

一、單選題 (每題二分, 答錯倒扣0.5分)

1. The general designation for a Grignard reagent is

- A. RMgX
- B. R_2Mg
- C. RXMg
- D. MgX_2
- E. RMgR

2. The triple bond consists of

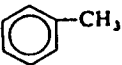
- A. two sigma bonds and one pi bond
- B. one sigma bond and two pi bonds
- C. three sigma bonds
- D. three pi bonds
- E. none of the above

3. Which of the following is NOT a characteristic of organic compounds?

- A. If water-soluble, they seldom conduct an electric current.
- B. They usually have low melting points.
- C. They usually are only slightly soluble or insoluble in water.
- D. The unit particles are ions and not distinct molecules.
- E. Bonds which bind the atoms together are nearly always of the covalent type.

4. Which of the following, on oxidation, yields a compound of formula $\text{C}_4\text{H}_8\text{O}$ that gives a negative result with Fehling's or Tollens' reagent?

- A. $\text{CH}_3\text{-CH}_2\text{-O-CH}_2\text{-CH}_3$
- B. $\text{CH}_3\text{-CH}_2\text{-CH-CH}_3$
 OH
- C. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{-OH}$
- D. $(\text{CH}_3)_2\text{CH-CH}_2\text{-OH}$
- E. none of the above

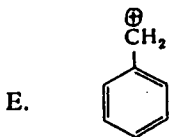
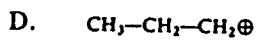
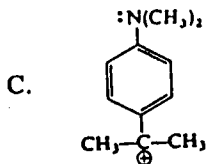
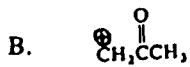
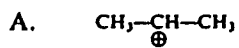
5.  is called

- A. aniline
- B. toluene
- C. phenol
- D. phenanthrene
- E. none of the above

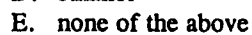
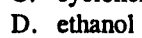
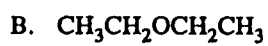
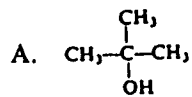
6. The chemical name of aspirin is

- A. methyl salicylate
- B. benzpyretic acid
- C. acetylsalicylic acid
- D. salicylic acid
- E. none of the above

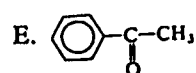
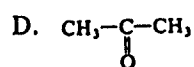
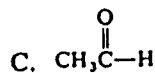
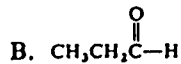
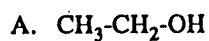
7. Which of the following is the most stable carbocation?



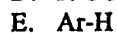
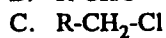
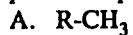
8. Which compound reacts most rapidly with sodium metal?



9. An unknown compound gave a positive Tollens' test. Treatment of the unknown with iodine and sodium hydroxide gave a solid which was identified as iodoform. This unknown was which of the following compounds?

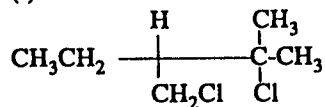


10. In the NMR spectrum, the farthest downfield shift will be exhibited by the proton or protons in which compound?

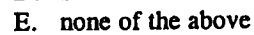
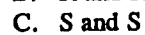
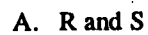
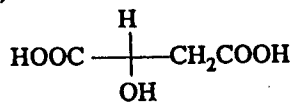


11. Consider the Fischer projections of compounds I and II, concerning the configurations at the asymmetric carbons, which of the following absolute configurational assignments of the compound I and II is CORRECT?

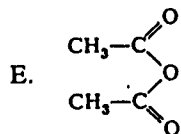
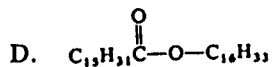
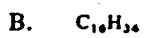
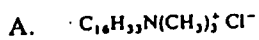
(I)



(II)



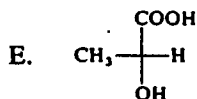
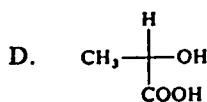
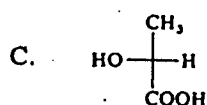
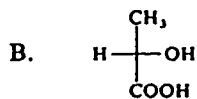
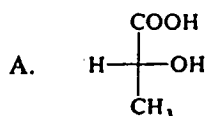
12. Which one of the following substances is a good detergent in water ?



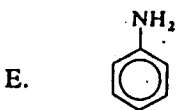
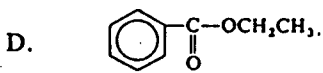
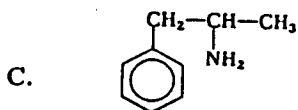
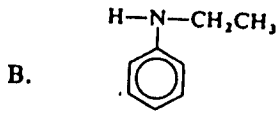
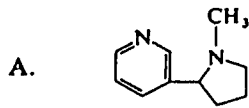
13. Which of the following statements is INCORRECT ?

- A. The carbonyl group contains a sigma and a pi bond.
- B. A hemiacetal has an alcohol and an ether group bonded to the same carbon atom.
- C. Diethyl ketone has the same molecular formula as butyraldehyde.
- D. The oxidation product of 3-pentol is diethylketone.
- E. A compound of formula $C_6H_{12}O$ can be either an aliphatic aldehyde or ketone.

14. Which of these projection formulas represent (+)-lactic acid?

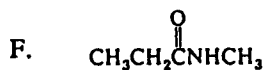
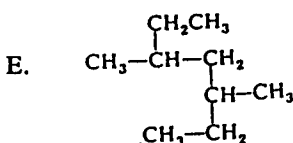
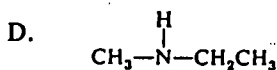
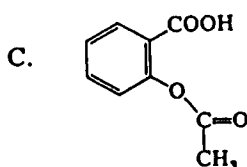
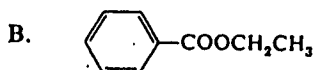
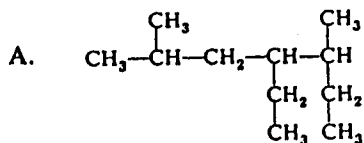


15. Amphetamines are a group of drugs that stimulate the central nervous system. Which of the following structures is CORRECT?



二、簡答題

16. Give the IUPAC name for each of the following structures:(12%)



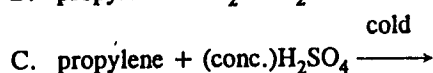
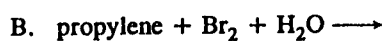
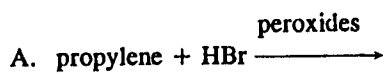
17. Write structure for the following compounds: (10%)

- diphenylketone
- cis-2-methyl-3-heptene
- p-aminobenzoic acid
- toluene
- DMSO

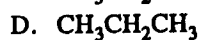
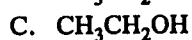
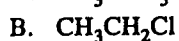
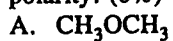
18. The following table lists some physical properties of five compounds of about the same molecular weight. How do you account for: (1) their relative boiling points, and (2) their relative solubilities in water? (4%)

STRUCTURE AND PHYSICAL PROPERTIES				
Name	Structure	Dipole moment D	B.p., °C	Solubility g/100 g H ₂ O
<i>n</i> -Pentane	CH ₃ CH ₂ CH ₂ CH ₂ CH ₃	0	36	<i>insol.</i>
Diethyl ether	CH ₃ CH ₂ -O-CH ₂ CH ₃	1.18	35	8
<i>n</i> -Propyl chloride	CH ₃ CH ₂ CH ₂ Cl	2.10	47	<i>insol.</i>
<i>n</i> -Butyraldehyde	CH ₃ CH ₂ CH ₂ CHO	2.72	76	7
<i>n</i> -Butyl alcohol	CH ₃ CH ₂ CH ₂ CH ₂ OH	1.63	118	8

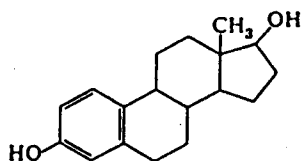
19. Draw structural formulas for the products of the following reactions: (6%)



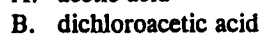
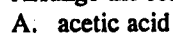
20. Name the following compounds, and arrange them in order of increasing polarity: (6%)



21. Estradiol is one of the major female sex hormones. Describe the structural features and identify the functional groups in the estradiol molecule: (4%)

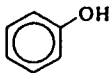


22. Arrange the following carboxylic acids in order of increasing acidity: (3%)



23. What chemical element does NADH/H⁺ supply when it acts as a reducing agent? (2%)

24. Assume that you have a 0.01 M solution of each of the following substances: (3%)

- (a). NH_3 (b). HCl (c). NaCl (d). NaOH (e). CH_3COOH (f). 

Arrange them in order of increasing pH (list the most acidic solution first).

25. Determine the empirical formula of an organic compound whose percentage composition determined by combustion analysis is: 40.01% carbon, 6.11% hydrogen. If the molecular mass is 180, what is the molecular formula? (4%)

26. Complete the following equations, if no reaction occurs, write NR. (16%)

