AP–516

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

6S : CHEMISTRY

Time—Three Hours]   [Maximum Marks—80

N.B. :— (1) **ALL** questions are compulsory

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

      (3) Draw diagram and write equations wherever necessary.

      (4) Use of scientific calculator is allowed.

1. (A) Fill in the blanks :

      (i) The analytical technique based on the measurement of colour intensity of a solution is called _____.

      (ii) The elements which are absolutely necessary for life process are called _____.

      (iii) In mass spectrum the peak given by most abundant ion and whose intensity is assumed to be 100% is known as _____.

      (iv) The processes which do not involve emission of radiation are referred to as _____.

                                      2

(B) Select the correct alternative :

(i) The number of waves which pass a given point in one second is called :

    (a) Wave number

    (b) Wavelength

    (c) Frequency

    (d) Speed

(ii) Silicones are :

    (a) Inorganic addition polymers

    (b) Inorganic condensation polymers

    (c) Inorganic co-ordination polymers

    (d) None of these

(iii) The types of electronic transitions observed in ethylene are :

    (a) $\sigma \rightarrow \sigma^*$ and $n \rightarrow \sigma^*$

    (b) $\sigma \rightarrow \sigma^*$ and $n \rightarrow \pi^*$

    (c) $\sigma \rightarrow \sigma^*$ and $\pi \rightarrow \pi^*$

    (d) $n \rightarrow \sigma^*$ and $n \rightarrow \pi^*$

(iv) The pH is defined as :

    (a) $pH = -\log 10 [H^+]$

    (b) $pH = \log [H^+]$

    (c) $pH = [H^+]$

    (d) None of these   2

(B) What are nuclear reactions ? Give their characteristics.   4

(C) Give the advantages and limitations of liquid drop model of nucleus.   4
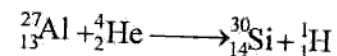
OR

13. (P) Discuss precipitation type of potentiometric titration.   4

(Q) What is nuclear fission ? Explain with example.   4

(R) Calculate the Q-value of the following nuclear reaction :

$$^{27}_{13}Al + ^{4}_{2}He \longrightarrow ^{30}_{14}Si + ^{1}_{1}H$$

Given $^{27}_{13}Al = 26.9815$ amu, $^{4}_{2}He = 4.0026$ amu

$^{30}_{14}Si = 29.9738$ amu, $^{1}_{1}H = 1.0078$ amu

Whether the reaction is exoergic or endoergic ? 4

UNIT—V

10. (A) State Beer's law. What is molar extinction coefficient ? 4

(B) Explain the terms :

(i) Inter System Crossing (ISC) and

(ii) Internal Conversion (IC). 4

(C) A certain system absorbs 3×10^{18} quanta of light per second. On irradiation for 400 seconds 0.001 mole of the reactant was found to have reacted. Calculate the quantum yield for the process. (Avagadro's number = 6.02×10^{23}). 4

OR

11. (P) Explain the kinetics of photochemical decomposition of HI. 4

(Q) What is bioluminescence ? Explain it with two examples. 4

(R) A substance when dissolved in water at 10^{-3} m concentration absorbs 10 percent of an incident radiation in a path of 1 cm length. What should be the concentration of the solution in order to absorb 90 percent of the same radiation. 4

UNIT—VI

12. (A) Explain the advantages and disadvantages of Quinhydrone electrode in the determination of pH of solution. 4

(C) Answer in **ONE** sentence :

(i) What do you mean by λ_{max} ?

(ii) Define organometallic compounds.

(iii) What are stretching vibrations ?

(iv) What are potentiometric titrations ? 4

UNIT—I

2. (A) Explain SN^2 associative mechanism of substitution in octahedral complexes. 4

(B) Draw the block diagram of spectrometer and explain its various components. 4

(C) What is R_f value ? Give the factors on which it depends. 4

OR

3. (P) Give the mechanisms of substitution reactions in square planar complexes involving solvent molecule as a nucleophile. 4

(Q) Describe colorimetric determination of concentration of Cu^{2+} ions. 6

(R) Explain the principle of paper chromatography. 2

UNIT—II

4. (A) Discuss the structure of $Cr(CO)_6$ on the basis of valence bond theory (VBT). 4

(B) What are metal carbonyls ? How are they classified ? 4

(C) Explain the role of haemoglobin and myoglobin in oxygen transport process. 4

OR

5. (P) Explain the three main steps in the preparation of linear silicone polymer. 4

(Q) Discuss the structure and bonding in Phosphonitrilic Chloride Trimer. 4

(R) Explain the role of Ca^{2+} ion in biological process. What are its toxic effects ? 4

UNIT—III

6. (A) Explain with examples the following types of transitions in electronic spectroscopy :

   (i) $\sigma \rightarrow \sigma^*$

   (ii) $\pi \rightarrow \pi^*$ 4

   (B) Describe IR spectrum of H_2O molecule. 4

   (C) Discuss the process of crystallisation. 4

OR

7. (P) Identify the types of transitions in each of the following :

   (i) $CH_3-\overset{..}{O}-CH_3$

   (ii) $CH_2=CH_2$

   (iii) CH_3-CH_3

   (iv) $CH_3-CH=O$. 4

   (Q) Describe different types of bending vibrations in IR Spectroscopy. 4

   (R) What is sublimation ? How will you purify naphthalene by this process ? 4

UNIT—IV

8. (A) Define the following terms in NMR spectroscopy with example :

   (i) Equivalent protons

   (ii) Non-equivalent protons. 4

   (B) Describe the principle of mass spectrometry. 4

   (C) Explain the principle (theory) of estimation of sulphur by Carius method. Give the formula to calculate percentage of sulphur. 4

OR

9. (P) How will you distinguish following pairs by their NMR spectra.

   (i) $CH_3-CH_2-CH_2-Br$ and $CH_3-CH(Br)-CH_3$

   (ii) $CH_3-CH_2-CH=O$ and $CH_3-CO-CH_3$. 4

   (Q) Calculate m/z values for the molecular ions of the following :

   (i) CH_3-CH_2-OH

   (ii) $CH_3-CH_2-NH_2$. 4

   (R) 0.286 g of benzene on complete combustion gave 0.968 g of CO_2 and 0.198 g of H_2O.

   Find out the percentage of carbon and hydrogen in it. 4