

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

032/2A

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

Time: 2:30 Hours

Year: 2021

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 dm³ = 1000 cm³.



1. You are provided with the following:

LL: 6.3 g of dibasic acid, $\text{H}_2\text{C}_2\text{O}_4 \cdot \text{XH}_2\text{O}$ dissolved to make 1 litre of a solution;

MM: 4.0 g of NaOH dissolved to make 1 litre of a solution.

Determine the value of X in the acid $\text{H}_2\text{C}_2\text{O}_4 \cdot \text{XH}_2\text{O}$. Proceed as follows:

- (i) Fill the burette with solution **LL**.
- (ii) Pipette $20/25 \text{ cm}^3$ of solution **MM** and put it in a conical flask.
- (iii) Titrate **LL** against **MM** using two drops of POP indicator.
- (iv) Repeat the titration to obtain three more titre values and record your results in a tabular form.

Questions

- (a)
 - (i) Indicate the volume of the pipette used.
 - (ii) Complete the table of results and compute the average volume of acid used for complete neutralization of **MM**.
- (b) Calculate the molarity of the base.
- (c) Write a balanced chemical equation for the reaction taking place.
- (d) Calculate the molarity of the acid.
- (e) Calculate;
 - (i) the value of X in $\text{H}_2\text{C}_2\text{O}_4 \cdot \text{XH}_2\text{O}$.
 - (ii) the percentage of water of crystallization in $\text{H}_2\text{C}_2\text{O}_4 \cdot \text{XH}_2\text{O}$.

2. You are provided with the following:

L1: 0.05 M sodium thiosulphate,

L2: 1.0 M nitric acid,

Stop watch,

A thermometer,

White sheet of paper marked with letter **X** on one side.

Procedure

- (i) Place a 100 cm^3 beaker on top of letter **X** in such a way that the letter **X** is visible when viewed from above.
- (ii) Measure 20 cm^3 of solution **L2** and put it into a 100 cm^3 beaker placed on top of a sheet of paper marked letter **X**.
- (iii) Measure 40 cm^3 of solution **L1**, put it into boiling test tube and heat it on a water bath until it reaches a temperature of 40°C .
- (iv) Pour the heated content of solution **L1** into a 100 cm^3 beaker placed on top of the sheet of paper marked letter **X**, and immediately start the stop watch.
- (v) Swirl the content and look through it from above. Record the time taken for the letter **X** to disappear.
- (vi) Repeat the procedures (i) – (v) using similar solutions at 50°C , 60°C , 70°C and 80°C as indicated in the following table of experimental data.

Table: Experimental data

Volume of L1 (cm ³)	Volume of L2 (cm ³)	Temperature of L1 (°C)	Time (s)	Rate (1/t) (s ⁻¹)
40	20	40		
40	20	50		
40	20	60		
40	20	70		
40	20	80		

Questions

- (a) What is the aim of the experiment?
- (b) Complete filling in the data in the table.
- (c) Plot a graph of temperature (°C), Y - axis against Rate (s⁻¹), X - axis.
- (d) What does the shape of the graph indicate?
- (e) Write the ionic equation for the reaction between **L1** and **L2**.
- (f) Why did the letter **X** disappear?