

八十六學年度 生命科學 系(所) 分生組乙 組碩士班研究生入學考試
 科目 有機化學 科號 1002 共 8 頁第 / 頁 *請在試卷【答案卷】內作答

I. (50%) 每4題2分

1. Naphthalene, $C_{10}H_8$, is most soluble in which of the following solvents?

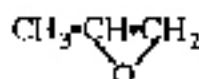
- (A) water
- (B) alcohol
- (C) oil
- (D) acetic acid
- (E) benzene

2. Of the following, the compound possessing optical isomerism is

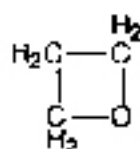
- (A) $CH_3 \cdot CH_2OH$
- (B) $CH_2OH \cdot CHOH \cdot CH_2OH$
- (C) CCl_2F_2
- (D) CCl_2BrF_2
- (E) $CH_3 \cdot CHOH \cdot C_2H_5$

3. The most probable structural formula for the compound whose empirical formula is C_3H_6O , and which can reduce Benedict's reagent, is

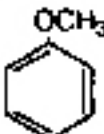


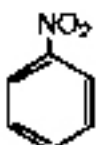
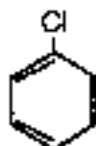
- (A) $CH_3 \cdot CH_2 \cdot CHO$
- (B) $CH_2=CH \cdot CH_2OH$
- (C)



- (D) $CH_3 \cdot O \cdot CH=CH_2$
- (E)



4. Select the most reactive toward Br_2 in the presence of $FeBr_3$:

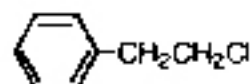
- (A) 
- (B) 
- (C) 
- (D) 
- (E) 

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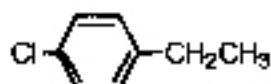
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5. Select the most reactive toward aqueous NaOH:

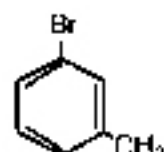
(A)



(B)



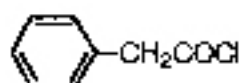
(C)



(D)

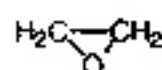


(E)



6. Select the most easily cleaved by HBr:

(A)



(B)



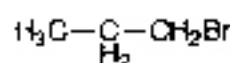
(C)



(D)



(E)



7. The strongest acid among the following is

(A) p-nitrophenol

(B) m-nitrophenol

(C) o-nitrophenol

(D) p-chlorophenol

(E) m-chlorophenol

8. Acetic acid may be made by the

(A) oxidation of ethyl alcohol

(B) destructive distillation of soft coal

(C) polymerization of ethylene

(D) esterification of propionic acid

(E) reduction of acetone

9. Ethyl acetoacetate is prepared from ethyl acetate by the

(A) Benzoin condensation

(B) Acyloin condensation

(C) Claisen condensation

(D) Aldol condensation

(E) Dieckmann condensation

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10. Which of the following ions will be most effective in an S_N2 displacement on methyl bromide?
- (A) $C_2H_5O^-$
 (B) HO^-
 (C) $C_6H_5O^-$
 (D) CH_3COO^-
 (E) NO_3^-
11. Ketones react with primary amines to give
- (A) Ureas
 (B) Guanidines
 (C) Amides
 (D) Schiff bases
 (E) Oximes
12. The Markovnikoff Rule is used in connection with
- (A) stereochemistry of elimination reactions
 (B) stability of free radicals
 (C) activity of enzymes
 (D) addition of acids to double bonds
 (E) electrophilic aromatic substitution
13. Which of the following would react fastest with N-bromosuccinimide?
- (A) Benzene
 (B) Methane
 (C) Cyclopropane
 (D) Pyridine
 (E) Toluene
14. The reaction $H_2O + C_{12}H_{22}O_{11} \rightarrow 4CO_2 + 4C_2H_5OH$ is an example of
- (A) fermentation
 (B) esterification
 (C) saponification
 (D) polymerization
 (E) photolysis

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15. CH_3NH_2 in water will act as a(n)
- (A) acid
 - (B) base
 - (C) ester
 - (D) salt
 - (E) ketone
16. The slow partial oxidation of ethyl alcohol results in the formation of
- (A) acetone
 - (B) acetic acid
 - (C) butyric acid
 - (D) propionic acid
 - (E) acetaldehyde
17. A reagent used in testing for a carbonate is
- (A) H_2S
 - (B) CaCl_2
 - (C) HCl
 - (D) NaOH
 - (E) MgCl_2
18. Homogenized milk is a colloidal suspension from which fats and proteins may be precipitated by
- (A) adding some ethanol
 - (B) allowing the milk to settle
 - (C) filtration
 - (D) pasteurization
 - (E) adding an acid
19. The simplest amino acid is
- (A) cystine
 - (B) alanine
 - (C) glycine
 - (D) histidine
 - (E) valine

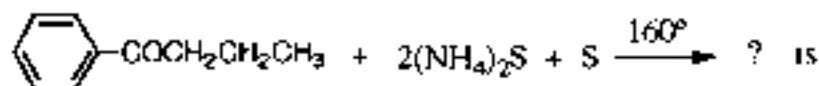
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20. Of the following substances, the one that would cause blue litmus to turn red is:
- (A) $(C_6H_{10}O_5)_x$
 - (B) CH_3CHO
 - (C) CH_3CH_2OH
 - (D) $C_{12}H_{22}O_{11}$
 - (E) CH_3COOH
21. A compound whose atoms are superimposable on their mirror images even though they contain asymmetric carbon atoms is called
- (A) a meso compound
 - (B) an erythro isomer
 - (C) a threo isomer
 - (D) a glycol
 - (E) an eutectic compound
22. Which of the following reagents would distinguish cis-cyclopenta-1, 2-diol from the trans-isomer?
- (A) Acetone
 - (B) Ozone
 - (C) Manganese dioxide
 - (D) Aluminium isopropoxide
 - (E) Lithium aluminum hydride
23. Which of the following amino acids would give a colored product when its HCl solution is treated with ninhydrin?
- (A) proline
 - (B) tryptophan
 - (C) tyrosine
 - (D) alanine
 - (E) glycine

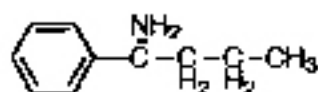
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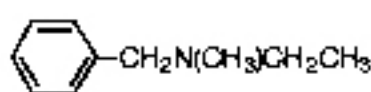
24. The product of the reaction:



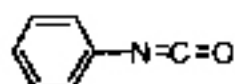
(A)



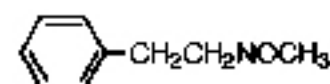
(B)



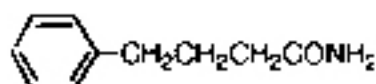
(C)



(D)



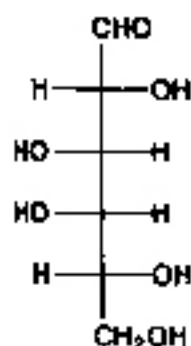
(E)



25. How many structural isomers [Kekule structures only] does bromodichlorobenzene have?

- (A) 3
(B) 4
(C) 5
(D) 6
(E) 7

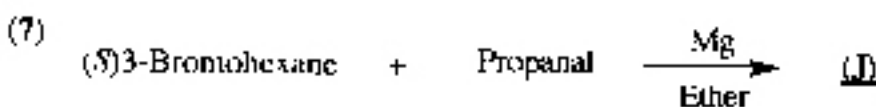
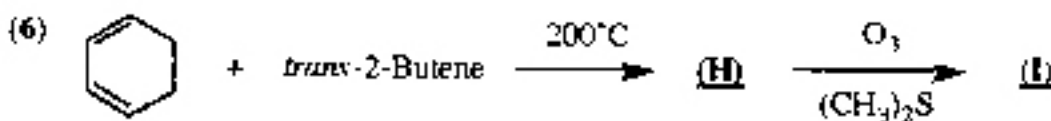
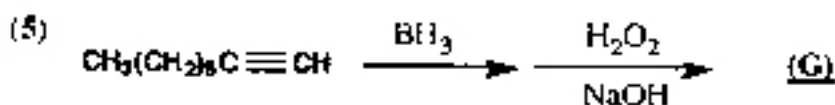
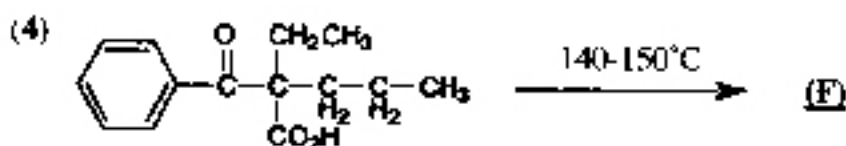
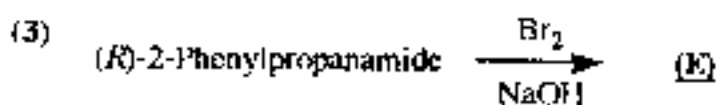
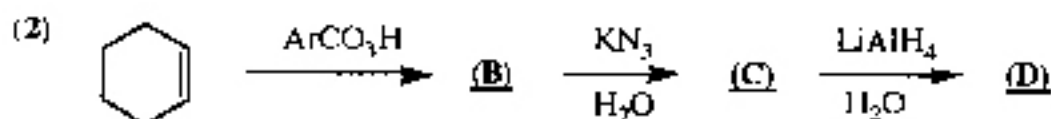
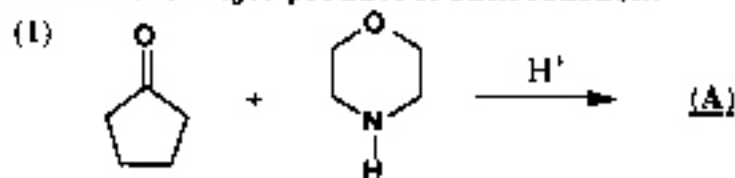
II. D-Galactose has the following structure and its cyclic forms, α -D-galactopyranose and β -D-galactopyranose, have specific rotations of $+190.7^\circ$ and $+52.8^\circ$, respectively. When α -D-galactose is dissolved in solution in the presence of trace amount of acid, the specific rotation gradually decreases to a value of $+80.2^\circ$. How do you account for the fact? (5%)



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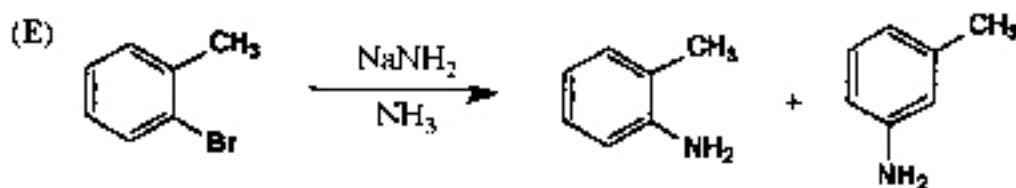
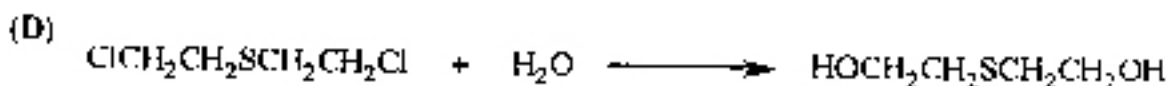
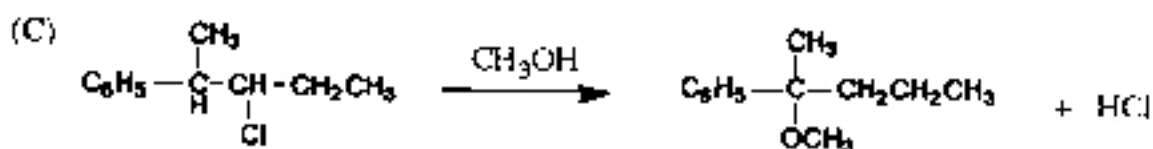
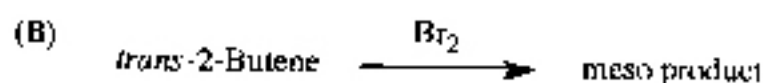
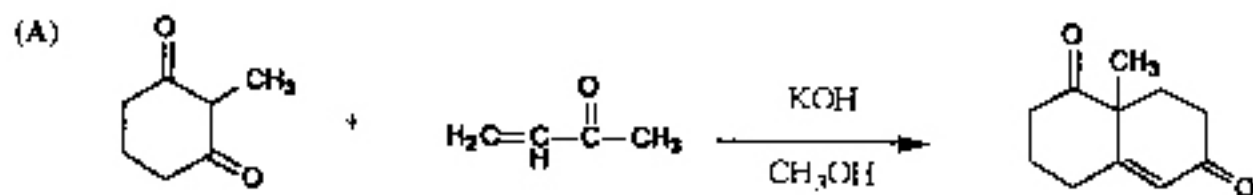
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III. Predict the major product of each reaction. (20%)



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IV. Propose a rational mechanism for the following reactions. (15%)



V. Deduce the structure formula of the compounds based on the spectroscopic data. (10%)

- (A) Mass spectrum: $M^+ = 88.1$
 IR: 3600 cm^{-1}
 ^{13}C NMR: $\delta = 25, 27, 35, 74 \text{ ppm}$
 ^1H NMR: $\delta = 0.9 \text{ ppm}$ (3H, triplet, $J = 7 \text{ Hz}$)
 1.0 ppm (1H, singlet)
 1.2 ppm (6H, singlet)
 1.4 ppm (2H, quartet, $J = 7 \text{ Hz}$)

- (B) $\text{C}_8\text{H}_9\text{Br}$
 ^1H NMR: $\delta = 1.8 \text{ ppm}$ (3H, doublet)
 5.0 ppm (1H, quartet)
 7.3 ppm (5H, singlet)