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1 (Sem-4) CHE 2

2025

CHEMISTRY

Paper : CHE0400204

(Organic Chemistry-I)

Full Marks : 45

Time : 2 hours

The figures in the margin indicate full marks for the questions.

1. Answer the following questions : 1×5=5

(A) Find out the correct answers :

(a) Complete hydrolysis of proteins produces—

(i) NH_3 and CO_2

(ii) Glycogen and fatty acid

(iii) Urea and Uric acid

(iv) a mixture of amino acids

(b) Substances which reduce the rate of enzyme catalyzed reactions are known as :

- (i) substrates
- (ii) enzymes
- (iii) products
- (iv) inhibitors

(c) The heterocyclic diene employed in cyclo-addition reaction is—

- (i) Furan
- (ii) Pyrrole
- (iii) Thiophene
- (iv) 2, 5-dimethyl pyrrole

(B) Fill in the blank :

Hydroxy acids undergo intramolecular **esterification** in the presence of acid catalyst to yield _____.

(C) Write the structure of nicotine.

2. Answer the following : **(any five)** $2 \times 5 = 10$

- (a) 'Thiophene is less reactive than furan'. Explain.
- (b) Why the boiling point of ethylamine ($\text{CH}_3\text{CH}_2\text{NH}_2$) is less than that of ethyl alcohol ($\text{CH}_3\text{CH}_2\text{OH}$).
- (c) Arrange the following sets of compounds in increasing order of basicity. $1 \times 2 = 2$

Set I : (i) $\text{CH}_3\text{CH}_2\text{NH}_2$

(ii) CH_3CONH_2

(iii) $\text{C}_6\text{H}_5\text{CONH}_2$

(iv) $\text{C}_6\text{H}_5\text{NH}_2$

Set II : (i) *p*-toluidine

(ii) *p*-nitroaniline

(iii) *N,N*-dimethyl-*p*-toluidine

(iv) aniline

- (d) Give the different types of bonds responsible for the tertiary structure of proteins.
- (e) How will you synthesize alanine from ethyl chloride ?

(f) How can you prepare mono-carboxylic acids from— $1 \times 2 = 2$

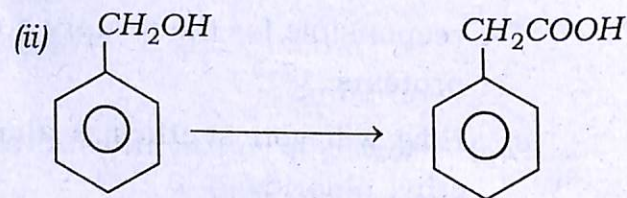
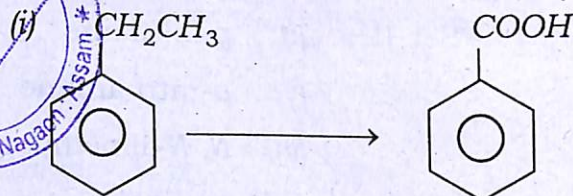
(i) a primary alcohol

(ii) an aldehyde

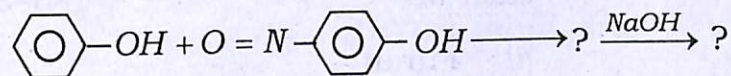
(g) Explain briefly why ethyl benzoate (Ph-COOEt) can not undergo claisen condensation reaction.

(h) How will you prepare lactic acid from acetylene ?

(i) Write chemical reactions for the following transformations— $1 \times 2 = 2$



(j) Complete the following reaction—



3. Answer **any four** from the following :

$5 \times 4 = 20$

(a) (i) How substituted pyridines can be prepared by Hantzsch synthesis ? 2

(ii) Explain the Fisher Indole synthesis with mechanism. 3

(b) (i) How will you establish the presence of pyridine nucleus in nicotine ? 2

(ii) What class of alkaloid does nicotine belongs to ? 1

(iii) What happen when aliphatic primary amine is diazotized ? 1

(iv) Mention one application of diazotization reaction. 1

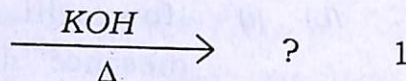
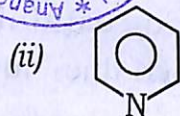
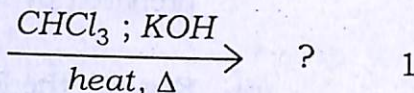
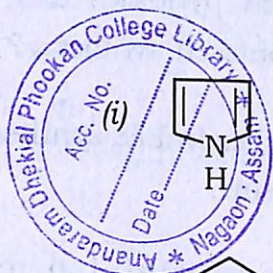
(c) (a) Give one method of preparation of each of— 1×3=3

(i) Furan

(ii) Pyrrole

(i) Thiophene

(b) complete the following reactions— 1×2=2



(d) (i) Compare the basicities of furan, pyrrole and thiophene. 3

(ii) Explain briefly why furan is less reactive than pyrrole. 2

(e) Describe the following (*any two*) : 2½×2=5

(i) ISO-electric point of amino acid

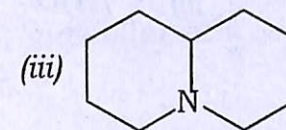
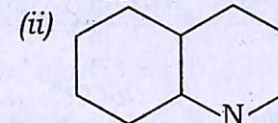
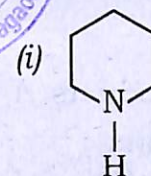
(ii) Denaturation of protein

(iii) Enzyme inhibitors.

(f) Write a short note on the effect of ring substituents on the basicities of aromatic amines.

(g) (i) What is Hoffmann Exhaustive Methylation reaction ? 2

(ii) Identify the products of the following compounds by using Hoffmann Exhaustive Methylation reaction. 1×3=3



- (h) (i) Explain various types of electronic transmissions possible for organic compounds in *uv*-visible spectroscopy.

OR

- (ii) In IR spectroscopy, absorption signals for molecular vibrations are recorded. What are these molecules vibrations?

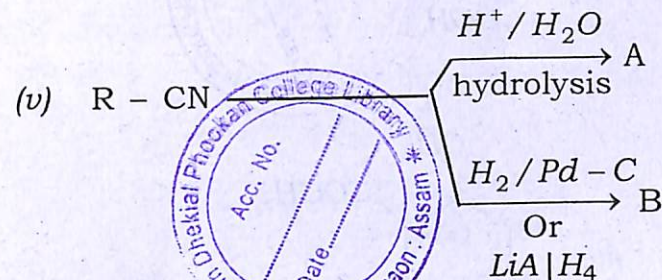
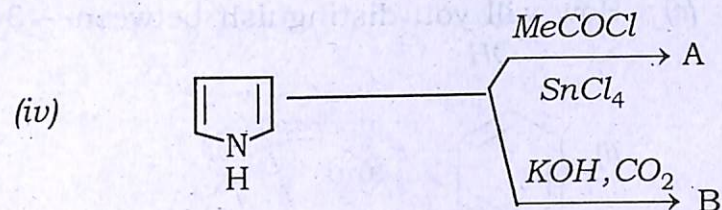
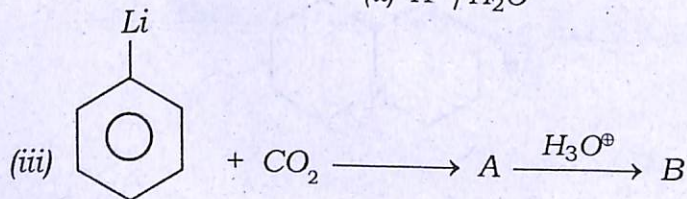
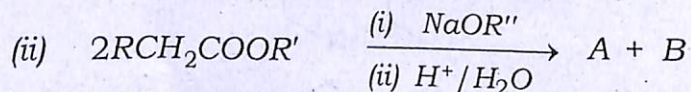
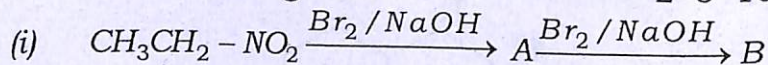
Show the types of molecular vibrations possible in a molecular of the type A_2x where 'x' is called anchor atom.

4. Answer **any four** from the following :

$$1 \times 10 = 10$$

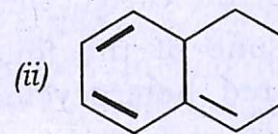
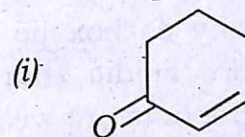
- (A) Find out the products A and B in the following reactions :

$$2 \times 5 = 10$$

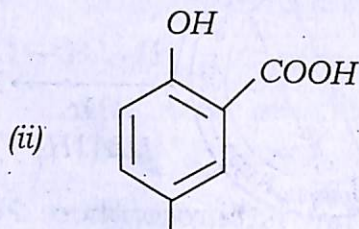
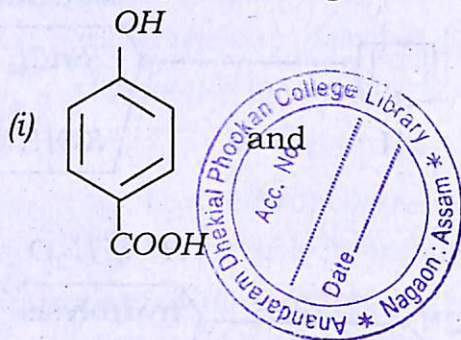


- (B) (a) What is chromophore ? Give one example. 1

- (b) Calculate the λ_{max} of the following compounds— 2×2=4



(c) How will you distinguish between— 3



by using IR-spectroscopy

(d) What is overtone and combination bond ? 2

(C) (a) Explain why carboxylic acids are much more acidic than alcohol, whereas phenols are weaker acids than carboxylic acids. 3

(b) Find out the correct answer—

(I) Which one of the following 5-membered heterocycle is most resonance stabilized ? 1

(i) Furan

(ii) Thiophene

(iii) Pyrrole

(iv) Pyridine

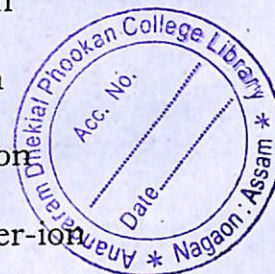
(II) In aqueous solution, an amino acid exists as— 1

(i) cation

(ii) anion

(iii) dianion

(iv) Zwitter-ion



(c) Write the name of the optically inactive amino acid. 1

(d) Why the electrophilic substitution of furan usually takes place at C-2 position ? 2

(g) Write Paal-Knorr synthesis of furan. 2

(D) (a) What is Hinsberg reagent ? How will you distinguish between 1°, 2° and 3° amines by using Hinsberg reagent. 1+3=4

(b) Why aniline can not undergo Friedel Craft reaction and nitration reaction ? 4

(c) How will you prepare ethylamine by Gabriel synthesis ? 2
