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Roll No. ..... Total Pages : 04

BT-1/D-22 41037

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) Define aromaticity. Write down the requirements for a compound to be aromatic. Explain different types of aromatic compounds citing suitable examples. **5**

(b) Write the postulates of Molecular Orbital theory. Explain the Linear combination of atomic orbitals to form molecular orbitals. Also explain the bond length in CO+ and CO molecules with molecular orbital enegry level diagrams. **10**

2. (a) Explain the splitting of *d*-orbitals in transition metal compounds in the tetrahedral and octahedral ligand field strength. Also explain the magnetic behaviour of any octahedral metal complex using Crysrtal Field theory. **10**

(b) Define doping in semiconductors. Differentiate between *n*-type and *p*-type semiconductors. 5

Unit II

3. Describe the following : 3×5=15

(a) Phosphorescence and Fluorescence

(b) Scattering of light and diffraction

(c) Differentiate types of electronic transitions possible in an organic molecule.

4. (a) Give another name for Vibrational Spectroscopy. Explain the various vibrational transitions occurring in an organic molecule. 6

(b) What the name of compound used as standard for taking NMR spectra of organic compounds. Also explain, why is it used. 4

(c) Define the term Spectroscopy. Explain the basic principle of NMR spectroscopy. 5

Unit III

5. (a) Write the postulates of VSEPR theory. Explain the difference in bond angle of the following using this theory : 6

(i) NH_3 and NF_3

(ii) H_2O and F_2O

(b) Derive Nernst equation and explain its applications. **5**

(c) Define free Energy. Write its types and explain the basic different between them. **4**

6. (a) Describe Fajan's rule for explaining polarizability of bond in different molecules. **6**

(b) Explain using the concept of effective nuclear charge and taking suitable examples, why electrons are filled first in $4s$ in place of $3d$ while writing electronic configuration and also the electron is removed first from $4s$ in place of $3d$ while converting an atom to cation ? **5**

(c) Define term Entropy. Justify the statement — "Entropy change for a reversible process is always zero while it is positive for an irreversible process." **4**

Unit IV

7. (a) Define the term isomer. Write the difference between structural isomers and seteroisomers with examples. Also explain the different types of structural iosmers using proper examples. **8**

(b) Write the general reaction, procedure and mechanism for the synthesis of Paracetamol. **7**

8. Differentiate between the following using suitable examples : **3×5=15**

(a) Diastereomers and Enantiomers

(b) E1 and E2 mechanism for elimination reactions

(c) Electrophilic addition reaction and nucleophilic addition reactions.