



WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 1st Semester Examination, 2022-23

CEMACOR01T-CHEMISTRY (CC1)

ORGANIC CHEMISTRY

Full Marks: 40

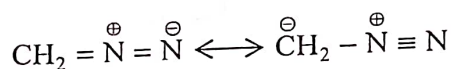
Time Allotted: 2 Hours

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

Answer any *three* questions taking *one* from each unit

UNIT-1

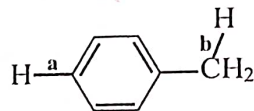
1. (a) Which of the following resonance structures of diazomethane is more stable and why? 2



- (b) Can you compare the stabilities of but-1-ene, *cis* and *trans* but-2-ene and 2-methylpropene by measuring their heat of hydrogenation? If not, why not? What method could you use? 4
- (c) Draw the HOMO of 1,3-butadiene (ground state configuration) and LUMO of 1,3,5-hexatriene (excited state). 3
- (d) Compare the dipole moment of *o*-nitroaniline and *p*-nitroaniline. 2
- (e) Which of the following bromo compound when treated with AgNO_3 solution, is expected to give precipitate of AgBr ? Give reason for your choice. 3

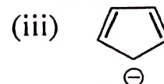
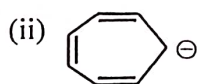
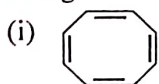


- (f) Compare the bond dissociation energies of the labelled C-H (a & b) bonds in toluene. 2



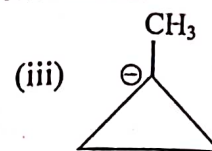
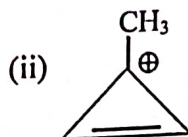
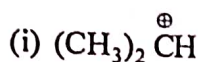
2. (a) Which has the higher dipole moment— (i) allyl bromide or (ii) vinyl bromide? Explain. 3

- (b) Assign the following compounds as aromatic, antiaromatic or nonaromatic. Justify. 3

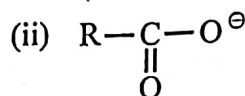
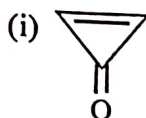


- (c) Mention the state of hybridization of each atom except hydrogen in $\text{CH}_3\text{-CH=C=O}$. Draw the orbital picture of this molecule. 4

(d) Arrange the following ions in order of increasing stability. Give reason.



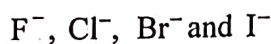
(e) Compare the C=O bond distances in



(f) Compare the H-C-H angles in methyl cation and methyl anion.

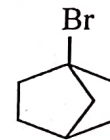
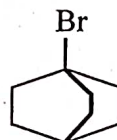
UNIT-2

3. (a) Arrange the following ions in the increasing order of nucleophilicity in (i) DMSO and (ii) ethanol and explain the fact.



(b) What do you mean by ambident nucleophile? Explain with suitable example.

(c) Explain the relative rates of solvolysis (in 80% aqueous ethanol) for the following compounds.



Relative rates: 1

10^{-6}

10^{-14}

4. (a) Despite of 1° -nature of the halide in neopentyl halide, it undergoes very slow $\text{S}_{\text{N}}2$ reaction. — Explain.

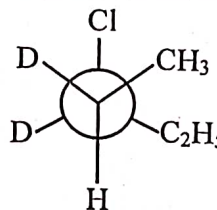
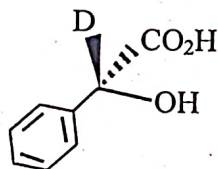
(b) Draw the orbital pictures of singlet and triplet Carbenes. Which state has higher energy and why?

(c) What are carbonium and carbenium ions? Give examples.

UNIT-3

5. (a) Indicate symmetry elements present in (i) *trans*-2-butene (ii) acetylene.

(b) Assign R/S-descriptors for the chiral centres in the following molecules.



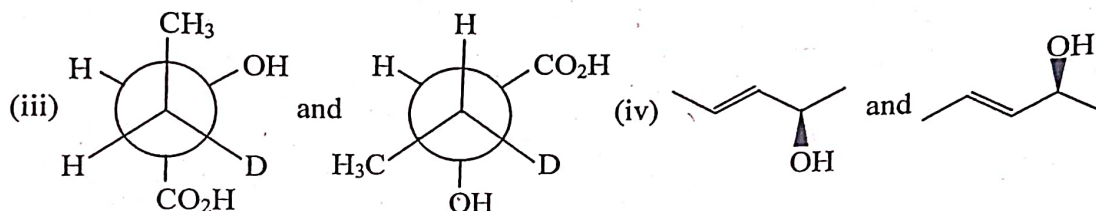
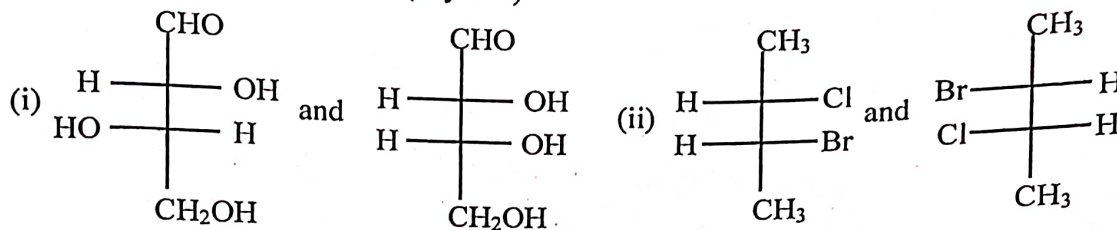
(c) What happens when *R*-1-phenylethyl acetate is treated with acid? Discuss the mechanism of the reaction indicating stereochemical implications.

(d) Give an example of an optically active compound possessing a C_2 -axis. Indicate the axis.

(e) Draw only the achiral stereoisomers of $\text{CH}=\underset{\text{CH}_3}{\text{C}}-\text{CHCl}-\text{CH}=\underset{\text{CH}_3}{\text{C}}$ and assign them

with appropriate configurational descriptors (R/S; E/Z).

6. (a) Does the presence of chiral centre sufficient for a molecule to be optically active? Explain with suitable example. 2
- (b) Outline the method for resolution of (\pm)-lactic acid mixture. 3
- (c) Consider the following pairs of structures and designate each pair as homomer, 2 \times 2=4 enantiomer and diastereomer. (any two)



- (d) Calculate the optical purity of a sample of 2-butanol which has specific rotation $+3.4^\circ$. What is the enantiomeric composition of the above mixture? (Optically pure sample of (R)-2-butanol is 13.6) 3
- (e) $\text{Ph} \begin{array}{c} \text{CH} \\ | \\ \text{Cl} \end{array} - \text{CH}_3$ undergoes racemization when treated with SbCl_5 . Offer an explanation. 2
- (f) Distinguish between racemic modification and racemization with suitable example. 2

—x—