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 thoery, 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 $[C_O(NH_3)_6]^{3+}$ using this thoery.   7

UNIT–II

3. (a) Explain the following : $4\frac{1}{2}\times 2=9$

        (i) MRI and its applications.

(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
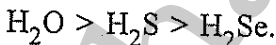
   (b) Write note on the following : $4 \times 2 = 8$

     (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-elemination. 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 priorites in R/S configuration system.

(c) Conformations of Cyclo hexane.

(d) Ring-opening reaction.   4,3,5,3