



**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours 1st Semester Examination, 2020, held in 2021



**CEMACOR01T-CHEMISTRY (CC1)**

Time Allotted: 2 Hours

Full Marks: 40

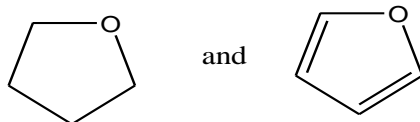
*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

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

**UNIT-1**

1. (a) Draw the orbital picture of  $\text{H}_2\text{C}=\text{CH}-\text{CN}$  mentioning the hybridization of each carbon atom and nitrogen atom. 3

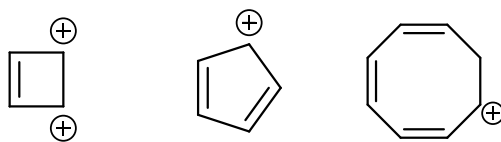
- (b) Which of the following compound has higher solubility in water and why? 2



- (c) Draw all possible canonical forms of  $\text{Me}_2\text{N}-\overset{+}{\text{C}}\text{HOCH}_3$  and justify which one is the most stable and which one is the least stable among them. 3

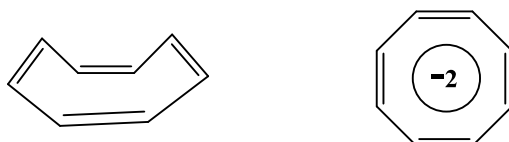
- (d) Draw a properly labeled  $\pi$ -molecular orbital diagram of 1, 3-butadiene. Indicate the HOMO and LUMO of the molecule in the ground state. 3

- (e) Classify the following molecules as non-aromatic, aromatic, antiaromatic or homoaromatic with reason. 3

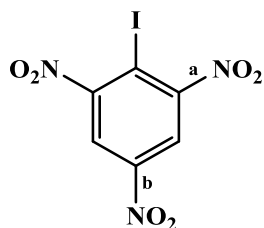


- (f) "Heat of combustion and not heat of hydrogenation is more suitable to compare the stability of 1-butene, 2-butene and isobutene" — Justify with the help of energy diagram. 2

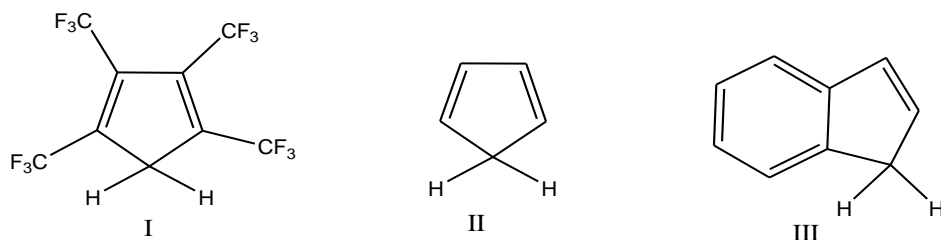
2. (a) Cyclooctatetraene is non-planar but its dianion is planar. Explain. 2



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



- (c) Arrange the following compounds in order of increasing  $pK_a$  values with explanation. 3



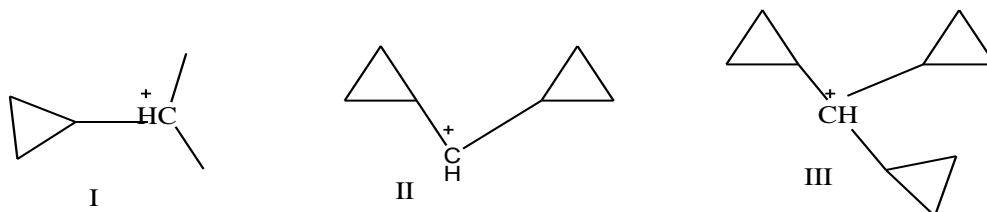
- (d) Could you compare the stabilities of pent-1-ene, cis- and trans-pent-2-enes and 3-methyl-but-1-ene by measuring their heat of hydrogenation? Explain. What method would you use? 3
- (e) Calculate the DBE of a compound with molecular formula  $C_6H_3Cl_2ON$ . 2
- (f) Three isomeric chlorotoluenes have  $\mu$  values 1.3D, 1.9D and 1.8D. Assign which is which with proper explanation. 3

### UNIT-2

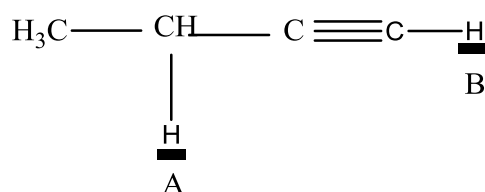
3. (a) Compare the order of nucleophilicity of  $EtO^-$ ,  $PhO^-$ ,  $MeCOO^-$ . 2
- (b) What do you mean by homolytic bond fission? Compare the energy required for homolytic fission of following C-H bonds (indicated as a, b, c). 2



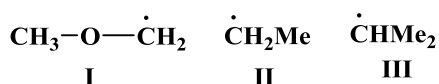
- (c) Arrange the following carbocations in increasing order of stability and justify. 2



- (d) Which one of the marked protons (A and B) in the following compound is more acidic and why? 2



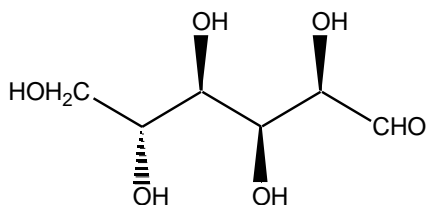
4. (a) All electrophiles are positively charged – justify or criticize the statement. 3  
 (b) Explain the order of stability of the following radicals. 2



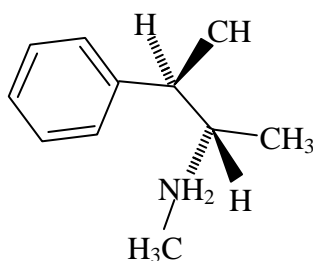
- (c) Write down the structural features of the singlet and triplet carbenes mentioning the hybridization involved herein. 3

### UNIT-3

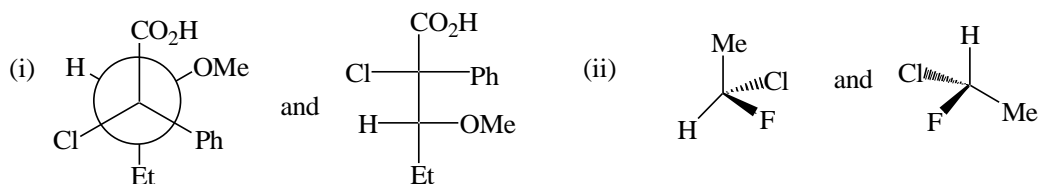
5. (a) Draw all stereoisomers of  $\text{CH}_3\text{CH}=\text{CH}-\text{CHBr}-\text{CH}=\text{CHCH}_3$  and comment on their optical activity. 3  
 (b) What are asymmetric and dissymmetric molecules? Illustrate with suitable examples. 3  
 (c) Convert the following zig-zag projection to Fischer projection. 2



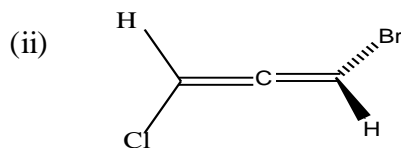
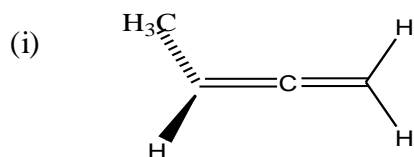
- (d) Draw the Flying wedge formula of the following. 3  
 (i) (R)-2-Deuteropropanoic acid  
 (ii) (2R, 3S)-3-phenyl-2-butanol  
 (e) An optically pure sample of (R)-2-butanol shows a specific rotation of  $-13.6^\circ$ . What relative molar proportion of (S)-2-butanol and (R)-2-butanol would give a specific rotation  $+6.8^\circ$ ? 3  
 (f) Assign the R/S of the chiral center of the following compound 2



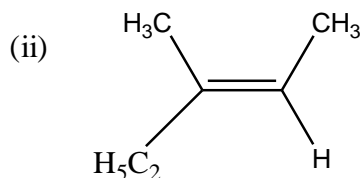
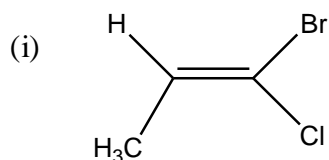
6. (a) Define center of symmetry with an example. 2  
 (b) Draw the *anti*-form in Sawhorse and Newmann projection of threo-3-bromobutan-2-ol. 3  
 (c) Label the following pair of molecules as homomer, enantiomer or diastereomer 2+1



(d) Comments on the optical activity of the following compounds with justification. 3



(e) Assign E/Z descriptor to the following stereostructures 2



(f) What are the differences between configurations and conformations? Explain with suitable example(s). 3

**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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