KCSE TRIAL 2020
CHEMISTRY PAPER 3

1. You are provided with the following:

- 1.0M Hydrochloric acid; solution Y
- 0.5M Sodium hydroxide; solution Z

Anhydrous sodium carbonate of unknown mass; solid X

You are required to determine the mass of sodium carbonate that was used in the reaction.

Procedure

Using a measuring cylinder, measure $60cm^3$ of 1M hydrochloric acid, solution Y and transfer into $100cm^3$ beaker. Add all sodium carbonate (solid X) and stir gently until there is no effervescence. Transfer the solution into a clean 100ml measuring cylinder and add distilled water to make $100cm^3$ of the solution. Transfer the solution onto $250cm^3$ beaker and shake. Label this solution F.

Fill the burette with solution Z. Pipette $25.0cm^3$ of solution F and transfer to a conical flask. Add 3 drops of Phenolphthalein indicator and titrate with solution Z. Record your results in the table 1 below. Repeat the procedure to complete the table.

(a).Table 1.   **(4 marks)**

Final burette readings (cm^3)	I	II	III
Initial burette reading (cm^3)			
Volume of solution Z (cm^3)			

(i). Determine the average volume of solution Z.   (1 mark)
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_____

(ii).Calculate the number of moles of sodium hydroxide (solution Z) used.   (1 mark)
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(iii). Find the number of moles of hydrochloric acid in 25.00cm^3 of solution F   (2 marks)

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(iv). Determine the number of moles of hydrochloric acid in 100cm^3 of solution F (2 marks)

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Calculate the number of moles of hydrochloric acid in the original 60cm^3 of solution Y. (1 mark)

(v). Calculate the number of moles of hydrochloric acid in the original 60cm^3 of solution Y.

(1 mark)

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 (vi). Calculate the number of moles of hydrochloric acid that reacted with sodium carbonate.

(1 mark)

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 (vii). Determine the mass of sodium carbonate that reacted with the acid (Na=23, C=12, O=16)

(2 marks)

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2. A. You are provided with

- Solid M
- A thermometer
- A test tube

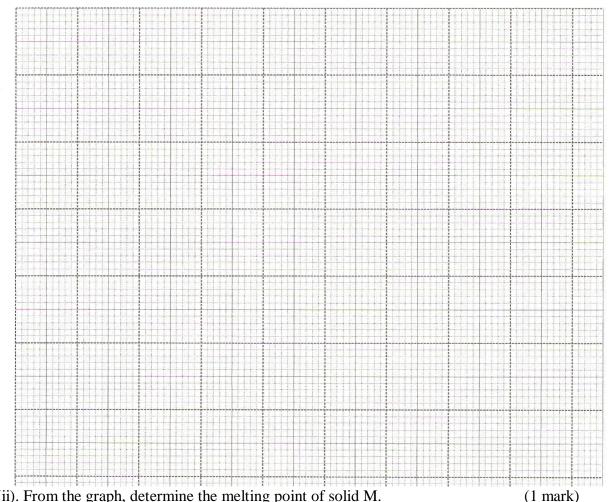You are required to determine the melting point of solid M

PROCEDURE
a). Place 150cm^3 of tap water in a 200 ml or 250 ml beaker

b). Heat the water to near boiling.

c). Insert a thermometer in the test tube containing solid M and take its temperature then record it in the table below under time 0.

d). Using a test-tube holder, immerse the test-tube containing solid M into the hot water (Ensure that half of the test-tube is immersed) and immediately start a stop Watch/clock and record the temperature of the contents of the test-tube after every Half-minute and complete the table.

e). Dip the thermometer into the hot bath to clean it then wipe it with tissue paper   (4 marks)

Time (Min)	0	½	1	1 ½	2	2 ½	3	3 ½
Temperature (^{o}C)								

(i). On the grid provided, plot a graph of time, (Horizontal axis) against temperature. (3 marks)

(ii). From the graph, determine the melting point of solid M.   (1 mark)

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_____

(iii). Name the type of heat change at the melting point.   (1 mark)

_____

_____

3. (a). You are provided with solid L. Carry out the tests below and record your observations

and inferences in the spaces provided.

(i). Heat gently then strongly half of solid L in a clean dry test tube, test any gas produced using red and blue litmus papers

Observations	Inferences
[1 mark]	[1 mark]

Take the remainder of solid L and put into a boiling tube. Add about 10cm^3 of distilled water and shake. Divide the solution into 3 portions.

(ii). To the first portion, add aqueous sodium hydroxide dropwise until in excess.

Observations	Inferences
[1 mark]	[1 mark]

iii). To the second portion, add about 5cm^3 of aqueous sodium sulphate.

Observations	Inferences

[1 mark]	[1 marks]

(iv). To the third portion, add about 2cm^3 of lead (II) nitrate.

Observations	Inferences
[1 mark]	[1 marks]

3.(b). You are provided with solid S perform the following tests and record your observations and inferences in the spaces provided.

(a). Put half of the solid on a clean METALLIC SPATULA ignite it in a non-luminous flame.

Observations	Inferences
[$^1/_2$ mark]	[$^1/_2$ mark]

(b). Put the remaining solid in a clean boiling tube, add water and shake thoroughly. (Retain this mixture for test bi-biii)

Observations	Inferences
[1 mark]	[1 mark]

(b).(i). In about 2cm³ of the mixture add 2 drops of bromine water.

Observations	Inferences
[1 mark]	[1 mark]

(ii). in about 5cm³ of the mixture add both blue and red litmus paper.

Observations	Inferences
[1 mark]	[1 mark]

(iii). use the remaining mixture to determine the pH of the mixture.

observations	Inferences
[1 mark]	[1 mark]