NAME: ....INDEX NO.......................

CLASS ....CANDIDATE'S SIGNATURE...................DATE ....

233/3

CHEMISTRY.

Theory

Paper 3

Time: 2 ¼ Hours

TRIALS   September 2022

ALLIANCE-MARYHILL   JOINT S

Kenya Certificate of Secondary

(a) Write your name and index number in the spaces provided above.

(b) Sign and write the date of examination in the spaces provided above

(c) Answer **ALL** the questions in the spaces provided in the question paper

(d) KNEC Mathematical tables and electronic calculators may be used for calculations

(e) All working **MUST** be clearly shown where necessary

(f) **This paper consists of 8 printed pages**

(g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing

(h) Candidates should answer the questions in English

<u>For examiners' use only.</u>

FOR EXAMINERS USE ONLY

Question	Maximum score	Candidates score
1	20	
2	12	
3	08	

1. You are provided with:
   - Acid A labelled solution A
   - 2.0M sodium hydroxide solution labelled solution B
   - Solution C containing 25.0g per litre of an alkanoic acid

You are required to:
a) Prepare a dilute solution of sodium hydroxide solution B.
b) Determine the:
   - Molar mass of the alkanoic acid
   - Reaction ratio between sodium hydroxide and acid A

Procedure 1

Using a pipette and pipette filler, place $25cm^3$ of solution B in to a 250.0 ml volumetric flask. Add about $200cm^3$ of distilled water. Shake well. Add more distilled water up to the mark. Label this solution D. **Retain the remaining solution B for use in Procedure 2.** Fill the burette with solution C. Using a clean pipette and pipette filler, place $25cm^3$ of solution D into a 250 ml conical flask. Add two drops of phenolphthalein indicator and titrate with solution C. Record your results in **Table 1**. Repeat the titration two more times to complete the table.   (4 marks)

Table 1	I	II	II
Final burette reading			
Initial burette reading			
Volume of solution C (cm^3) added			

Determine the:

(a) Average volume of solution C used.   (1 mark)

(b) Concentration of solution D in moles per litre.   (1 mark)

(c) Concentration of the alkanoic acid in solution C in moles per litre. (1 mole of the acid reacts with 3 moles of the base).   (1 mark)

(d) Molar mass of the alkanoic acid.   (1 mark)

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Procedure 2

Fill a clean burette with solution A. Place 5 cm³ of solution A in to a 100ml beaker. Measure the initial temperature of solution A in the beaker and record in **Table 2**. Using a 50 ml measuring cylinder, measure 25 cm³ of solution B. Add it to solution A in the beaker and immediately stir the mixture with a thermometer. Record the maximum temperature reached in **Table 2**. Repeat the experiment with other sets of volume of solutions A and B and complete the table.

Table 2   (5 marks)

Volume of solution A (cm³)	5	9	13	17	21	25
Volume of solution B (cm³)	25	21	17	13	9	5
Maximum temperature (°C)						
Initial temperature (°C)						
Change in temperature, ΔT						

(e) On the grid provided, plot a graph of ΔT (vertical axis) against the volume of solution A.   (3 marks)
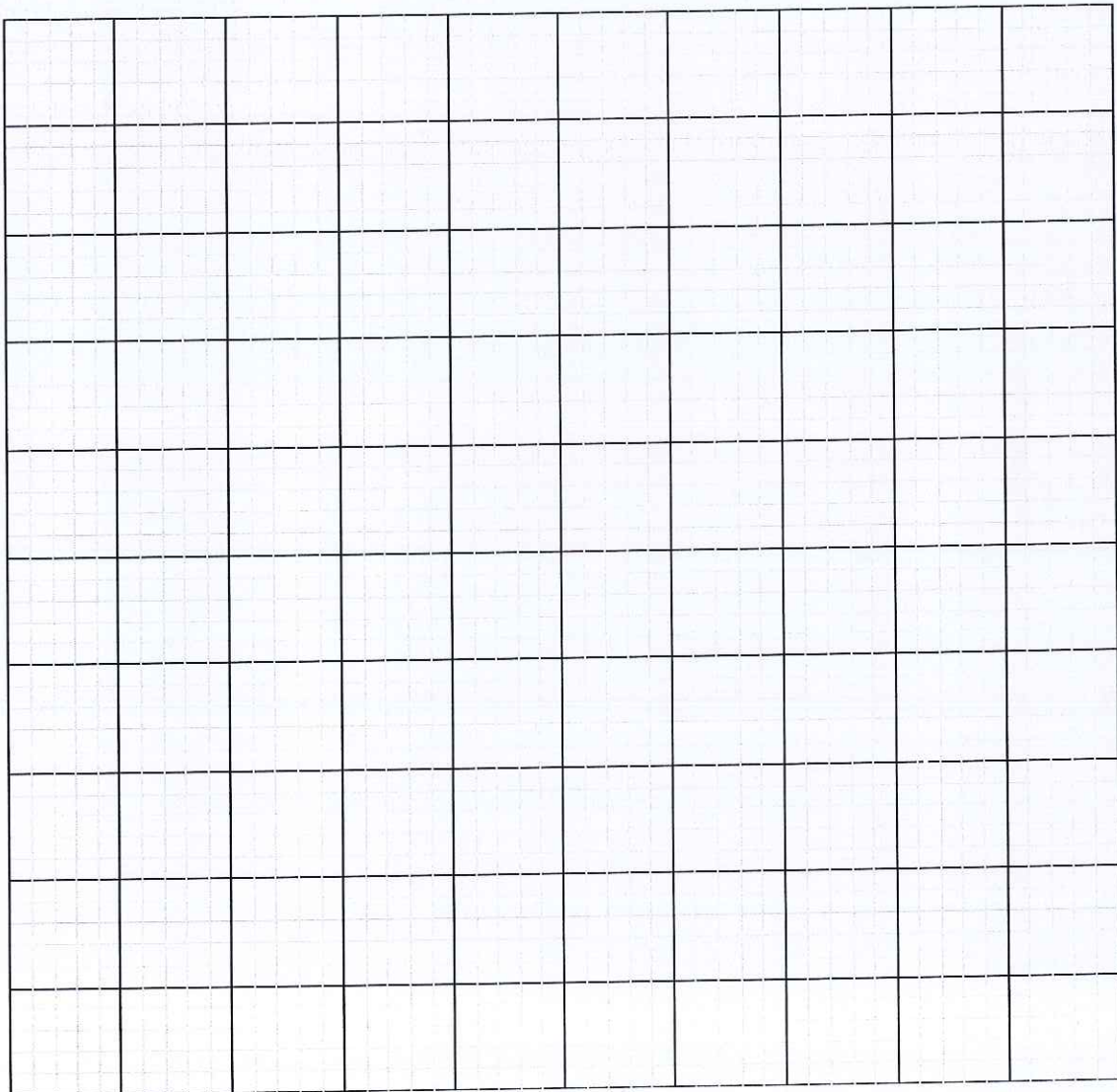
(f) From the graph determine the volume of solution A which gave the maximum change in temperature.

(1 mark)

(g) Determine the volume of solution B that reacted with the volume of solution A.

(1 marks)

(h) Calculate the:
   (i) Ratio between volume of solution A and B that neutralized one another.

(1 mark)

   (ii) Concentration in moles per litre of the acid in solution A. (Assume that the volume ratio is the same as the mole ratio).

(1 mark)

2. You are provided with solid **E**. Carry out the following tests and write your observations and inferences in the spaces provided.

(a) Place about one half of solid K in a test – tube and heat it strongly. Test any gases produced with both red and blue litmus papers.

Observations	Inferences
(2 marks)	(1 mark)

(b) Place the rest of solid in a boiling tube. Add about 10cm³ of distilled water. Divide the resulting solution into five portions. To the first portion, add lead(II) nitrate

Observations	Inferences
1 mark)	(1 mark)

(c) To the second portion add dilute Nitric (IV) acid .

Observations	Inferences
1 mark)	1 mark)

(d) To the third portion add barium nitrate

Observations	Inferences
½ mark)	½ mark)

(e) To the fourth portion add aqueous ammonia till in excess

Observations	Inferences
1 mark)	(1 mark)

(f) To the fifth portion add sodium hydroxide dropwise till in excess

Observations	Inferences
1 mark	1 mark

3. *You are provided with solid F*
Carry out the tests below write your observations and inferences in the spaces provided
   a) *Place all of solid F in a test-tube and add 6cm³ of sodium hydroxide solution*

Observations	Inferences
(1 mark)	(1 mark)

b. *Place the solution obtained in a above in a boiling tube* add about 10cm³ of 2M dilute hydrochloric acid drop wise ,filter the mixture and retain the residue for tests below. Wash the residue with about 10 cm³ of distilled water. Dry the residue Between filter papers.
   i.   Place about one third of the dry residue n metallic spatula and burn t on a Bunsen burner flame.

Observations	Inferences
1 mark)	(1 mark)

c. Place all the remaining residue in to a boiling tube. Add about 10 cm³ of distilled water and shake Divide the mixture in to two portions:
i. To the first portion add two drops of bromine water

Observations	Inferences
(1 mark)	(1 mark)

ii. To the second portion, about 5 cm³ of dilute sulphuric (VI) acid and then about 5 cm³ of ethanol. Warm the mixture.

Observations	Inferences
(1 mark)	(1 mark)