



WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 2nd Semester Examination, 2022

CEMACOR04T-CHEMISTRY (CC4)

ORGANIC CHEMISTRY-II

Time Allotted: 2 Hours

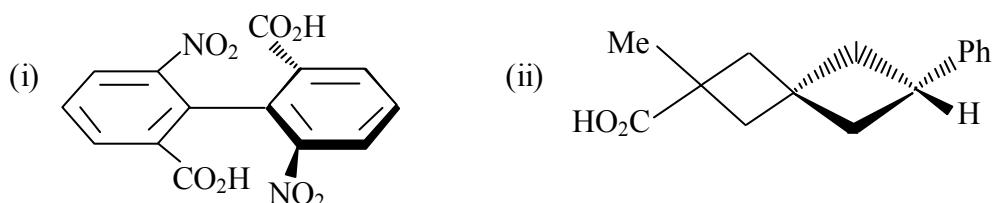
Full Marks: 40

*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

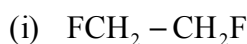
Unit-I

1. (a) Find out (*R/S*) configurational descriptors for the following molecules. 2

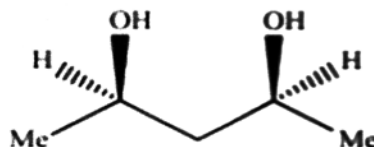


- (b) Draw the Newman projections of all six conformations and show their position in the potential energy diagram for the rotation about the C2–C3 bond in (*R*)-2-iodobutane. 3

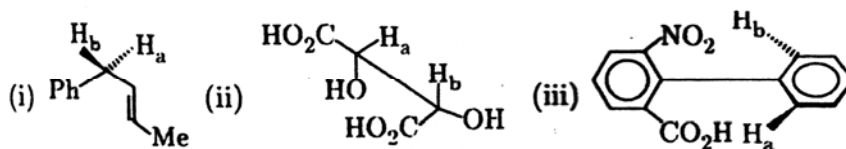
- (c) Draw the most populated conformer of the following molecules. 1+2



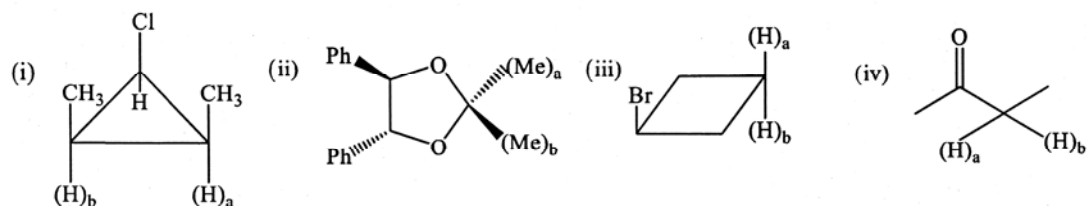
- (d) Write down the compound obtained by substitution of pro-s hydrogen of the following compound by Cl. Also find out the configuration of the chlorine substituted Carbon. 2



- (e) Identify $\mathbf{H_A}$ and $\mathbf{H_B}$ in each of the following structures as homotopic, enantiotopic or diastereotopic ligands with explanation. 3



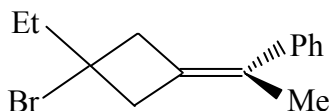
2. (a) Identify the topic relationships (homotopic, enantiotopic or diastereotopic) between the ligands marked 'a' and 'b' in the following compounds. (any **three**) 3



- (b) Draw the three staggered conformations of 1,2-dichloroethane and label each of those with Klyne-Prelog system of conformational terminology. 3
- (c) Draw the s-cis and s-trans conformations of (2S, 3E, 5E, 7S)-2, 7-dibromoocta-3, 5-diene. 2
- (d) Explain the following: The intramolecular H-bonding in *active*-butan-2,3-diol is relatively stronger than that in *meso*-butan-2,3-diol; 2
- (e) Label the marked hydrogen atom (H*) as *pro-R*, *pro-S*, *pro-E* or *pro-Z*. 2

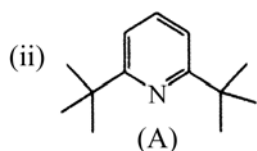


- (f) Find out (*R/S*) configurational descriptor for the following molecule. 1



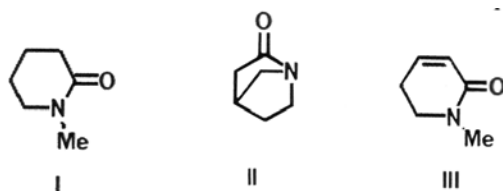
Unit-II

3. (a) Explain the following: 3
- (i) A reaction will not take place at all if ΔH° is positive and ΔS° is negative.

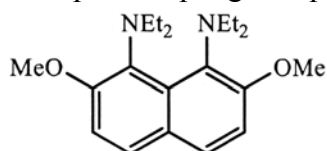


(A) is known as an excellent scavenger of protons.

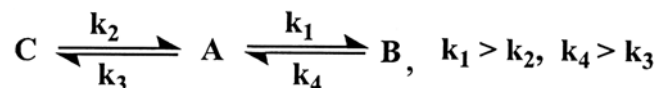
- (b) Cyclic 1, 2-diketones exist mainly in the enol form; Explain. 1
- (c) The enol content of 4, 4, 4-trifluoro-2-butanone is larger than that of 2-butanone. Explain the fact. 2
- (d) Compare the basicity of the following compounds with explanation; 2



- (e) The following compound acts as a proton-sponge. Explain. 2

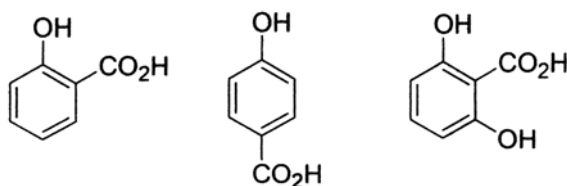


- (f) Reactions of HBr with 1,3-butadiene give the 1,4- and 1,2-addition products at different temps; Explain the mechanism of the reaction stating the reaction conditions for Kinetically controlled product and thermodynamically controlled product. 2
- (g) Why ethyl acetoacetate exist in the enol form much more in hexane than in water? 2
4. (a) Draw the energy profile diagram of the following reaction and offer an explanation in favour of your answer. 4



Where A = reactant, B, C = stable products; k_1, k_2, k_3, k_4 = rates of reactions. Which product is formed at low temperature? Which is the thermodynamically more stable product?

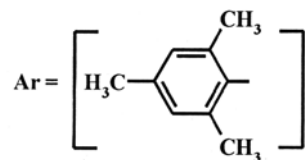
- (b) Arrange the following compounds in increasing order of acid strength and explain. 2



- (c) Bromination of methane is less exothermic than that of chlorination. Explain this statement. 2

[Bond energies (in kcal/mole): C–H = 104; Br–Br = 46; H–Br = 87.5; Cl–Cl = 58; H–Cl = 103; C–Cl = 83.5; C–Br = 71].

- (d) $[\text{Me}_3\text{CO}]_3\text{CH}$ exists almost entirely in the keto form, whereas Ar_2CHCHO exists mainly in the enol form. Explain. 2



- (e) Explain why the following two structures are tautomers but not the resonance forms. 2



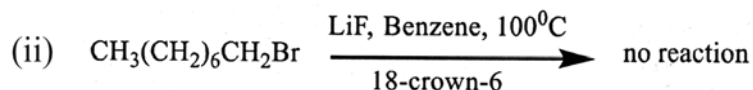
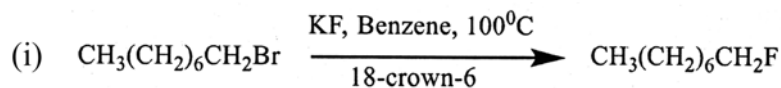
- (f) Arrange the following compounds in the increasing order of basicity and nucleophilicity. 2



Unit-III

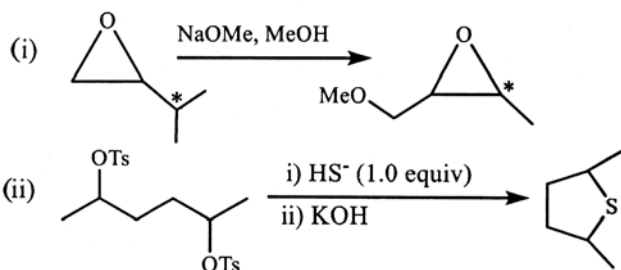
5. Explain the following observations:
- (a) Me_3CH on chlorination using chlorine in diffused sunlight gives primary halide as major monosubstituted product, while bromination by heating with bromine produces tertiary halide as the major product. 2
- (b) Solvolysis of (+) $\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)\text{Cl}$ leads to 98% racemisation whereas solvolysis of (+) $\text{C}_6\text{H}_{13}\text{CH}(\text{CH}_3)\text{Cl}$ gives only 34% racemisation. 2

- (c) BF_3 accelerates the unimolecular substitution reactions of alkyl fluorides but not those of alkyl chlorides. The reverse is true for AgF . 2
- (d) The reaction rate of CH_3I with N_3 at 0°C is increased 4.5×10^4 fold on change of solvent from methanol to DMF. Explain. 2
- (e) $\text{C}_6\text{H}_5\text{SNa}$ reacts with vinyl chloride in presence of NaOEt catalyst. Without NaOEt , the reaction does not occur at all. Explain. 2
- (f) Justify the following observations: 3



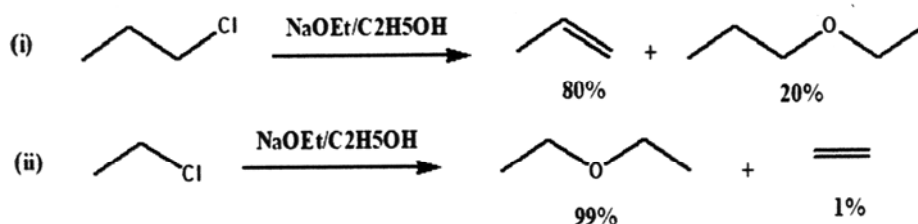
6. (a) Account for the following observations:

2×2 = 4



(b) Explain with mechanisms of the following observations;

3



(c) Predict the product(s) with plausible mechanism in the following cases—

2×3 = 6



N.B. : Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.

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