AR – 608

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

(Old)

6S CHEMISTRY

P. Pages : 8

Time : Three Hours] [Max. Marks : 80

Note : (1) All questions are compulsory.
(2) Question No. **1** carries **8** marks while each of the remaining questions carry **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 technique of separation of components between two phases out of which one is a stationary and other is a mobile phase is called ————.

(ii) In NMR spectroscopy the difference between the position of signal for a given type of proton and position of the peak for TMS (trimethyl silane) is called ————.

(iii) The reactions which are induced by the absorption of light are known as ——.

(iv) The branch of chemistry which deals with chemical changes and electricity is called ————. 2

(B) Select the correct alternative :

(i) The 'heme' group in haemoglobin consists of the following ion co-ordinated with porphyrin ligand.

(a) Fe^{2+} (b) Mg^{2+}

(c) Fe^{3+} (d) Cr^{3+}.

(ii) The band in UV-Visible spectrum which is formed due to $n \longrightarrow \pi^*$ transition in carbonyl group of aldehydes and ketones is called

(a) K-band (b) B-band

(c) E-band (d) R-band.

(iii) When an alpha (α) particle is released in nuclear decay, the mass of the nucleus undergoing decay

(a) remains the same.

(b) decreases by four.

(c) decreases by two.

(d) increases by two.

(iv) For a reaction that obeys Stark Einstein law the quantum yield is

(a) Less than one.

(b) One.

(c) Greater than one.

(d) None of these. 2

(C) Answer in one sentence :—

(i) Define Rf value.

(ii) What are Metal Carbonyls ?

(iii) What is coupling constant ?

(iv) Define molar extinction coefficient. 4

UNIT I

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

(B) Draw the block diagram of spectrophotometer and describe its components. 4

(C) Explain the principle of differential migration. 4

OR

3. (P) Define labile and inert complexes with one example of each. 4

(Q) Describe the technique of ascending paper chromatography. 4

(R) How will you differentiate between a colorimeter and a spectrophotometer ? 4

UNIT II

4. (A) What are phosphonitrillic halides ? Give their applications. 4

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

(C) Give the evidence in favour of multiple nature of M-C (metal-carbon) bond in metal carbonyls. 4

OR

5. (P) What is EAN (Effective Atomic Number) rule ? How is it used to explain the formation of $Ni(CO)_4$ and $Fe(CO)_5$. 4

(Q) What are essential elements ? Give their classification with examples. 4

(R) What are silicones ? Give their uses. 4

UNIT III

6. (A) Explain with examples the $\pi \longrightarrow \pi^*$ and $n\text{-}\pi^*$ transitions in UV-Visible spectroscopy. 4

(B) Describe different types of bending vibrations in IR spectroscopy. 4

(C) Explain the process of purification of an organic compound by crystallisation. 4

OR

7. (P) What do you mean by bathochromic and hypsochromic shifts in UV-Visible spectroscopy ? Explain each with example. 4

(Q) How will you distinguish between the following pairs of compounds by IR spectroscopy ?

(i) $CH_3–CH_2–OH$ and $CH_3–O–CH_3$

(ii) CH_3COCH_3 and CH_3COOH 4

(R) Describe the process of sublimation for purifying an organic substance. 4

UNIT IV

8. (A) Define with example the equivalent and non-equivalent protons in NMR spectroscopy. 4

(B) Describe the principle of mass spectroscopy. 4

(C) In Kjeldahl's method 0.35 g of an organic compound was digested with conc. H_2SO_4 and then distilled with KOH. The ammonia gas evolved was absorbed in 50 ml of 0.2 N acid. The excess acid required 18.4 ml of 0.1 N alkali. Find out the percentage of nitrogen in the compound. 4

OR

9. (P) Explain with example the phenomenon of 'splitting of signal' in NMR spectroscopy. 4

(Q) Explain the following terms

(a) Metastable peak.

(b) Molecular ion peak. 4

(R) On analysis an organic compound was found to contain 10.06 percent carbon, 0.84 percent hydrogen and 89.10 percent chlorine. Calculate its empirical formula. 4

UNIT V

10. (A) Differentiate between thermal and photochemical reactions. 4

(B) What is quantum yield ? What are the reasons for high quantum yield ? 4

(C) A 10^{-3} molar solution of a compound transmits 20% of the radiation in a container with path length equal to 1 cm. Calculate the molar extinction coefficient of the compound. 4

OR

11. (P) What is bioluminescence ? Explain with examples. 4

(Q) What are chemical actinometers ? Discuss uranyl oxalate actinometer. 4

(R) Calculate the energy associated with one photon and also one Einstein of radiation of wave length 360 nm. (Given $h = 6.62 \times 10^{-34}$ J sec, $C = 3 \times 10^{8}$ m sec^{-1}, $N = 6.02 \times 10^{23}$). 4

UNIT VI

12. (A) What are potentiometric titrations ? Give their advantages. 4

(B) Give the similarities between atomic nucleus and liquid drop. 4

(C) Calculate the Q value of the following nuclear reaction :

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

(Given $^{27}_{13}Al$ = 26.9815 amu, $^{4}_{2}He$ = 4.0026 amu $^{30}_{14}Si$ = 29.9738 amu and $^{1}_{1}H$ = 1.0078 amu, 1 amu = 931.5 Mev)

State whether the reaction is endoergic or exoergic. 4

13. (P) What is fission yield ? Explain fission yield curve. 4

(Q) How is pH of a solution determined by using glass electrode ? Give the advantages of this electrode. 4

(R) Complete the following nuclear reactions :

(i) $^{24}_{12}Mg + ^{1}_{0}n \longrightarrow ^{24}_{11}Na + ?$

(ii) $^{12}_{6}C + ^{2}_{1}H \longrightarrow ? + ^{1}_{0}n.$ 4