

Andaug'o



MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education

MOCK EXAMINATIONS 2022

233/3

CHEMISTRY

Paper 3

June 2022 – TIME Hours

Name:

Adm No:

Class: Candidate's Signature:

Date: 24/06/2022

CHEMISTRY (PRACTICALS)

TIME: 2 ¼ HOURS

INSTRUCTIONS TO CANDIDATES

- (a) Write your Name, Adm. number and Class in the spaces provided in the question paper.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer ALL questions in the spaces provided on the question paper
- (d) You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the apparatus and chemicals that you may need.
- (e) All working MUST be clearly shown where necessary
- (f) Mathematical tables and silent non-programmed electronic calculators may be used.

FOR EXAMINERS USE ONLY.

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	20	
2	10	
3	10	
Total Score	40	

This paper consists of 8 printed pages.

Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

1. (A) You are provided with:

- **Solution A** – Acidified aqueous potassium manganate(VII).
- **Solution B** – containing 23.5g of ammonium Iron (II) sulphate; $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$, per litre.

You are required to Standardize the potassium manganate (VII), solution A, using the ammonium iron(II) sulphate, Solution B.

Procedure

- Fill the burette with solution A.
- Pipette 25.0cm³ of solution B into a conical flask. Titrate solution B with solution A until a permanent PINK colour just appears.
- Record your results in table I below.
- Repeat the titration two more times and complete the table below.

Titre	1	2	3
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of Solution A used (cm ³)			

(4 marks)

(a) Determine the average volume of solution A used.

(1 mark)

$$= \frac{\text{titre 1} + \text{titre 2} + \text{titre 3}}{3}$$

± 0.2 of each titre.

= Average titre.

(b) Calculate the concentration of the ammonium iron (II) sulphate, Solution B, in moles per litre. (RFM of $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ = 392)

(1 mark)

$$= \frac{23.5}{392} \times \frac{1}{2}$$

$$= 0.05995 \text{ moles per litre}$$

penalize 0.06 moles per litre.

(c) Calculate the number of moles of iron(II) ions in the 25.0cm³ of solution B.

(1 mark)

$$= \frac{25 \times \text{answer (b)}}{1000} = \frac{25 \times 0.05995}{1000}$$

$$= \text{Correct Answer} = 0.001499$$

Dr. Malala / HOD

B, R, P, V, W, Y, M, O, G, C

CT - 1
D - 1
A - 1
PA - 1
FA - 1
05

- (d) Using the ionic equation for the reaction between manganate(VII) ions and iron(II) ions given below, calculate the concentration of manganate(VII) ions in solution A in moles per litre.



Moles of A used = $\frac{1}{5} \times \text{answer (c)}$
 = Answer Q

Moles of A in 1000 cm³ = Answer Q x 1000
 Average titre = Correct Answer

$M_1 V_1 = M_2 V_2$ (2 marks)
 $M_1 V_1 = 5$
 $M_2 V_2 = \text{Answer (b)} \times 25$
 $5 \times \text{Ans. titre} = \text{Correct Answer}$

1. (B) You are provided with:
- 4.5g of solid D, Potassium chlorate in a boiling tube.
 - Distilled water in a wash bottle

You are required to determine the solubility of solid D at different temperatures

Procedure

- Clean the burette and fill it with distilled water.
- Place 8.0 cm³ of distilled into the boiling tube containing solid D.
- Warm the mixture until all the solid D dissolves.
- Place the thermometer into the solution and remove it from the Bunsen burner flame.
- Stir the solution with the thermometer gently as it cools. Note the temperature at which the crystals first appear and record it in table 2 below.
- Add 2.0 cm³ of distilled water into the mixture and repeat the procedure (c) – (e) above to complete table 2 below.

Volume of water added (cm ³)	Temperature at which first crystals appear (°C)	Mass of KClO ₃ in g/100g of water
8	75 ± 2°C	42.5 56.25
10	42	25.0 45.0
12	30	56.25 37.50
14	28	45.0 32.14

Temp below 25-10.

(6 marks)

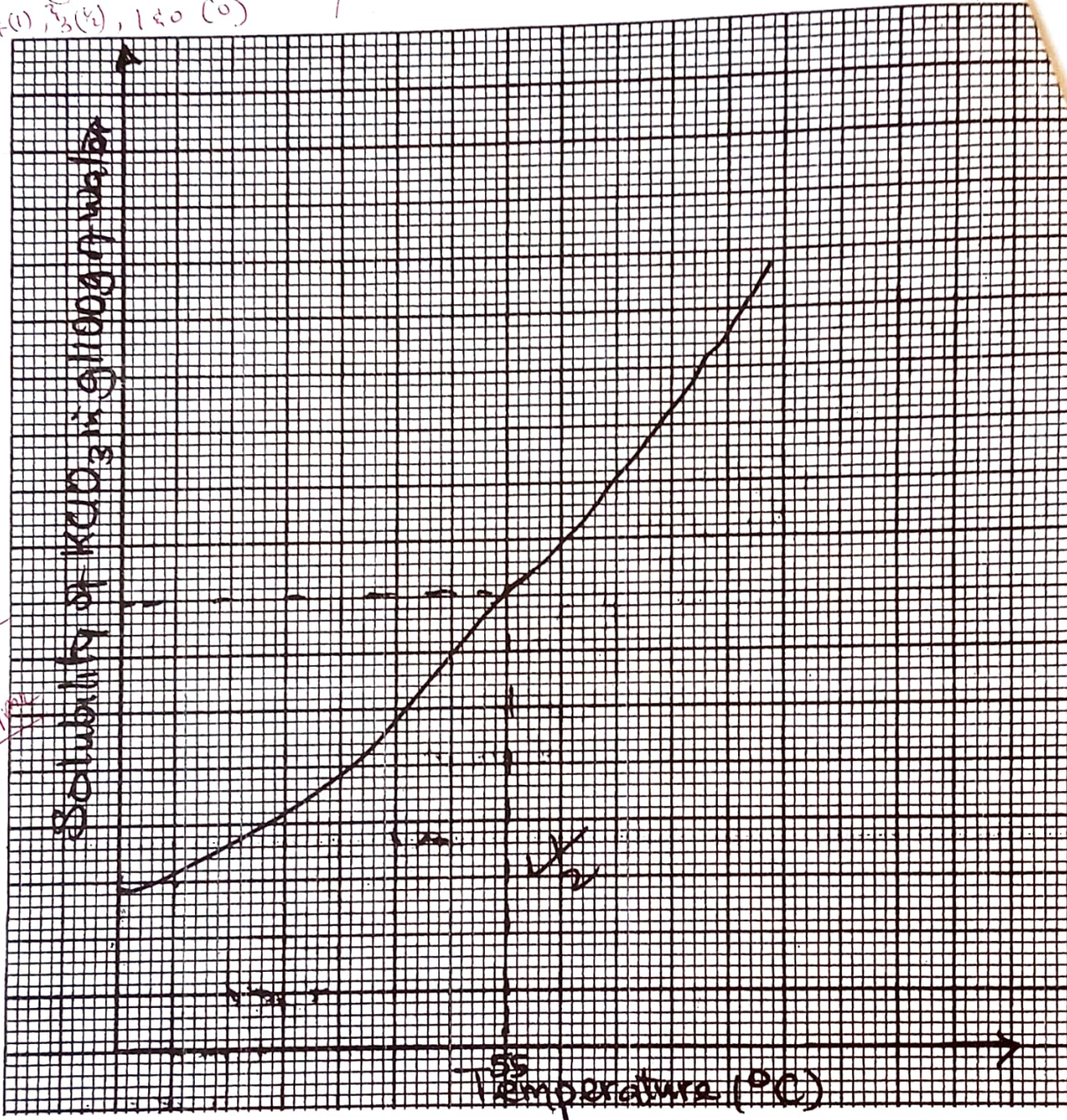
- g) Plot a graph of solubility of KClO₃ (y-axis) against temperature at which crystals first appear. (3marks)

Scale ϵ - at least 10 sq. a axis
10 sq. y axis.

Axis - Quantity & units

4

Plotting - $4(1)$, $3(4)$, $1(0)$
five correct plots.



ii) State the effect of changes in temperature on the solubility of $KClO_3$. (1 mark)

Increase in temperature increases the solubility of $KClO_3$. decrease in temperature decreases the solubility of $KClO_3$.

GOA

OBONYO

B, C, G, M, O, R.

V, W, Y, P, R

iii) From your graph, determine the solubility of KClO_3 at 55°C .

(1 mark)

Showing $\checkmark/2$
 Correct reading $\checkmark/2$

2. You are provided with solid R. Carry out the tests below. Write your observations and inferences in the spaces provided.

(a) Place about one third of solid R in a clean dry test-tube and heat it strongly.

Observations	Inferences
Colourless liquid forms on the cooler parts of the test tube Residue is yellow when hot and white when cold. (1 mark) <i>Yellow solid // yellow residue</i>	Water of crystallisation or Hydrated Salt. ZnO formed (1 mark) <i>or H^- present</i>

(b) Place the remaining solid R in a boiling tube. Add about 10cm^3 of distilled water and shake well. Retain the mixture for tests in (d) below.

Observations	Inferences
Solid R dissolves to form a colourless solution. (1 mark)	Soluble salt. Absence of coloured ions. Fe^{2+} , Fe^{3+} , Cu^{2+} (1 mark) <i>must mention the ions.</i>

Omenda / Elijah
 B, C, G, M, O, V, W, Y, P, R

(c) Use about 2cm^3 portions of the mixture obtained in (b) for tests (i) to (iii) below.

(i) Add two to three drops of aqueous barium nitrate to the mixture.

Observations	Inferences
White precipitate <i>acc white solid white suspension.</i> (1 mark)	SO_4^{2-} , CO_3^{2-} , SO_3^{2-} present All 3 mentioned - 1mk 2 mentioned - $\frac{1}{2}$ mk 1 mentioned - 0mk. (1mark) <i>penalize $\frac{1}{2}$ mk for contradiction to a max of 1mk.</i>

(ii) Add five drops of dilute nitric(V) acid to the mixture. *in (i) above*

Observations	Inferences
White ppt, insoluble on addition of nitric (v) acid. <i>white ppt persists, white ppt does not dissolve</i> (1 mark)	SO_4^{2-} present. Accept for $\frac{1}{2}$ mk. SO_3^{2-} , CO_3^{2-} absent. (1mark) <i>contradictory; penalize fully.</i>

(iii) Add to the mixture, aqueous ammonia dropwise until in excess

Observations	Inferences
White ppt soluble in excess. (1 mark)	Zn^{2+} (1mark)

IMBUGA / JESSE
 B, R, O, V, W Y, M, G, C, P

3. You are provided with an IMPURE organic substance, **solid Q**. You are required to carry out the tests indicated below.

Place a ALL of **solid Q** in a boiling tube. Add about 10 cm³ of distilled water and shake well. Divide the mixture into four equal portions in test tubes.

Observations	Inferences
<p><u>Dissolve</u> to form a <u>colourless</u> solution</p> <p>(1 mark)</p>	<p>Polar organic compound</p> <p>polar compound [also scores]</p> <p>(1 mark)</p>

- a) To the first portion, add two drops of acidified potassium manganate (VII) solution.

Observations	Inferences
<p>Purple H⁺/KMnO₄ (aq) changes to colourless</p> <p>ref turns (1 mark)</p>	<p>$\text{C}=\text{C}$, $-\text{C}\equiv\text{C}-$, R-OH</p> <p>$\frac{1}{2}$ mark (either or both) (1 mark)</p>

- b) To the second portion, add three drops of acidified potassium dichromate(VI).

Observations	Inferences
<p>Orange H⁺/K₂Cr₂O₇ (aq) changes to green.</p> <p>(1 mark)</p>	<p>R-OH present [either]</p> <p>or reducing agent. (1 mark)</p>

Joshua / Tim
B, P, R, C, G Or, V, W, Y, M

(c) To the third portion, add all the sodium hydrogen carbonate.

Observations	Inferences
Bubbles of a colourless gas / Effervescence (1 mark)	H^+ , H_3O^+ , $R-COOH$ <i>H⁺ alone ½ mark</i> <i>H₃O⁺ alone ½ mark</i> <i>R-COOH alone full mark</i> (1 mark)

(d) Test the pH of the fourth portion using universal indicator solution provided.

Observations	Inferences
$pH = 3$ Accept $pH = 1, 2, 3$ (1 mark)	Strongly Acidic <i>Req strong acid</i> (1 mark)

Req range

Jerry / Odundo
B, G, M, Or ~~G~~, V, W, P, R, C

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END