

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

CHEMISTRY 2A
(ACTUAL PRACTICAL A)

732/2A

Time: 3 Hours DR. MYO TA - F.
CB

Wednesday, 17th May 2011 a.m.

Instructions

This paper consists of **three (3)** questions.

Answer **all** questions.

Question 1 carries **forty (40)** marks and the rest carry **thirty (30)** marks each.

A qualitative analysis guide pamphlet for answering question number 3 may be used.

Cellular phones are **not** allowed in the examination room.

Mathematical tables and non-programmable calculators may be used.

Write your **Examination Number** on every page of your answer booklet(s).

The following constants might be useful in your calculations

Atomic masses:

H = 1; C = 12; O = 16; Na = 23; S = 32; K = 39; Mn = 55; Fe = 56.

1 Litre = $1\text{dm}^3 = 1000\text{cm}^3$.

Gas constant, $R = 8.314\text{ Jmol}^{-1}$.

1. You are provided with the following reagents:

ZA: A standard solution of 0.02M KMnO_4 (potassium permanganate);

ZB: A solution of unknown concentration of $\text{FeSO}_4 \cdot \text{YH}_2\text{O}$;

ZC: Dilute sulphuric acid (1M H_2SO_4);

Procedure:

- Fill the burette with **ZA**.
- Pipette out 20 cm^3 (or 25 cm^3) of **ZB** into a clean conical flask. Add to it 20 cm^3 to the same conical flask.
- Titrate this solution against **ZA** until permanent colour change is observed.
- Repeat procedure (i) - (iii) so as to get three more readings.
- Record your results in tabular form as shown in Table 1.

Table 1: Titration results

Titration No.	Trial	1	2	3
Final volume (cm^3)				
Initial volume (cm^3)				
Volume used (cm^3)				

Questions:

- From the experiment:
 - Determine the average titre value.
 - Write the half Redox reaction equation between **ZA** and **ZB**.
 - Write overall balanced ionic equations for the reaction.
 - State which species was oxidized and which one was reduced.
- Calculate the concentration of:
 - KMnO_4 in g/dm^3 .
 - $\text{FeSO}_4 \cdot \text{YH}_2\text{O}$ in mol/dm^3 .
 - Concentration of FeSO_4 in g/dm^3 .

You are provided with the following materials;

PQ: A solution of 80 g sodium thiosulphate ($\text{Na}_2\text{S}_2\text{O}_3$) in 1dm^3 ;

PR: A solution of 0.1M HCl;

PS: Distilled water;

Stopwatch;

Two 10 cm^3 measuring cylinders.

Procedure:

- (i) Use a blue or black pen to write a letter **V** on a white piece of paper.
- (ii) Place a small beaker ($50 - 100\text{cm}^3$) on top of a written letter such that the letter is visible through the solution.
- (iii) Use a measuring cylinder to measure 2 cm^3 of **PQ** and 8 cm^3 of **PS** and then put them in a small beaker on top of the letter **V**.
- (iv) Using another measuring cylinder, measure 10 cm^3 of **PR** and put it into the beaker containing **PS** and **PQ**. Immediately start the stopwatch.
- (v) Record the time taken for the letter **V** to disappear completely.
- (vi) Repeat the experiment as shown in Table 2.1

Table 2.1: Summary of procedure

Experiment No.	Vol. of $\text{Na}_2\text{S}_2\text{O}_3$ (cm^3) (PQ)	Vol. of H_2O (cm^3) (PS)	Vol. of HCl (cm^3) (PR)
1	2	8	10
2	4	6	10
3	6	4	10
4	8	2	10

Record your results in tabular form as shown in Table 2.2.

Table 2.2: Experimental results

Experiment No.	Vol. of PR (cm^3)	Vol. of PQ (cm^3)	Vol. of PS (cm^3)	Time (sec)	$\frac{1}{t}(\text{s}^{-1})$
1	10	8	2		
2	10	6	4		
3	10	4	6		
4	10	2	8		

Questions:

- (a) Write a balanced chemical equation for the reaction between **PQ** and **PR**.
 - (b) What is the reaction product which causes the solution to cloud the letter **V**?
 - (c) Calculate the order of reaction with respect to the concentration of the acid.
3. Compound **J** contains **one cation** and **one anion**. Perform a systematic qualitative analysis experiment to identify the ions present in salt **J**. Write a chemical formula of **J**.