T(I)-Biochemistry-H-1(Mod.-II)

2×10

2021

BIOCHEMISTRY—HONOURS

First Paper

(Module - II)

Full Marks : 50

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable.

Question no. 1 is compulsory and answer any one question from each Unit.

- 1. Answer any ten questions :
 - (a) Write down the canonical forms of the following cation and indicate with reason the most contributing one.



- (b) Explain the role of Li^+ in $LiAlH_4$ reduction of carbonyl compounds.
- (c) Arrange with explanation, the following compounds in order of increasing dipole moment :

 CH_3CH_2Cl , $HC \equiv CCl$, $H_2C = CHCl$

- (d) Explain the terms 'dihedral angle' and 'torsion angle' with a suitable example.
- (e) Write down the products of ozonolysis of $CH_3 CH = CH CH_2 CH = CH_2$.
- (f) Draw the orbital picture of $CH_2 = CH C \equiv N$ and indicate the state of hybridization of each carbon atom.
- (g) Write down one reaction for the generation of carbenes.
- (h) Treatment of $Cl \longrightarrow Q$ with AgNO₃ gives AgCl along with a cyclic compound. What is the driving force for this reaction?
- (i) Explain why acetals are stable to alkali but not to acids.
- (j) Why is dry ether or dry THF used in the preparation of Grignard reagent?
- (k) What happens when *cis*-2-butene reacts with mCPBA?
- (1) Write down the names of one purine and one pyrimidine base along with their structures.
- (m) How would you synthesize a tertiary alcohol using a Grignard reagent? Give the reaction.
- (n) Draw the Newman Projections for gauche and anti conformations of *n*-butane.
- (o) Explain why nitrobenzene is used as a solvent in Friedel-Crafts alkylation reaction.

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Unit - I

(2)

- 2. (a) Draw the following as directed :
 - (i) (S) -2-Methylpentan-1-ol (in Fischer projection)
 - (ii) (2R, 3S)-2-Bromo-3-chlorobutane (in Newman projection-eclipsed and staggered forms)
 - (iii) Erythro-3-Aminobutan-2-ol (in Flying Wedge).
 - (b) Compare the C = O bond lengths of the following compounds with reason



- (c) Arrange the following compounds in increasing order of acid strength and explain.
 - (i) 4-Nitrophenol
 - (ii) 2, 6-Dimethyl-4-nitrophenol
 - (iii) 3, 5-Dimethyl-4-nitrophenol.
- 3. (a) Why does the following compound exist mainly in the enol form?



(b) Classify the following compounds as aromatic, anti-aromatic or non-aromatic.



3+3+4

(e) Give the R/S descriptors of the following compounds indicating the priority sequence of the ligands around the chiral centre. 2+2+2+2+2



Unit-II

- 4. (a) What are carbenium and carbonium ions? Give one example for each of them.
 - (b) Explain 'Neighbouring Group Participation' in $S_N 2$ reaction with a suitable example.
 - (c) Give the mechanism for the nitration of benzene with mixed acid reagent and draw the energy profile diagram for the reaction. 3+3+4
- 5. (a) Predict the product with mechanism for the following reactions :



- (b) $PhCH_2Cl$ is a good substrate for both S_N1 and S_N2 reactions. Explain.
- (c) Discuss the stereochemistry of dehydrobromination of *meso*-1,2-dibromo-1,2-diphenylethane with NaOEt in EtOH. Write down the product.

Unit - III

- **6.** (a) Write a short note on hydroboration of alkene. How can you synthesize 1-butanol from 1-butene using this reaction?
 - (b) What is Grignard reagent? How is it prepared? Synthesize the following compounds using a Grignard reagent :
 - (i) Acetic acid (ii) Isopropyl alcohol.

Please Turn Over

(3)

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(c) Convert : H = H + 4 + 2

(4)

- 7. (a) Compare the basicities of pyridine and pyrrole with justification.
 - (b) Give the product along with mechanism for the following reactions :
 - (i) PhCHO + HCHO + NaOH Solution (50%) \longrightarrow
 - (ii) (E) -2-Butene $\xrightarrow{\operatorname{Br}_2/\operatorname{CCl}_4}$.
 - (c) Give the products of following reaction with reason.
 - (i) $NO_2 CH = CH_2 + HBr \longrightarrow$
 - (ii) $CH_3CH = CH_2 + HBr \longrightarrow$

 $3+(2+2)+(1\frac{1}{2}+1\frac{1}{2})$