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

732/2A **CHEMISTRY 2A**

(PRACTICAL A)

Time: 3 Hours **Year: 2020**

Instructions

1. This paper consists of **three (03)** questions.
2. Answer **all** the questions.
3. Question **one (1)** carries **twenty (20)** marks and the rest carry **fifteen (15)** marks each.
4. Qualitative Analysis Guide Sheet authorized by NECTA and non-programmable calculators may be used.
5. Cellular phones and any unauthorised 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 = $1dm^3$ = $1000cm^3$.

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1. You are provided with a solution of 10.6 g anhydrous sodium carbonate in 2 litres, labelled **SS** and dilute solution of sulphuric acid of unknown concentration, labeled **AA**. You are also given Methyl orange (**MO**).

   (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) Find the molarity of **SS**.

   (e) What mass in grams of sulphuric acid is present in one litre of the acid solution?

   (f) What volume of sulphuric acid is required to complete neutralization, if the concentration of Na_2CO_3 is doubled?

2. You are provided with solutions **TT** (0.22M $Na_2S_2O_3$) and **HH** (0.15M HCl). You are also given distilled water, stop watch/clock and a sheet of white A4 paper marked '**X**.'

Procedure

(i) Put a 50 cm^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 **TT** and 8 ml of distilled water and put them in the beaker on top of mark '**X**'.

(iii) Using another measuring cylinder, measure out 10ml of **HH** and pour it into a beaker containing **TT** 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		

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Questions

(a) Complete Table 1 with appropriate data.

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

(c) Given the value of d = 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 **Z** 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 **Z**.		
(b)	- Dissolve a small amount of sample **Z** in distilled water and shake it well. Study its solubility. - Divide the sample solution into four portions.		
(c)	To the first portion, add conc. H_2SO_4.		
(d)	To the second portion, add iron II sulphate ($FeSO_4$) followed by conc. H_2SO_4.		
(e)	To the third portion, add dilute NaOH drop wise till in excess.		
(f)	To the fourth portion, add dilute NH_4OH drop wise till in excess.		

Questions

(a) Complete the table with appropriate information.

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

(c) Write down the chemical formula of **Z**.

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

(e) What is the difference between experiment (e) and (f)?

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