

Roll No.

Total Pages : 3

BT-2/M-22

42034

CHEMISTRY

Paper-BS-101A

Time Allowed : 3 Hours]

[Maximum Marks : 75

Note : Attempt five questions in all, selecting at least one question from each Unit. All questions carry equal marks.

UNIT-I

1. (a) Write the main features of Molecular Orbital Theory. Using this theory, explain that out of following species. Which has the shortest bond length- CO^{+1} , CO and CO^{-1} . 7
- (b) Describe pi-molecular orbitals of benzene and also explain stability of benzene. 5
- (c) Define Aromatic compounds. Describe different types of aromatic compounds with examples. 3
2. (a) Describe Band theory for solids. Give the different types of solid based on Band theory. Also explain the semiconductors in detail. 8
- (b) Write a note on Crystal Field Theory. Explain the magnetic behaviour of $[\text{Co}(\text{NH}_3)_6]^{3+}$ using this theory. 7

UNIT-II

3. (a) Explain the following : $4\frac{1}{2} \times 2 = 9$
 - (i) MRI and its applications.

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- (ii) Molecular vibrations in IR spectroscopy.
- (b) Define following terms : $1\frac{1}{2} \times 4 = 6$
- (i) Chemical shift.
 - (ii) Hyperchromic shift.
 - (iii) Bathochromic shift.
 - (iv) Hypsochromic shift.
4. (a) Describe the electromagnetic spectrum. Also explain various electronic transitions possible in different organic molecules. 7
- (b) Write note on the following : $4 \times 2 = 8$
- (i) Fluorescence and its applications.
 - (ii) Scattering of light and its significance.

UNIT-III

5. (a) On basis of VSEPR theory, account for the following order of bond angles. 3
- $H_2O > H_2S > H_2Se.$
- (b) Why CuCl is less soluble in water than NaCl. 3
- (c) Define term. Electronegativity. Describe the factors affecting Electronegativity. Also give its significance. 6
- (d) Give the reason for filling of 4s orbital earlier than 3d orbital using the concept of Effective Nuclear charge. 3
6. (a) Derive Nemst equation. Give its significance also. 5
- (b) Write different statements for Second Law of thermodynamics. 2

- (c) Derive an equation/expression for change in Entropy of an ideal gas. 5
- (d) Calculate entropy increase in the evaporation of one mole of water at 100°C. Heat of vaporisation of water at 100°C is 2259.4 J/gram. 3

UNIT-IV

7. (a) Define the term-Isomer. Explain different types of structural isomers with suitable examples. 6
- (b) Give differences between Diastereomers and Enantiomers using proper examples. 4
- (c) What is β -elimination. Distinguish between E_1 and E_2 mechanism of elimination taking suitable examples. 5
8. Write notes on the following :
- (a) Free radical substitution reaction.
- (b) CIP rules for assigning priorities in R/S configuration system.
- (c) Conformations of Cyclo hexane.
- (d) Ring-opening reaction. 4,3,5,3