AT–402

B.Sc. (Part-III) Semester-VI Examination

6S : CHEMISTRY (NEW)

Time : Three Hours] [Maximum Marks : 80

Note :— (1) **ALL** questions are compulsory.

(2) Question No. **1** carries **8** marks while each of the remaining questions carries **12** marks.

(3) Draw diagrams and write equations wherever necessary.

(4) Use of scientific calculator is allowed.

1. (A) Fill in the blanks : 2

(i) In the nickel carbonyl, the oxidation state of nickel is _____.

(ii) The peak corresponding to the most abundant ion in the mass spectrum of a compound is called _____.

(iii) The angular part of p-orbitals depends on zenith angle (θ) and _____.

(iv) Electrochemistry is the branch of chemistry which deals with the interconversion of chemical energy and _____.

(B) Select the correct alternative : 2

(i) Heme is a porphyrin complex of :

(a) Fe (II) (b) Fe (III)

(c) Mg (II) (d) Zn (II)

(ii) How many NMR signals would be given by the compound $(CH_3)_2CHCH_2CH_3$?

(a) 3 (b) 4

(c) 5 (d) 2

(iii) Classical mechanics does not provide satisfactory explanation for :

(a) Black body radiation (b) Photoelectric effect

(c) Heat capacity of solid (d) All the above

(iv) Increase in the intensity of absorption in uv-visible spectrum is called :

(a) Hypsochromic shift (b) Bathochromic shift

(c) Hyperchromic shift (d) Hypochromic shift

(C) Answer in one sentence : 4

(i) What is paper chromatography ?

(ii) What is chemical shift ?

(iii) What are magic numbers ?

(iv) What is threshold frequency ?

UNIT—I

2. (A) Explain the nature of ligands affecting the stability of complexes. 4

(B) Draw the block diagram of spectrophotometer and explain its working. 4

(C) What is chromatography ? Explain the process of descending paper chromatography. 4

OR

3. (P) Explain the term labile and inert complexes with examples. 4

(Q) Explain SN^2 dissociative mechanism for octahedral complexes. 4

(R) What is R_f value ? What are the factors affecting it ? 4

UNIT—II

4. (A) Explain the structure of nickel tetracarbonyl on the basis of hybridization. 4

(B) Explain the role of Ca^{2+} ions in metabolic activities. 4

(C) What are inorganic polymers ? Give their classification on the basis of types of reactions. 4

OR

5. (P) Explain the nature of metal-carbon bond in carbonyls. 4

(Q) What is the action of following on iron pentacarbonyl :

(i) heat and

(ii) HCl ? 4

(R) What are silicones ? Give the preparation of linear silicone polymer. 4

UNIT—III

6. (A) Illustrate with diagram the different types of bending vibrations. 4

(B) Explain the different types of electronic transitions that occur in ultraviolet region with suitable diagram. 4

(C) Define the terms with suitable example :

(i) Auxochrome

(ii) Hypsochromic shift. 4

OR

7. (P) Differentiate the following pairs of compounds on the basis of IR spectroscopy :
   (i) Acetaldehyde and acetone
   (ii) Acetamide and acetic acid. 4

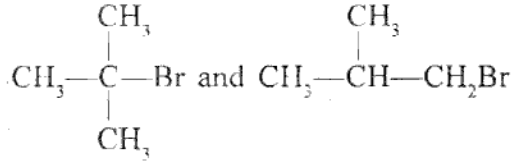
   (Q) What types of electronic transitions do you expect in each of the following ?
   (i) $CH_3CH_2CH_2OH$
   (ii) CH_3CN
   (iii) $CH_3CH_2CH_3$
   (iv) CH_3CH_2Br 4

   (R) Arrange the following compounds in the increasing order of their λ_{max} values. Give reasons.
   (i) Cyclohexatriene
   (ii) Cyclohexane
   (iii) 1, 3-cyclohexadiene. 4

UNIT—IV

8. (A) Explain equivalent and non-equivalent protons with suitable example. 4

   (B) How will you distinguish the following pairs of compounds by NMR spectra in high resolution ?
   (i) $CH_3CH_2CH_2Br$ and $CH_3CHBrCH_3$

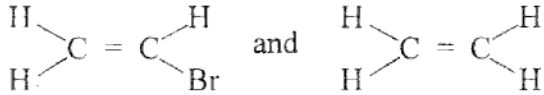
   (ii)  4

   (C) Calculate m/z value for each of the following :
   (i) $[CH_3COCH_3]^+$
   (ii) $[C_6H_5CHO]^+$ 4

OR

9. (P) Explain the terms :
   (i) Molecular ion
   (ii) Base peak. 4

   (Q) How many peaks are observed in high resolution NMR spectra for methyl ethyl ether ($CH_3—O—CH_2—CH_3$). 4

   (R) How will you distinguish the following pairs of compounds by NMR spectra ?
   (i) 
   (ii) CH_3COCH_3 and CH_3CHO 4

UNIT—V

10. (A) State and explain Heisenberg's uncertainty principle. 4

(B) State and explain Compton's effect. 4

(C) What is the ground state energy of an electron in one dimensional box of width 1.0×10^{-10} m ?

(Given : m = 9.1×10^{-31} kg, h = 6.626×10^{-34} Js) 4

OR

11. (P) Derive Schrodinger's wave equation for one dimension. 4

(Q) Define :

(i) Photoelectric effect

(ii) Atomic orbitals. 4

(R) A particle having wavelength 6.6×10^{-6} m is moving with velocity 10^4 ms^{-1}. Find the mass of the particle. 4

UNIT—VI

12. (A) How is hydrogen electrode used for the determination of pH of the solution ? 4

(B) Define :

(i) Potentiometric titrations

(ii) Concentration cells. 2×2=4

(C) Discuss the nuclear shell model. 4

OR

13. (P) Distinguish between nuclear fission and nuclear fusion reactions. 4

(Q) Give the applications of radioisotopes in :

(i) Agriculture

(ii) Medicine. 4

(R) What are the advantages and disadvantages of quinhydrone electrode ? 4