UNIVERSITY OF NORTH BENGAL

B.Sc. Honours Part-III Examination, 2021

CHEMISTRY

PAPER-VII

ORGANIC CHEMISTRY

Full Marks: 65

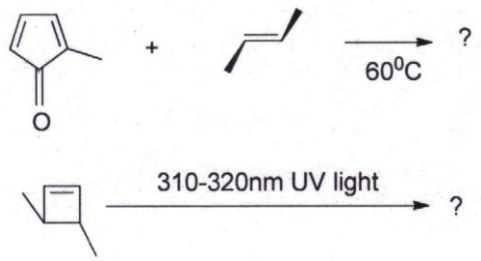
ASSIGNMENT

The figures in the margin indicate full marks.
All symbols are of usual significance.

1 mark for neat and precise presentation.

Answer any *four* questions from the following 16×4 = 64

1. (a) Predict product(s) from the following reactions: 5



(b) (i) In CCl_4, 2-Bromo-4-t butyl cyclohexanone exists in axial form by ~78% while in dioxane it is recorded ~63%. Explain the variation. 5

(ii) Predict A and B, write the scheme with structural formula.

(c) (i) Phenolphthalein is used as an acid-base indicator. Explain this behaviour. 5

(ii) Does boiling of egg denature existing protein structure?

(d) Write structure of a dipeptide having an aromatic amino acid at N-terminal and alanine at C-terminal. 1

2. (a) Electrocyclic reaction of 2E,4E-Hexa-2,4-diene under thermal and photochemical excitation produces a set of stereospecific products. Comment on this statement mentioning their valence orbitals, directional character of termini orbitals, and orientation of substituents in the products. 2+2+2

(b) Complete the following sentence: 2+2

Cycloaddition of 2E,4E-Hexa-2,4-diene and acraldehyde involves HOMO of _____ and LUMO of _____. What is the difference if you consider reverse set of FMOs?

(c) How do you determine C-terminal and N-terminals of protein? 3+3

3. Answer the following questions:

(a) Proton and ^{13}C are NMR active. — Why? 3

(b) Carrot is a bright coloured vegetable. What makes it coloured? 3

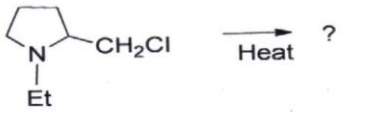
(c) What difference is noticed for signals of aromatic protons in 4-Nitro toluene and 1,4-Dinitro benzene? 3

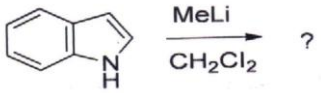
(d) How do you distinguish 2-Nitro phenol and 4-Nitro phenol by IR spectroscopy? 3

(e) Draw a rough sketch of ^{1}H-NMR spectrum of ethanol. 3

(f) Between anthracene and phenanthrene which one is more aromatic? 1

4. (a) Complete following equations: 3+3+3





(b) Write the preparations of the following: 3+3

(i) 8-Hydroxy quinoline from 2-Aminophenol

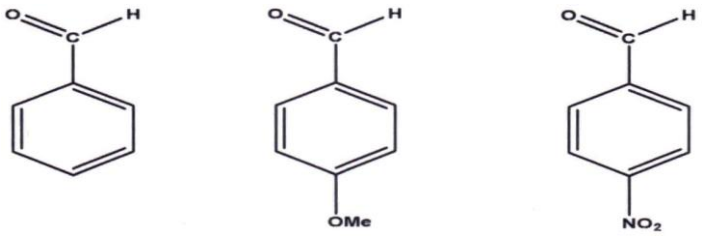
(ii) 3-Amino pyridine from β-Picoline

(c) What is a purine base? 1

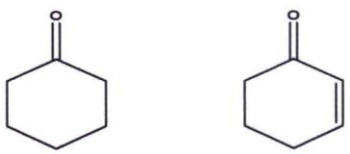
5. (a) What is the Amadori rearrangement? Explain the formation of glucosazone with the help of the rearrangement. 3

(b) Arrange the following compounds in order of their increasing C = O stretching frequencies. 6

(i)



(ii)



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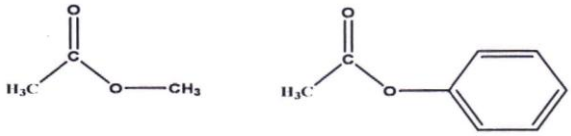
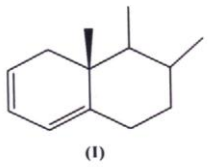


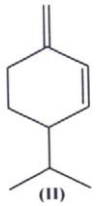
(c) Discuss about the different conformations of the anomers of D-glucose, their structure and relative stability. 3

(d) Which group acts as an auxochrome in Methyl Orange dye? How is Methyl Orange dye prepared commercially? 4

6. (a) Calculate λ_{max} values for the following compounds: 4



(I)



(II)

(b) What is "precessional frequency"? What is its importance in an NMR experiment? 3

(c) What do you mean by spin-spin coupling? What are coupling constants? 3

(d) An organic compound having molecular formula $C_6H_{11}BrO_2$ exhibits ^1H NMR signals at: 4

δ 4.1 (2H, q, J = 7.5 Hz), 4.0 (2H, t, J = 7.5 Hz), 1.5-2.2 (4H, m), 1.25 (3H, t, J = 7.5 Hz). Predict the structure of the compound.

(e) Define the terms "Chromophore" and "Auxochrome". 2

7. Write short notes on: 4×4=16

(i) Claisen-ester condensation

(ii) Baeyer strain theory

(iii) Gabriel Phthalimide synthesis of amino acids

(iv) Fischer Indole synthesis.

8. (a) Draw the M.O. diagram of benzene. Why is benzene more stable than hexatriene? 3

(b) Discuss the regioselectivity and stereoselectivity observed in Diels-Alder Reaction. 4

(c) Why is TMS selected as an internal standard for NMR Spectroscopy? 2

(d) What is the Tschitschibabin reaction? Give its mechanism. 3

(e) Draw the energy profile diagram of the different conformations of cyclohexane and compare their relative stabilities. 4

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