THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
DIPLOMA IN SECONDARY EDUCATION EXAMINATION

732/2A **CHEMISTRY 2A**

(ACTUAL PRACTICAL A)

Time: 3 Hours **Thursday, 17th May 2018 a.m.**

Instructions

1. This paper consists of **three (03)** questions.
2. Answer **all** questions.
3. Question 1 carries **twenty (20)** marks and the rest carry **fifteen (15)** marks each.
4. Qualitative Analysis Guide Sheet may be used after a thorough check by the supervisor.
5. Cellular phones, programmable calculators and any unauthorized materials 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:

   Molar masses: H = 1; C = 12; O = 16; Na = 23; S = 32.

   1 Litre = $1dm^3 = 1000cm^3$.

1. You are provided with a solution of 5.3g anhydrous sodium carbonate in a litre, labelled **BX**; and dilute solution of sulphuric acid of unknown concentration, labeled **AX**. Methyl orange (**MO**) is also given.

   (a) Perform titration procedure to determine the volume of sulphuric acid used for neutralization. Record your results in a relevant table of titration results.

   (b) Comment on the colour change.

   (c) Write a balanced chemical equation for the reaction taking place in the experiment.

   (d) Calculate the:
   (i) Molarity of **BX**.
   (ii) Number of grams of sulphuric acid present in one litre of the acid solution.

   (e) If the concentration of Na_2CO_3 is doubled, what volume of sulphuric acid will be needed to complete neutralization?

2. You are provided with solutions **AA** (0.2M $Na_2S_2O_3$) and **BB** (0.1M HCl). You are also given distilled water, stop watch/clock and a sheet of white A4 paper marked '**X**.'

   Procedure

   (i) Put a $50cm^3$ beaker on top of mark '**X**' on the sheet of paper in such a way that the mark is clearly seen through the beaker.

   (ii) Using a measuring cylinder, measure out 2 ml of **AA** and 8 ml of distilled water and put them in the beaker on top of marked '**X**'.

   (iii) Using another measuring cylinder, measure out 10ml of **BB** and pour it into a beaker containing **AA** and distilled water and immediately start a stop-watch or clock.

   (iv) Record the time taken for the mark '**X**' to disappear.

   (v) Repeat the experiment with other concentrations as shown in Table 1. In each reaction the total volume of solution is 20 ml.

Table 1: Experimental data

Expt	$S_2O_3^{-2}(cm^3)$	$H_2O\ (cm^3)$	$HCl\ (cm^3)$	Time, t (sec)	$1/t\ (sec^{-1})$
A	2	8	10		
B	4	6	10		
C	8	2	10		

Questions

(a) Complete the Table 1 with appropriate data.

(b) If the rate expression is $-d[S_2O_3^{-2}] = \frac{-\delta[S_2O_3^{-2}]}{\delta t} = K[S_2O_3^{-2}]^a[H^+]^b$, calculate the value of a. Take volume of solution as its concentration.

(c) Given the value of b = 2, find the value of K.

(d) Write the ionic equation for the reaction taking place in this experiment.

(e) Plot a graph of 1/t (vertical axis) against the volume of sodium thiosulphate (horizontal axis).

(f) Based on the nature of the graph in (e), suggest the order of reaction with respect to sodium thiosulphate:

3. You are given sample **L** which contains one cation and one anion. Carry out qualitative analysis to identify the cation and anion present in a salt using the tests given in Table 2.

Table 2: Experimental Observation and Inferences.

S/N	Experiment	Observation	Inference
(a)	Observe the appearance of sample **L**.		
(b)	Heat the sample in a clean test tube.		
(c)	Dissolve a small amount of sample **L** in distilled water and shake it. Divide the sample solution into six portions.		
(d)	To the first portion add concentrated H_2SO_4.		

S/N	Experiment	Observation	Inference
(e)	To the second portion, add dilute HCl.		
(f)	Add iron II sulphate ($FeSO_4$) followed by concentrated H_2SO_4 to the third portion.		
(g)	To the fourth portion, add dilute NaOH drop wise till in excess.		
(h)	To the fifth portion, add dilute NH_4OH drop wise till in excess.		
(i)	Add potassium iodide (KI) solution to the last portion.		

(a) Complete the table with appropriate information.

(b) Give the name and chemical formula of the cation in sample **L**.

(c) Write down the chemical formula of sample **L**.

(d) What is the common name for experiment (f)?

(e) Is it the anion or cation that determined the observed solubility property of the salt? Give reason for your answer.