TANZANIA HEADS OF ISLAMIC SCHOOLS COUNCIL

FORM SIX INTER ISLAMIC MOCK EXAMINATION 2025

CHEMISTRY 3A MARKING SCHEME

132/3A (ACTUAL PRACTICAL)

1. The volume of pipette used was 25cm³ 01
The volume of burette used was 50cm³

Burette readings (05 marks)

Titration number	Pilot			3
Final volume(cm³)	25.80	25.00	24.80	24.90
Initial volume(cm³)	0.00	0.00	0.00	0.00
Volume used(cm³)	25.80	25.00	24.80	24.90

04

Accuracy
decimal
Arrange
Complete

Average titre value = $\left(\frac{V_1 + V_2 + V_3}{3}\right)$ cm³

Average titre value = $\left(\frac{25 + 24.80 + 24.90}{3}\right)$ cm³

Average titre value = 24.90 cm³ (01 marks) 01

Summary:

01 $24.90 cm^3$ of BB required $25 cm^3$ of AA for complete reaction. (01 marks) 01

(a) Half reactions involved

$MnO_{4(aq)}^{-} + 8H_{(aq)}^{+} + 5\bar{e} \longrightarrow Mn_{(aq)}^{2+} + 4H_2O_{(l)}$

(reduction). (01 marks) 01

$H_2O_{2(aq)} \longrightarrow 2H_{(aq)}^{+} + O_{2(g)} + 2\bar{e}$

(Oxidation). (01 marks) 01

Overall equation

$5H_2O_{2(aq)} + 2MnO_{4(aq)}^{-} + 6H_{(aq)}^{+} \longrightarrow Mn_{(aq)}^{2+} + 8H_2O_{(l)} + 5O_{2(g)}$ (01 marks) 01

01 (b) (i) Concentration of hydrogen peroxide in mol/dm³ (AA).

From

$$M_{H_2O_2} = \frac{M_{MnO_4^-} \times V_{MnO_4^-} \times n_{H_2O_2}}{V_{H_2O_2} \times n_{MnO_4^-}}$$ (01 marks) 01

$$M_{H_2O_2} = \frac{0.02M \times 24.90 cm^3 \times 5}{25 cm^3 \times 2.} = 0.05M$$ (01 marks) 01

Concentration of AA (H_2O_2) is 0.05 mol/dm³ (01 marks) 01.

(ii) Concentration of AA (H_2O_2) in g/L.

01 Concentration = Molarity × Molar mass (0½ marks)

Concentration = $0.05 mol/dm^3 \times 34 g/mol$ (0½ marks)

Concentration = $1.7 g/dm^3$ } 01

Concentration of AA(H_2O_2) is $1.7 g/dm^3$ (01 marks) 01

(iii) Original concentration of H_2O_2 in g/dm^3.

$12.5 cm^3$ of H_2O_2 ≡ $500 cm^3$ of distilled water

$1000 cm^3$ of distilled water (01 marks) 01

$x = 25 cm^3$, so

$25 cm^3$ of H_2O_2 ≡ $1.7 g/dm^3$ (01 marks) 01

$1000 cm^3$ of H_2O_2 ≡ ??

$x = \frac{1000 \times 1.7}{25} = 68 g/dm^3$

∴ Original concentration of H_2O_2 is $68 g/dm^3$ (01 marks) 01

01 (iv) From the reaction

$H_2O_2 \longrightarrow 2H_2O + O_2$

68g of H_2O_2 ≡ $22.4 dm^3$ of O_2 at s.t.p. (01 marks) 01

68g of H_2O_2 ≡ ??

$x = \frac{68 \times 22.4}{68} = 22.4 dm^3$ (01½ marks)

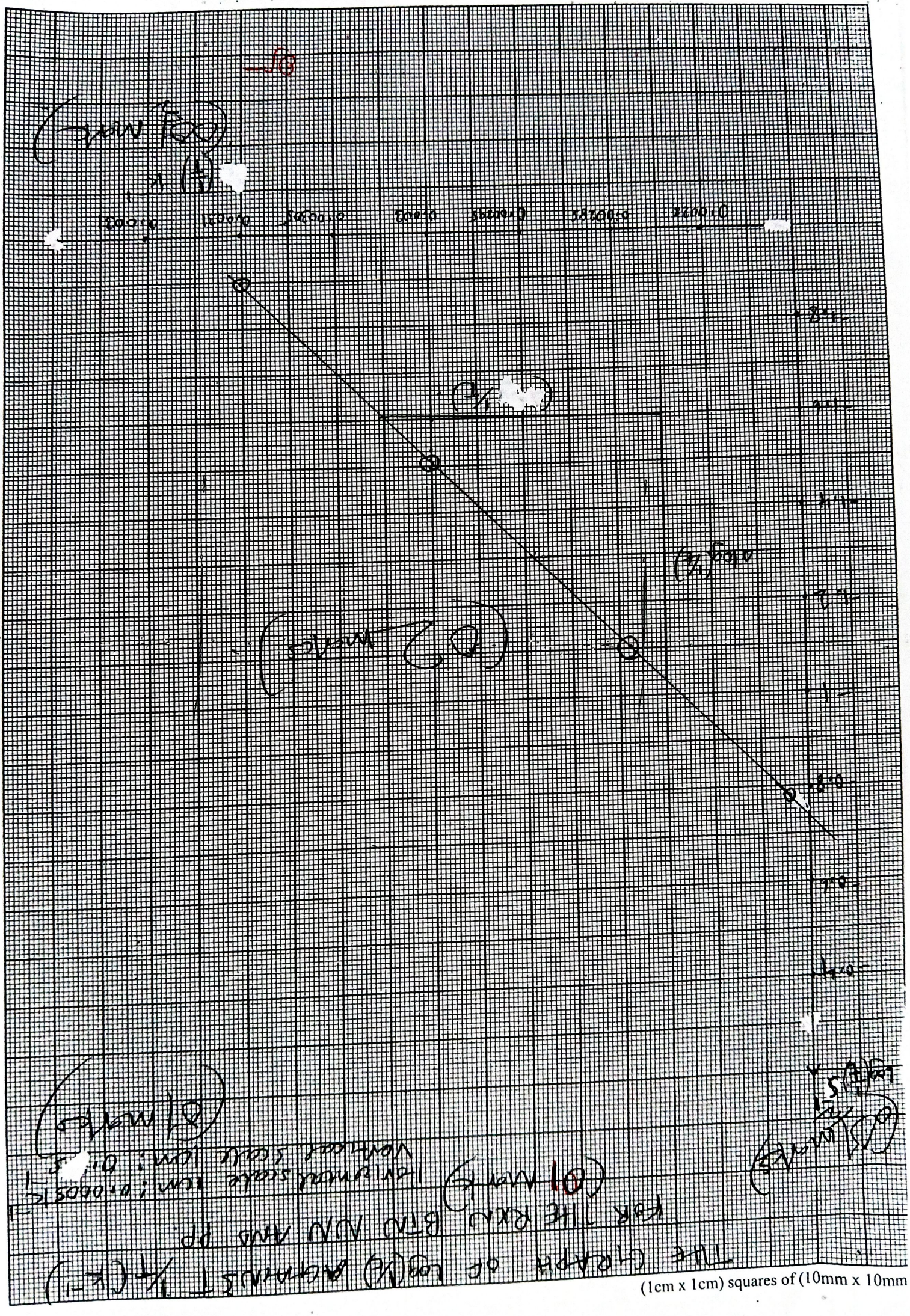
Volume strength of H_2O_2 is $22.4 dm^3$ (01½ marks) 01

2. Table of results.

Temperature °C	Temperature K	Time t(sec)	$\frac{1}{T}(K^{-1})$	$\frac{1}{t}(sec^{-1})$	$\log(\frac{1}{t})$
50	32	42	3.1×10^{-3}	0.02	-1.70
60	333	20	3.00×10^{-3}	0.05	-1.30
70	343	10	2.922×10^{-3}	0.1	-1.00
80	353	5	2.83×10^{-3}	0.2	-0.70

(05 Marks) .05

2 (a) A graph of $\log(\frac{1}{t})$ against $\frac{1}{T}(K^{-1})$


THE GRAPH OF log(x) AGAINST x
FOR THE BOX AND WHISKER PLOT
Horizontal scale 1cm : 0.5
Vertical scale 1cm : 0.1
(1cm x 1cm) squares of (10mm x 10mm

(b) slope $= \frac{\Delta \log 1/t}{\Delta 1/T} = -3.88 \times 10^{-3} K s^{-1}$ (01 marks)

(c) The value of A and E from the graph in (a) above

From

$\log(1/t) = \left(\frac{-E}{2.303R}\right)\left(\frac{1}{T}\right) + \log A + C$

$m \quad x$ (00½ marks)

Slope $= \frac{-E}{2.303R}$ (00½ marks)

$E = -(\text{slope} \times 2.303R)$

$E = -(-3.88 \times 10^{-3} \times 2.303 \times 8.314)$ (01/2 marks)

$E = 7.12 \times 10^{4} J mol^{-1}$ (01/2 marks).

Therefore, the activation energy is $7.12 \times 10^{4} J mol^{-1}$ (00½ marks)

The value A

From $A = \log(1/t) \rightarrow$, intercept.

$A = 0.635 sec^{-1}$ (01½ marks).

01

01

01½

Table of results.

S/N	EXPERIMENT	OBSERVATIONS	INFERENCE
(a)	Appearance (i) Colour	Green (00½ marks)	Fe^{2+}, Ni^{2+}, Cr^{3+} and Cu^{2+} may be present (00½ marks)
	(ii) Texture	crystalline form (00½ marks)	NO_3^-, SO_4^{2-}, Cl^- CO_4^{2-} may be present (00½ marks)
	(iii) Deliquescence	Absorbed water from the atmosphere to form solution (00½ marks)	NO_3^-, Cl^- and SO_4^{2-} may be present (00½ marks)
(b)	Add a little of sample Q in a dry test tube was heated	Colourless gas with a pungent smell was evolved, which turn blue litmus paper red (00½ marks)	SO_4^{2-} may be present (00½ marks)
(c)	Dissolves a little sample Q in water and divide the resulting solution into four portions	The salt dissolved in water to form colourless solution (00½ marks)	soluble salts were present Na^+, NH_4^+, K^+ of Cl^-, NO_3^-, and SO_4^{2-} (00½ marks)
	(i) To the one portion NaOH solution was added and warm gently	Gas evolved on warming (00½ marks)	NH_4^+ may be present (00½ marks)

S/N	EXPERIMENT	OBSERVATION	INFERENCE
	(ii) To the second portion Barium chloride was added followed by dilute HCl solution	White precipitate was formed insoluble in dilute (0½ marks)	SO_4^{2-} was present and confirmed (0½ marks)
	(iii) To the third portion add few drops of potassium hexacynoferrate (III)	Dark blue precipitate was ~~formed~~ not formed (0½ marks)	Fe^{2+} was ~~present and confirmed~~ absent (0½ marks)
(d)	To a little solid sample Q in a dry test tube, dilute sodium hydroxide was added and warmed	Colourless gas which turned wet red litmus paper blue and formed white fumes with concentrated HCl (0½ marks)	NH_4^+ was present and confirmed. (0½ marks)

Conclusion

(a) The cation in sample Q were Fe^{2+} and NH_4^+ (0|marks)

(b) The molecular formula of sample Q was $FeSO_4$ and $(NH_4)_2SO_4$ (0|marks)

(c) The reaction equation in experiment (b).

$(NH_4)_2SO_{4(aq)} + 2NaOH_{(aq)} \longrightarrow Na_2SO_{4(aq)} + NH_{3(g)} + 2H_2O_{(l)}$ (0|marks)

$FeSO_{4(aq)} + 2NaOH_{(aq)} \longrightarrow Fe(OH)_{2(s)} + Na_2SO_{4(aq)}$ (0|marks)

white ppt

(d) > used in manufacturing of building materials like gypsum.

> used in water treatment and purification eg Aluminium sulphate

> used in laboratory test for water eg cupric sulphate

> used in medical items like POP (plaster of paris).

(Any two points, 2 marks), ~~01~~ each

08