

233/3
CHEMISTRY
PAPER 3
TIME: 2 HOURS 15 MINUTES
KCSE 2023 TOP PREDICTION MASTER
CYCLE 1

Name.....

Adm No.....

Stream.....

Date

Sign

INSTRUCTIONS TO CANDIDATES

[a] Answer ALL questions in the spaces provided in each question.

[b] Mathematical tables and electronic calculators may be used for calculations.

[c] all working must be clearly shown where necessary.

FOR EXAMINERS ONLY

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	15	
2	13	
3	12	
Total	40	

1. You are provided with
- 2.0M NaOH solution labelled B
 - Sulphuric(VI) acid solution labelled A`

You are to:

- [a] Prepare a dilute solution of NaOH solution.
 [b] Determine the concentration of in moles per litre.

PROCEDURE 1

- Using a pipette 25.0cm³ of solution B and place it into 250cm³ volumetric flask.
- Add about 200cm³ of distilled water and shake well.
- Add more water to make up to 250cm³ mark. Label this solution C

- [a] Calculate the concentration of the dilute solution C in moles per litres. [2mks]

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PROCEDURE 2

- Fill the burette with solution A and record the readings in the table below.
- Pipette 25cm³ of dilute solution C and place it into 250ml conical flask.
- Add 2-3 drops of phenolphthalein indicator.
- Titrate with solution A.
- Record your results in the table below.
- Repeat the titration two or more times and complete the table.

	I	II	III
Final burette reading (cm ³)			
Initial burette reading(cm ³)			
Volume of solution A(cm ³)			

[4mks]

- [a] Determine average volume of the acid (solution A) used. [1mk]

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- [b] Determine moles of dilute solution C in the volume used. [2mks]

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[c] Write an equation for the reaction taking place. [1mk]

[d] Determine the number of moles of A used. [2mks]

[e] Determine the concentration of A in moles per litre. [2mks]

2. You are provided with the following

- 2M sodium hydroxide solution, solution B
- 2M hydrochloric acid, solution D

You are required to determine the molar enthalpy of neutralization of the acid using sodium hydroxide.

PROCEDURE

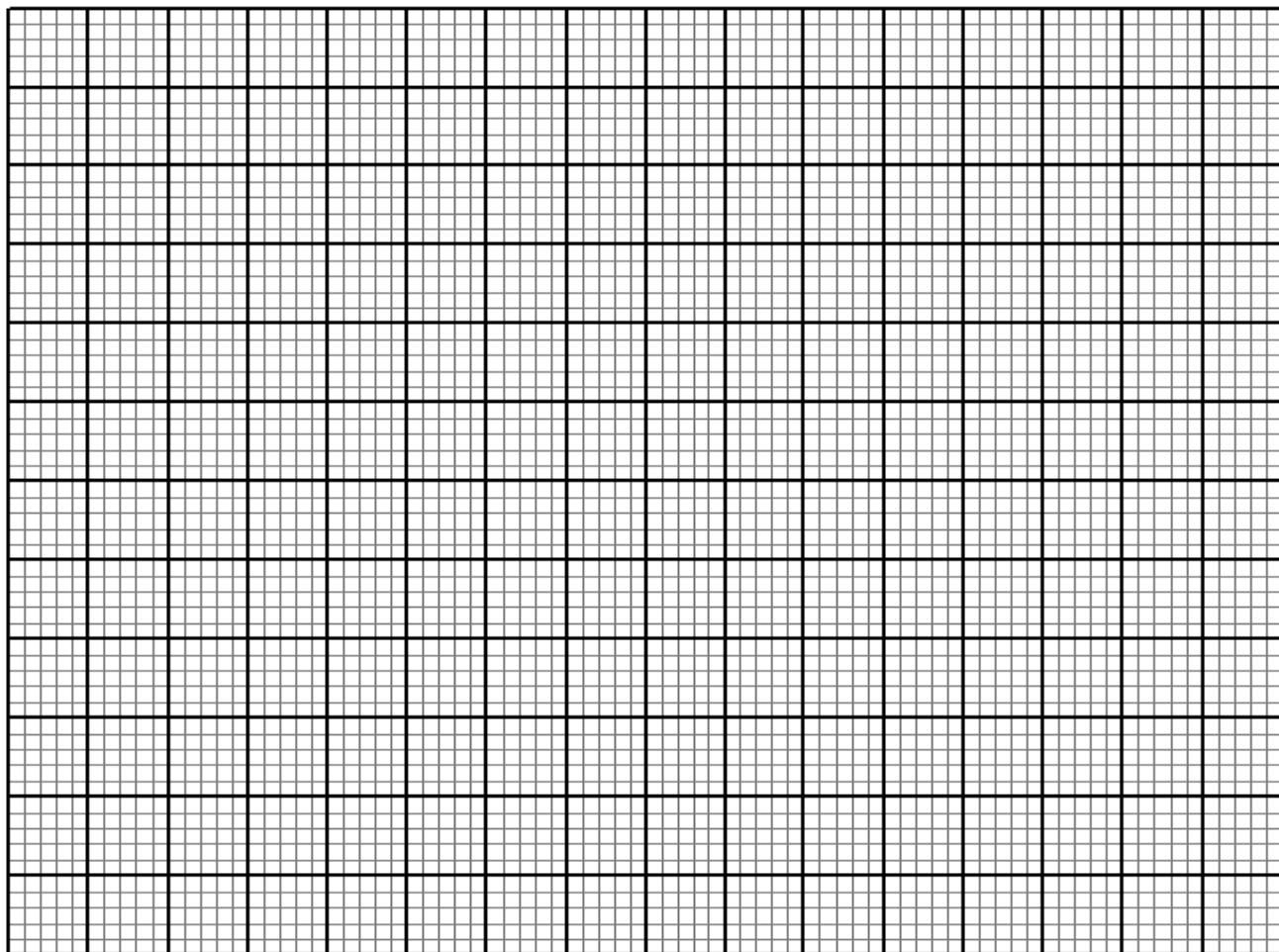
- [i] Measure out 20cm³ of acid into a clean plastic beaker.
- [ii] Record the temperature of this solution in the table below
- [iii] Measure 5cm³ of sodium hydroxide and add it to the hydrochloric acid.
- [iv] Stir with the thermometer and record the maximum temperature reached.
- [v] Repeat the above procedure adding 5cm³ portions of sodium hydroxide until the total volume of the solution is 50cm³.

Volume of acid(cm ³)	20	20	20	20	20	20	20
Volume of NaoH added cm ³	0	5	10	15	20	25	30
Temperature(°C)of solution							

[3mks]

You are required to:

- [a]. Plot a graph of temperature rise against sodium hydroxide added. [3mks]



[b] From your graph determine:

- [i] maximum temperature change. [1mk]

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- [ii] the volume of NaOH that is required for complete neutralization [1mk]

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- [iii] Calculate the molar enthalpy of neutralization for this reaction. ($C=4.2\text{J/g/K}$)
assume density of solution is 1gcm^{-3} [2mks]

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[iii] The theoretical molar heat of neutralization is -57.2kJ/mol^{-1} . Compare your value in [ii] above with the theoretical value. Give the reasons for any differences noted between these two values. [2mks]

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3. You are provided with solid N carry out the tests below and record your observations and inferences.

[a] Place a spatula of N in a test tube and add 5cm^3 of water and shake well divide the solution in to three portions.

OBSERVATION (1mk)	INFERENCE (1mk)

[b] Add sodium hydroxide to the first portion drop wise while observing till in excess

OBSERVATION (1mk)	INFERENCE (2mks)

[c] Add ammonia solution to the second portion drop wise until in excess.

OBSERVATION (1mk)	INFERENCE (1mk)

[d] Add four drops of potassium iodide solution to the third portion.

OBSERVATION (1mk)	INFERENCE (1mk)

[e] Add three drops of acid barium nitrate to the fourth followed by 5 drops of nitric acid.

OBSERVATION (2mks)	INFERENCE (1mk)