[This question paper contains 2 printed pages.]

Sr. No. of Question Paper : 1903 **GC-3** **Your Roll No.....**

Unique Paper Code : 42174301

Name of the Paper : 3, Quantitative Methods of Analysis

Name of the Course : **B.Sc. (P) Applied Physical Sciences – Analytical Chemistry (CBCS)**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on the receipt of this question paper.
2. Answer any **five** questions.
3. **All** questions carry equal marks.

1. (a) Explain the indicator theory of acid base volumetric analysis. What would be the suitable indicator for the titration of (i) ammonia with hydrochloric acid (ii) acetic acid with sodium hydroxide ?

   (b) What is the role of buffer solution in the complexometric titrations ? Explain why ammonium oxalate behaves as a buffer whereas potassium chloride does not ?

   (c) Define and differentiate between Co-precipitation and Post precipitation. How can you minimize the error occurring due to them ? (5+5+5)

2. (a) Derive the Henderson-Hasselbalch equation to calculate the pH of a buffer solution.

   (b) A mixture of solid $SrSO_4$ and solid $BaSO_4$ is shaken up with water until saturation equilibrium is established. Given that Ksp ($SrSO_4$) = 7.6×10^{-7} M^2 and Ksp ($BaSO_4$) = 1.5×10^{-9} M^2, calculate the concentrations of Sr^{2+}, Ba^{2+} and SO_4^{2-}.

P.T.O.

(c) Write short note on :

(i) Fajan's Titration

(ii) Applications of solubility equilibria (5+5+5)

3. (a) EBT is pH sensitive indicator-comment.

(b) 50 ml of 0.1N HCl is titrated against 0.1N NaOH. Calculate the pH at the start of titration and after the addition of 10, 50, 60 ml of NaOH. Depict these changes by suitable titration curve.

(c) In Gravimetric analysis, washing is more efficiently carried out by the use of many small portions of the liquid rather than with a few large portions, the volume being the same in both cases, Explain. (5+5+5)

4. (a) What is Density Gradient technique ? Explain.

(b) Propose a method to control SO_2 emission.

(c) Why is sulphuric acid added during preparation of a solution of Mohr's salt ? What is the role of phosphoric acid in the titration of Mohr's salt with $K_2Cr_2O_7$. (5+5+5)

5. (a) Explain briefly the procedure to estimate the following ions gravimetrically

(i) Ni (II) (ii) Cu (I).

The gravimetric estimation of 30 ml of $NiCl_2$ solution yields 0.3g Ni-DMG precipitate. What is the strength of Ni (II) ? Given molecular mass of Ni = 58.69 g and Ni-DMG = 289g.

(b) Describe method for the estimation of dissolved oxygen in water sample.

(c) Determine the pH of a solution obtained by mixing equal volume of 0.10N ammonium nitrate and 0.02N ammonium hydroxide, K_b for NH_4OH at 25°C being 1.8×10^{-5}. (5+5+5)

6. (a) Explain Zonal rotors and Elutriator rotors with the help of suitable diagrams.

(b) What do you understand by radioactive/radiation pollution ? List some of its main cases.

(c) Explain the difference between nucleation and particle growth. (5+5+5)

(100)