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

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

Date: ……………………………..

233/2
CHEMISTRY
THEORY
PAPER 2
JULY/AUGUST 2011
TIME: 2 HOURS

MUMIAS DISTRICT JOINT EVALUATION EXAM

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

Chemistry
Paper 2

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.*
- *All working **must** be clearly shown where necessary.*
- *Mathematical tables and electronic calculators can be used.*

For Examiner's Use Only

Question	Maximum score	Candidate's score
1	13	
2	13	
3	12	
4	10	
5	11	
6	11	
7	11	
Total	80	

This paper consists of 10 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

1. (a) The table below shows the ions of elements **W**,**X**,**Y Z** and their electron arrangement. The letters do not represent the actual symbols of the elements.

Ion	Electronic Configuration
W⁻	2,8,8
X²⁺	2,8,8
Y³⁺	2,8
Z²⁻	2,8

(i) Which **two** elements belong to the same period. Give a reason. (2mks)

……

……

(ii) In which group of the periodic table does Y^{3+} belong. (1mk)

……

(iii) Write the formula of the compound formed between **W** and **X** (1mk)

……

……

(iv) What type of bond is formed between **W** and **X**, Explain. (3mks)

……

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……

……

(b) (i) What is a co-ordinate bond. (1mk)

……

……

(ii) Draw a dot (•) cross (**x**) diagram to show bonding in the hydroxonium, H_3O^+ ion.

(c) Aluminium chloride and sodium chloride are both chlorides of period 3 elements. Use this information to explain the following observations.

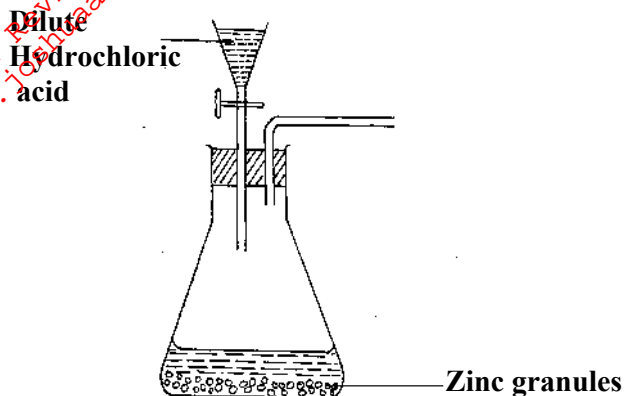I. A solution of Al_2Cl_3 in water turns blue litmus paper red while that of sodium Chloride does not

(1½ mks)

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……

II. The melting point of sodium chloride (801°C) is higher than that of Al$_2$Cl$_3$ (180°C)   (1 ½mks)

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2.   (a) The set up below was used to prepare hydrogen gas. Complete the diagram to show how a dry

   sample of the gas can be collected.   (3mks)

Dilute Hydrochloric acid

Zinc granules

(i) Write an equation for the reaction producing hydrogen gas.   (1mk)

(ii) How can the rate of production of gas be increased using the set up above.   (1mk)

……

 (b) Dry hydrogen gas was passed over heated copper (II) oxide in a combustion tube as shown

    below.

Copper (II) Oxide

Dry H$_{2(g)}$

Heat

Liquid X

Ice cold water

Flame
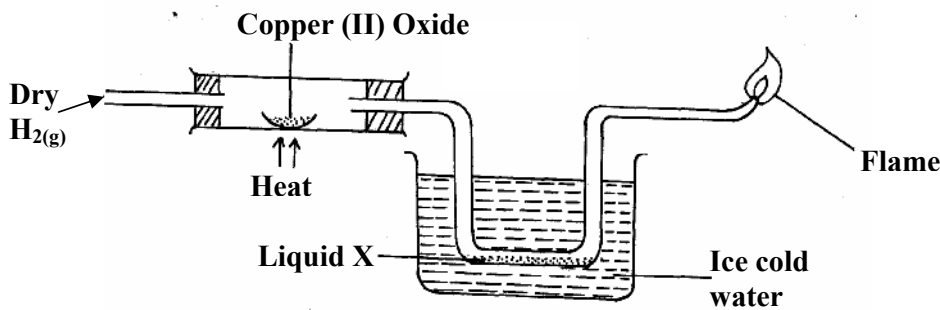
(i) State and explain the observation made in the combustion tube.   (2mks)

……

……

 (ii) Write an equation for the reaction that took place in the combustion tube.   (1mk)

(c) (i) Identify liquid **X**.   (1mk)

……

   (ii) Give **one** chemical test that can be used to prove the identity of liquid **X.** (2mks)

……

(d) (i)When magnesium oxide is used in place of copper (II) oxide no liquid is formed in the U –tube dipped in ice cold water Explain. (1mk)

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

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

(ii) Write an equation for the reaction at flame point. (1mk)

3. Aluminium is extracted using the electrolytic cell represented by the diagram below.
REDRAW
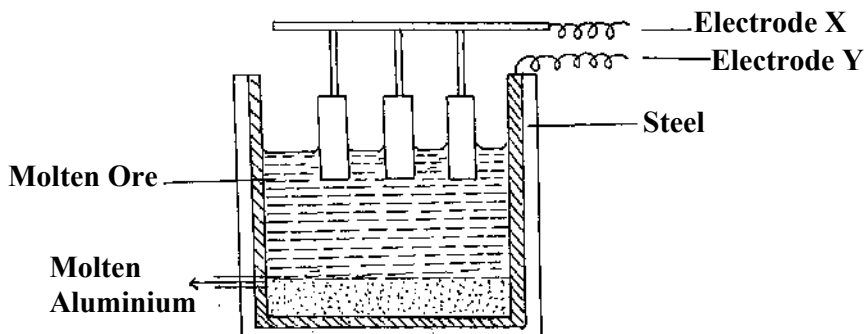
(a) Why is aluminium extracted by electrolytic method. (1mk)

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

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

(b) Name the electrodes labelled

   X………………………………………… (½ mk)

   Y.. (½ mk)

(c) The chief ore from which aluminium is extracted is bauxite.

(i) Name **two** main impurities present in bauxite. (2mks)

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

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

(ii) Aluminium oxide is the main component in bauxite with a melting point of 2015^oC, but Electrolysis of molten aluminium oxide is carried out at 800^oC. Explain how this is achieved. (2mks)

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

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

(d) Write the equations for the reactions taking place at the

   I. Cathode (1mk)

   II. Anode (1mk)

(e) One of the electrodes named in (d) above is replaced periodically. Which one and why?   (2mks)

……

……

(f) Duralumin (an alloy of copper aluminium and magnesium) is preferred to pure aluminium in the

construction of aeroplane bodies. Give **two** properties of duralumin that are considered.   (2mks)

……

……

4.   A hydrocarbon contains 88.2% carbon. Its molecular mass is 68g.

(a) (i) Determine its empirical and molecular formula.   (2mks)

(ii) Draw **two** positional isomers of the hydrocarbon.   (1mk)

(iii) Write an equation for the reaction between one of the isomers with chlorine and name the

product formed.   (2mks)

Equation

Name

……

(b) In an experiment an organic acid was reacted with absolute ethanol in the presence of concentrated sulphuric(VI) acid to form a compound whose formula is $CH_3CH_2CH_2COOCH_2CH_3$.

(i) Name:

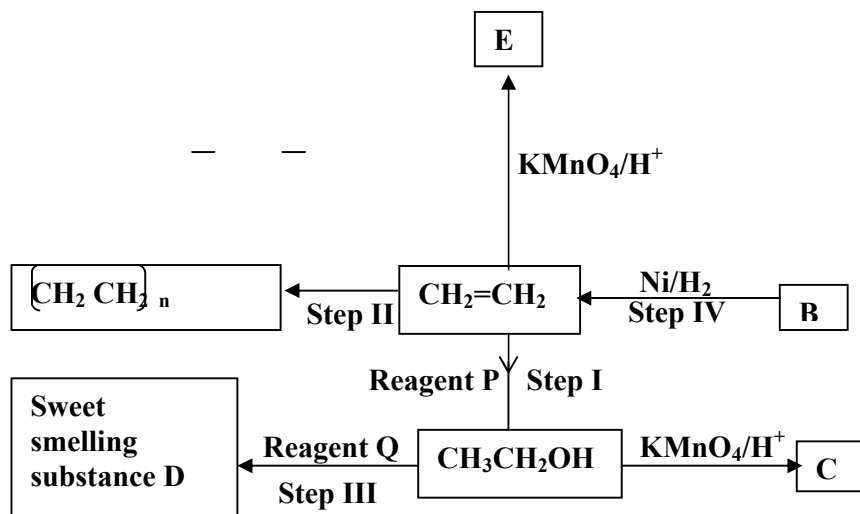(I) The type of reaction that took place.   (½ mk)

……………………………………………………………………………………………

(II) The name of organic compounds to which the compound belonged.   (½ mk)

……………………………………………………………………………………………

(ii) Write the structural formula and give the systematic name of the acid used in the above experiment.   (1mk)

(c) Study the flow diagram below and answer the questions that follow.

(i) Identify the following compounds

B…………………………………………..   (½ mk)

C…………………………………………..   (½ mk)

D…………………………………………..   (½ mk)

E……………………………………………   (½ mk)

(ii) Name the process in steps

I…………………………………………….

II…………………………………………….

IV…………………………………………….

(iii) Reagent **P**:…………………………………………….   (½ mk)

Q:…………………………………………… (½ mk)

5. The table below shows the solubility of a salt **X** in g/100g of water at different temperatures.

Temperature (^{o}C)	0	20	40	60	80	100
Solubility X (g/100g of water	10	15	26	40	63	100

(a) Define the term solubility. (1mk)

……

……

(b) On the graph provided, plot a graph of solubility of **X** against temperature. (3mks)
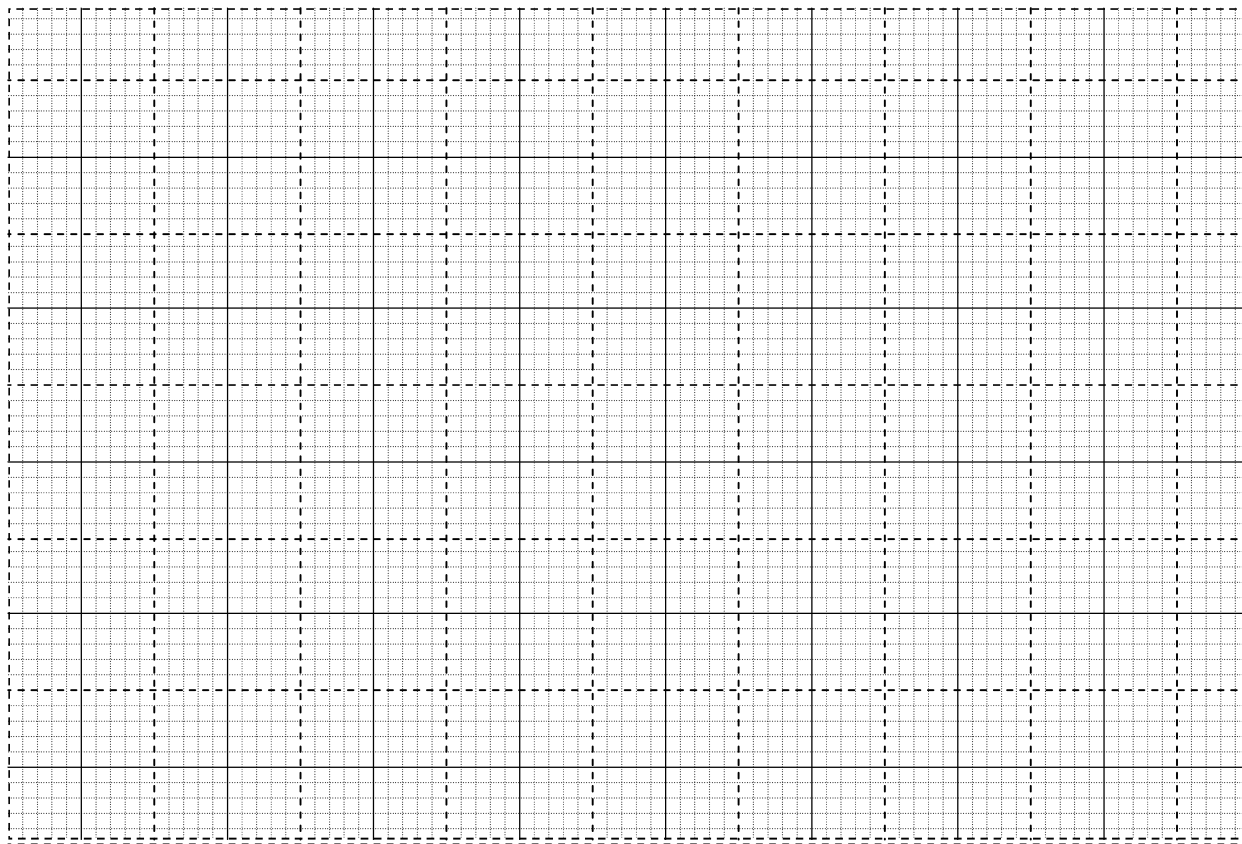
(c) From the graph determine the solubility of **X** at:

(i) 30°C (½ mk)

……

(ii) 50°C (½ mk)

....

   (iii) The temperature at which the solubility of **X** will be 50g/100g of water.   (½ mk)

....
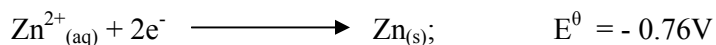
  (e) (i) On the same grid plot a graph of solubility of another salt Y whose values of solubility in
     g/100g of water are in the table below

Temperature (^{o}C)	0	20	40	60	80	100
Solubility Y g/100g of water	30	34	37	40	44	48

  (ii) At what temperature will X and Y have the same solubility.   (1mk)

....

....

  (iii) Given a mixture of equal mass of X and Y, how would a pure salt be obtained   (1mk)

....

....

6.   (a) The reduction potentials of $Mg_{(s)}/Mg^{2+}_{(aq)}$ and $Zn_{(s)}/Zn^{2+}_{(aq)}$

    $Mg^{2+}_{(aq)} + 2e^- \longrightarrow Mg_{(s)};$ $E^\theta = -2.71V$

    $Zn^{2+}_{(aq)} + 2e^- \longrightarrow Zn_{(s)};$ $E^\theta = -0.76V$

  (i) Write an ionic equation for the cell made by combining the two half cells.   (1mk)

  (ii) Calculate the cell e.m.f for the cell formed in (a) (i) above.   (2mks)

  (iii) Write the cell notation for the cell in (a) (i) above.   (1mk)

  (iv) In the space provided, draw the diagram of the electro-chemical cell in (a) (iii) above.   (2mks)
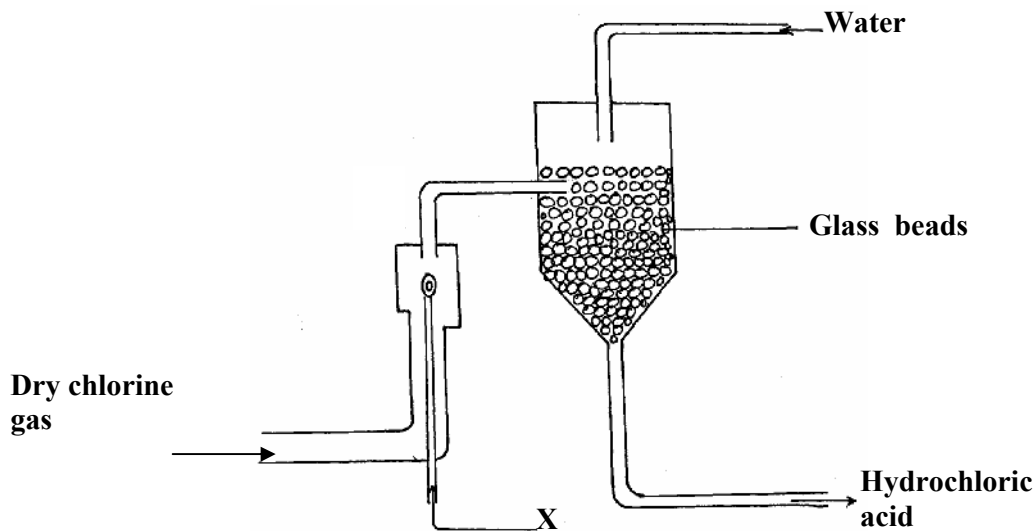
(b) Give **two** functions of the salt bridge in an electrochemical cell. (2mks)

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

(c) One of the applications of electrolysis is purification of metals. Describe briefly how pure copper is obtained from impure copper. (2mks)

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

7. The diagram below represents a set up for large scale manufacture of hydrochloric acid. Study it and answer the questions that follow:

(a) Name substance **X** (1mk)

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

(b) What is the purpose of glass beads. (1mk)

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

(c) Give **one** source of substance **X** used in the above process. (1mk)

………

(d) Write an equation from the reaction producing hydrogen Chloride gas in the above process.(1mk)

(e) The reaction in (d) above is very explosive, what precaution must be taken to prevent this. (1mk)

………

(f) 25.0 cm^3 of 0.1M HCl reacted with 8.4g of a mixture of sodium carbonate and sodium chloride.

During the reaction, 20.0 cm^3 of the mixture reacted. Calculate the percentage of sodium

chloride in the mixture.   (3mks)

(g) Give **two** uses of hydrochloric acid.   (2mks)

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