

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

**032/2C**

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

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

***Thursday, 20<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 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, Na = 23.

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

1. You are provided with the following:
- C:** Solution of 2.0 g sodium hydroxide in 0.5 dm<sup>3</sup> of the solution;
- F:** Solution of 3.15 g of hydrated oxalic acid, (COOH)<sub>2</sub>xH<sub>2</sub>O in 0.25 dm<sup>3</sup> of the solution;
- POP:** Phenolphthalein indicator.

**Procedure:**

Put solution **F** into the burette. Pipette 20 cm<sup>3</sup> or 25 cm<sup>3</sup> of solution **C** in a titration flask. Add two drops of phenolphthalein indicator. Titrate solution **C** against **F** from the burette until a colour change is observed. Note the reading of the burette. Repeat the procedure to obtain three more readings and record your results in a tabular form.

**Questions:**

- (a) (i) Determine the titre volume.  
(ii) \_\_\_\_\_ cm<sup>3</sup> of solution **C** required \_\_\_\_\_ cm<sup>3</sup> of solution of **F** for complete reaction.
- (b) Given the equation for the reaction:
- $$(\text{COOH})_{2(aq)} + 2\text{NaOH}_{(aq)} \rightarrow (\text{COONa})_{2(aq)} + 2\text{H}_2\text{O}_{(l)}$$
- Calculate the:
- (i) Concentration of **C** in grams per dm<sup>3</sup>.
- (ii) Molarity of **F**.
- (iii) Concentration of **F** in grams per dm<sup>3</sup>.
- (c) Find the value of x, in the formula (COOH)<sub>2</sub> .xH<sub>2</sub>O.
- (d) What colour change is observed when phenophalein is added to solution **C** (NaOH) ?
- (e) What is the colour change of the mixture at the end of each titration?
- (f) What is the significance of the colour change when enough acid has been added to the base?

**(20 marks)**

2. You are provided with the following materials:  
**JJ:** A solution of 0.13M  $\text{Na}_2\text{S}_2\text{O}_3$  (sodium thiosulphate);  
**KK:** A solution of 2M  $\text{HCl}$ ;  
Stopwatch;  
Thermometer;  
Heat source/ burner;  
Distilled water.

**Procedure:**

Place  $150\text{ cm}^3$  of water in the  $200\text{ cm}^3$  beaker and heat water to  $80^\circ\text{C}$ . This is your water bath. Use  $10\text{ cm}^3$  measuring cylinder, measure  $10\text{ cm}^3$  of **JJ** and  $30\text{ cm}^3$  of water. Pour the content in the  $100\text{ cm}^3$  beaker and put it in a hot water bath. Measure the temperature of the solution by using a thermometer. Use different measuring cylinder, measure  $10\text{ cm}^3$  of **KK** and pour it into the beaker containing **JJ** and distilled water, immediately start the stop watch. Swirl the beaker twice. Place the beaker with the contents on top of a piece of paper marked **X**. 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 cross is invisible. Record the time taken for the letter **X** to disappear completely. Repeat the experiment at temperatures of  $50^\circ\text{C}$ ,  $60^\circ\text{C}$  and  $70^\circ\text{C}$ .

Record your results in tabular form as shown in Table 1.

Table 1: Table of results

Exp. No.	Temperature	Time (sec)
1	40	
2	50	
3	60	
4	70	

**Questions:**

- Complete the Table 1 provided.
- What substance was produced during the reaction which obscured the letter **X**?
- Write a balanced chemical equation for this reaction.
- Plot a graph of time against temperature.
- Give a brief comment on how the time changes with temperature.

**(15 marks)**



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

Table 2: Table of results

S/n	Experiment	Observation	Inference
(a)	Observe the appearance of sample Y.		
(b)	Put a little sample in a test tube and heat.		
(c)	Put a spatulaful of the sample in a dry test tube and add dilute hydrochloric acid.		
(d)	Put a spatulaful of the sample in a test tube. Add distilled water and shake to dissolve. Divide the solution into three portions and add the following:		
	(i) NaOH solution in small quantities till in excess to the first portion.		
	(ii) KI solution to the second portion.		
	(iii) $\text{MgSO}_4(\text{aq})$ then boil to the third portion.		

**Conclusion:**

- The cation in sample Y is \_\_\_\_\_ and anion is \_\_\_\_\_.
- Write the chemical formula of sample Y.
- Write a balanced chemical equation for the reactions taking place in experiments (b) and (d) (iii).

**(15 marks)**