B.Tech.(2007-2010 Batches)   (Sem.–1,2)
ENGINEERING   CHEMISTRY
Subject Code : CH-101
Paper ID : [A0110]

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C. have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

1. **Write briefly :**

   (a) Why the water is soften before using in boiler?

   (b) Why rusting of iron in saline water is quicker than ordinary water?

   (c) What is the basic principle of chromatographic techniques?

   (d) State the difference between critical point and triple point.

   (e) What is Fluorescence and how it is different from phosphorescence?

   (f) State phase rule.

   (g) Define Retention Factor (R_f).

   (h) What are primary and secondary photochemical processes?

   (i) Determine the number of components, number of phase and degree of freedom on the following equilibrium

   (a) $N_2O_4(g) \rightleftharpoons 2NO_2(g)$

   (b) $NH_4Cl(s) \rightleftharpoons NH_3(g) + HCI(g)$
        When $P(NH_3) \rightleftharpoons P(HCL)$

   (j) What is range of electromagnetic radiations used in UV-Vis spectrophotometer? Define λ_{max}.

SECTION-B

2. (a) Calculate the quantity of lime and soda needed for softening 60,000 liters of water containing the following salts per litter : $Ca(HCO_3)_2$ = 8.6 mg, $Mg(HCO_3)_2$ = 7.0 mg, $CaSO_4$ = 13.6 mg, $MgSO_4$ =12.3 mg, $MgCI_2$ = 2.0 mg and NaCI = 4.9 mg.

   (b) Discuss hot lime soda process of water softening.   (4, 4)

3. (a) Explain the mechanism of electrochemical corrosion.

   (b) What are inhibitors ? Explain types of inhibitors employed to control corrosion.

                                                                          (4, 4)

4. (a) Discuss various types of liquid chromatography.

   (b) Discuss briefly the flow diagram of LC instrument with diagram.   (4, 4)

5. (a) Derive Nernst equation and give its significance.

   (b) Calculate the EMF of the given cell at 298°K.

   $Ag(s)|Ag(NO_3)$ (0.018 m) $|| Ag(NO_3)$ (1.2 m) $| Ag(s)$.   (5, 3)

SECTION-C

6. (a) How photochemical reactions differ from thermal reactions? Discuss stark-Einstein law of photochemical equivalence.

   (b) Define quantum yield. Discuss reasons for low and high quantum yield. (5, 3)

7. (a) "*IR specta is often characterized as molecular finger prints*." Justify this statement.

   (b) Calculate the number of vibrational degrees of freedom in following compounds:

   (i) CO_2 (ii) SO_2 (iii) CH_4

   (c) Which of the following molecules will show IR Spectra and why

   H_2, HCl, CH_4, CO_2, H_2O (3, 3, 2)

8. (a) Discuss the principles of NMR.

   (b) Explain the ^1H NMR patterns and intensities of isopropyl group in isopropyl alcohol.   (4, 4)

9. State and explain phase rule, describe phase diagram of (i) Phenol-water system and (ii) triethylamine-water system.   (8)