**RAJARATA UNIVERSITY OF SRI LANKA**
**FACULTY OF APPLIED SCIENCES**

**B.Sc. (Honours) Degree in Chemistry**
**Third Year - Semester I Examination – September / October 2019**

**CHE 3217 ADVANCED INORGANIC CHEMISTRY – LABORATORY**

**Time: Six (06) hours**

Answer all questions

Use of a non-programmable calculator is permitted.

01) Synthesize the compound using given instructions.

Weigh out 2.0 g of compound named 'X' into a beaker. Add a few drops of 2 M $H_2SO_4$ and 6 mL of water. Take another beaker containing 6 mL of water and dissolve 1.0 g of 'Y' in water and add to the mixture prepared. Heat the solution cautiously with continuous stirring to the boiling point. After cooling to room temperature, pour off the supernatant liquid and wash the precipitate with 5 mL of hot water. Repeat this step one more time. Filter the crude product using Buchner funnel and wash with 5 mL of hot water followed by 5 mL of Acetone. Dry and weigh out your product, make a suitable solution and obtain the UV spectrum.

Submit your product in boiling tube labeled as "Q1 – Index number"

a) Identify your product with the use of the obtained UV spectrum compared to the standard spectra given.

b) Identify 'X' and 'Y'.

c) Calculate the percentage yield of your product.

d) Describe the role of $H_2SO_4$ acid in this synthesis.

e) With your knowledge of polymer chemistry and coordination chemistry, explain the reason for the low solubility of the product you synthesized and give suggestions to enhance the solubility. Structural drawings are expected.

02) Collect and measure the conductivity of 10 mL of provided 'P' solution. Prepare 20 ml of $1\times10^{-3}$ M concentrated Q solution (M.W. 250.04 $gmol^{-1}$). Measure the conductivity.

a) Calculate cell constant (k-0.002768 $ohm^{-1}$) using 'P' solution.

b) Calculate the specific conductivity of 'Q'.

c) Calculate the molar conductance of 'Q'.

d) Estimate the number of ions produced in a solution 'Q'. A range of values of molar conductance for 2-5 ions at 25°C in water is given below.

| Number of ions | Molar Conductance / ($cm^{-1}$ $mol^{-1}$ $ohm^{-1}$) |
|---|---|
| 2 | 118-131 |
| 3 | 235-273 |
| 4 | 408-435 |
| 5 | ~560 |

e) Describe the changes of the ionic conductivity upon dilution?

f) Discuss the idea given by 'Werner Theory'.

g) Discuss the limitations of Werner Theory?

03) You are provided a procedure to determine the strength (in g/L) of ferrous ammonium sulphate ($FeSO_4(NH_4)_2SO_4.6H_2O$) by titrating it against standard (1.0 g/L) potassium dichromate ($K_2Cr_2O_7$) solution.

Rinse the burette and fill up with potassium dichromate solution. Pipette out 10 ml of ferrous ammonium sulphate solution and transfer into a clean 100 ml conical flask. Add 10 ml of 2.5 M $H_2SO_4$ to the solution taken into the conical flask. Add 2-3 drops of N-phenylanthranilic acid into the solution as an indicator. Titrate the solution against dichromate solution. Carry out the determination in duplicate. Record the burette readings.

a) Write down the possible reactions.

b) Calculate the strength of ferrous ammonium sulphate solution in g/L.

c) Explain the colour change that takes place at the endpoint of the titration.

d) Justify that one cannot use ferrous sulphate instead of ferrous ammonium sulphate as a primary standard.

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