THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
DIPLOMA IN SECONDARY EDUCATTION EXAMINATION

732/2B **CHEMISTRY 2B**

(PRACTICAL 2B)

Time: 3 Hours **Year: 2024**

Instructions.

1. This paper consists of sections of **Three (3)** questions.
2. Answer **all** questions.
3. Cellular phones are **note** allowed in the examination room.
4. Write your **examination Number** on every page of your answer booklet(s).

Answer **All** questions.

1. A certain solution labeled **B** whose components have a formula unit of M2CO3 was prepared by dissolving 2.65 g of M2CO3 to make 0.5 dm3 solution. In order to identify the unknown element M in the formula, an 49 experiment is required to be performed using 0.10 M HCl which is kept in the beaker labelled **G**. Methyl orange indicator is also available. Then, follow the following procedure to identify element M.

   Procedure:
   (i) Pipette 20 cm3 or 25 cm3 of **B** and transfer it into a titrating flask. Add three drops of methyl orange indicator.
   (ii) Transfer solution **G** into the burette.
   (iii) Titrate solution **G** against **B** until end point is reached.
   (iv) Repeat procedures (i) to (iii) three more times.

   Questions

   (a) (i) What is the volume of the pipette used?
   (ii) Present your results in an appropriate table of results.
   (b) Calculate the average titre volume.
   (c) Write a balanced chemical equation for the reaction between solutions labelled **B** and **G** and the corresponding ionic equation. Include the state symbols in both equations.
   (d) Calculate the concentration of **B** in
   (i) g dm^{-3}.
   (ii) mol dm^{-3}
   (e) Calculate the molar mass of M2CO3 and identify element M.
   (f) If element M is reacted with water,
   (i) Write a balanced chemical equation that shows the reaction.
   (ii) Give the colour of the solution when few drops of POP are added to the solution.

2. The order of reaction between $S_2O_3^{2-}$ and H^+ can be established by using solutions 0.16 M $Na_2S_2O_3.5H_2O$ labelled **C** and 1.0 M H_2SO_4 labelled **D**. Use the given facilities; distilled water, stopwatch, 100 cm^3 beaker, 10 cm^3 measuring cylinder, glass rod, and a white piece of paper with a mark "**Z**" to establish the order of reaction with respect to S_2O_{32-} and H^+. Perform the activities listed in the given procedure and then answer the questions that follow.

   Procedure:
   (i) Put a paper with a mark "**Z**" on a working bench and place an empty 100 cm^3 beaker on the top of mark in such a way that the mark is clearly seen from the top of the beaker.
   (ii) By using measuring cylinder, measure 4 cm^3 of **C** and 6 cm^3 of distilled water and transfer it in the beaker placed on the mark "**Z**".
   (iii) Using measuring cylinder, measure 10 cm^3 of **D** and pour it into the beaker containing **C** and distilled water; and immediately start the stopwatch. (iv) Stir the reaction mixture with the glass rod and record the time taken for the mark "**Z**" to disappear completely.
   (iv) Repeat the procedure (i) to (iv) twice except that instead of 4 cm^3 of **C** and 6 cm^3 of distilled water in procedure (ii), use 6 cm^3, 8 cm^3, 10 cm^3 of **C** and 4 cm^3, 2 cm^3 and 0 cm^3 of distilled water.

Questions

(a) Compete the following table:

Table of Results

Experiment	**C (cm^3)**	**Water (cm^3)**	**D (cm^3)**	**Time [t(s)]**	**Rate - $1/t(s^{-1})$**
1	4	6	10		
2	6	4	10		
3	8	2	10		
4	10	0	10		

(b) Draw the appropriate well labelled graph of a rate of reaction as a function of volume of sodium thiosulphate.

(c) Use the graph in (b) to determine the order of the reaction with respect to the concentration of thiosulphate ions.

3. Salt from Mzee Bayobo's factory was brought in the laboratory with the aim of identifying the cation and the anion present in the sample. For the sake of record, the sample was labeled **O**. Perform qualitative analysis procedure to identify the cation and the anion present in the sample. Base your experiment on the following tests and answer the questions that follow:

(i) Appearance of sample **O**.
(ii) Action of heat on sample **O** in a test tube.
(iii) Action of dilute sulphuric or hydrochloric acid to solid sample.
(iv) Action of concentrated sulphuric acid on solid sample.
(v) Flame test.
(vi) Solubility of the sample.
(vii) Confirmatory test for the anion.
(viii) Confirmatory test for the cation.

Questions

(a) Prepare a relevant Table showing the qualitative analysis results.
(b) What are the cation and anion present in the unknown salt?
(c) Write the reaction equation to indicate what took place in test (iii).