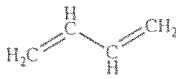

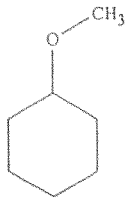
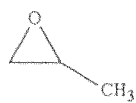
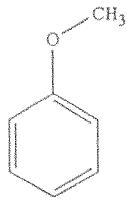
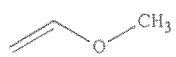


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## Multiple Choice (沒有倒扣)

Identify the choice that best completes the statement or answers the question.

- Which of the following is an ionic bond? (3 %)
  - Fluorine-Fluorine
  - Carbon-Hydrogen
  - Lithium-Oxygen
  - Carbon-Nitrogen
- Which of the following compounds has only 1° and 3° carbon atoms? (3 %)
  - hexane
  - 2-methylpentane
  - 3-methylpentane
  - 2,3-dimethylbutane
- An accurate description of the structure of benzene is: (3 %)
  - The  $\pi$  bonds are quickly moving around the ring.
  - There are two distinct structures that are in equilibrium.
  - All the carbon-carbon bonds are equal in length.
  - There are distinct single and double bonds.
  - Some bonds are longer than others.
- What is the preferred stereochemistry of the E2 elimination? (3 %)
  - inversion
  - retention
  - antiperiplanar
  - synperiplanar
  - gauche
- Which of the following compounds gives an infrared spectrum with peaks at  $3300\text{ cm}^{-1}$  (sharp peak) and  $2150\text{ cm}^{-1}$  (sharp peak)? (3 %)
  - $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CH}$
  - $\text{CH}_3\text{C}\equiv\text{CCH}_3$
  - 
  - 
- Which of the following are ethers? (3 %)
  - 
  - 
  - 
  - 

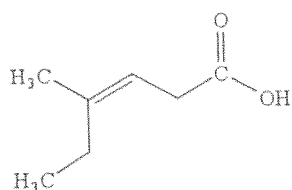
- only 1 and 2
- only 1 and 4
- only 1, 2 and 3
- all are ethers

注意：背面有試題

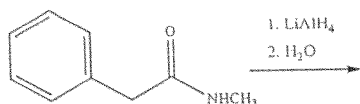
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7. What is the IUPAC name of the following compound? (3 %)



- (E)-4-ethylpent-3-enoic acid
  - (Z)-4-ethylpent-3-enoic acid
  - (E)-4-methylhex-3-enoic acid
  - (Z)-4-methylhex-3-enoic acid
8. Which of the following is the correct order of *decreasing* acid strength (more acidic > less acidic)? (3 %)
- $\text{ICH}_2\text{COOH} > \text{ClCH}_2\text{COOH} > \text{FCH}_2\text{COOH}$
  - $\text{Cl}_2\text{CHCOOH} > \text{ClCH}_2\text{COOH} > \text{CH}_3\text{COOH}$
  - $\text{BrCH}_2\text{COOH} > \text{FCH}_2\text{COOH} > \text{ClCH}_2\text{COOH}$
  - $\text{CH}_3\text{COOH} > \text{FCH}_2\text{COOH} > \text{CH}_3\text{CH}_2\text{OH}$
9. What is the major organic product obtained from the following reaction? (3 %)

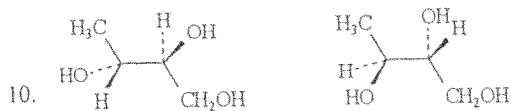


- 
- 
- 
- 

Matching

Label each pair of stereoisomers below as: (3 %)

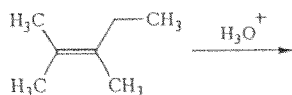
- enantiomers
- diastereomers
- identical



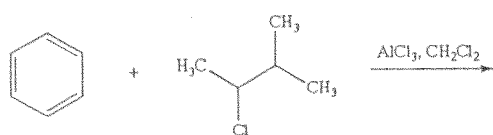
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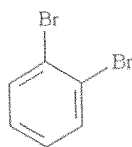
11. Draw the mechanism and predict the two alcohol addition products obtained by reaction of the following alkene with aqueous acid. (3 %)



12. Draw the mechanism and predict the major product of the following reaction: (3 %)



13. For each of the compounds below, tell how many signals you would expect the molecule to have in its normal, broadband decoupled  $^{13}\text{C}$  NMR spectra. (3 %)



14. Provide the missing structure(s) or reagent(s) for each reaction or sequences of reactions. Show all relevant stereochemistry. (3 %)



15. Classify the reaction below: (3 %)

- addition
- elimination
- substitution
- rearrangement

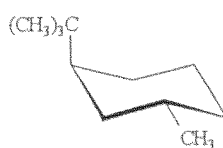


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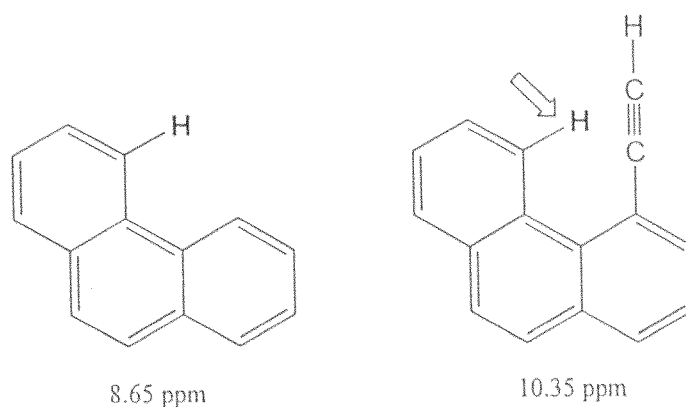
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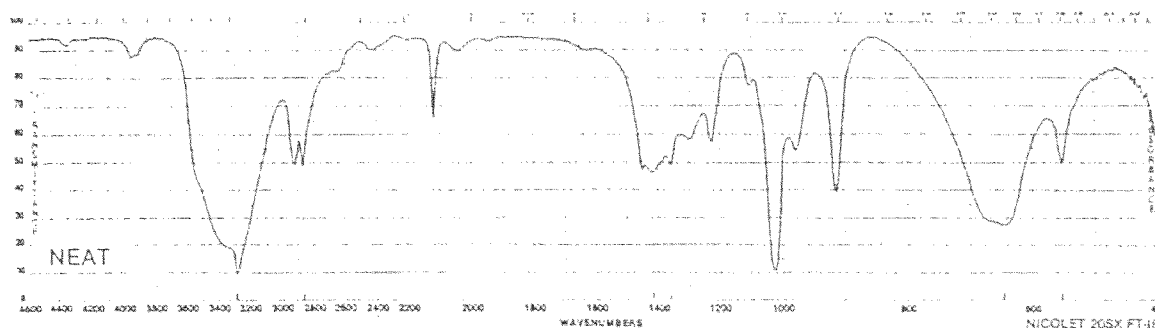
16. For each substituted cyclohexane, draw its ring-flip isomer. Circle the *most* stable conformation. (3 %)



17. The following example of the neighbouring group effect is provided by the acetylene-substituted phenanthrene. The indicated proton suffers a shift of 1.7 ppm compared to the corresponding proton in phenanthrene itself. Can you account for any observed differences? (10 %)



18. The compound whose IR spectrum appears below has a highest EI mass spectrum  $m/z$  at 56 amu and a  $^1\text{H}$  NMR with just three peaks ( $\delta$  2.5 *t*,  $J=2$  Hz;  $\delta$  3.1 *bs*;  $\delta$  4.25 *d*,  $J=2$  Hz). Given this information, propose a structure. (15 %)

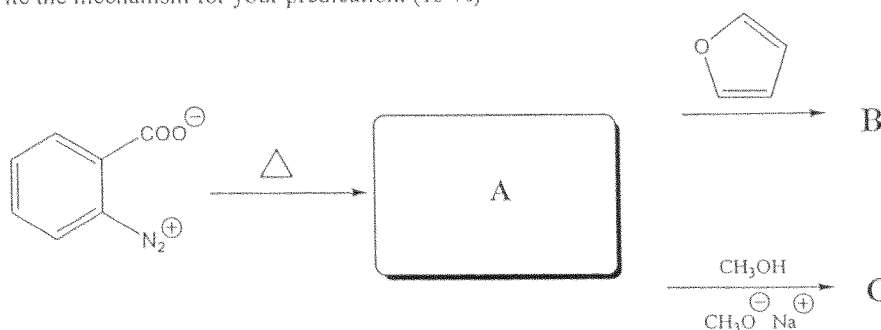


注意：背面有試題

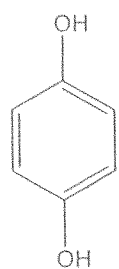
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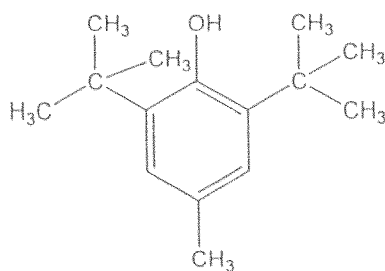
19. A useful benzyne precursor is benzenediazonium-2-carboxylate, a molecule readily formed from anthranilic acid. Provide arrow formalisms for the formation of the following products A, B and C. Write the mechanism for your predication. (15 %)



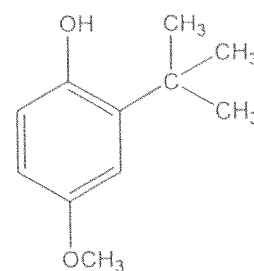
20. Radical inhibitors are often added to foods to retard radical reactions causing spoilage. Figure below shows a few typical radical inhibitors. Should you think a bit about how they might function in intercepting radicals? (12 %)



Hydroquinone



BHT



BHA