THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

032/2A

CHEMISTRY 2A
PRACTICAL A
(For Both School and Private Candidates)

Time: 2:30 Hours **Year: 2020**

Instructions

1. This paper consists of **two (2)** questions. Answer **all** the questions.
2. Each question carries **twenty five (25)** marks.
3. Cellular phones and any unauthorised materials are **not** allowed in the examination room.
4. Write your **Examination Number** on every page of your answer booklet(s).
5. You may use the following constants:
   Atomic masses: H=1, C=12, O = 16, Na = 23, S = 32, Cl =35.5.
   1 litre = 1 dm^3 = 1000 cm^3.

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1. You are required to standardize dilute hydrochloric acid using standard aqueous sodium carbonate of 0.1 M concentration. Proceed as follows:

(i) Pour a small amount (about 2 cm^3) of solutions **AX** and **AY** into separate test tubes and add two drops of phenolphthalein (POP) or methyl orange (MO) indicator to identify the dilute hydrochloric acid and 0.1 M sodium carbonate solution given.
(ii) Fill the burette with the acid solution.
(iii) Using a pipette, measure out 20 cm^3 or 25 cm^3 of the base solution and put it into a clean titration or conical flask.
(iv) Titrate the acid (in the burette) against the base using two drops of methyl orange (MO) as an indicator and obtain three titre volumes. Record your results in a tabular form.

Questions

(a) Which is an acid or base between **AX** and **AY**?
(b) What is the mean titre volume of the acid?
(c) Write a balanced chemical equation for this reaction.
(d) Calculate molarity of the acid.
(e) Calculate the mass of the acid dissolved in one litre of the solution.

2. You are provided with the following:

P_1: 0.50 M sodium thiosulphate,
P_2: 0.10 M hydrochloric acid,
P_3: Distilled water,
Stop watch,
Plain white paper marked **X**.

Theory

Sodium thiosulphate and hydrochloric acid react quantitatively, and gradually the solution changes from colourless to opaque, thus, the reaction can be used to evaluate various chemical kinetics parameters.

Procedure

(i) Place a 100 cm^3 beaker on top of letter **X** such that the letter **X** is visible when viewed from above.
(ii) Using a measuring cylinder measure 5 cm^3 of **P_1** and pour into the 100 cm^3 beaker in (i). Add 20 cm^3 of **P_3**.
(iii) Measure 25 cm^3 of **P_2** and pour it into the beaker containing solution **P_1** and **P_3** in (ii) and immediately start the stop watch/ clock.
(iv) Observe the letter **X** from the mouth of the beaker and record the time taken for the letter **X** to disappear completely.
(v) Repeat the steps (i) – (iv) by varying the volumes of **P_1** and **P_3** as indicated in the following experimental data table:

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Table: Experimental Data

Volume of P_1 (cm^3)	Volume of P_3 (cm^3)	Volume of P_2 (cm^3)	Time (s)	Rate of reaction $(1/t)(s^{-1})$
5	20	25		
10	15	25		
15	10	25		
20	5	25		
25	0	25		

Questions

(a) Complete filling the Table.

(b) What is the aim of the experiment?

(c) Write the electronic configuration of the product which causes the solution to be cloudy (milky).

(d) Write the balanced ionic equation for the reaction between $\mathbf{P_1}$ and $\mathbf{P_2}$ indicating all the state symbols.

(e) Plot a graph of volume of $\mathbf{P_1}$ against the rate of reaction.

(f) What can you conclude from the graph?

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