

Name.....Index. No.....

Adm. No.....class.....

School.....Candidate's sign.....Date.....

233/3

CHEMISTRY

PRACTICAL

PAPER 3

Time: 2 ¼ Hours

RCEA JOINT EXAMINATION– 2026

Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES

- Write your name in the spaces provided above.
- Answer all the questions in the spaces provided
- All workings must be clearly shown where necessary

FOR EXAMINERS USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORES
1	15	
2	07	
3	18	
TOTAL SCORE	40	

This paper contains 7 printed pages

1. You are provided with:

- Solid A
- 2M hydrochloric acid solution B.
- 0.1M Sodium hydroxide solution D

You are required to determine the enthalpy change for the reaction between solid A and one mole of hydrochloric acid.

PROCEDURE A

Using a burette, place 20cm³ of 2M hydrochloric acid, solution B in 100ml beaker. Add all solid A to the acid. Stir the mixture gently with the thermometer. Measure the temperature of the mixture after every half a minute and record the values in the **table 1**. RETAIN THE MIXTURE TO BE USED IN PROCEDURE 2.

TABLE 1 (3mks)

Time (min)	0	½	1	1 ½	2	2 ½	3	3 ½	4	4 ½	5
Temperature (0°)											

(a) Plot the graph of temperature against time. (3mks)

(b) Using the graph determine the temperature change. (1mk)

(c) Calculate the heat change for the reaction. Assume the specific heat capacity of the mixture is 4.2J/g/k and density of the mixture is 1g/cm³. (1mk)

PROCEDURE B

Rinse the burette thoroughly and fill it with sodium hydroxide (D). Transfer all the contents of 100ml beaker used in procedure A into 250ml volumetric flask. Add distilled water up to the mark. Label the solution C. using pipette and pipette filler place 25cm³ of solution C into 250ml conical flask. Add 2 to 3 drops of phenolphthalein indicator and titrate against sodium hydroxide. Record the results in the table. Repeat titration two more times and complete the table 2.

TITRATIONS (4mks)

Final burette reading (cm ³)	1	2	3
Initial burette reading (cm ³)			
Volume of solution c used (cm ³)			

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- i. Calculate the average volume used. (1mk)

- ii. Calculate the number of moles of sodium hydroxide used. (1mk)

- iii. Calculate the number of moles of hydrochloric acid in 25cm³ of solution C. (1mk)

- iv. Calculate the number of moles of hydrochloric acid in 250cm³ of solution C. (1mk)

- v. Calculate the number of moles of hydrochloric acid in 20cm³ of solution B. (1mk)

- vi. Calculate the number of moles of hydrochloric acid that reacted with solid A. (1mk)

2. You are provided with 4g of solid F. You are required to determine the solubility of solid F at different temperatures.

Procedure

- i. Carefully transfer all accurately weighed solid F in a clean boiling tube
- ii. Use burette to add exactly 15cm^3 of distilled water to the boiling tube containing solid F
- iii. Fill a glass beaker about three quarters full of water and heat it on bunsen burner until it is boiling
- iv. Place the boiling tube into hot water bath
- v. Continuously stir potassium chlorate mixture with your thermometer until all the solid has completely dissolved forming clear colorless solution.
- vi. Remove boiling tube from hot water bath
- vii. Allow the solution to cool while stirring
- viii. Note and record the temperature at which crystals first appear
- ix. Once you have recorded the crystallization temperature for your first volume (e.g. 15cm^3 place the boiling tube back into the hot water bath until crystals completely dissolves
- x. Remove the boiling tube and add 5cm^3 of distilled water using your burette to increase the total volume.
- xi. Stir, heat to dissolve and cool it again to note the new crystallization temperature.
- xii. Repeat this step adding water in 5cm^3 increments until you reach a total volume of 40cm^3 and complete table III By calculating the solubility of solid F at different temperatures.

TABLE III (3mks)

Volume of water in the boiling tube (cm^3)	Temperature at which crystals of solid F first appear	Solubility of solid F in g/100g of water
15		
20		
25		
35		
40		

- (i) On the grid provide plot a graph of solubility of solid F (vertical axis) against temperature (horizontal axis). (3mks)
- (ii) Using your graph, determine the temperature at which 15g of solid F, would dissolve in 100cm³ of water. (1mk)
3. (i) You are provided with solid N. Carry out the following tests and write your observations and inferences in the spaces provide.
- (a) Place half of solid N, in a boiling tube. Add about 10cm³ distilled water and shake. Divide the mixture into 4 portions.

Observations	Inferences
(1mk)	(1mk)

- (b) To the first portion, add sodium hydroxide drop wise until in excess.

Observations	Inferences
(1mk)	(1mk)

(c) To the second portion, add aqueous ammonia drop wise until in excess.

Observations	Inferences
(1mk)	(1mk)

(d) To the third portion, add 3 drops of barium nitrate followed by 2cm³ of 2M nitric (V) acid.

Observations	Inferences
(1mk)	(1mk)

(e) To the fourth, add 1cm³ sodium hydroxide followed by aluminium foil and warm the mixture. Test any gases produced using red litmus paper.

Observations	Inferences
(1 mk)	(1 mk)

II. You are provided with solid M.

Carry out the tests below and write your observations and inferences in the spaces provided.

(a) Place about half of solid M in a metallic spatula and burn it in a non-luminous flame.

Observations	Inferences
(1mk)	(1mk)

(b) Place the remaining M in a boiling tube. Add about 6cm³ of distilled water and shake thoroughly. Divide the solution into three portions.

Observations	Inferences
(1 mk)	(1mk)

(c)

i) To the first portion, add 2 drops of bromine water.

Observations	Inferences

(1 mk)	(1 mk)
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(ii) To the second portion, add all the sodium carbonate. Test for any gases using a burning splint.

Observations	Inferences
(1/2 mk)	(1/2 mk)

(iii) To the third portion, add 3 drops of acidified potassium dichromate(VI).

Observations	Inferences
(½ mk)	(½ mk)

