



MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education
PRE-MOCK EXAMINATIONS 2023

233/3

CHEMISTRY

Paper 3

April 2023 – TIME Hours

Name: *Marking guide* Adm No:

Class: Candidate's Signature: Date: 15/04/2023

CHEMISTRY (PRACTICALS)

TIME: 2 ¼ HOURS

INSTRUCTIONS TO CANDIDATES

- Write your Name, Adm. number and Class in the spaces provided in the question paper.
- Sign and write the date of examination in the spaces provided above.
- Answer ALL questions in the spaces provided on the question paper
- 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.
- All working **MUST** be clearly shown where necessary
- Mathematical tables and silent non-programmed electronic calculators may be used.

FOR EXAMINERS USE ONLY.

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	20	20
2	10	10
3	10	10
Total Score	40	<u>40</u>

This paper consists of 9 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

1. You are provided with:

- **Solid A** – 6.2g of an alkanolic acid in a boiling tube.
- **Solution B** – 2.0M sodium hydroxide solution.

You are required to;

- Determine the solubility of solid A at different temperatures.
- Find the molar mass of alkanolic acid.

Procedure I

- Using a burette, add 10cm³ of distilled water to solid A in the boiling tube. Heat the mixture while stirring with the thermometer to about 75°C. When the entire solid has dissolved, allow the solution to cool while stirring with the thermometer. Note the temperature at which crystals of solid A appear. Record this temperature in **table 1**.
 - Using the burette, add 2cm³ of distilled water to the contents of the boiling tube. Warm the mixture while stirring with the thermometer until the solid dissolves. Allow the mixture to cool while stirring. Note the temperature at which crystals of solid A appear.
 - Repeat procedure (b) two more times and record the thermometer readings in **table I**. Retain the contents of the boiling tube for use in procedure II.
- i. Complete table 1 by calculating the solubility of solid A at different temperatures.

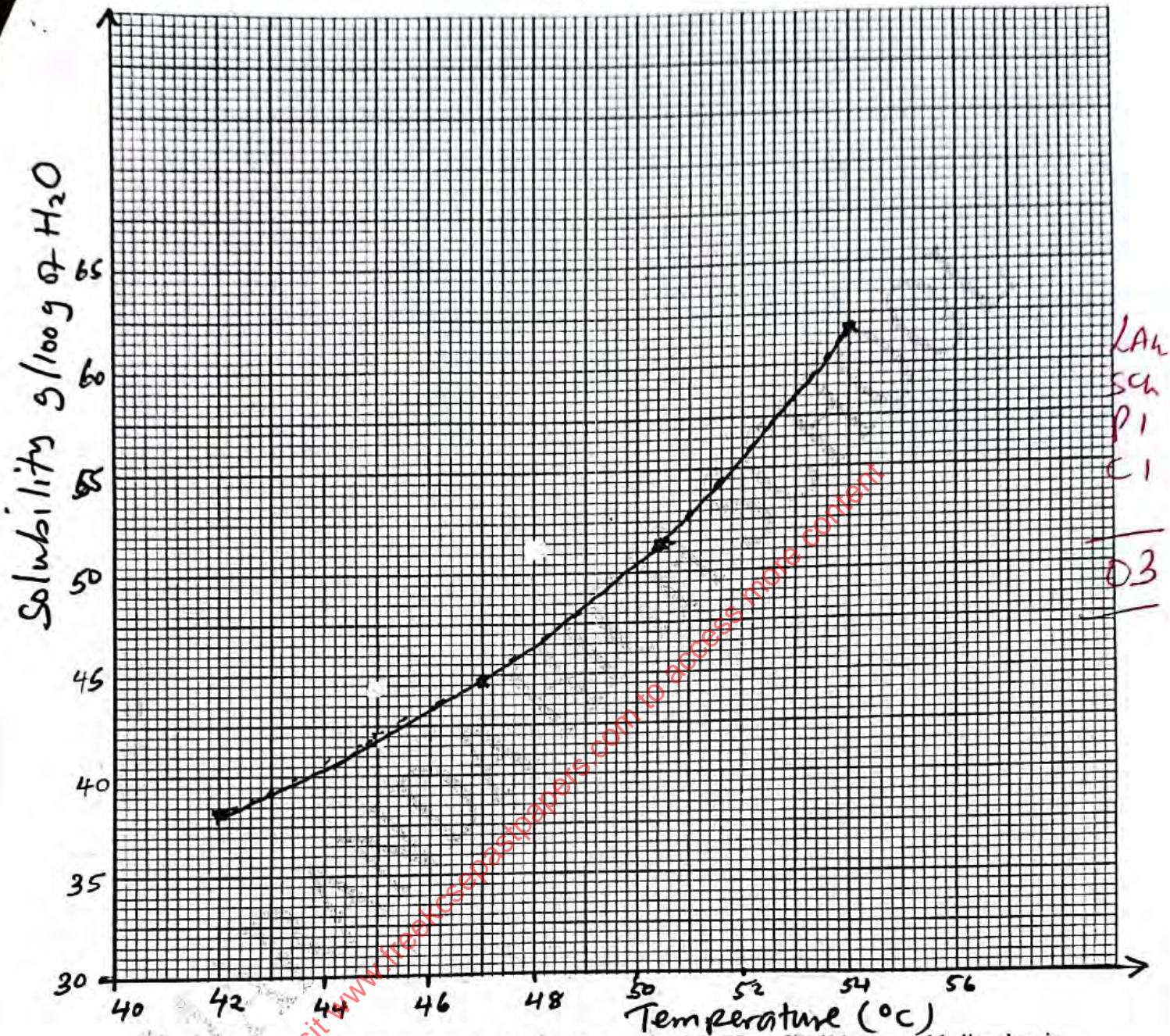
Table 1

Volume of water added(cm ³)	Temperature at which first crystals appear (°C)	Solubility of solid A (g/100g of water)
10	54.0	62.0 ✓
12	50.5	51.7 ✓
14	47.0	44.3 ✓
16	42.0	38.8 ✓

(5 marks)

- ii. On the grid provided, plot a graph of the solubility of solid A against temperature.

(3 marks)



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03

iii. Using the graph determine the temperature at which 52g of solid A would dissolve in 100cm³ of water. (1 mark)

Correct showing ✓₂
Correct reading ✓₂

I

Procedure II

- (i) Transfer the contents of the boiling tube in procedure I into a 250ml volumetric flask. Rinse both the boiling tube and the thermometer with distilled water and add it to the volumetric flask. Add more distilled water to make up to the mark. Transfer the solution into a 250ml beaker. Label this **solution E**. Rinse the volumetric flask with distilled water ready for use in step (ii).
- (ii) Using measuring cylinder, place 25cm³ of solution B into a 250ml volumetric flask. Add about 200cm³ of distilled water and shake well. Add more distilled water to make up to the mark. Label this **solution F**.
- (iii) Fill the burette with solution E. using a pipette filler, place 25cm³ of solution F into a conical flask. Add 2-3 drops of phenolphthalein indicator and titrate with solution E. record your results in table II. Repeat this procedure two more times to complete the table 2 below.

Table 2

	1	2	3
Final burette reading (cm ³)	12.6	12.7	12.8
Initial burette reading (cm ³)	0.0	0.0	0.0
Volume of Solution E used (cm ³)	12.6	12.7	12.8

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(4 marks)

- (a) Determine the average volume of solution E used.

(1 mark)

$$= \frac{12.6 + 12.7 + 12.8}{3}$$

$$= 12.7 \text{ cm}^3$$

- (b) Determine the concentration of solution F in moles per litre.

(1 mark)

$$2 \times 25 = M \times 250$$

$$M = 0.2 \text{ M}$$

- (c) Calculate the number of moles in 25cm³ of solution F

(1 mark)

$$\frac{0.2 \times 25}{1000} = 0.005$$

- (d) Calculate the moles of alkanolic acid, **solution E**, used (1 mole of acid reacts with 2 moles of base). (1 mark)

$$\frac{0.005}{2} = 0.0025$$

- (e) Calculate the concentration of **solution E** in moles per litre. (1 mark)

$$\frac{0.0025 \times 1000}{12.7} = 0.19685$$

- (f) Determine the relative formula mass of the alkanolic acid, **Solid A**. (C=12, H=1, O=16) (2 marks)

$$\begin{array}{l} \text{Conc in g/l} = \frac{6.2 \times 1000}{250} \\ = 24.8 \end{array} \quad \left| \quad \begin{array}{l} \text{RFM} = \frac{24.8}{0.19685} \\ = 125.98 \end{array} \right.$$

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

Place solid R in a boiling tube, add 10cm³ of distilled water and shake well. Use about 2cm³ portions for test (i) to (v) below.

- (i) Add 3 drops of sodium sulphate solution.

Observations	Inferences
No white ppt (1 mark)	Ca ²⁺ , Pb ²⁺ , Ba ²⁺ Absent. 3-mentioned ✓ 2-mentioned ✓ (1 mark) 1-mentioned 0

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(ii) Add sodium hydroxide solution dropwise until in excess.

Observations	Inferences
White ppt that dissolves in excess (1 mark)	Zn^{2+} , Al^{3+} present Penalize $\frac{1}{2}$ mark for Pb^{2+} if mentioned (1 mark)

(iii) Add aqueous ammonia dropwise until in excess.

Observations	Inferences
White ppt soluble in excess (1 mark)	Zn^{2+} present Penalize FULL for any contradictory ion mentioned. (1 mark)

(iv) Add 3 drops of barium (II) nitrate solution

Observations	Inferences
White ppt (1 mark)	SO_4^{2-} , SO_3^{2-} present Penalize $\frac{1}{2}$ mark for CO_3^{2-} if mentioned. (1 mark)

(v) Add 3 drops of ^{potassium} dichromate(VI) solution

Observations	Inferences
Orange $\text{Cr}_2\text{O}_7^{2-}$ solution changes to green. (1 mark)	SO_3^{2-} present. Penalise Fully for Any Contradiction (1 mark)

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3. You are provided with an 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
Dissolves to form a colourless solution. (1 mark)	Polar compound. (1 mark)

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

Observations	Inferences
Purple KMnO_4 changes to colourless/ is decolourised. (1 mark)	$\text{C}=\text{C}$ or $\text{C}\equiv\text{C}$, R-OH present. (1 mark)

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

Observations	Inferences
$K_2Cr_2O_7$ remains orange ✓ (1 mark)	$C=C$ / $-C \equiv C-$ present ✓ or $R-OH$ absent. ✓ (1 mark)

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

Observations	Inferences
Effervescence / bubbles / Fizzing ✓ (1 mark)	$R-COOH$ present ✓ accept H^+ / H_3O^+ for $\frac{1}{2}$ mark ✓ (1 mark)

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

Observations	Inferences
pH value 1/2/3 ✓ value must be specified. ✓ (1 mark)	Strongly acidic ✓ (1 mark)

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