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 dm^3 = 1000 cm^3.

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1. You are provided with the following:
   LL: 6.3 g of dibasic acid, $H_2C_2O_4.XH_2O$ 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 $H_2C_2O_4.XH_2O$. Proceed as follows:

   (i)   Fill the burette with solution **LL**.
   (ii) Pipette 20/25 cm³ 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 $H_2C_2O_4.XH_2O$.
         (ii) the percentage of water of crystallization in $H_2C_2O_4.XH_2O$.

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 cm³ beaker on top of letter **X** in such a way that the letter **X** is visible when viewed from above.
   (ii) Measure 20 cm³ of solution **L2** and put it into a 100 cm³ beaker placed on top of a sheet of paper marked letter **X**.
   (iii) Measure 40 cm³ 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 cm³ 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?