

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

732/2A

CHEMISTRY 2A
(PRACTICAL A)

Year: 2020

Time: 3 Hours

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: $H = 1$; $C = 12$; $O = 16$; $Na = 23$; $S = 32$.
 $1 \text{ Litre} = 1\text{dm}^3 = 1000\text{cm}^3$.



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** ($0.22\text{M Na}_2\text{S}_2\text{O}_3$) 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	$\text{S}_2\text{O}_3^{2-}(\text{cm}^3)$	$\text{H}_2\text{O}(\text{cm}^3)$	$\text{HCl}(\text{cm}^3)$	Time, t (sec)	$1/t(\text{sec}^{-1})$
A	2	8	10		
B	4	6	10		
C	8	2	10		

Questions

- Complete Table 1 with appropriate data.
 - 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.
 - Given the value of $d = 2$, find the value of K.
 - Write the ionic equation for the reaction taking place in this experiment.
 - Plot a graph of $1/t$ (vertical axis) against the volume of sodium thiosulphate (horizontal axis).
 - 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

- Complete the table with appropriate information.
- Give the name and chemical formula of the cation in **Z**.
- Write down the chemical formula of **Z**.

- (d) What is the common name for experiment (d)?
- (e) What is the difference between experiment (e) and (f)?