NAME……INDEX No……

SIGNATURE…….

233/2
CHEMISTRY
PAPER 2
(THEORY)
JULY/AUGUST, 2018
TIME: 2HRS

LANY JOINT EVALUATION TEST

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES.

- Write your name and index number in the spaces provided above.
- Sign and write the date of exam in the spaces provided above.
- Answer **ALL** the questions in the spaces provided.
- Mathematical tables and silent electronic calculators may be used.
- All working **MUST** be clearly shown where necessary.
- This paper consists of 12 printed pages. Candidates should check to ensure that all pages are printed as indicated and no questions are missing

FOR EXAMINER'S USE ONLY.

Questions	Maximum score	Candidates score
1	13	
2	10	
3	13	
4	13	
5	11	
6	09	
7	11	
Total score	**80**	

1. a) Study the information in the table below and answer the questions that follow. (The letters do not represent the actual symbols of the elements)

Element	Electronic configuration	Ionisation energy kj moi^{-1}
P	2.1	519
Q	2.8.1	494
R	2.8.8.1	418

i. What is the general name given to the group in which elements P, Q and R belong? (1mk)

ii. What is meant by ionization energy? (1mk)

iii. Explain why element P has the highest ionization energy. (1mk)

iv. When a piece of element Q is placed on water, it melts and a hissing sound is produced as it moves on the surface of the water. Explain these observations. (2mks)

v. Write an equation for the reaction between element Q and water. (1mk)

b. Distinguish between a strong and a weak base. Give an example in each. (3mks)

c. Neutralization is one of the methods of preparing salts.

i. What is meant by neutralization? (1mk)

ii. Describe how you would prepare crystals of sodium nitrate starting with $200cm^3$ of 2M sodium hydroxide. (2mks)

iii. Write an equation for the reaction that takes place when a solid sample of sodium nitrate is heated. (1mk)

2a) State two factors that should be considered when choosing fuel for cooking. (2mks)

b) During an experiment to determine the molar heat of combustion of ethanol the data given below was recorded

Volume of water	$450cm^3$
Initial temperature of water	25
Find temperature of water	46.5
Mass of ethanol + lamp before burning	125.5 g
Mass of ethanol + lamp after burning	124.0 g

Calculate the:

i) Heat evolved during the experiment t(Density of water = 1 g/cm3, specific heat capacity of water = $4.25g^{-1}k^{-1}$ (2mks)

ii) Molar heat of combustion of ethanol(C=12.0, O=16.0,H= 1.0) (2mks)

c) Write the equation for the complete combustion of ethanol (1mk)

d) The value of the molar heat of combustion of ethanol obtained in (b) (ii) above is lower than the theoretical value. State one source of error in the experiment. (1mk)

e) Draw an energy level diagram to show molar heat of combustion of ethanol. (2mks)

3 An organic compound was subjected to combustion. 1.0 g of it formed 1.37 **g** of carbon (IV) oxide, 1.12 **g** of water as the only products. (C = 12, H = 1 , 0 = 16)

(a) Calculate the mass of carbon and hydrogen in the compound (3 mks)

(b) What other element must be present (1mk)

(c) Calculate the empirical formula of the compound (2mks)

(d) What is meant by the term positional isomerism, give an example (2mks)

(e) Draw the structural formulae of the following
(i) Ethanoic acid (1mk)

(ii) Butane (1mk)

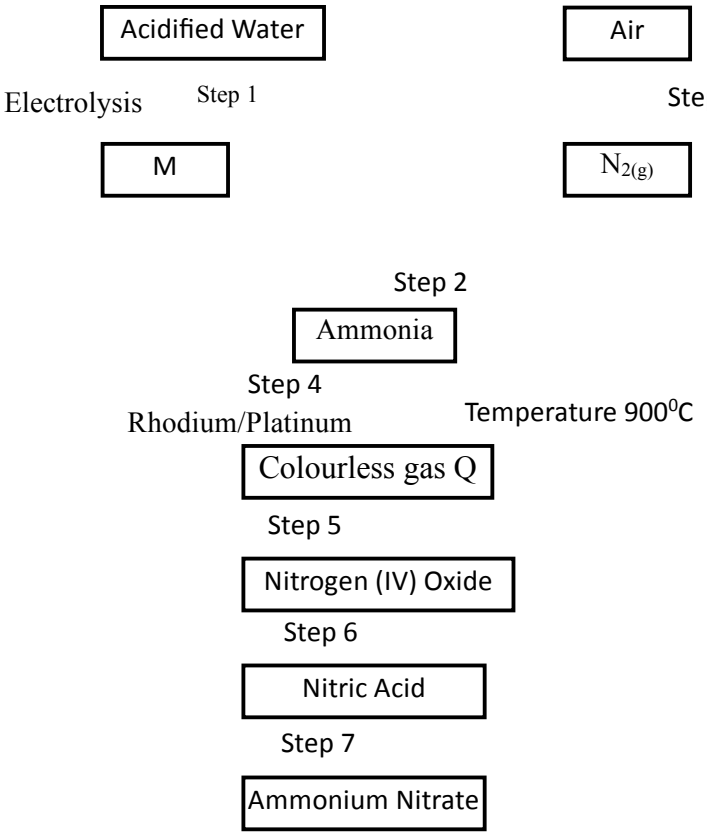
(f) **I** Ethene can be converted to ethane industrially. Name the reagent and conditions necessary for this reaction to occur. (2mks)

II What is the importance of the reaction above in **I** (1mk)

4. Fractional distillation of liquid air usually produces Nitrogen and Oxygen as the major products.
   (a) (i) Name one substance used to remove carbon (IV) Oxide from air before it is changed into liquid. (1mk)

   (ii) Describe how nitrogen is obtained from liquid air. (Boiling point of Nitrogen = -196^0C, Oxygen = -183^0C) (3mks)

(b) Study the flow diagram below and answer the questions that follow:-



(i) Name the element M (1mk)

(ii) Why is it necessary to use excess air in step 4 (1mk)

(iii) Write an equation for the reaction in step 7 (1mk)

(iv)In the harber process, the optimum yield of ammonia obtained is when a temperature of 450^0C a pressure of 200 atmospheres and iron catalyst are used.

$N2_{(g)} + 3H_{2(g)} \quad 2NH_{3(g)}$, $\Delta = -92kJmol^{-1}$

(I) How the yield of ammonia would be affected if the temperature is raised to 600^0C. Explain (2mks)

(II) State two uses of ammonia gas (2mks)

(c)State and explain the observations made if a sample of Sulphur is heated in concentrated Nitric (v) acid (2mks)

5. The table below gives standard electrode potentials for the metals represented by the letters **G**, **X**, **Y**, **W**. The letters are not the actual symbols of the metals. Study it and answer the questions that follow.

Metal	Standard electrode potential (E^{θ}) volt
G	-0.76
X	+0.34
Y	+0.85
W	-0.13

(a)(i) Which metal can be displaced from a solution of its salt by all the other metals in the table? (½mk)

(ii)Give a reason for your answer in (a)(i) above. (½mk)

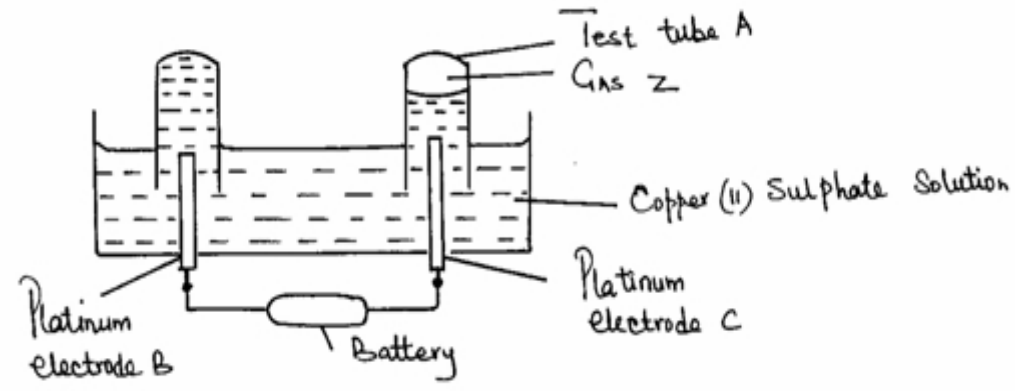
(b) The metals **G** and **X** were connected to a cell as shown in the diagram below.

(i) Write the equations for the reaction that occur at electrode **X** and **G**. (2mk)

(ii) On the diagram; indicate with an arrow the direction in which electrons would flow. (1mk)

(iii) State **two** functions of the salt bridge. (2mks)

(c)An electric current was passed through a aqueous solution of copper (II) sulphate as shown in the diagram below.



(i) Identify the ions present in the copper (II) sulphate solution. (2mks)

(ii) Identify the electrode which is serving as the anode. (1mk)

(iii) Explain the change in intensity of blue colour of the copper (II) sulphate solution in the above set up. (2mks)

6. (a) In an experiment to study the rate of a reaction,2.0g of Manganese (IV) oxide was added to 100cm^3 of hydrogen peroxide solution at 25^oC. The volume of oxygen released was measured at 10 seconds intervals. The results obtained are tabulated below

Time (sec)	0	10	20	30	40	50	60	70	80	90
Volume (cm^3)	0	60	90	105	112	116	118	120	120	120

(i) Plot a graph of volume of gas (vertical axis) against time and label it X.(3mks)

(ii) Use the graph to find:

(I) The volume of gas produced after 25 seconds (1mk)

(II) The time taken to produce 80cm^3 of oxygen (1mk)

(iii) Explain why the volume of oxygen produced does not exceed 120cm^3 (1mk)

(iv)Sketch a graph Y, on the same grid to show the results if the experiment was repeated using hydrogen peroxide at 10^{o}C. Explain (2mks)

(v) The mass of the solid residue after the experiment was found to be 2.0g when dried. Explain (1mk)

7.(a) Below is a simplified diagram of the Down's cell used for the manufacture of sodium.

Study it and answer the questions that follow.

(i) The anode is made of graphite and not steel. Give a reason.
(2mks)

(ii) What precaution is taken to prevent chlorine and sodium from re-combining? (1mk)

(iii) Write an ionic equation for the reaction in which chlorine gas is formed. (1mk)

(iv) In the Down's process a certain salt is added to lower the melting point of sodium chloride from about 800°C to about 600°C.

(a) Name the salt that is added. (1mk)

(b) State why it is necessary to lower the temperature. (1mk)

(c) Explain why aqueous sodium chloride is not suitable as an electrolyte for the manufacture of sodium in the Down's process.

(2mks)

(d) Sodium metal reacts with air to form two oxides. Give the formulae of the two oxides. (2mks)

(e) State **one** use of sodium metal. (1mk)