



**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours 1st Semester Examination, 2021-22

**CEMACOR01T-CHEMISTRY (CC1)**

**ORGANIC CHEMISTRY-I**

Time Allotted: 2 Hours

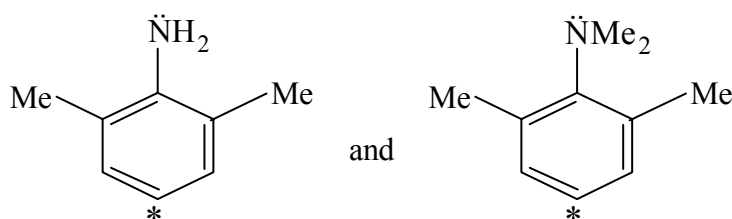
Full Marks: 40

*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**

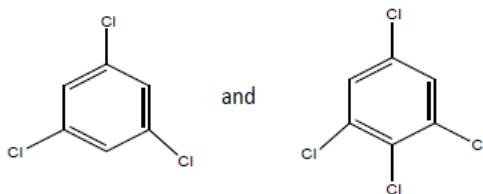
**UNIT-1**

1. (a) Draw the orbital picture of  $O_2N-CH_2-CHO$  and mention the state of hybridization of each atom except hydrogens. 3
- (b) Draw all possible canonical forms of  $EtO_2C-\bar{C}H-\overset{+}{N}\equiv N$  and justify which one is the most stable structure among them. 3
- (c) Draw a properly labelled  $\pi$ -molecular orbital diagram of allylic anion. Indicate the HOMO and LUMO of the molecule in the ground state. 3
- (d) Arrange the following compounds in order of their increasing heat of hydrogenation values with proper reason. 3  
1-hexene, *cis*-3-hexene, *trans*-3-hexene
- (e) Which compound among the following pair has higher electron density at the marked carbon atom? 3

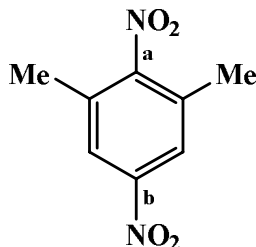


- (f) Calculate the DBE for the molecule with molecular formula  $C_{10}H_7Cl$ . 1
2. (a) Three isomeric pentane molecules have boiling points  $9.5^\circ C$ ,  $28^\circ C$  and  $36^\circ C$ . Match each boiling point with correct isomers and give reason. 3
- (b) Show the species formed in the following two cases and also comment on their stability. 4
  - (i) Cyclooctatetraene is reacted with conc.  $H_2SO_4$
  - (ii) 1,3-cyclopentadiene is reacted with  $NaOH$ .

- (c) Which one of the following pair has the higher dipole moment and why? 2



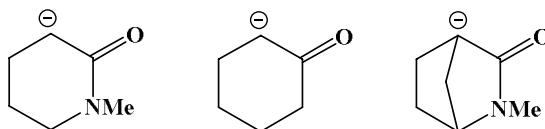
- (d) Compare the bond lengths (a vs b) of the following compound with reason. 3



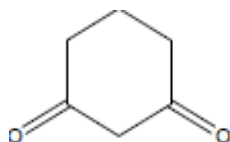
- (e) Compare dipole moments of  $\text{NH}_3$ ,  $\text{NF}_3$  and  $\text{BF}_3$  with explanation. 2
- (f) Draw the Frost diagram for the  $\pi$ -MOs of square planar cyclobutadiene. 2

### UNIT-2

3. (a) Compare the order of nucleophilicity of  $\text{NH}_3$ ,  $\text{H}_2\text{O}$  and  $\text{H}_2\text{N}-\text{NH}_2$ . 2
- (b) Explain the order of stability of the following anions. 2

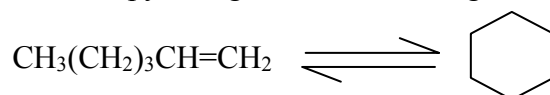


- (c) The following compound is readily soluble in aq NaOH but not in water.— Explain. 2

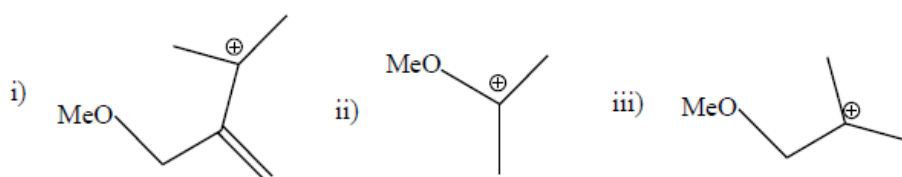


- (d) Compare the stability of the following radicals. 2
- $\dot{\text{C}}\text{F}_3$ ,  $\dot{\text{C}}\text{H}_2\text{F}$ ,  $\dot{\text{C}}\text{H}_3$

4. (a) Predict the sign of the entropy change for the following transformation and justify. 2



- (b) Give the correct order of stability of the following carbocations with explanation. 2



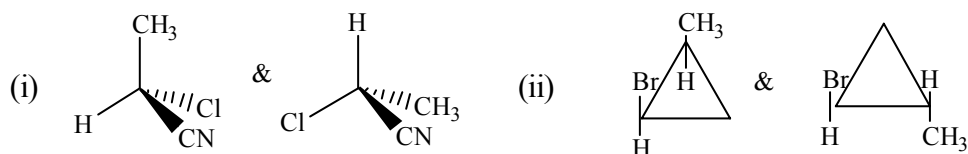
- (c) What are pericyclic reactions? Explain with one example. 2
- (d) Nucleophiles may be charged or neutral species — Justify. 2

## UNIT-3

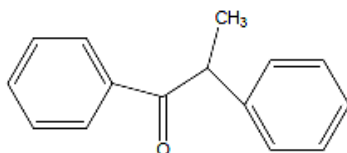
5. (a) Define alternating axis of symmetry with an example. 2
- (b) Draw the following as directed. 2

Erythro-3-amino-2-butanol (*anti*-form in Sawhorse representation)

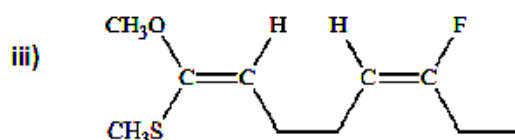
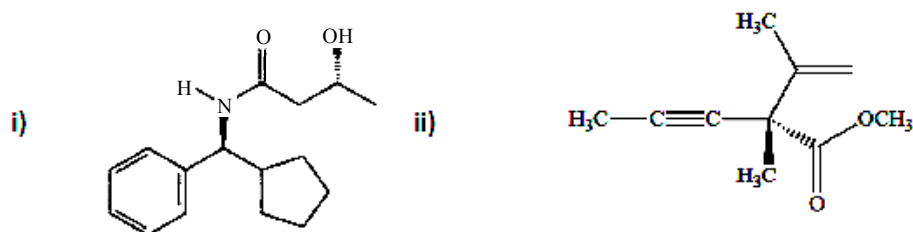
- (c) Label the following pair of molecules as homomer, enantiomer or diastereomer with reason 2+2



- (d) Specific rotation of an enantiomeric mixture is (+) 15.90 and the specific rotation of the R-enantiomer is  $-38.90$ , determine the percentage of each isomer in the mixture. 3
- (e) Define the term “Stereogenic center”. Are centres of stereogenicity always centres of chirality? Explain with suitable example. 3
- (f) The following optically active ketone loses its optical activity when treated with a little base. Explain showing the mechanism. 2

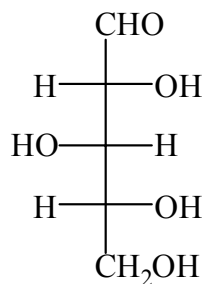


6. (a) What is diastereoisomer? Explain with an example. 2
- (b) Give examples of molecules having  $D_{3h}$  and  $C_{3h}$  point groups. 2
- (c) Label each  $sp^3$  stereocenter, as R or S and each alkene as E or Z. 1+1+2



(d) Convert the following Fischer projection to *zig-zag* projection.

3



(e) What are the symmetry elements present in *trans*-1,2-dichloroethene?

2

(f) Explain whether the following compounds are resolvable or not?

3

(i)  $\text{H}_3\text{CCH}=\text{C}=\text{CHCH}_3$  (ii)  $\text{PhN}(\text{Me})\text{Et}$ .

**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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