NAME……INDEX NUMBER……

CANDIDATES SIGNATURE……..

DATE……..

233/2

CHEMISTRY PAPER 2

(THEORY)

JULY/AUGUST 2011

TIME 2HOURS

THIKA PROVINCIAL SCHOOLS JOINT EVALUATION EXAMINATION 2011

INSTRUCTION TO CANDIDATES

- ANSWER ALL THE QUESTION ON THE SPACES PROVIDED
- ALL WORKING MUST BE CLEARLY SHOWN
- MATHEMATICAL TABLES AND ELECTRONIC CALCULATORS MAY BE USED.

FOR EXAMINERS USE ONLY

QUESTION	MARKS SCORE	SCORE
1	10	
2	11	
3	11	
4	7	
5	14	
6	9	
7	8	
8	10	
TOTAL SCORE	80	

1. The grid below shows part of the periodic table study it and answer the questions that follow. The letters do not represent the true symbols.

						A		
	B		C		D		E	
F	G							
							H	

(a) Which element forms ions with charge of 2-. Explain (2mks)

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(b) What is the nature of the oxide formed by C. (1mk)

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(c) How does the reactivity of H compare with that of E. Explain? (2mks)

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(d)Write down a balanced equation between B and Chlorine. (1mk)

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(e) Explain how the atomic radii of F and G compare. (1mk)

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(f) If the oxides of F and D are separately dissolved in water, state and explain the effects of their aqueous solutions on litmus. (3mks)

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2. Study the structural formula below and answer the questions that follow.

I. $CH_3\ CH_2\ COOH$

II $CH_3\ CH_2\ CH_2CH_2\ OH$

(a) (i) Give the systematic name of each compound. (1mk)

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(ii) Write the molecular formula of each compound. (1mk)

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(iii) How does the boiling point of I compare to that of II? (1mk)

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(iv) A gas J is bubbled into concentrated sulphuric (VI) acid. Water is added to the mixture then boiled to yield compound II. Name gas J. (1mk)

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(v) Draw the structural formula of the compound immediately after compound **I** in the homologous series. (1mk)

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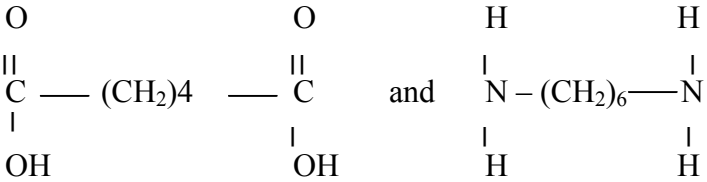
(b) Study the structural formula of the two monomers below and answer the questions that follow.



(i) Name the type of polymerization these monomers would undergo to form a polymer. (1mk)

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(ii) Draw the structural formula to represent the polymer formed. (1mk)

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(iii) What is the name of the polymer. (1mk)

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(iv) State the use of this polymer. (1mk)

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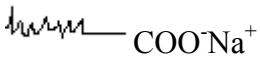
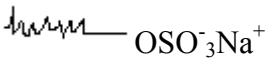
(c) Two cleansing agents are represented below.



Detergent P



Detergent R

Select one that would be suitable for use in hard water. Explain. (2mks)

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3(a) Two ores of aluminium are bauxite $Al_2O_3.H_2O$ and China clay, $Al_2Si_2O_7.H_2O$. Suggest two reasons why bauxite is usually preferred to china clay for extraction of Aluminium. (2mks)

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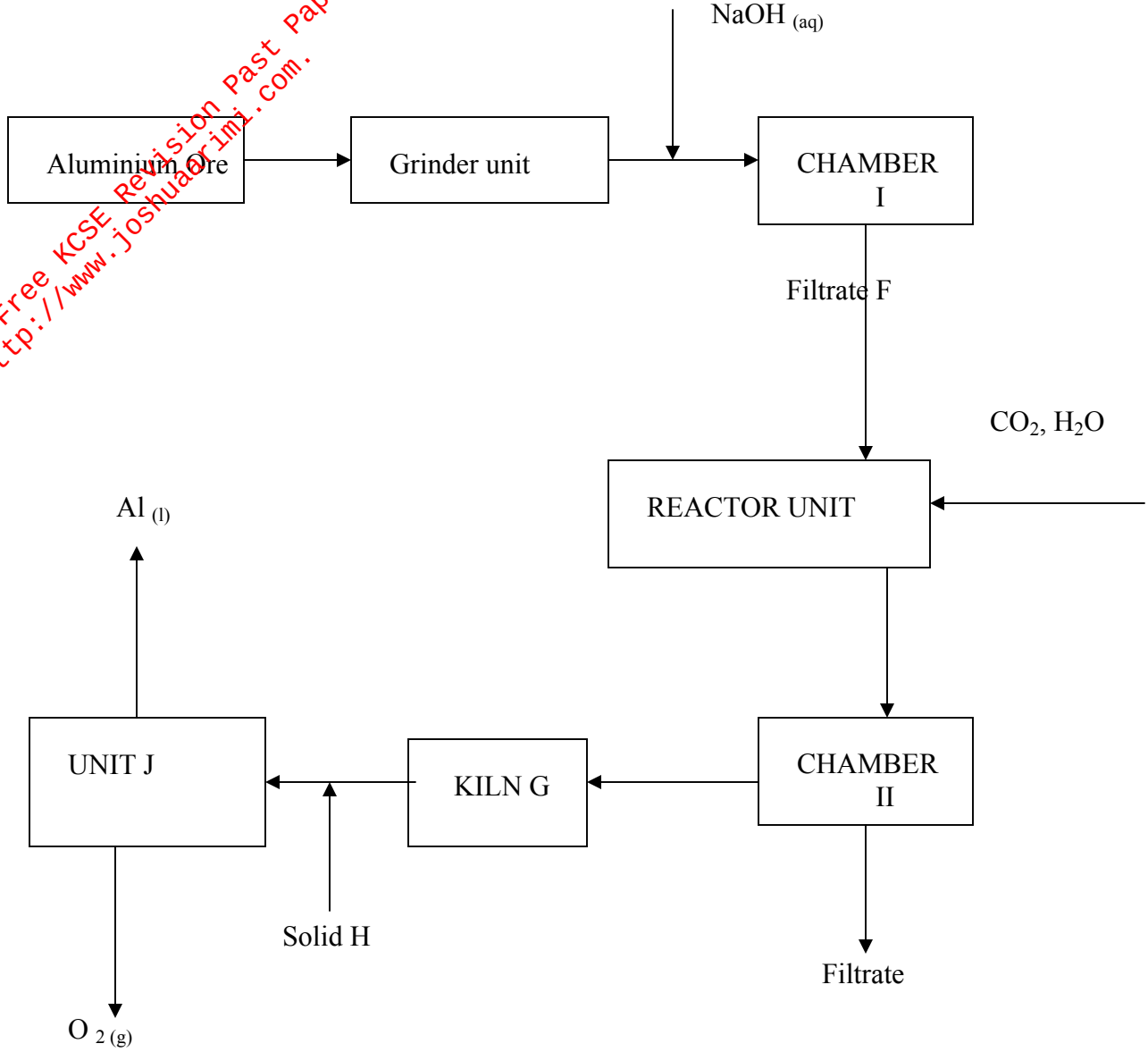
(b) Aluminium metal is extracted from its ore according to the scheme shown below. Study the scheme and answer the questions that follow.



(i) Iron (III) oxide and silicates are the main impurities. Identify the chambers where each of these impurities is removed.

I. Iron (III) oxide ($^1/_2$mk)

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II. Silicates ($^1/_2$mk)

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(ii) Explain the functions of sodium hydroxide solution. (1mk)

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(iii) Write the formula of the anion present in filtrate F. (1mk)

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(iv) Write the equation for the reaction in Kiln G. (1mk)

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(v) Give the name of solid H and state its function. (2mks)

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(c) Give two properties of aluminium or its alloys which make it useful in making sufurias. (2mks)

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(d) Explain why it is difficult to extract aluminium metal by chemical reduction of its oxide. (1mk)

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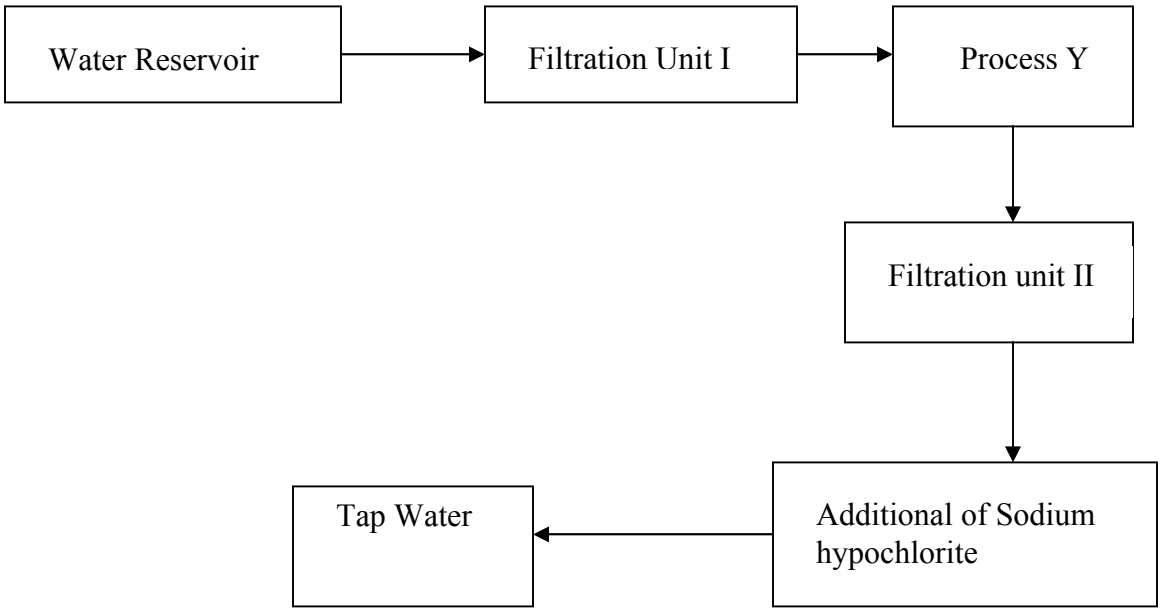
4(a) The flow chart below shows the various stages of water treatment. Study it and answer the questions that follow.



(i) What substances are likely to be removed in filtration unit I. (1mk)

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(ii) What is the name of process Y.? (1mk)

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(iii) What is the purpose of:-

I. process Y. (1mk)

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II. Addition of Sodium hypochlorite. (1mk)

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(b) It was confirmed that magnesium sulphate was present in the tap water.

(i) What type of hardness was present in the water. (1mk)

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(ii) Explain how the hardness can be removed. (2mks)

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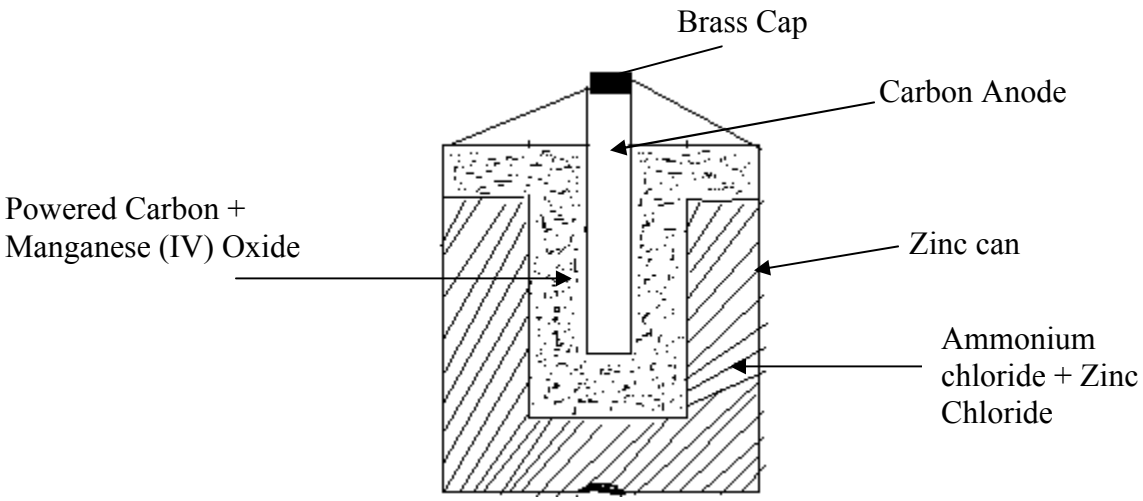
5(a) The diagram below is a cross section of a dry cell. Study it and answer the questions that follow.



(i) On the diagram, show with a +ve the positive terminal. (1mk)

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(ii) Write the equation for the reaction at the negative terminal. (1mk)

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(iii) A paste of ammonium chloride and zinc chloride is used. What would happen if the mixture becomes dry? Give a reason. (2mks)

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(iv) Give one advantage and one disadvantage of dry cells. (1mk)

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(b) Given the following standard electrode potentials.

$Mg^{2+}_{(aq)} + 2e^- \longrightarrow Mg_{(s)}$ -2.37v

$Ce^{4+}_{(aq)} + e \longrightarrow Ce^{3+}_{(aq)}$ +1.61v

(i) Write the cell representation for a voltaic cell from the above half equations. (1mk)

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(ii) Calculate the voltage of the cell in. (i) above (1mk)

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(iii) Write the overall electrochemical equation for the cell reaction. (1mk)

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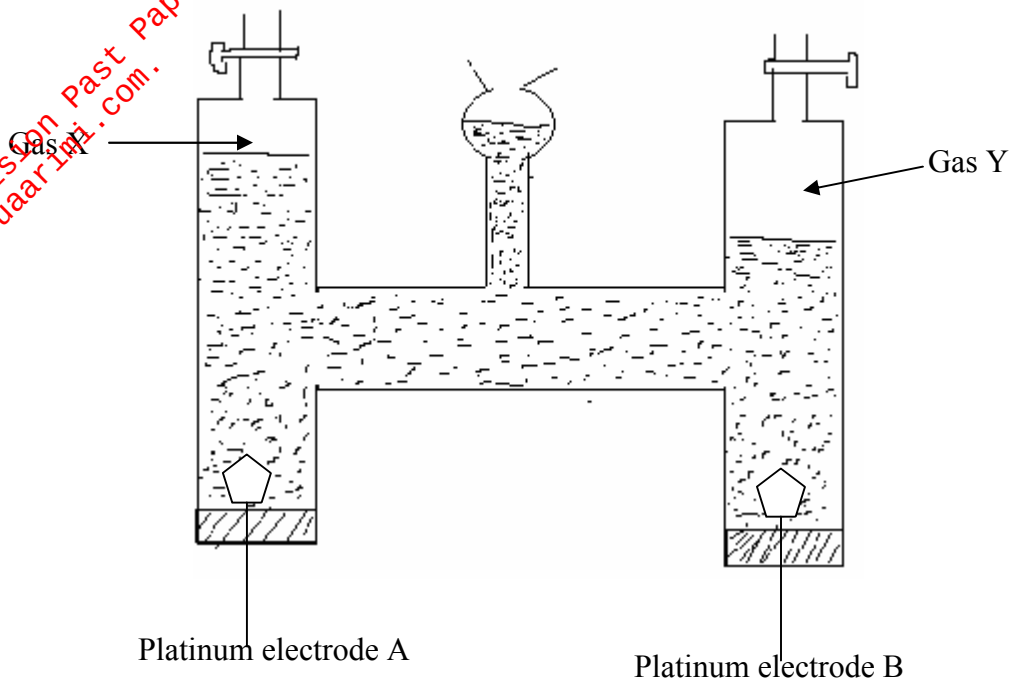
(c) The diagram below shows the apparatus that can be used to electroyse acidified water to obtain gas X and gas Y.



(i) Identify the electrode where oxidation takes places. (1mk)

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(ii) Explain why hydrochloric acid may not be used to acidify the water. (1mk)

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(iii)Write the half equation for the reaction at the anode. (1mk)

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(vi) During electrolysis a current of 3 amperes is passed through the solution for 45 min and 30 sec. What volume of gas if liberated at the anode. (Molar gas volume at R.T.P = 24.0dm^2, 1 Faraday = 96,500C) (3mks)

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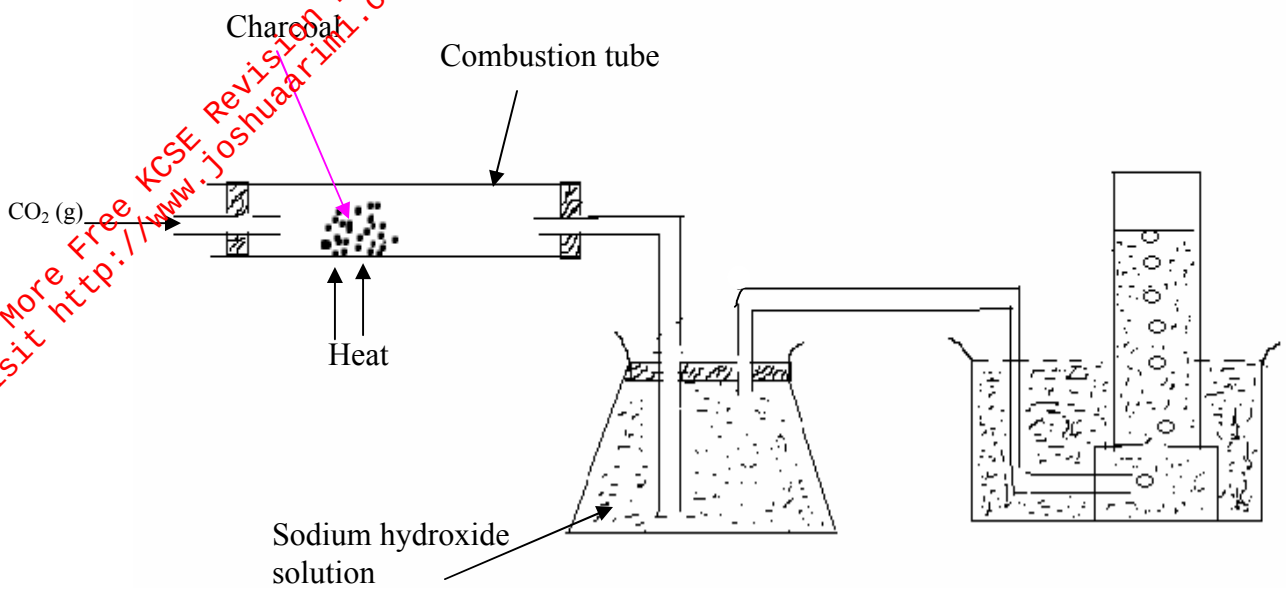
6. In an experiment carbon (iv) oxide was passed over heated charcoal and the gas produced collected as shown in the diagram below.



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

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(ii) Name another chemical substance that can be used instead of sodium hydroxide. (1mk)

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(iii) Describe a simple chemical test that can be used to distinguish between carbon (II) oxide and carbon (IV) oxide. (2mks)

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(iv) State one use of carbon (II) oxide. (1mk)

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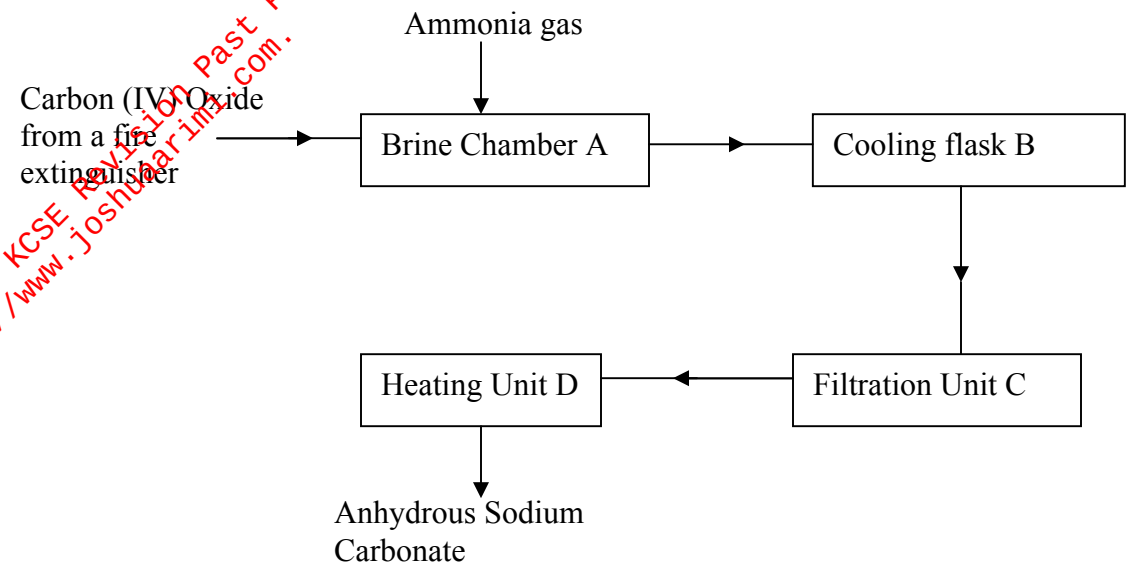
(b) In another experiment to synthesize sodium carbonate in the lab students passed carbon (IV) oxide and ammonia gas into brine as shown in the flow diagram below. Use it to answer the questions that follow.



(i) Why is the mixture obtained in chamber A cooled in chamber B. (2mks)

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(ii) Give a reason why it is difficult to synthesize potassium carbonate by the same method. (1mk)

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(iv) State two properties of carbon (IV) oxide that enables it to be used in the fire extinguishers.(1mk)

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7. Butane is a gas at room temperature an pressure. It is used to melt bitumen to apply on roads.

(a) Write the equation for complete combustion of butane. (1mk)

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(b) Define the term standard enthalpy of combustion. (1mk)

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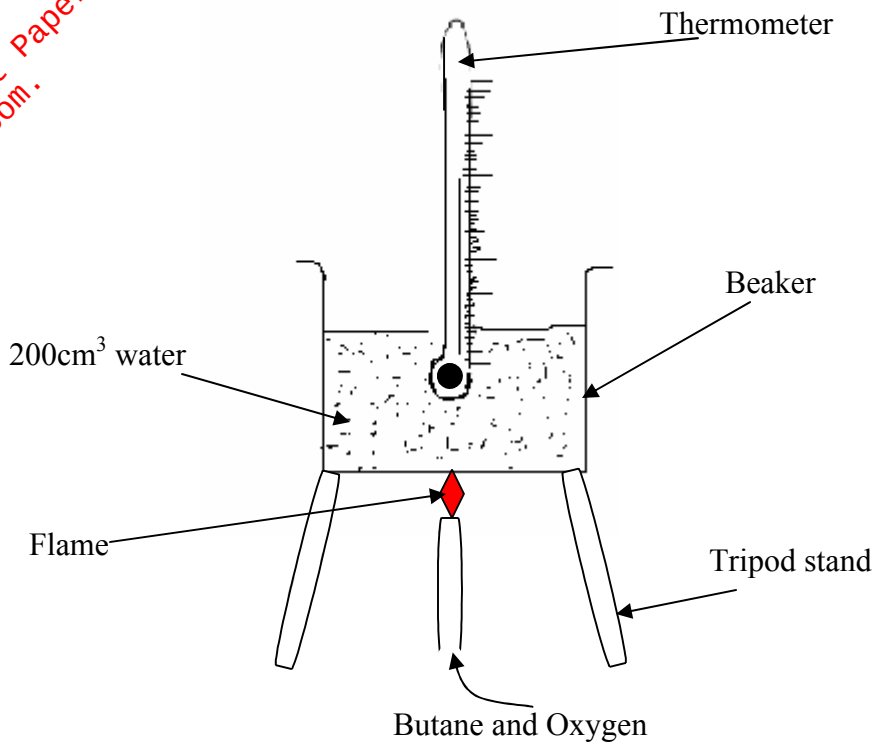
(c) The set-up below was used to determine the enthalpy of combustion of butane.



In the set up, 200cm^3 of water were used. The temperature changed from 22^{o}c to 70^{o}c, when 1g of butane burnt completely in oxygen.

(i) Calculate the heat energy produced in kJ]. (1½mks)

(Specific heat capacity = 4.18kJ kg^{-1} K^{-1}

Density of water = 1g /cm^3)

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(ii) Calculate the enthalpy change of combustion of butane in kJ mol^{-1}. (1 ½mks)

(C=12 H=1)

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(iii) Find the heat value of butane. (1mk)

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(b) Given the following data.

DH_c^{θ} (carbon) = -393 k $Jmol^{-1}$
DH_c^{θ} (Hydrogen)= -286 k $Jmol^{-1}$
DH_c^{θ} (Butane) = -2320 k $Jmol^{-1}$

Calculate the enthalpy of formation of butane. (2mks)

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8. (a) The table below gives formula and volumes occupied by 1g of some gases. Study it carefully and answer the questions that follow.

Formula of gas	Ne	C_2H_2	O_2	Ar	NO_2	SO_2	SO_3
Relative formula mass	20	26	32	40	46	64	80
Volume occupied by 1g	1120	861	700	560	485	350	280

(i) Plot the graph of volume of gas (y – axis) against the relative formula mass on the grid provided below. (3mks)

(ii) Use the graph to predict the volume occupied at S.T.P by.

I. 1g of hydrogen chloride gas (H=1.0 Cl=35.5) (1mk)

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II. Relative molecular mass of a gas which occupies 508cm^3 per gram at s.t.p.(1mk)

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(b) A gas x diffuses through a porous plug in 60 sec. An equal volume of gas Y diffuses through the same plug in 90sec.

(i) What is meant by the term diffusion? (1mk)

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(ii) Calculate the relative molecular mass of gas Y. (R.M.M. of X = 34) (2mks)

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(iii) A gas occupies 100cm^3 at O^{o}c and 1 atmospheric pressure. Calculate the temperature at which the volume is doubled and pressure halved. (2mks)

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