Name …………………...…………………………….. Index No...……………..…….……

Candidate signature…………………………………...   Date: …………………..

233/3
CHEMISTRY
Paper 3 (PRACTICAL)
July / August – 2018
Time: 2 Hours 15mins

INSTRUCTIONS TO CANDIDATES
- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the spaces provided.
- Answer **all** the questions in the spaces provided.
- KNEC mathematical tables and non-programmable electronic calculators may be used.
- All working **must** be clearly shown where necessary
- Candidates should check whether the question paper to ascertain that all the pages are printed and that no questions are missing.
- Candidates should answer the questions in **English**

For Examiners Use Only

Question	Maxi. score	Candidate's score
1	24	
2	9	
3	7	
Total	40	

1. **You are provided with:**
   - Sodium hydroxide solution **K**
   - **0.128M** hydrochloric acid solution **L**
   - Carboxylic acid solution **M**

Solution **N** is prepared by diluting **25**cm^3 of solution **K** with distilled water to 150cm^3 of solution.

You are required to;

a) Standardize solution **N** with solution **L**
b) Determine the reaction ratio between sodium hydroxide solution **K** and the carboxylic acid solution **M.**

Procedure I
Fill the burette with solution **L**. Pipette **25**cm^3 of solution **N** into a clean conical flask. Add **two** drops of **phenolphthalein** indicator and titrate with solution **L**.
Record your results in the table below. Repeat the titration two more times and complete the table below.
Table I

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

(4mks)

a) Determine the average volume of solution L used   (1mk)

b) Calculate
   i)   The concentration of sodium hydroxide in mole per litre in solution **N**   (2mk)

   ii)   The concentration of sodium hydroxide in moles per litre in solution K   (2mk)

Procedure II

Using a clean burette, place **16** cm^3 of solution **M** into a boiling tube. Take its initial temperature and record it in the table below. Using a clean measuring cylinder, place **4** cm^3 of solution **K** in the boiling tube. Stir the mixture immediately with thermometer and record the maximum temperature reached.

Repeat the experiment with other set of volume of **M** and **K** to complete table **II**.

N/B: Rinse the thermometer and boiling tube after each experiment.

Table II (6mks)

Volume of solution **M** (cm^3)	16	12	8	6	4	2
Volume of solution **K** (cm^3)	4	8	12	14	16	18
Final temperature (^{o}C)						
Initial temperature (^{o}C)						
Change in temperature (Δ**T**)						

a) On the graph paper provided plot a graph of Δ**T** against volume of sodium hydroxide solution **K** (3mks)

b) From the graph, determine the volume of sodium hydroxide, solution **K** required to neutralize the carboxylic acid (1mk)

c) Calculate the volume of carboxylic acid solution **M** used for neutralization. (1mk)

d) Calculate:
   i)   Ratio between the volumes of solutions **K** and **M** (2mks)

   ii)   Concentration in moles per litre of carboxylic acid, solution **M.** (assume the volume ratio is the same as mole ratio) (2mks)

2. **You are provided with:**
   - Solid **Q**
   - Aqueous sodium hydroxide
   - Dilute nitric (V) acid
   - Wooden splint
   - Potassium Iodide solution

Solid Q is **suspected** to be **lead (II) carbonate**.

a) From the reagents provided, select and describe three tests that could be carried out **consecutively** to confirm if solid Q is **lead (II) carbonate**. Write the tests and expected observations in the spaces provided.

i)

Test 1	Expected observations
(1mk)	(1mk)

ii)

Test 2	Expected observations
(1mk)	(1mk)

iii)

Test 3	Expected observations
(1mk)	(1mk)

b) Carry out the tests described in (a) using solid Q and record the observations and inferences in the spaces provided

Test 1

Observations	Inferences
(½mk)	(½mk)

Test 2

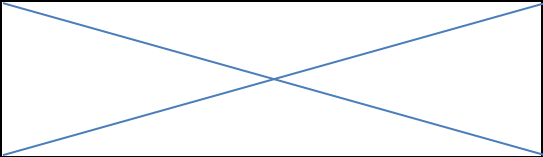| Observations	Inferences
(½mk)	(½mk)

Test 3

Observations	Inferences
(½mk)	(½mk)

3. You are provided with solid **T**.Carry out the tests and write your observations and inferences in the spaces provided.
   a) Place a third of solid **T** on a metallic spatula and burn it over a Bunsen burner flame

Observations	Inferences
(1mk)	(1mk)

   b) Place the rest of solid **T** in a boiling tube. Add about **8 cm^3** of distilled water. Shake the mixture well. Retain the mixture.

Observations	Inferences
(½mk)	

   Divide the mixture into four portions of 2cm^3 each.
   i)   To the first portion of 2cm^3 of the mixture, add the **magnesium ribbon provided.**

Observations	Inferences
(½mk)	(½mk)

ii)   To the second portion of the mixture, add about 1cm^3 of **acidified potassium dichromate (VI)** solution and warm.

observations	Inferences
(½mk)	(½mk)

iii)   To the third portion of the mixture, add 2 drops of **bromine water.**

Observations	Inferences
(½mk)	(½mk)

iv)   Determine the **pH** of the mixture using the forth portion

Method used	Inferences
(1mk)	(½mk)