

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

**32/2A**

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

**Time: 2:30 Hours**

**Tuesday, 11<sup>th</sup> November 2014 a.m.**

**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 Pamphlets may be used after a thorough check by the supervisor.
- 4. Cellular phones and calculators 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 constants:  
Atomic masses:  
H = 1, C = 12, O = 16, K = 39.  
1 litre = 1 dm<sup>3</sup> = 1000 cm<sup>3</sup>.

1. You are provided with the following solutions:

**H:** Containing 6.3 g of hydrated oxalic acid,  $(\text{COOH})_2 \cdot \text{XH}_2\text{O}$  in  $1\text{dm}^3$  of solution.

**M:** Containing 1.4 g of potassium hydroxide in  $0.5\text{ dm}^3$  of the solution.  
Phenolphthalein indicator.

### Questions

- Titrate the acid (in a burette) against the base (in a conical flask) using the drops of the indicator and obtain three titre values.
- $\text{cm}^3$  of **M** required  $\text{cm}^3$  of **H** for complete reaction.
  - The colour change at the end point was from \_\_\_\_\_ to \_\_\_\_\_.
  - Is the use of methyl orange indicator in this experiment as suitable as the use of phenolphthalein? Give a reason for your answer.
- Showing your procedures clearly, determine the value of **X** in the formula  $(\text{COOH})_2 \cdot \text{XH}_2\text{O}$  given that the equation for the reaction is  

$$(\text{COOH})_{2(aq)} + 2\text{KOH}_{(aq)} \rightarrow (\text{COOK})_{2(aq)} + 2\text{H}_2\text{O}_{(l)}$$
- State any four precautions you would observe to ensure accuracy in this experiment.

(20 marks)

2. You are provided with the following:

Solution **Z** containing 1 M sodium thiosulphate ( $\text{Na}_2\text{S}_2\text{O}_3$ );

Solution **T** containing 0.1 M nitric acid ( $\text{HNO}_3$ );

Distilled water;

Piece of paper marked **X**;

Stop-watch.

### Procedure

- Using measuring cylinder, measure  $5\text{ cm}^3$  of solution **Z** and put into  $100\text{ cm}^3$  beaker.
- Measure  $5\text{ cm}^3$  of solution **T** and put into  $100\text{ cm}^3$  beaker containing solution **Z**, and immediately start the stop-watch.
- Swirl the contents in the  $100\text{ cm}^3$  beaker and put the beaker on top of mark **X** on the piece of the paper. Watch the mixture from the above and observe changes.
- Switch off the stop-watch when the mark **X** disappears.
- Record the time taken for the letter **X** to disappear.
- Repeat procedures (i) to (v) using the data shown in Table 1.

Table 1

Experiment	Vol. of T ( $\text{cm}^3$ )	Vol. of Z ( $\text{cm}^3$ )	Vol. of Distilled water ( $\text{cm}^3$ )	Time (s)
1	5	5	0	
2	5	4	1	
3	5	3	2	
4	5	2	3	

### Questions

- (a) Complete Table 1.
- (b) Write a balanced equation for reaction between **T** and **Z**.
- (c) What substance was produced during the reaction which obscured letter **X**?
- (d) Plot the graph of volume of  $\text{Na}_2\text{S}_2\text{O}_3$  solution against time (s).
- (e) What conclusion can you draw from this experiment?

**(15 marks)**

Sample **Q** is a simple salt containing one cation and one anion. Carry out the experiments described below. Record carefully your observations, inferences and finally identify the anion and cation present in sample **Q**.

Table 2

S/n	Experiment	Observation	Inference
(a)	Observe the appearance of sample <b>Q</b> .		
(b)	Dissolve a little sample <b>Q</b> in distilled water in a test tube, stir and then boil.		
(c)	Put a spatulaful of sample <b>Q</b> in a test tube then add concentrated sulphuric acid and warm.		
(d)	Put a spatulaful of sample <b>Q</b> in a test tube and then add dilute nitric acid. Divide the resulting solution into three portions and add the following: i. $\text{NaOH}$ solution till in excess to the first portion.		
	ii. $\text{KI}$ solution till in excess to the second portion.		
	iii. $\text{AgNO}_3$ solution followed by dilute $\text{HNO}_3$ and then $\text{NH}_3$ solution to the third portion.		

### Conclusion

- (i) The cation in sample **Q** is \_\_\_\_\_.
- (ii) The anion in sample **Q** is \_\_\_\_\_.
- (iii) The formula of the compound **Q** is \_\_\_\_\_.
- (iv) The name of compound **Q** is \_\_\_\_\_.

**(15 marks)**