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, 11th 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 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^3 = 1000 cm^3.

1. You are provided with the following:
AA A solution of 0.2M nitric acid (HNO_3);
BB A solution of 4.2 g $NaxCO_3$ per 0.5 dm^3 of solution;
MO is methyl orange indicator.

Procedure

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

(b) If the mole ratio for the reaction is 1:1 find:
(i) Concentration of $NaxCO_3$ in mol/dm^3 and g/dm^3.
(ii) Molecular mass of $NaxCO_3$.
(iii) Atomic mass of x and replace it in the formula $NaxCO_3$.

(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 $Na_2S_2O_3$ (sodium thiosulphate);
HH: A solution of 2M HCl;
Distilled water;
Stopwatch.

Procedure:

(i) Using 10 cm^3 measuring cylinder, measure 20 cm^3 of solution **TT** and put into 100cm^3 beaker.
(ii) Use different measuring cylinder to measure 10 cm^3 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 **HH** (cm^3)	Vol. of **TT** (cm^3)	Vol. of Distilled water (cm^3)	Time (sec)	$\frac{1}{t}(s^{-1})$
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).