NAME:..... INDEX NO.....

SCHOOL..... CANDIDATE'S SIGN.....

DATE.....

233/2
CHEMISTRY
(THEORY)
PAPER TWO
FORM FOUR
MARCH/APRIL 2013
TIME: 2 HOURS

WESTERN ZONE JOINT EXAMINATIONS (WEZOJE) - 2013

The Kenya Certificate of Secondary Education

Instructions to Candidates

1. Write your name, class and admission number in the space provided at the top of this page.
2. Answer all questins in the spaces provided

FOR EXAMINERS USE ONLY

QUESTION	MAX. SCORE	CAND. SCORE
1	13	
2	12	
3	11	
4	12	
5	10	
6	11	
7	11	
TOTAL SCORE		

1. Study the table in which letters J – Q (not actual symbols) represents elements.

Element	J	K	L	M	N	O	P	Q
Atomic number	3	7	8	9	10	11	12	14

a) Select two elements which belongs to the same . (2marks)

i) Group

.....

ii) Period

.....

b) Name the element from the table.

i) Which will form a divalent anion? (1mark)

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ii) React most vigorously with water. (1mark)

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c) Write a balanced equation for the reaction that occurs between atoms O and excess L. (1mark)

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d) i) Compare the atomic radii of O and P. Explain your comparison. (3marks)

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ii) Suggest a suitable structure that forms when a compound is formed between M and O. Explain your answer. (2marks)

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e) i) Write ionic equations to show how an ion is formed by element L. (1mark)

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ii) Compare the ionic radius of L to that of its atomic radius. (2marks)

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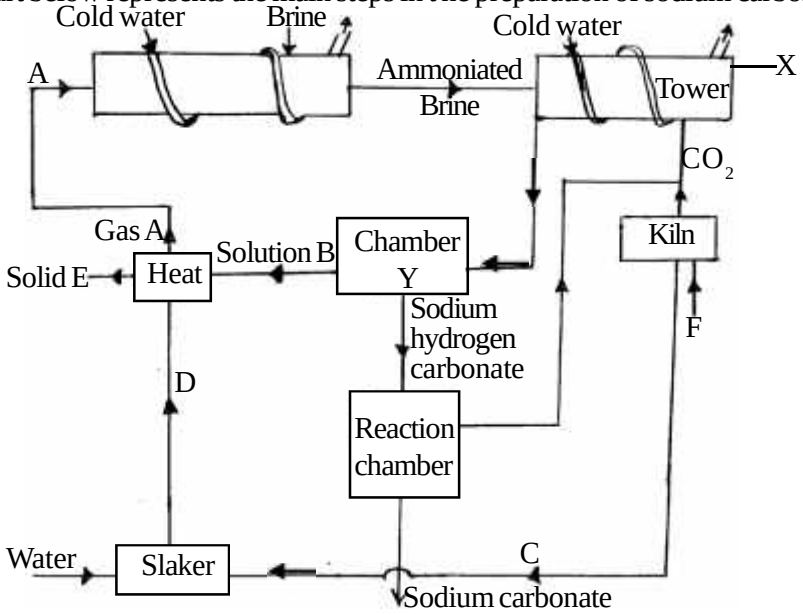
2. The flow chart below represents the main steps in t he preparation of sodium carbonate.



a) i) Name the substance labeled. (3marks)

A _____

B _____

C _____

D _____

E _____

F _____

ii) Cold water is made to circulate around X. What does this suggest about the reaction between Ammoniated Brine, Carbon (IV) oxide and water . (2marks)

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iii) Explain briefly how you would obtain crystals of sodium carbonate from sodium hydrogen carbonate obtained at Y? Give equation for any chemical changes that occur. (2marks)

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iv) Name two by-products that are recycled in the process. (2marks)

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v) Why is recycling important? (1mark)

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b) Fractional crystallization occurs in solvay tower. Identify the crystalline substance formed in the tower. (1mark)

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c) Suggest one reason why potassium hydrogen carbonate cannot be manufactured by the same process as sodium hydrogen carbonate. (1mark)

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3. a) When excess magnesium powder was added to $20cm^3$ of 0.4M Iron (II) sulphate solution, the temperature changed from 20^0C to 26^0C.

i) A part from change in temperature, what other observation was noted during the reaction. (1mark)

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ii) Write the ionic equation of the reaction. (1mark)

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iii) Calculate the molar enthalpy of displacement of Iron by magnesium. (Density of the solution $=1g/cm^3$ Specific heat capacity = $4.2KJkg^{-1}k^{-1}$) (3marks)

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iv) Draw energy level diagram for the reaction above. (2marks)

b) Use the information below to answer the questions that follow.

$H_{2(g)} + ½ O_{2(g)} \longrightarrow H_2\text{-} O_{(l)}$ $\Delta H = -286kJ/mol$

$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$ $\Delta H = -393kJ/mol$

Given that the enthalpy of formation of ethanol is -257kJ/mol.

i) Define the term enthalpy of formation of a compound. (1mark)

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ii) Calculate the molar enthalpy of combustion of ethanol. (3marks)

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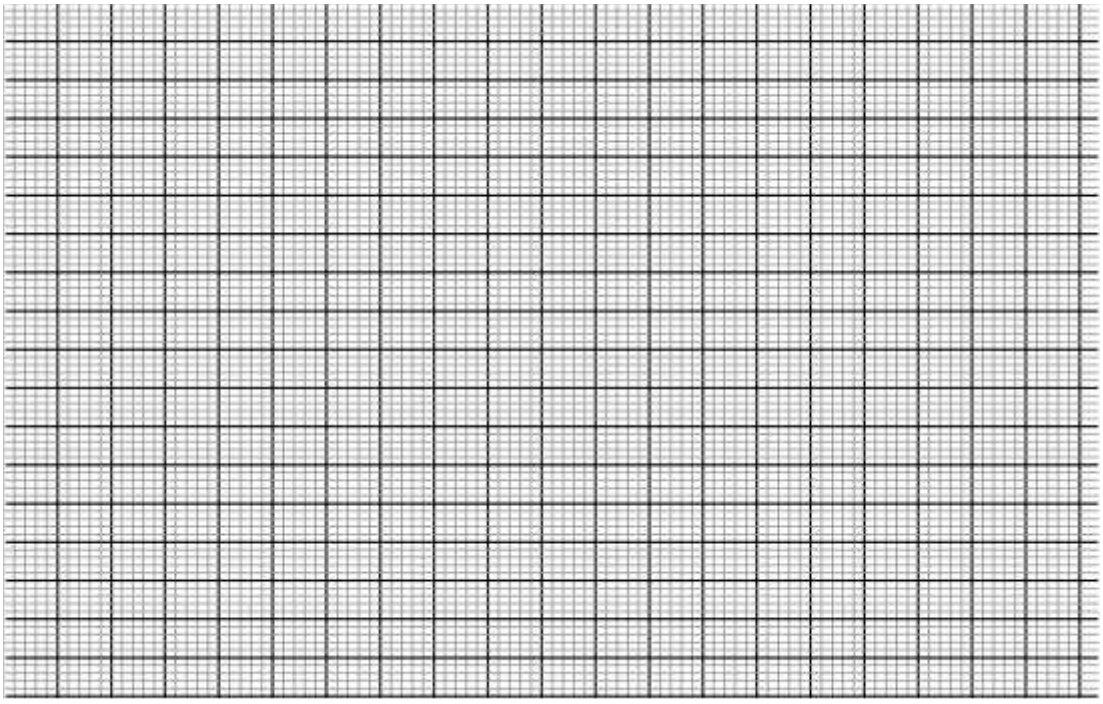
4. The table below shows results recorded on an experiment carried out to determine the solubility of potassium nitrite.

Temp ^0C	20	30	40	50	60	70	80	90
Solubility in g per 100g of H_2O	32	46	64	86	110	138	169	202

a) Use the data above to plot a graph of solubility against temperature on the grid provided. (3marks)



b) From the graph determine the solubility of potassium nitrite at:- (2marks)

i) 25^0C

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ii) 83^0C

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c) What mass of potassium nitrite will crystalize when a saturated solution is cooled from 75^oC to 20^0C. (2mark)

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d) The table below represents results of four samples of water. Study it and answer the questions that follow.

Sample of water	Drops of soap used to produce lather	
	Before boiling	After boiling
A	20	10
B	3	3
C	15	3
D	20	20

i) What is hard water? (1mark)

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ii) Which sample is likely to be temporary hard water? Explain. (2marks)

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iii) Give two advantages of hard water. (2marks)

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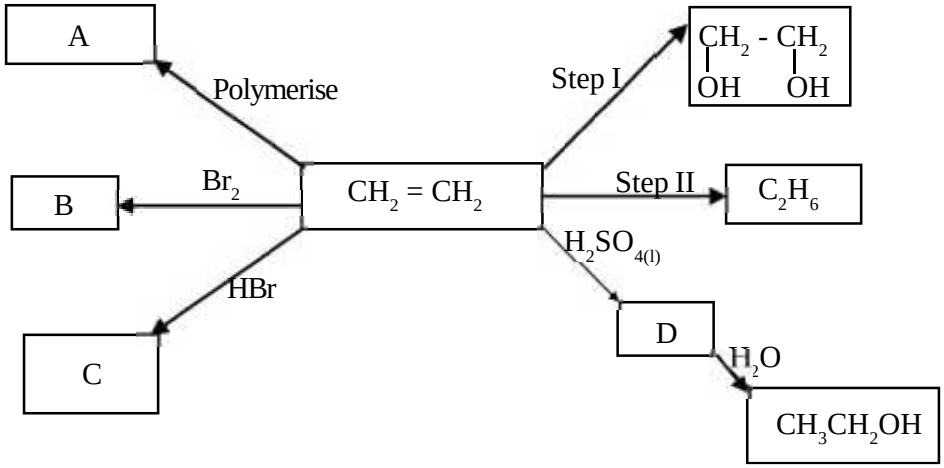
5. a)



i) State the conditions and reagents required to effect Step I and Step II

Step I

Reagent _____ (½ mark)

Condition _____ (½ mark)

Step II

Reagent _____ (½ mark)

Condition _____ (½ mark)

ii) Give the formulae of the products A,B, C and D.

A

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B

..... (2marks)

C

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D

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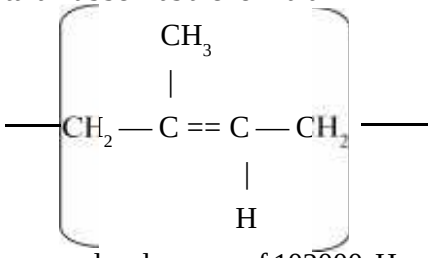
b) Natural rubber has the formula



It has a molecular mass of 102000. How many units make up natural rubber? (2marks)

(C = 12, H = 1)

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c) If one mole of sugar, $C_6H_{12}O_6$, produces two moles of pure ethanol, C_2H_5OH and two moles of Carbon (IV) oxide gas as the only products.

i) Write an equation for the reactions. (1mark)

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ii) Find how many moles of ethanol would be produced by 148.8kg of sugar. (3marks)

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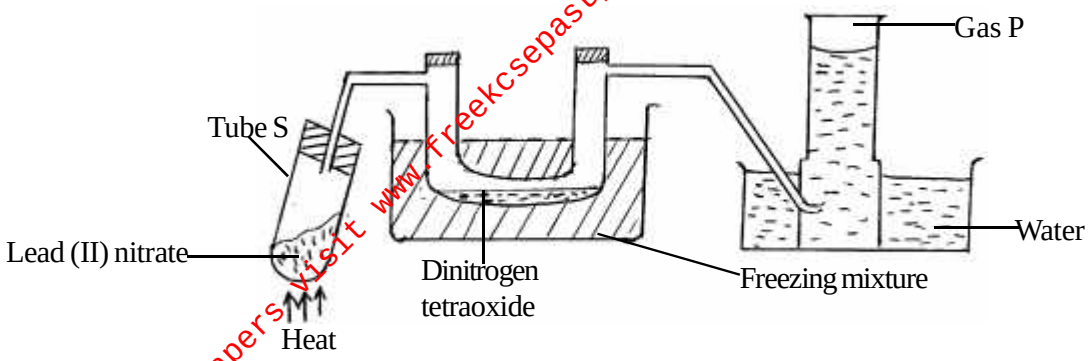
6. a) The diagram below represents a set-up that can be used to prepare and collect nitrogen (IV) oxide.



a) Name gas P (1mark)

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b) Give the observations that would be made in the tube S. (2marks)

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c) What property of nitrogen (IV) oxide makes it possible for its collection as shown above. (2marks)

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d) Why is it not advisable to use other nitrates. (1mark)

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e) Write an equation showing a reaction of nitrogen (IV) oxide and water. (1mark)

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f) Explain the following observations; a piece of burning magnesium is lowered into a gas jar full of nitrogen (IV) oxide, it continues to burn forming a white solid and a colourless gas. (2marks)

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i) Name the white solid (1mark)

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ii) Name the colourless gas (1mark)

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7. a) State Le Chatellier's principle. (1mark)

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b) Give two factors that affects rate of reaction. (2marks)

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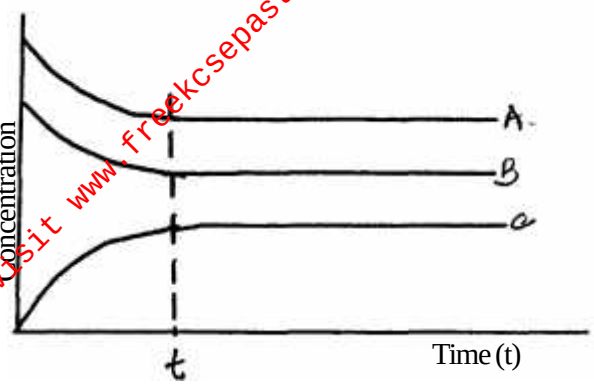
c) The curves below shows the general variations of the concentration of two reactants and a product with time in the Haber process. The forward process is exothermic producing 184kJ.



I. i) Write a thermo chemical equation for the reaction leading to formation of ammonia. (1mark)

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ii) Name the catalyst used in the process. (1mark)

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iii) What happens at the time, t, shown by dotted line. (1mark)

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II. Explain how each of the following affect the yield of ammonia.

i) Increase in pressure. (1½marks)

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ii) Increase in temperature (1½marks)

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III. Ammonia sulphate is a nitrogenous fertilizer. Calculate the number of nitrogen atoms in 13.2g of ammonia sulphate. L = 6.0×10^{23}

(N = 14.0, H = 1.0, S = 32.0, O = 16.0, L = 6.0×10^{23}) (2marks)

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