

RAMAKRISHNA MISSION VIDYAMANDIRA
(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SIXTH SEMESTER EXAMINATION, MAY 2025

THIRD YEAR (BATCH 2022-25)

CHEMISTRY (HONOURS)

Paper : DSE 3

Date : 10/05/2025

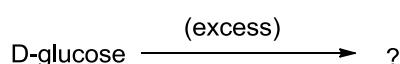
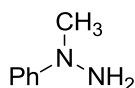
Time : 11.00 am – 1.00 pm

Full Marks : 50

Answer **any five** of the following questions :

[5×10]

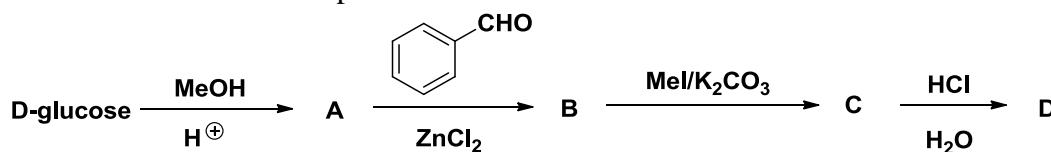
1. a) Di-isopropylidene derivative of D-glucose can be O-methylated at C-3, but that of D-galactose can't give the same result -Explain.
b) Identify the product of the following reaction (Mechanism is not needed)



- c) Illustrate the term epimer with D-glucose and D-mannose.
d) Explain why sucrose is a non-reducing sugar while lactose is reducing. Use structure in your explanation.
e) How does RNA differ from DNA in terms of sugar-phosphate backbone and nitrogenous bases? [2+2+1+3+2]
2. a) Outline the steps and intermediate structure in the Wohl degradation of D-glucose to D-arabinose.
b) β - D- glucopyranose is oxidised 250 times faster than α - D- glucopyranose using Br_2/water -Explain.
c) How would you justify the fact that all methyl-pyranoside of α - D-hexose series have same configuration at C-1 and C-5.
d) Define Mutarotation. [3+2+3+2]
3. a) What is isoelectric point? Calculate the pI of any amino acid from its pK_a rules.
b) Name two essential and two non-essential amino acid with structure.
c) Account for the observed anomeric composition of D (+)-glucose in different media as shown below:

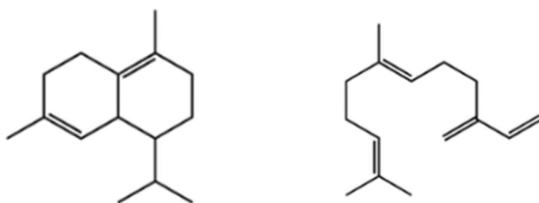
	α - anomer	β - anomer
Water	36%	64%
Anhy. MeOH	50%	50%

- d) Why is RNA readily hydrolyzed in alkali, but DNA is stable?
e) Where does transcription and translation typically occur in a eukaryotic cell? [3+2+2+2+1]
4. a) Give the structures of the products A-D and rationalize their formation:



- b) Why proline is rarely found in alpha helix?
c) State Chargaff's rule. Do Chargaff's rules strictly apply to all forms of RNA molecules.
d) How the N-terminal amino acid residue of a peptide is determined with the help on 2,4-dinitrofluorobenzene? [4+2+2+2]

5. a) The specific rotation of α - D-glucopyranose is $+112^\circ$, while that of the β - anomer is $+18.7^\circ$. When either of the pure anomers is dissolved in water, the specific rotation gradually changes to $+52.7^\circ$. Determine the percentage of the two anomers present at equilibrium.
- b) State the biological role of mRNA, tRNA and rRNA.
- c) Imagine you have a peptide with the sequence Ala-Gly-Ser-Leu-Val. Write down the structure of the PTH-amino acid released after the second cycle of Edman degradation.
- d) Define (i) Anticodon, (ii) Start and Stop codons. [2+3+2+3]
6. a) Draw C2'-endo vs. C3'-endo conformations in DNA. How does the sugar pucker generally affect the overall geometry of the DNA helix.
- b) Draw and label the hydrogen bonding between
 (i) Adenine and Thymine
 (ii) Guanine and Cytosine
- c) State "isoprene rule" with example. Give one example with structure for Sesquiterpenes.
- d) Give a flow chart to isolate alkaloid from natural source. [3+2+3+2]
7. a) Briefly describe the different levels of protein structure (primary, secondary, tertiary, and quaternary). Which of these levels are primarily disrupted during protein denaturation?
- b) What is the role of terpenes in plants? Name one monoterpene and one diterpene.
- c) Give structure and biological activities for the following alkaloids:
 (i) Phenylethylamine alkaloids
 (ii) Pyrrole and Pyrrolidine alkaloids [4+2+4]
8. a) Draw the structures of any two alkaloids from the following and mention their medicinal use. [any two]
 (i) Morphine
 (ii) Caffeine
 (iii) Quinine
- b) Indicate the nature of head-tail combination present in the following molecules:



- c) Convert : Adenosine triphosphate to adenosine. [4+(2+2)+2]

