

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education



Paper 3

233/3

CHEMISTRY (Practical)

Nov. 2024 – 2 ¼ hours

Serial No.
 35421376

Name: _____ Index Number: _____

Candidate's signature: _____ Date: _____

Instructions to Candidates



- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the spaces provided above.
- Answer **all** questions in the spaces provided in the question paper.
- You are **not** allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ Hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need.
- All working **must** be clearly shown where necessary.
- KNEC mathematical tables and silent electronic calculators may be used.
- This paper consists of 10 printed pages.**
- Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- Candidates should answer the questions in English.**

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1	26	
2	12	
3	12	
Total Score	40	



Turn over

ATTEMPT ALL QUESTIONS

QUESTION NO 1.

You are provided with:

- Aqueous sodium hydroxide solution A.
- 0.1M HCl solution B Solid C
- 2.0M HCl solution D

You are required to determine:

- The concentration of sodium hydroxide solution A
- Molar enthalpy of reaction between solid C and solution D.

PROCEDURE 1

Fill the burette with solution A, aqueous sodium hydroxide. Using pipette and pipette filler, place 25.0 cm³ of solution B HCl into a clean conical flask. Add 3 drops of phenolphthalein indicator and titrate solution B with A from the burette. Record your results in the table I below. Repeat the titration 2 more times to complete the table.

TABLE I

	I	II	III
Final burette reading cm ³			
Initial burette reading cm ³			
Volume of solution A cm ³			

(4 Marks)

I Determine:

- a) The average volume of solution A used. (1 Mark)

.....

- b) Number of moles of Hydrochloric acid solution B used. (1 Mark)

.....

- c) Number of moles of sodium hydroxide solution A used (1 Mark)

.....

- d) Concentration of aqueous sodium hydroxide solution A (1 Mark)

.....



.....

PROCEDURE 2

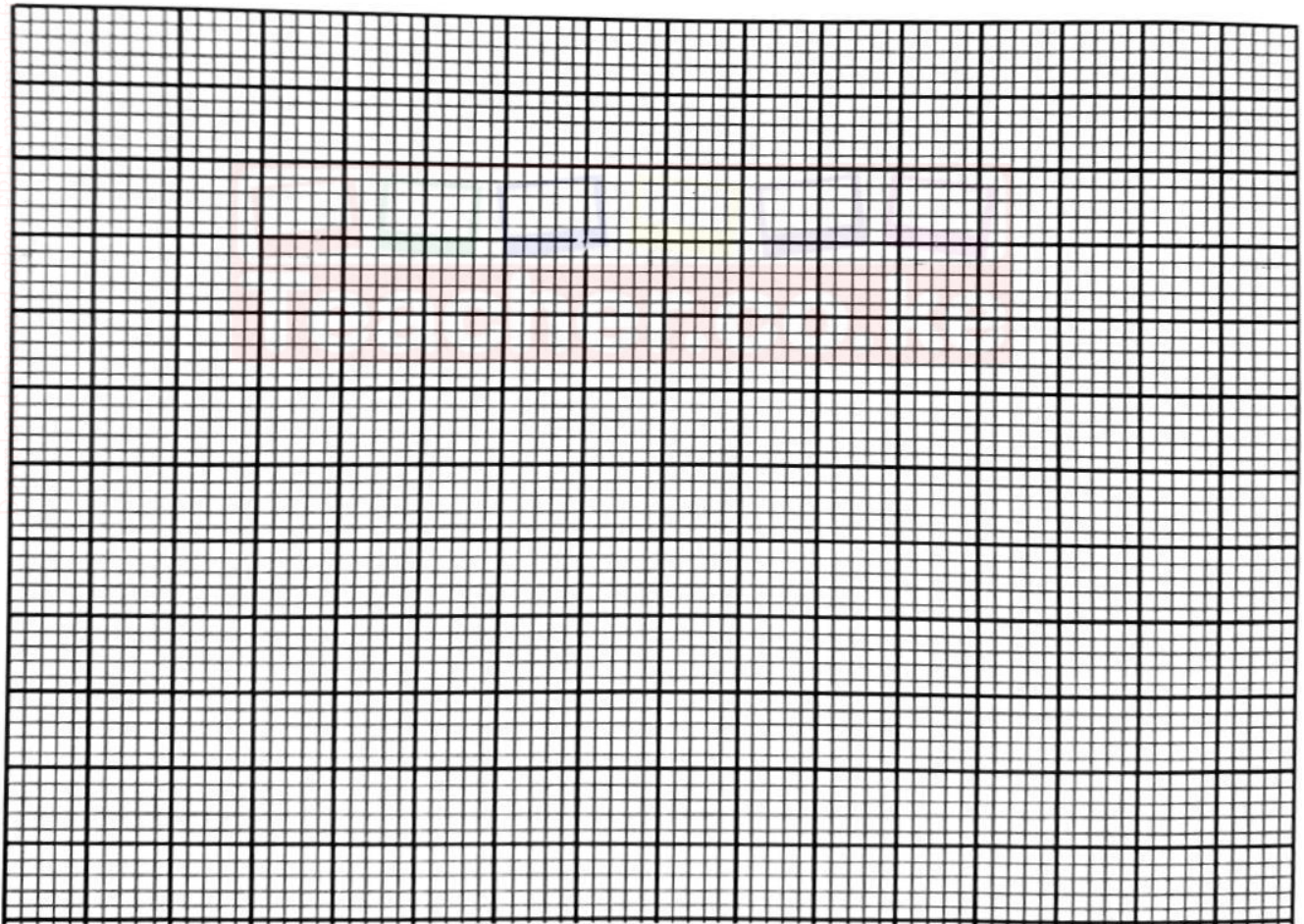
Using 100 ml measuring cylinder place 50cm³ of Hydrochloric acid solution D into 100ml plastic beaker. Stir gently with thermometer and note its temperature in table II below. Start A stop watch and note the temperature of solution D in the beaker after every 30 seconds. Record the results in table II below. At 2 minutes add all Solid C once and continue stirring the mixture with the thermometer and record the temperature of the mixture after every half minute up to the 7th minute.

(PRESERVE THE SOLUTION OBTAINED FOR PROCEDURE III).

TABLE II

Time (Minutes)	0	1	1 ½	2	2 ½	3	3 ½	4	4 ½	5	5 ½	6	6 ½	7
Temperature (°C)														

(4 Marks)



II. a) Plot a graph of temperature (y-axis) against time.

(3 Marks)

.....

b) From the graph, determine the highest change in temperature

.....

c) Calculate the Enthalpy Change for the reaction
 (Given that $C = 4.2 \text{ kJ/kg/k}$, Density of Solution = 1 g/cm^3)

.....

PROCEDURE 3

Transfer all the contents of 100ml beaker into 250ml volumetric flask. Add distilled water to make up to the mark. Label the resulting solution as solution E. Refill the burette with solution A, aqueous sodium hydroxide. Using a pipette and pipette filler place 25.0 cm^3 of E into a conical flask. Add 3 drops of phenolphthalein indicator. Titrate solution E with solution A until there is a permanent colour change. Record your results in table III below. Repeat titration two more times and complete table III.



TABLE III

	I	II	III
Final burette reading cm^3			
Initial burette reading cm^3			
Volume of solution A cm^3			

(4 Marks)

I Determine:

a) The average volume of sodium hydroxide solution A used (1 Mark)

.....

b) Number of moles of sodium hydroxide solution A used (1 Mark)

.....

c) Calculate

i. Number of moles **hydrochloric acid present in solution E** used. (1 Mark)

.....

.....
 ii. Number of moles **hydrochloric acid present in 250 cm³ of solution E** (1 Mark)

.....

.....
 iii. Number of moles **hydrochloric acid present in solution D** (1 Mark)

.....

.....
 iv. Number of moles **hydrochloric acid solution D that reacted with solid C** (1 Mark)

.....

.....
 v. Molar enthalpy changes for the reaction between solution D and solid C (1 Mark)

.....

QUESTION NO 2.

You are provided with Solid F. Carry out the tests below and record your observations and inferences in the spaces provided.

- a) Place half of Solid F into a clean dry test tube. Heat gently and then strongly. Test for any gas using litmus papers.

OBSERVATIONS	INFERENCES
(1 Mark)	(1 Mark)

- b) Place the other half of solid F in a boiling tube, add 10cm³ of distilled water and shake to dissolve. Divide the resulting solution into 4 portions.

OBSERVATIONS	INFERENCE
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(1 Mark)	(1 Mark)

c)

- i. To the 1st portion add sodium hydroxide dropwise until excess

OBSERVATIONS	INFERENCE
(1 Mark)	(1 Mark)

- ii. To the 2nd portion add aqueous ammonia dropwise until excess

OBSERVATIONS	INFERENCE
(1 Mark)	(1 Mark)

- iii. To the third portion add 3 drops of sodium chloride solution

OBSERVATIONS	INFERENCE
(1 Mark)	(1 Mark)

- iv. To the 4th portion add aqueous barium nitrate solution followed with dilute nitric (V) acid

OBSERVATIONS	INFERENCE
(1 Mark)	(1 Mark)

QUESTION NO 3.

You are provided with Solid G. Carry out the tests below and record your observations and inferences in the spaces provided.

- a) Place half of solid G in a metallic spatula and burn in non-luminous flame

OBSERVATIONS	INFERENCE



(1 Mark)	(1 Mark)

- b) Place the other half in a boiling tube and add 10cm³ of distilled water and shake. Divide the resulting solution into 4 portions

OBSERVATIONS	INFERENCE
(1 Mark)	(1 Mark)

- c) i) to the 1st portion add sodium hydrogen carbonate

OBSERVATIONS	INFERENCE
(1 Mark)	(1 Mark)

- ii) to the second portion add acidified potassium dichromate (VI)

OBSERVATIONS	INFERENCE
(1 Mark)	(1 Mark)

- iii) to the 3rd portion add bromine water

OBSERVATIONS	INFERENCE
(1 Mark)	(1 Mark)

- iv) to the 4th portion dip litmus paper provided

OBSERVATIONS	INFERENCE

(1 Mark)	(1 Mark)
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