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BT-2/M-23 42034

CHEMISTRY

BS-101A

Time : Three 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) What are Aromatic compounds ? Describe the conditions an organic compound must fulfill to be an aromatic compound. Give examples also. 4

   (b) Explain pi- molecular orbitals of Benzene on the basis of Molecular orbital theory. 4

   (c) Classify the solids on the basis of band structure. Also explain different types of semiconductors. 7

2. (a) Explain the magnetic behaviour of $[Co(NH_3)_6]^{+3}$ on the basis of Crystal field theory. Also describe the octahederal splitting of d-orbitals with diagram. 6

(b) Write the postulates of Molecular orbital theory. Calculate the bond order for N_2, N_2^+ and N_2^- using Molecular orbital energy level diagram of N_2. 7

(c) Differentiate between Atomic orbitals and molecular orbitals. 2

Unit II

3. (a) What is the principle of IR spectroscopy ? Explain different molecular vibrations feasible in a molecule that are considered in Vibrational spectroscopy. 6

(b) Which radiations are used for electronic spectroscopy ? Also explain various electronic transitions that can occur in an organic molecule with example. 6

(c) What is the difference between Phosphorescence and fluorescence ? 3

4. Write notes on the following : 5+4+6

(a) NMR spectrocopy

(b) Jablonski diagram

(c) Diffraction and scattering of light.

Unit III

5. (a) Define Entropy. Write its units. How entropy changes for an ideal gas when temperature and pressure change at constant volume ? 6

(b) Derive Nernst equation and write its significance. 5

(c) Define the terms-Electrode potential, concentration cell, Gibbs' free energy and electrochemical series. 4

6. (a) Why is there variation in bond angle in NH_3 and NF_3 ? Explain on the basis of VSEPR theory. 3

(b) Define Polarisation and polarisability. Which one is more polar–Sodium chloride or silver chloride and why ? 4

(c) Define Effective nuclear charge. Calculate effective nuclear charge for d-electron of Iron. 4

(d) What is the difference between Ionisation energy and Elèctronegativity ? Explain with suitable examples. 4

Unit IV

7. (a) Differentiate between E_1 and E_{1cb} mechanism of elimination reactions using proper examples. 6

(b) Describe the synthesis of Paracetamol with mechanism. 5

(c) Define cyclisation reaction and ring opening reaction. Also cite some examples to support your answer. 4

8. (a) What are optically active compounds ? Describe enantiomers, meso compounds and diastereomers. 7

(b) Explain chair and boat conformation of cyclohexane. Which one is more stable and why ? 5

(c) Write Fischer projection of the following compounds :

(i) (S)- 2-Bromopropanoic acid

(ii) (R)- 2-Chloro-2-hydroxyethanal. 3