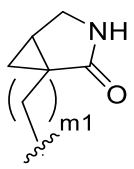
78. The compound of Claim 75 or 76, wherein the monocyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl) is a 6-membered monocyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl).

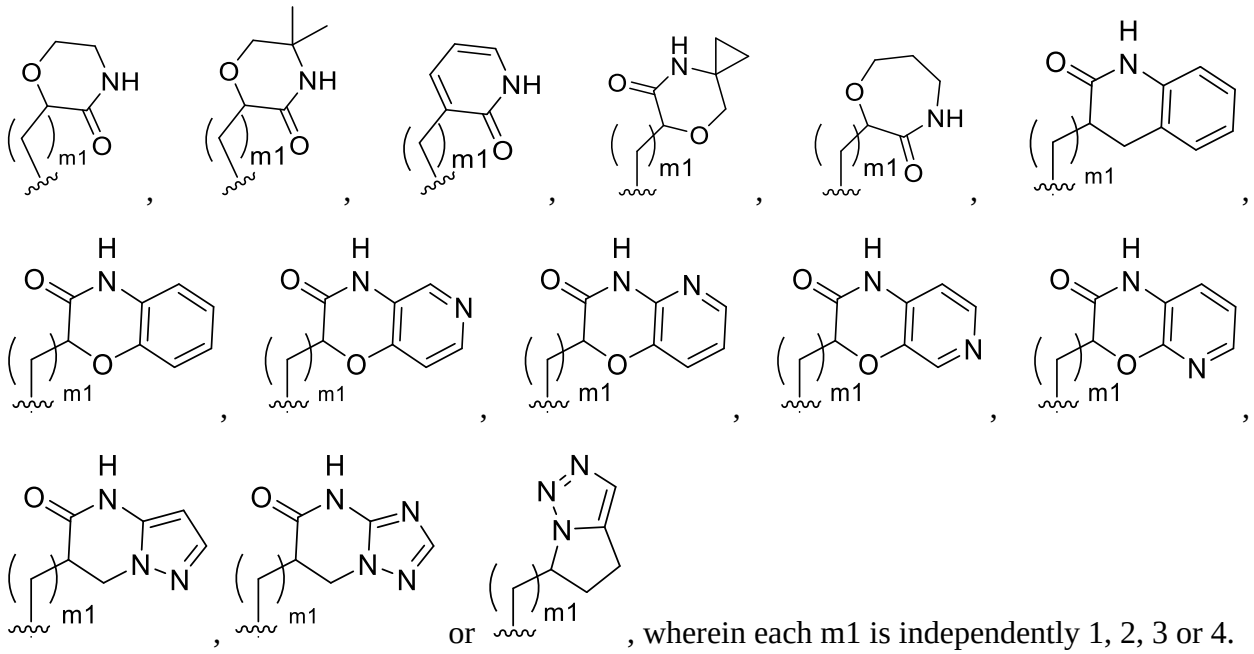
79. The compound of Claim 75 or 76, wherein the monocyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl) is azepan-2-one(C_{1-4} alkyl), imidazolidin-2-one(C_{1-4} alkyl), tetrahydropyrimidin-2-one(C_{1-4} alkyl), pyrrolidin-2-one(C_{1-4} alkyl), piperidin-2-one(C_{1-4} alkyl), pyrazolidin-3-one(C_{1-4} alkyl), morpholin-3-one(C_{1-4} alkyl), oxazolidin-4-one(C_{1-4} alkyl) 1,4-oxazepan-3-one(C_{1-4} alkyl) or morpholin-3-one(C_{1-4} alkyl).

80. The compound of any one of Claims 1-74, wherein R^3 is an unsubstituted bicyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl).

81. The compound of any one of Claims 1-74, wherein R^3 is a substituted bicyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl).

82. The compound of Claim 80 or 81, wherein the bicyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl) is a 9-membered or 10-membered bicyclic nitrogen-containing heterocyclyl(C_{1-4} alkyl).

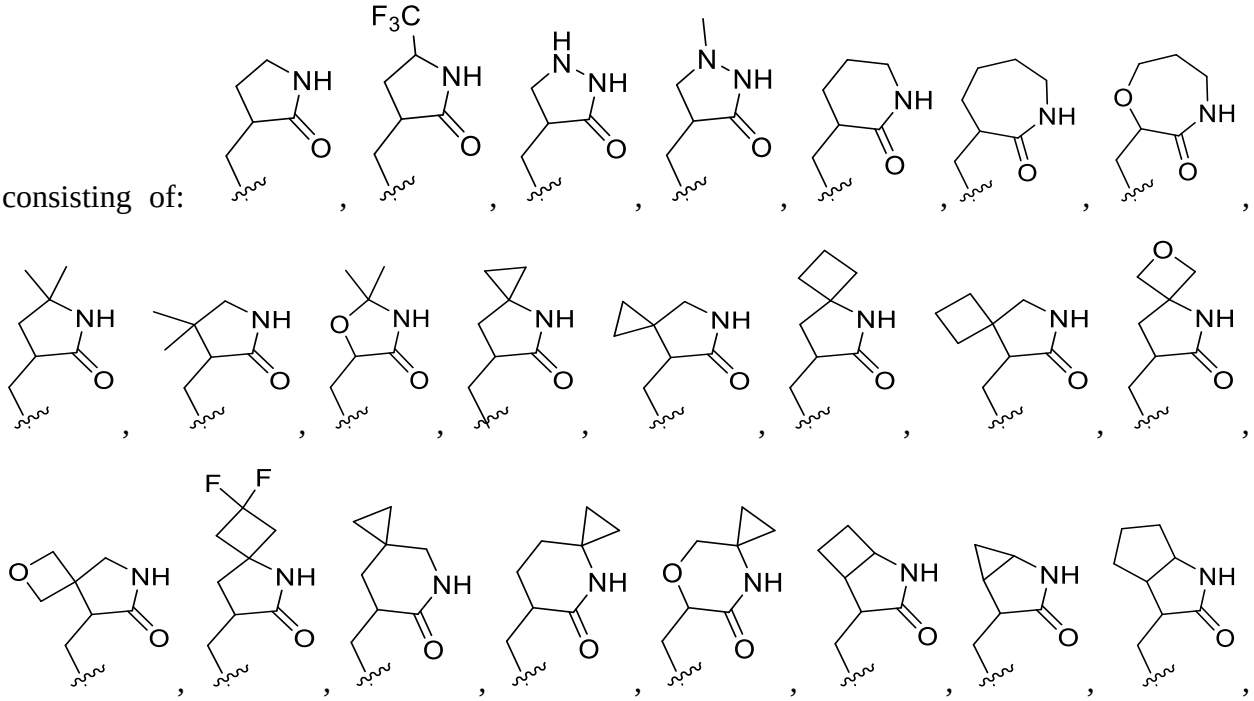
83. The compound of Claim 80 or 81, wherein R^3 is , , , , , , , , , , , , , , , ,

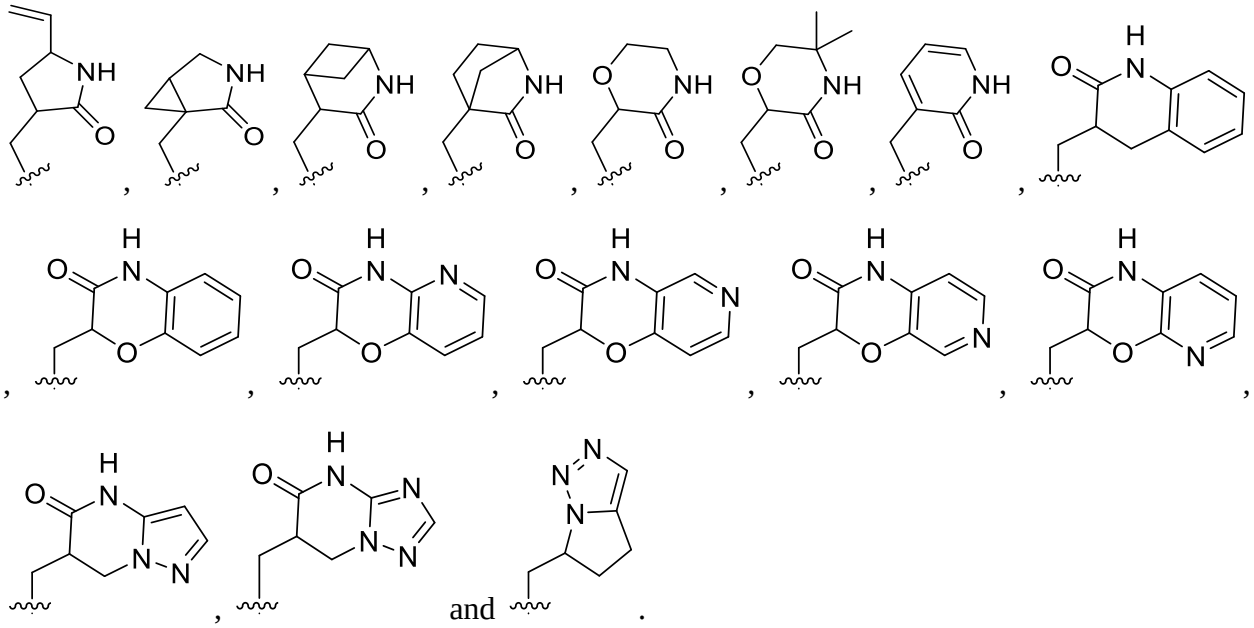

, wherein each m1 is independently 1, 2, 3 or 4.

84. The compound of any one of Claims 1-74, wherein R^3 is an unsubstituted monocyclic nitrogen-containing heteroaryl(C_{1-4} alkyl).

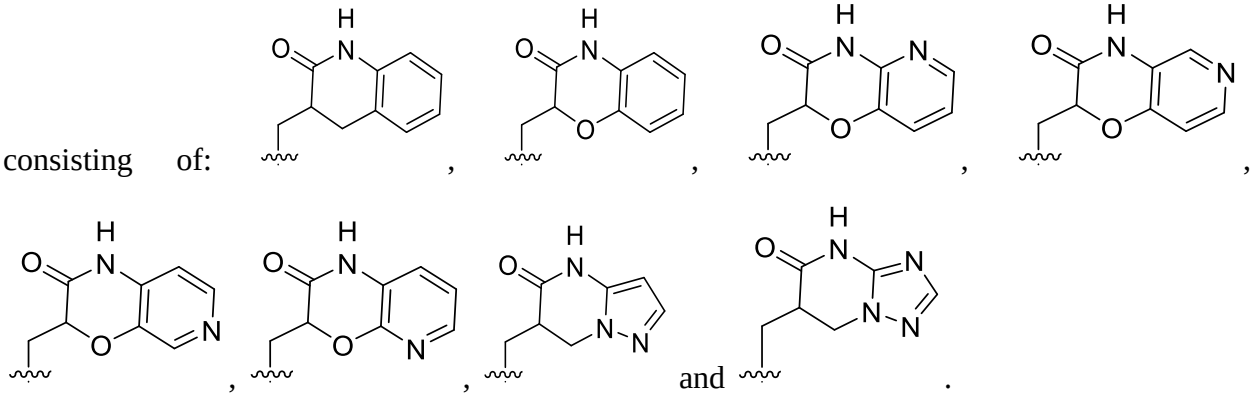
85. The compound of any one of Claims 1-74, wherein R^3 is a substituted monocyclic nitrogen-containing heteroaryl(C_{1-4} alkyl).

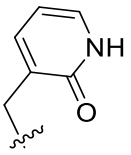
86. The compound of any one of Claims 1-74, wherein R^3 is selected from the group consisting of:





87. The compound of any one of Claims 1-74, wherein R^3 is selected from the group consisting of:



88. The compound of any one of Claims 1-74, wherein R^3 is .

89. The compound of any one of Claims 1-88, wherein R^2 is hydrogen.

90. The compound of any one of Claims 1-88, wherein R^2 is deuterium.

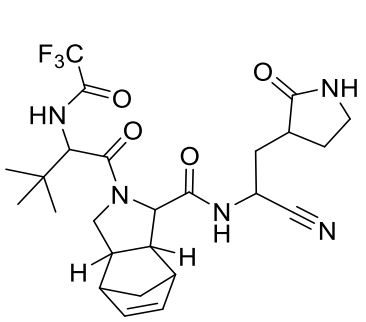
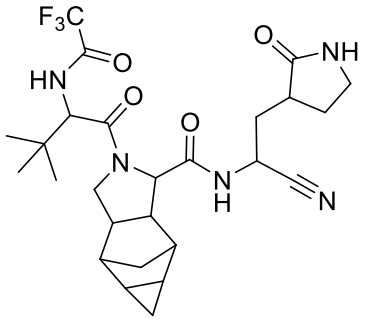
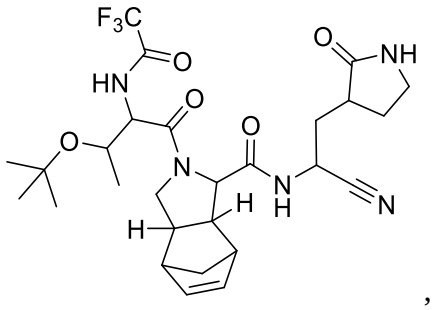
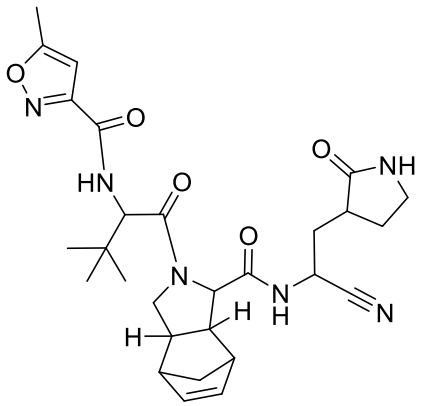
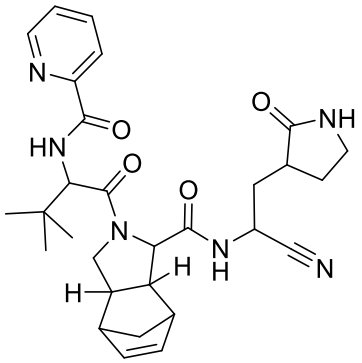
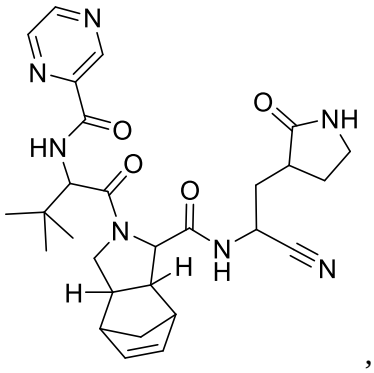
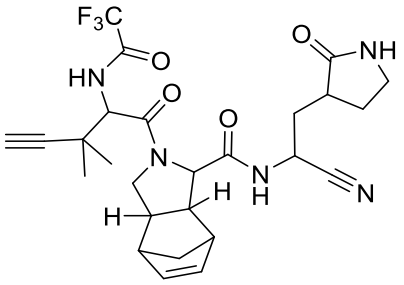
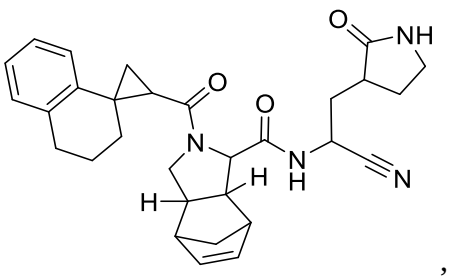
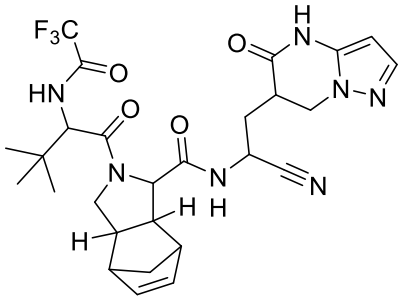
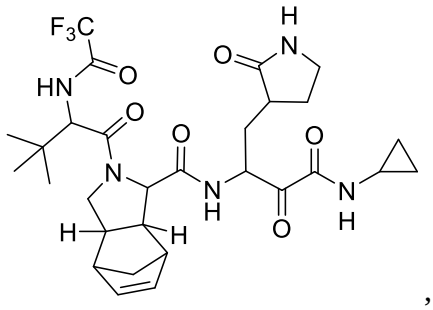
91. The compound of any one of Claims 1-88, wherein R^2 is halogen.

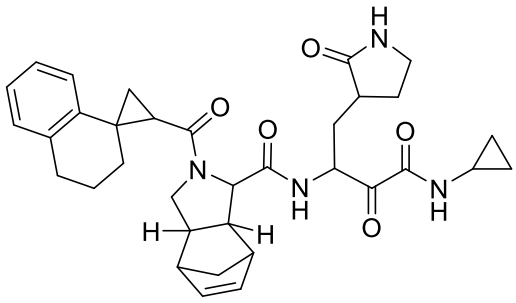
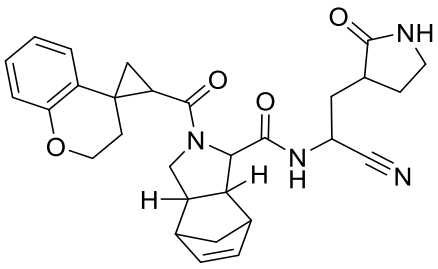
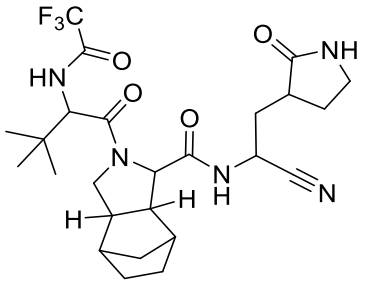
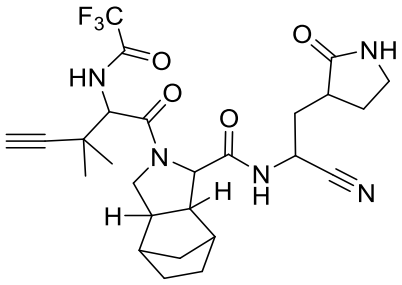
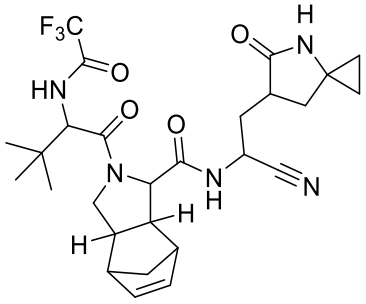
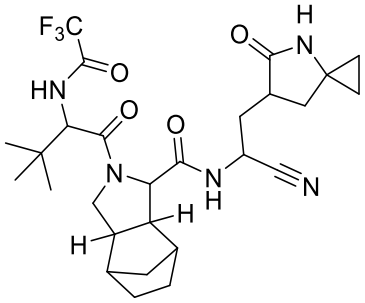
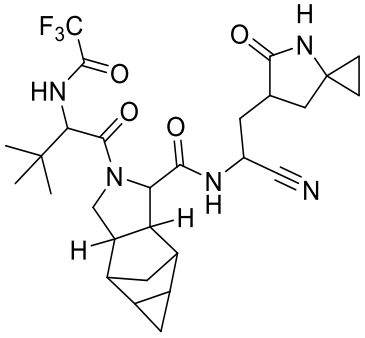
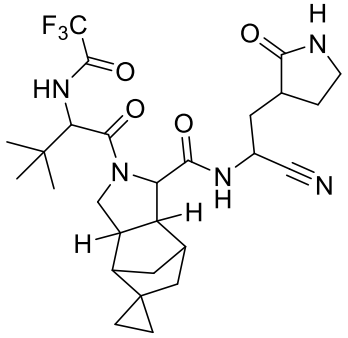
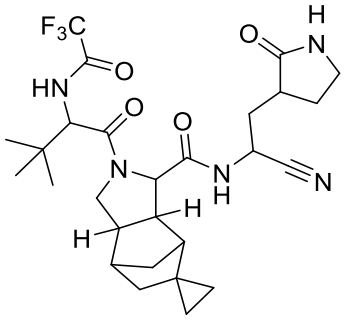
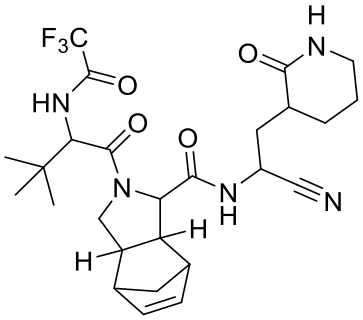
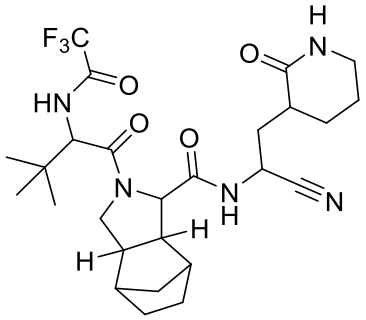
92. The compound of any one of Claims 1-91, wherein R^4 is hydrogen.

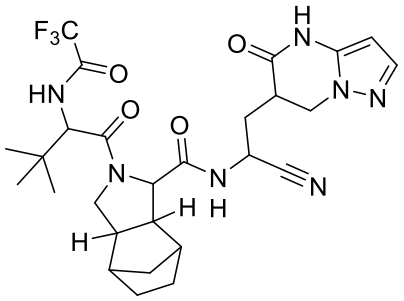
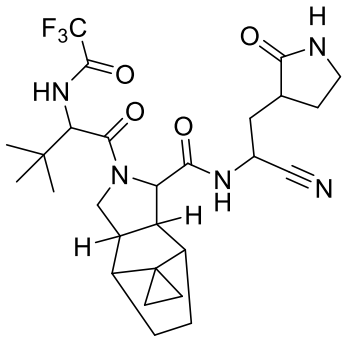
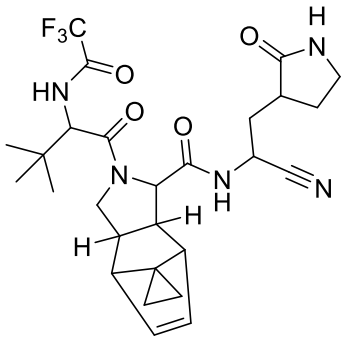
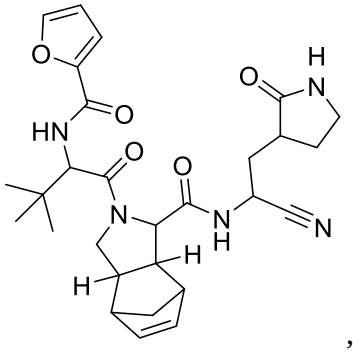
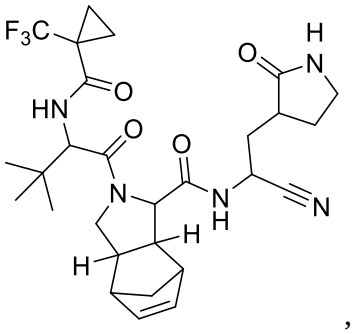
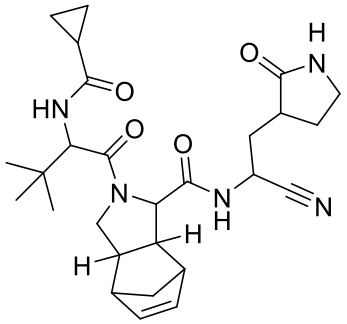
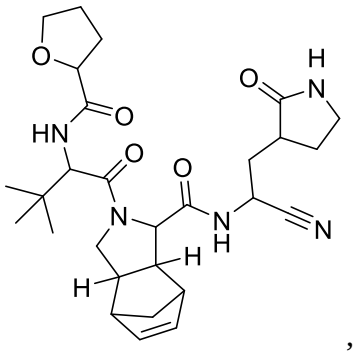
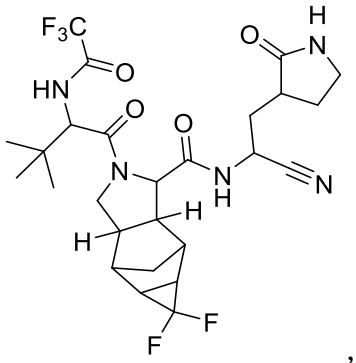
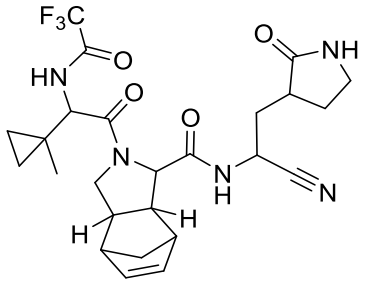
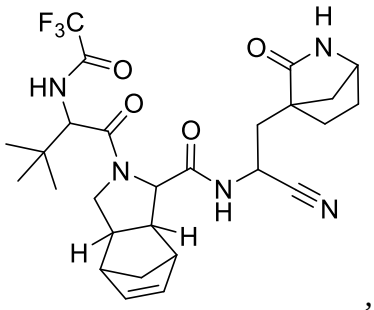
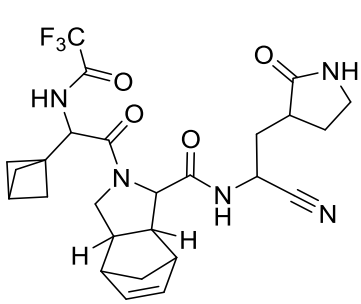
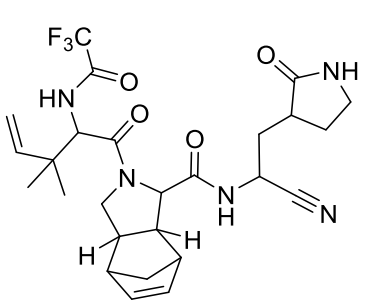
93. The compound of any one of Claims 1-91, wherein R^4 is deuterium.

94. The compound of any one of Claims 1-91, wherein R^4 is halogen.

95. The compound of Claim 1, wherein the compound is selected from the group consisting of:


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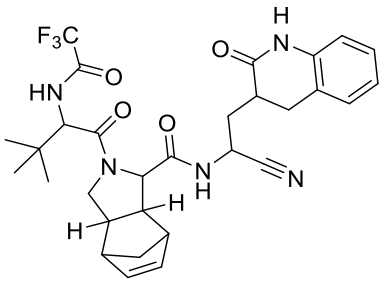
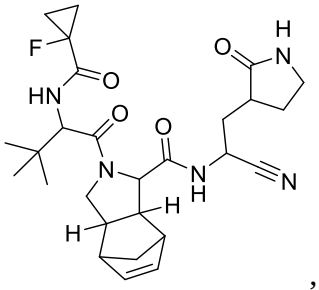
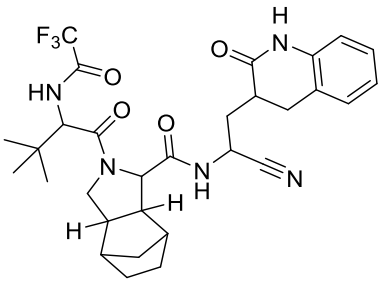
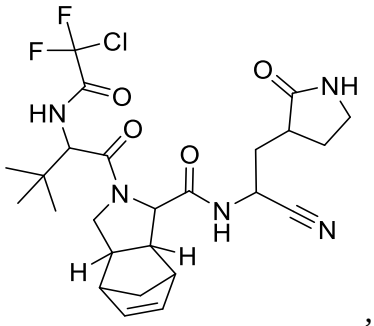
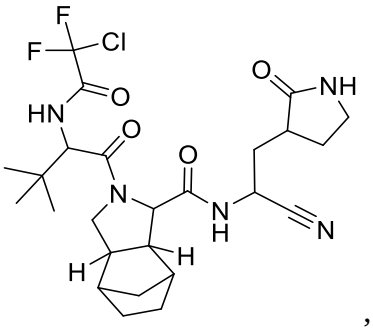
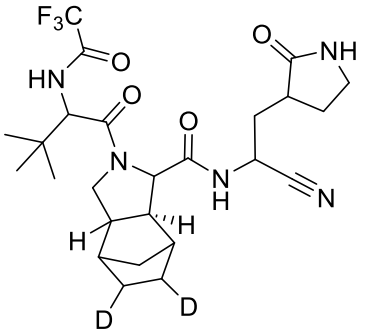
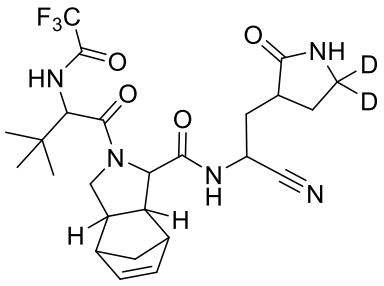
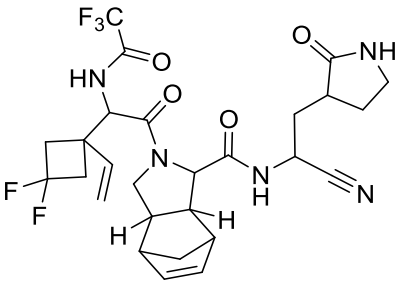
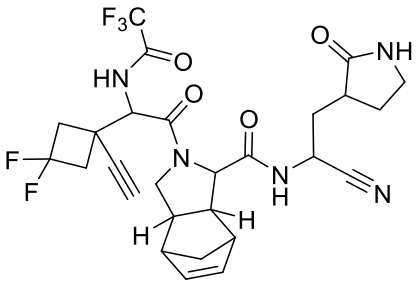
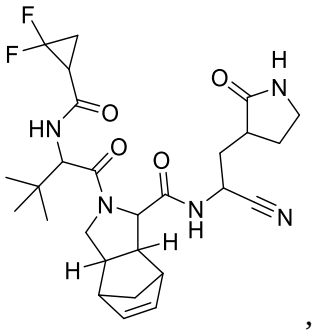
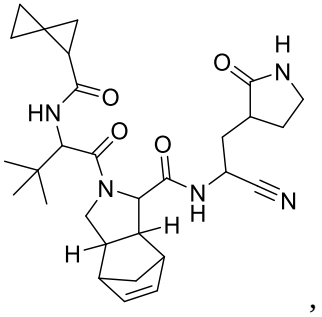
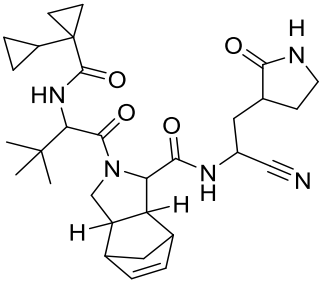

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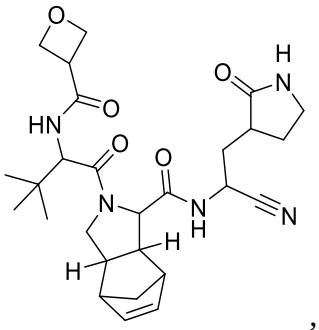
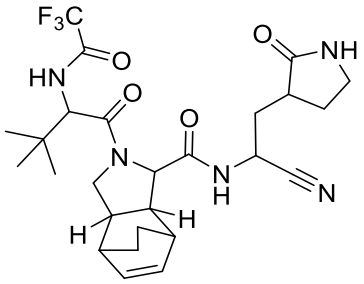
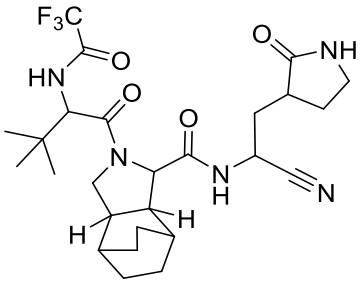
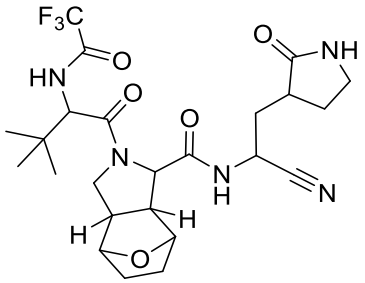
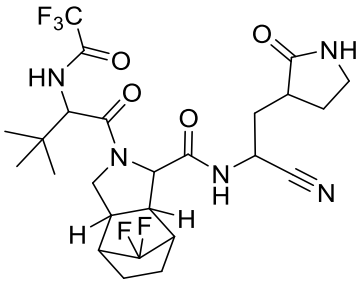
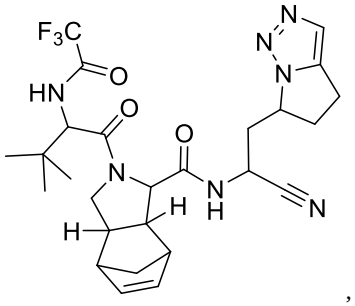
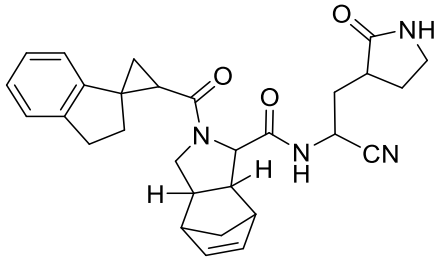
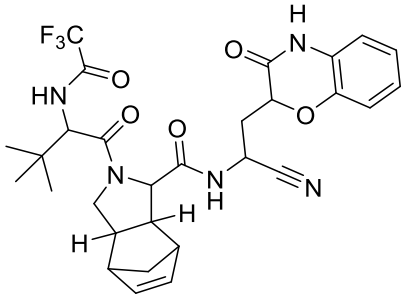
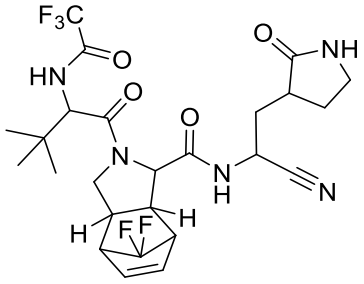
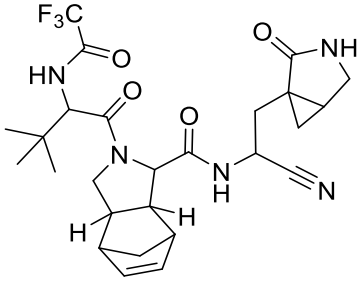
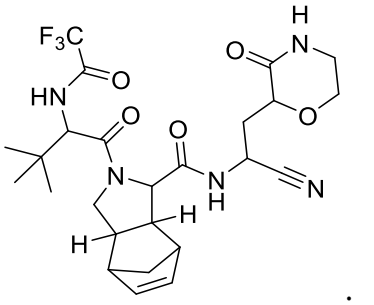
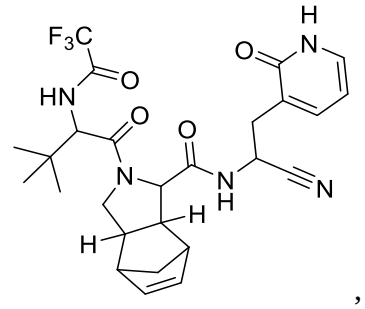

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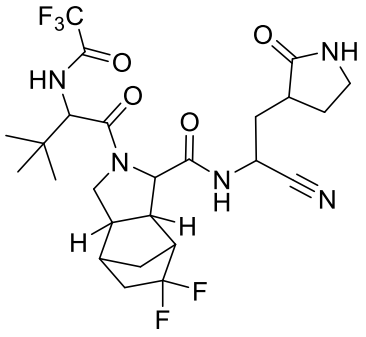
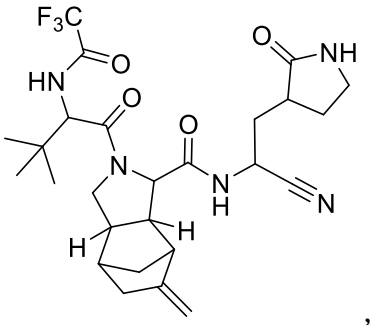
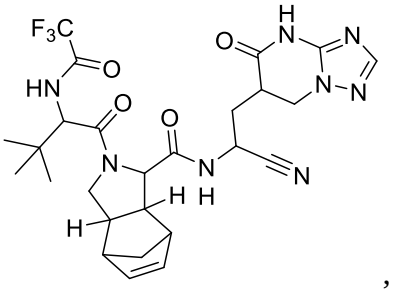
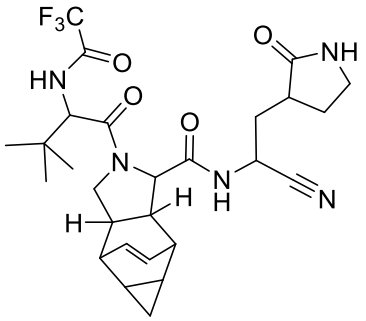
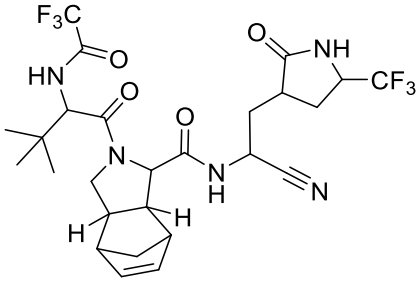
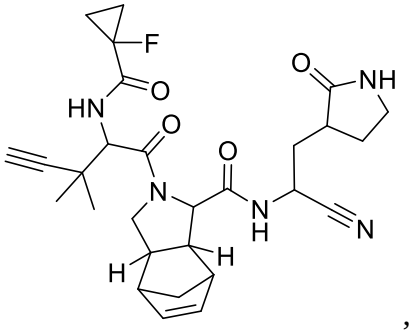
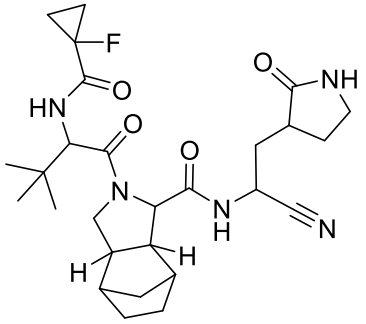
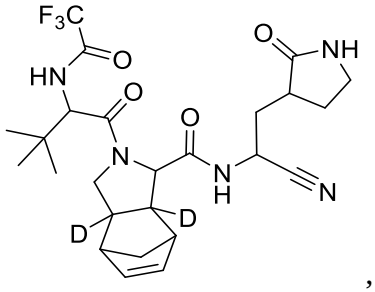
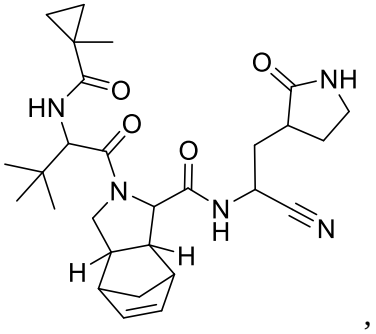
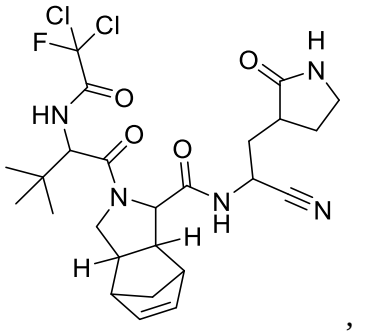
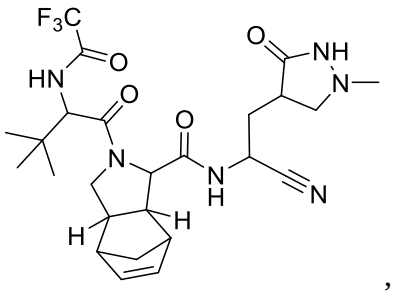
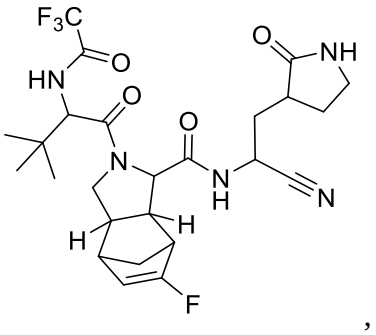
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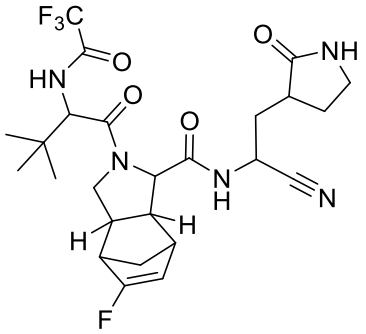
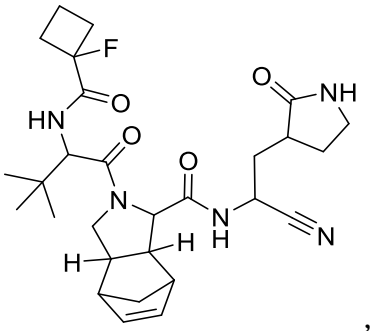
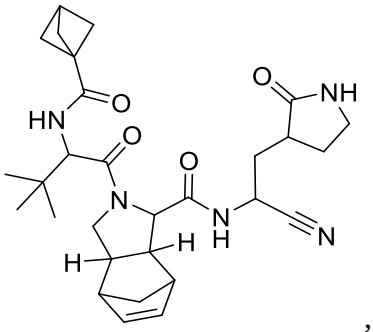
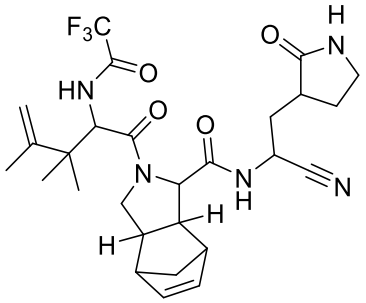
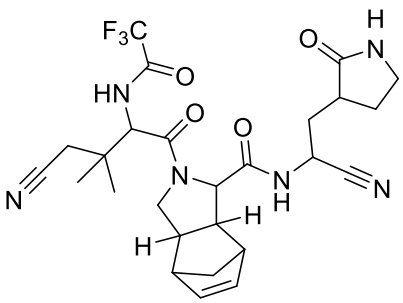
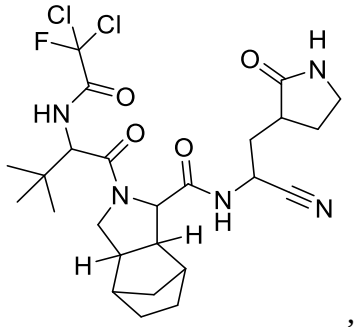
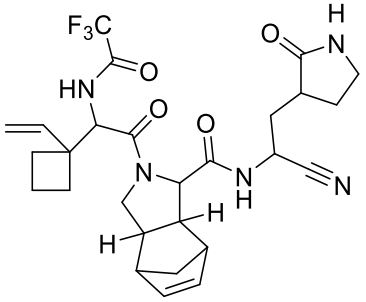
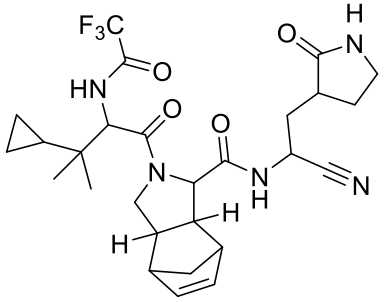
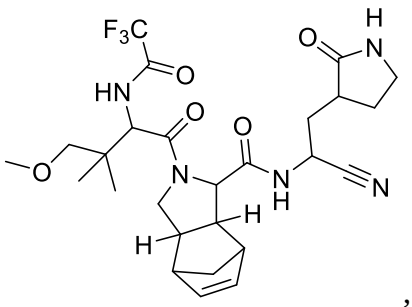
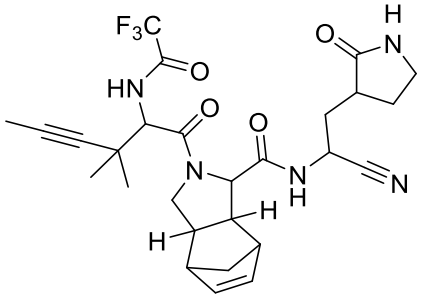
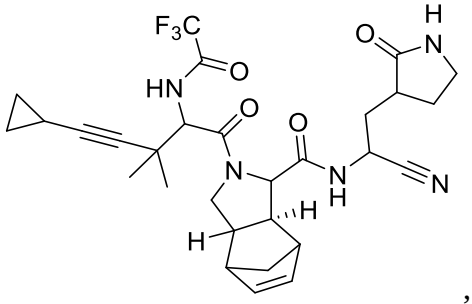
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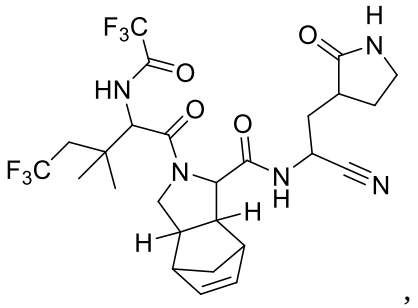
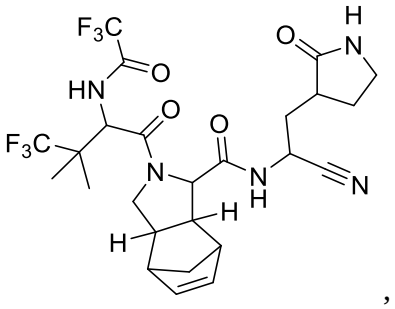
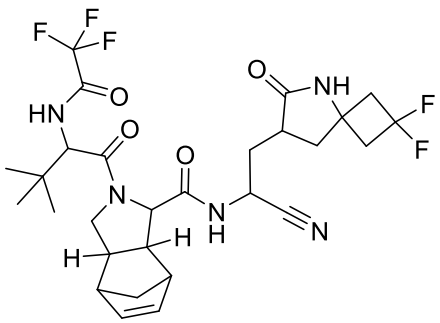
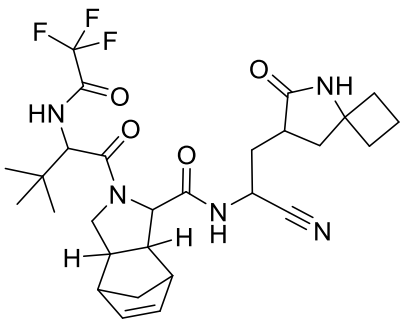
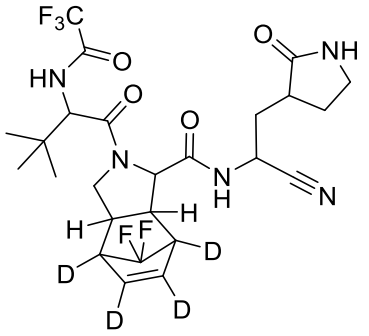
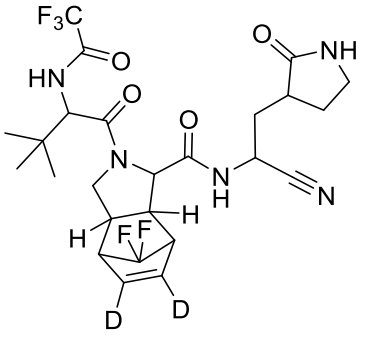
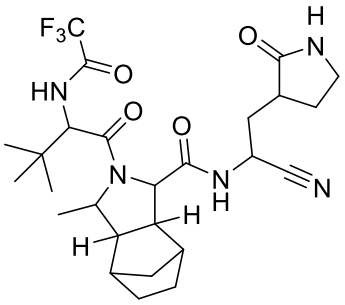
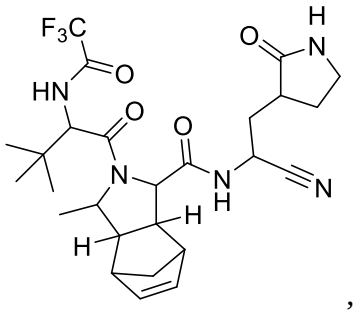
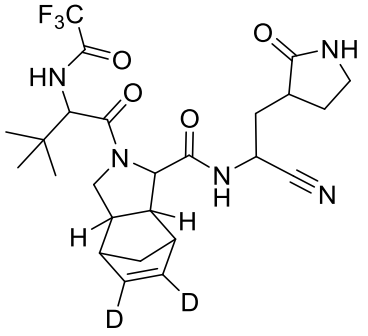
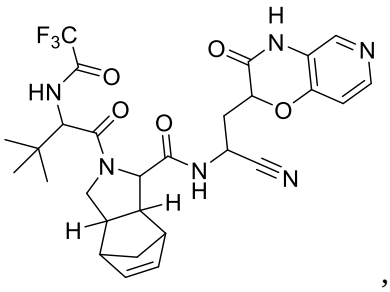
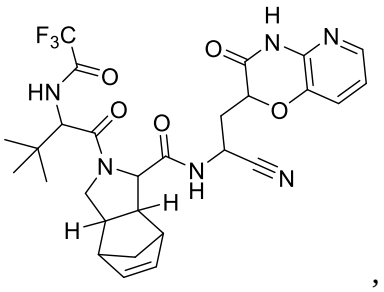
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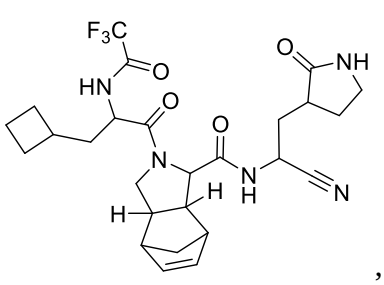
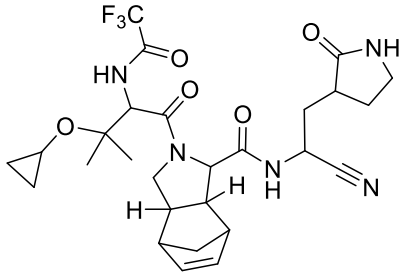
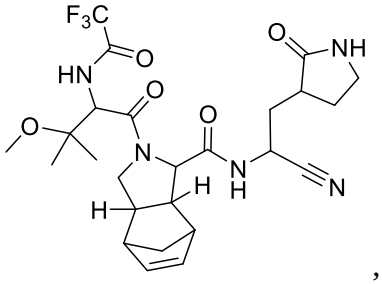
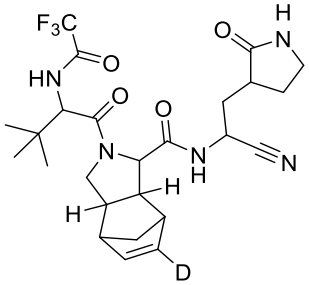
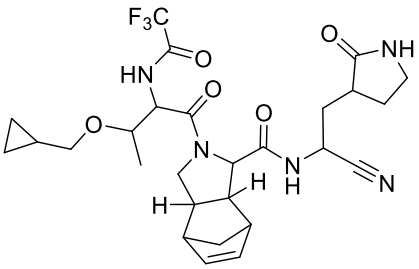
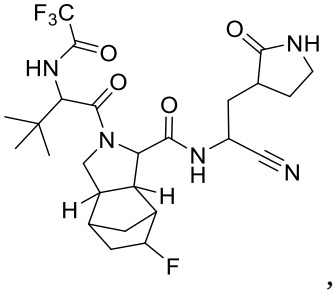
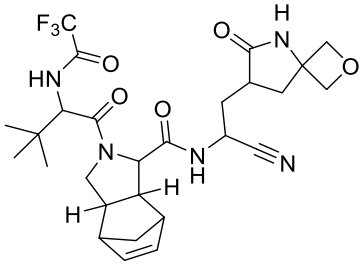
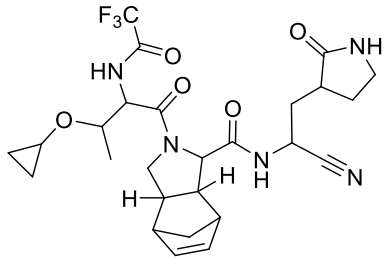
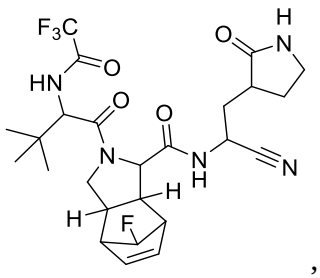
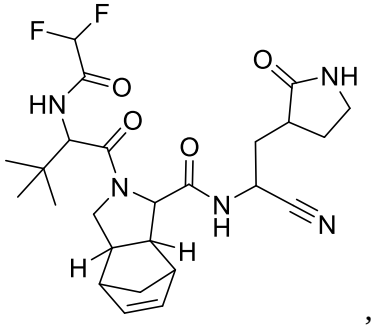
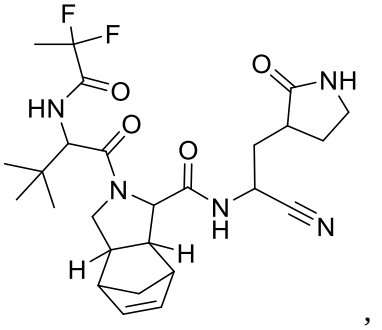
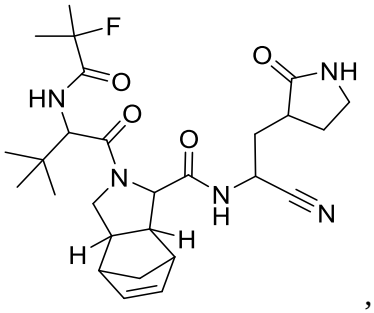
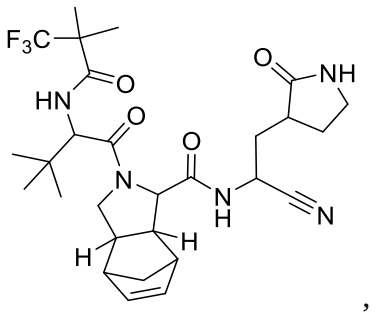
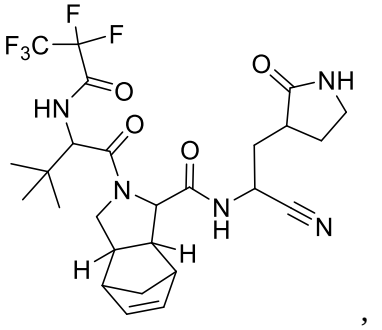
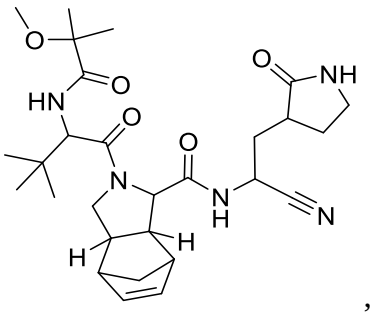

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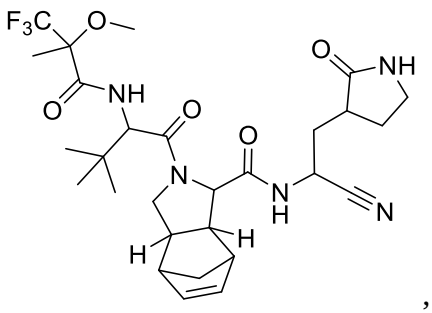
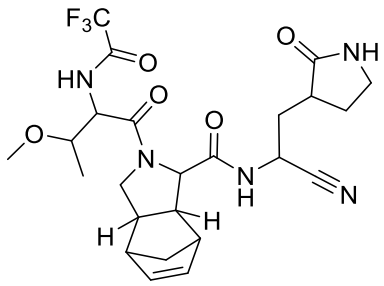
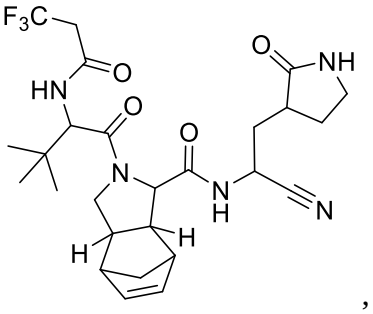
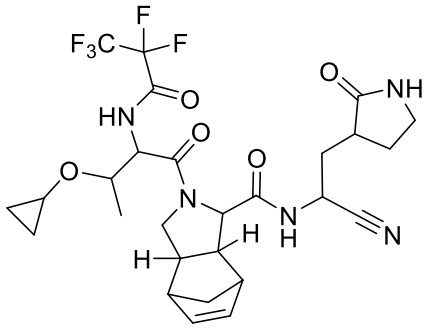
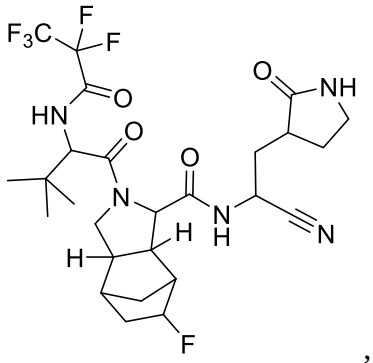
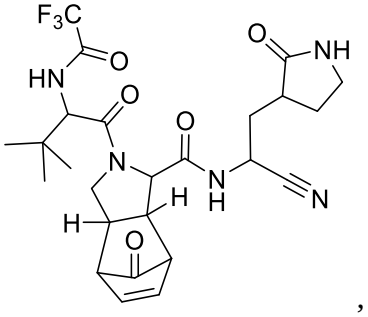
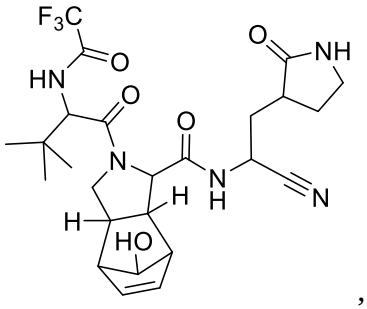
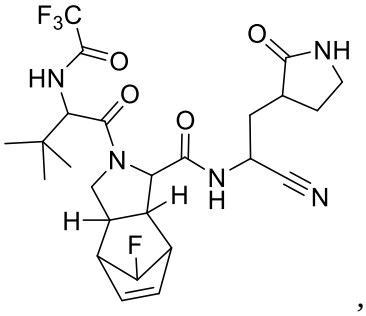
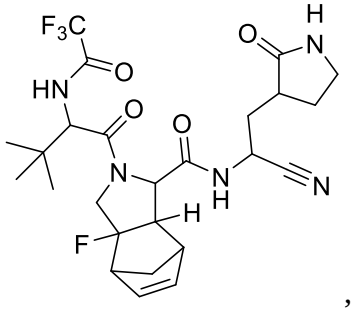
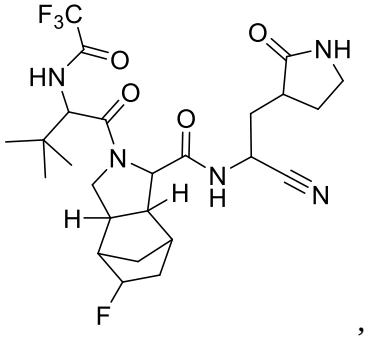
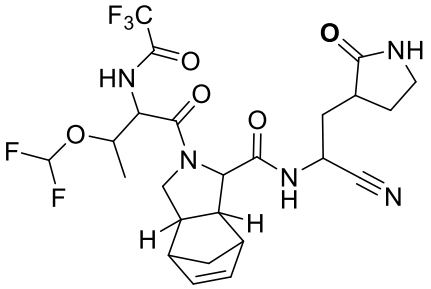
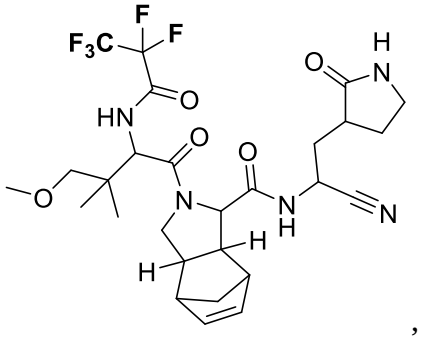

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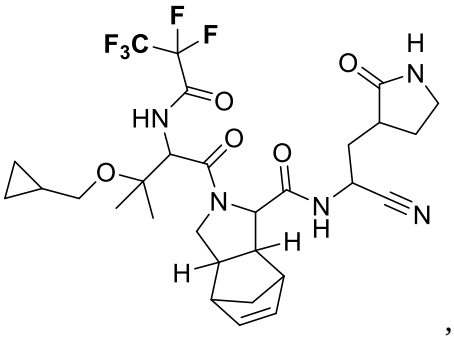
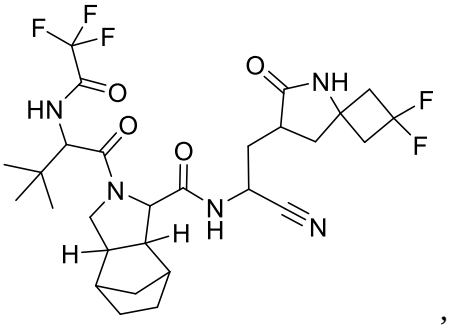
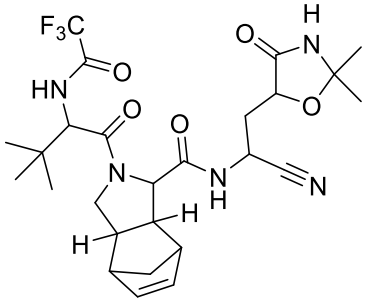
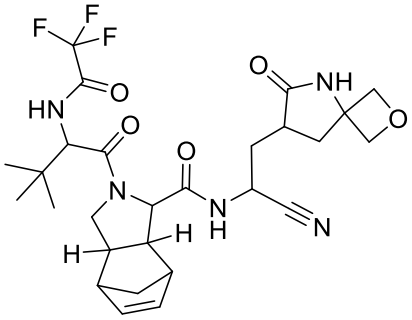
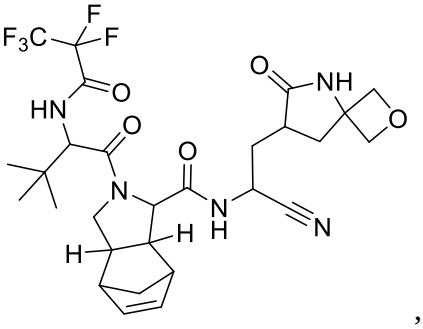
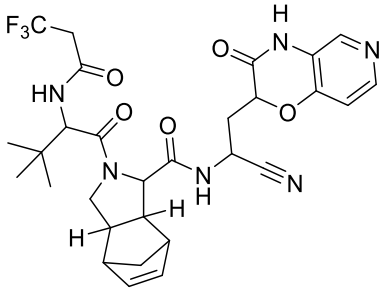
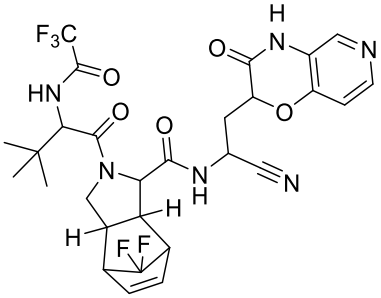
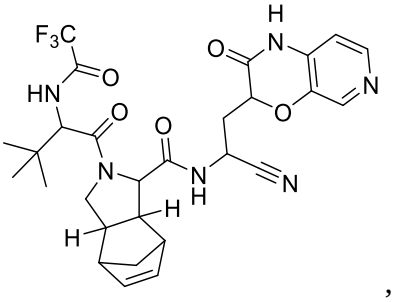
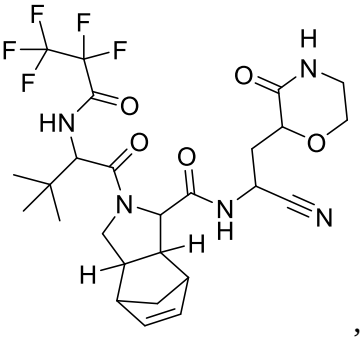
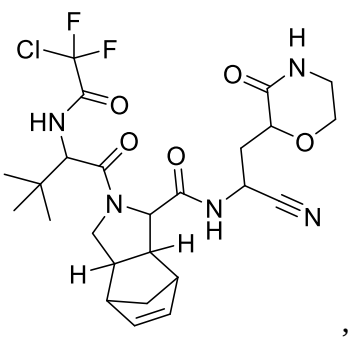
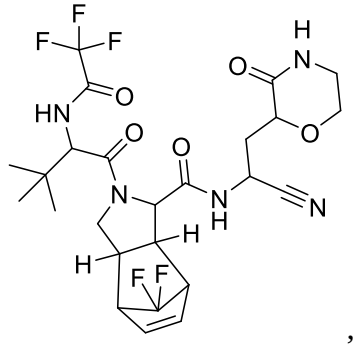

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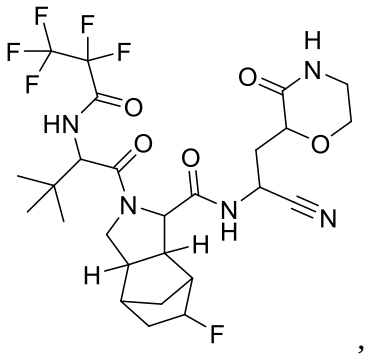
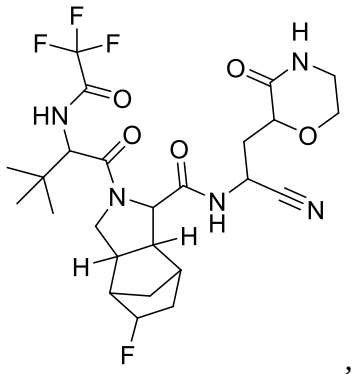
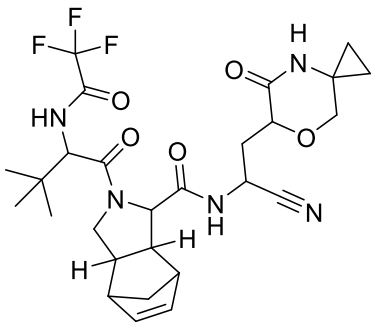
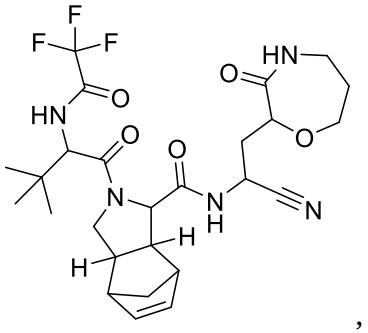
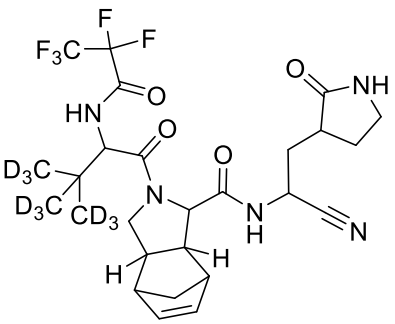
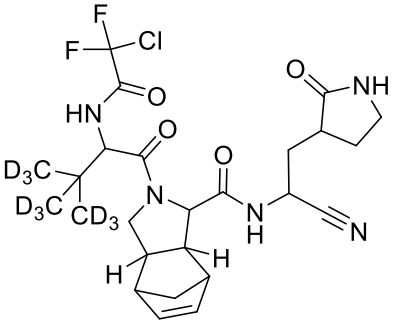
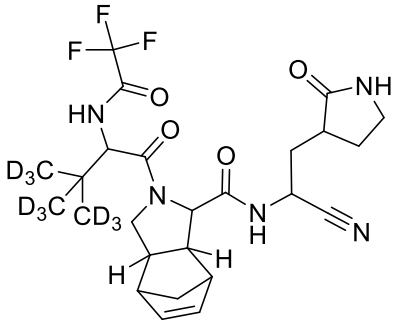
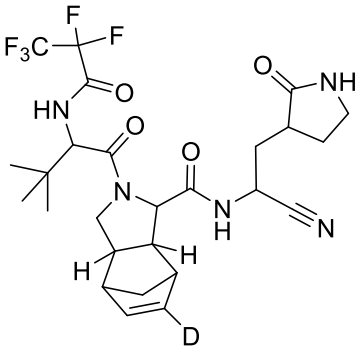
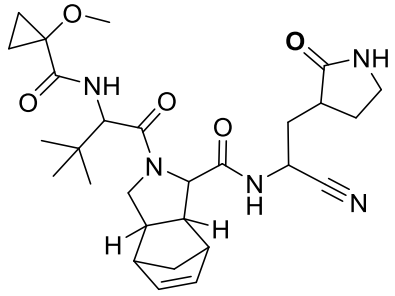
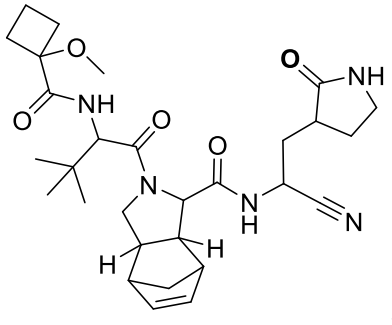
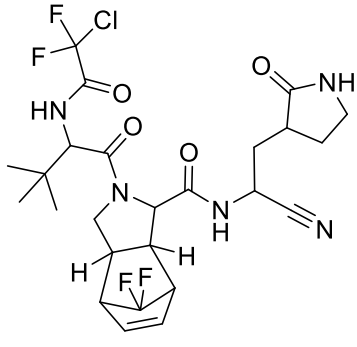
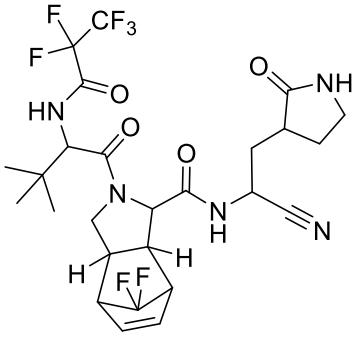

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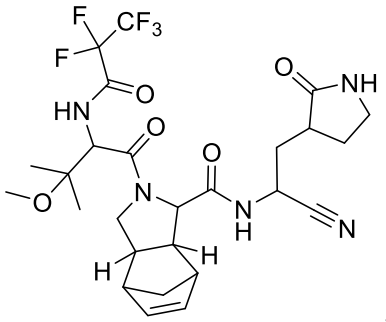
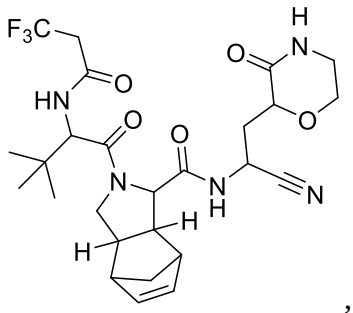
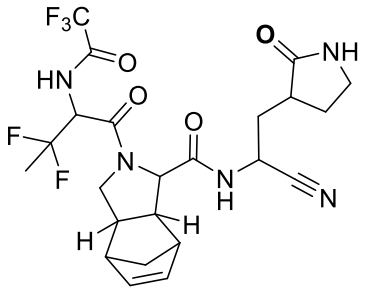
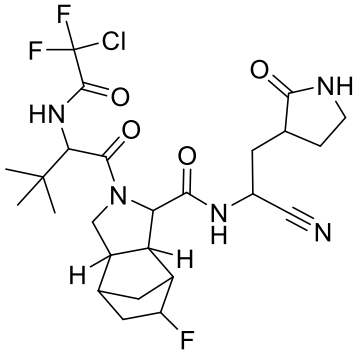
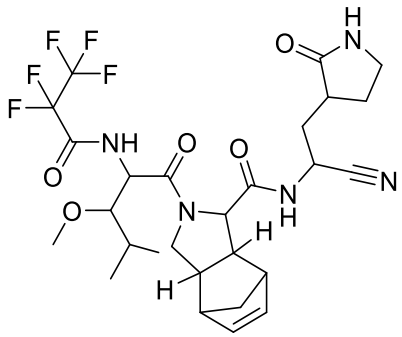
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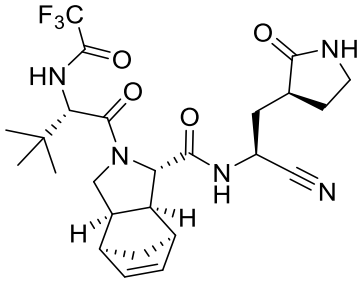
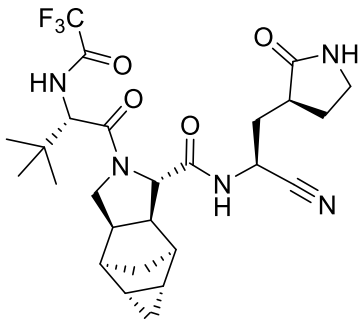
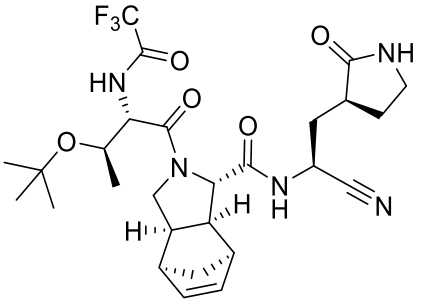
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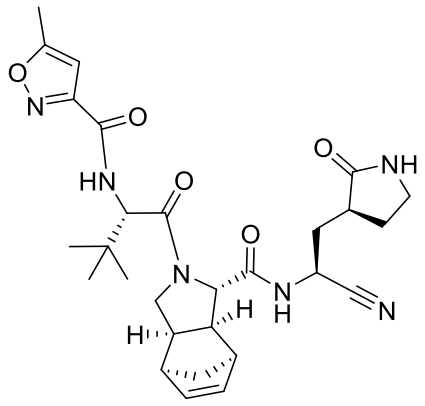
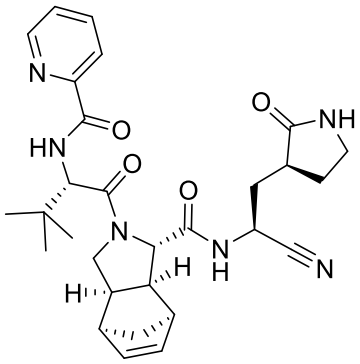
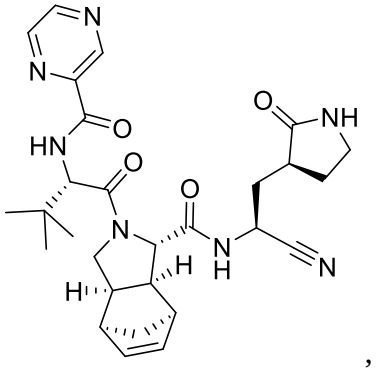
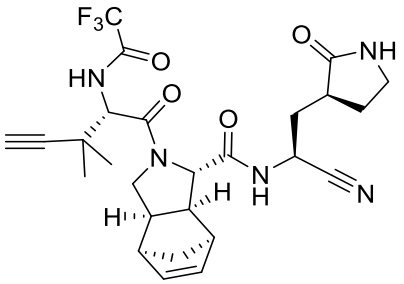
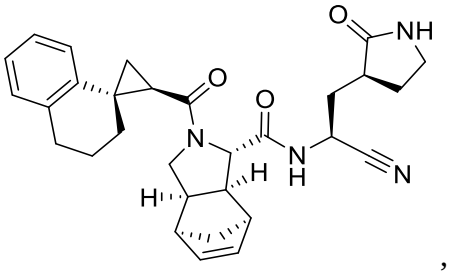
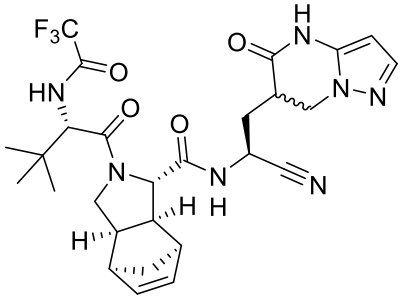
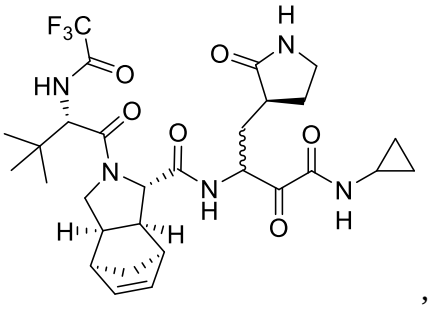
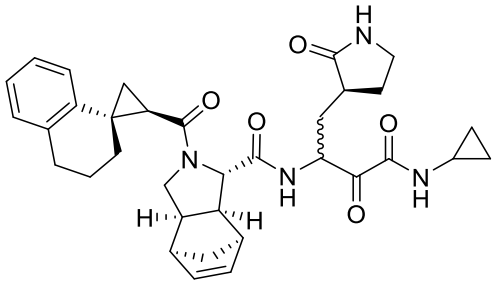
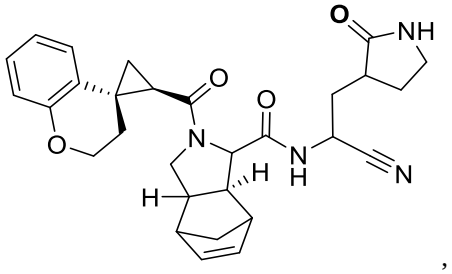
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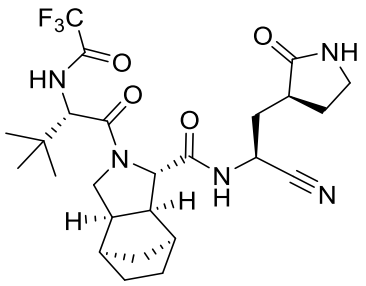
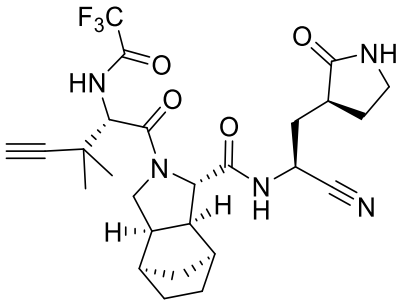
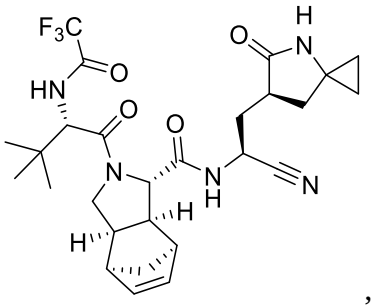
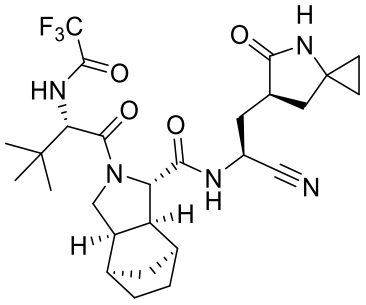
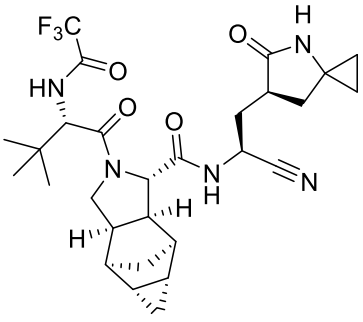
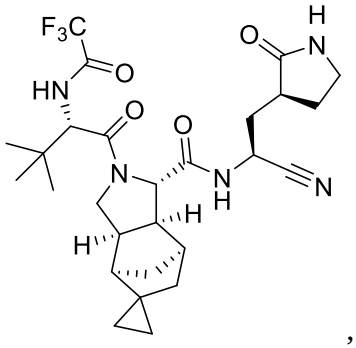
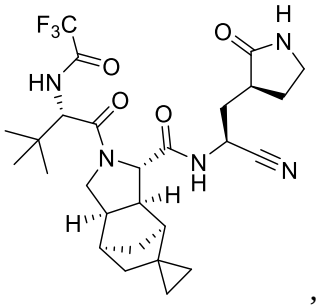
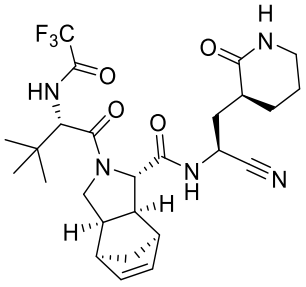
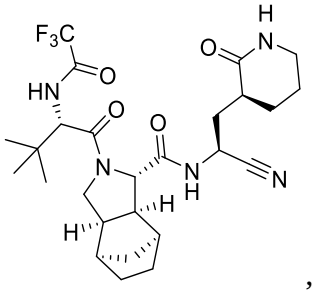
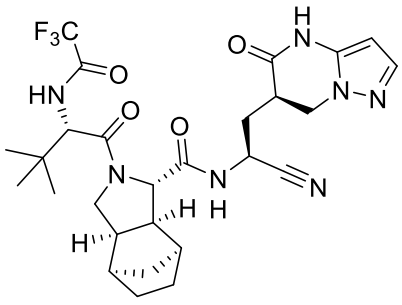
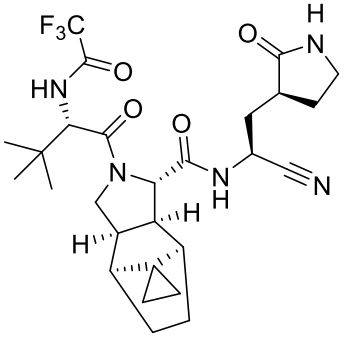
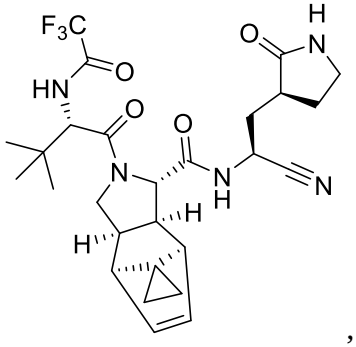
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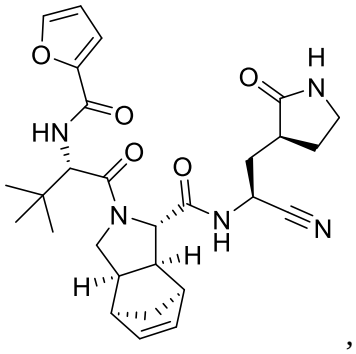
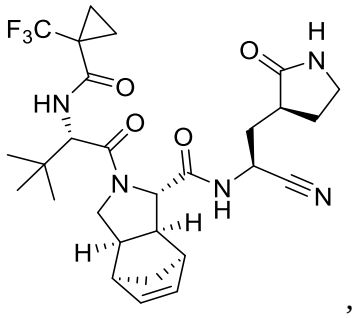
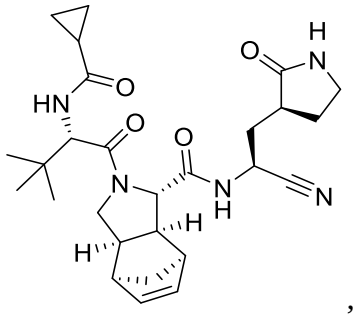
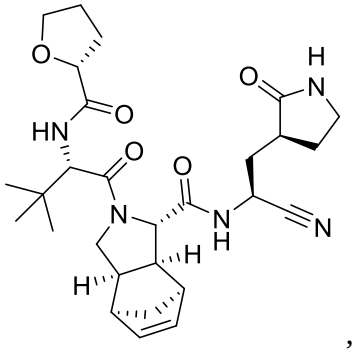
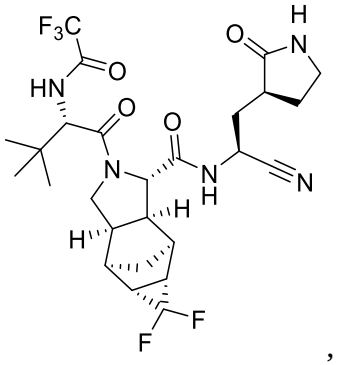
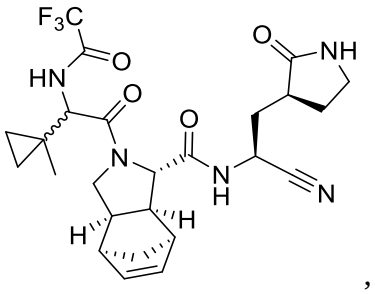
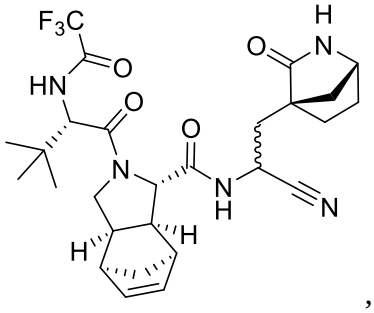
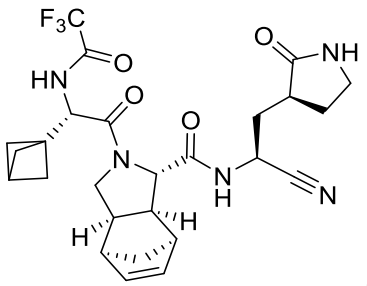
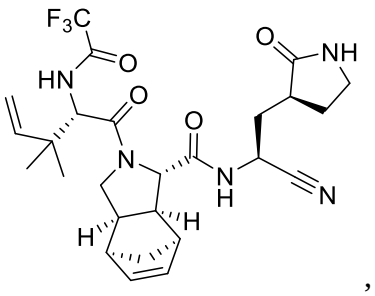
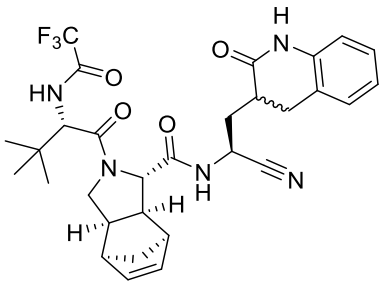
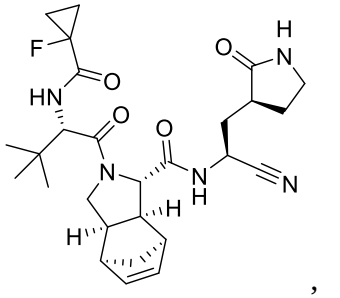
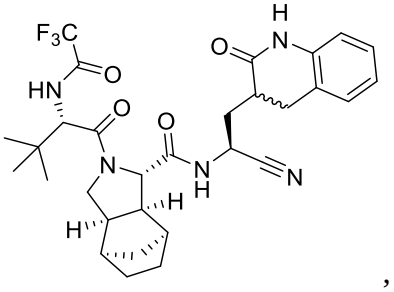

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, or a pharmaceutically acceptable salt of any of the foregoing.

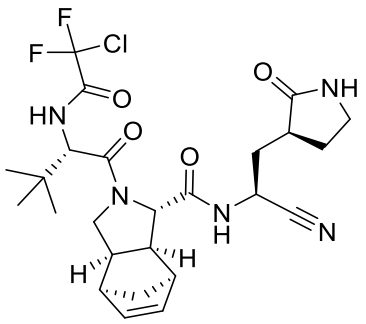
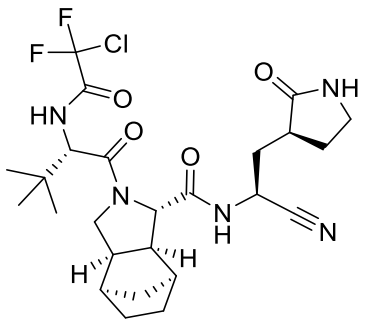
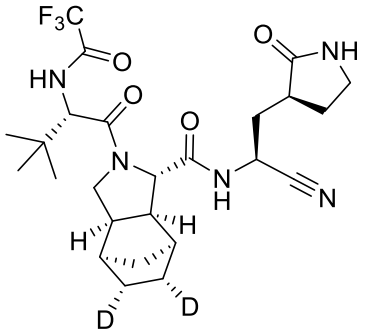
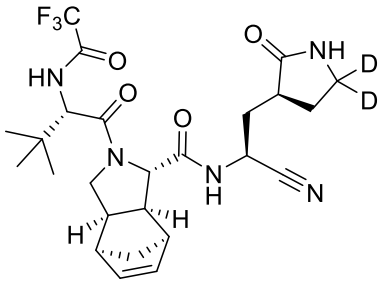
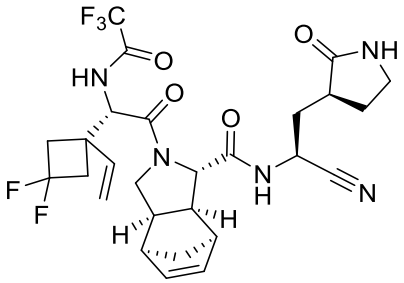
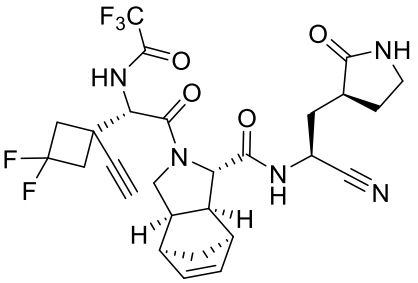
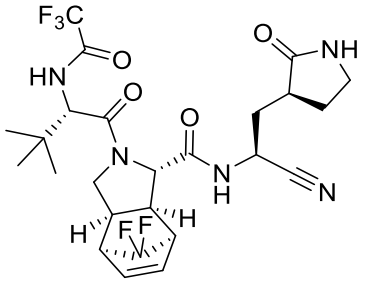
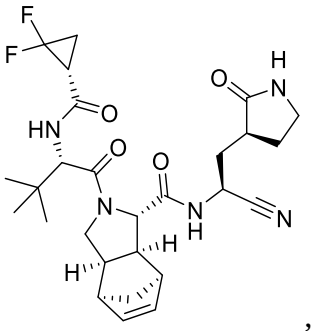
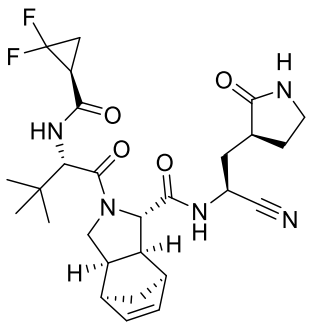
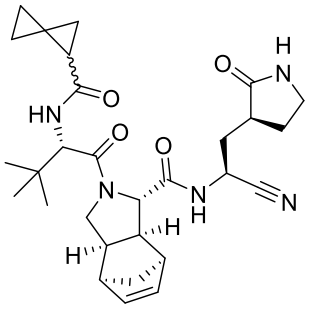
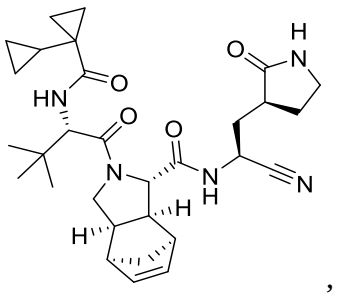
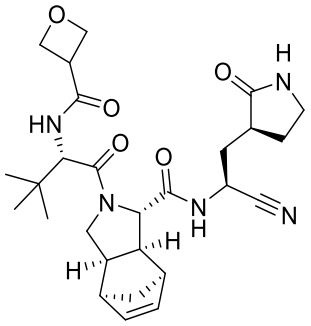
96. The compound of Claim 1, wherein the compound is selected from the group consisting of:

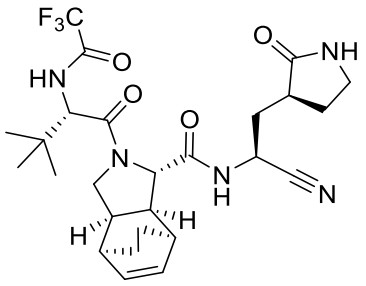
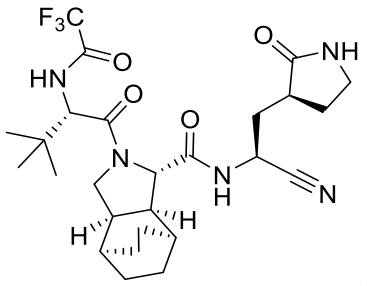
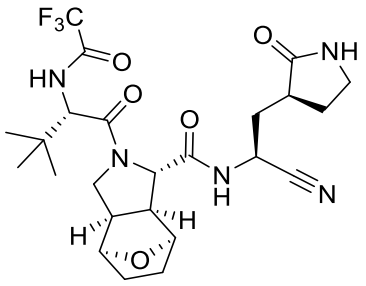
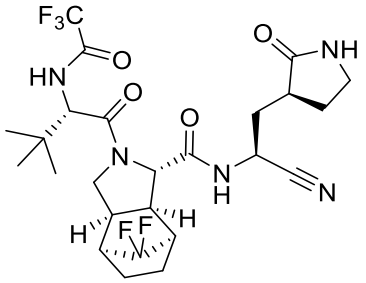
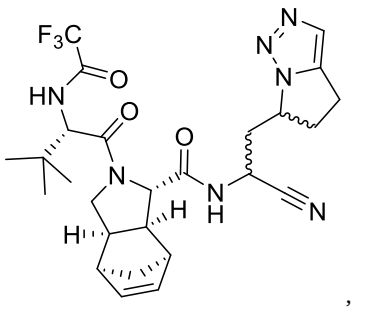
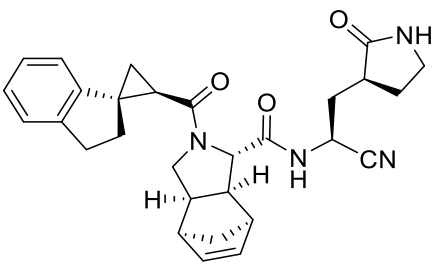
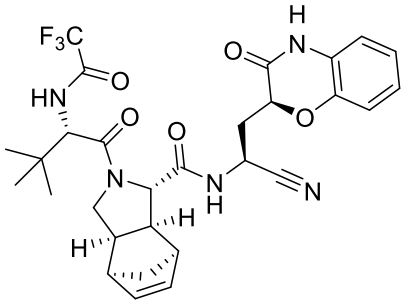
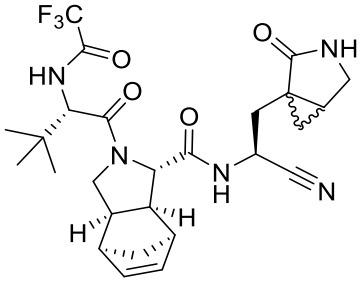
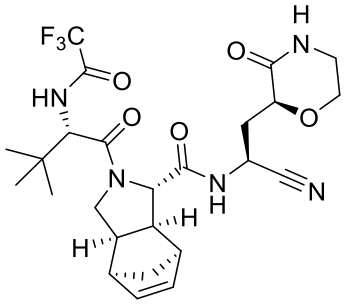
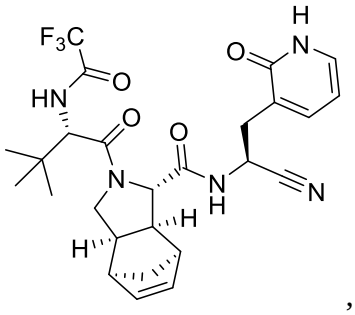
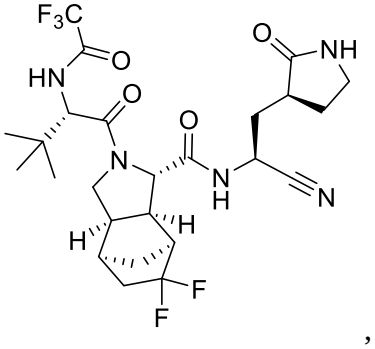
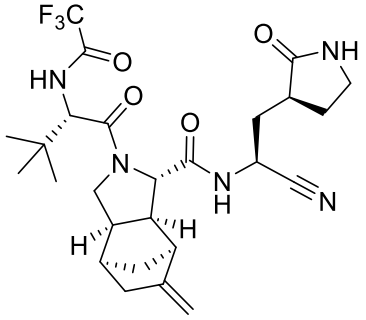

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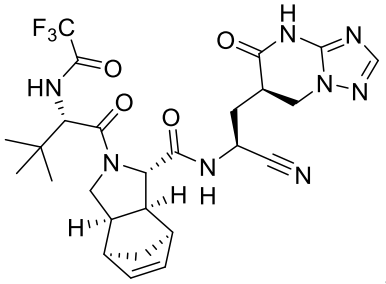
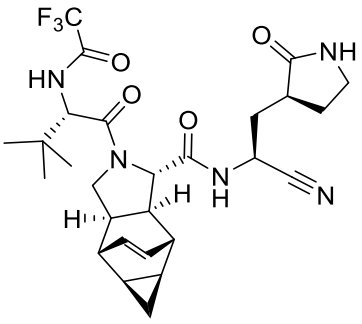
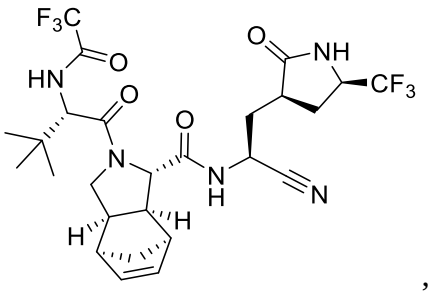
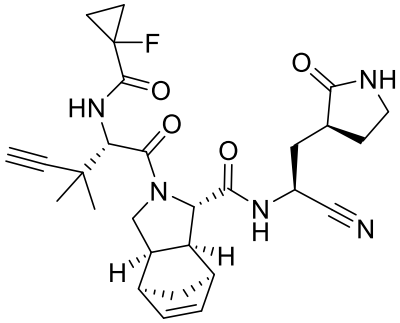
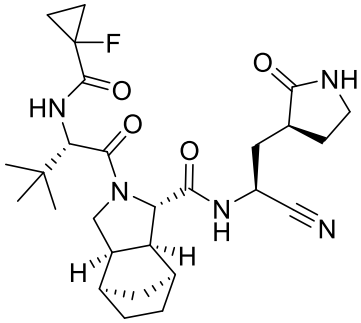
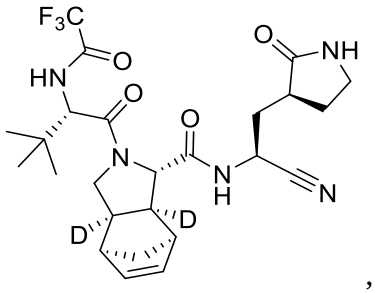
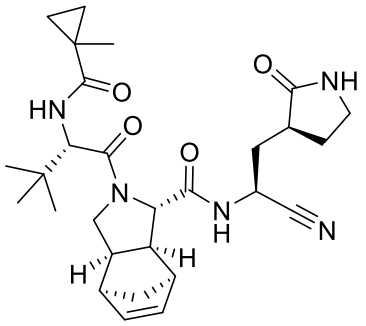
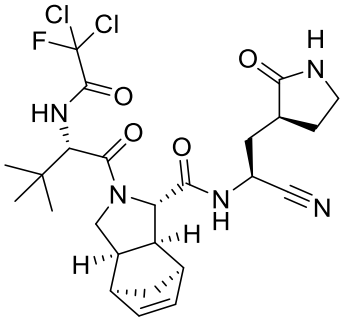
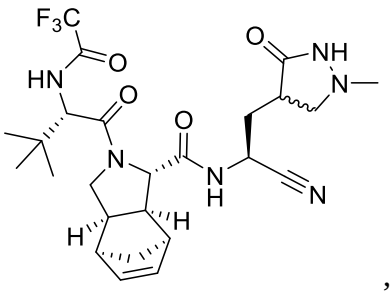
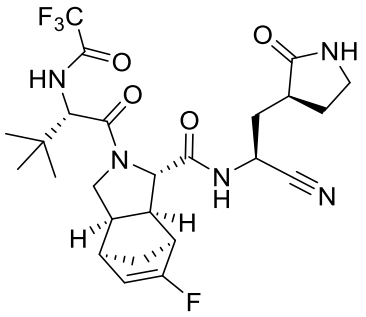
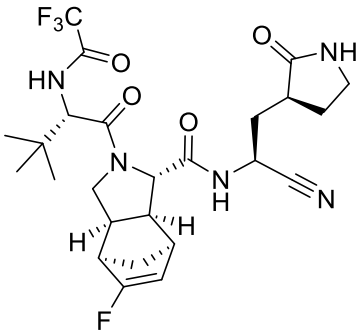
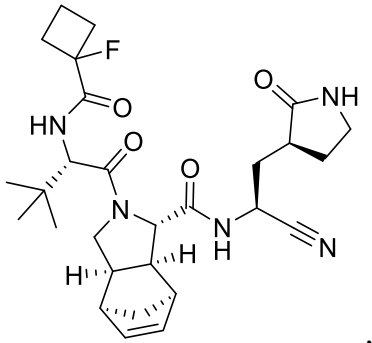

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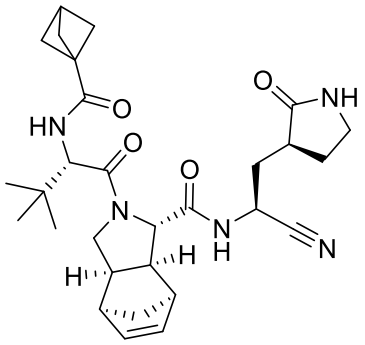
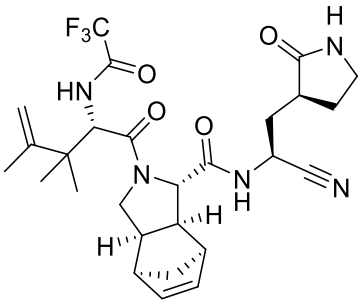
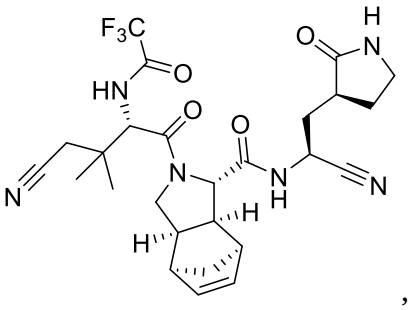
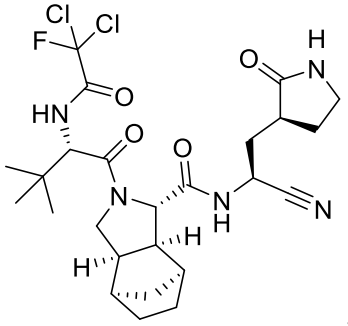
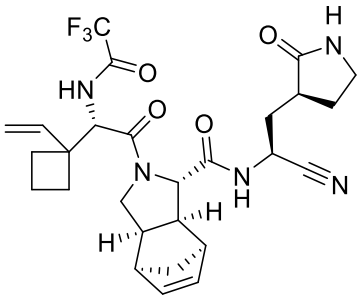
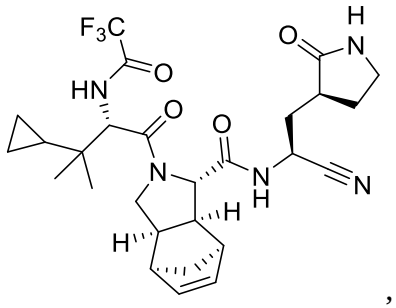
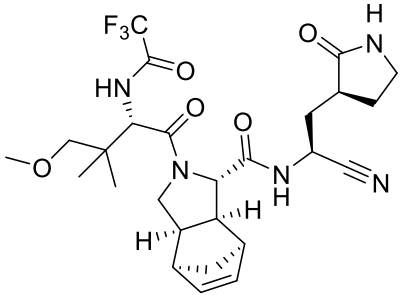
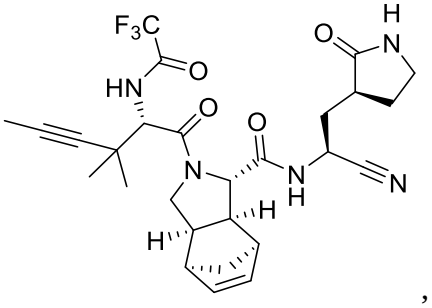
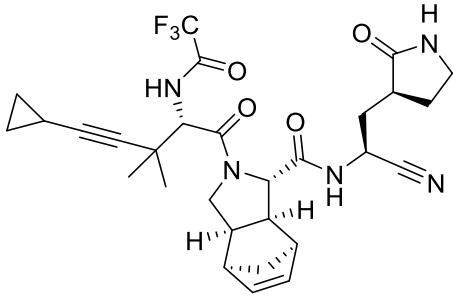
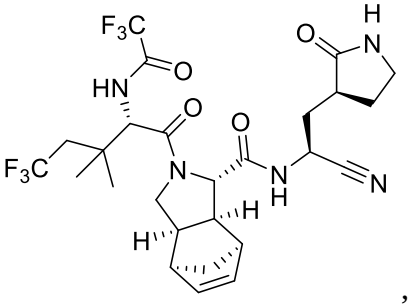

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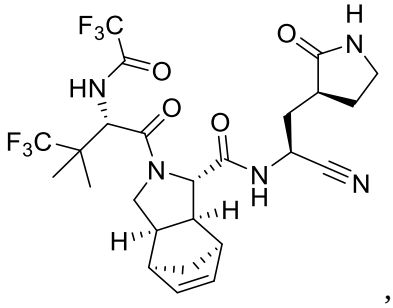
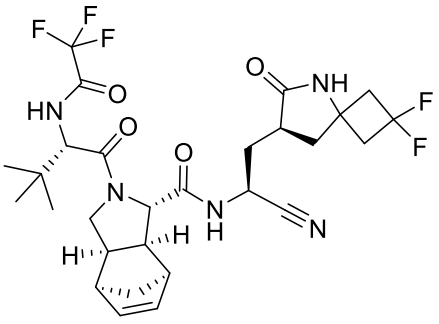
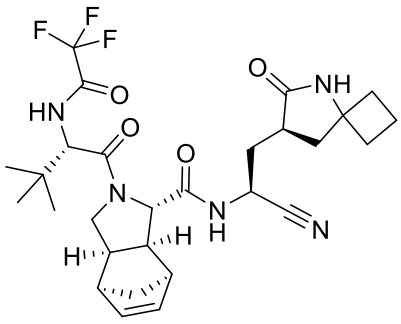
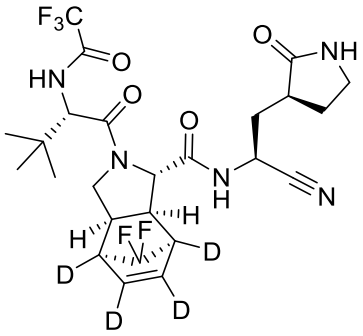
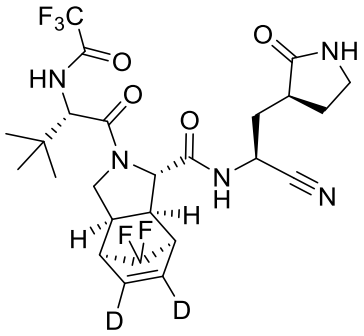
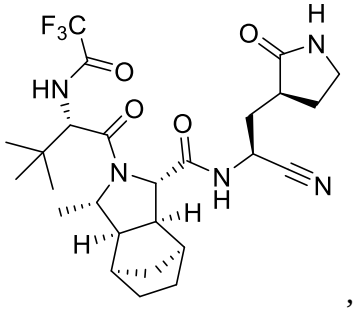
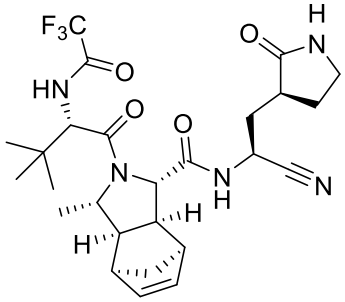
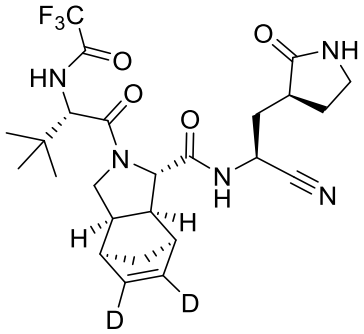
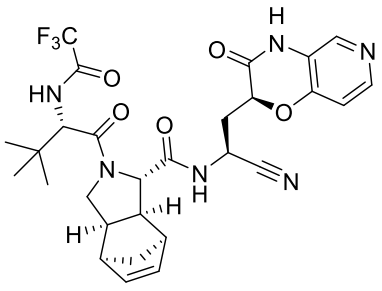
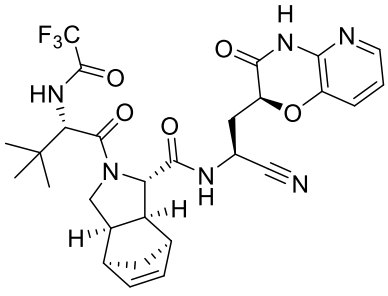
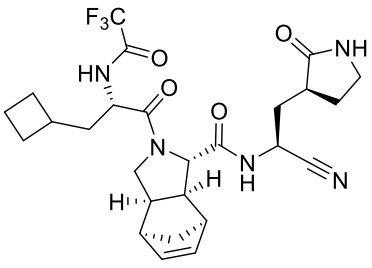

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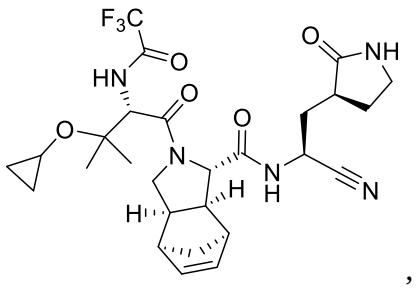
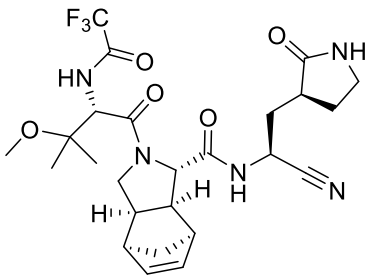
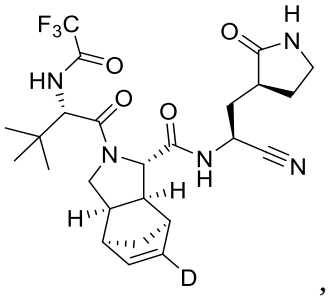
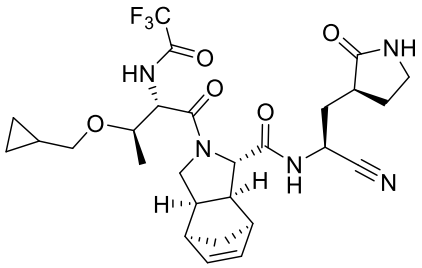
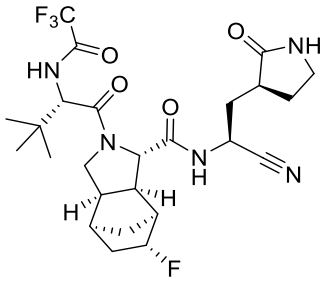
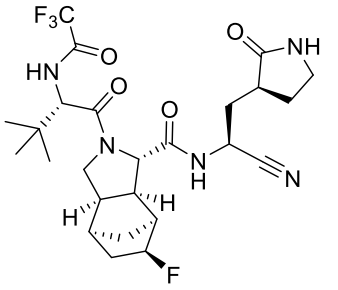
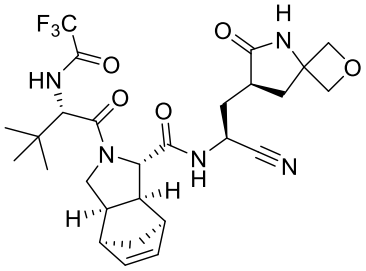
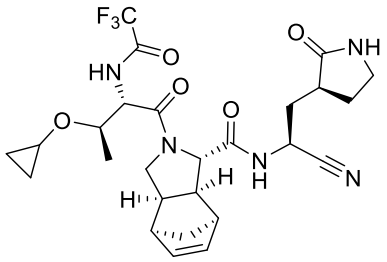
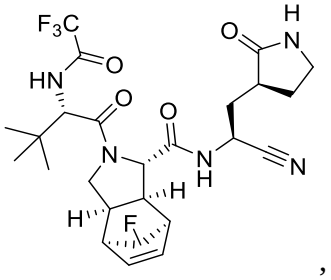
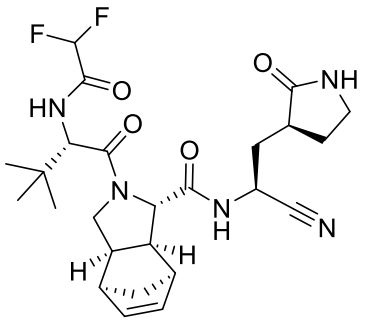
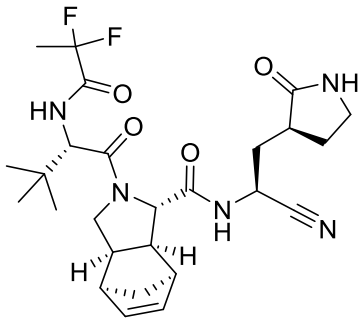
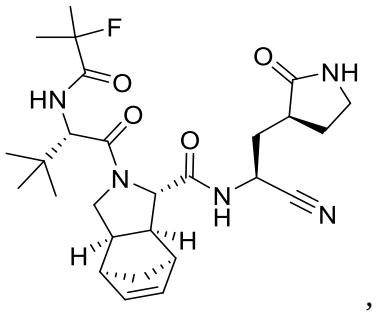
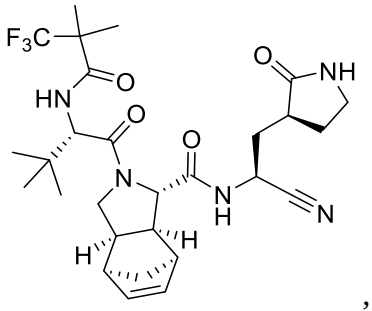
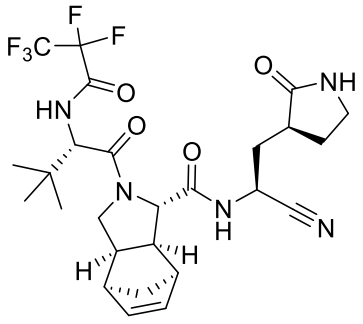
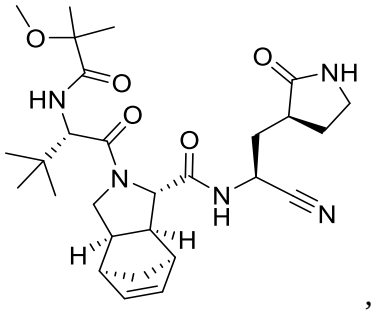
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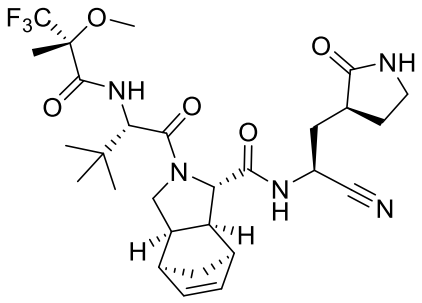
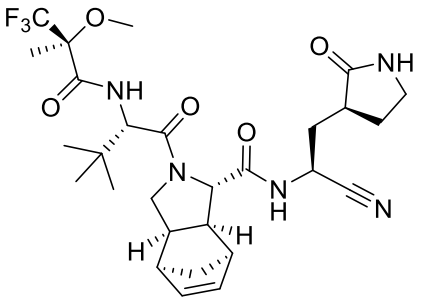
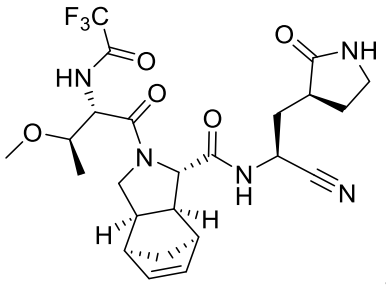
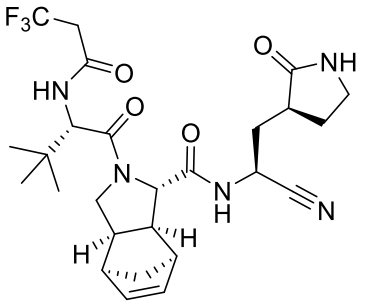
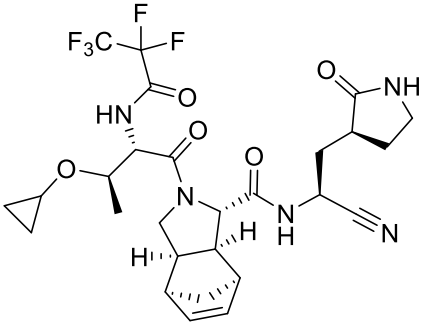
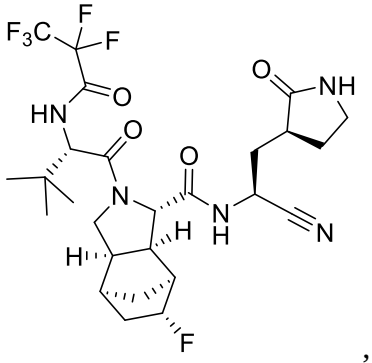
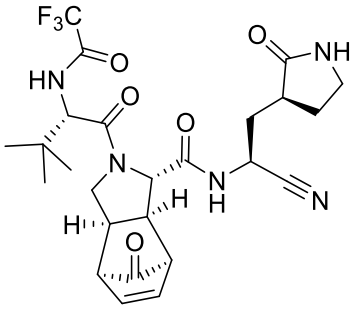
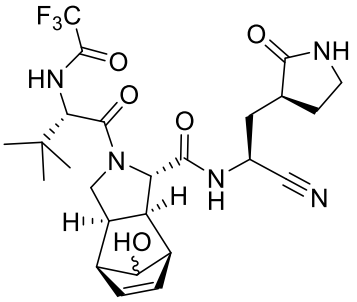
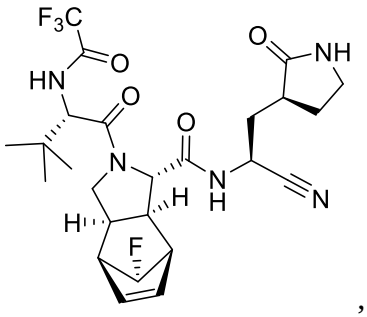
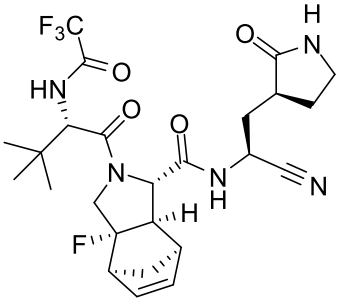
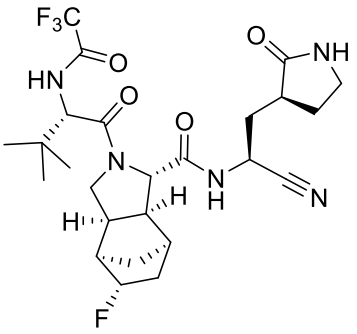
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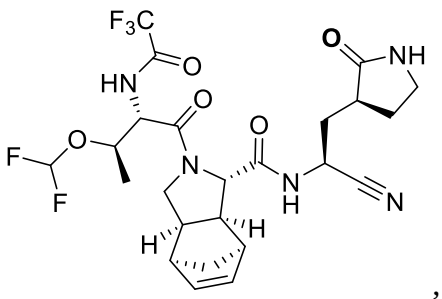
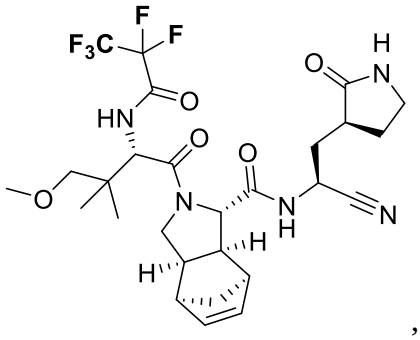
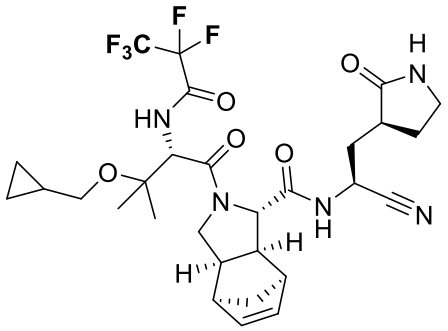
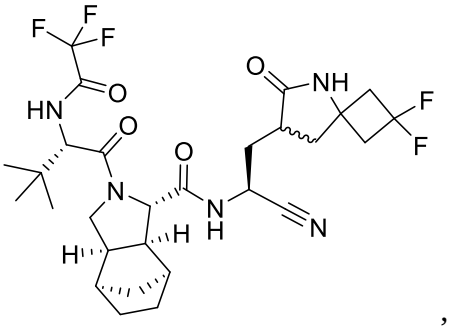
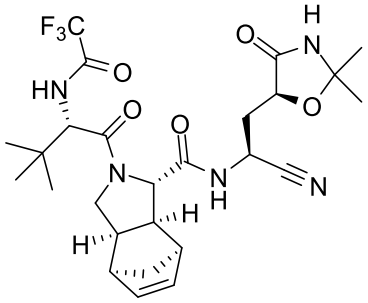
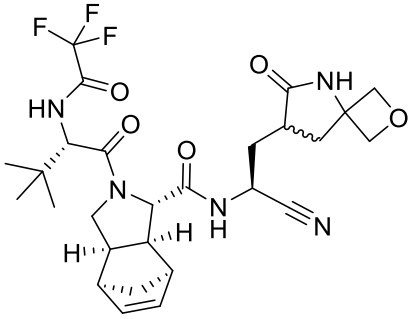
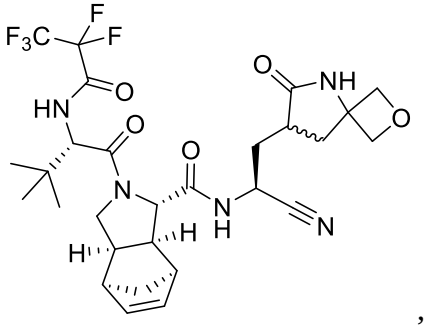
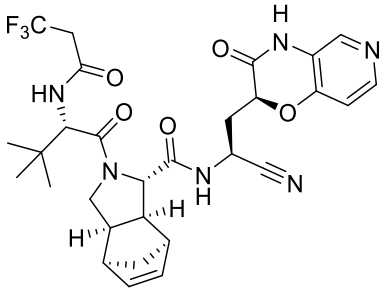
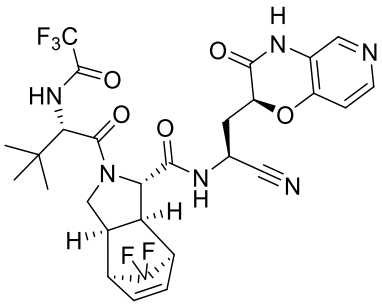
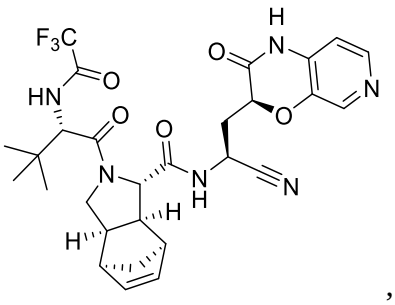
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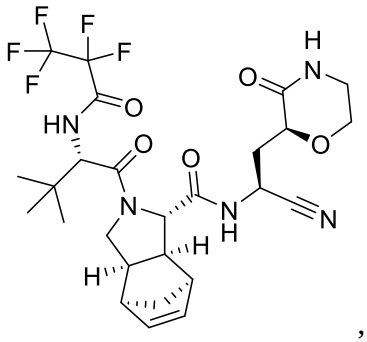
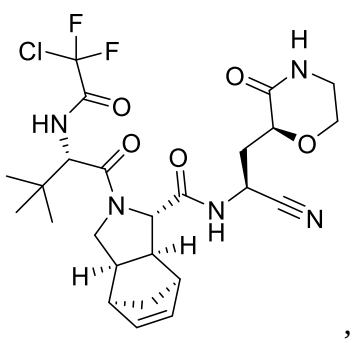
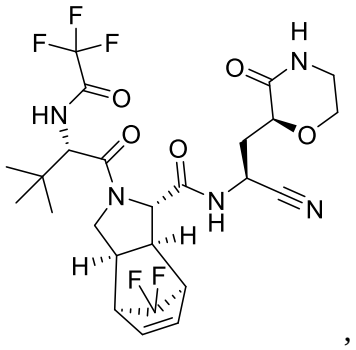
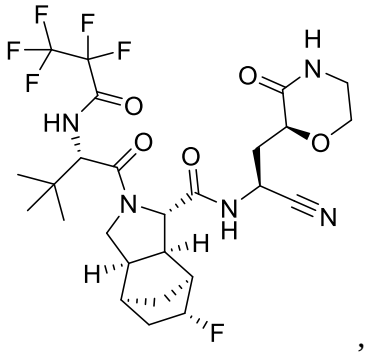
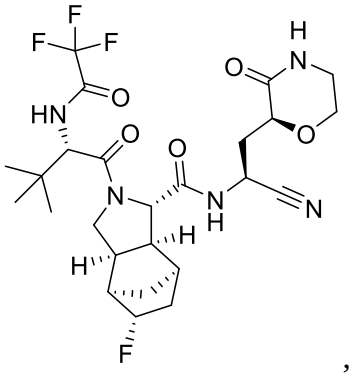
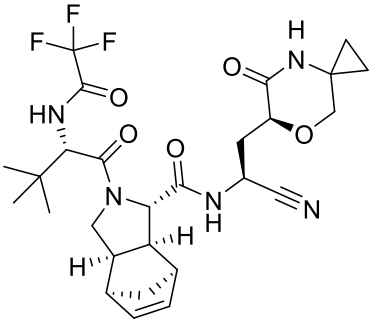
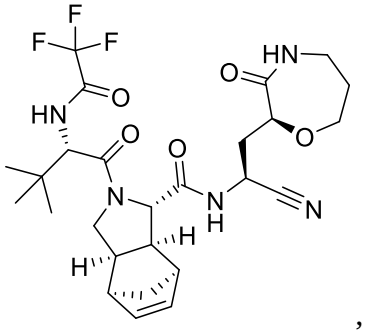
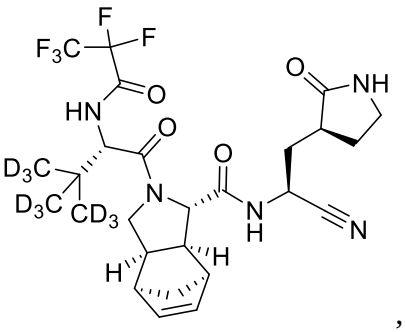
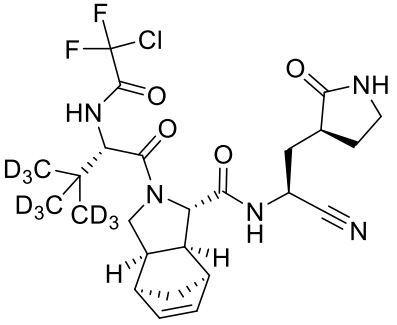
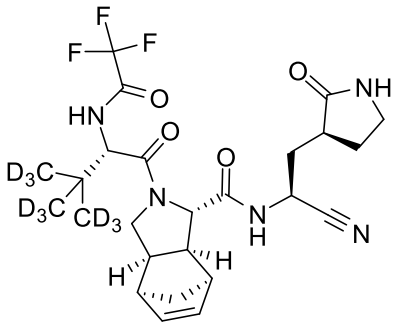
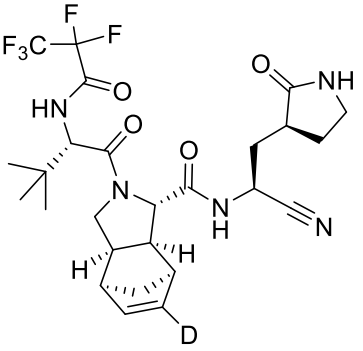
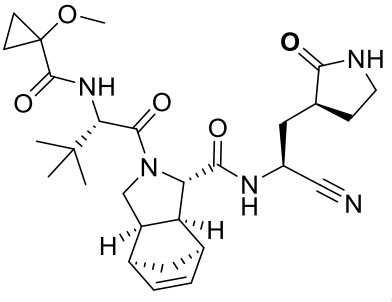

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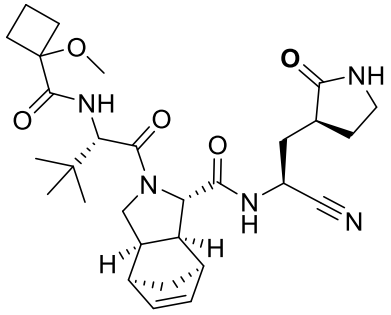
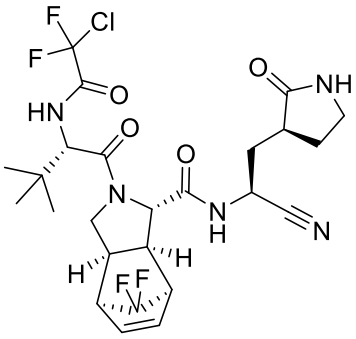
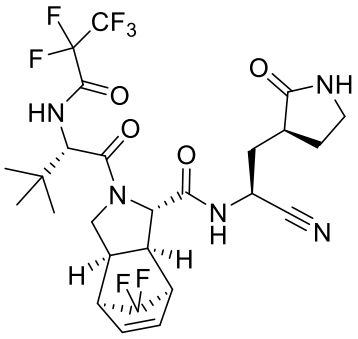
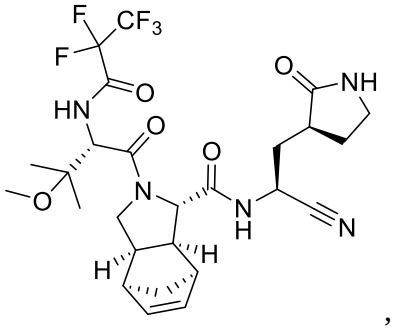
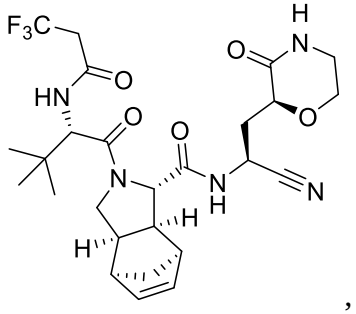
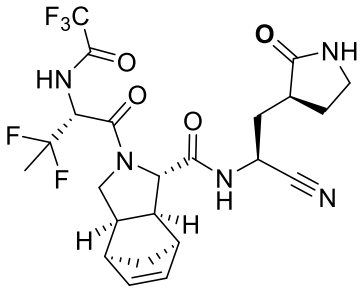
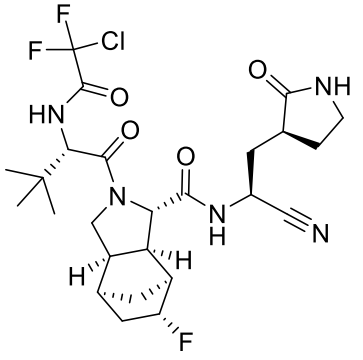
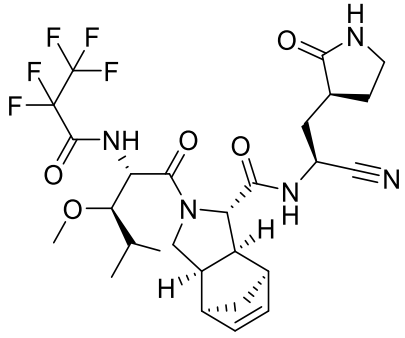

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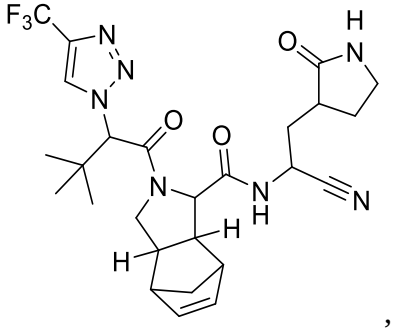
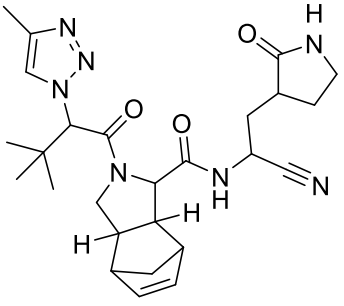
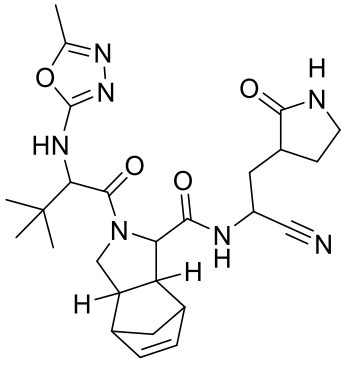

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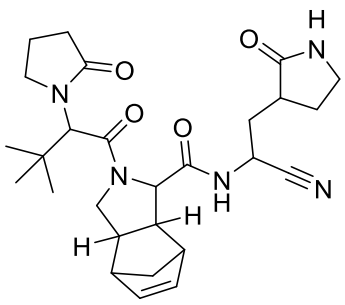
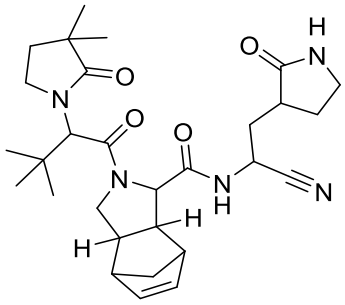
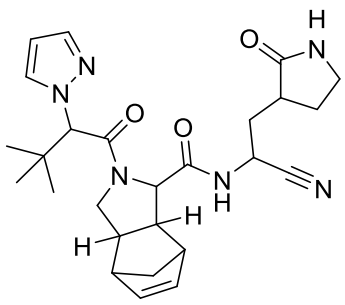
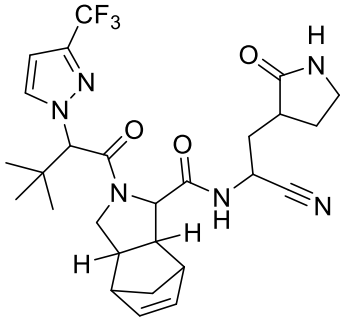
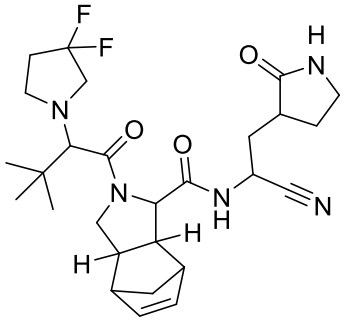
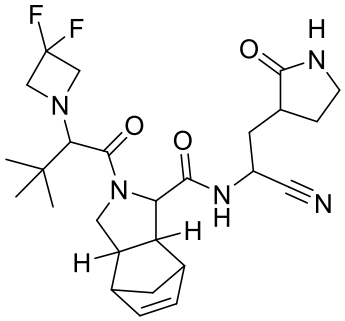
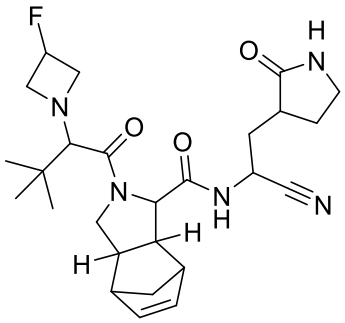
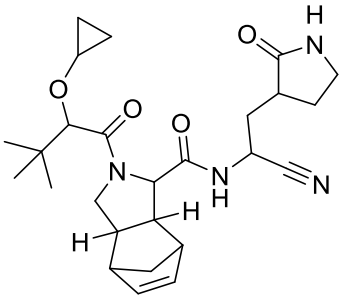
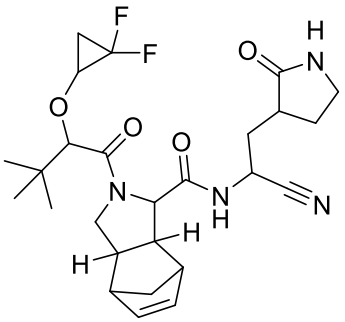
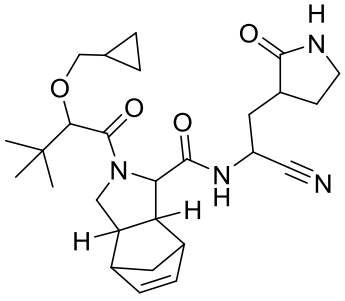

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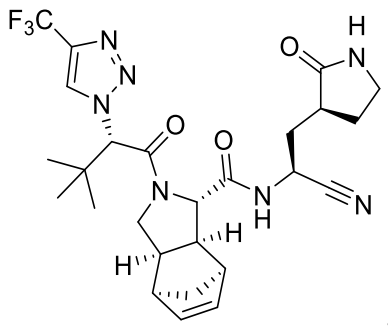
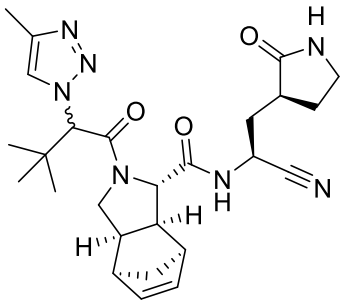
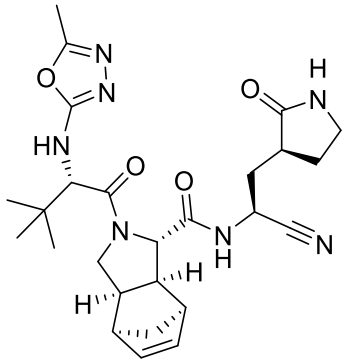
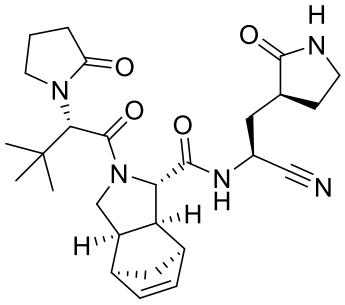
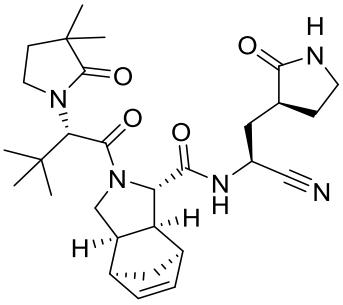
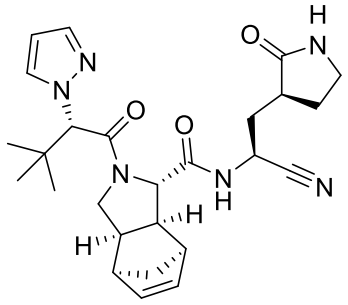
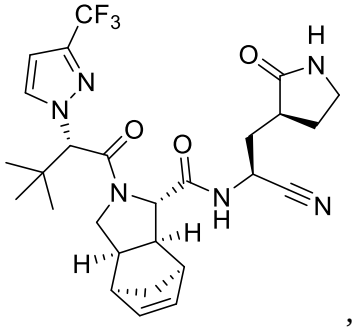
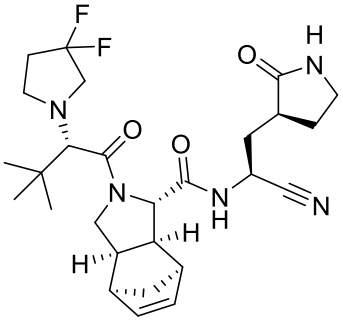
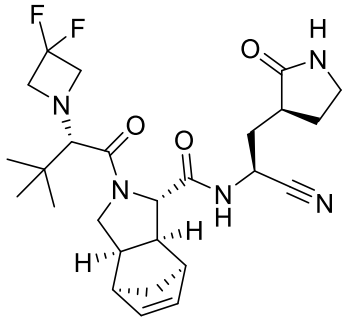
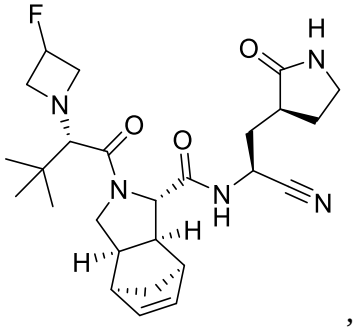
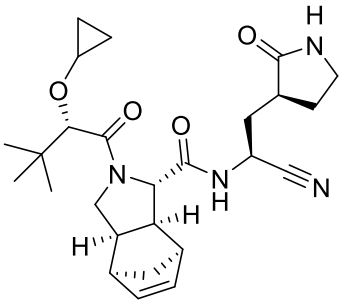
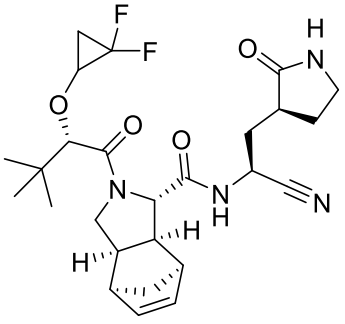
97. The compound of Claim 1, wherein the compound is selected from the group consisting of:

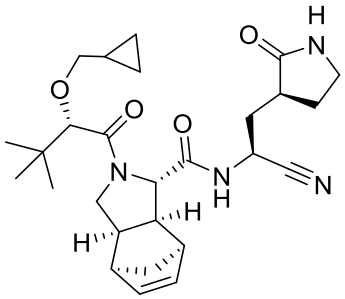

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and

, or a pharmaceutically acceptable salt of any of the foregoing.

98. The compound of Claim 1, wherein the compound is selected from the group

consisting of:


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and



, or a pharmaceutically acceptable salt of any of the foregoing.

99. A pharmaceutical composition comprising an effective amount of a compound of any one of Claims 1-98, or a pharmaceutically acceptable salt thereof, and excipient.

100. Use of the compound of any one of Claims 1-98, or a pharmaceutically acceptable salt thereof, in the preparation of a medicament for the treatment of a coronavirus infection.

101. The use of Claim 100, wherein the use further comprises the use of an additional agent selected from the group consisting of an ACE inhibitor, an anticoagulant, an anti-inflammatory, an ARB, an ASO, a Covid-19 convalescent plasma, an entry inhibitor, an H_2 pump antagonist, an H-conducting channel, an HIV protease inhibitor, an HMG-CoA reductase inhibitor, an immune globulin, an immunosuppressant, an immunotherapeutic agent, a neuraminidase inhibitor, a nucleoside inhibitor, a nucleoside analog inhibitor, a polymerase inhibitor, a protease inhibitor, an siRNA, a statin, a tissue plasminogen activator, an antibiotic, an antimicrobial and a vaccine.

102. The use of Claim 101, wherein the additional agent selected from the group consisting of Ascorbic acid, Anakinra, Azithromycin, Baloxavir, Baricitinib, Chloroquine Phosphate, Colchicine, a corticosteroid, Epoprostenol, Famotidine, Favipiravir, an IGIV, an interferon, an IVIG, Ivermectin, γ-globulin, lopinavir, Methylprednisolone, Niclosamide, Molnupiravir (MK-4482 or EIDD-2801), Nitazoxanide, Nitric oxide, Oseltamivir, Peramivir, RANTES, ribavirin, Remdesivir, Ruxolitinib, Sarilumab, Siltuximab, Sirolimus, a statin, Tacrolimus, Tocilizumab, Umifenovir, Zanamivir, Casirivimab, imdevimab, bamlanivimab, etesevimab and AT-527.

103. The use of any one of Claims 100-102, wherein the coronavirus is β-coronavirus.

104. The use of any one of Claims 100-102, wherein the coronavirus is coronavirus selected from the group consisting of CoV 229E, CoV NL63, CoV OC43, CoV HKU1, Middle East Respiratory Syndrome (MERS)-CoV, Severe Acute Respiratory Syndrome (SARS)-CoV,

and SARS-CoV-2.

105. Use of the compound of any one of Claims 1-98, or a pharmaceutically acceptable salt thereof, in the preparation of a medicament for the treatment of a picornavirus infection.

106. The use of Claim 105, wherein the picornavirus infection is a rhinovirus infection.

107. Use of the compound of any one of Claims 1-98, or a pharmaceutically acceptable salt thereof, in the preparation of a medicament for the treatment of a norovirus infection.

108. The use of any one of Claims 100-104, wherein the coronavirus causes one or more symptoms selected from the group consisting of coughing, sore throat, runny nose, sneezing, headache, fever, shortness of breath, myalgia, abdominal pain, fatigue, difficulty breathing, persistent chest pain or pressure, difficulty waking, loss of smell and taste, muscle or joint pain, chills, nausea or vomiting, nasal congestion, diarrhea, haemoptysis, conjunctival congestion, sputum production, chest tightness and palpitations.

109. The use of any one of Claims 100-104, wherein the coronavirus causes a complication selected from the group consisting of sinusitis, otitis media, pneumonia, acute respiratory distress syndrome, disseminated intravascular coagulation, pericarditis and kidney failure.

110. The use of Claim 102, wherein the interferon is selected from the group consisting of recombinant interferon alpha 2b, IFN-α and PEG-IFN-α-2a.

111. Use of a compound of any one of Claims 1-98, or a pharmaceutically acceptable salt thereof, in the preparation of a medicament that selectively inhibits a coronavirus protease compared to a host protease.

112. The use of Claim 111, wherein the compound of formula (I) selectively inhibits the coronavirus protease over the host protease that is selected from the group consisting of Cathepsin L, Cathepsin B, Cathepsin D, Cathepsin K, Leukocyte Elastase, Chymotrypsin, Trypsin, Thrombin, Pepsin, Caspase 2, Elastase and Calpain.

113. The use of Claim 111 or 112, wherein the host protease is selected from Cathepsin L and Cathepsin B.

114. The use of any one of Claims 111-113, wherein the selectively is > 2-fold.