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

School: ……………………………………………. Candidate's Sign. ………..............

Date: ……………………….......................................

233/2
CHEMISTRY
PAPER 2
THEORY
MAY/JUNE 2014
TIME: 2 HOURS

CROSS COUNTRY EXAM 2014

Kenya Certificate of Secondary Education (K.C.S.E.)

INSTRUCTIONS TO CANDIDATES:

- *Write your **name** and **index** on the spaces provided above*
- *Answer **all** the questions in the spaces provided.*
- *All working **must** be clearly shown where necessary.*
- *Mathematical tables, Electronic calculators may be used.*

For Examiners Use Only

Question	Maximum score	Candidate's score
1	13	
2	12	
3	13	
4	10	
5	10	
6	12	
7	10	
Total	**80**	

This paper consists of 8 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

1. The figure below shows a section of the periodic table. The letters do not represent the actual symbols of the elements

A								B
C			D			E	F	
G	H	I	J	K	L	M	N	
O	P		Q			R	S	

(a) Give the name of the family of the elements to which M belongs   (1mk)

……………………………………………………………………………………………………

(b) Write the electronic configuration of the stable ion of element;

(i) **L**…………………………………………………………………….   (1mk)

(ii) **P**……………………………………………………………………   (1mk)

(c) Give **one** use of element   (1mk)

(i) **A**…………………………………………………..…………………...   (1mk)

(ii) **M**……………………………………………………………………   (1mk)

(d) The melting point of element **C** is higher than that of **G**. explain   (2mks)

………………………………………………………………………………………………….

………………………………………………………………………………………………….

(e) What is the structure of element J?   (1mk)

…………………………………………………………………………………………………..

(f) With explanation compare the atomic radius of O and **P**?   (2mks)

………………………………………………………………………………………………….

………………………………………………………………………………………………….

(g) Which is the most reactive?………………………………………………………………………….

(i) Non-metal? Explain   (1½mks)

…………………………………………………………………………………………………

…………………………………………………………………………………………………

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

………………………………………………………………………………………………….

………………………………………………………………………………………………….

(b) The diagram below represents a set-up that was used to determine the molar heat of combustion of ethanol.

Thermometer

Metallic container

Lamp

Ethanol

2
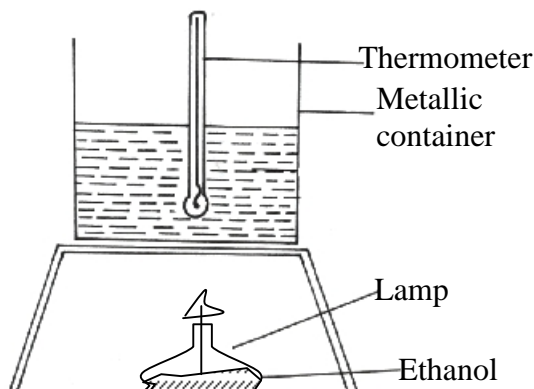
During the experiment, the data given below were recorded;

Volume of eater 450cm³
Initial temperature of water 25°C
Final temperature of water 46.5°C
Mass of Ethanol + lamp 125.5g
Mass of Ethanol + lamp 124.0g
After burning

Calculate the ;
(i) Heat evolved during the experiment (*Density of eater = 1g/cm³*) specific heat capacity of water =4.2KJ/Kg/K) (3mks)

………
………
………
………
………
………

(ii) Molar heat of combustion of ethanol (2mks)

………
………

(iii) Write the thermo-chemical equation for the combustion of ethanol (1mk)
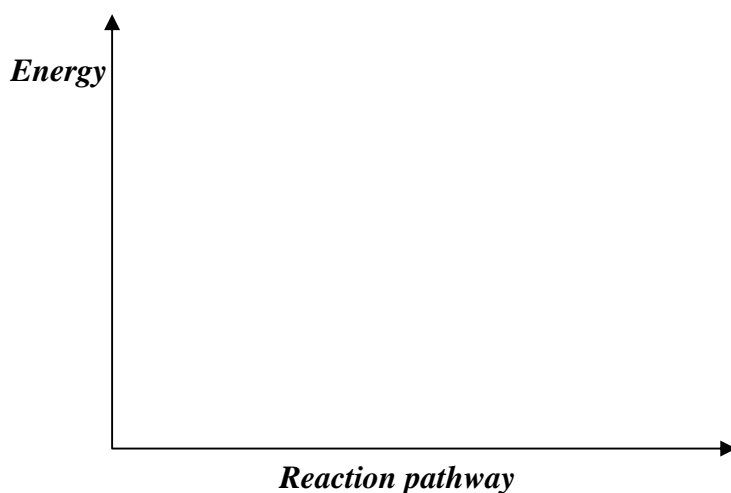
………

(iv) Molar heat of combustion of ethanol obtained in b(i) above lower than the theoretical value.

State the **two** sources of error in the experiment. (C=12 O=16 H=1) (2mks)

………
………

(d) On the axis, draw an energy level diagram for the combustion of ethanol (2mks)

Energy

Reaction pathway

3

3. Study the flow chart below that shows some reactions of dried air then answer the questions that follow:
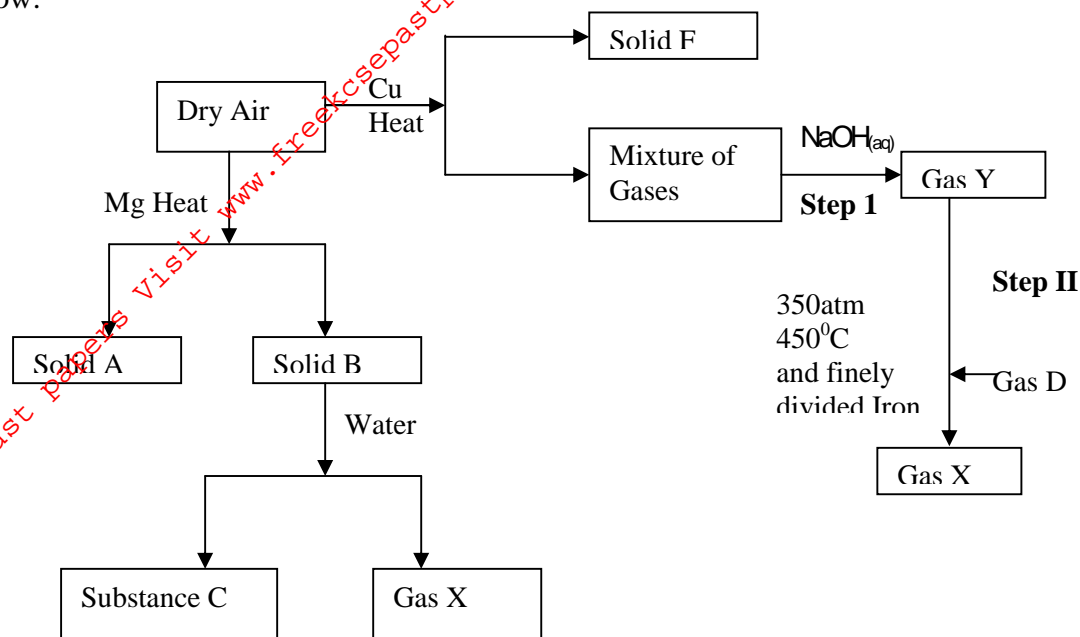
(a) Identify; (2mks)

   (i) Solid **A**………………………………………………………………………………..

   (ii) Gas **D**……………………………………………………………..………..

   (iii) Gas **X**……………………………………………………….………......

   (iv) Solid **B**………………………………………………………….……………

(b) Whys is the amount of solid **B** obtained much less than **solid A**? (2mks)

………………………………………………………………………………………………

………………………………………………………………………………………………

(c) Write a balanced equation for the reaction between **solid B** and water (2mks)

………………………………………………………………………………………………

………………………………………………………………………………………………

(d) (i) How can gas **Y** be obtained from gas **X** in the laboratory? (2mks)

………………………………………………………………………………………………

………………………………………………………………………………………………

(ii) Write an equation for the process in d(i) above (1mk)

………………………………………………………………………………………………

(e) Which gas is absorbed by NaOH in step I (1mk)

………………………………………………………………………………………………

(f) Gas **Y** in step I is impure. Name one impurity it contains. (1mk)

………………………………………………………………………………………………

(g) (i) What name is given to the process that occurs in step II? (1mk)

………………………………………………………………………………………………

(ii) Explain the effect of using much lower temperature than that in step II (2mks)

………………………………………………………………………………………………

………………………………………………………………………………………………

4

4. The table below gives the volume of gas produced when different volume 1M hydrochloric acid was reacted with 1.6g of zinc powder at room temperature

Volume of 1M HCl (cm^3)	Volume of gas (Cm^3)
0	0
20	200
40	400
60	600
80	600
100	600

(a) Write an equation for the reaction between zinc and HCl   (1mk)

……………………………………………………………………………………………………….

(b) Plot a graph of the gas produced against the volume of the acid added.   (3mks)
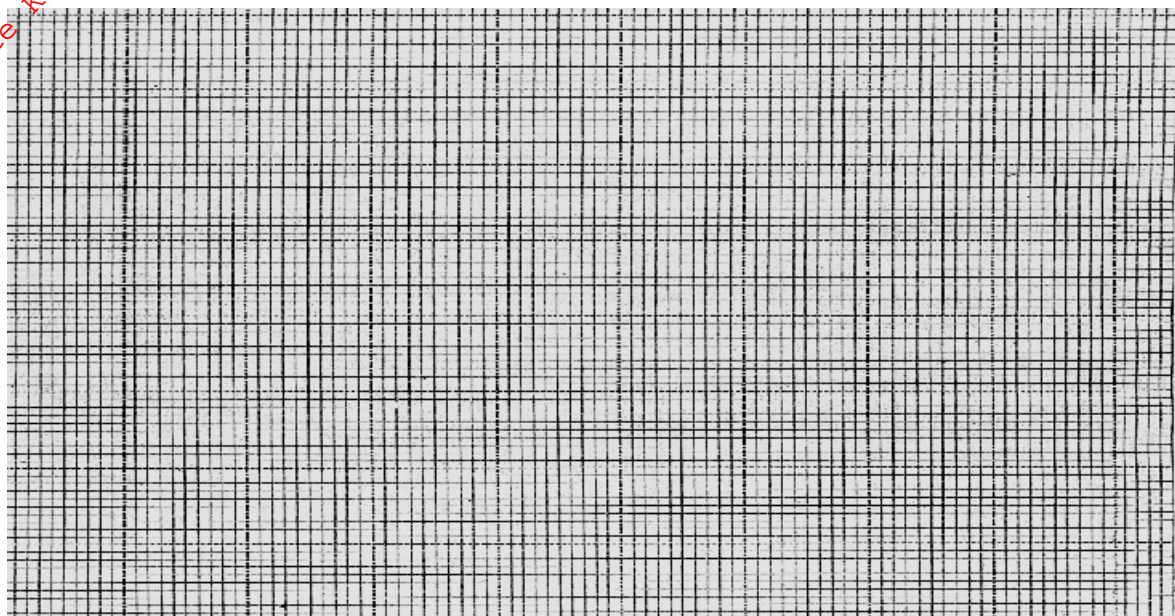
(c) From the graph determine;
  (i) The volume of gas produced if 25cm^3 of 1M HCl had been used.   (1mk)

……………………………………………………………………………………………………….

  (ii) The volume of 1M HCl which reacted completely with 1.6g of zinc powder   (1mk)

……………………………………………………………………………………………………….

……………………………………………………………………………………………………….

(d) State and explain the effect on the rate of production of the gas if;
  (i) 1.6g of zinc granules were used instead of zinc powder.   (2mks)

……………………………………………………………………………………………………….

……………………………………………………………………………………………………….

  (ii) 2M HCl was used instead of 1M HCl   (2mks)

……………………………………………………………………………………………………….

……………………………………………………………………………………………………….

5

5. The flow chart below shows the industrial manufacture of Nitric (V) acid

```
                          B
                          ↓
   Air ──→ [Filter] ──────→ [Compressor] ──────→ [Chamber D]
                                                      ↑ │
                    [Oxidation  ←──────────────────────┘ │
   Air ──────────→   chamber]           [Catalytic ←──────┘
                        │  │              chamber]
                        E  │C
                        ↓  ↓
                 [Absorption  ──────→ [Nitric (V) acid]
            F ←──  chamber]
```
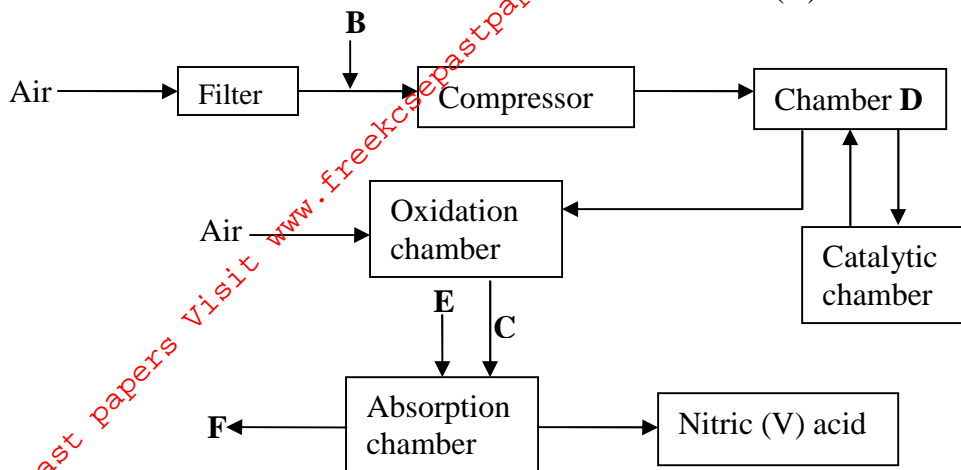
(a) Identify substances; (2mks)

B...

C...

E...

F...

(b) Describe what happens in the catalytic chamber (2mks)

....

....

....

(c) State what takes place in chamber **D** (1mk)

....

(d) 60-65% Nitric (V) acid is produced in the absorption chamber. Describe how the acid can be concentrated (2mks)

....

....

(e) Copper reacts with Nitric (V) acid and not hydrochloric acid. Explain (2mks)

....

....

6. Study the given reduction potentials and answer the questions that follow.
   (*The letters do not represent actual symbols of the elements*)

$$\begin{array}{lll} & & \textbf{E V} \\ X^{2+}_{(aq)} + 2e^- & \longrightarrow X_{(s)} & -2.90 \\ Y^{2+} + 2e^- & \longrightarrow Y_{(s)} & -2.38 \\ Z^+ + e^- & \longrightarrow \frac{1}{2} Z_{2(g)} & 0.00 \\ \frac{1}{2} A_2 + e^- & \longrightarrow A^-_{(l)} & +2.87 \end{array}$$

(a) (i) Which element is likely to be hydrogen? (1mk)

....

6

(ii) Draw an electrochemical cell made up of **Y** and **X** half cells. Show the direction

of flow of electrons   (2mks)

……….

……….

(iii) Draw a diagram of a set-up showing how a spoon made of iron can be coated with silver metal

(2mks)

b) The diagram below represents a set-up that was used during electrolysis of a solution of magnesium sulphate using inert electrodes.

Battery

Electrode A

Electrode B

Aqueous Magnesium Sulphate
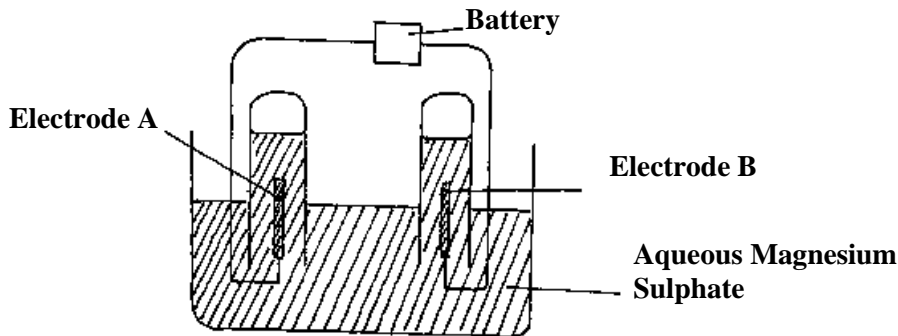
(i) Identify the ions present in the electrolyte   (2mks)

……….

……….

(ii) Write ionic equations for the reactions occurring at;   (2mks)

Cathode

……….

Anode

……….
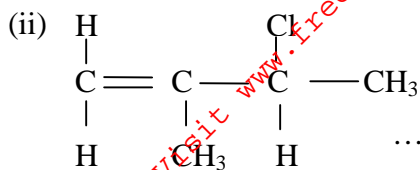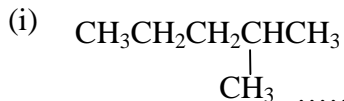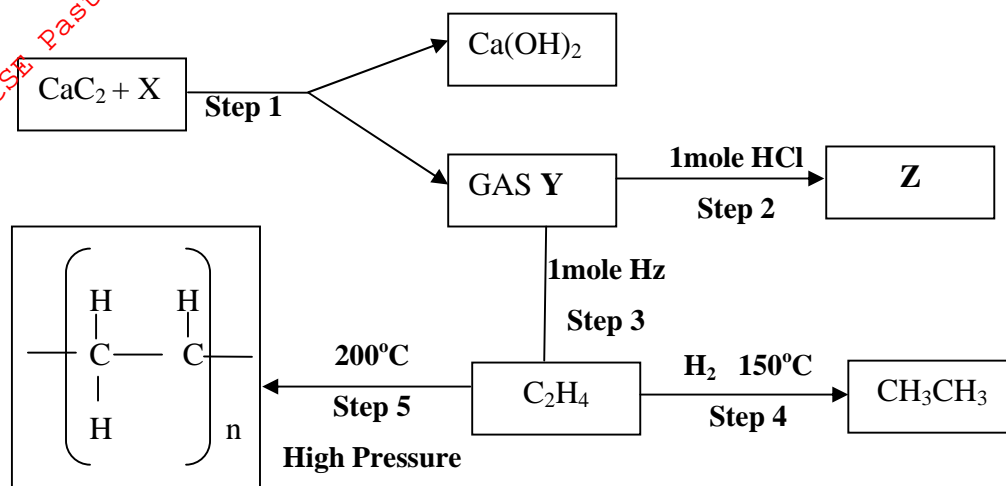
(iii) Calculate the quantity of electricity in coulombs that will liberate 1.2dm^3 of oxygen gas at r.t.p
(*Molar gas volume at r.t.p = 24dm^3*) (*1 Farady = 95600C*)   (3mks)

7. (a) Give the systematic names of the following compounds. (2mks)

(i)

$CH_3CH_2CH_2CHCH_3$
$\qquad$ CH_3 ....

(ii)

H   Cl
\ |
C = C — C — CH$_3$
/ | |
H   CH$_3$ H   ....

(b) Study the flow chart below and answer the questions that follow;

(i) Identify reagent **X** (1mk)

………………………………………………………………………………………………….

(ii) Name the catalyst used in step **4** (1mk)

………………………………………………………………………………………………….

(iii) Draw the structure of gas **Y** (1mk)

………………………………………………………………………………………………….

(iv) What name is given to the process that takes place in step **5** (1mk)

………………………………………………………………………………………………….

(v) Identify substance **Z** (1mk)

………………………………………………………………………………………………….

(vi) Draw the structure of substance **Z** (1mk)

………………………………………………………………………………………………………

(vii) State any **two** environmental effects of the product in step **5** (2mks)

………………………………………………………………………………………………….

………………………………………………………………………………………….……….