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, 20th October 2011 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, Na = 23.
   1 litre = 1 dm^3 = 1000 cm^3

1. You are provided with the following:
   C: Solution of 2.0 g sodium hydroxide in 0.5 dm^3 of the solution;
   F: Solution of 3.15 g of hydrated oxalic acid, $(COOH)_2xH_2O$ in 0.25 dm^3 of the solution;
   POP: Phenolphthalein indicator.

Procedure:
Put solution **F** into the burette. Pipette 20 cm^3 or 25 cm^3 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^3 of solution **C** required _____ cm^3 of solution of **F** for complete reaction.

(b) Given the equation for the reaction:

$$(COOH)_{2(aq)} + 2NaOH_{(aq)} \rightarrow (COONa)_{2(aq)} + 2H_2O_{(l)}.$$

Calculate the:
(i) Concentration of **C** in grams per dm^3.
(ii) Molarity of **F**.
(iii) Concentration of **F** in grams per dm^3.

(c) Find the value of x, in the formula $(COOH)_2.xH_2O$.

(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 $Na_2S_2O_3$ (sodium thiosulphate);
KK: A solution of 2M HCl;
Stopwatch;
Thermometer;
Heat source/ burner;
Distilled water.

Procedure:
Place 150 cm^3 of water in the 200 cm^3 beaker and heat water to 80^0C. This is your water bath. Use 10 cm^3 measuring cylinder, measure 10 cm^3 of **JJ** and 30 cm^3 of water. Pour the content in the 100 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 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 50^0C, 60^0C and 70^0C.

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:

(i) Complete the Table 1 provided.
(ii) What substance was produced during the reaction which obscured the letter **X**?
(iii) Write a balanced chemical equation for this reaction.
(iv) Plot a graph of time against temperature.
(v) 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) $MgSO_{4(aq)}$ then boil to the third portion.		

Conclusion:

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

(15 marks)