

NAME..... INDEX DATE.....

SCHOOL:SIGNATURE.....

233/3

CHEMISTRY

PAPER 3

July 2025

2¼ HOURS

LAINNAKU II FORM IV JOINT EVALUATION 2025

Kenya Certificate of Secondary Education 2025

INSTRUCTIONS TO CANDIDATES

- ❖ Write your name, index number, name of the school and the date in the spaces provided.
- ❖ You are required to spend 15 minutes of the 2¼hrs reading through the paper and make sure you have all the apparatus and chemicals needed for the practical.
- ❖ Answer all the questions in the spaces provided after each question
- ❖ Electronic calculators and mathematical tables may be used
- ❖ All working must be clearly shown where necessary.

For Examiners Use Only

Question	Maximum score	Candidate's Score
1	25	
2	08	
3	07	
Total	40	

1 (A). You are provided with:

- Solution Y₁ containing 3.15g of a dibasic acid represented as H₂A dissolved to make 250cm³ of a solution.
- Solution Y₂, 0.2M sodium hydroxide.
- Phenolphthalein indicator.

You are required to:

- Titrate solution Y₁ against solution Y₂.
- Determine the molecular mass of the organic acid.

Procedure:

Clean the burette and fill it with solution Y₁. Using a pipette and pipette filler, pipette 25.0cm³ of solution Y₂ into a 250ml conical flask. Add 2 to 3 drops of phenolphthalein indicator into the solution in the conical flask and then titrate with solution Y₁. Record your results in the table 1 **below**. Repeat the procedure two more times and complete the table.

TABLE 1	1	2	3
Final burette reading			
Initial burette reading			
Volume of solution Y ₁ (cm ³)			

- (a) Calculate the average volume of solution Y₁ used. (4marks)
(1mark)

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- (b) Write an equation for the reaction between the acid H₂A and sodium hydroxide solution. (1mark)

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- (c) Calculate: -

- (i) The concentration of the acid solution Y₁ in moles per litre. (2marks)

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(ii) The concentration of acid Y_1 in grams per litre. (1mark)

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(iii) The relative molecular mass of the acid Y_1 . (1mark)

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(c) Given that the formula of the acid is $H_2A \cdot xH_2O$. Calculate the value of x .
($H = 1.0$, $O = 16.0$, $A = 88.0$). (2marks)

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1. (B) You are provided with solid E weighed exactly of 4.0g.

(You are required to determine the solubility of solid E at different temperatures.)

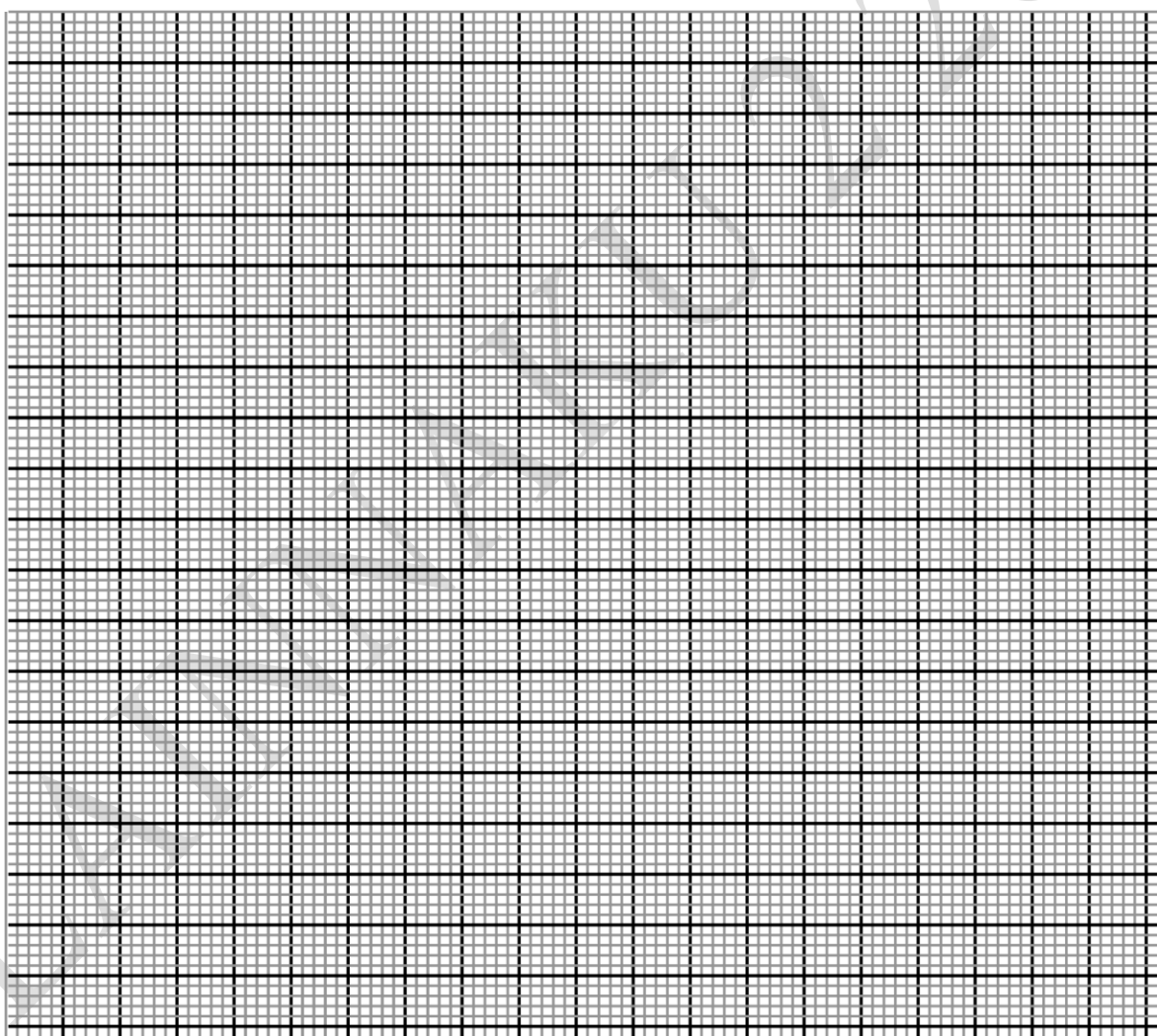
Procedure

Fill a clean burette with distilled water. Transfer 4cm^3 of distilled water to a boiling tube containing the entire solid E provided. Heat the mixture while stirring with the thermometer to a temperature of about 80°C . (When the entire solid will have dissolved). Allow the solution to cool while stirring with the thermometer. Note the temperature at which crystals start to appear and record the temperature in the table below. To the same solution, add 2cm^3 of distilled water from the burette, heat the mixture while stirring with the thermometer gently until when the entire solid just dissolves. Allow the mixture to cool and record the temperature at which crystals first appear in the table below. Repeat the procedure three more times and record the temperature in the table.

Complete the table of solubility of solid E at different temperatures. (6 marks)

Volume of water in boiling tube (cm ³)	Temperature at which crystals first appear(°C)	Solubility of solid E in g/100g of water
4		
6		
8		
10		
12		

(a) On the grid provided plot the graph of solubility of solid E against temperature (3marks)



- (b) Use the graph to determine the mass of solid deposited when 94g of a saturated solution is cooled from 55°C to 50°C (3 marks)

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- (c) Use your graph to determine the temperature at which 40g of solid E would dissolve in 50g of water (1mark)

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

- (a) Place all the solid in a boiling tube and add about 8cm³ distilled water, shake and divide the mixture into **four portions**.

Observation	Inference
(1 Mark)	(1 Mark)

(b) To the first portion, add 3 drops lead (II) nitrate solution

Observations	Inferences

(c) To the second portion, add 3 drops of acidified barium nitrate solution.

Observations	Inferences
(½ Mark)	(1 Mark)

(d) To the third portion, add a few drops of sodium hydroxide solution till in excess

Observation(s)	Inferences
(1 Mark)	(1 Mark)

(1mk)

Anion

(i) Place about a third of solid N on a metallic spatula and burn it in a non-luminous flame

(b) Place a small portion of solid N in a test tube and add about 2 cm³ of sodium hydroxide solution.

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(c) Place the rest of solid N in a boiling tube. Add about 10 cm³ of distilled water. Shake the mixture well. Retain the mixture to use in the tests in (c) (i) to (iii).

(i) To 2cm³ of the mixture in a test tube, add 2 drops of acidified potassium manganate (VII) solution provided.

Observations	Inferences
(1 Mark)	(½ Mark)

(ii). To 2cm³ of the mixture in a test tube add solid sodium hydrogen carbonate.

Observations	Inferences
(1 Mark)	(½ Mark)

(iii). Use the universal indicator paper provided to determine the pH of the mixture obtained in (c) above.

Observation	Inferences
(½ Mark)	(½ Mark)