



TANZANIA HEADS OF ISLAMIC SCHOOLS COUNCIL
FORM SIX INTER ISLAMIC MOCK EXAMINATION

CHEMISTRY 3A

(Actual Practical)

132/3A

(For both School and Private Candidates)

TIME: 3:20 HOURS

Tuesday, 13th March 2024 a.m.

Instructions

1. This paper consists of **three (3)** questions.
2. Answer all questions.
3. Question **one (1)** carries **twenty (20)** marks, question **two (2)** and **three (3)** each carries **fifteen (15)** marks.
4. Mathematical tables and non-programmable calculators may be used.
5. Cellular phones 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. For your calculations the following constants may be useful:

Atomic masses: H=1, C=12, O=16, Cl=35.5, S=32, Na=23, Cu=64, K=39, Mn=55.

1. You are provided with the following solutions

B₁: A solution made by dissolving 5.00g of impure potassium permanganate in 0.25dm³ of distilled water.

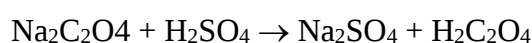
B₂: A solution made by dissolving 4.00g of sodium oxalate in 0.25dm³ of distilled water.

B₃: A solution of 1M sulphuric acid.

B₄: Thermometer.

Theory:

The reaction between B₁ and B₂ in presence of B₃ may be presented as



Procedure:

- (i) Pipette 20cm³ or 25cm³ of B₂ into a titrating or conical flask. Add to it 15cm³ of B₃.
- (ii) Put B₁ into a burette and titrate B₁ against the solution containing B₂ and B₃ until the solution becomes pale pink (about 2 to 5 drops of B₁ are enough).
- (iii) Allow the solution to stand until it becomes colourless. Warm the solution to about 50°C to 60°C and continue the titration until the solution becomes just pink.
- (iv) Repeat procedures (i) to (iii) three times and record the volume used in a tabular form.

Titration number	Pilot	1	2	3
Final reading (cm ³)				
Initial reading (cm ³)				
Volume used (cm ³)				

Summary:

_____cm³ of B₂ required _____cm³ of B₁ in the presence of B₃ for complete reaction.

Questions:

- (a) (i) Write a balanced half reaction equation for reduction of permanganate ions and oxidation of oxalate ions in this experiment.
- (ii) Why was sulphuric acid added initially in the sodium oxalate?
- (iii) Why the solution mixture was warmed then titrated while still hot?
- (b) Calculate:
- (i) Molarity of B₂
- (ii) Molarity of B₁
- (iii) Concentration of pure B₁ in gdm⁻³.
- (iv) Percentage purity of potassium permanganate.
- (v) Percentage impurity of potassium permanganate.

2. You are provided with the following:

P₁: A solution containing 20g of sodium Thiosulphate pentahydrate in 0.5dm³ of solution.

P₂: A solution of dilute hydrochloric acid.

P₃: Distilled water

Stop watch

Procedures:

- (i) Draw a clear letter **W** on a piece of white paper provided and place a 100cm³ beaker on top of the letter **W** in such a way that the letter is visible when viewed from the top.
- (ii) Measure 10cm³ of P₁ into a beaker in (i).
- (iii) Add 5cm³ of P₂ into the solution in (ii) and immediately start the stop watch, swirl the mixture and record the time taken for the letter **W** to disappear completely.
- (iv) Repeat procedures (i) to (ii) using specification given in table 1.

S/N	VOLUME OF P ₁	VOLUME OF P ₂	VOLUME OF P ₃
1	10	5	0
2	8	5	2
3	6	5	4
4	4	5	6

Record your results as indicated in table 2.

S/N	t(sec)	1/t (sec ⁻¹)	[P ₁]M
1			
2			
3			
4			

Questions:

- (a) Plot a graph of $[P_1]$ against time, t .
- (b) Plot a graph of $\frac{1}{t}$ against $[P_1]$.
- (c) From the graphs in (a) and (b)
- What is the effect of concentration of P_1 on the rate of reaction?
 - What is the order of reaction with respect to P_1 ? Give reason for your answer.
3. Substance T contains two cations and a common anion. Use the information given in the experiment column in a table below to complete the observations and inferences and hence identify the two cations and the common anion.

S/N	EXPERIMENT	OBSERVATIONS	INFERENCES
(a)	Appearance		
(b)	Heat a little of sample T in a dry test tube		
(c)	Dissolve a little of sample T in water and divide the resulting solution into four portions.		
	(i) To first portion add NaOH solution and warm gently.		
	(ii) To the second portion add $AgNO_3$ solution till excess		
	(iii) To the third portion add ethanoic acid followed by lead ethanoate solution		
	(iv) In the fourth portion add few drops of potassium hexacyanoferrate (III).		
(d)	To a little sample T in a dry test tube add dilute sodium hydroxide solution then heat.		

Conclusion:

- The cations in sample T are _____ and _____.
- Write the molecular formula of sample T.
- Write the reaction equation in experiment (d).

Wabillah Tawfiq