Roll No. ..... Total Pages : 3

BT–1/D-24 **41037**

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) Explain the Splitting of d-orbitals for square planer complexes, citing an example, on the basis of Crystal field theory. 6

   (b) Explain the Magnetic behavior of $[Co\ (NH_3)_6]^{3+}$ with the Energy level diagram on the basis of Crystal Field Theory. 6

   (c) Differentiate between Bonding molecular orbitals and anti-bonding molecular orbitals. 3

2. (a) Write the key features of molecular orbital theory. Using Molecular Orbital energy level diagram, explain the bond length order of N_2 and N_2^+. 7

   (b) Define Aromaticity in Organic compounds. Explain different types of aromatic compounds with examples. 3

(c) Describe Band theory. Explain different type of solids on the basis of Band theory with examples. 5

UNIT–II

3. (a) Describe Lambert- Beer law for absorption of light. Define terms- Chromophore, Auxochrome and hypsochromic and hyperchromic shift with examples wherever possible. 10

(b) Describe the scattering of light and give its significance. 5

4. Write short notes on the following :

(a) Fluorescence and Phosphorescence. 7

(b) Principle of NMR spectroscopy and key features of NMR spectrum. 8

UNIT–III

5. (a) Define Free energy. Also differentiate between Gibbs free energy and Helmholtz free energy. Derive the equation for variation of Gibb's free energy for an isothermal process. 7

(b) Derive Nernest Equation and describe its applications. 4

(c) Describe the shapes and geometries of H_2O and NH_3 on the basis of VSEPR theory. 4

6. Describe following in detail : 3×5=15

(a) Fajan's rule for polarization.

(b) Hard/soft acid and bases.

(c) Electronegativity.

UNIT–IV

7. (a) Describe the Mechanism of free radical and electrophillic addition reaction with the help of suitable examples. 8

(b) Explain the Properties, Method and Mechanism of preparation of Paracetamol. 7

8. (a) Define the term Isomerism. Differentiate between Configurational isomers and Conformations. Explain different conformations possible for butane molecule. Types of structural isomers with examples. 6

(b) What are Geometrical isomers ? Explain the rules for assigning E/z configurations to these isomers. 4

(c) Explain Cyclization and Reduction reactions for organic compounds with examples. 5