NAME…….. **INDEX NO**…….....

233/2 **CANDIDATE'S SIGN**……..……..

CHEMISTRY

PAPER 2 **DATE**……..……

(THEORY)

TIME: 2 HOURS

CENTRAL KENYA NATIONAL SCHOOLS JOINT EXAM - 2015

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 2
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

(i) Write your **name** and **index number** in the spaces provided **above**.
(ii) **Sign** and write the **date** of examination in the spaces provided **above**.
(iii) Answer **ALL** the questions in the spaces provided.
(iv) Electronic calculators and Mathematical table **may be** used.
(v) All working **must be** clearly shown where necessary.

FOR EXAMINER'S USE ONLY:

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

This paper consists of **12** printed pages.
Candidates should check to ascertain that all the pages are printed as indicated and that no questions are missing.

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

Element C	Atomic number	Melting point °C
L	11	97.8
K	12	650
M	13	660
N	14	1410
Q	17	-101
R	19	63.7

(a) Write the electronic arrangement for the ions formed by elements **M** and **Q**.

M _____ (½mk)

Q _____ (½mk)

(b) Select an element which is:

(i) the most electronegative element. _____ (1mk)

(ii) a poor conductor of electricity. _____ (1mk)

(c) In which period of the periodic table does element **Q** belong? Explain. (1mk)

_____

_____

(d) Compare the re-activity of element **R** and **L**. Explain your answer. (2mks)

_____

_____

_____

_____

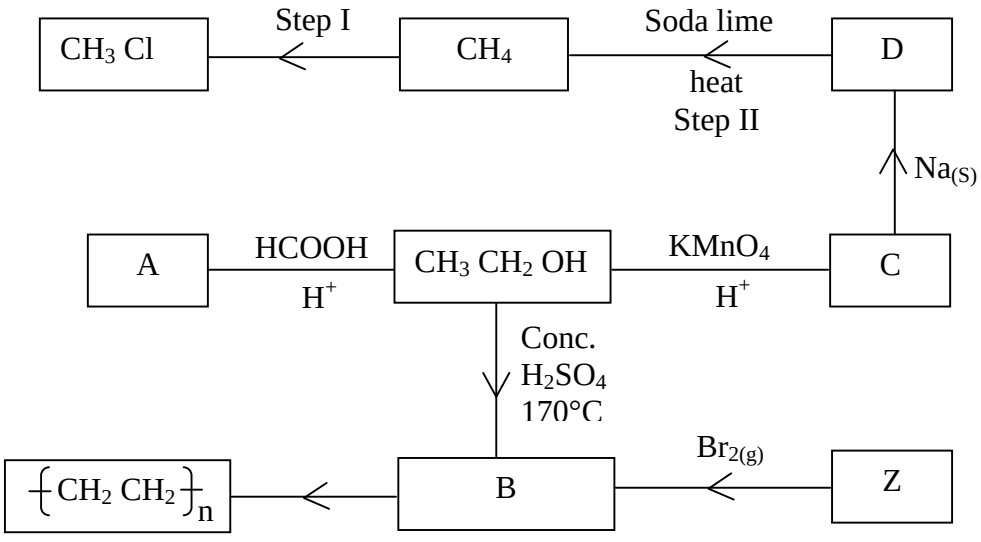
(e) Using dots (•) and crosses (X) to represent outmost electrons, show bonding in the compound formed by elements **M** and **Q**. (1mk)

(f) Explain why the melting point of element **M** is higher than that of element **L**. (2mks)

(g) Write an equation for the reaction that would occur between **K** and water. (1mk)

(h) In terms of structure and bonding, explain why there is a large difference in the melting points of **N** and **Q**. (2mks)

2. I The scheme below show some reactions starting with ethanol.



(a) Name substances. (2mks)

A _____

B _____

C _____

D _____

(b) Name the reagent and condition for the reaction in step **I**. (1mk)

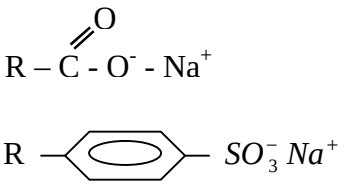
(c) Write the chemical equation for the reaction between
(i) sodium metal and C. (1mk)

(ii) Bromine gas and compound B. (1mk)

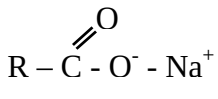
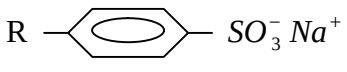
(d) Name the process represented by step **I**. (1mk)

(e) Given that the relative molecular mass of $\{CH_2 - CH_2\}_n$ is 39200. Calculate the value of n (C = 12, H = 1). (1mk)

II The structures below represents two cleansing agents.



In the table below, give **one** advantage and one disadvantage of using each one of them.

	Advantage	Disadvantage
		
		

(2mks)

III Complete the table below by inserting the missing information in the spaces provided.

Name of polymer	Monomer	Use
	Styrene	
polyvinylchloride		

(2mks)

3. I Use standard electrode potentials for elements **A**, **B**, **C**, **D** and **F** given below to answer the questions that follow.

			E^{θ} (volts)
$A^{2+}_{(aq)}$ + $2e$	$\rightarrow$	$A_{(S)}$	-2.90
$B^{2+}_{(aq)}$ + $2e$	$\rightarrow$	$B_{(S)}$	-2.38
$C^{+}_{(aq)}$ + e	$\rightarrow$	$\frac{1}{2}C_{2(g)}$	0.00
$D^{2+}_{(aq)}$ + $2e$	$\rightarrow$	$D_{(S)}$	+0.34
$\frac{1}{2}F_{2(g)}$ + e	$\rightarrow$	$F^{-}_{(aq)}$	+2.87

(a) Identify the strongest oxidizing agent. Give reason for your answer. (1mk)

_____

(b) Which two half-cells would produce the highest potential difference when combined? (1mk)

(c) In the space provided, draw a labelled diagram of the electrochemical cell that would be obtained when half-cells above is formed (b) above. Show the direction of flow of electrons. (3mks)

(d) Calculate E^{θ} value of the electrochemical cell constructed in (c) above. (2mks)

_____

_____

(e) Is it advisable to store solution of a nitrate of **D** in a container made of metal **B**. Explain. (2mks)

_____

_____

_____

_____

II During the electrolysis of aqueous copper (II) sulphate using copper electrodes, a current of 0.2 amperes was passed through the cell for 5 hours.

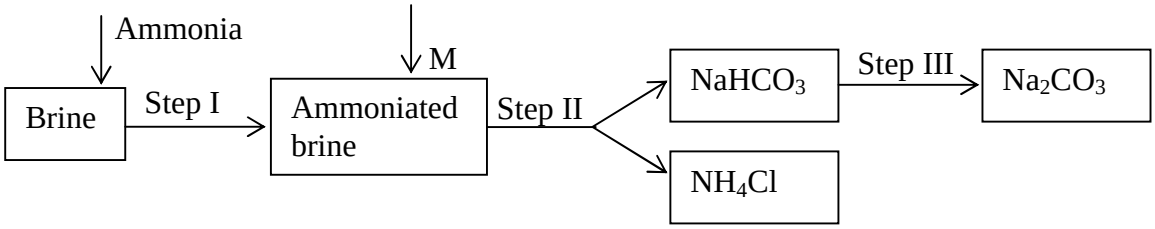
(i) Write an ionic equation for the reaction that took place at the anode. (1mk)

(ii) Determine the change in mass of the anode which occurred as a result of the electrolysis process. Cu = 63.5, 1 Faraday = 96,500 coulombs). (3mks)

4. I (a) Define allotropy. (1mk)

(b) Name the **two** crystalline allotropes of carbon. (2mks)

II Below is a simplified process for manufacture of sodium carbonate by Solvay process.



(a) Name substance **M**. (1mk)

(b) Name the process taking place in Step **II** (1mk)

(c) Write an equation for the reaction in Step **III**. (1mk)

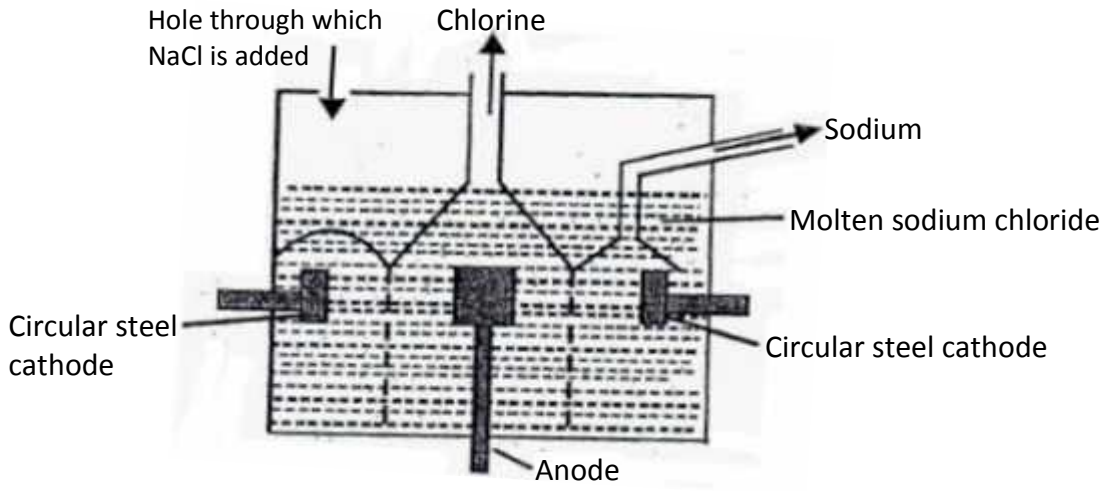
(d) What happens to ammonium chloride in the solvay process. (1mk)

(e) Name **two** substances that are recycled in the process. (2mks)

(f) State **one** use of sodium carbonate. (1mk)

(g) Name **one** other industry that can be located near the solvay plant. (1mk)

5. (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)

(b) 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.

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

(ii) 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)

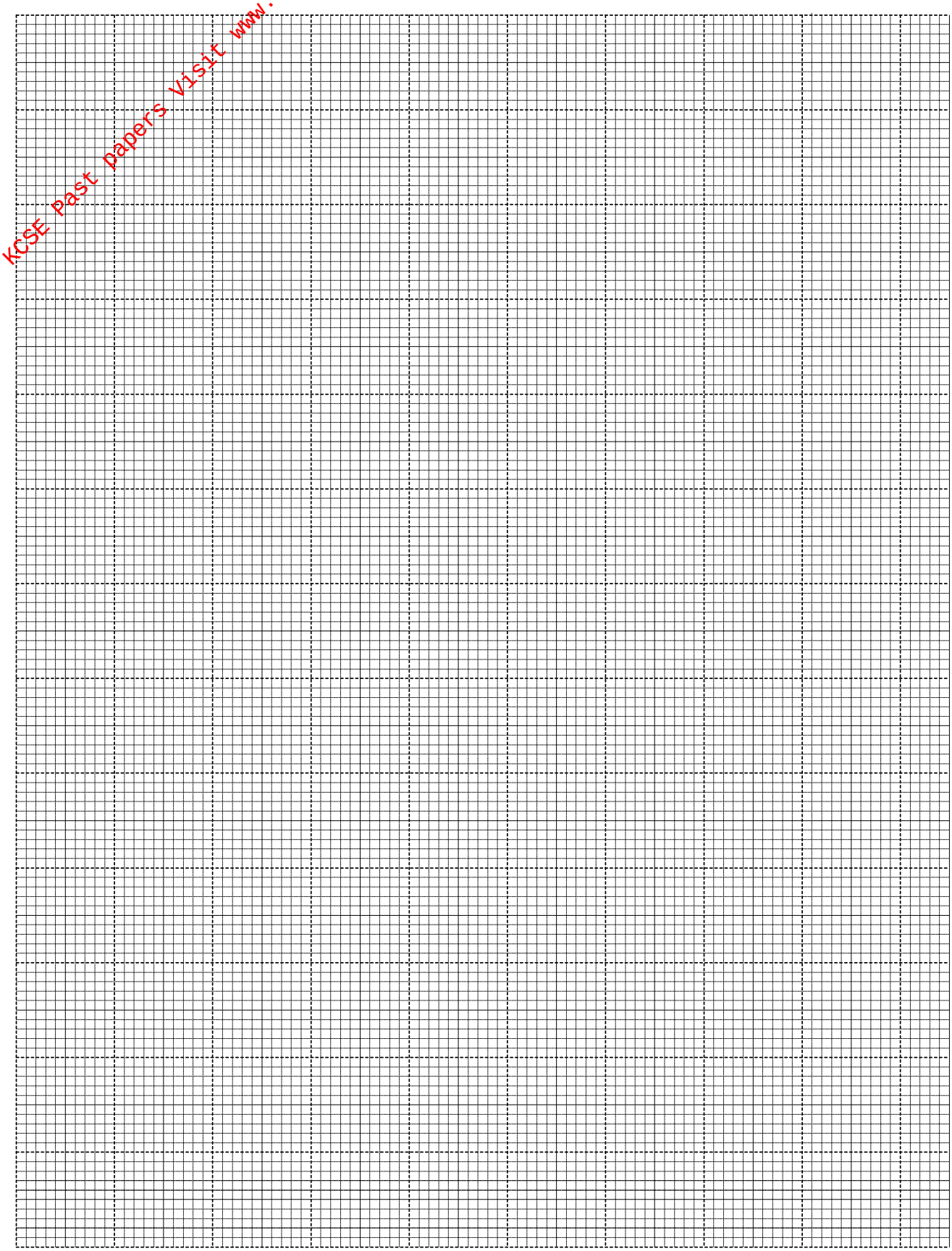
(e) State **one** use of sodium metal. (1mk)

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

(b) The table below gives the solubilities of potassium nitrate at different temperature.

Temperature (°C)	12	20	28	36	44	52
Solubility g/100g water	22	31	42	55	70	90

(i) Plot a graph of solubility of potassium nitrate (vertical axis) against temperature. (3mks)



(ii) Using the graph.

I determine the solubility of potassium nitrate at 25°C. (1mk)

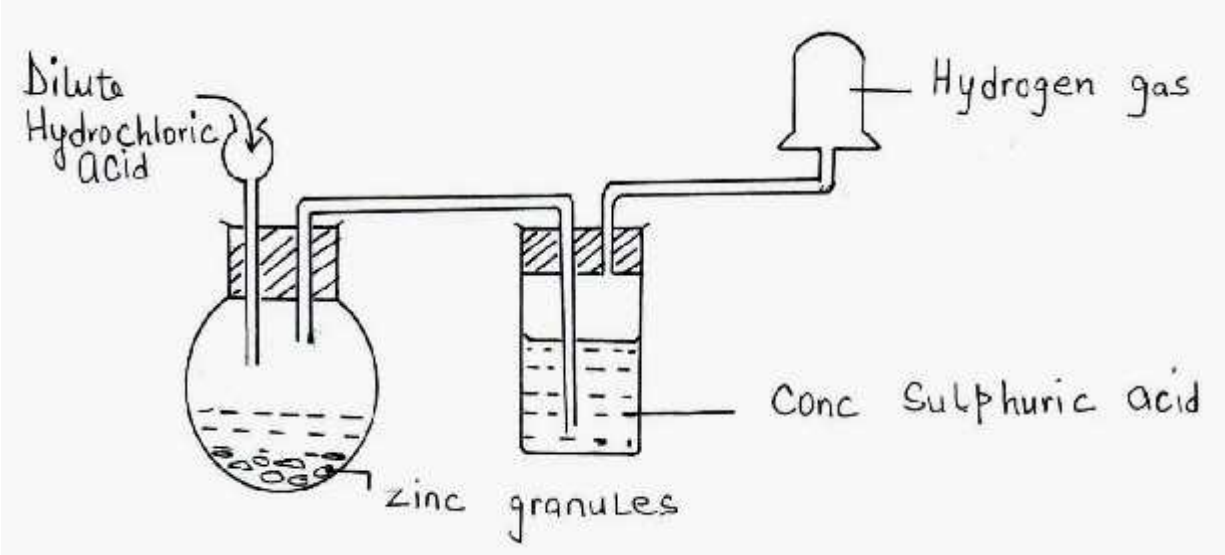
_____

II Determine the mass of potassium nitrate that remained undissolved given-that 100g of potassium nitrate were added to 100cm³ of water and warmed to 50°C. (2mks)

_____

(c) Determine the molar concentration of potassium nitrate at 25°C. (Assume there is no change in density of water at this temperature). (K = 39.0; N = 14.0; O = 16.0). (3mks)

7. The diagram below shows the set-up used to prepare dry hydrogen gas in the laboratory. Study the diagram and answer the questions that follow:



(a) (i) State **one** mistake in the set up. (1mk)

_____

_____

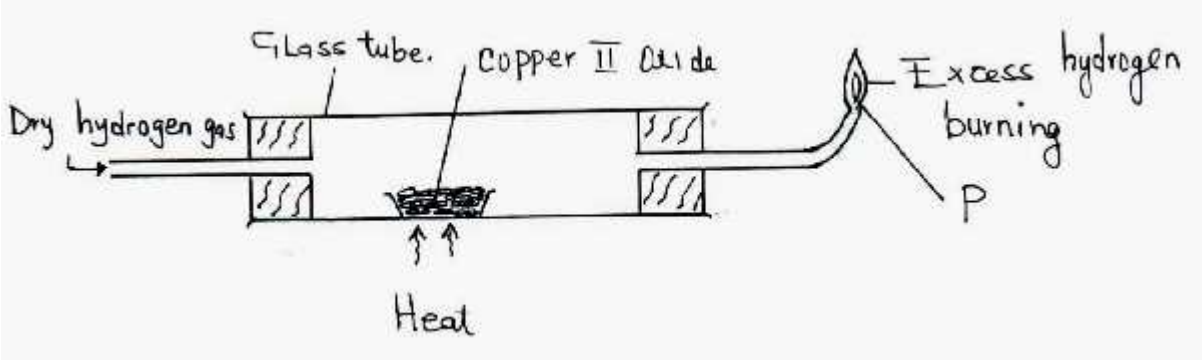
(ii) Which property of hydrogen gas enables it to be collected as shown in the diagram? (1mk)

_____

(iii) (i) Write a chemical equation for the reaction between dilute sulphuric acid and zinc to produce hydrogen gas. (1mk)

(ii) If 200cm³ of hydrogen gas was produced at R.T.P, calculate the mass of Zn used. (Zn = 65, MGV at R.T.P is 24dm³). (2mks)

(b) Hydrogen gas is passed over heated copper II oxide in a hard glass tube as shown below.



(i) Which precaution is taken before lighting the gas at point P.? (1mk)

_____

_____

(ii) State the observation made at the end of the experiment in the glass tube. Explain. (2mks)

_____

_____

_____

_____

(iii) Excess hydrogen burns to form water. State **one** chemical test that can be carried out to identify water. (1mk)

_____

_____

_____

(iv) What would you expect to happen if magnesium oxide (MgO) is used instead of copper (II) oxide? Explain. (1mk)

_____

_____

_____

(v) State **one** industrial use of hydrogen. (1mk)

_____

_____