

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

032/2A

CHEMISTRY 2A
(For Both School and Private Candidates)

Time: 2 Hours 30 Minutes

Wednesday, October 19, 2005 a.m.

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **two (2)** questions including question **number 1**.
3. All questions carry equal marks.
4. Qualitative Analysis Guidance Pamphlets may be used after a thorough check by the supervisor.
5. Electronic calculators are **not** allowed in the examination room.
6. Cellular phones are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).
8. The following constants may be used.

$\text{Na} = 23, \quad \text{C} = 12, \quad \text{O} = 16, \quad \text{K} = 39, \quad \text{H} = 1, \quad \text{Ca} = 40.$

$1 \text{ litre} = 1 \text{ dm}^3 = 1000 \text{ cm}^3.$

1. You are provided with the following:

Solution Q containing 2.0 g of sodium hydroxide in 0.5 dm³ of the solution.

Solution R containing 3.15 g of hydrated oxalic acid, (COOH)₂ · XH₂O in 0.25 dm³ of the solution

Phenolphthalein indicator.

You are required to determine the value of X in (COOH)₂ · XH₂O.

Procedure

Pipette 25 cm³ or 20 cm³ of solution Q into the conical flask. Add two or three drops of phenolphthalein indicator and titrate it against solution R from the burette to the end point. Note the burette reading. Repeat the procedure to obtain three more readings and record your results in a table as shown below.

(a) **Table of results**

(i) Burette readings

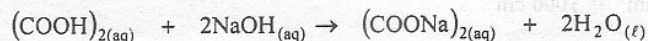
Titration	Pilot	1	2	3
Final reading (cm ³)				
Initial reading (cm ³)				
Volume used (cm ³)				

(ii) The volume of the pipette used was _____ cm³.

(iii) The colour change at the end point was from _____ to _____.

(iv) The volume of solution R needed for complete neutralization of _____ cm³ of solution Q was _____ cm³.

(b) Given the equation for the reaction



(i) Calculate the concentration of the base, in grams per dm³.

(ii) Calculate the concentration of the acid solution R in moles per dm³ and in grams per dm³.

(iii) Find the value of X, the number of molecules of water of crystallization of oxalic acid in the formula, (COOH)₂ · XH₂O.

2. Sample **B** is a simple salt containing **one** cation and **one** anion. Carry out carefully the experiments described below and record **all** your observations and appropriate inferences. Identify the **cation** and **anion** present in sample **B**.

S/N	Experiment	Observation	Inference
(a)	Observe the solid for its appearance.		
(b)	Dissolve half a spatula of the sample B in distilled water. Shake well.		
(c)	Put a spatulaful of sample B in a test tube and heat gently, then very strongly.		
(d)	Add dilute hydrochloric acid to a half spatulaful of sample B in a test tube.		
(e)	Add concentrated sulphuric acid to a half spatulaful of sample B in a test tube.		
(f)	Dissolve a spatulaful of sample B in dilute hydrochloric acid in a test tube. Shake until no solid remains. Divide the solution into three portions.		
(i)	To the first portion add dilute sodium hydroxide solution dropwise until excess.		
(ii)	To the second portion add dilute ammonia solution dropwise until excess.		
(iii)	To the third portion add potassium ferrocyanide solution.		

Conclusion

The cation in **B** is _____ and the anion is _____.

The salt **B** is _____.

3. Sample **TR** is a simple salt containing **one** anion and **one** cation. Using the systematic qualitative analysis procedures, carry out tests on sample **TR** and make appropriate observations and inferences to identify the **cation** and **anion** present in sample **TR**.

Experiment	Observation	Inference

Conclusion

The cation in sample **TR** is _____ and the anion is _____.