Five Year Integrated M.Sc. Examination 2021-2022

Semester - V

Course: CH-3-5-5

(Analytical Chemistry-I)

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

Questions are of value as indicated in the margin

Group-A

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

   (a) An acidic solution of **A** and **B** is treated with NH_2OH. The solution is then made alkaline and **B** is estimated with EDTA in presence of **A**. Identify **A** and **B**. Suggest the name of the indicator for the titration.

   (b) Explain a method for determining the carbon and hydrogen content in an organic compound.

   (c) How will you precipitate zinc ions from a solution in a gravimetric analysis? What are the precautions that are needed to be taken for such precipitation in the presence of mercuric ions?

   (d) Justify the iodometric estimation of cupric ions in aqueous solutions.
   Given: E^o of $\frac{1}{2}I_2/I^-$ = 0.54 V and E^o of Cu^{2+}/Cu^+ = 0.15 V

   (e) Explain with suitable example whether accurate or precise result will be preferred for any measurement and the risk associated with choosing the wrong preference.

   (f) Discuss a procedure which can be used for the separation of a mixture of proteins.

Group-B

Answer ***any six*** questions

2. Name a primary standard which can be used for both acid-base and oxidation-reduction titrations and write the relevant equations associated with the two types of titrations. Is there any special requirement for its use in any of the titrimetric methods? If so, explain the reason behind such selection of conditions. 2+1+2

3. Analyse the following set of data carefully and find out the mean, median, standard deviation and variance of the acceptable data. 5

   20.5, 20.6, 20.9, 19.0, 20.7, 20.9, 21.2

4. When do we get colloidal precipitates? What is the reason behind high stability of such precipitates? Explain with appropriate example how such properties assist in the detection of end point in an argentometric titration. 1+2+2

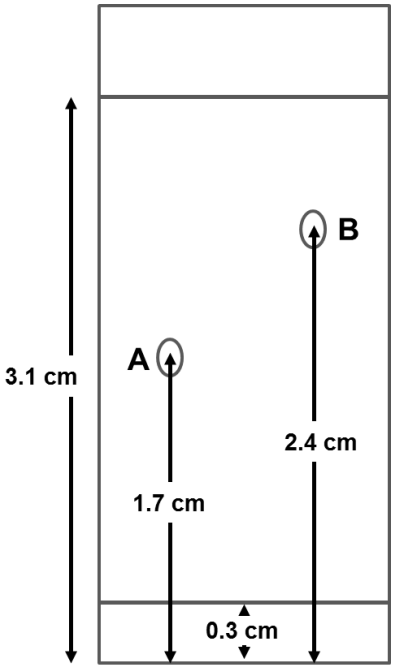
5. (a) Phenolphthalein can be used as an indicator both for the titration of hydrochloric acid and acetic 2

acid with sodium hydroxide. Explain

(b) Show the effect of concentration on the titration curves for two acid-base titrations, one with concentration of HCl and NaOH as 0.1 N and the other with 0.01 N, from the values of pH obtained when 49.8 mL, 50 mL and 50.2 mL of NaOH has been added to 50 mL solution of HCl. 3

6. Draw the structure of Fe^{3+}-EDTA complex. Fe^{3+} also forms a complex with CN^-. What is its formula? Among EDTA and CN^-, which ligand will be preferred in a titrimetric analysis? Justify your answer. 5

7. 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**.

8. (a) Permanganate acts as a self-indicator. Explain whether there is any error associated with such titrations. If yes, what are the types in which you can classify such an error? Briefly propose a technique by which you can improve the results. 3

(b) How will you estimate the amount of individual ions in a mixture of calcium, copper and cadmium ions? 2