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: 2022**

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.
   1 litre = 1 dm^3 = 1000 cm^3.



You are provided with solutions **A** and **D**. One of this is acidic and the other is a basic solution. The basic solution was made by dissolving 3.5 g of an impure sodium hydroxide (NaOH) in a distilled water making up to a litre of solution. The acidic solution is 0.03 M sulphuric acid (H_2SO_4). Perform the following procedures and then answer the questions that follow.

Procedure

(i) Pour about 1 cm^3 of a solution **A** into a test tube and use a litmus paper to test if it is an acid or a base.

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

(iii) Repeat the procedures (i) and (ii) using a solution **D**.

(iv) Titrate the acid solution (in a burette) against the base solution (in a titration flask) using methyl orange (**MO**) as an indicator up to the end point.

(v) Repeat the step (iv) to obtain three more readings and record the results in a tabular form.

Questions

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

(ii) What was the colour change at the end point?

(iii) Calculate the average volume of the acid used to neutralize the base.

(b) Write a balanced chemical equation for the neutralization reaction between solution **A** and **D**.

(c) Calculate the percentage purity of sodium hydroxide.

2. You are provided with the following:

LL: A solution of 0.13 M $Na_2S_2O_3$ (sodium thiosulphate);
NN: A solution of 2 M HCl;
Distilled water;
Stopwatch or stop clock;
A sheet of white paper marked **X**.

Procedure

(i) Measure 20 cm^3 of solution **LL** and put it into a 100 cm^3 beaker.

(ii) Place the beaker containing solution **LL** on the top of a letter **X** drawn on a sheet of paper.

(iii) Measure 10 cm^3 of **NN**; pour it into a beaker containing solution **LL** and immediately start the stopwatch. Swirl the beaker with contents twice.

(iv) Look down vertically through the mouth of the beaker so as to see the cross at the bottom of the beaker. Stop the clock when the letter **X** is invisible.

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

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

Table: Experimental data

Experiment No.	Volume of NN (cm^3)	Volume of LL (cm^3)	Volume of distilled water (cm^3)	Time (sec)	$\frac{1}{t}$ (sec^{-1})
1	10	20	0		
2	10	15	5		
3	10	10	10		
4	10	5	15		

Questions

(a) Complete filling the experimental table.

(b) What does $\frac{1}{t}$ represent in the experimental table?

(c) Write a balanced chemical equation for the reaction between **LL** and **NN**.

(d) How was the factor of concentration varied in this experiment?

(e) Plot a graph of volume of solution **LL** against $\frac{1}{t}$.

(f) Use the graph you have drawn in (e) above to explain how the variation of concentration affects the rate of chemical reaction.