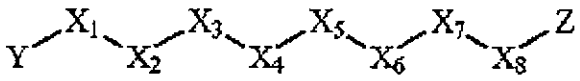
CLAIMS

1. An anthelmintic compound of formula (I):



(I)

wherein:

Y is a bicyclic carbocyclic or a bicyclic heterocyclic group optionally substituted by one or more of halogen, nitro, cyano, hydroxy, alkyl, haloalkyl, alkoxy, haloalkoxy, alkylthio, halothio, haloalkylthio, alkylsulfinyl, haloalkylsulfinyl, alkylsulfonyl, haloalkylsulfonyl or phenyl; and Z is phenyl optionally substituted with one or more substituents independently selected from selected from the group consisting of halogen, nitro, cyano, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, C_1-C_4haloalkoxy, C_1-C_4alkylthio, C_1-C_4halothio, C_1-C_4haloalkylthio, C_1-C_4alkylsulfinyl, C_1-C_4haloalkylsulfinyl, C_1-C_4alkylsulfonyl, C_1-C_4haloalkylsulfonyl, phenyl, C_1-C_4alkylcarbonyl or C_1-C_4haloalkylcarbonyl;

X_1 is a bond, —C(O)—, or —CH_2— wherein —$(CH_2)_n$ the —CH_2— group is optionally substituted with alkyl;

X_2 is a 1,4-piperazinyl linker optionally substituted with one or two alkyl groups;

X_3 is a diradical group;

X_4 is —CH_2—, wherein the —CH_2— is optionally substituted with alkyl;

X_5 is a bond;

X_6 is —O—;

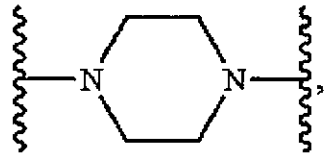
X_7 is 1,4-trans-cyclohexylenyl; and

X_8 is —NH— optionally substituted with alkyl.

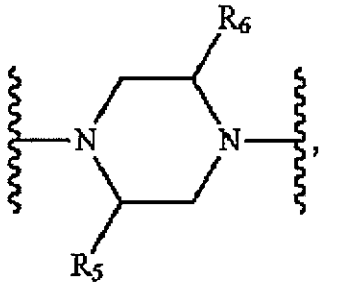
2. The compound of claim 1, wherein Y is optionally substituted naphthyl, indolyl, benzothiazolyl, benzoxazolyl, benzodioxolyl, benzothienyl, quinuclidinyl, quinolinyl, tetrahydroisoquinolinyl, isoquinolinyl, benzimidazolyl, benzopyranyl, indolizinyl, benzofuranyl, dihydrobenzofuranyl, chromonyl, coumarinyl, benzopyranyl, cinnolinyl, quinoxalinyl, indazolyl, pyrrolopyridyl, furopyridinyl, dihydroisoindolyl, dihydroquinazolinyl or tetrahydroquinolinyl.

3. The compound of claim 1, wherein
X_2 is L1, L13, L14 or L15:

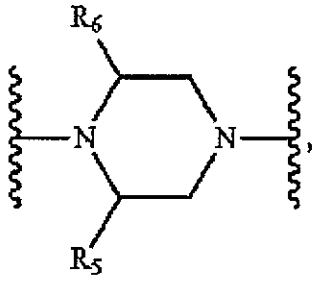
L1



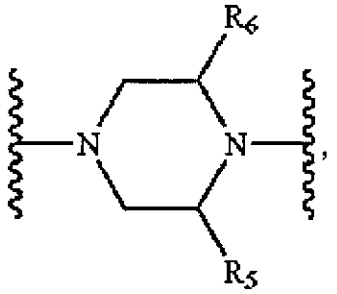
L13



L14



L15



wherein R_5 and R_6 are independently hydrogen or C_1-C_3-alkyl.

4. A composition for the treatment of a parasitic infection or infestation in an animal, comprising an effective amount of at least one anthelmintic compound of any one of claims 1 to 3 in combination with a pharmaceutically acceptable carrier.

5. The composition of claim 4, wherein the composition comprises an additional parasiticidal active agent.

6. The compound of claim 3, wherein X_2 is L1.

7. The compound of claim 3, wherein X_8 is unsubstituted —NH—; and X_4 is unsubstituted —CH_2—.

8. The compound of claim 6, wherein:

X_1 is a bond or —CH_2—;

X_4 is unsubstituted —CH_2—;

X_8 is —NH— or —N(CH_3)—;

Y is optionally substituted benzothiazolyl, benzoxazolyl or quinolinyl; and

Z is phenyl substituted with one or two C_1-C_4haloalkyl, halogen, nitro, cyano or C_1-C_4haloalkylsulfonyl.

9. The compound of claim 1 or 3, wherein Y is optionally substituted naphthyl, indolyl, benzothiazolyl, benzoxazolyl, benzodioxolyl, benzothienyl, quinuclidinyl, quinolinyl, tetrahydroisoquinolinyl, isoquinolinyl, benzimidazolyl, benzopyranyl, indolizinyl, benzofuranyl, dihydrobenzofuranyl, chromonyl, coumarinyl, benzopyranyl, cinnolinyl, quinoxalinyl, indazolyl, pyrrolopyridyl, furopyridinyl, dihydroisoindolyl, dihydroquinazolinyl or tetrahydroquinolinyl.

10. The compound of claim **9**, wherein Y is optionally substituted indolyl, benzothiazolyl, benzoxazolyl, quinolinyl, tetrahydroisoquinolinyl, isoquinolinyl, benzimidazolyl, benzopyranyl, indolizinyl, benzofuranyl, dihydrobenzofuranyl, benzopyranyl, indazolyl, dihydroisoindolyl, dihydroquinazolinyl or tetrahydroquinolinyl; and Z is phenyl optionally substituted with one or more of halogen, nitro, cyano, C_1-C_4haloalkyl, C_1-C_4alkoxy, C_1-C_4haloalkoxy, halothio, C_1-C_4alkylthio, C_1-C_4haloalkylthio or C_1-C_4haloalkylsulfonyl.

11. The compound of claim **10**, wherein Y is indolyl, benzothiazolyl, benzoxazolyl, quinolinyl, tetrahydroisoquinolinyl, isoquinolinyl, benzimidazolyl, benzopyranyl, indolizinyl, benzofuranyl, dihydrobenzofuranyl, benzopyranyl, indazolyl, dihydroisoindolyl, dihydroquinazolinyl or tetrahydroquinolinyl optionally substituted with one or more halogen, cyano, alkyl, haloalkyl, alkoxy, haloalkoxy, halothio, alkylthio, haloalkylthio, alkylsulfinyl, haloalkylsulfinyl and alkylsulfonyl.

12. The compound of claim **11**, wherein Y is indolyl, benzothiazolyl, benzoxazolyl, quinolinyl, tetrahydroisoquinolinyl, isoquinolinyl, benzimidazolyl, benzopyranyl, indolizinyl, benzofuranyl, dihydrobenzofuranyl, benzopyranyl, indazolyl, dihydroisoindolyl, dihydroquinazolinyl or tetrahydroquinolinyl optionally substituted with one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, C_1-C_4haloalkoxy, C_1-C_4alkylthio or SF_5; and Z is phenyl optionally substituted with one or more of halogen, nitro, cyano, C_1-C_4 alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy or C_1-C_4haloalkoxy.

13. The compound of claim **12**, wherein Y is indolyl, benzothiazolyl, benzoxazolyl, quinolinyl, tetrahydroisoquinolinyl, isoquinolinyl, benzimidazolyl, benzopyranyl, indolizinyl, benzofuranyl, dihydrobenzofuranyl, benzopyranyl, indazolyl, dihydroisoindolyl, dihydroquinazolinyl or tetrahydroquinolinyl optionally substituted with one or more F, Cl, Br, methyl, CF_3, OCH_3, OCF_3, SF_5 or SCF_3; and Z is phenyl optionally substituted with one or more of F, Cl, Br, nitro, cyano, methyl, CF_3, OCH_3 or OCF_3.

14. The compound of claim **13**, wherein Y is benzothiazolyl, benzoxazolyl or quinolinyl substituted with one or more F, Cl, Br, CF_3, OCF_3, SF_5 or SCF_3; and Z is phenyl substituted with two to four substituents selected from the group consisting of F, Cl, Br, nitro, cyano, methyl, CF_3, OCF_3 or SCF_3.

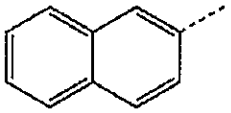
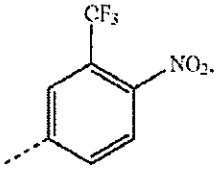
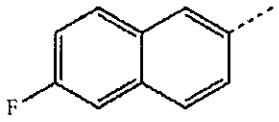
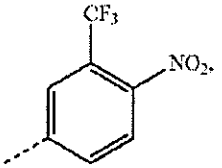
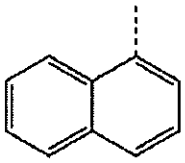
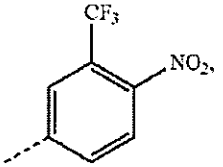
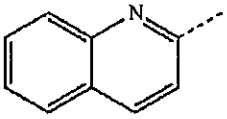
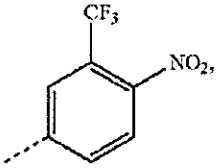
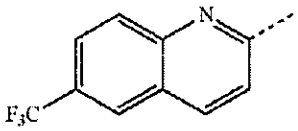
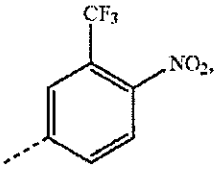
15. The compound of claim **6**, wherein:

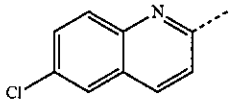
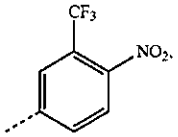
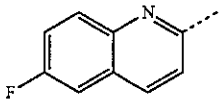
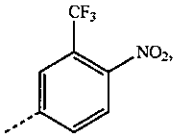
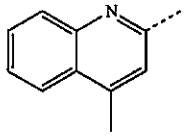
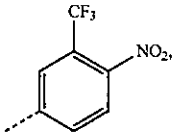
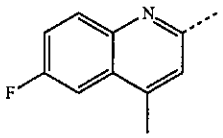
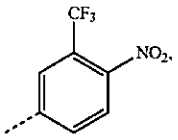
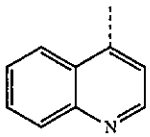
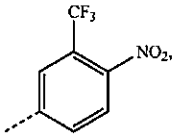
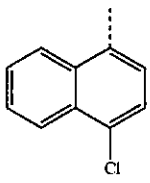
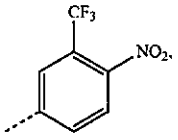
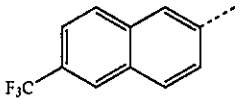
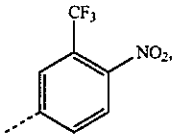
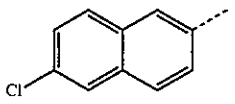
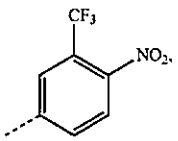
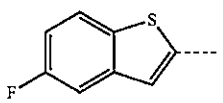
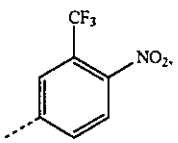
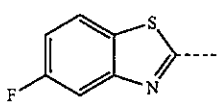
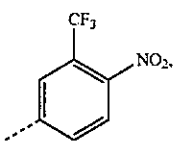
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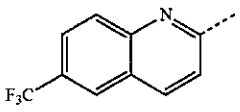
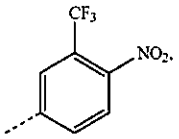
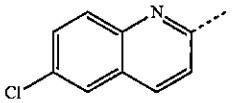
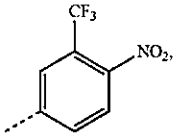
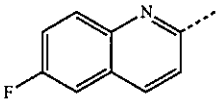
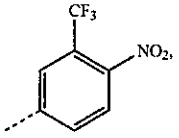
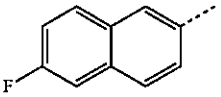
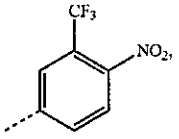
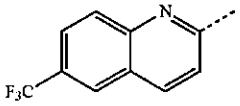
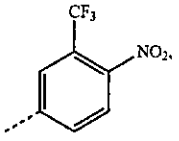
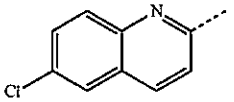
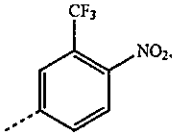
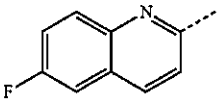
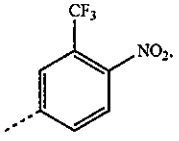
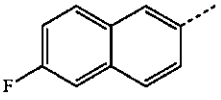
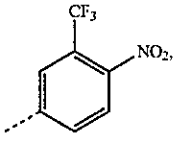
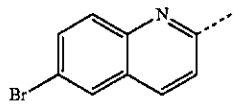
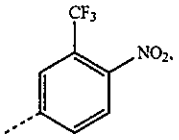
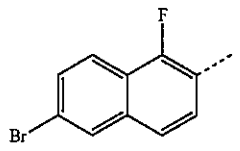
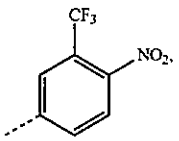
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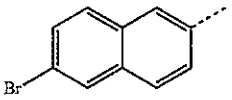
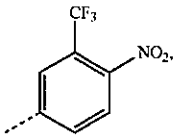
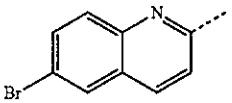
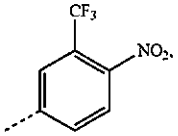
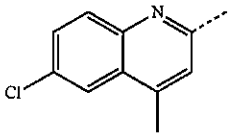
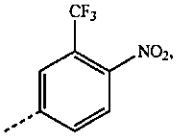
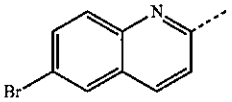
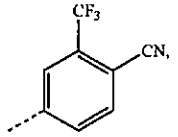
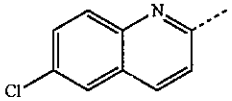
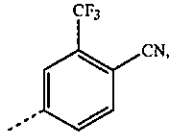
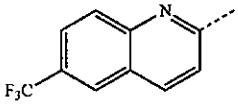
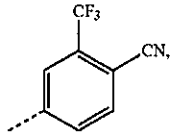
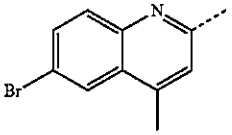
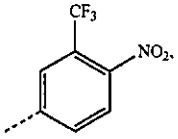
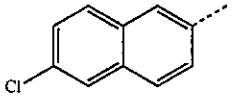
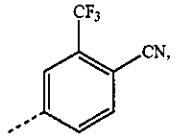
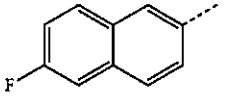
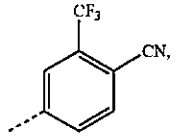
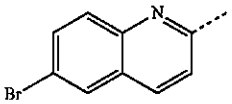
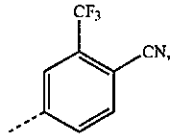
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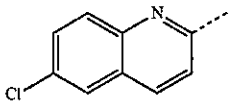
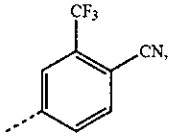
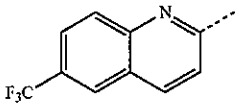
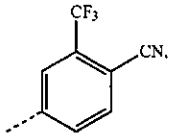
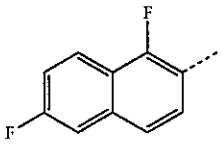
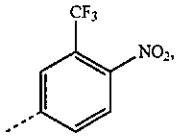
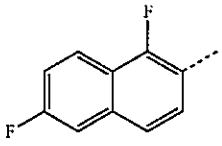
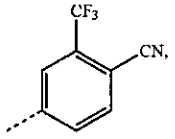
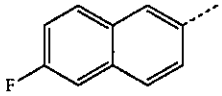
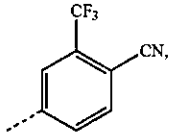
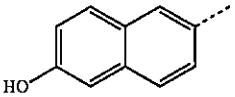
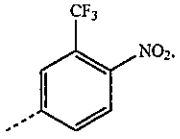
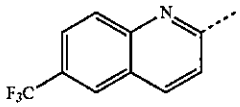
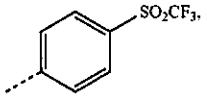
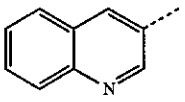
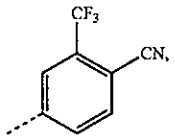
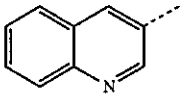
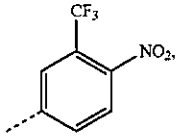
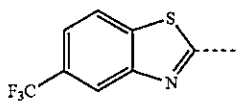
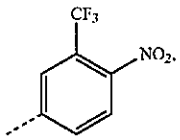
16. The compound of claim **3**, wherein the compound is selected from the group consisting of:

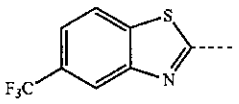
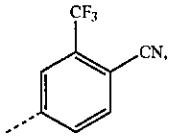
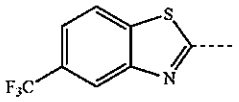
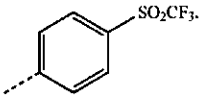
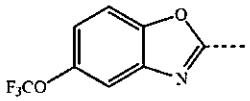
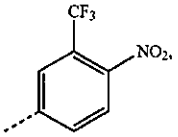
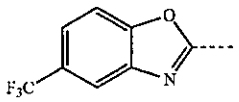
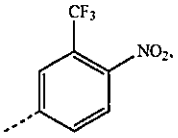
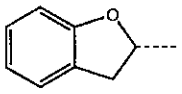
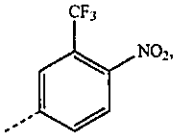
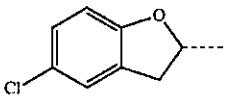
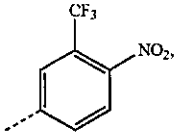
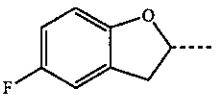
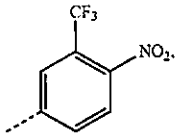
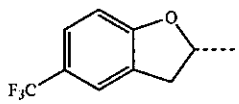
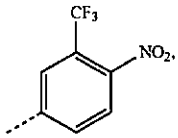
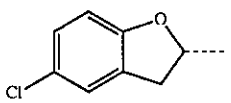
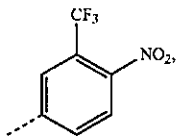
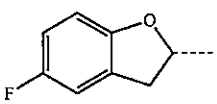
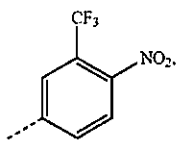
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14		bond	L1	—CH_2—	NH	
17		bond	L1	—CH_2—	NH	
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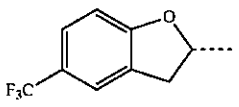
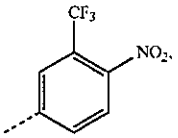
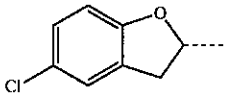
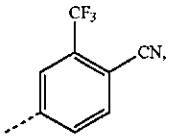
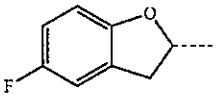
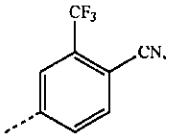
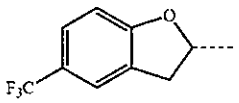
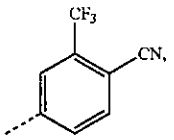
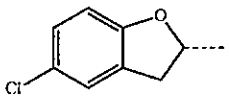
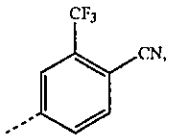
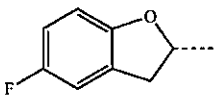
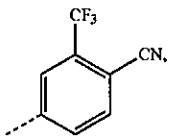
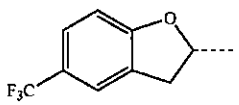
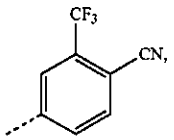
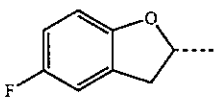
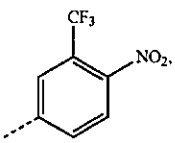
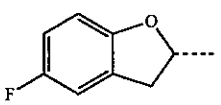
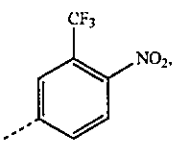
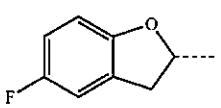
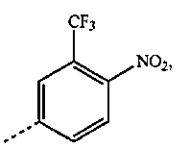
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99		bond	L1	—CH_2—	NH	
160		bond	L1	—CH_2—	NH	
161		bond	L1	—CH_2—	NH	
232		bond	L1	—CH_2—	NH	
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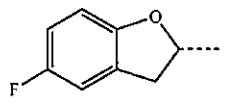
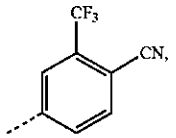
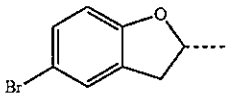
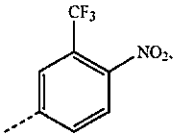
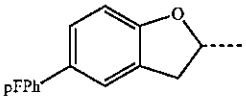
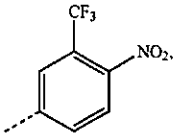
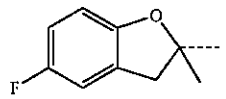
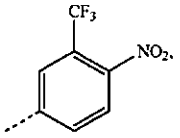
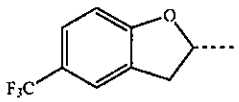
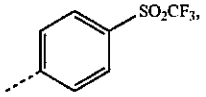
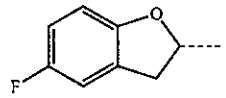
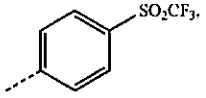
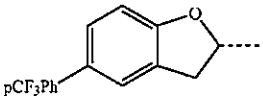
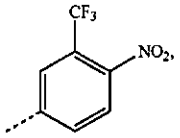
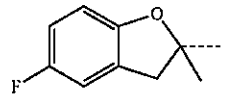
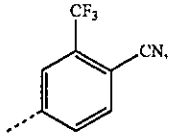
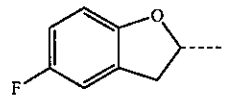
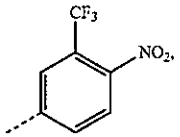
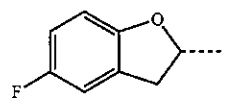
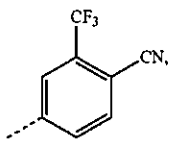
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247		bond	L1	—CH_2—	NMe	
248		bond	L1	—CH_2—	NMe	
249		bond	L1	—$CH(CH_3)$—	NH	
250		bond	L1	—$CH(CH_3)$—	NH	
251		bond	L1	—$CH(CH_3)$—	NH	
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266		bond	L1	—CH_2—	NH	
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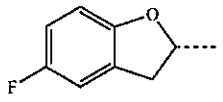
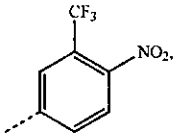
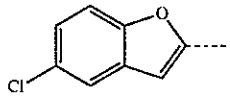
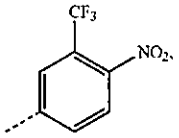
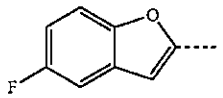
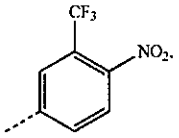
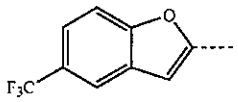
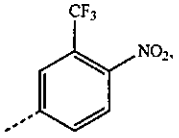
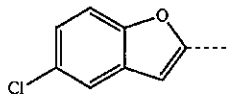
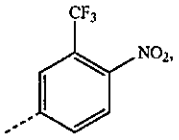
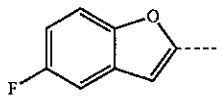
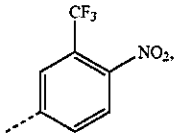
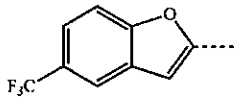
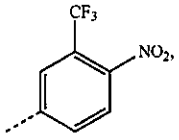
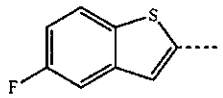
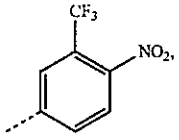
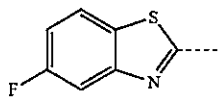
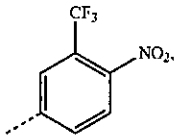
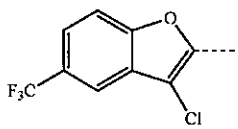
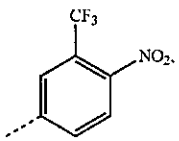
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271		bond	L1	—CH_2—	NH	
272		bond	L1	—CH_2—	NH	
273		bond	L1	—CH_2—	NH	
277		bond	L1	—CH_2—	NH	
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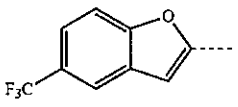
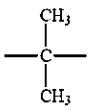
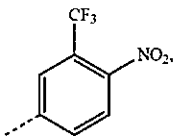
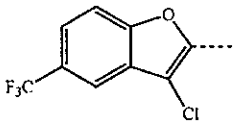
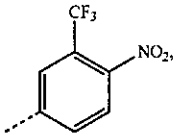
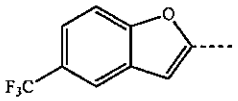
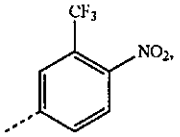
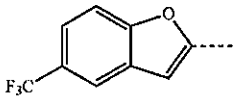
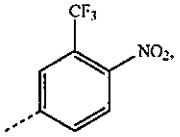
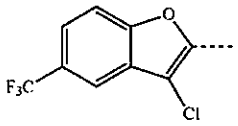
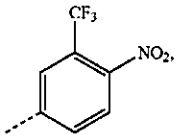
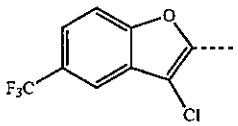
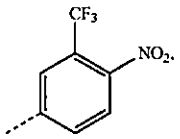
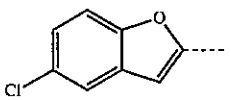
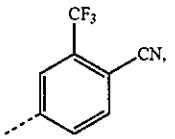
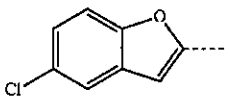
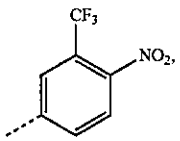
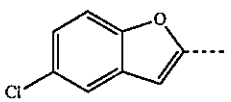
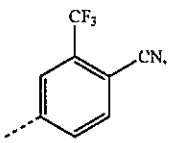
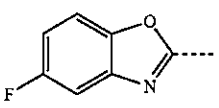
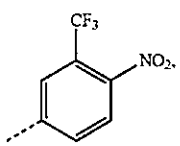
#	Y	X_1	X_2	X_4	X_8	Z
282		bond	L1	—CH_2—	NMe	
283		bond	L1	—CH_2—	NMe	
289		bond	L1	—CH_2—	NH	
290		bond	L1	—CH_2—	NH	
293		bond	L1	—CH_2—	NMe	
314		bond	L1	—CH_2—	NH	
331		bond	L1	—CH_2—	NH	
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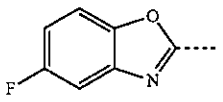
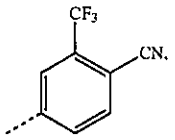
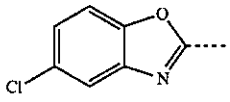
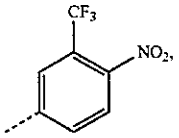
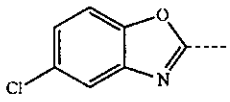
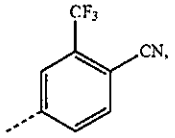
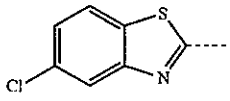
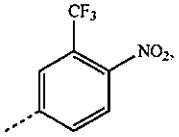
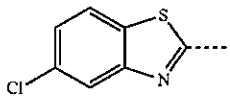
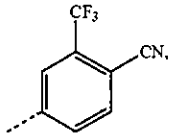
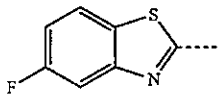
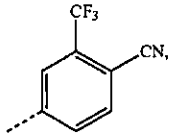
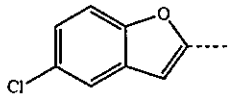
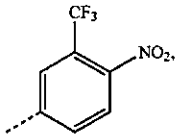
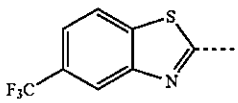
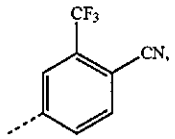
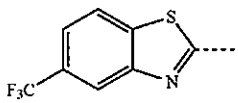
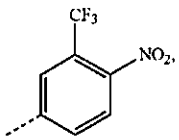
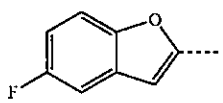
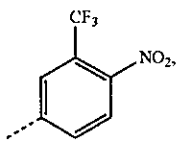
#	Y	X_1	X_2	X_4	X_8	Z
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399		bond	L1	—CH_2—	NH	
400		bond	L1	—CH_2—	NH	
24		CH_2	L1	—CH_2—	NH	
76		CH_2	L1	—CH_2—	NH	
77		CH_2	L1	—CH_2—	NH	
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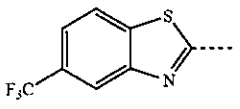
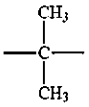
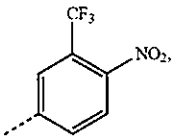
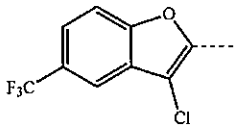
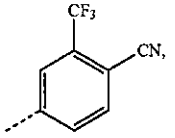
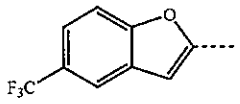
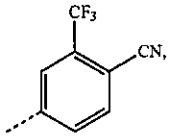
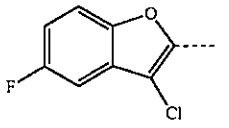
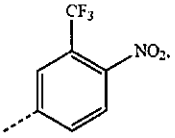
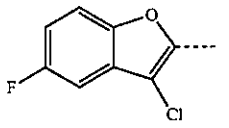
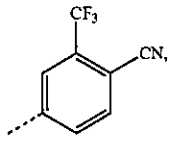
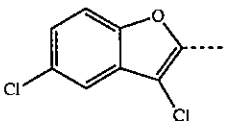
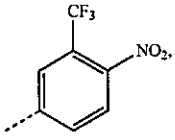
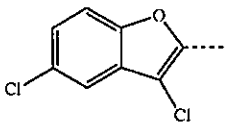
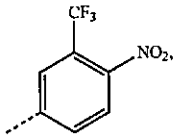
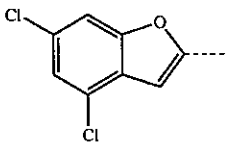
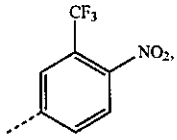
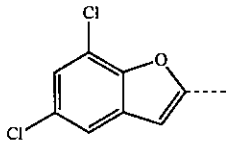
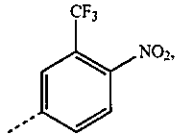
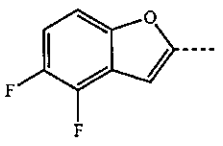
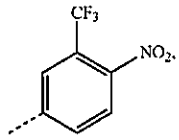
#	Y	X_1	X_2	X_4	X_8	Z
81		C(O)	L1	—CH_2—	NH	
82		CH_2	L1	—CH_2—	NH	
83		CH_2	L1	—CH_2—	NH	
84		CH_2	L1	—CH_2—	NH	
85		C(O)	L1	—CH_2—	NH	
86		C(O)	L1	—CH_2—	NH	
87		C(O)	L1	—CH_2—	NH	
260		CH_2	L1	—CH_2—	NH	
261		CH_2	L1	—CH_2—	NMe	
262			L1	—CH_2—	NMe	

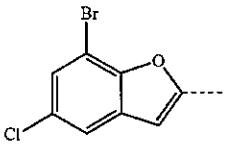
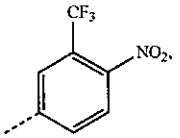
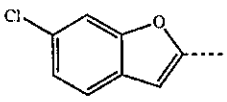
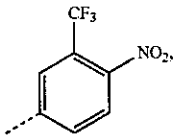
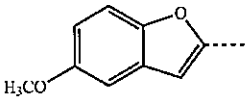
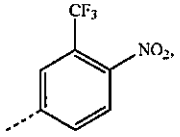
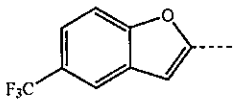
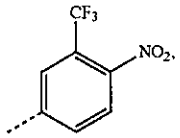
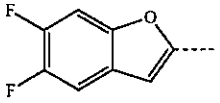
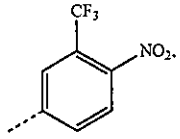
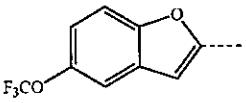
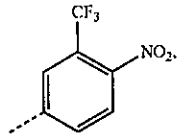
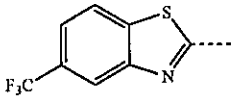
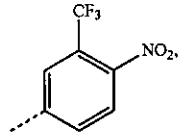
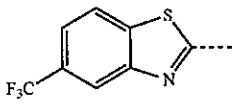
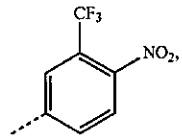
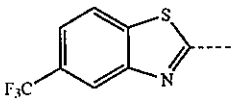
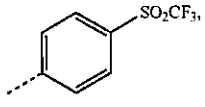
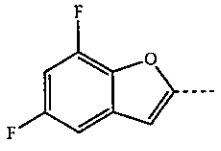
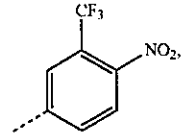
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299		CH_2	L1	—CH_2—	NH	
310		CH_2	L1	—CH_2—	NH	
377		CH_2	L1	—CH_2—	NH	
378		CH_2	L1	—CH_2—	NH	
379		CH_2	L1	—CH_2—	NH	
380		CH_2	L1	—CH_2—	NH	
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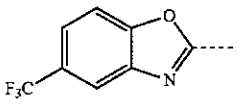
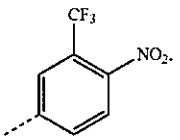
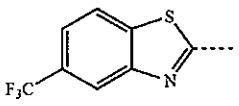
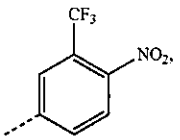
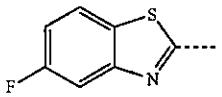
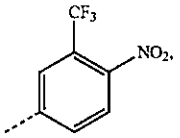
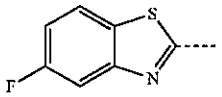
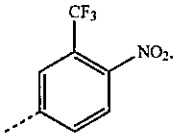
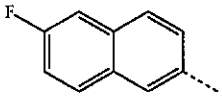
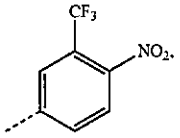
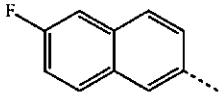
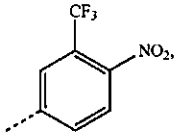
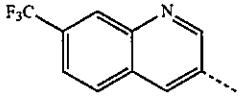
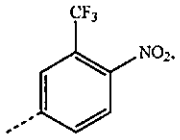
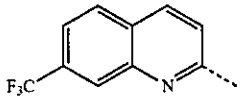
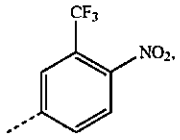
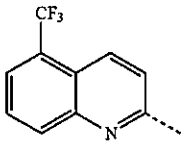
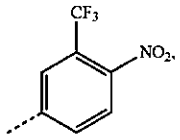
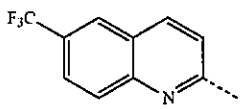
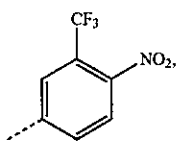
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179		CH_2	L1	$—CH_2—$	NH	
180		CH_2	L1	$—CH_2—$	NH	
181		C(O)	L1	$—CH_2—$	NH	
182		C(O)	L1	$—CH_2—$	NH	
183		C(O)	L1	$—CH_2—$	NH	
234		CH_2	L1	$—CH_2—$	NH	
235		CH_2	L1	$—CH_2—$	NH	
253		CH_2	L1	$—CH_2—$	NH	

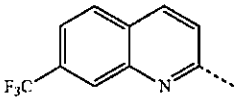
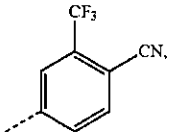
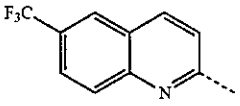
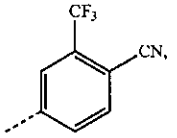
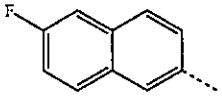
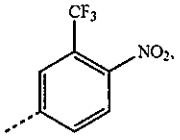
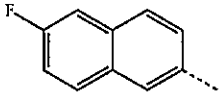
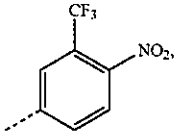
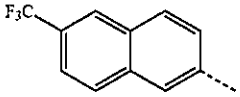
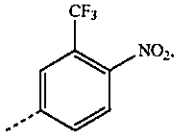
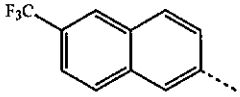
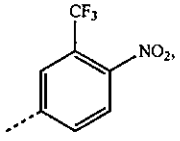
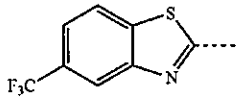
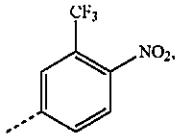
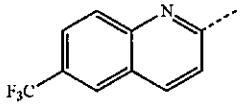
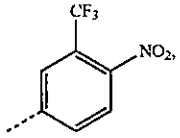
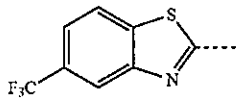
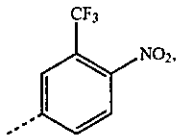
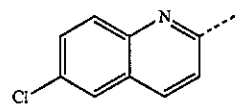
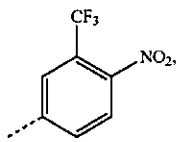
#	Y	X_1	X_2	X_4	X_8	Z
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255			L1	—CH_2—	NH	
256		CH_2	L1	—CH_2—	NMe	
257			L1	—CH_2—	NMe	
258		CH_2	L1	—CH_2—	NMe	
259			L1	—CH_2—	NMe	
274		CH_2	L1	—CH_2—	NH	
275		CH_2	L1	—CH_2—	NMe	
284		CH_2	L1	—CH_2—	NMe	
285		CH_2	L1	—CH_2—	NH	

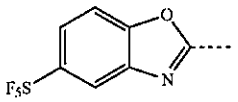
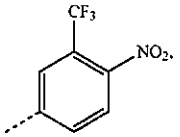
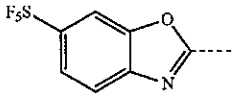
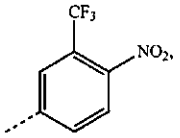
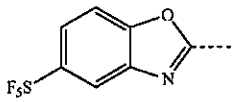
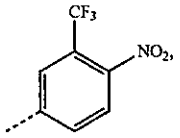
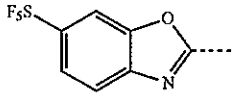
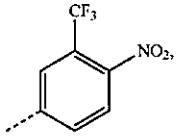
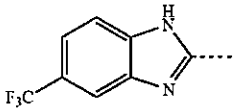
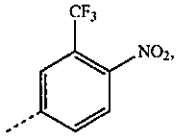
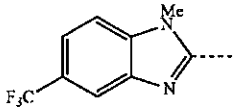
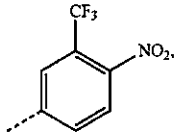
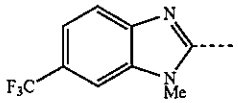
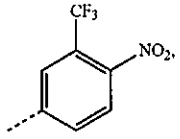
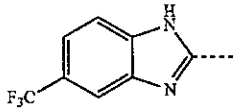
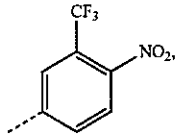
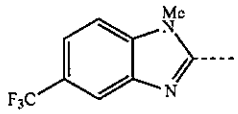
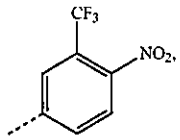
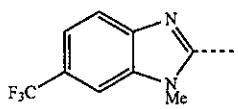
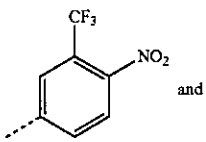
#	Y	X_1	X_2	X_4	X_8	Z
286		CH_2	L1	—CH_2—	NH	
287		CH_2	L1	—CH_2—	NH	
288		CH_2	L1	—CH_2—	NH	
291		CH_2	L1	—CH_2—	NH	
292		CH_2	L1	—CH_2—	NH	
294		CH_2	L1	—CH_2—	NH	
300			L1	—CH_2—	NH	
301		CH_2	L1	—CH_2—	NH	
302		CH_2	L1	—CH_2—	NH	
304			L1	—CH_2—	NH	

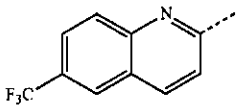
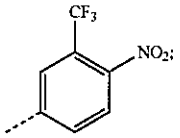
#	Y	X_1	X_2	X_4	X_8	Z
406			L1	—CH_2—	NH	
305		CH_2	L1	—CH_2—	NH	
306		CH_2	L1	—CH_2—	NH	
312		CH_2	L1	—CH_2—	NH	
313		CH_2	L1	—CH_2—	NH	
315		CH_2	L1	—CH_2—	NH	
316		CH_2	L1	—CH_2—	NH	
318		CH_2	L1	—CH_2—	NH	
319		CH_2	L1	—CH_2—	NH	
320		CH_2	L1	—CH_2—	NH	

#	Y	X_1	X_2	X_4	X_8	Z
321		CH_2	L1	—CH_2—	NH	
322		CH_2	L1	—CH_2—	NH	
323		CH_2	L1	—CH_2—	NH	
324		CH_2	L1	—CH_2—	NH	
325		CH_2	L1	—CH_2—	NH	
326		CH_2	L1	—CH_2—	NH	
338		C(O)	L1	—CH_2—	NH	
343			L1	—CH_2—	NH	
344		CH_2	L1	—CH_2—	NH	
375		CH_2	L1	—CH_2—	NH	

#	Y	X_1	X_2	X_4	X_8	Z
376		CH_2	L1	$—CH_2—$	NH	
365		CH_2	L13	$—CH_2—$	NH	
370		CH_2	L13	$—CH_2—$	NH	
371		CH_2	L14	$—CH_2—$	NH	
297		CH_2	L1	$—CH_2—$	NH	
298			L1	$—CH_2—$	NH	
327		CH_2	L1	$—CH_2—$	NH	
328		CH_2	L1	$—CH_2—$	NH	
329		CH_2	L1	$—CH_2—$	NH	
332		CH_2	L1	$—CH_2—$	NH	

#	Y	X_1	X_2	X_4	X_8	Z
333		CH_2	L1	—CH_2—	NH	
334		CH_2	L1	—CH_2—	NH	
357		CH_2	L13	—CH_2—	NH	
372		CH_2	L14	—CH_2—	NH	
373		CH_2	L13	—CH_2—	NH	
374		CH_2	L14	—CH_2—	NH	
391		bond	L1	—CH_2—	NH	
392		bond	L1	—CH_2—	NH	
393		CH_2	L1	—CH_2—	NH	
394		bond	L1	—CH_2—	NH	

#	Y	X_1	X_2	X_4	X_8	Z
417		bond	L1	—CH_2—	NH	
418		bond	L1	—CH_2—	NH	
419		CH_2	L1	—CH_2—	NH	
420		CH_2	L1	—CH_2—	NH	
421		bond	L1	—CH_2—	NH	
422		bond	L1	—CH_2—	NH	
423		bond	L1	—CH_2—	NH	
424		CH_2	L1	—CH_2—	NH	
425		CH_2	L1	—CH_2—	NH	
426		CH_2	L1	—CH_2—	NH	 and

#	Y	X_1	X_2	X_4	X_8	Z
427		bond	L15	$—CH_2—$	NH	

wherein Y, X_1, X_2, X_4, X_8 and Z are as shown.