KENYA HIGH SCHOOL MOCK 2020
CHEMISTRY PAPER 3

Q1.   You are provided with:
- 2g of solid A which is a mixture of sodium carbonate and sodium chloride.
- 0.4M Hcl solution B

You are provided to:
- Determine the concentration of sodium carbonate in the mixture.
- Determine the percentage of sodium chloride in the mixture.

PROCEDURE

Transfer the entire solid in a 250ml volumetric flask. Add about 100cm³ of distilled water. Shake to dissolve.
Top up with distilled water to make upto the mark. Label this solution A₂. Using a pipette and a pipette filler, transfer 25cm³ of this solution into a conical flask. Add 3 drops of methyl orange indicator. Fill the burette with solution B. Titrate B against A₂ in the conical flask to get an accurate and point. Record your results in table I below. Repeat the experiment two more times to complete the table I below.

Table 1

	I	II	III
Final burette reading (cm³)			
Initial burette reading (cm³)			
Volume of Soln. B used (cm³)			

Q1.   (a)   Calculate: (4mks)
       (i)   the average volume of solution B used.   (1mk)

       (ii)   the number of moles of Hcl in the average titre.   (1mk)

       (b)   (i)   Write an equation for the reaction.   (1mk)

       (c)   Calculate the number of:
              (i)   Moles of sodium carbonate in 25cm³ of solution A₂.   (1mk

              (ii)   the moles of sodium carbonate in 250cm³ of solution A₂.   (1mk)

       (d)   Determine the mass of sodium carbonate in solid A (Na= 23, C=12, H=1, 0=16   (1mk

(e)   Calculate the percentage of sodium chloride in solid A.   (1mk)

Q2.   You are provided with:
- Solution D, 2M Hcl
- Solution C, 2M NaoH

You are required to determine the heat of neutralization.

PROCEDURE
- Using a 50cm³ measuring cylinder, transfer 20cm³ of solution C into a plastic beaker. Take the initial temperature and record it in table II below.
- Using a 10cm³ measuring cylinder, measure 5cm³ of solution D and add it to solution C. Stir the mixture immediately with the thermometer and record the highest temperature in table II.
- Continue adding 5cm³ portions of solution D, every time recording the highest temperature attained to complete table II.

Volume of solution D (cm³)	0	5	10	15	20	25	30
Vol. of solution (C + D) cm³	20	25	30	35	40	45	50
Highest temperature of mixture (⁰c)							

                                                 (4mks)

Plot a graph of volume of solution D (x-axis) against highest temperature.   (3mks)

(a)   From the graph, determine
       (i)   The volume of solution D that reacts completely with solution C.   (1mk)

       (ii)   The highest temperature change ΔT.   (1mk)

(b)
       (i)   Calculate the amount of heat evolved by the reaction cassume specific heat capacity = 4.2Jg⁻¹ K⁻¹, density of solution = 1g/cm³   (1mk)

       (ii)   Calculate the number of moles of Hcl used   (1mk)

       (iii)   Calculate the molar heat of neutralization of Hcl.   (2mks)

3.   You are provided with solid F. Carry out the tests below and record your observations and inferences in the spaces provided. Place all solid F in a boiling tube. Add 10cm³ of distilled water. Divide into four portions.

Observations	Inferences
(½mk)	(½mk)

(i)   To the first portion, add aqueous sodium hydroxide until in excess.

Observations	Inferences
(1mk)	1mk)

(ii)   To the second portion, add aqueous ammonium hydroxide until in excess.

Observations	Inferences
($\frac{1}{2}$mk)	($\frac{1}{2}$mk)

(iii)   To the third portion, add 5 drops of Barium nitrate solution, followed by 3 drops of dilute nitric (V) acid.

Observations	Inferences
(1mk)	(1mk)

(b)   You are provided with solid E. Carry out the following tests and write your observations   and inferences in the spaces provided.

(i)   Place a spatula full of solid E in a metallic spatula and ignite using a Bunsen burner flame.

Observations	Inferences
(1mk)	(1mk)

(ii)   Place all the remaining solid in a boiling tube. Add 5cm³ of distilled water. Shake the mixture and divide it into four portions.

Observations	Inferences
(1mk)	(1mk)

(i)   To the first portion, add 3 drops of acidified potassium manganite (VII).

Observations	Inferences
(1mk)	(1mk)

(ii)   To the second portion, add 3 drops of bromine water.

Observations	Inferences
(1mk)	(1mk)

(iii)   To the third portion, add all sodium hydrogen carbonate provided.

Observations	Inferences
($\frac{1}{2}$ mk)	($\frac{1}{2}$ mk)