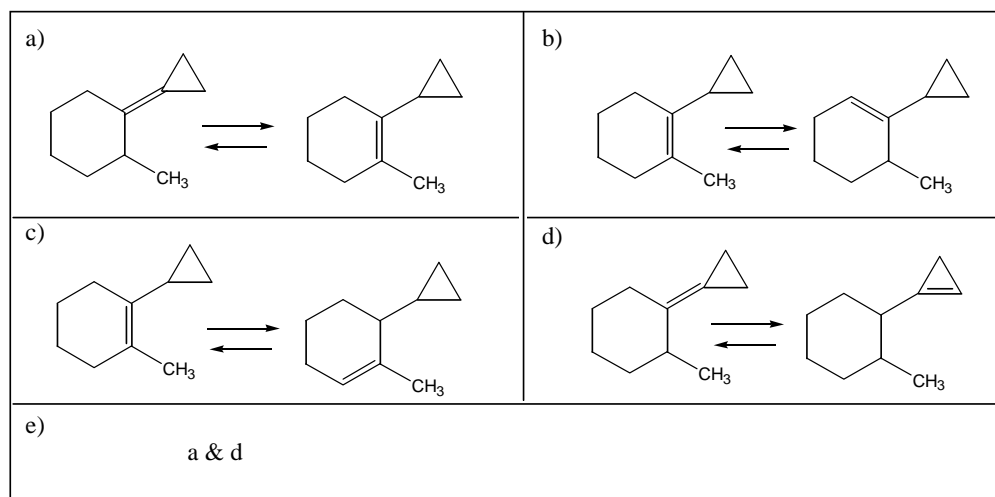
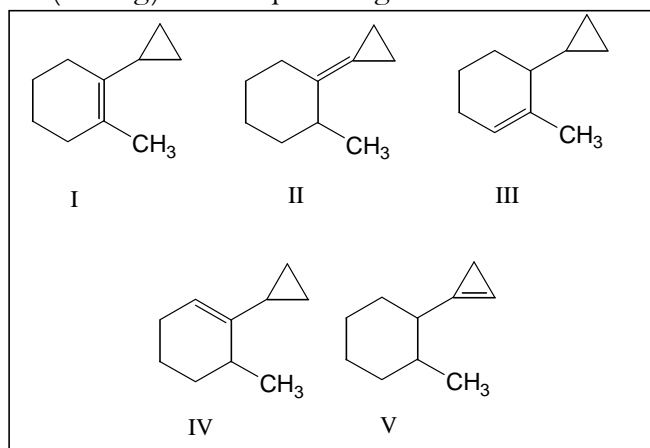


1. Myrophine, a narcotic analgesic, has a molecular formula of $C_{38}H_{51}NO_4$. Its degree of unsaturation is:
- 10
 - 11
 - 12
 - 13
 - 14
2. Which of the following transformation(s) has a $K_{eq} > 1$?

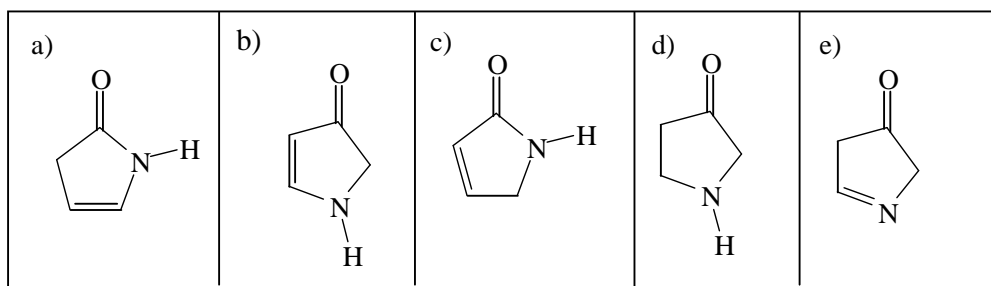


3. Which of the following statements are true as they relate to the relationship(s) between (among) the compounds given below?

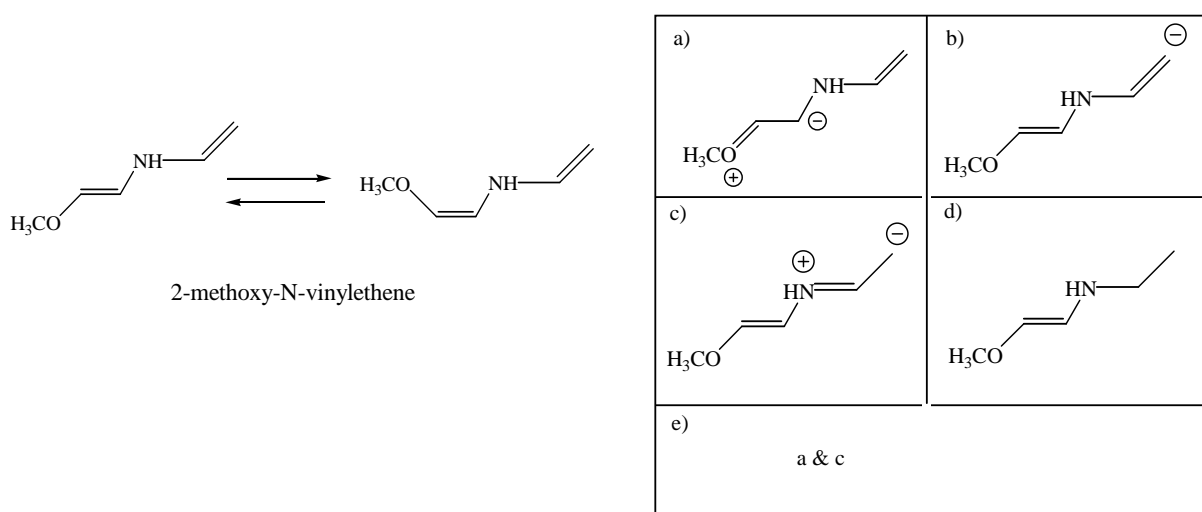


- | |
|---|
| <p>a) The stereochemistry of II is Z.</p> <p>b) Structures III and IV are the same compound.</p> <p>c) Structures I and III are positional isomers.</p> <p>d) All of these compounds are isomers of each other.</p> |
|---|

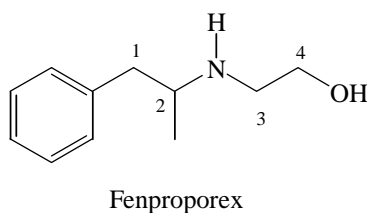
4. Which of the following compounds has the highest pKa?



5. The E and Z stereoisomers of 2-methoxy-N-vinylethene can be interconverted due to resonance. Which of the following structures is a resonance form that is involved in the E/Z conversion of 2-methoxy-N-vinylethene's stereoisomers?



6. The energy associated with least stable conformation of the C₁-C₂ bond of fenproporex, an agent used for weight loss, is:

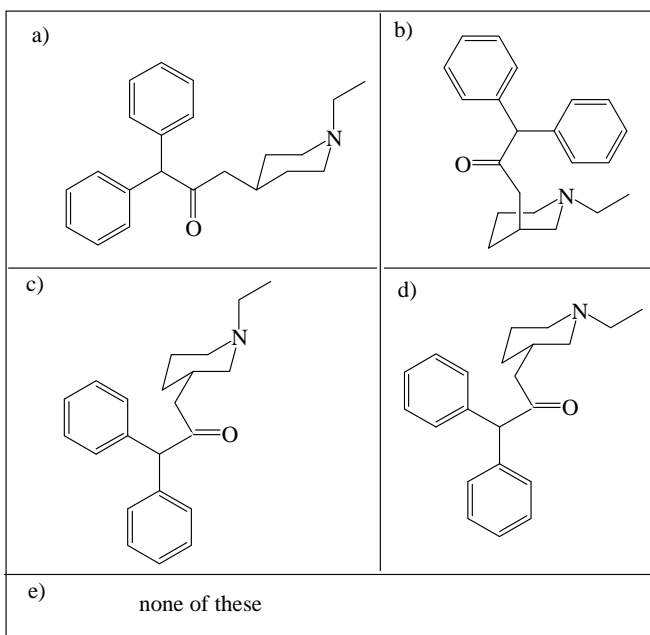
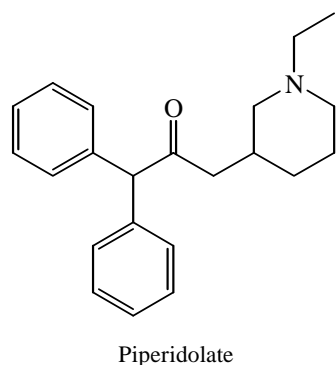


- a) 7.1 kcal
b) 6.8 kcal
c) 6.5 kcal
d) 6.2 kcal
e) none of these

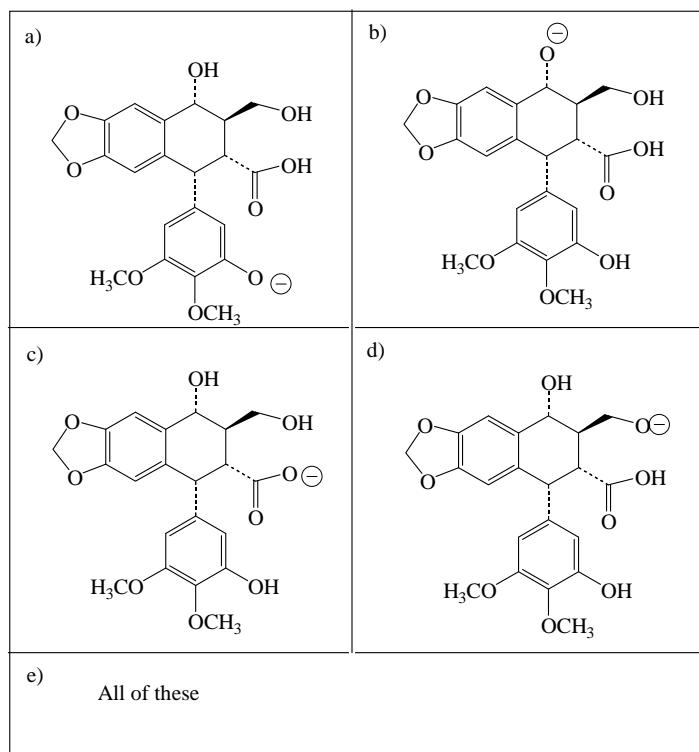
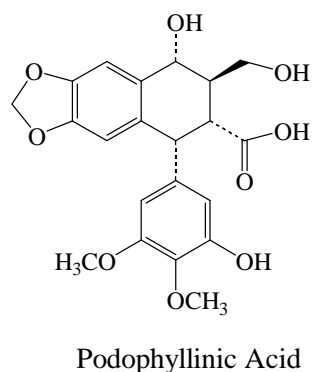
Torsional Strain Energy	
H-H	1.0kcal
H-Me	1.4 kcal
H-Ph	2.1 kcal
Me-Me	2.4 kcal
H-NH(CH ₂) ₂ OH	2.4 kcal
Me- NH(CH ₂) ₂ OH	2.9 kcal
Ph-Me	3.1 kcal
Ph- NH(CH ₂) ₂ OH	3.8 kcal
Steric Strain Energy	
Ph- NH(CH ₂) ₂ OH	2.2 kcal
Ph-Me	1.8 kcal
Me- NH(CH ₂) ₂ OH	1.6 kcal
Me-Me	1.0 kcal

7. Six membered rings that contain heteroatoms also have chair conformations associated with them, *if all the atoms in the ring are sp³ hybridized*. For nitrogen-containing six-membered rings, the lone pair on the N atom occupies either an axial or equatorial position. When

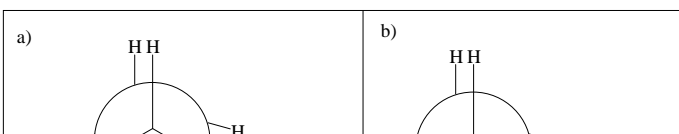
lone pairs are axial, they are so small, they do not contribute to steric strain energy due to 1,3-diaxial interactions. Which of the following structures represents the most stable chair conformation of the anticholenergetic, piperidolate?

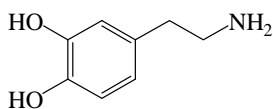


8. At physiologic pH (~7.4), some of the functional groups of podophyllinic acid are ionized. Which of the following structures represents podophyllinic acid at physiologic pH?



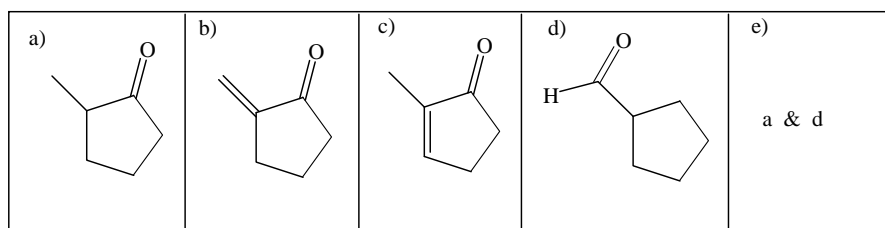
9. Dopamine is a neurotransmitter which must adopt an anti conformation to fit into its receptor site. Which of the following Newman projections represents the pharmacologically-active conformer of dopamine?



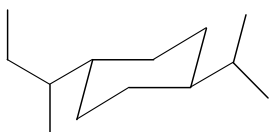


Dopamine

10. Which of the following compounds has the least angle strain?

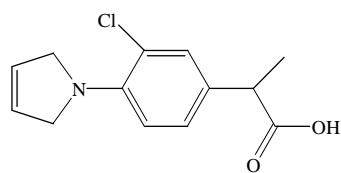


11. The name of the compound represented by the chair conformation given below is:



- | |
|--|
| <ul style="list-style-type: none"> a) cis-1-sec-butyl-4-isopropylcyclohexane b) trans-1-sec-butyl-4-isopropylcyclohexane c) cis-1-isopropyl-3-isobutylcyclohexane d) trans-1-isobutyl-4-isopropylcyclohexane e) trans-1-tert-butyl-3-isopropylcyclohexane |
|--|

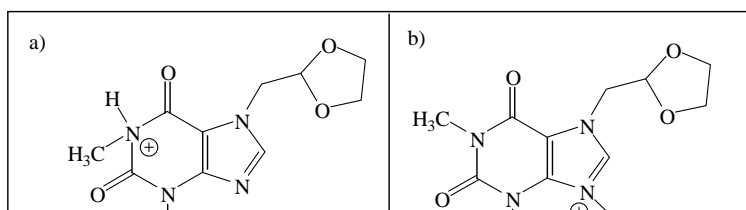
12. The percent ionization of the amine functional group ($pK_a = 8.1$) of pirprofen, an anti-inflammatory agent, at pH 7.8 is:

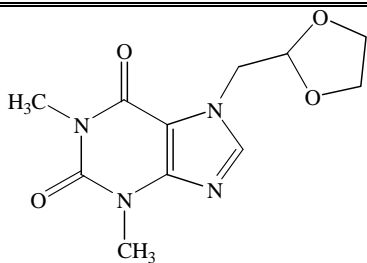


Pirprofen

- | |
|--|
| <ul style="list-style-type: none"> a) 33% b) 66% c) 57% d) 43% e) 75% |
|--|

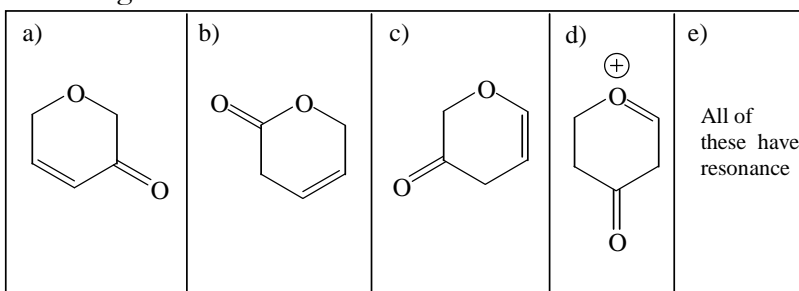
13. Which of the following structures represents the conjugate acid that is generated when the most basic site of doxofylline, a bronchodilator, reacts with acid?



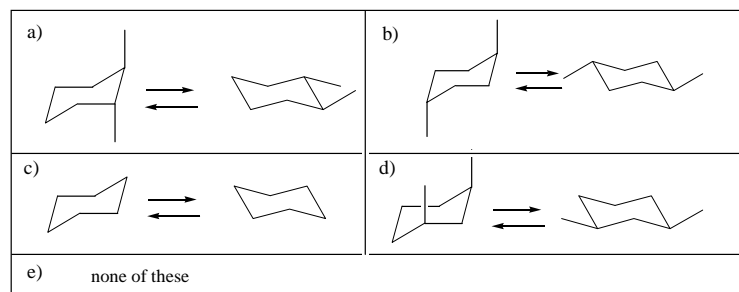
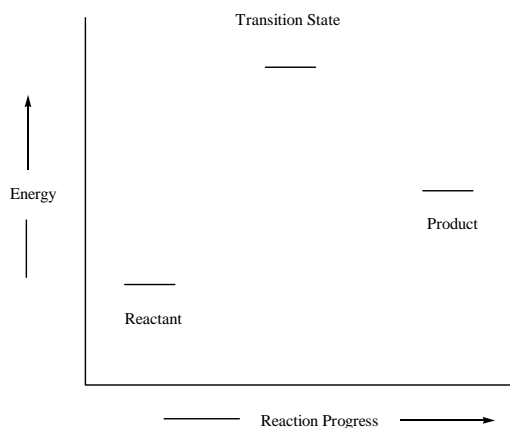


Doxofylline

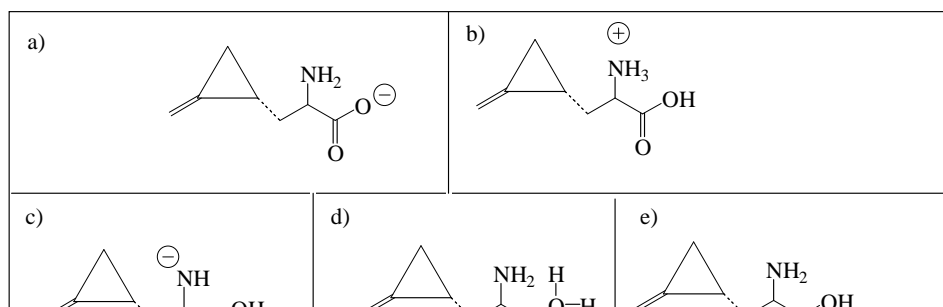
14. Which of the following molecules *do not* have resonance forms associated with them?

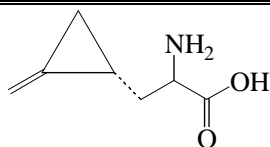


15. The reaction energy diagram given below corresponds to which of the following conformer conversions?



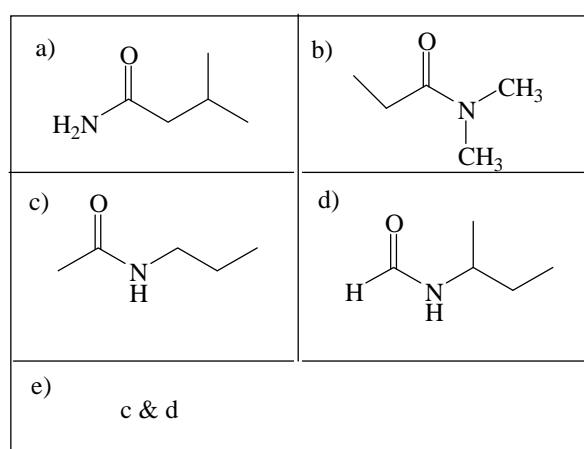
16. The conjugate base of hypoglycine A is:



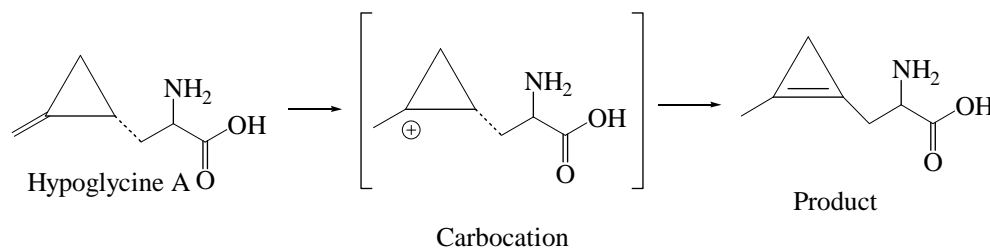


Hypoglycine A

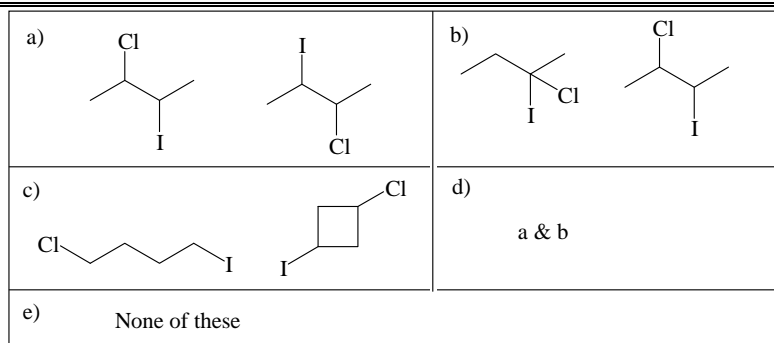
17. Resonance forms of amides have a C=N pi bond which in some cases has E or Z stereochemistry. Which of the following amide-containing compounds have resonance forms with E/Z stereochemistry?



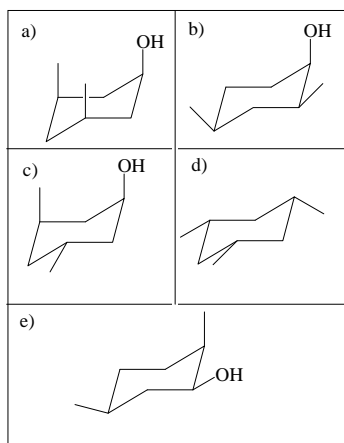
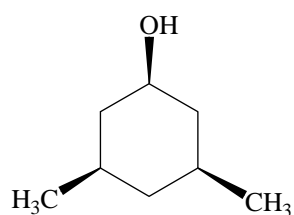
18. Hypoglycine A can be reacted with strong acid to generate a carbocation, which then reacts to generate a new cyclopropene. Which of the following statements is true related to this transformation?



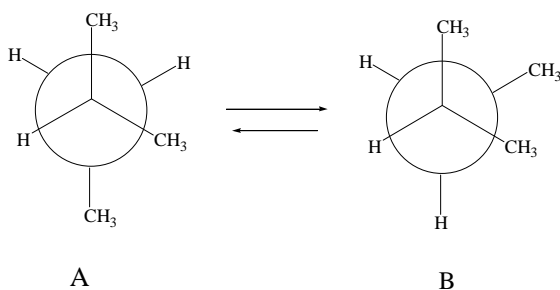
- The reaction is endothermic.
 - The product has more angle strain than hypoglycine A.
 - The alkene of hypoglycine A is disubstituted.
 - The product has no steric strain energy.
 - All of these statements are true.
19. A pair of positional isomers with a molecular formula C_4H_8ClI is:



20. The least stable chair conformation of the molecule below is:

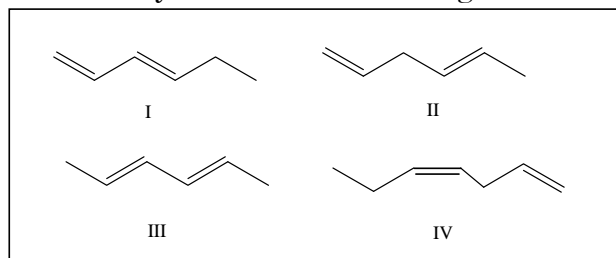


21. The percent distribution of the two conformers below at 30°C is (See table in question 6 for energy values; $R = 0.002 \text{ kcal/Kmol}$):



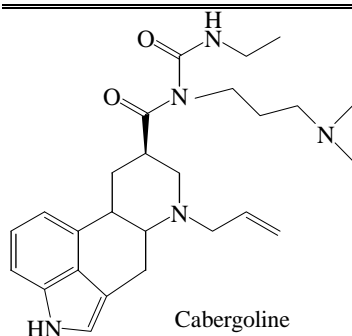
- | |
|--------------------|
| a) 2.3% A; 97.7% B |
| b) 84% A; 16% B |
| c) 16% A; 84% B |
| d) 99% A; 1% B |
| e) 50% A; 50% B |

22. The stability order for the alkenes given below is:



- | |
|----------------------|
| a) III > I > II > IV |
| b) III > II > I > IV |
| c) I > III > II > IV |
| d) II > I > III > IV |
| e) I > IV > III > II |

23. Which of the following functional groups are present in cabergoline, a prolactin inhibitor?



- a) disubstituted alkene, imine, secondary amine
- b) imide, monosubstituted alkene, tertiary amine
- c) cis alkene, primary amine, imine
- d) tetrasubstituted alkene, tertiary amide, secondary amine
- e) none of these

24. Which one of the following alkanes is *lowest* in energy?

- a) cyclopropane
- b) cyclobutane
- c) cyclohexane
- d) cyclopentane
- e) All are of equal energy

25. Which of the following compounds has a degree of unsaturation of 6?

- a) $C_{20}H_{14}N_2O$
- b) $C_{20}H_{18}O_3$
- c) $C_{21}H_{10}Cl_{12}$
- d) $C_{20}H_{31}N$
- e) none of these