

Name .....

Index No.....

School .....

Candidate's Signature .....

Date .....

233/1

**CHEMISTRY**

**PAPER 1**

**JULY-AUGUST**

**(THEORY)**

**TIME: 2 HOURS**

## **MASINGA DISTRICT JOINT EVALUATION TEST - 2011**

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

233/1

**CHEMISTRY**

**PAPER 1**

**(THEORY)**

**TIME: 2 HOURS**

### **INSTRUCTIONS**

1. Write your name and index no. in the spaces provided above.
2. Answer **ALL** the questions in the spaces provided
3. Mathematical tables and Electronic calculators may be used.
4. All working **MUST** be clearly shown where necessary.

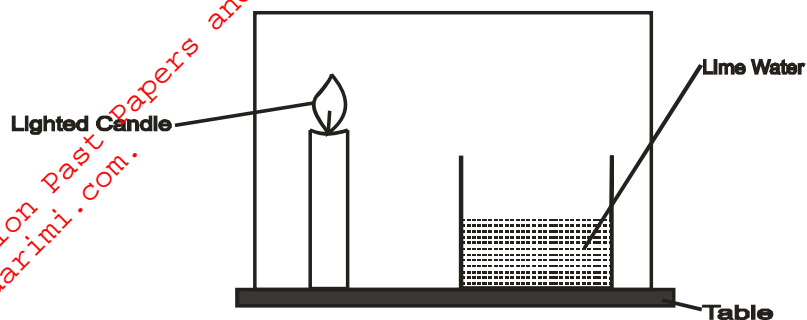
### **FOR EXAMINERS USE ONLY**

<b>QUESTIONS</b>	<b>MAXIMUM SCORE</b>	<b>CANDIDATES SCORE</b>
1 - 30	80 Marks	

*This paper consists of 12 printed pages.*

*Candidates should check to ensure that all pages are printed as indicated and no questions are missing.*

1. Study the arrangement below and answer the questions that follow.



Explain what will be observed after sometime.

(2 Marks)

2. Boilers used for boiling hard water are normally covered with a boiler scale after sometime.

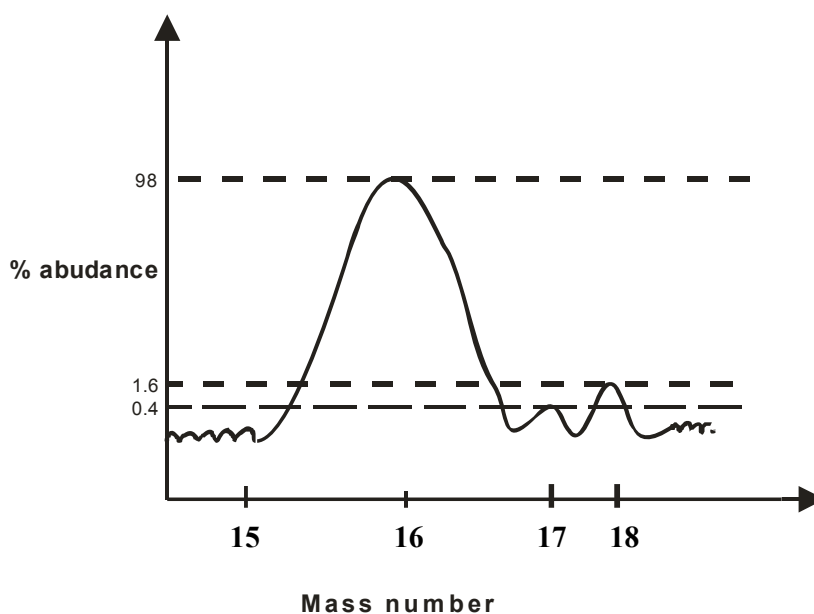
a) What is the chemical name for boiler scale?

(1 Mark)

b) With an aid of an equation explain how a chemical substance can be used to remove boiler scales.

(2 Marks)

3. Analysis of a sample of gas X on a spectrometre revealed the following results (Graph not drawn to scale)



- a) If the atomic number of element X is 8, calculate the number of neutrons in the least abundant isotope. (2 Marks)

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- b) Work out the relative atomic mass of X from the information in the graph. (2 Marks)

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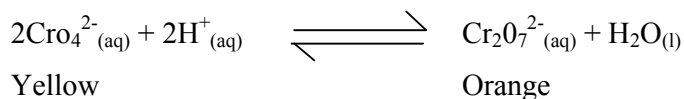
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4. a) State the Le chateliers principle. (1 Mark)

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- b) The solution of chromate (vi) ions attain equilibrium as shown below.



Describe the observations made in the equilibrium mixture if a few drops of dilute sodium hydroxide are added. (2 Marks)

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5. When 50cm<sup>3</sup> of 1M potassium hydroxide was reacted with 50cm<sup>3</sup> of 1M hydrochloric acid the temperature rose by 8<sup>0</sup>c. When the same volume of potassium hydroxide was reacted with 50cm<sup>3</sup> of 1M propanoic acid the temperature rose by 4<sup>0</sup>c.

- i. Give reasons for the difference in temperature rise. (2 Marks)

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- .....
- ii. Given that the density of solution is 1g/cm<sup>3</sup> S.H.C. is 4.2j/g<sup>0</sup>c. Calculate the molar enthalpy of neutralization of potassium hydroxide by hydrochloric acid. Indicate the sign of enthalpy change. (3 Marks)

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- iii. Write an equation for the dissociation of propanoic acid. (1 Mark)

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6. Give the names of the following types of reactions.

- i. Reaction between pentanoic acid and butan-1-ol to form an organic compound. (1 Mark)

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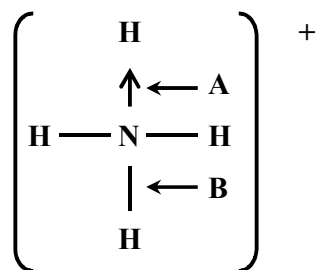
- ii. Reaction between chlorine and potassium iodide to form a dark brown solution. (1 Mark)

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- iii. Reaction between bromine and methane in presence of U.V light. (1 Mark)

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7. Study the structure below and answer the questions that follow



Name the bond represented by

A.....

B.....

8. Name the electrolyte that gives sodium at cathode and chlorine at anode using graphite electrodes.

(1 Mark)

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9. A radioactive cobalt undergoes decay by emitting a beta particle and forming Nickel atom.

- a) Write a balanced decay equation for the above change. (1 Mark)

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- b) If a sample of the cobalt has an activity of 1000 counts per minute, determine the time it would take for its activity to decrease to 62.50. If the half life of the element is 30 years. (2 Marks)

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- c) Give one use of radioactive cobalt. (1 Mark)

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10. The electronic configuration of  $X^{2+}$  and  $Y^-$  are 2.8 and 2.8 respectively.

- i. Write the electronic configuration of the atoms of X and Y. (1 Mark)

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- ii. Write the formula of the oxide of X. (1 Mark)

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- iii. Compare the atomic radius of Y and  $Y^-$ . (1 Mark)

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11. Iron roofing sheets are coated with Zinc as “sacrificial” metal.

- a) Give the name of the process by which iron sheets are coated with Zinc. (1 Mark)

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- b) Give a reason why copper is not used as a “sacrificial metal” in the process named above.

(2 Marks)

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12. 2.12g of anhydrous Sodium Carbonate was dissolved in 200cm<sup>3</sup> of water. 25cm<sup>3</sup> of this solution neutralized 80cm<sup>3</sup> of hydrochloric acid solution. Calculate the concentration of the hydrochloric acid in Mol dm<sup>-3</sup>. (3 Marks)

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13. Thirty five grams of a saturated solution of salt and water at 25<sup>0</sup>c yielded 10.5g of the solid when evaporated to dryness. Find the solubility of the salt at 25<sup>0</sup>c. (2 Marks)

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14. Carbon (iv) oxide is a greenhouse gas. It is given a greenhouse factor 1 other gases are given a greenhouse factor that compares their effect with carbon (iv) oxide. The greenhouse effect increases as the factor value increases. The table below gives some information about four different gases.

Gas	Green house factor	% of the gas in the atmosphere
CO <sub>2</sub>	1	0.036
CH <sub>4</sub>	30	0.0017
N <sub>2</sub> O	160	3.0x10 <sup>-4</sup>
CCl <sub>3</sub> F	21000	2.8x10 <sup>-8</sup>

- a) State one possible consequences of an increased greenhouse effect. (1 Mark)

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- b) Give one source of methane. (1 Mark)

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- c) Why is an increase in percentage of methane more worrying than the same percentage of increase carbon (iv) oxide. (1 Mark)

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- d) What other environmental problems beside its action as a greenhouse gas is caused by  $\text{CCl}_3\text{F}$ ? (1 Mark)

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15. Use equations to show the difference between the bleaching by chlorine and bleaching by Sulphur (iv) oxide gases. (2 Marks)

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16. The empirical formula of a hydrocarbon is  $\text{C}_2\text{H}_3$ . It has a molecular mass of 54 if  $\text{H}=1$   $\text{C}=12$ , determine and draw the structural formula of the hydrocarbon. (3 Marks)

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17. Explain the difference in boiling points of  $\text{CH}_4$  (RMM16), Bpt  $91.1^\circ\text{C}$  and ammonia  $\text{NH}_3$  RMM 17 Bpt  $240^\circ\text{C}$ . (2 Marks)

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18. Use the data in the table below, where appropriate to answer the questions that follow standard electrode potentials.

Standard Electrode Potentials					Volts
$\text{Fe}^{3+}$	+	$\text{e}^-$	$\longrightarrow$	$\text{Fe}^{2+}$	+0.77
$\text{Cl}_2$	+	$2\text{e}^-$	$\longrightarrow$	$2\text{Cl}^-_{(\text{aq})}$	+1.36
$\text{BrO}^-_{(\text{aq})}$	+	$12\text{H}^+ + 10\text{e}^-$	$\longrightarrow$	$\text{Br}_{2(\text{aq})} + 6\text{H}_2\text{O}_{(\text{l})}$	+1.52
$\text{O}_{3(\text{g})}$	+	$2\text{H}^+_{(\text{aq})} + 2\text{e}^-$	$\longrightarrow$	$\text{O}_{2(\text{g})} + \text{H}_2\text{O}_{(\text{l})}$	+2.08
$\text{F}_2\text{O}$	+	$2\text{H}^+_{(\text{aq})} + 4\text{e}^-$	$\longrightarrow$	$2\text{F}^-_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})}$	+2.15

Each of the above reactions can be reversed under suitable conditions.

a) Identify

i. The strongest reducing agent.

(1 Mark)

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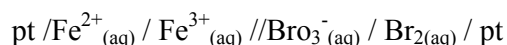
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ii. All the species in the table which can be oxidized in acidic solution by  $\text{BrO}_3^-$  (aq). (1 Mark)

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b) i) Calculate the emf of cell represented as below



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ii) State and explain the effect on the e.m.f of the cell of the concentration of  $\text{Fe}^{3+}$  ions is increased.

(2 Marks)

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19. State one advantage of luminous over non luminous flame.

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20. The table below shows some properties of elements along the third period in the periodic table.

Element	Na	Mg	Al	Si	P	S	Cl	Ar
Atomic No.	11	12	13	14	15	16	17	18
1 <sup>st</sup> Ionization Energy	500	740	600	790	1000	990	1250	1525
Melting Point	98	650	660	1410	44	113	-102	-189

a) Explain the change in atomic radius along the period.

(2 Marks)

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b) Compare the 1<sup>st</sup> ionization energy of Sodium to that of Aluminium.

(2 Marks)

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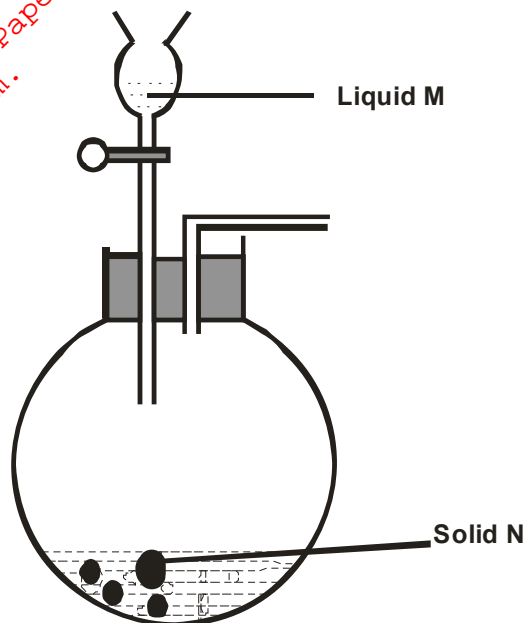
c) Give a reason why the melting point of silicon is very high.

(1 Mark)

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21. The diagram below shows an incomplete set up of preparation and collection of dry hydrogen chloride. Use it to answer the question that follow.



- a) i) Identify solid N and liquid M. (1 Mark)

N .....

M.....

- ii) Write a balanced equation for the reaction between the two. (1 Mark)

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- b) Complete the diagram above to show how the preparation and collection was achieved. (2 Marks)

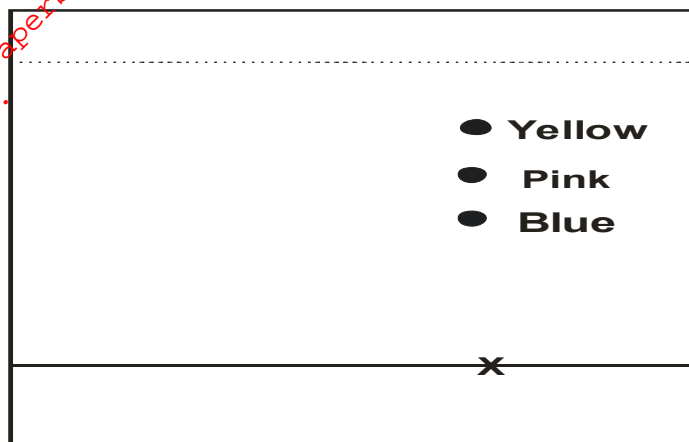
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- c) On the space provide below draw a diagram showing how hydrogen chloride may be dissolved in water. (1 Mark)

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22. A student obtained the chromatogram below during an experiment to extract various dyes from a common plant.



- a) Name a suitable solvent that was used to carry out the chromatography. (1 Mark)

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- b) On the diagram identify and label the baseline. (1 Mark)

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- c) State with a reason the least soluble dye in the solvent used. (1 Mark)

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23. In the extraction of copper from its ore several stages are involved.

- i. Name two major ores from which copper is extracted. (1 Mark)

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- ii. Some of the stages involved include ore concentration reduction and refining of the product.

With aid of a diagram explain what happens during the electrolytic refining stage. (3 Marks)

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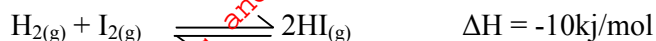
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- iii. State any use of each of a named alloy of copper. (2 Marks)

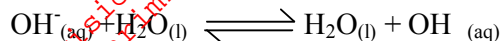
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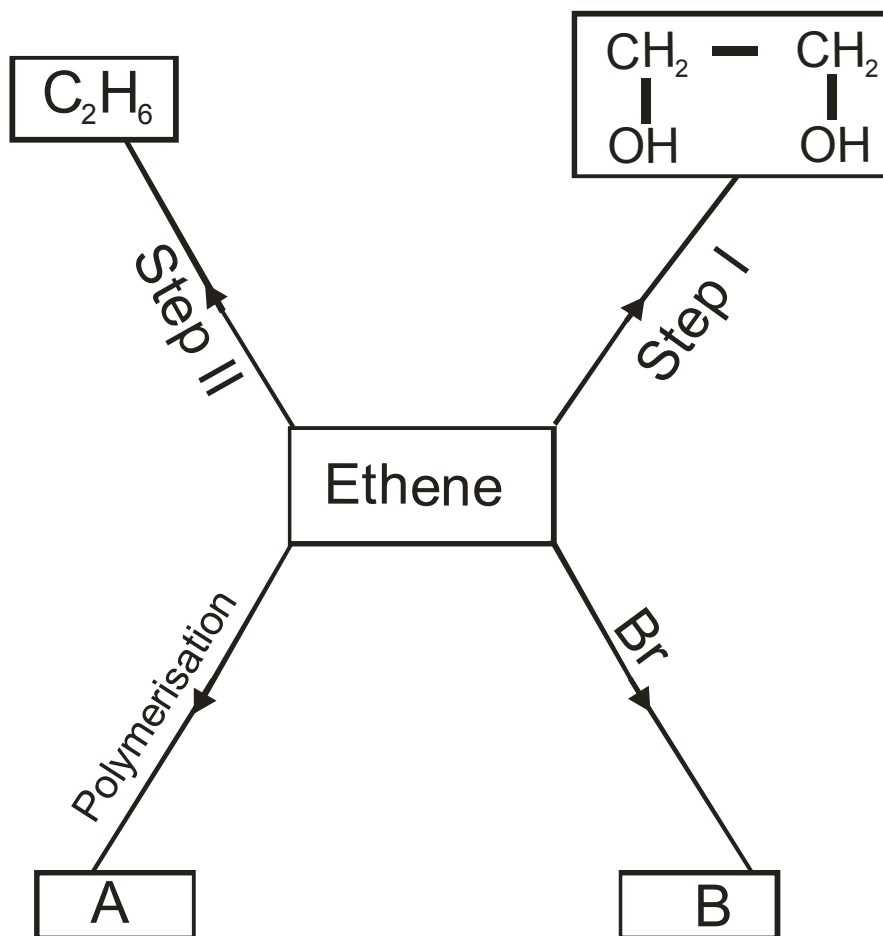
24. What is the effect of increasing temperature on the rate of the reaction below? Explain. (2 Marks)



25. In the equation below give the acid in the forward reaction and the base in the backward reaction. (2 Marks)



26. Study the scheme below and answer the questions that follow.



a) Name the process in

i. Step I..... ( ½ Mark)

ii. Step II ..... ( ½ Mark)

b) Draw the structural formula and name compound A. (1 Mark)

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27. Given the following Standard Molar enthalpies of combustion. Calculate the standard heat of formation of butane ( $C_4H_{10}$ ). (3 Marks)

$\Delta H$  Carbon (Graphite) = -393.5KJ/mol

$\Delta H$  Hydrogen = 285.8KJ/mol

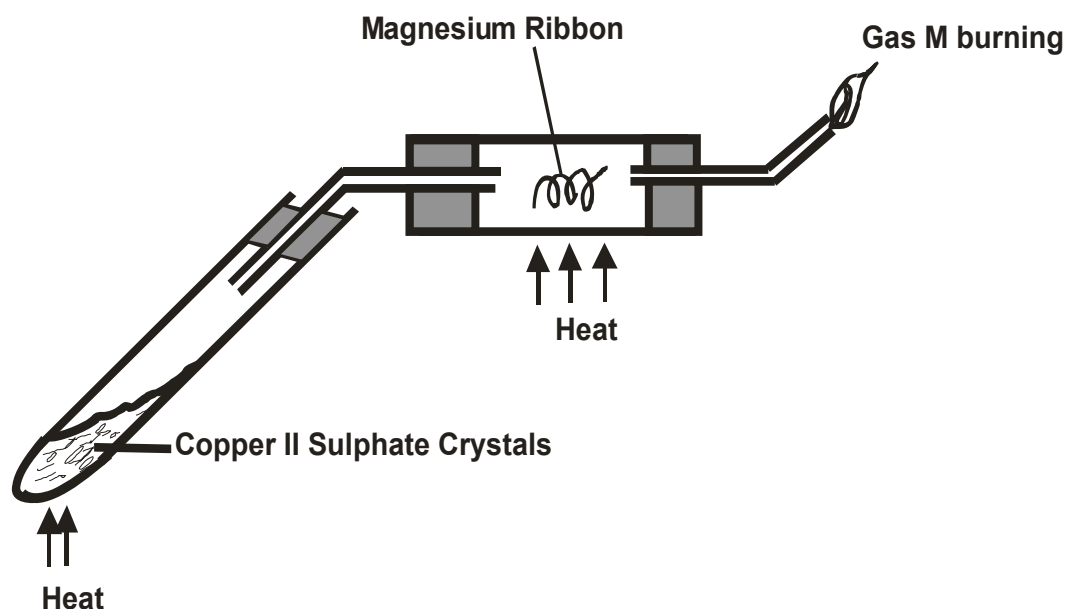
$\Delta H$  butane = -2877KJ/mol

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28. Study the setup below and answer the questions that follow.



- a) Identify gas M. (½ Mark)

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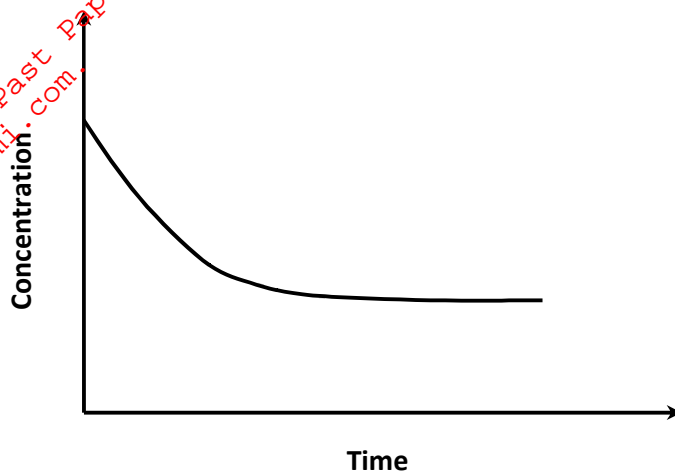
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- b) Write an equation of the reaction that takes place in the combustion tube. (1 Mark)

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29. The graph below shows the change in concentration of  $\text{SO}_2$  with time for an industry that had achieved 50% yield of  $\text{SO}_3$ . On the same axes sketch how the concentration of  $\text{SO}_3$  changes with time. (1Mark)



30. Using dot (•) and cross (X) to represent electrons show bonding between

i. C and G with atomic numbers 12 and 17 respectively.

(1 Mark)

ii. D and hydrogen atomic numbers 14 and 1 respectively.

(1 Mark)