AS–1476

B.Sc. Part—III Semester—VI Examination

CHEMISTRY (New)

Time : Three Hours] [Maximum Marks : 80

Note :— (i) **All** questions are compulsory.

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

(iii) Draw diagrams and write equations wherever necessary.

(iv) Use of scientific calculator is allowed.

1. (A) Fill in the blanks :

(i) The complexes in which substitution of one ligand by another takes place rapidly are called as _____ complexes.

(ii) The stretching and _____ vibrations are the fundamental modes of vibrations.

(iii) Uncertainty principle is significant only for _____ particle.

(iv) Nuclear reactions accompanied by the absorption of energy are known as _____ reactions. 2

(B) Select the correct alternative :

(i) What is oxidation state of iron in haemoglobin and myoglobin respectively ?

(a) 3, 2 (b) 2, 2

(c) 2, 3 (d) 3, 3

(ii) Which of the compounds is taken as standard for recording chemical shift ?

(a) Dimesthylsilane (b) Trimethylsilane

(c) Tetramethylsilane (d) Methylsilane

(iii) The nuclear reaction is balanced in terms of _____.

(a) Mass only (b) Mass and energy

(c) No. of atoms (d) None of the above

(iv) Disorder of thyroid glands can be detected by using :

(a) ^{60}Co (b) ^{24}Na

(c) ^{32}P (d) ^{131}I 2

(C) Answer in **one** sentence each :

(i) Define the R_f value.

(ii) What is threshold frequency ?

(iii) What are potentiometric titrations ?

(iv) Define the term chromosphore. 4

UNIT—I

2. (A) Discuss the mechanism of substitution reaction in square planar complexes by solvent as a nucleophile. 4

(B) Give the conditions for validity of Beer's law. 4

(C) What is paper chromatography ? Describe the technique of ascending paper chromatography. 4

OR

3. (P) How does nature of central metal ion affect the stability of complexes ? 4

(Q) Differentiate between colorimeter and spectrophotometer. 4

(R) How will you determine the amount of copper in given solution by colorimetry ? 4

UNIT—II

4. (A) Explain the structure of chromium hexacarbonyl on the basis of hybridization. 4

(B) What are silicones ? Write their applications. 4

(C) Explain the role of K^+ in biological activities. 4

OR

5. (P) What is the action of following on nickel tetracarbonyl :

(i) Heat and

(ii) H_2SO_4 ? 4

(Q) Explain the role of Ca^{2+} in biological activities. 4

(R) What are phosphonitrilic halide polymers ? Write any three applications. 4

UNIT—III

6. (A) Explain the following electronic transitions with suitable examples :
   (i) $\sigma \rightarrow \sigma^*$
   (ii) $\pi \rightarrow \pi^*$. 4

   (B) Calculate the number of fundamental modes of vibrations for the following molecules :
   (i) Water (ii) Ammonia
   (iii) Carbon dioxide (iv) Benzene. 4

   (C) Differentiate the following pairs of compounds on the basis of IR Spectroscopy :
   (i) Acetone and ethanol
   (ii) Acetamide and acetic acid. 4

OR

7. (P) What types of electronic transitions do you expect in each of the following ?
   (i) $CH_3 - CH_3$ (ii) $CH_3 - Cl$
   (iii) $CH_3CH_2 - NH_2$ (iv) $CH_3CH_2CH = CH_2$. 4

   (Q) Define the terms with suitable example :
   (i) Bathochromic shift
   (ii) Hypochromic shift. 4

   (R) In which region of IR, absorption bonds of stretching vibrations occur for the following functional groups ?
   (i) — C = O (ii) — N — H
   (iii) — C — H (iv) — C = C —. 4

UNIT—IV

8. (A) Explain the following terms with an example :
   (i) Chemical shift
   (ii) Spin-spin coupling. 4

   (B) How will you distinguish the following pairs by NMR spectroscopy ?
   (i) CH_3COCH_3 and CH_3CHO
   (ii) CH_3OCH_3 and CH_3CH_2OH. 4

   (C) Calculate m/z value for each of the following molecular ions :
   (i) $[CH_3 - CH_2 - OH]^+$
   (ii) $[CH_3COCH_3]^+$. 4

OR

9. (P) Give the number of NMR signals shown by following compounds :
   (i) Ethyl acetate (ii) 1,3-dichloropropane
   (iii) Isobutane (iv) Cyclobutane. 4
   (Q) Explain the terms :
   (i) Fragmentation
   (ii) Molecular ion. 4
   (R) Predict the multiplicities of the signals in the proton NMR spectra of the following :
   (i) Ethyl bromide
   (ii) Isopropyl bromide. 4

UNIT—V

10. (A) Explain the postulates of Planck's quantum theory of radiation. 4
   (B) What do you understand by dual character of matter ? Derive the de Broglie's equation. 4
   (C) Derive an expression for the energy of a particle in one dimensional box. 4

OR

11. (P) State and explain photoelectric effect. 4
   (Q) Differentiate between classical mechanics and quantum mechanics. 4
   (R) Explain the physical significance of ψ and ψ^2. 4

UNIT—VI

12. (A) What are the advantages and disadvantages of glass electrode ? 4
   (B) Differentiate between nuclear reactions and chemical reaction. 4
   (C) Give the applications of radioactive isotopes in :
   (i) Industry
   (ii) Bioscience. 4

OR

13. (P) Explain the nuclear forces on the basis of meson theory. 4
   (Q) Complete the following nuclear reactions :
   (i) $^{27}Al(\alpha, n)$
   (ii) $^{14}N(p, \alpha)$. 4
   (R) How is quinhydrone electrode used for the determination of pH of the solution ? 4