

FORM FOUR CLUSTER KCSE MODEL8

CHEMISTRY PAPER 3 QUESTION

1. a) You are provided with:

i) 0.5g of a metal carbonate X_2CO_3 labelled E.

ii) Sulphuric (VI) acid labelled as solution N.

iii) Solution R prepared by dissolving 40g of sodium hydroxide in 400cm³ of distilled and made up to 1 litre.

You are required to determine the value of X in the metal carbonate.

Procedure I

Fill the burette with sulphuric (VI) acid solution up to the mark.

Pipette 25.0cm³ of solution R into a conical flask.

Add 2 -3 drops of phenolphthalein indicator.

Titrate solution R against solution N.

Repeat the experiment two more times and record your results as in table I below.

Titration number	1	2	3
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of solution K used (cm ³)			

Calculate:-

i) The average volume of solution N used.

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ii) The number of moles of solution R used.

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iii) The number of moles of solution N used.

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iv) The number of moles of sulphuric (VI) in 100cm³ of solution N

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Procedure 2

Using a measuring cylinder, measure 100cm³ of solution N into a 250cm³ beaker.

Add all of the 0.5g of solid E into the beaker and swirl the beaker. When the solution is complete, label this solution as solution K.

Rinse the burette and fill it with solution K.

Pipette 25.0cm³ of solution R into a conical flask.

Add 2 – 3 drops of phenolphthalein indicator.

Titrate solution R against K.

Record your results as in table 2 below

Titration number	1	2	3
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of solution K used (cm ³)			

Calculate:- i) The average volume of solution K used.

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ii) The number of moles of solution K used.

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iii) The number of moles of sulphuric (VI) acid in 100cm³.

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iv) The number of moles of sulphuric (VI) acid that reacted with 0.5g of the metal carbonate.

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v) Determine the relative formula mass of the metal carbonate X₂CO₃.

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vi) Work out the value of X in X₂CO₃. (C=12.0, O=16.0)

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2. You are provided with:-

One plastic beaker.

- 50cm³ (or 100ml) measuring cylinder.

- 0.2M copper (II) Sulphate solution.

- Thermometer. - 0.6g of zinc powder. Procedure

- Put 25.0cm³ of 0.2M copper (II) Sulphate solution into a plastic beaker. Record its temperature.

- Transfer all the 0.6g of zinc powder into 0.2M copper (II) solution and stir with a thermometer. Record the highest temperature reached.

- Mass of zinc powder = 0.6g.

- Temperature of copper (II) sulphate solution = °C

- Highest temperature reached in the mixture = °C

- Change in temperature ΔT = °C

a) i) Write an equation for the reaction between copper (II) sulphate and zinc powder.

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ii) Calculate the number of moles of copper (II) sulphate used in the reaction. (Cu -63.5)

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iii) Calculate the heat evolved in the reaction between copper (II) sulphate and zinc powder. (C= 4.2kJ/kg/k.

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iv) Hence calculate the molar heat of displacement of copper.

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3. a) You are provided with solid T.

Carry out the experiments in the table below and record your observations and inferences in the spaces provided.

Put all of solid T in a boiling tube. Add 40cm³ of distilled water.

Shake and filter. Divide the filtrate into three portions.

Retain the residue. i) To the first portion add a few drops of 2M sodium hydroxide and then excess.

Observations	Inferences
 (1mark)	 (1mark)

ii) To the second portion add a few drops of ammonia solution and then excess.

Observations	Inferences
 (1mark)	 (1mark)

To the third portion add a few drops of barium chloride followed by dilute hydrochloric acid.

Observations	Inferences
(1mark)	(1mark)

b) Dissolve the residue in 2cm³ hydrochloric acid in a test tube.

Ensure some residue remains. Decant. Divide the solution into two portions.

i) To the first portion, add a little sodium hydroxide solution until in excess.

Observations	Inferences
(1mark)	(1mark)

To the second portion add a little ammonia solution in excess.

Observations	Inferences
(1mark)	(1mark)

