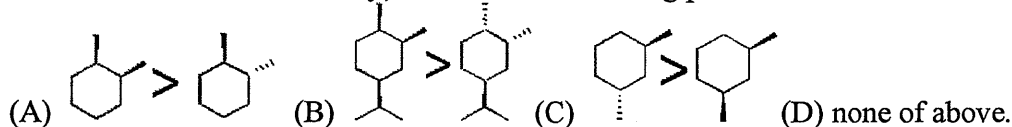


※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

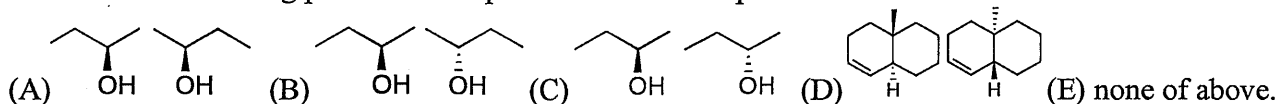
一、選擇題：(單選，每題 2 分，共 40 分)

1. How many constitutional isomers exist in form of  $C_6H_{14}$ ? (A) 3 (B) 4 (C) 5 (D) 6 (E) 7.

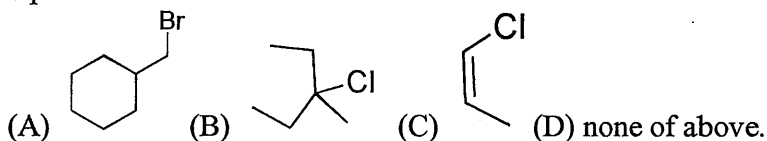
2. In terms of molecular stability, which of the following pairs has a correct order?



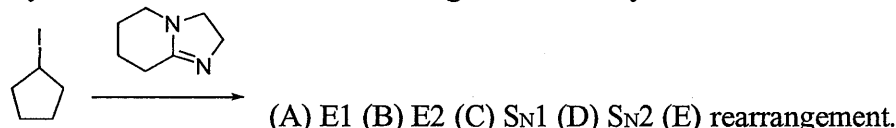
3. Which of the following pairs does not process a relationship of enantiomer between each other?



4. Which of the following compounds most likely undergoes  $S_N1$  reaction mechanism for substitution as compared to  $S_N2$ ?

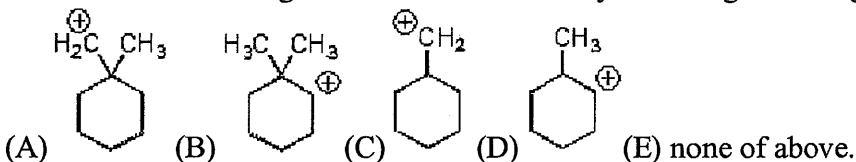


5. By what mechanism is the following reaction likely to occur?

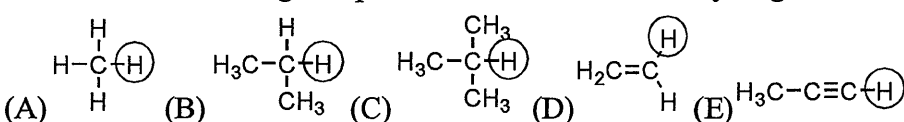


6. Which of the following statements is false? (A) entropy is negative for ring closures (B) In an addition reaction to an alkene, the  $\pi$  bond plays the role of nucleophile (C) For an addition reaction, the free energy term,  $\Delta G$ , become more positive with increasing temperature (D) Addition reactions are favorable at low temperatures because the negative enthalpy term is smaller than the positive entropy term (E) none of above.

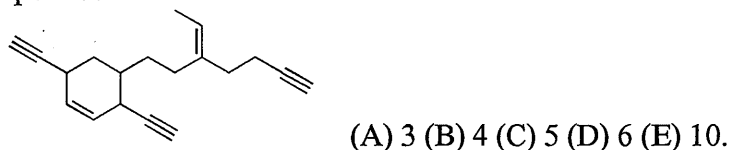
7. Which of the following carbocations is not likely to undergo rearrangement?



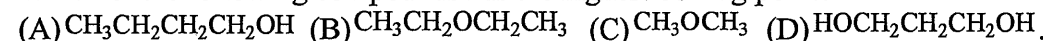
8. Which of the following compounds has the most acidic hydrogen which is circled?



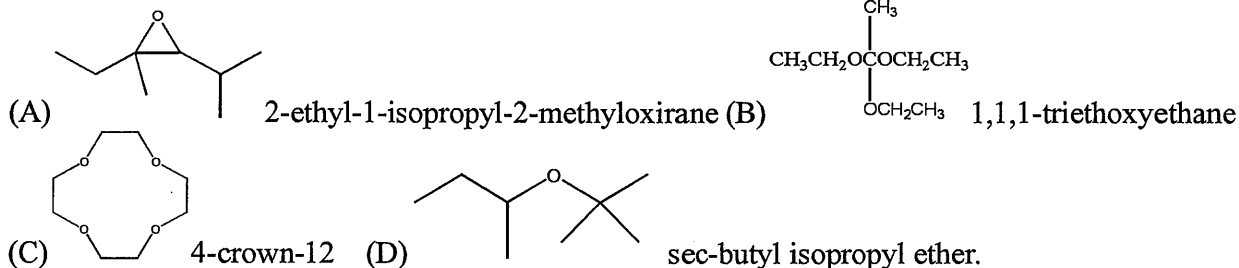
9. How many moles of  $CO_2$  can be produced upon complete ozonolysis of one mole of the following compound?



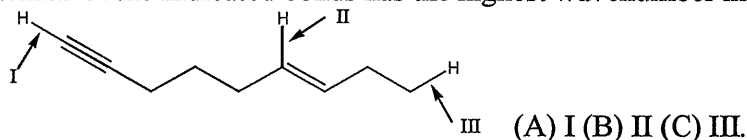
10. Which of the following compounds has the highest boiling point?



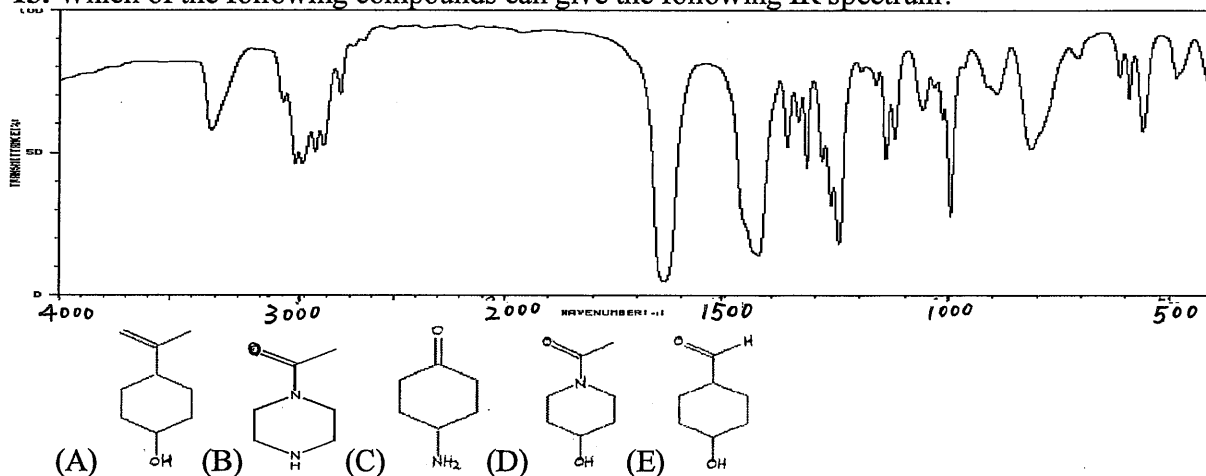
11. Which of the following pairs has a correct match in the name-and-structure relationship?



12. Which of the indicated bonds has the highest wavenumber in IR spectroscopy?



13. Which of the following compounds can give the following IR spectrum?

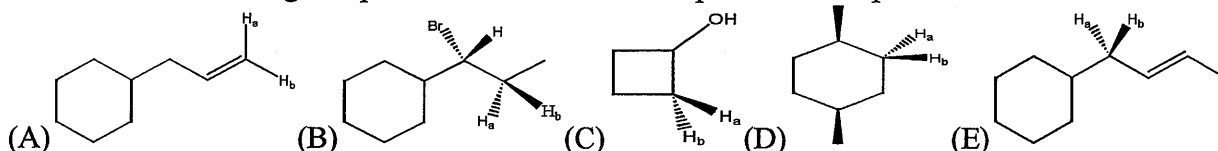


14. In mass spectrometry, which of the following statements is not true? (A) Radical cation is initially produced when a compound is bombarded with high energy electrons (B) The molecular ion is often unstable and can undergo fragmentation (C) The separation of ions in the mass spectrometer is done by their mass to charge ratio (D) The ion is produced by a loss of pair of electrons from the molecule (E) none of above.

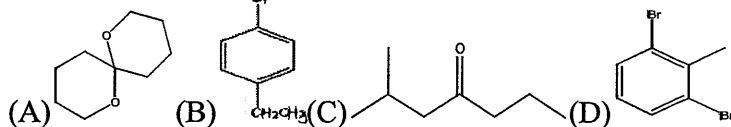
15. Which of the following statements regarding mass spectroscopy is not true? (A) Compounds containing chlorine or bromine usually show a strong M+2 peak (B) Bromine will produce M<sup>+</sup> and (M+2)<sup>+</sup> peaks of equal intensity (C) High-resolution mass spectrometry is used to determine the molecular formula of a compound (D) GC-mass spectrometry is used to find the molecular formula of each compound in a mixture of compounds (E) none of above

16. In NMR, which of the following statements is true? (A) Deshielded protons experience a net magnetic field strength that is smaller than the applied magnetic field (B) The strength of the magnetic field is a determining factor for the range of frequencies that must be used for NMR spectrometer (C) The number of signals in a <sup>1</sup>H NMR spectrum indicates the electronic environment of neighboring protons (D) The location of signals in a <sup>1</sup>H NMR spectrum indicates the number of protons in the signal (E) none of above.

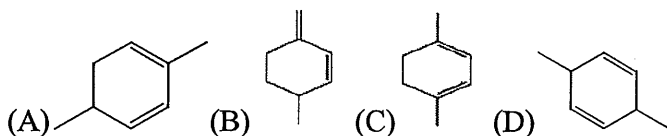
17. Which of the following compounds shows an enantiotopic relationship between H<sub>a</sub> and H<sub>b</sub>?



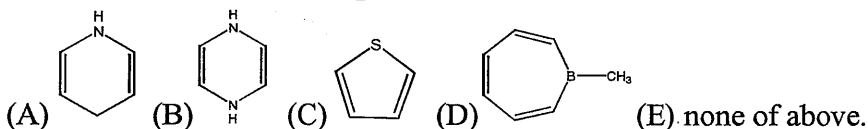
18. Which of the following compounds has the highest number of signals in the  $^{13}\text{C}$  NMR spectrum?



19. Which of the following compounds will give the lowest heat of hydrogenation?



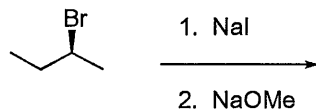
20. Which of the following compounds is nonaromatic?



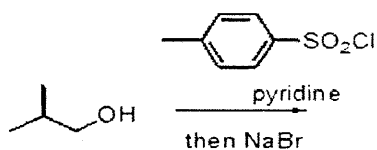
二、簡答題：(每題 3 分，共 60 分)

Provide the major product for the following reactions (第 1-17 題).

1.



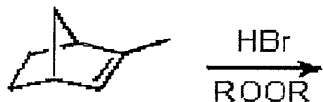
2.



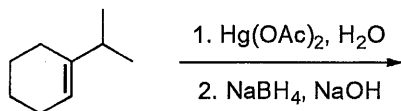
3.



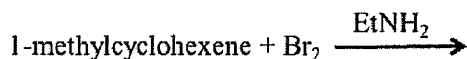
4.



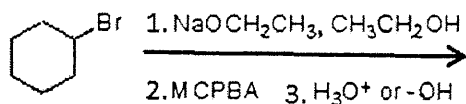
5.



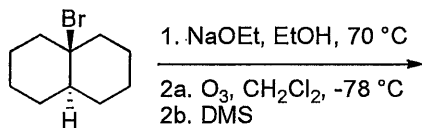
6.



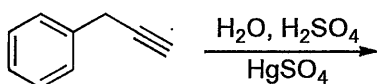
7.



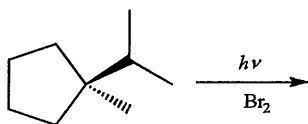
8.



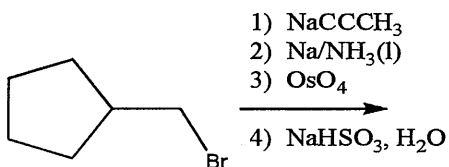
9.



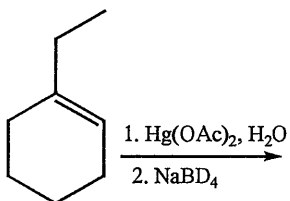
10.



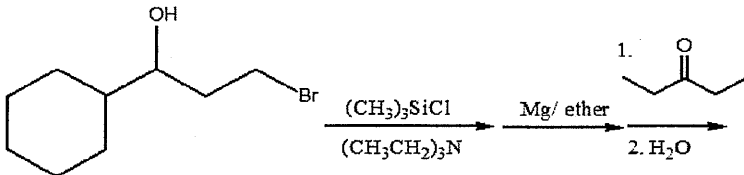
11.



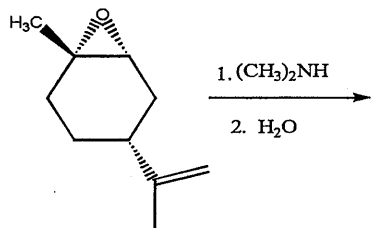
12.



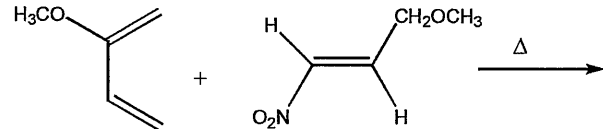
13.



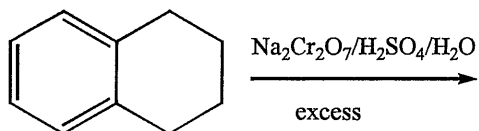
14.



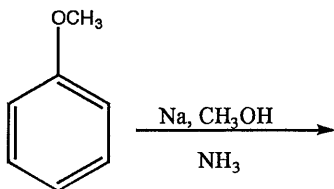
15.



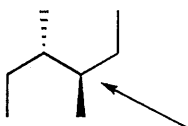
16.



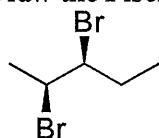
17.



18. Draw a Newman projection for the following compound as viewed down the indicated bond.



19. Draw the Fischer projection for the following structure indicated by wedge/dash drawing.

20. A compound X (C<sub>10</sub>H<sub>12</sub>O) has the following spectroscopic data:

IR: 1680 cm<sup>-1</sup>; <sup>1</sup>H NMR: 1.0δ (triplet, I=3), 1.5δ (sextet, I=2), 2.6δ (triplet, I=4), 7.4δ (triplet, I=2), 7.5δ (triplet, I=1), 7.9δ (doublet, I=2); <sup>13</sup>C NMR: 8 signals.

Write out the possible chemical structure for this compound X.