



‘সমানো মন্ত্র: সমিতি: সমানী’

## UNIVERSITY OF NORTH BENGAL

B.Sc. Honours Part-III Examination, 2022

## CHEMISTRY

## PAPER-VII

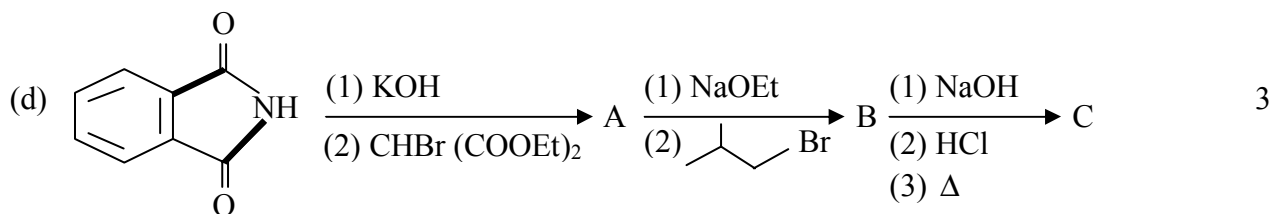
Time Allotted: 4 Hours

Full Marks: 65

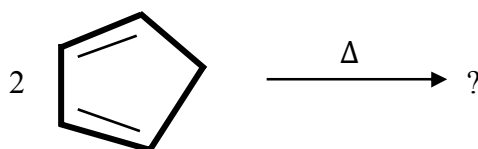
*The figures in the margin indicate full marks.**All symbols are of usual significance.***Answer Questions No. 1 and any five from the rest**

1. Explain the following facts: 3×5 = 15
- (a) Pyridine-N-oxide is an important substrate for synthetic chemists. Justify the statement with suitable examples.
- (b) *Trans*-decalin is more stable than *cis*-decalin.
- (c) [2 + 2] cycloaddition is thermally not allowed but photochemically allowed. Explain.
- (d) The reaction of naphthalene and conc. H<sub>2</sub>SO<sub>4</sub> at 40°C and at 160°C give different sulfonated products. Explain.
- (e) The chemical shift value of protons in acetylene appears at 1.5-3.5 ppm though it contains  $\pi$ -bonds.

2. (a) What is meant by the term ‘epimer’? Show the mechanism of epimerization of D-glucose to D-mannose. 3
- (b) Establish the structure of sucrose taking conventional ring structure of glucose and fructose. 2
- (c) Give the chemical evidence in favour of the pyranose ring of natural D-fructose. 2

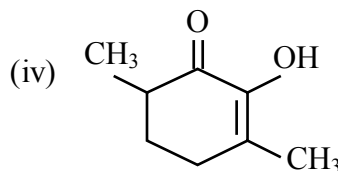
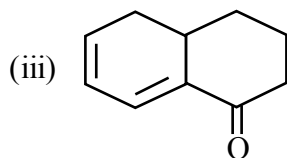
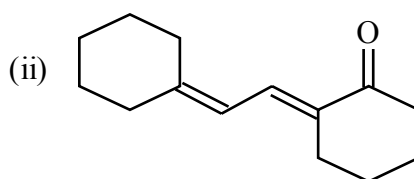
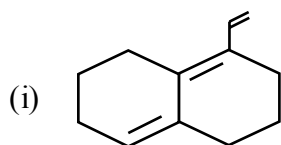


3. (a) Predict the product with proper stereochemistry: 2



(b) Calculate the  $\lambda_{\max}$  for the following compounds:

$$1\frac{1}{2} \times 4 = 6$$

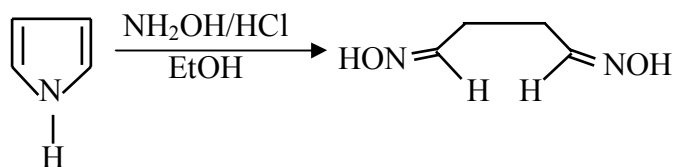


(c) How would you distinguish  $\text{CH}_3\text{CHO}$  from  $\text{CH}_3\text{COCH}_3$  with the help of NMR spectroscopy? 2

4. (a) Explain why pyrrole exhibits close similarity with aniline. 2

(b) Give an example each of  $\pi$ -excessive and  $\pi$ -deficient aromatic heterocycles. Why are they so-called? 2+1 = 3

(c) Give the mechanism of the following transformation: 2



(d) Synthesize Indole-2-acetic acid with proper substrate and reagent. 3

5. (a) What do you mean by chemical shift? 2

(b) How many signals appear in the  $^1\text{H}$ -NMR spectra for 2-chloropropionic acid? Give the splitting pattern. 2

(c) A compound of molecular formula  $\text{C}_4\text{H}_7\text{BrO}_2$  gives different peaks in  $^1\text{H}$ -NMR spectra:  $\delta = 1.2$  (t, 3H),  $2.3$  (m, 2H),  $4.3$  (t, 1H),  $12.0$  (s, 1H). Suggest the structure with proper explanations. 3

(d) How will you distinguish between intermolecular and intra molecular hydrogen bonding using IR spectroscopy? 3

6. (a) What is isoelectric point of an amino acid? How can you calculate it for a monoamino monocarboxylic acid? 1+2 = 3

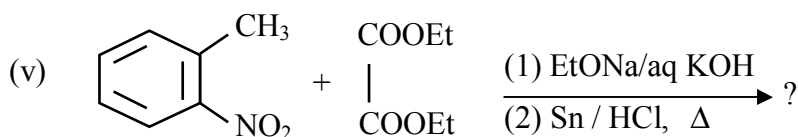
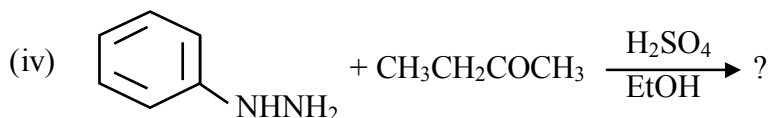
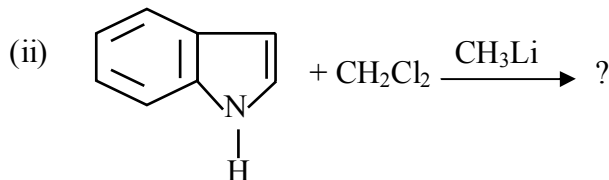
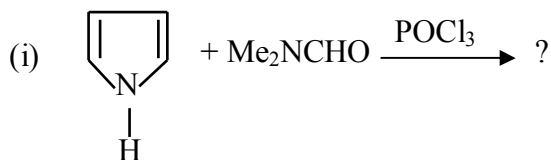
(b) What do you understand by denaturation of protein? Mention two conditions under which denaturation occurs. 1+1 = 2

(c) Describe a method of synthesis of phenylalanine. 2

(d) Describe any one method of determination of N-terminal of a protein. 3

7. Predict the products with plausible mechanism:

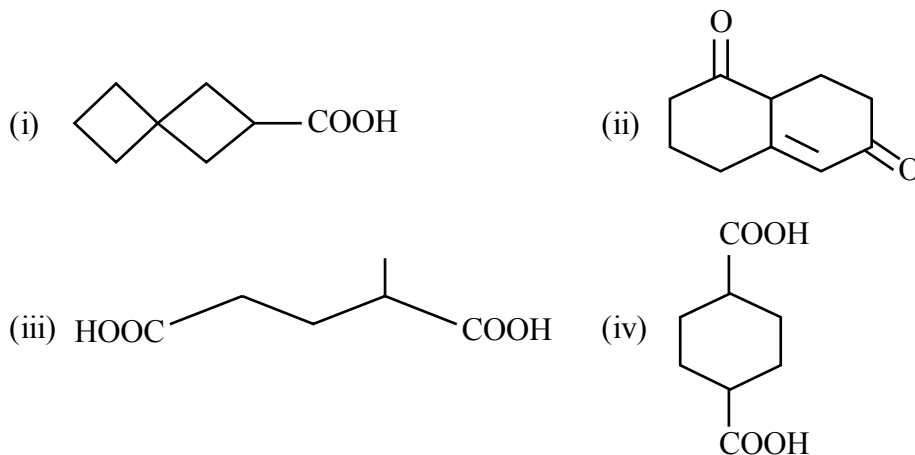
2×5 = 10



8. (a) How is indigotin prepared from anthranilic acid? 2  
 (b) Draw the structures of nucleoside and nucleotide. 2  
 (c) Define prosthetic group with suitable example. 2  
 (d) Explain why RNA is less stable than DNA in alkaline medium. 3  
 (e) Name the reagents used in the Edmann method and the Sanger method. 1

9. (a) Synthesize the following compounds, using an active methylene compound:

2×4 = 8

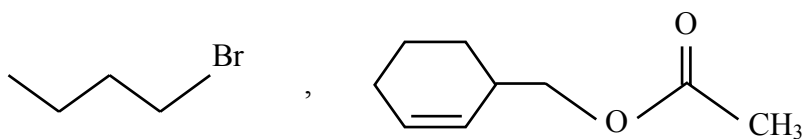


(b) Write the importance of 'finger print region' in IR spectroscopy.

2

10.(a)  $\text{Br}_2/\text{H}_2\text{O}$  oxidation of  $\alpha$ -anomer of D-gluco-pyranose is 250 times slower than that of  $\beta$ -anomer of D-glucopyranose. Explain. 3

(b) Predict the number of chemical shift position in  $^1\text{H-NMR}$  of the following compounds:  $1 \frac{1}{2} \times 2 = 3$



(c) A compound having molecular formula  $\text{C}_{10}\text{H}_{12}\text{O}_2$  shows strong IR bands at  $1748 \text{ cm}^{-1}$  and gives peaks in  $^1\text{H-NMR}$  at 7.28 (m, 5H), 4.23 (q, 2H), 3.60 (s, 2H), 1.23 (t, 3H). Find the probable structure of the compound. 4

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