Five Year Integrated M.Sc. Examination 2024

Semester - V

Course: CH-3-5-5

(Analytical Chemistry-I)

Time: Three Hours **Full Marks: 40**

Questions are of values as indicated in the margin

Group-A

1. Answer ***any five*** questions: $5 \times 2 = 10$

   (a) What are the various techniques to obtain easily filterable crystalline precipitate for an analyte that gives a colloidal precipitate?

   (b) In connection to chromatography name a (i) non-polar organic compound, (ii) polar organic compound, (iii) non-polar eluting solvent and (iv) polar eluting solvent.

   (c) Write a note on reverse phase chromatography.

   (d) Explain the phenomenon of post-precipitation with suitable example. How can it be overcome?

   (e) Which indicator is used in iodometric titration? When is it added and why?

   (f) Discuss the mechanism of functioning of an adsorption indicator. Give suitable example.

Group-B

Answer ***any six*** questions

2. (a) Using a suitable diagram, explain situations of (i) low accuracy low precision, (ii) low accuracy high precision, (iii) high accuracy low precision and (iv) high accuracy high precision. 2

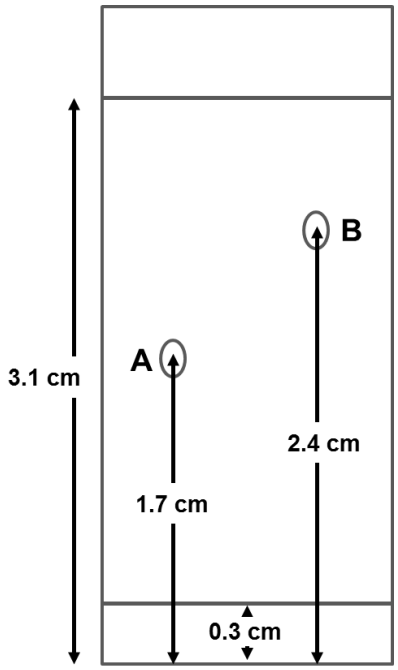
   (b) What are the various sources of instrumental errors? How can they be eliminated? 2+1

3. (a) Sketch the apparatus of column chromatography set-up. Discuss the different methods to pack the column. 1+2

   (b) Show that the frequency distribution for measurements with indeterminate errors results in a Gaussian curve. 2

4. What are the various stages of precipitate formation? Explain each of them in brief. Hence explain the formation of colloidal precipitate. 1+3+1

5. A silica coated TLC plate appears as follows after developing. 1+2+2



Comment on the properties of **A** and **B**. Find out the $\mathbf{R_f}$ values of **A** and **B** from the figure. Explain the ways in which you can increase or decrease the separation between the spots of **A** and **B**.

6. Draw the titration curves for argentometric titration of 50 ml of 0.2 M (i) NaCl and (ii) KI solutions with 0.2 M $AgNO_3$ solution using at least five data points for each (two pre-equivalence, equivalence and two post-equivalence). Solubility products of AgCl and AgI are 1.8×10^{-10} and 8.3×10^{-17}, respectively 5

7. (a) What are the general properties of an indicator in a complexometric titration? 2

   (b) Why $KMnO_4$ is not used as a primary standard? How do you standardize a $KMnO_4$ solution? Give balanced equations. 1+2

8. (a) Amounts of Fe in a sample are found in replicate measurements as 60.2, 59.8, 60.0, 60.2, 60.3 and 59.8 ppm. Calculate mean and median. 2

   (b) Explain how you can use the techniques of masking and demasking to estimate Mg, Zn and Cu content of a mixture. Give chemical equations. 3