QP Code : **08823**

(2 Hours) [Total Marks : 60

N.B : (1) **All** questions are **compulsory.**
(2) **Figures** to the **right** indicate **full** marks.
(3) **Use of logarithmic table/non programmable calculator is allowed.**
(4) At. Wts : H=l, C=12, N=14, 0=16, Na=23, AI=27, S=32, Cl=35.5, K=39, Ca=40, Ag=108, Ba=137, Pb=207.

1. (a) Attempt any **two** of the following :—
   (i) Define: Figures of Merit for analytical methods. What is the advantage of it? Enlist the figures of merit for precision of Analytical Methods. **4**
   (ii) What is 'Quality Manual'? List the activities that should be included in Quality Manual. **4**
   (iii) What is data domain? Discuss its classification in brief. **4**
   (iv) What are the responsibilities of quality manager in maintaining and improving the laboratory's quality system? **4**

   (b) Attempt any **one** of the following :—
   (i) With respect to quality, explain the terms, 'Quality audit' and 'Quality review'. **4**
   (ii) The selectivity coefficient for an ion selective electrode for K^+ with respect to Na^+ is reported to be 0.052. Calculate the relative error in the determination of K^+ in a solution that has K^+ concentration 2.4×10^{-3}M if the Na^+concentration is **4**
   (1) 1.5×10^{-2}M
   (2) 1.5×10^{-3}M
   (3) 1.5×10^{-4}M
   Assume that instrumental signal for blank S_{bl} was approximately zero.

2. (a) Attempt any **two** of the following :—
   (i) (1) How many grams and m illimoles of Potassium Sulphate are present in its 50.0cm^3 of 0.2M solution? **2**
   (2) Using $AgN0_3$, how will you prepare 1.2 dm^3 of a solution containing 25 ppm of Ag^+? **2**
   (ii) Chloroform reacts with chlorine, to form carbon tetrachloride (CCl_4) and hydrogen chloride. In an experiment 25 grams of chloroform and 25 grams of chlorine were allowed to react. Which is the limiting reactant? What is the maximum yield of CCl_4 in moles and in grams? **4**
   (iii) What is the normality of 12.30% (w/w) solution of sulphuric acid (Specific gravity =1.085)? How many cm^3 of 3.0M potassium hydroxide solution will be neutralized by 18.0 cm^3 of the above acid solution? **4**

(iv) Calculate the pH of 4

(1) 50 cm^3 of 0.1N NH_4OH

(2) A solution obtained by mixing 50 cm^3 of 0.1N NH_4OH and 50cm^3 of 0.05N HCl. (Given : K_b of NH_4OH=1.8 x 10^{-5})

(b) Attempt any **one** of the following:

(i) The pH of $Mg(OH)_2$ solution is 10.45 at 25°C. Calculate the solubility product of $Mg(OH)_2$. 4

(ii) How many moles of AgBr can dissolve in 1.0 dm^3 of 1.0 M NH_3? 4

The reaction is

$$AgBr_{(s)} + 2NH_{3(aq)} \rightleftharpoons Ag(NH_3)^{2+}_{(aq)} + Br^-_{(aq)}$$

Given: Equilibrium constant = 8.0 x 10^{-6}

3. (a) Attempt any **two** of the following :—

(i) What are the important steps involved in solvent extraction? What are the advantages of solid phase extraction over solvent extraction? 4

(ii) What is the application of crown ethers in solvent extraction? 4

(iii) Discuss any two factors affecting extraction by chelate formation. 4

(iv) Derive mathematical expression to relate distribution ratio (D) to pH of aqueous solution in solvent extraction involving chelation. 4

(b) Attempt any **one** of the following :—

(i) 80 cm^3 of an aqueous solution containing 60 mg of solute, when extracted once with 20 cm^3 of an organic solvent, 48 mg of the solute was transferred to the organic solvent. Calculate the minimum number of extractions required to transfer 95% of the solute, by using same volume of organic solvent. 4

(ii) With the help of neat labeled diagram describe the construction and working of fluorimetric detector used in HPTLC. 4

4. (a) Attempt any **two** of the following :—

(i) What are the characteristics of ideal carrier gas used in GC? Give an account of different carrier gases used in GC. 4

(ii) With the help of neat labeled diagram, describe construction and working of electrochemical detector used in HPLC. 4

(iii) How will you separate a mixture of He, O_2, N_2, CH_4 and CO_2 at room temperature, using gas chromatographic method? 4

(iv) Give a comparative account of WCOT, SCOT and FSOT columns. 4