Name …… Index No……...../……..

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Date……

233/2

CHEMISTRY THEORY

PAPER 2

JULY 2013

2 Hours

LARI DISTRICT JOINT MOCK - 2013

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

INSTRUCTIONS TO CANDIDATES

1. **Answer ALL questions in the spaces provided**
2. **Mathematical tables and electronic calculators may be used.**
3. **All working MUST be shown clearly where necessary.**

FOR EXAMINERS USE ONLY

questions	Maximum score	Candidate's score
1	13	
2	13	
3	13	
4	13	
5	11	
6	8	
7	**9**	
TOTAL SCORE	**80**	

This paper consists of 14 printed pages. Candidates should check the questions to ensure that all pages are printed as indicated and no question(s) are missing

1. The table below shows some elements in the periodic table. Use it to answer the questions that follow. The letters are not the actual symbols of the elements.

									F
A	**G**		**E**		**B**		**D**		
C									

a) (i) Show the electron arrangement of elements:

A…… (1mk)

D……. (1mk)

(ii) Write the formula of the compound formed between the elements in (i) above. (1mk)

b) Show on the table above an element **Y** belonging to Period 4 and group six (VI). (1mk)

(c). Compare the following with explanations:
(i) The reactivity of **A** and **C** (2mks)

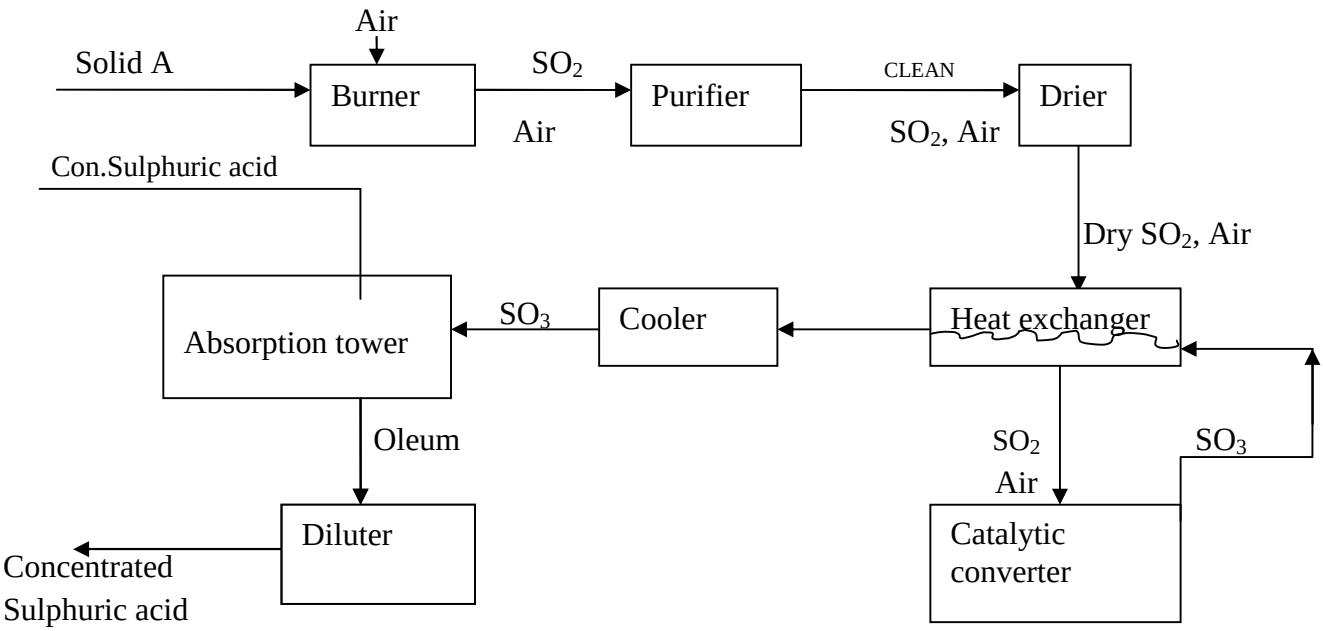
(ii) Atomic radii of elements **E** and **B** (2mks)

(iii) Ionization energies of elements **A** and **C**. (2mks)

(d). (i) While the chloride of **G** is ionic, the chloride of **E** is covalent. Explain. (2mks)

(ii) Write equation for the action of water on the chlorine of **E** (1mk)

2. The diagram below illustrates the contact process for the manufacture of sulphuric (IV) acid. Study it and answer the questions that follow.



(a) Name three possible identities of solid A. (3mks)

(b) (i) Name two impurities removed by the purifier. (1mks)

(ii)Why is it necessary to remove the impurities? (1mk)

(c). Write down the equation for the reaction that takes place in the converter. (1mk)

d) i) Name the two catalysts that can be used in the converter. (1mk)

(ii) Which of the two catalysts is most commonly used and why? (1mk)

(e) Why is sulphuric (IV) oxide not absorbed directly into water? (1mk)

(f) Give the equation for the reaction that takes place in the absorption tower. (1mk)

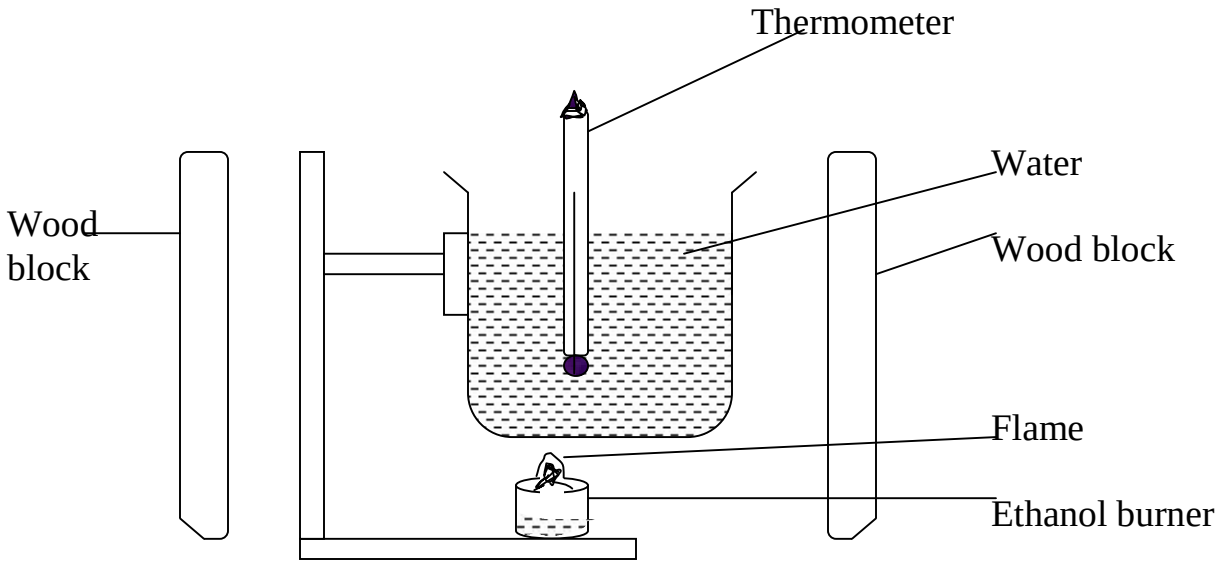
(g) Name the main pollutant in the contact process. (1mk)

(h) Name two methods by which pollution is controlled in the contact process. (2mks)

3. a) i) What is meant by the heat value of a fuel? (1mk)

ii) Calculate the heating value of methanol given that $\Delta H_{(c)}$ (methanol) = - 715.0 kilojoules per mole. (C=12, H=1) 2mks.

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



During the experiment the data given below was recorded.
Volume of water = 400cm^3
Initial temperature of water = 26^{0}C
Final temperature of water = 47.5^{0}C
Mass of Ethanol + lamp before burning 125.5g
Mass of Ethanol + lamp after burning = 124.0g
Specific heat capacity 4.2kJKg^{-1} K^{-1}

i) Calculate the number of moles of ethanol burnt during the experiment.
(C=12, H=1, O=16) 1mk.

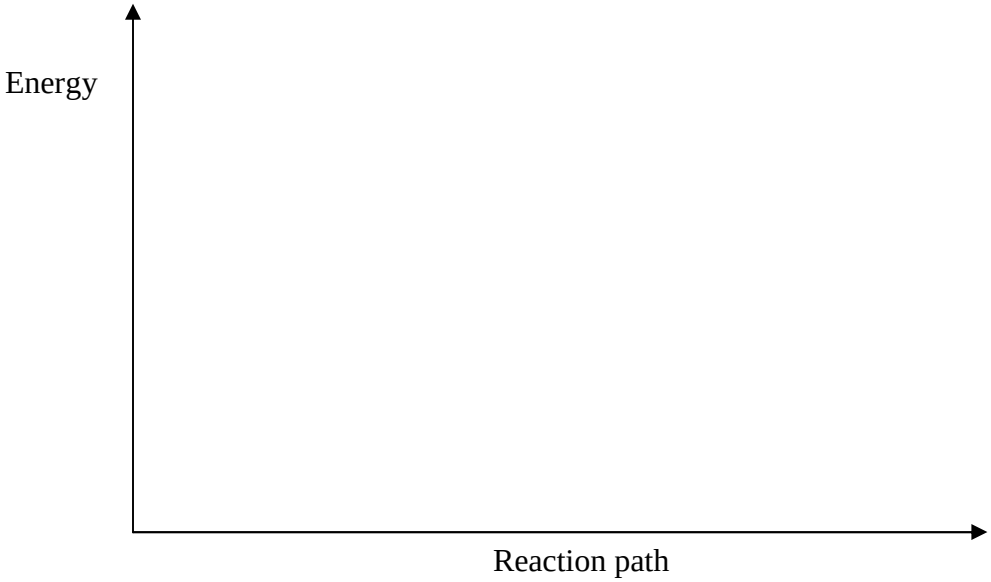
ii) The heat change in the experiment. 1mk.

iii) The molar heat of combustion of ethanol. 1mk.

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

(d) Write down the thermochemical equation for the reaction. 1mk.

(e) (i). On the axes below draw the energy level diagram for the reaction. 2mks.



ii) Study the information in the table below and answer the question that follow.

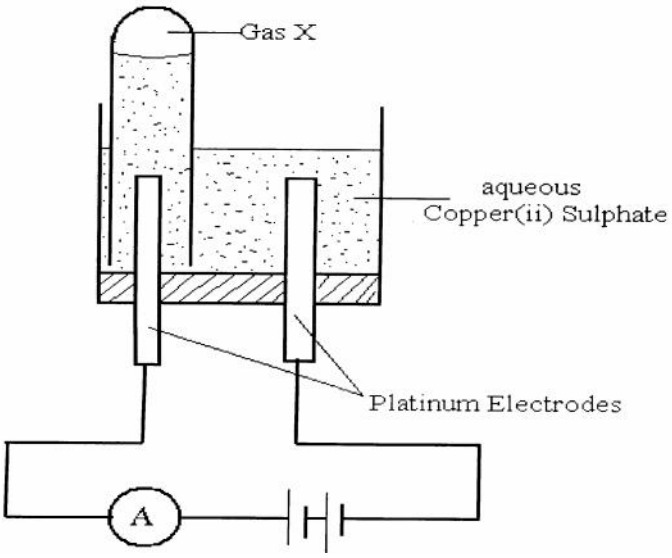
Bonds	C – H	Cl – Cl	C – Cl	H – Cl
Bond energy	413	244	340	431

Calculate the enthalpy change for the reaction:

$C_2H_6(g) + Cl_2(g) \longrightarrow C_2H_5Cl(g) + HCl(g)$. 3mks.

4. The set up below was used to electrolyses copper (II) sulphate. Study it and answer the equations that follow.

5.



(a) (i) Name gas X (1mk)

(ii) Write the ionic equation for the reaction which produces gas X (1mk)

(iii) How would you identify gas X? (1mk)

(b) What happens to the pH of the electrolyte during the electrolysis? Explain your answer (1mk)

(c) If the above set up had copper electrodes instead of platinum electrode.

(i) Write electrode half equation at:

Anode (1mk)

Cathode (1mk)

(ii) What happens to the colour of the electrolyte during the electrolysis? Explain your answer (1mk)

(d) An iron spoon is to be electroplated with silver. Draw a labeled diagram of the apparatus that could be used to represent this process (2mk)

(e) The table below shows the ammeter readings obtained when two different electrolytes of the same concentration were tested.

Electrolyte	**Ammeter reading (Amps)**
Hydrochloric acid	4.0
Ethanoic acid	1.2

Why does Ethanoic acid give a lower ammeter reading? Explain your answer (2mks)

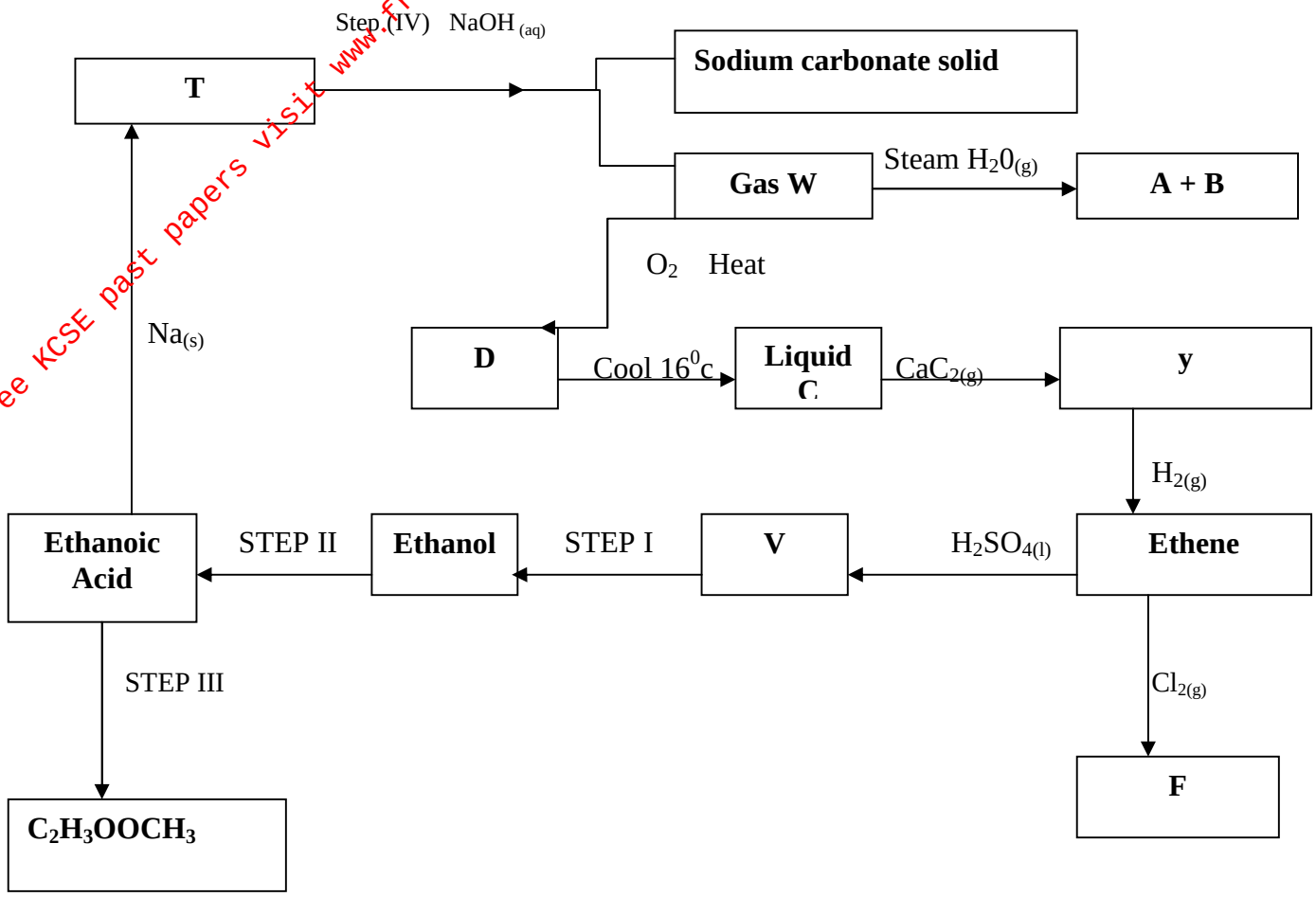
(f) Use the following half cell stand electrode potentials to answer the questions that follow

	E^{θ}(Volts)
$Zn^{2+}_{(aq)} + 2e \longrightarrow Zn(s)$	-0.76
$Pb^{2+}(aq) + 2e \longrightarrow Pb(s)$	-0.13
$Ag^{+}_{(aq)} + e \longrightarrow Ag(s)$	+0.80
$Cu_2+(aq) + 2e \longrightarrow Cu(s)$	+0.34

(i) Select the half cells which when combined give the largest cell potential (1mk

(ii) Calculate the cell potential of the cell in **f (i) above** (1mks)

5. Study the flow chart below and answer the questions that follow.



(a) Name the substances

T……½mk
W……½mk
A and B……½mk
C……½mk
D……½mk
Y……½mk
V……½mk
F……½mk

(b). Write the equation in step (iv). (1mk)

(c)i) Name the reagents used in step (iii) (1mk)

(ii) Name two conditions necessary for the reaction in step iii to take place. (1mk)

(d) Name the reagents used in:

i) Step II (1mk)

ii) Step 1 (1mk)

(e) Write the equation between gas W and steam H_2O (1mk)

(f) Write the equation for the reaction between liquid C and calcium carbide. (1mk)

6. The amount of sulphur (IV) oxide that can dissolve in water at different temperatures is shown in the table.

Temperature(0^C)	5	10	20	25	35	50	56
Solubility of SO_2 (g/100g of water)	190	154	107	90	67	42	35

(a) Plot a graph of the mass of sulphur (iv) oxide against the temperature (4mks)

GRID

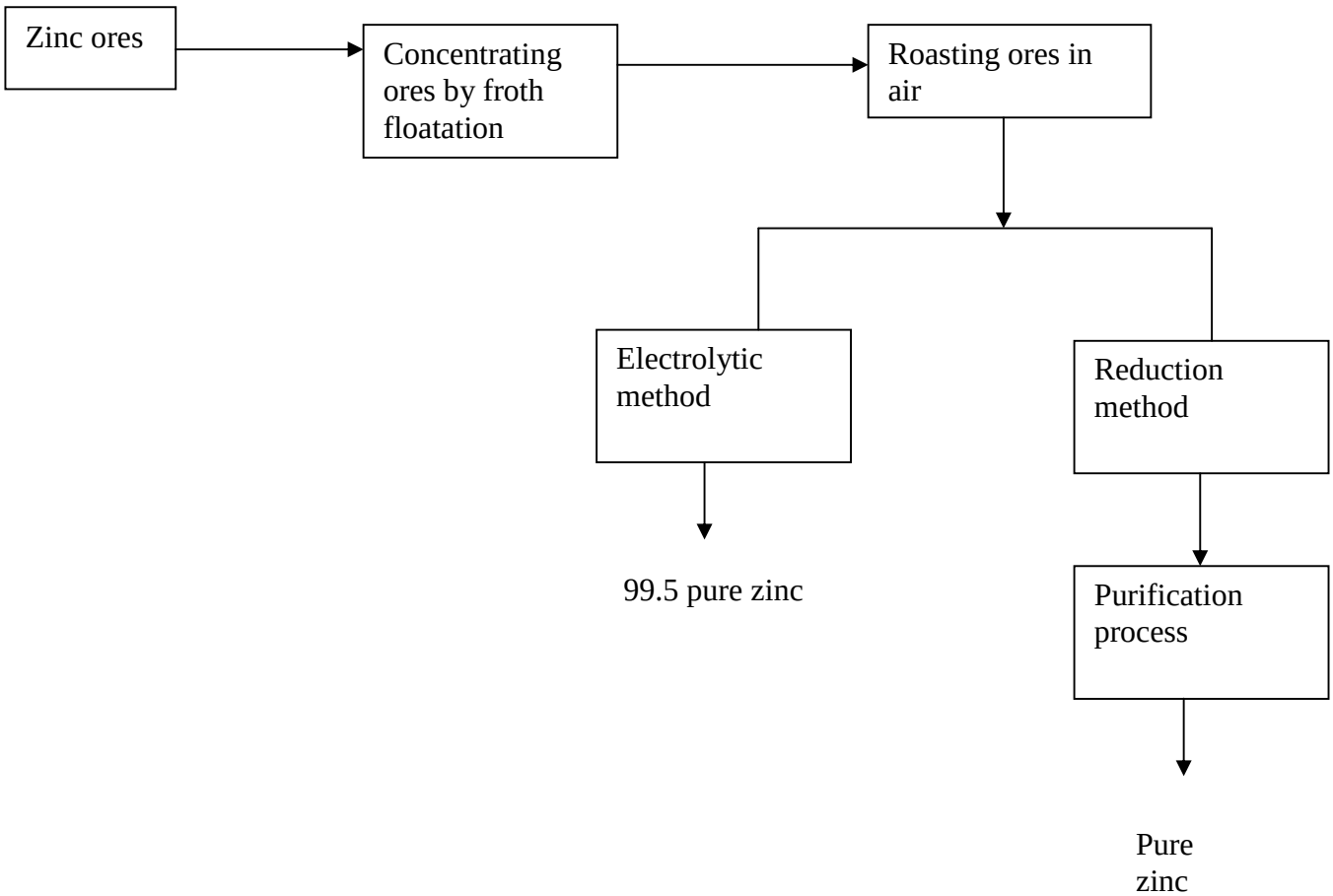
(b) From the graph, determine;

i. The mass of sulphur (IV) oxide that would dissolve in one litre of solution at 30^0C.(1mk)

ii. The temperature at which a litre of solution contains 40g of sulphur (IV) oxide. (1mk)

iii. Calculate the molarity of the solution at 50^0C. (S=32.0, O=16.0). (2mks)

7. Study the following reaction scheme for extraction of zinc metal and then answer the questions that follow.



(i) Name the two ore from which zinc can be extracted. (2mks)

(ii) Write the equation for the reaction that takes place when zinc ores are roasted in air. (1mks)

(b) Explain the effects of the by-products of the roasting process of zinc ores on the environment. (2mks)

(c) i) Name the reducing agents used in the furnace during extraction process of zinc by reduction method. (1mks)

ii) Write the equations for the reduction processes to obtain zinc. (1mks)

(d) Name the electrolyte used in the electrolyte method and explain how it is acquired. (2mks)