

1. You are provided with:

- 2M Hydrochloric acid labeled as solution R.
- 0.4M Sodium hydroxide labeled as solution Q.
- 1.06g accurately weighed Anhydrous carbonate X_2CO_3 labeled solid A.

You are required to determine the relative atomic mass X in one mole of X_2CO_3 .

Procedure

- i) Using a clean measuring cylinder, measures 50cm^3 of solution R and transfer in 100cm^3 plastic beaker.
- ii) Add all solid A at once into the contents of the beaker, stir until effervescence stops.
- iii) Transfer this solution into a 250ml volumetric flask and add distilled water upto the mark. Label this solution as solution B.
- iv) Fill the burette with solution Q.
- v) Using a pipette and a pipette filler, place 25cm^3 of solution B into conical flask. Add 2 drops of phenolphthalein indicator.
- vi) Titrate solution B using solution Q and record the volume of solution Q used.
- vii) Repeat the titration two more times and complete the table below.

	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution Q used (cm^3)			

a) Calculate the average volume of solution Q used.

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b) Calculate the number of moles of hydrochloric in 25cm^3 of solution B.

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c) Calculate the number of moles of hydrochloric acid in 250cm^3 of solution B.

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d) Number of moles of hydrochloric acid in 50cm^3 of solution R.

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e) Number of moles of hydrochloric that reacted with the carbonate (solid A).

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f) Number of moles of carbonate that reacted with 50cm³ of solution R.

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g) Atomic mass of X in one mole of X₂CO₃ (c=12,o=16)

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2. You are provided with solution B(1M HNO₃) and solution X (1M NaOH)

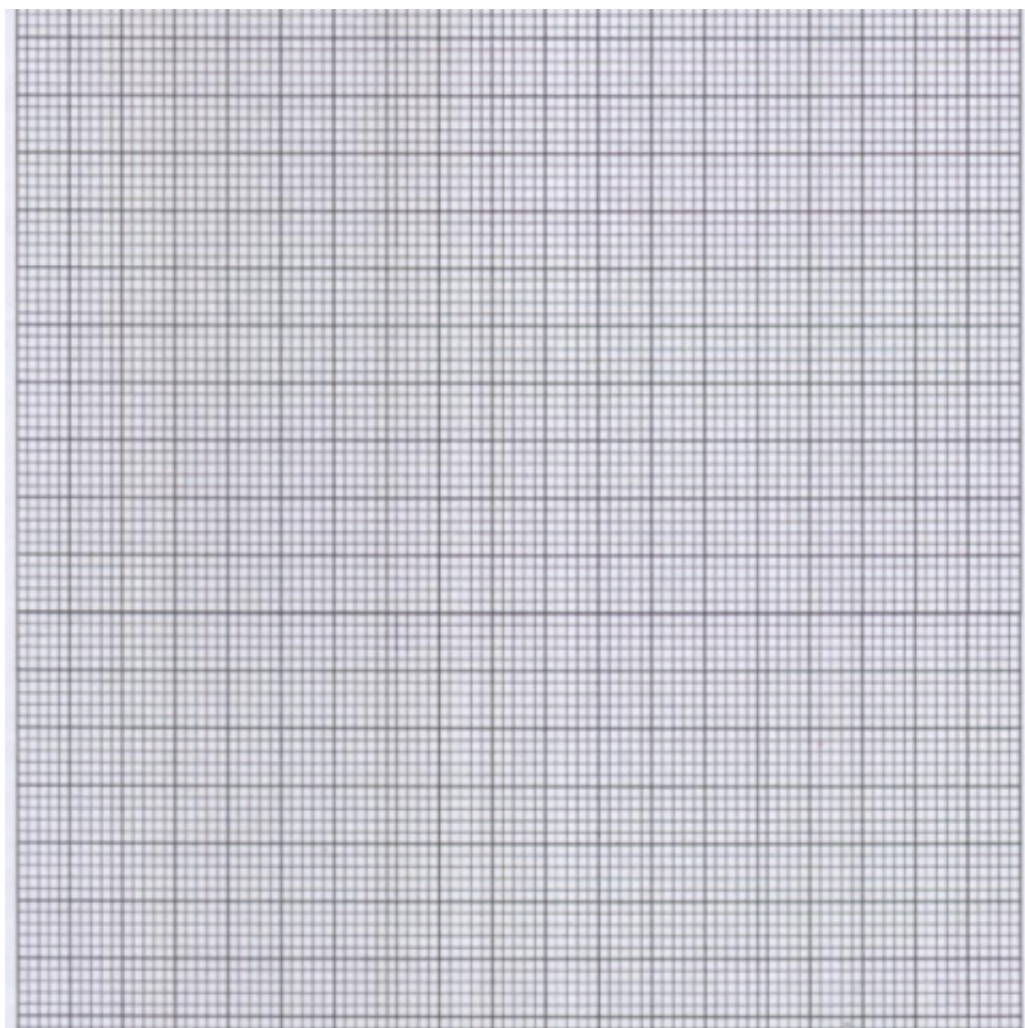
You are required to determine the molar heat of solution B Using the procedure below;

Procedure

- i) Fill the burette with solution B.
- ii) Using a measuring cylinder put 20cm³ of solution X into a plastic cup provided.
- iii) Add 4cm³ of solution B from the burette and determine the highest temperature attained.
- iv) Continue adding 4cm³ portions of solution B and every time determining the highest temperature attained.
- v) Record the highest temperature attained after every addition.

Volume of solution B (cm ³)	4	8	12	16	20	24	28	32
Temperature obtained (°C)								

a) Plot a graph of volume of solution B used against highest temperature of solution attained.



b) Determine the volume of solution B that reacts completely with solution X.

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c) From the graph, determine the initial temperature of solution B.

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d) Determine the temperature change when solution X is completely reacted with solution B.

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e) Determine molar heat of solution B used.

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3. You are provided with solid D. Carry out the following tests and write your observations and

inferences in the spaces provided.

a) Place a spatula endful of solid D into a clean dry test tube and heat strongly. Test the gases evolved using litmus papers.

Observation	Inferences

b) Place the remaining solid D into a clean boiling tube and add 10cm³ of distilled water. Shake the boiling tube to dissolve the solid. Divide the solution into four portions.

Observation	Inferences

i) To the first portion, add sodium hydroxide solution dropwise till in excess.

Observation	Inferences

ii) To the second portion add ammonia solution dropwise till in excess.

Observation	Inferences

iii) To the third portion, add a few drops of lead (II) nitrate and then filter.

Observation	Inferences

iv) To the fourth portion, add a few drops of acidified barium nitrate solution.

Observation	Inferences