## 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<sup>3</sup> = 1000 cm<sup>3</sup>.



- 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<sup>3</sup>) 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<sup>3</sup> or 25 cm<sup>3</sup> 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**<sub>1</sub>: 0.50 M sodium thiosulphate,
  - $P_2$ : 0.10 M hydrochloric acid,
  - **P**<sub>3</sub>: 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<sup>3</sup> 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<sup>3</sup> of  $P_1$  and pour into the 100 cm<sup>3</sup> beaker in (i). Add 20 cm<sup>3</sup> of  $P_3$ .
- (iii) Measure 25 cm<sup>3</sup> 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:

## Table: Experimental Data

Volume of $P_1$ (cm <sup>3</sup> )	Volume of P <sub>3</sub> (cm <sup>3</sup> )	Volume of P <sub>2</sub> (cm <sup>3</sup> )	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  $P_1$  and  $P_2$  indicating all the state symbols.
- (e) Plot a graph of volume of  $P_1$  against the rate of reaction.
- (f) What can you conclude from the graph?

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