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; $(NH_4)_2Fe(SO_4)_2.6H_2O$), 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 25.0cm^3 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)

CT – 1
D – 1
A – 1
PA – 1
FA –
05

(a) Determine the average volume of **solution A** used. (1 mark)

= titre1 + titre2 + titre3 / 3 ± 0·2 of each other.

= Average titre.

(b) Calculate the concentration of the ammonium iron (II) sulphate, **Solution B**, in moles per litre. (RFM of $(NH_4)_2Fe(SO_4)_2.6H_2O$) = 392) (1 mark)

= 23.5 / 392 ½

= 0.05995 moles per litre ½ 1

Penalize 0·06 moles per litre.

(c) Calculate the number of moles of iron(II) ions in the 25.0cm^3 of **solution B**. (1 mark)

= 25 × answer(b) / 1000 ½ = 25 × 0.05995 / 1000 1

= Correct Answer ½ = 0.001499.

Dr. Malala / HOD

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

(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.

$MnO^-_{4(aq)} + 5Fe^{2+}_{(aq)} + 8H^+_{(aq)} \longrightarrow Mn^{2+}_{(aq)} + 5Fe^{3+}_{(aq)} + 4H_2O_{(l)}$

(2 marks)

Moles of A used = 1/5 x answer (c) = Answer Q

Moles of A in 1000 cm^3 = Answer Q x 1000 / Average titre = Correct Answer

$M_1V_1 = 5$ / M_2V_2 / M_2 = Answer (b) x 25 / 5 x Ave. titre = Correct Answer

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

units can be left out if given must be correct Rej mols or M/L ... at least 3 s.f

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

Procedure

a) Clean the burette and fill it with distilled water.
b) Place 8.0cm^3 of distilled into the boiling tube containing solid D.
c) Warm the mixture until all the solid D dissolves.
d) Place the thermometer into the solution and remove it from the Bunsen burner flame.
e) 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.
f) Add 2.0cm^3 of distilled water into the mixture and repeat the procedure (c) – (e) above to complete table 2 below.

CT - 3 >2
D -
A - [3
Ir - dec.

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	~~75.0~~ 45.0
12	30	~~56.25~~ 37.50
14	28	~~45.0~~ 32.14

½ mk each.

Temp btw 25 - 110.

(6 marks)

g) Plot a graph of solubility of $KClO_3$ (y-axis) against temperature at which crystals first appear. (3marks)

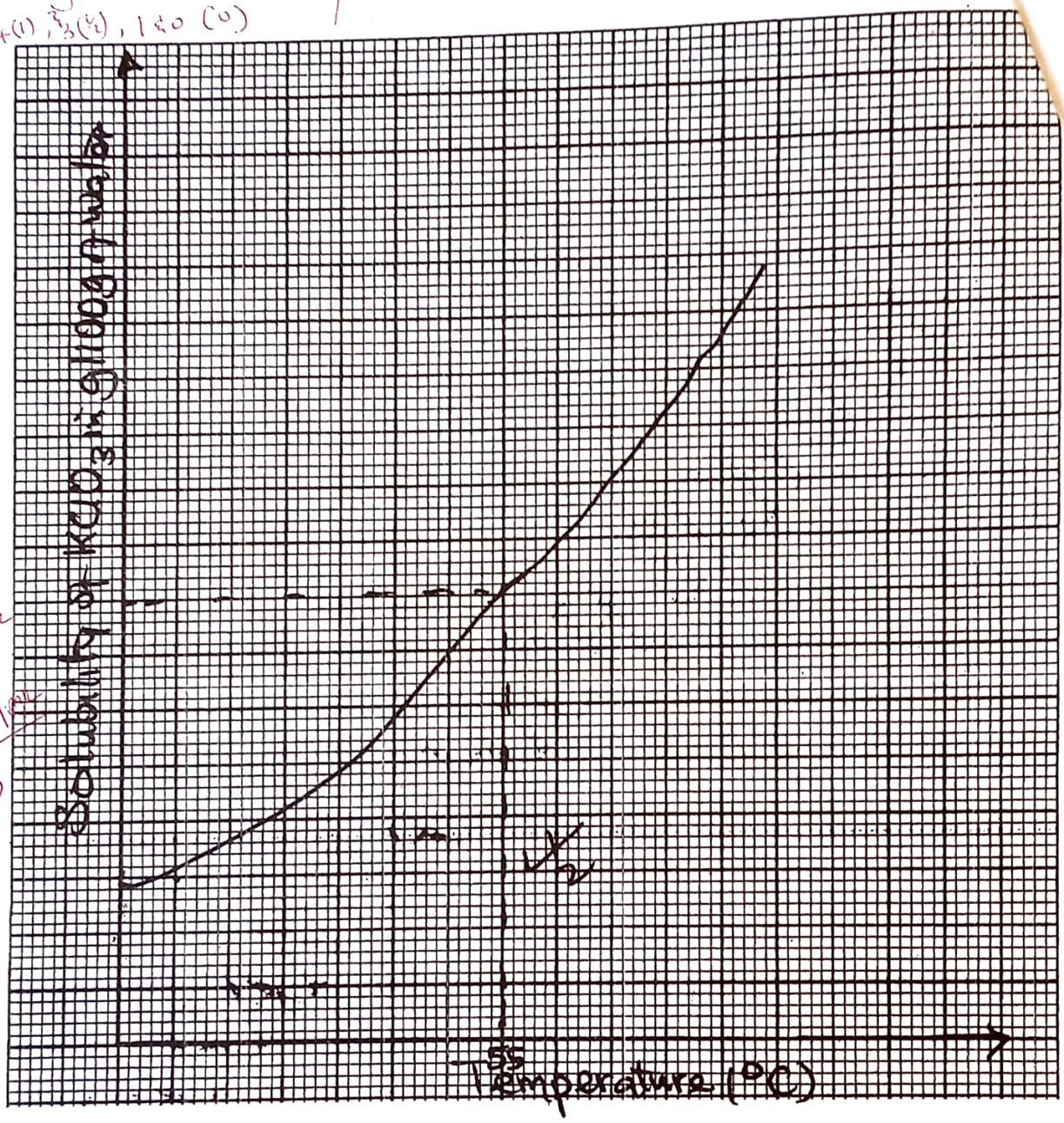
Peter / Rose / Brian

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

Scale - at least 10 sq x axis
10 sq y axis.

Axis - Quantity & units

Plotting - 4(1), 3(½), 1&0 (0)
for correct plots.



S-½
Axis-½
Plot-1
Label-½
03

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
B, C, G, M, Dr.

OBONYO
V, W, Y, P, R

iii) From your graph, determine the solubility of $KClO_3$ at 55°C. (1 mark)

Showing ½

Correct reading ½

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. (1mark) Yellow solid // Yellow residue	Water of crystallisation or Hydrated salt. ✓ or OH^- ½ mk for any ✓ formed ZnO or Zn^{2+} present (1 mark)

(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. (1mark)	• Soluble salt. ✓ • Absence of ~~Colourless~~ coloured ions. ½ Fe^{2+}, Fe^{3+}, Cu^{2+} must mention the ions. (1mark)

Omenda / Elijah
B, C, G, M, Or 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 acc white solid white suspension. (1 mark)	SO_4^{2-}, CO_3^{2-}, SO_3^{2-} present All 3 mentioned – 1mk 2 mentioned – ½mk 1 mentioned – 0mk. Penalize ½ mk for contradiction to a max of 1mk. (1mark)

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

Observations	Inferences
White ppt, insoluble on addition of nitric(V) acid. (1 mark)	SO_4^{2-} present. Accept for ½mk. SO_3^{2-}, CO_3^{2-} absent. (1mark) contradicting; penalize fully.

White ppt persists, white ppt does not dissolve

(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, Or, V, W Y, W, 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 cm^3 of distilled water and shake well. Divide the mixture into four equal portions in test tubes.

Observations	Inferences
Dissolue to form a colourless solution (1 mark)	Polar organic compound polar compound [also scores] (1 mark)

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

Observations	Inferences
Purple $H^+/KMnO_4(aq)$ changes to colourless rej turns (1 mark)	$C=C$, $-C\equiv C-$, R-OH. ½ mk (either or both) ½ mk (1 mark)

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

Observations	Inferences
Orange $H^+/K_2Cr_2O_7(aq)$ changes to green. (1 mark)	R-OH present [either] or reducing agent. (1 mark)

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 H^+ alone ½ mk H_3O^+ alone ½ mk RCOOH alone full mark (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) Rej range	Strongly Acidic Rej strong acid (1 mark)

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

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END