

**MURANG'A EXTRA COUNTY SCHOOLS  
CHEMISTRY FORM 4 END OF TERM 2 – 2022 EXAMINATION**

**NAME:** .....**CLASS**..... **ADMNO** .....

**233/3**

**CHEMISTRY**

**PAPER 3**

**TIME: 2¼ HOURS**

*Kenya Certificate of Secondary Education*

**INSTRUCTIONS TO CANDIDATES**

- (a) Write your name and admission number in the spaces provided above.
- (b) Answer all the questions in the spaces provided.
- (c) Mathematical tables and silent non-programmable electronic calculator may be used.
- (d) All working must be clearly shown where necessary.

**FOR EXAMINER'S USE ONLY**

<b>QUESTION</b>	<b>MAXIMUM SCORE</b>	<b>CANDIDATE'S SCORE</b>
1	21	
2	11	
3	8	
<b>TOTAL SCORE</b>	<b>40</b>	

*This paper consists of 6 printed page Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.*

You are provided with:

- Solid F
- 2.0 M hydrochloric acid solution G
- 0.1 M sodium hydroxide

You are required to determine the;

- i) Enthalpy change  $\Delta H$ , for the reaction between solid F and one mole of hydrochloric acid

**Procedure:**

- I. Using a burette place 20.0cm<sup>3</sup> of 2.0M hydrochloric acid, solution G in a 100ml beaker. Measure the initial temperature of the solution after every ½ minute and record the values in table 1 below. At exactly 2 minutes, add all of solid F to the acid. Stir the mixture gently with the thermometer. Measure the temperature of the mixture after every half-minute and complete the table. **(Retain the mixture for use in procedure II)**

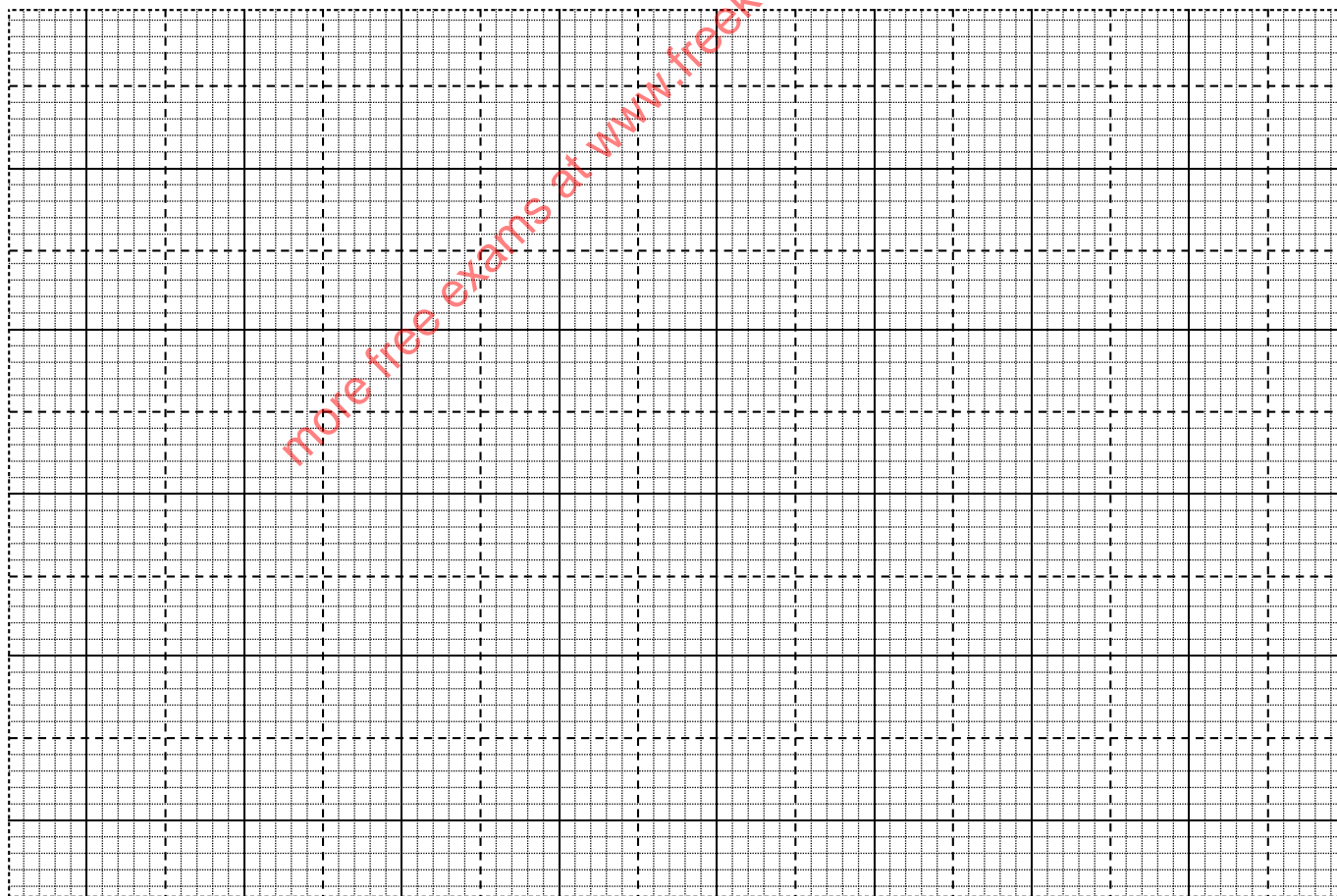
**Table 1**

(5 marks)

Time (min)	0	½	1	1½	2	2½	3	3½	4	4½	5
Temperature (°C)					X						

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

(3 marks)



b) From the graph determine the change in temperature  $\Delta T$  (1mark)

c) Calculate the heat change for the reaction (Assume the specific heat capacity of the mixture is  $4.2 \text{ J g}^{-1} \text{ K}^{-1}$  and the density of the mixture is  $1 \text{ g/cm}^3$ ) (1mark)

### Procedure II

Rinse the burette thoroughly and fill it with sodium hydroxide. Transfer all the contents of the 100ml beaker from procedure I above into a 250ml volumetric flask, add distilled water to make up to the mark. Label this solution H. using a pipette and a pipette filler, place  $25 \text{ cm}^3$  of solution H into a 250ml conical flask. Add two to three drops of phenolphthalein indicator and titrate against sodium hydroxide. Record your results in table 2. Repeat the titration two more times and complete the table.

Table 2 (4 marks)

	I	II	III
Final burette reading ( $\text{cm}^3$ )			
Initial burette reading ( $\text{cm}^3$ )			
Volume of solution solution D used ( $\text{cm}^3$ )			

Calculate the;

I. Average volume of sodium hydroxide used (1mark)

II. Number of moles of:

i) Sodium hydroxide used (1 mark)

ii) Hydrochloric acid in 25cm<sup>3</sup> of solution H (1 mark)

iii) Hydrochloric acid in 250cm<sup>3</sup> of solution H (1 mark)

iv) Hydrochloric acid in 20cm<sup>3</sup> of solution G (1 mark)

v) Hydrochloric acid reacted with solid F (1 mark)

c. Calculate the enthalpy of reaction between solid F and one mole of hydrochloric acid.

(Show the sign of  $\Delta H$ ) (1 mark)

2. You are provided with solid A. Carry out the tests described below and write your observations and inferences accordingly.

- i. Dissolve solid A in about  $10\text{cm}^3$  of distilled water in a boiling tube divide the resulting solution into five portions.

Observations	Inferences
(1 mark)	(1 mark)

- ii. To the first portion add 5 drops of 2M sodium hydroxide solution

Observations	Inferences
(1 mark)	(1 mark)

- iii. To the second portion dip a glass rod to one of the remaining portions and heat it in a non-luminous flame.

Observations	Inferences
( $\frac{1}{2}$ mark)	( $\frac{1}{2}$ mark)

- iv. To the third portion add 2 or 3 drops of lead (II) nitrate solution

Observations	Inferences
(1 mark)	(1 mark)

- v. To the fourth portion add 2 or 3 drops of barium (II) chloride followed by 2cm<sup>3</sup> of 2M hydrochloric acid. Shake the mixture well.

Observations	Inferences
(1 mark)	(1 mark)

- vi. To the fifth portion add 3 drops of acidified potassium manganate (VII) solution

Observations	Inferences
(1 mark)	(1 mark)

3. You are provided with substance B.

Carry out the tests described below and record your observations and inferences accordingly.

Procedure

- (i) Place a little amount of substance B in a metallic spatula and ignite it in a blue bunsen burner flame.

Observations	Inferences
(1 mark)	(1 mark)

- (ii) Place a spatulaful of substance B in a boiling tube. Add about 20cm<sup>3</sup> of distilled water and shake well. Divide the solution into three portions. Test the pH of one portion of the solution above using a full range pH chart.

Observations	Inferences
(1 mark)	(1 mark)

(iii) Add the sodium carbonate provided to the second portion.

Observations	Inferences
(1 mark)	(1 mark)

(iv) Add a few drops of potassium manganate (VII) solution to the third portion and warm mixture.

Observations	Inferences
(1 mark)	(1 mark)

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