

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

**032/2A**

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

***Time: 2:30 Hours***

***Tuesday, 11<sup>th</sup> October 2011 a.m.***

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**Instructions**

1. This paper consists of **three (3)** questions. Answer all the questions.
2. Question 1 carries **twenty (20)** marks and the rest carry **fifteen (15)** marks each.
3. Qualitative Analysis Guidance Sheet may be used after a thorough check by the supervisor.
5. Cellular phones and calculators are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).
7. You may use the following constants:  
Atomic masses:

H = 1, C = 12, N = 14, O = 16, Na = 23, S = 32

1 litre = 1 dm<sup>3</sup> = 1000 cm<sup>3</sup>.



1. You are provided with the following:  
**AA** A solution of 0.2M nitric acid ( $\text{HNO}_3$ );  
**BB** A solution of 4.2 g  $\text{Na}_x\text{CO}_3$  per  $0.5 \text{ dm}^3$  of solution;  
**MO** is methyl orange indicator.

### Procedure

Put solution **AA** into the burette. Pipette  $20 \text{ cm}^3$  or  $25 \text{ cm}^3$  of solution **BB** in a titration flask. Add two drops of methyl orange indicator into the titration flask. Titrate solution **BB** against **AA** until the end point is reached. Record the burette reading. Repeat the procedure to obtain three more readings and record your results in a tabular form.

### Questions:

- (a) (i) Calculate the average titre volume.  
(ii) Summary: \_\_\_\_\_  $\text{cm}^3$  of solution **BB** required \_\_\_\_\_  $\text{cm}^3$  of solution **AA** for complete reaction.
- (b) If the mole ratio for the reaction is 1:1 find:  
(i) Concentration of  $\text{Na}_x\text{CO}_3$  in  $\text{mol/dm}^3$  and  $\text{g/dm}^3$ .  
(ii) Molecular mass of  $\text{Na}_x\text{CO}_3$ .  
(iii) Atomic mass of x and replace it in the formula  $\text{Na}_x\text{CO}_3$ .
- (c) Write a balanced chemical equation for the reaction in this experiment.
- (d) What is the significance of the indicator in this experiment?
- (e) Why is there a colour change when enough acid has been added to the base?  
(20 marks)

2. You are provided with the following materials:  
**TT:** A solution of 0.13M Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> (sodium thiosulphate);  
**HH:** A solution of 2M HCl;  
 Distilled water;  
 Stopwatch.

**Procedure:**

- (i) Using 10 cm<sup>3</sup> measuring cylinder, measure 20 cm<sup>3</sup> of solution **TT** and put into 100cm<sup>3</sup> beaker.
- (ii) Use different measuring cylinder to measure 10 cm<sup>3</sup> of **HH** and pour it into the beaker containing solution **TT**, immediately start the stop watch. Swirl the beaker twice.
- (iii) Place the beaker with the contents on top of a piece of paper marked **X**.
- (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 as shown in Table 1.
- (vii) Record your results in tabular form as shown in Table 1.

Table 1: Table of results

Exp. No.	Vol. of <b>HH</b> (cm <sup>3</sup> )	Vol. of <b>TT</b> (cm <sup>3</sup> )	Vol. of Distilled water (cm <sup>3</sup> )	Time (sec)	$\frac{1}{t}$ (s <sup>-1</sup> )
1	10	20	0		
2	10	15	5		
3	10	10	10		
4	10	5	15		

**Questions:**

- (a) Complete filling the table of results (Table 1).
- (b) Write a balanced equation for reaction between **TT** and **HH**.
- (c) What is the reaction product which causes the solution to cloud the letter **X**?
- (d) How was the factor of concentration varied in this experiment?
- (e) Plot a graph of 1/t against the volume of the thiosulphate.
- (f) Use the graph to explain how variation of concentration affects the rate of chemical reaction.

(15 marks)

3. Sample S is a simple salt containing one cation and one anion. Carry out the experiments described below. Record your observations and inferences as shown in Table 2.

Table 2: Experimental results

S/n	Experiment	Observation	Inference
(a)	Observe the appearance of sample S.		
(b)	Place a spoonful of sample S in a test tube, add water and shake to dissolve.		
(c)	Put a spatulaful of sample S in a test tube and heat.		
(d)	Add three drops of sodium hydroxide solution to the solid sample in a test tube.		
(e)	Put a spatulaful of sample S in a dry test tube and add concentrated sulphuric acid. Warm the mixture and test for any gas evolved.		
(f)	Put a spatulaful of sample S in a dry test tube and add concentrated sulphuric acid and manganese dioxide. Warm the mixture and test for any gas evolved.		
(g)	To a portion of the solution from (f) add aqueous silver nitrate followed by aqueous ammonia.		

**Conclusion:**

- (a) The cation present in S is \_\_\_\_\_ and the anion is \_\_\_\_\_.
- (b) The name of sample S is \_\_\_\_\_.
- (c) Write a balanced chemical equation for the reactions taking place in experiments (c) and (d).

(15 marks).