THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

032/2C **CHEMISTRY 2C**

(ACTUAL PRACTICAL C)

(For Both School and Private candidates)

Time: 2:30 Hours **Year: 2021**

Instructions

1. This paper consists of **two (2)** questions**.**
2. Answer **all** questions**.**
3. Each question carries twenty **five (25)** marks**.**
4. All writing must be in **blue** or **black** ink **except** drawing which must be in pencil.
5. Cellular phones, and any unauthorized materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet (s)

Atomic masses: H=1, C=12, 0=16, Na=23.

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

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1. Determine water of crystallization in sodium carbonate. You are provided with the following solutions:

   K: 1.825 g of hydrochloric acid in a 0.50 dm^3 solution.

   L: 3.575 g of pure hydrated sodium carbonate ($\mathbf{Na_2CO_3.XH_2O}$) in a 0.25 dm3 of solution.

   Titrate the acid (in the burette) against the alkali (in the conical flask) using methyl orange (**MO**) indicator. Next they had to repeat the procedure to obtain three more titre values and record the results in a tabular form.

   (a) What was the volume of pipette used?

   (b) What was the colour change at the end point of titration?

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

   (d) Showing your procedure clearly, determine the value of X (the number of molecules of water of crystallization) in the formula ($\mathbf{Na_2CO_3.XH_2O}$).

2. Determine the effect of concentration on the rate of chemical reaction. The chemicals provided are labelled as **W** containing 79.0 g of sodium thiosulphate in 0.5 litre of solution and **V** containing 6.3 g/dm^3 nitric acid solution. You are also provided with a stopwatch and a piece of white paper marked X on which a 50 cm^3 beaker containing the reaction mixture.

   Proceed as follows:

   (i) Place a 50 cm^3 beaker on top of letter X in such a way that the letter X is visible when viewed from above.

   (ii) Using measuring cylinder, measure 2 cm^3 of solution **W** and pour it into a 50 cm^3 beaker. Add 3 cm^3 of distilled water.

   (iii) Measure 5 cm^3 of solution **V** and put it into a 50 cm^3 beaker containing solution **W** and distilled water and immediately start a stopwatch.

   (iv) Swirl the contents in the 50 cm^3 beaker and stop the stopwatch when

the letter X disappears.

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

(vi) Repeat the experiment by varying the volume of **W** and distilled water as shown in the following table of experimental data.

Table: Experimental Data

Experiment	Volume of **W** (cm^3)	Volume of **V** (cm^3)	Volume of Distilled water (cm^3)	Time taken for the letter X to disappear in sec.
(i)	2	5	3	
(ii)	3	5	2	
(iii)	4	5	1	
(iv)	5	5	0	

Questions

(a) Complete the table by filling the empty column.

(b) Write a balanced chemical equation for the reaction between sodium thiosulphate and nitric acid.

(c) What substance caused the letter X to disappear in experiment?

(d) Plot a graph of the volume of $\mathbf{Na_2S_2O_3}$ (cm^3), y-axis against time (s), x-axis.

(e) What conclusion can you draw from the graph regarding the disappearance of the letter X?