Eastern University, Sri Lanka
Third Year Examination in Science-2020/2021 (Oct/Nov 2024)
Honours Degree in Chemistry
CH4193- Advanced Inorganic Chemistry Laboratory

Answer **all** questions Time: **Four** hours

1. Take 10.0 cm^3 of the chlorate solution ((labeled **P**) in a glass stopper flask and add 1.0 g of KBr and 20 cm^3 of Con.HCl. Shake the stopper bottle well and allow to stand for 5-10 minutes. Add 100 cm^3 of 1% KI solution to the resultant solution and titrate the liberated I_2 with sodium thiosulphate (0.5 M) by using starch as an indicator.
   i) Take at least three readings and tabulate them.
   ii) Write down all of the balanced reactions to the experiment.
   iii) Explain the role of KBr in the above experiment.
   iii) Determination of the chlorate ion in the given solution **P.**

2. Weigh 6.00g of Ammonium ferrous sulphate ($(NH_4)_2SO_4.FeSO_4.6H_2O$). Transfer it into a beaker and dissolve in 40 mL of Distilled water. Acidify with 0.8 mL of Dil.H_2SO_4. Weigh 3 g of Oxalic acid dehydrated ($H_2C_2O_4.2H_2O$) and dissolve it in 60 ml of distilled water. Add this solution to the solution of Ammonium ferrous sulphate. Heat the mixture continuously to boiling temperature and allow the coloured solid to settle down by cooling to room temperature. Remove the supernatant liquid using dropper without appreciable loss of solids. Stir the solid with 20 mL of hot water and again remove the supernatant liquid. Add another 20 mL of hot water stir well and filter the solid product using low suction. Wash the solid with 25 mL of hot water and keep it in a desiccator. Weigh the solid at last.(**Carry out the experiment in duplicate**)

   i) Tabulate your Readings

   ii) Write down all the reactions involved in these experiments with balanced chemical equation/s

   iii) Determine the yield percentage of Ferrous oxalic dehydrate.

Contd.

3. Pipette out 10.0 cm^3 Hydroxylamine hydrochloride into a stopper bottle. Add 40 cm^3 of distilled water and 75.00 cm^3 of $KBrO_3$ (0.017 M) from burette. Add 40 cm^3 of 6 M HCl in this solution. Allow the mixture to stand at room temperature for 20 minutes to determine the excess bromate present. Add 2 g of KI and 10 % Ammonium molybdate (4 drops) to this solution. Allow the mixture to stand for five minutes and titrate it with 0.25 M $Na_2S_2O_3$ against liberated I_2 by using starch as an indicator.

   i) Take at least three readings and tabulate them.

   ii) Write down all of the balanced reactions to the experiment.

   ii) Explain the role of $KBrO_3$ in the above experiment.

   iii) Determine the concentration of Hydroxylamine in the experiment.

4. You are provided with the following solutions.

   i) A standard solution (0.1 M) of Zn^{2+} (labeled **A**)

   ii) pH 10 Buffer solution (labeled **B**)

   iii) An aqueous solution of EDTA (labeled **C**)

   iv) Water sample (labeled **D**)

Perform the following experiments and answer the questions listed out below.

Experiment I

Pipette out 10.0 mL aliquots of **A** into a titration flask, add 2 mL of **B** into it and titrate with solution **C** using ***Eriochrome Black T*** indicator.

Experiment II

Pipette out 10.0 ml aliquots of **D** into a titration flask, add 2 mL of **B** and titrate with solution **C** using ***Eriochrome Black T*** indicator.

Contd.

Experiment III

Pipette out 10.0 mL aliquots of **D** into a titration flask, add 2 mL of **B** and titrate with solution **C** using *Patton* **and** *Reeder's* indicator.

Take two readings for each titration

Questions:

i) Tabulate all your readings.

ii) Give all the reactions involved in these experiments with balanced chemical equations (Assume that the water sample contains Ca^{2+} and Mg^{2+} only)

iii) Discuss the role of Eriochrome black T indicator in a complexometric titration.

iv) Calculate the strength of EDTA solution.

v) Calculate the hardness of water in ppm for Ca^{2+} and Mg^{2+} separately

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