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: 2023**

Instructions

1. This paper consists of **two (2)** questions. Answer **all** the questions.
2. Each question carries **twenty five (25)** marks.
3. All writings should be in **blue** or **black** ink, except for diagrams which must be in pencil.
4. Cellular phones and any unauthorised materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. You may use the following atomic masses:

   H=1, O = 16, Na =23, Cl = 35.5.

1. You are asked to determine the concentration of sodium hydroxide contaminating drinking water source in a certain village. In order to investigate the problem, a sample from the village water source (containing NaOH) has been brought in the chemistry laboratory for you to carry out a volumetric analysis. You are also given a standard solution of 1.825 g hydrochloric acid dissolved in 0.5 dm^3 of the solution. Use methyl orange (MO) and litmus papers as indicators.

Procedure

(i) Pour about 2 cm^3 of solution **V1** into a test tube, use litmus papers to test if it is an acidic or a basic solution.

(ii) Discard the content and wash the test tube.

(iii) Repeat the procedure (i) and (ii) using solution **V2**.

(iv) Titrate the acid (in the burette) against the sample solution (sodium hydroxide) using **MO** up to the end point. Repeat the procedure to obtain three more readings and record your results in a tabular form.

Questions

(a) What was the volume of the pipette used?

(b) Calculate the average volume of the acid used.

(c) What were the changes on the litmus papers?

(d) Indicating all the state symbols, write a balanced chemical equation for the neutralization reaction between **V1** and **V2**.

(e) Write an ionic equation for the reaction.

(f) Showing your procedures clearly, calculate the concentration in g/dm^3 of the claimed component (sodium hydroxide).

2. You are provided with the following:

RR: a solution containing 0.2 M sodium thiosulphate ($Na_2S_2O_3$);
SS: a solution containing 1.0 M hydrochloric acid (HCl);
Distilled water;
Plain paper marked **M**;
Stopwatch.

Procedure

(i) Measure 4 cm^3 of **RR** and put it into the 50 cm^3 beaker. Add 6 cm^3 of distilled water.

(ii) Measure 10 cm^3 of **SS** and put it into the 50 cm^3 beaker containing **RR** and distilled water, and immediately start the stopwatch.

(iii) Swirl the contents and place the beaker on top of the letter **M** marked on the plain paper provided. Watch from above and observe the changes.

(iv) Switch off the stop watch when the mark **M** disappears.

(v) Record the time taken for the letter **M** to disappear.

(vi) Repeat the experiment using different data as shown in the following table.

Table: Experimental Data

Experiment	1	2	3	4
Volume of RR (cm^3)	10	8	6	4
Volume of Distilled Water (cm^3)	0	2	4	6
Volume of SS (cm^3)	10	10	10	10
Time (s)				

Questions

(a) What is the aim of this experiment?

(b) Complete filling the table.

(c) Giving reason(s), identify the experiment in which the reaction was:
- (i) slow
- (ii) fast.

(d) (i) Indicating the state symbols of the reactants and products, write a balanced chemical equation for the reaction between **RR** and **SS**.
- (ii) Write the ionic equation for the reaction.

(e) How does the concentration of **RR** affect the time for the mark **M** to disappear?

(f) (i) Plot a graph of volume of **RR** against time.
- (ii) What can you conclude from the graph?