



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

CHEMISTRY 3A

(ACTUAL PRACTICAL)

(For Both School and Private Candidates)

132/3A

TIME: 3 HOURS

Wednesday, 12th March 2025 a.m.

Instructions

1. This paper consists of **three (3)** questions.
2. Question **one (1)** carries **twenty (20)** marks and other two questions carry **fifteen (15)** marks each.
3. Mathematical tables and non-programmable calculators may be used.
4. Cellular phones and any unauthorized materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. The following information may be used:
 - Universal gas constant, $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ or $0.0821 \text{ atm dm}^3 \text{ mol}^{-1}$
 - Standard pressure = $670 \text{ mmHg} = 1.0 \times 10^{-5} \text{ Nm}^2$
 - Avogadro's number = 6.02×10^{23}
 - Atomic masses H=1, C=12, O=16, N=14, Cl=35.5, Br=80, Na=23, Mn=55, K=39

1. You are provided with the following

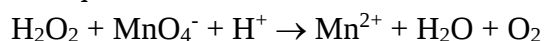
AA: A solution made by diluting 12.50cm³ of a given hydrogen peroxide in 500cm³ of distilled water

BB: A standard solution of 0.02M Potassium permanganate

CC: A 2M Sulphuric acid solution.

Theory:

In acidic media hydrogen peroxide reacts with potassium permanganate ions according to the equation below



Procedures:

1. Pipette 20cm³ or 25cm³ of solution AA into a conical flask. Add to it about 20cm³ of CC.
2. Titrate this mixture with solution BB until a permanent pink colour is observed.
3. Repeat procedures (1) to (2) three more times and record your titration results in tabular form as shown below:

Results

The volume of pipette used was _____cm³

The volume of burette used was _____cm³

_____cm³ of solution AA needed _____cm³ of solution BB for complete reaction.

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

Questions:

- (a) Write down half reactions equations to show oxidation and reduction processes taking place when hydrogen peroxide reacts with permanganate ions in the excess acid.
- (b) Calculate
 - (i) Concentration of hydrogen peroxide in moldm⁻³
 - (ii) Concentration of hydrogen peroxide in gdm⁻³
 - (iii)Original concentration of hydrogen peroxide in gdm⁻³
 - (iv)Volume strength of hydrogen peroxide.

2. You are provided with the following:

NN: A solution of 0.5M Na₂S₂O₃

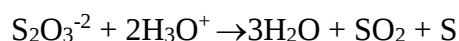
PP: A solution of 0.10M nitric acid

A thermometer (0° – 100°C)

Stop watch/clock

Theory:

A yellow precipitate of amorphous sulphur can be obtained by the action of a dilute acid on sodium thiosulphate (Na₂S₂O₃) according to the equation



The precipitated sulphur causes the solution to become opaque. From this phenomenon, you can assess the rate of sulphur precipitation by measuring the time taken by the solution to become totally opaqued by the sulphur.

Procedure:

1. Using a blue/black pen, draw a clear letter “N” on a white piece of paper and place a small beaker provided on top of the letter N, such that the letter is visible through the solution
2. Pour about 200cm³ of water into the clear 250cm³ or 500cm³ beaker and warm. Use this as your water bath for subsequent steps (if needed).
3. Measure out 10cm³ of NN and 10cm³ of PP into separate boiling tubes.
4. Put the two boiling test tubes containing NN and PP in (3) into the water bath in (2) above and warm the contents to about 50°C.
5. Immediately pour the hot solutions of NN and PP in (4) above in the small beaker in (1) above and simultaneously start the stop watch/clock.
6. Using a glass rod stir the reaction mixture in (5) and record the time taken in seconds for the letter “N” to disappear completely.
7. Repeat the whole procedure (3) to (6) using temperature 60°C, 70°C, 80°C and record your results in tabular form as shown below

Temperature of the reaction		Time of reaction t(s)	$\frac{1}{T}(\text{K}^{-1})$
°C	K		
50			
60			
70			
80			

Questions:

- (a) Plot the graph of $\text{Log}_{10} 1/t(\text{s}^{-1})$ against $1/T(\text{K}^{-1})$
- (b) Determine the slope of the graph obtained in (a) above.
- (c) Using equation, $K = Ae^{-E_a/RT}$ which gives the relationship describing the dependence of the rate constant on temperature, determine the value of A and E_a , for the given equation using the data obtained.
3. A substance Q containing two cations and common anion. Use the information given in the experiment column in table below to complete the observations and inferences and hence identify two cations and the common anion.

S/N	Experiment	Observation	Inference
(a)	Appearance		
(b)	Heat a little sample of Q in a dry test tube		
(c)	Dissolve a little sample Q in water and divide the resulting solution into three portions.		
	(i) To one portion add NaOH solution and warm gently		
	(ii) To the second portion add Barium chloride solution followed by dilute HCl		
	(iii) To the third portion add few drops of potassium hexacyanoferrate (III)		
(d)	To a little sample Q in a dry test tube, add dilute sodium hydroxide solution and warm the mixture.		

Conclusion:

- (a) The cations in sample Q are _____ and _____
- (b) Write the molecular formula of sample Q.
- (c) Write the reaction equation in experiment (d)
- (d) Suggest any two uses of compounds made by the anion identified in sample Q

Wabillah Tanfiq