

**2024/TDC (CBCS)/EVEN/SEM/
CHMHCC-201T/299**

TDC (CBCS) Even Semester Exam., 2024

CHEMISTRY

(2nd Semester)

Course No. : CHMHCC-201T

(Organic Chemistry)

Full Marks : 50

Pass Marks : 20

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

UNIT—I

- 1.** Answer any two questions from the following: 2×2=4

(a) The central bond of buta-1,3-diyne is 137 pm whereas a normal C—C bond length is 154 pm. Account for this difference in bond lengths.

(b) Acyl cation has resonating structures (I) and (II) :



Which structure is more stable and why?

(2)

- (c) Which of the following is a better nucleophile? Give reason :

(i) $\text{Cl}^{(-)}$ or (ii) $\text{Br}^{(-)}$

2. Answer either (a) or (b) :

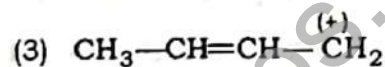
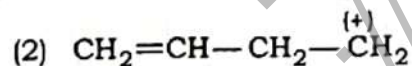
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- (a) (i) Select the compounds from the following which have sp^3 -, sp^2 - and sp -hybridization : $\frac{1}{2} \times 4 = 2$

NH_3 , H_2O , $\text{HC}\equiv\text{CH}$, C_6H_6

- (ii) What are carbenes? Explain the multiplicity of carbenes. $1+1=2$

- (iii) Buta-1,3-diene when accepts a proton, an allylic cation is formed. Which one of the following does not represent a resonance structure? Give reason for your choice : 2



- (b) (i) Bring out the differences between inductive effect and mesomeric effect. 2

(3)

- (ii) Pickup the electrophile and nucleophile from the following : 2

(1) $:\text{CCl}_2$

(2) $\ddot{\text{N}}\text{H}_3$

(3) BF_3

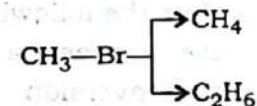
(4) AlCl_3

- (iii) What is ambident nucleophile? Explain with example. 2

UNIT—II

3. Answer any two questions from the following : $2 \times 2 = 4$

- (a) Carry out the following single-step conversions :



- (b) (i) When alkanes are heated, C—C bonds break rather than C—H bond. Explain why.

- (ii) Identify the product in the following reaction :



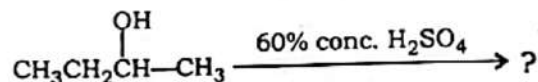
- (c) Why does HI not show peroxide effect?

(4)

4. Answer either (a) or (b) :

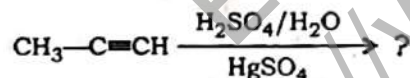
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- (a) (i) Predict the major product and propose a reasonable mechanism for the following reaction : $2\frac{1}{2}$

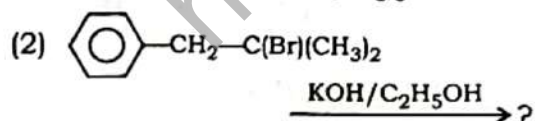
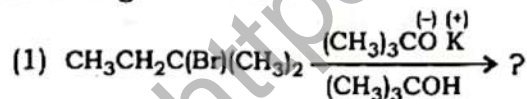


- (ii) Describe E1cB mechanism with an example. $2\frac{1}{2}$
- (iii) What product is predominantly formed when HBr adds to 1-phenylpropene? (Write the equation and name of the product) 1

- (b) (i) What is Diels-Alder reaction? Give an example. $1\frac{1}{2}$
- (ii) Complete the following reaction and propose a reasonable mechanism for the conversion : $2\frac{1}{2}$



- (iii) Predict the major products of the following reactions : $1 \times 2 = 2$



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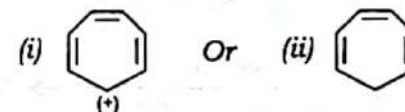
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UNIT—III

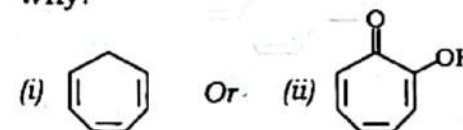
5. Answer any two questions from the following : $2 \times 2 = 4$

- (a) Benzene is an unsaturated hydrocarbon but failed to give addition reactions. Explain.

- (b) Which of the following is aromatic? Justify :



- (c) Which of the following is anti-aromatic? Why?



6. Answer either (a) or (b) :

6

- (a) (i) Visualize the mechanism of nitration of benzene including generation of electrophile for the reaction. 3

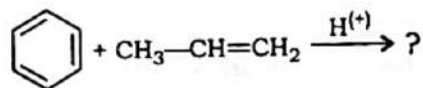
- (ii) How will you justify that naphthalene contains two ortho-fused benzene ring? 3

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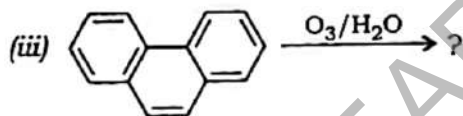
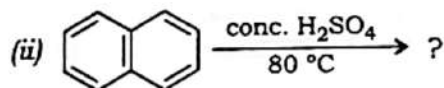
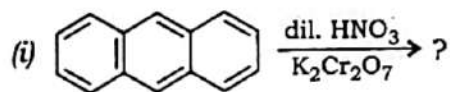
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(6)

- (b) (i) Complete the following reaction and propose its mechanism : 3



- (ii) Complete the following reactions : 1×3=3



UNIT—IV

7. Answer any two questions from the following : 2×2=4

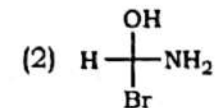
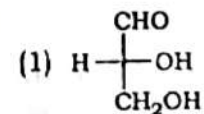
- (a) Explain specific rotation.
- (b) What is optical activity? What is essential requirement for a substance to be optically active?
- (c) Distinguish between enantiomer and diastereomer.

(7)

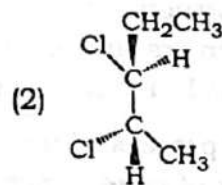
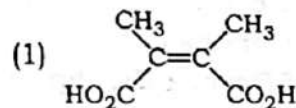
8. Answer either (a) or (b) : 6

- (a) (i) 1,2-dichloroethene exists in two geometrical isomeric forms. One of the isomers has a dipole moment of $\mu = 1.85\text{D}$ while the dipole moment value of the other isomer is $\mu = 0$. Draw the structures of these two different isomers and explain their different dipole moment values. 3
- (ii) What is the process of separation of components of enantiomers called? Discuss the principle of chemical method of separation of components of enantiomers from their mixture. $\frac{1}{2} + 1\frac{1}{2} = 2$
- (iii) Represent the *erythro*-2,3-dihydroxy butanoic acid in (1) Fischer and (2) Newmann projection formulae. $\frac{1}{2} + 1\frac{1}{2} = 1$

- (b) (i) What is a *meso*-compound? Why are *meso*-compounds optically inactive? 1+1=2
- (ii) Assign the configurations, whether R or S to the following : 1+1=2



- (iii) Draw the diastereomers for each of the following compounds : 1+1=2



UNIT—V

9. Answer any two questions from the following : 2×2=4

- (a) Chair conformation of cyclohexane is more stable than boat conformation. Explain.
- (b) Cyclopropane is least stable member of cycloalkanes. Justify.
- (c) Depict the most stable conformers for the following :

(i) *cis*-1-tert-butyl-3-methyl
cyclohexane

(ii) *trans*-1-tert-butyl-3-methyl
cyclohexane

10. Answer either (a) or (b) :

6

- (a) Discuss chair- and boat-conformation of cyclohexane. What are axial and equatorial bonds? Why is its equatorial substituted chair-conformation more stable than the axial substituted chair-conformation? 2+2+2=6

- (b) Compare the stabilities of *cis*- and *trans*-cyclohexane-1,3-diol by drawing the conformations and with proper reasoning. 6
