

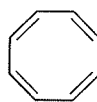
B.Sc.-M.Sc. Integrated Program
Semester-I Examination, 2021
Paper Title: Basics of Chemistry
Paper Code: BCH-CC2-TH

Time: Three Hours

Max Marks: 75

Attempt all questions. Use only A4 sheets. All parts of a question must be attempted in continuation. Start answer of a fresh question on a new page. Cite examples and draw labelled diagrams wherever necessary.

Q1. Answer all the questions given below (a-j) (1.5x10= 15)

- a. Number of bond pair and lone pair electrons present on N atom in NO_3^- are
(A) 3, 1 (B) 4, 0 (C) 2, 2 (D) 1, 3
- b. In BrF_3 molecule the lone pairs occupy an equatorial position to minimise
(A) lone pair-bond pair repulsion only
(B) bond pair-bond pair repulsion only
(C) lone pair-lone pair repulsion and lone pair-bond pair repulsion
(D) lone pair-lone pair repulsion only
- c. If the water molecule is linear
(A) it would have a very high boiling point (B) it would be highly reactive
(C) its dipole moment would be zero (D) it would be highly ionic
- d. What is the hybridisation of each carbon in $\text{H}_2\text{C}=\text{C}=\text{CH}_2$?
(A) SP , SP^2 , SP^3 (B) SP , SP^2 , SP^3 (C) SP^2 , SP^2 , SP^2 (D) SP^2 , SP , SP^2
- e. Which of the following is aromatic?
(A)  (B)  (C)  (D) 
- f. Arrange the hydrocarbons of the following hybridizations in the increasing order of their acidity.
 SP^2 SP SP^3
- g. What is a meso compound?
- h. The shape of PCl_5 molecule is _____
- i. State the hybridization and geometry of carbanion.
- j. Draw the Lewis dot structures of Carbon monoxide and acetylene.

Q2. Attempt ANY TWO of the following:

(7.5x2=15)

- A. Explain briefly of the following: (i) Lattice Energy (ii) Solvation energy (iii) Fajan's rule (iv) Bond polarity, and (v) Born Haber Cycle?

- B. Discuss the effect of chemical forces on physical properties like melting and boiling points?
- C. Using Molecular Orbital diagram discuss the magnetic properties and bond strength for the following molecules (i) NF, (ii) OF, (iii) CH₄, (iv) BH₃, and (v) XeF₆?
- D. Describe the types of bonds and orbitals in acetone, (CH₃)₂CO?

Q3. Attempt ANY TWO of the following:

(7.5x2=15)

- A. What are the limitations of First law of thermodynamics?
- B. Differentiate between reversible and cyclic process.
- C. Define thermodynamic. What is system and surrounding?
- D. Why entropy of perfectly crystalline substance is taken as zero at absolute zero?

Q4. Write a detailed note on ANY TWO of the following:

(7.5x2=15)

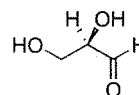
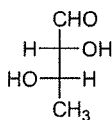
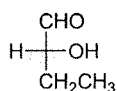
- A. Factors influencing the stability of carbocations.
- B. Hydrogen bonding.
- C. Describe different types of hybridizations with suitable examples.
- D. What are intermolecular forces? Explain about the following intermolecular forces.
 - (i) Dipole-Dipole interaction forces
 - (ii) London forces

Q5. Answer ANY TWO of the following:

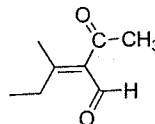
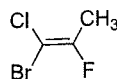
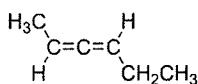
(7.5x2=15)

- A. Explain the various methods of resolution of a racemic mixture.
- B. (a) Define the terms optical activity, optical rotation, dextrorotation, levorotation and specific rotation.
 (b) 0.3gm of an optically active compound is dissolved in 15mL of chloroform and the resulting solution was taken in 10cm polarimeter tube. The optical rotation of the solution was measured as +0.96°. Calculate the specific rotation of the compound.
- C. Draw the conformational energy diagram for ethane and highlight the relative stabilities of the conformers.
- D. Assign configurations of the following compounds.

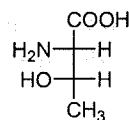
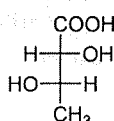
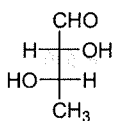
R/S Configuration:



E/Z Configuration:



D/L Configuration:



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