## 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 $\mathrm{Li}^{+}$in $\mathrm{LiAlH}_{4}$ reduction of carbonyl compounds.
(c) Arrange with explanation, the following compounds in order of increasing dipole moment:

$$
\mathrm{CH}_{3} \mathrm{CH}_{2} \mathrm{Cl}, \mathrm{HC} \equiv \mathrm{CCl}, \mathrm{H}_{2} \mathrm{C}=\mathrm{CHCl}
$$

(d) Explain the terms 'dihedral angle' and 'torsion angle' with a suitable example.
(e) Write down the products of ozonolysis of $\mathrm{CH}_{3}-\mathrm{CH}=\mathrm{CH}-\mathrm{CH}_{2}-\mathrm{CH}=\mathrm{CH}_{2}$.
(f) Draw the orbital picture of $\mathrm{CH}_{2}=\mathrm{CH}-\mathrm{C} \equiv \mathrm{N}$ and indicate the state of hybridization of each carbon atom.
(g) Write down one reaction for the generation of carbenes.
(h) Treatment of Cl with $\mathrm{AgNO}_{3}$ 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?
(l) 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.

## Unit - I

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 $\mathrm{C}=\mathrm{O}$ 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.

(c) Explain why guanidine $(\mathrm{HN}=\mathrm{C}$
(d) Write down the structures of syn-and anti-benzaldoxime.
(e) Give the R/S descriptors of the following compounds indicating the priority sequence of the ligands around the chiral centre.
(i)

(ii)


## Unit-II

4. (a) What are carbenium and carbonium ions? Give one example for each of them.
(b) Explain 'Neighbouring Group Participation' in $\mathrm{S}_{\mathrm{N}} 2$ 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.
5. (a) Predict the product with mechanism for the following reactions:


(b) $\mathrm{PhCH}_{2} \mathrm{Cl}$ is a good substrate for both $\mathrm{S}_{\mathrm{N}} 1$ and $\mathrm{S}_{\mathrm{N}} 2$ 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.

T(I)-Biochemistry-H-1(Mod.-II)
(c) Convert :

$4+4+2$
7. (a) Compare the basicities of pyridine and pyrrole with justification.
(b) Give the product along with mechanism for the following reactions :
(i) $\mathrm{PhCHO}+\mathrm{HCHO}+\mathrm{NaOH}$ Solution $(50 \%) \longrightarrow$
(ii) (E) -2-Butene $\xrightarrow{\mathrm{Br}_{2} / \mathrm{CCl}_{4}}$.
(c) Give the products of following reaction with reason.
(i) $\mathrm{NO}_{2}-\mathrm{CH}=\mathrm{CH}_{2}+\mathrm{HBr} \longrightarrow$
(ii) $\mathrm{CH}_{3} \mathrm{CH}=\mathrm{CH}_{2}+\mathrm{HBr} \longrightarrow$

