NAME: ……………………………………………………………… DATE: …………………………………

SCHOOL: …………………………………………….. ADM. NO: ……………… STREAM: ……..….…

233/3

CHEMISTRY

PAPER 3 / PRACTICAL

NYAHOKAKIRA JOINT EVALUATION

TIME: 2¼ HOURS

NYAHOKAKIRA JOINT EVALUATION CLUSTER II JULY 2024

Kenya Certificate of Secondary Education

233/3
CHEMISTRY

INSTRUCTIONS TO CANDIDATES

❖ *Write your name, school, admission number, date and stream in the spaces provided.*

❖ *You are required to spend 15 minutes of the 2¼hrs reading through the paper and make sure you have all the apparatus and chemicals needed for the practical.*

❖ *Answer all the questions in the spaces provided after each question*

❖ *Electronic calculators and mathematical tables may be used*

❖ *All working **must** be clearly shown where necessary.*

For Examiner's Use Only

Question	Maximum score	Candidate's Score
1	20	
2	14	
3	06	
Total	40	

Candidates should check the question paper to ensure that all the 5 pages are printed as indicated and no questions are missing.

Turn over

1. You are provided with;

Solution **A**; (xM hydrochloric acid)

Solution **B**; (1M sodium hydroxide solution)

You are required to:

• *Determine the molar heat of neutralization of solution b by solution A.*

• *Determine the concentration of the solution A in moles per litre.*

Procedure I

i. Using a clean measuring cylinder measure $20.0cm^3$ of solution B into a plastic cup/beaker provided.

ii. Measure the temperature of solution B and record in table 1 below.

iii. Fill the burette with solution A.

Note: You are required to add solution A into solution B in portion of exactly $5.0cm^3$ each.

iv. Add the first $5.0cm^3$ portion of solution **A** to solution **B** in the beaker. Stir the mixture with a thermometer and record the highest temperature attained in table 1 below.

v. Add the other $5.0cm^3$ portion of solution **B**, stirring the mixture and record the highest temperature attained after each addition. Continue until a total volume of $50cm^3$ has been added.

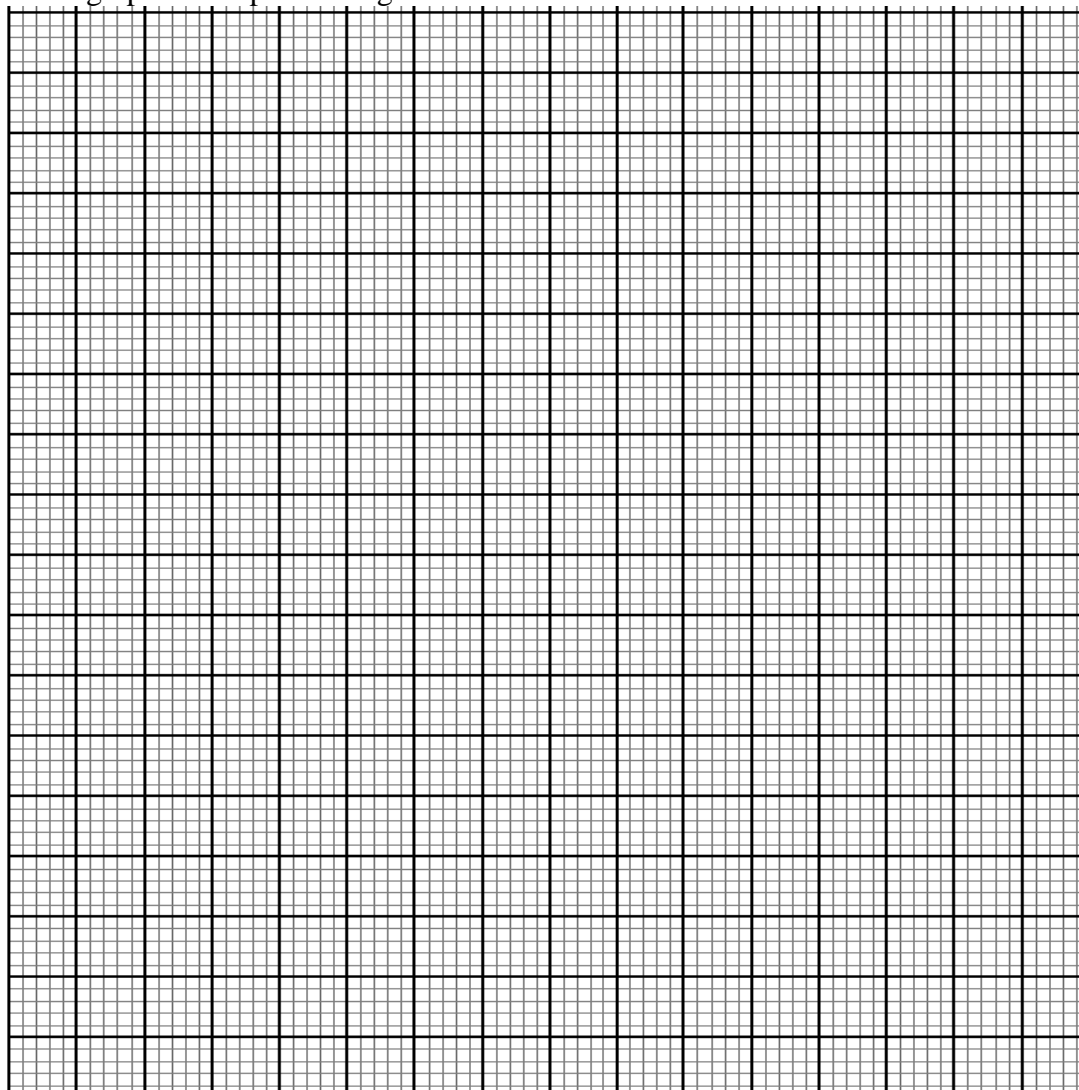**(Label the solution in the beaker as solution C and retain it for the next procedure)**

Table 1.   (3mks)

Volume of solution **A** added (cm^3)	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
Temperature (^0C)											

(a) Plot a graph of temperature against the volume of a solution A added.   (3mks)

b) From the graph, determine the volume of solution **A** that reacted completely with the 20cm^3 of solution **B**. (1mk)

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c) Calculate the number of moles of solution **B** that reacted. (1mk)

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d) From the graph, determine maximum temperature change. (1mk)

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e) Calculate the molar heat of neutralization of solution **B** by solution **A**. (1mk)

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Procedure II

  i. Pipette 25cm^3 of solution **C** into a clean conical flask. Add 3 drops of phenolphthalein indicator.
 ii. Rinse the burette and fill it with solution **B**.
iii. Titrate solution **C** with solution B from the burette until a permanent **pink** colour appears. Record your values in table 2 below.
 iv. Repeat the procedure two more times to fill the table 2 below.

Table 2

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

(4mks)

a) Determine the average volume of solution **C** used. (1mk)

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b) Calculate the number of moles of:

I. Solution **B** used. (1mk)

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II. Solution **C** used. (1mk)

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III. Solution **C** in 70cm^3 of solution. (1mk)

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c) Determine the **total** number of moles of solution **A**. (1mk)

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d) Calculate the concentration of solution **A** in moles per litre. (1mk)

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Q2. A) You are provided with solid **M**. Carry out the following tests and record your observations and inference in the spaces provided

i) Place all the solid **M** in a dry boiling tube. Add about 10cm³ distilled water and shake. Filter the solution and retain both filtrate and residue. Divide the filtrate into three portions.

Observations	Inferences
(1mk)	(1mk)

ii) To the 1ˢᵗ portion of the filtrate, add solution hydroxide solution drop-wise then in excess.

Observations	Inferences
(1mk)	(1mk)

iii) To the 2ⁿᵈ portion of the filtrate, add about 1cm³ of dilute sulphuric (VI) acid.

Observations	Inferences
(1mk)	(1mk)

iv) To the 3ʳᵈ portion of the filtrate, add 5 drops of barium (II) nitrate solution.

Observations	Inferences
(1mk)	(1mk)

Q2 B) i) Transfer the entire residue into a boiling tube; add about 3cm³ of dilute nitric (V) acid provided. Test for any gases evolved using a burning wooden splint. Divide the resultant solution into two portions.

Observations	Inferences
(1mk)	(1mk)

ii) To the 1ˢᵗ portion of the filtrate, add solution hydroxide solution drop-wise then in excess.

Observations	Inferences
(1mk)	(1mk)

iii) To the 2ⁿᵈ portion, add three drops of potassium iodide provided.

Observations	Inferences
(1mk)	(1mk)

Q3. You are provided with liquid **R**. Carry out the tests below and record your observations and inferences in the spaces provided.

(a) To about $1cm^3$ of liquid **R** in a test tube, add about $1cm^3$ of distilled water and shake thoroughly

Observations	Inferences
(1mk)	(1mk)

(b) Put about $1cm^3$ of liquid **R** add 3 drops of universal indicator solution.

Observations	Inferences
(1mk)	(1mk)

(c) To about $2cm^3$ of liquid **R** in a test tube, add a spatula end full of sodium carbonate provided.

Observations	Inferences
(1mk)	(1mk)

Last printed page

NYAHOKAKIRA JOINT EVALUATION CLUSTER II 2024

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CHEMISTRY 233/3

JULY 2024

CONFIDENTIAL

1. 100ml solution **A**
2. 60ml Solution **B**
3. About 1g Solid **M**
4. About 5ml Liquid **R**
5. 1 wooden splint
6. 50ml measuring cylinder
7. Thermometer (-10°C to 110°C)
8. 2 conical flasks
9. 1 label
10. 100ml plastic beaker
11. Stop watch
12. $50cm^3$ burette
13. 25ml pipette
14. Clamp and stand
15. White tile
16. Filter funnel
17. Filter paper
18. 6 dry test tubes
19. 1 boiling tube
20. 500ml distilled water
21. Metallic spatula

Access to:
1. Phenolphthalein indicator
2. 2M sodium hydroxide solution
3. 2M sulphuric (VI) acid
4. 2M barium (II) nitrate solution
5. 2M potassium iodide solution
6. Sodium carbonate solid
7. 2M nitric (V) acid
8. Universal indicator
9. pH chart

Preparations

1. Solution **A** is 1.2M hydrochloric acid. Prepared by dissolving 103.2 cm^3 of concentrated hydrochloric acid in $600cm^3$ of distilled water and top up to the mark.

2. Solution **B** is 1M sodium hydroxide solution. Prepared by dissolving 40g of sodium hydroxide in 600ml of distilled water and making it up to one litre of solution.

3. Solid **M** is a mixture of lead (II) carbonate and magnesium sulphate in the ratio 1:1

4. Liquid **R** is 0.5M ethanedioic acid (oxalic acid) solution.