Name……. Index No……/…….

Candidates Signature……

Date ……..

233/1
CHEMISTRY
Paper 1
2 Hours

CANDIDATES 2020 TRIAL KCSE MOCK EXAM

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

233/1
CHEMISTRY
Paper 1

2 Hours

Instructions to Candidates

(a) Write your name and index number in the spaces provided above.
(b) Sign and write the date of examination in the spaces provided above
*(c) Answer **ALL** the questions in the spaces provided in the question paper*
(d) KNEC Mathematical tables and electronic calculators may be used for calculations
*(e) All working **MUST** be clearly shown where necessary*
(f) This paper consists of 15 printed pages
(g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing
(h) Candidates should answer the questions in English

FOR EXAMINER'S ONLY

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1-29	**80**	

This paper consists of 13 printed pages. Candidates should check the question paper to Ensure that all the pages are printed as indicated and no questions are missing

1. Give the name and formula of;

(i) A complex cation containing a transition metal (1mark)

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(ii) A complex anion containing a transition metal (1mark)

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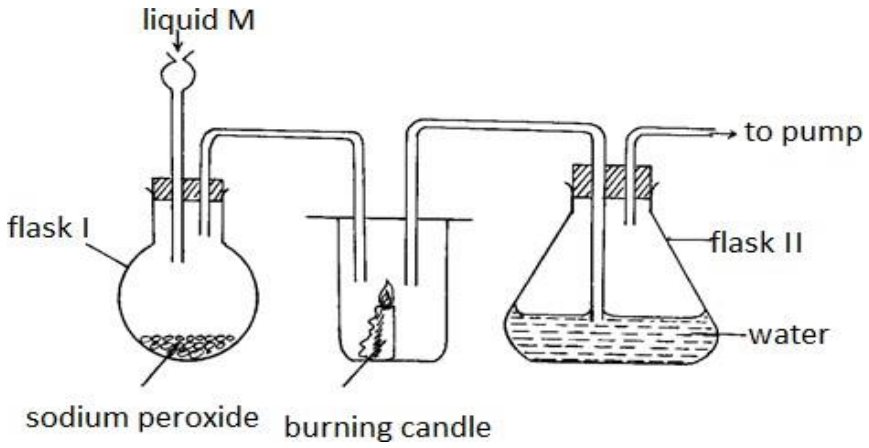
2. The diagram below shows a set up of apparatus used to prepare oxygen gas and pass it over burning candle. The experiment was allowed to run for several minutes.



(i) Identify liquid M. (1mark)

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(ii) Write an equation for the reaction that forms oxygen gas in the set up. (1mark)

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(iii) The pH of the solution in flask II was found to be less than 7. Explain. (1mark)

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3. During heating of a hydrated copper (II) sulphate crystals, the following readings were got.

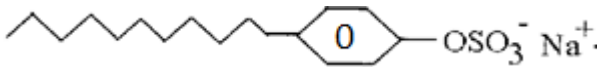
Mass of evaporating dish = 300g

Mass of evaporating dish + hydrated salt = 305g

Mass of evaporating dish + dehydrated salt = 303.2g

Calculate the empirical formula of hydrated copper (II) sulphate. (Cu = 63.5, S=32, O=16, H=1) (3marks)

4. (a). Identify the following cleansing agents. (1 mark)

i $CH_3(CH_2)CH_2-\underset{\underset{O}{\|}}{C}-O-Na^+$ ii 

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(b). State one disadvantage of using the cleansing agent in (a) (ii) above. (1mark)

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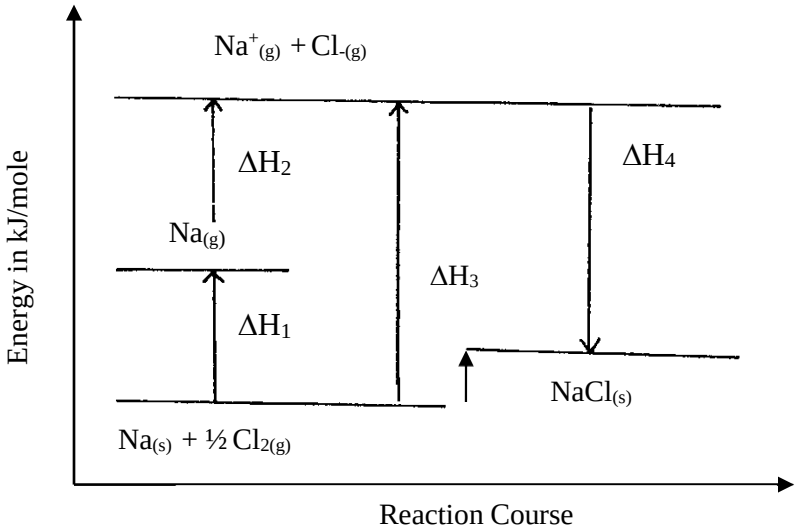
5. Study the energy level diagram below and answer the questions that follow.



(a). Identify the enthalpy changes represented by

ΔH_1 ..... ½ mark

ΔH_2 ..... ½ mark

ΔH_4 ..... ½ mark

(b). Given that

ΔH_1 = + 434 KJ/Mol

ΔH_2 = + 371 KJ/Mol

ΔH_3 = + 483 KJ/Mol

ΔH_4 = - 781 KJ /Mol

Calculate the enthalpy change (Δ H) for the reaction. (1½ marks)

$Na_{(s)} + ½\ Cl_{2(g)} \longrightarrow NaCl_{(s)}$

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6. Giving a reason in each case, identify an acid and a base in the equation.

$$H_3O^+_{(aq)} + NH_{3(aq)} \longrightarrow NH_4^+_{(aq)} + H_2O$$

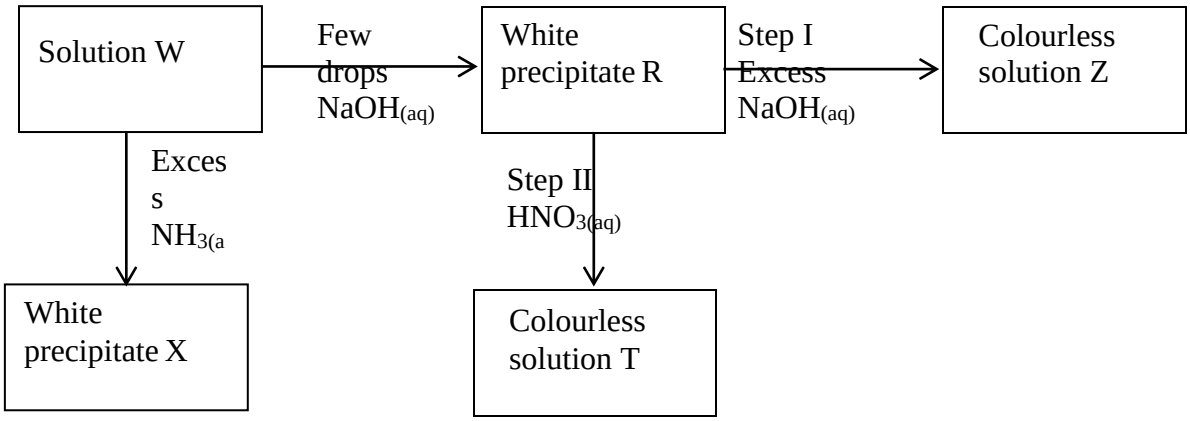
Acid.....½ mark

Reason..... ½ mark

Base..... ½ mark

Reason..... ½ mark

7. Study the reaction scheme **below** and answer the questions that follow.



(a)What property of the white precipitate **R** is demonstrated by steps **I** and **II**. (1 mark)

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(b)If the metal ion in solution **W** is divalent suggest its identity. (1mark)

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(c)Write an ionic equation for the reaction taking place in step **I**. (1 mark)

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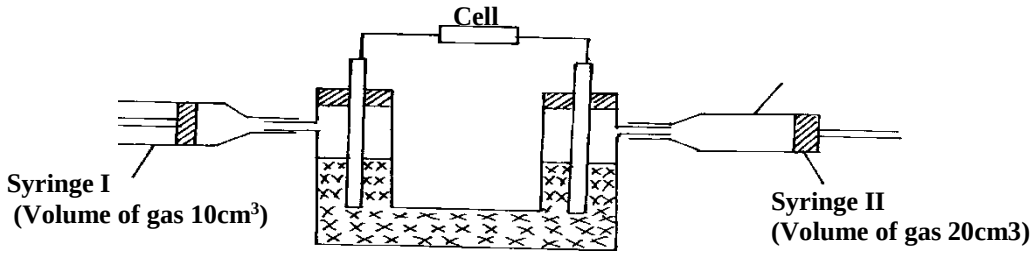
8. The diagram below shows a set up that was used to electrolyse aqueous magnesium chloride.



i) On the diagram above, using arrows, show the direction of flow of electrons. (1mark)

ii) Identify the syringe in which oxygen gas would be collected. (1mark)

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iii) State and explain the change of magnesium chloride concentration at the end of the experiment. (1 ½ marks)

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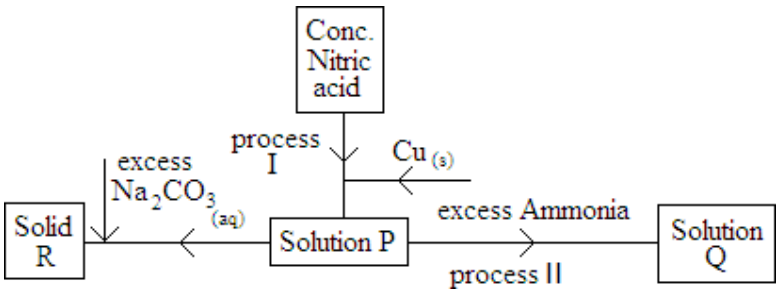
9. Study flow chat below and answer the questions that follow.



(i).Write a chemical equation to show how solid R is formed. (1mark)

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(ii).Write observation made in process (II). (1mark)

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10. The table below shows the standard reduction potentials for four half–cells. Study it and answer the questions that follow (letter are not the actual symbols for the elements)

				E^{θ} (Volts)
$F_{2(aq)}$	+ 2 e	⟶	$2F^-_{(aq)}$	+0.54
$G^{2+}_{(aq)}$	+ 2e	⟶	$G_{(s)}$	-0.44
$H^{2+}_{(aq)}$	+ 2e	⟶	$H_{(s)}$	+0.34
$2J^{+}_{(aq)}$	+ 2e	⟶	$J_{2(g)}$	0.00

i. Identify the strongest reducing agent. (1mark)

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ii. Write the equation for the reaction which takes place when solid G is added to a solution containing H^{2+} ions. (1 mark)

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iii. Calculate the E^0 value for the reaction in (ii) above. (1mark)

11. (a) State the Charles' law. (1mark)

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(b) A certain mass of gas occupies 146dm^3 at 291K and 98.31kPa. What will be its temperature if its volume is reduced to 133dm^3 at 101.325 kPa? (2 marks)

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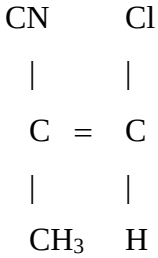
12. Below is the structure of a monomer used in polymerization.



a) Draw the structure of part of the polymer involving 3 units. (1mark)

b) What type of polymerisation takes place? (1mark)

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c) Give one advantage of artificial fibres over natural ones. (1mark)

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13. 20.0cm^3 of NaOH solution containing 8.0gdm^{-3} were required for complete neutralization of 0.118g of a dibasic acid. Calculate the Relative Molecular Mass (R.M.M) of the acid. (Na=23, O=16, H=1) (3marks)

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14. The table below shows the results obtained when a current of 2 amperes is passed through copper II sulphate solution for 15 minutes.

Initial mass of cathode	1.0g
Final mass on cathode	1.60g
Change in mass at the cathode	0.60g

Calculate the quantity of electricity required to deposit one mole of copper (Cu= 63.5) (2marks)

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15. The following equation shows a reversible reaction.

$$H_{2(g)} + Br_{2(g)} \rightleftharpoons 2HBr_{(g)} \qquad \Delta H = -74.4kJ$$

reddish brown *colourless*

(a). **State** and explain the observation that can be made when:-

(i). Temperature is increased. (1½marks)

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(ii).Pressure is reduced. (1½marks)

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16. *You are provided with:*

A clean metallic spatula
Distilled water
Lead (II) nitrate solution
Source of heat
A rack of test – tubes
A white solid suspected to be sodium chloride

Required

Draft a procedure you would use to enable you test and confirm that the white solid is a chloride compound. (3marks)

Test	Observation	Inference

17. Sulphur is one of the elements with varying oxidation States

(a) What is oxidation state? (1mark)

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(b) Determine the oxidation state of sulphur in SO_3^{2-} (1mark)

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(c) Give the electron pattern of sulphur in SO_3^{2-} (1mark)

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18. When fuels burn in the internal combustion engine at high temperature, one of the products formed is nitrogen (II) oxide.

(a) Write the equation for the formation of nitrogen (II) oxide. (1mark)

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(b) Give a reason why nitrogen (II) oxide is not formed at room temperature. (1mark)

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(c) Describe how formation of nitrogen (II) oxide in the internal combustion engine leads to gaseous pollution? (1mark)

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19. Use part of the periodic table grid below to answer questions that follow. (Letters do not represent actual symbols of the elements)

				A		B	C	
D			E	F			G	
							H	

a) Which is the most reactive non-metal? Explain. (1 mark)

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b) Name the bond type formed when element A and B react. Explain. (1 mark)

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c) Giving a reason compare the atomic radius of element D and E. (1mark)

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20. Use the standard enthalpies of combustion given below to calculate the enthalpy of formation of ethane.

$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$ $\Delta H_C = -394 Kjmol^{-1}$

$H_{2(g)} + O_{2(g)} \longrightarrow H_2O_{(l)}$ $\Delta H_C = -286 Kjmol^{-1}$

$C_2H_{6(g)} + 5O_{2(g)} \longrightarrow 2CO_{2(g)} + 3H_2O_{l)}$ $\Delta H_c = -1300 Kjmol^{-1}$ (2 ½ marks)

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21. Describe how a solid sample of Lead (II) Sulphate would be prepared using the following reagents. Dilute Sulphuric (VI) acid, Nitric (V) acid, solid lead (II) Carbonate. (3marks)

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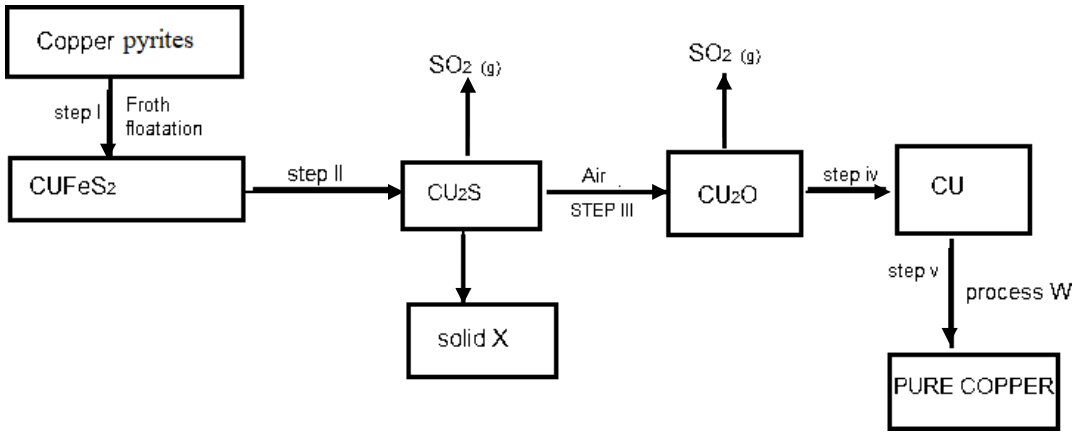
22. Study the flow chart below and answer the questions that follow



a. Identify

i. Solid X (½ mark)

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ii. Process W (½ mark)

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b. Write an equation for the reaction in step II. (1mark)

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c. Explain why Copper is suitable in making soldering equipment. (1mark)

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23. The table below gives the rate of decay for a sample of radioactive element P.

Mass of P(g)	**Number of days**
48	0
18	90
6	180

a) Determine its half-life (1mark)

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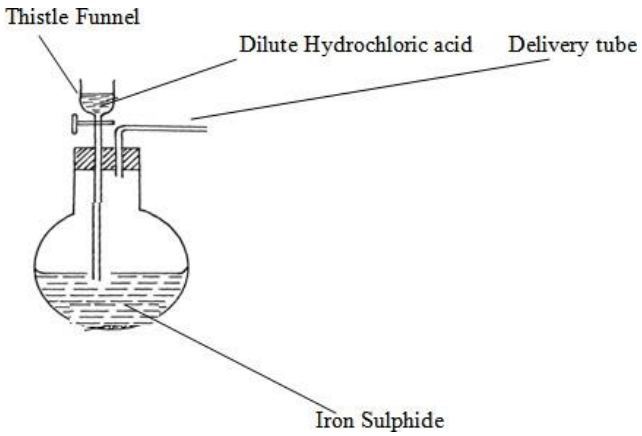
b) Complete the following nuclear equation (1mark)

$$^{14}_{6}C \longrightarrow \_\_\_\_\_ + {}^{0}_{-1}e$$

24. Complete this set up below for the preparation and collection of dry Hydrogen Sulphate. (3marks)

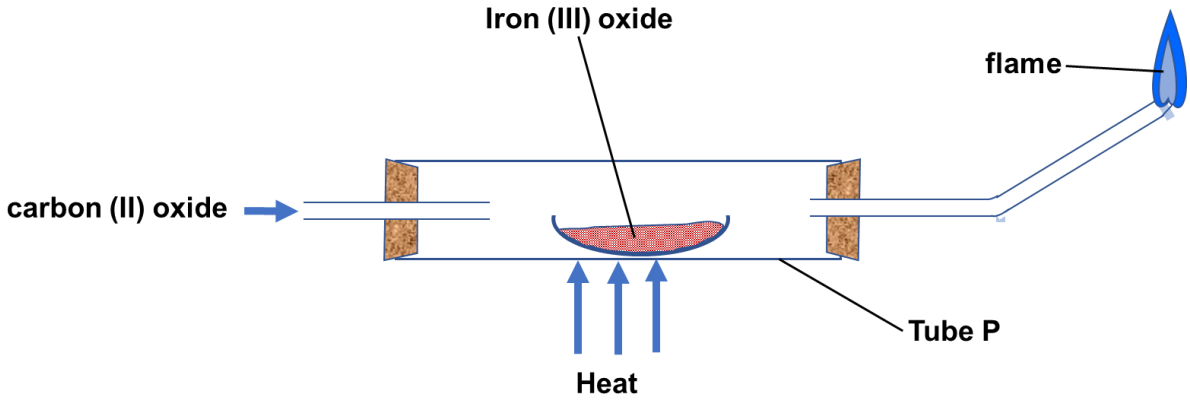


25. Using dots (**.**) and crosses (**x**) to represent elections draw diagram to represent

(i) NH_4^+ (1½ mark)

(ii) Mg_3N_2 (1½ mark)

26. A sample of carbon (II) oxide gas was passed through hot iron (III) oxide in a combustion tube P.



(i) State the observation made in **Tube P**. (1 mark)

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(ii) Write a chemical equation for the reaction that took place in **Tube P**. (1mark)

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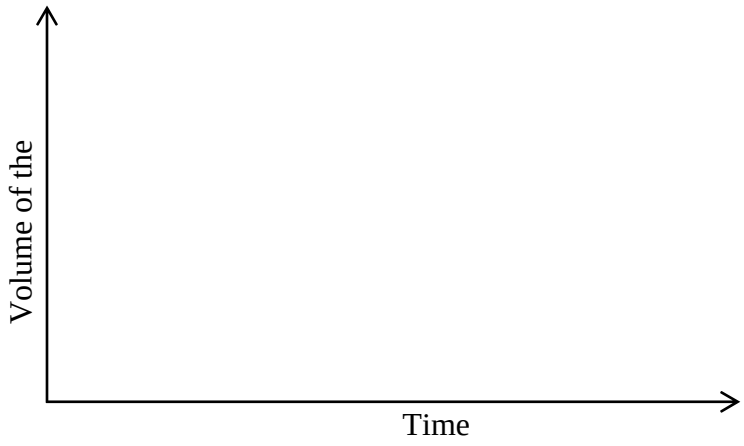
27. A student performed three experiments on the reaction of magnesium with dilute hydrochloric acid and collected the hydrogen gas evolved for each experiment.

(i) **Experiment I:** Reacted 2g of magnesium ribbon with 1M hydrochloric acid.
(ii) **Experiment II:** Reacted 2g of magnesium powder with 1M hydrochloric acid
(iii) **Experiment III:** Reacted 2g of magnesium ribbon with 0.5M hydrochloric acid

On the grid **below** sketch the graphs for each of the three experiments performed. (3marks)



28. In the manufacture of sodium carbonate by solvay process, ammoniated brine trickles down the carbonator while carbon (IV) oxide rises up the same tower.

a) What is ammoniated brine? (1/2 mark)

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b) What is the main source of carbon (IV) oxide in the above process? (1/2 mark)

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c) Write two equations for the reactions in the carbonator (2 marks)

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29. The table below shows the solubility of a salt at various temperatures.

Temperature ^{0}C	Solubility (g/100g water)
0	36
40	30
80	25
100	22
120	20

Define the term **Fractional Crystallization.** (1 mark)

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(a) A saturated solution of the salt at 40^0C was heated to 100^0C. State and explain the observation made. (1mark)

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(b) Calculate the mass of salt formed when a saturated solution of the salt at 0^0C is place in a water bath maintained at 100^0C. (1 mark)