

Materials from <https://teacher.co.ke/notes>

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 of the elements.

					A			
I	B		C		D		E	
F	G						H	

a) Which element forms an ion of charge - 2? Explain your answer **2marks**

A - Element in group VI have 6 electrons in the outermost energy level, they react by gaining 2 electrons

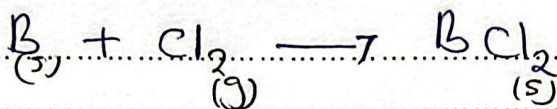
b) What is the nature of the oxide formed by element C? **1mark**

Amphoteric oxide

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

E is more reactive than H. Element E and H are non-metal in group VII and reactivity decreases down the group. E is smaller than H and hence has a higher electron affinity therefore more reactive.

d) Write the chemical equation for the reaction between B and chlorine? 1mark



e) Explain how the atomic radii of the following compare; 2marks

i) F and G

Atomic radius of element F is greater than that of G. Across the period number nuclear charge increases increasing effective nuclear charge.

ii) B and G

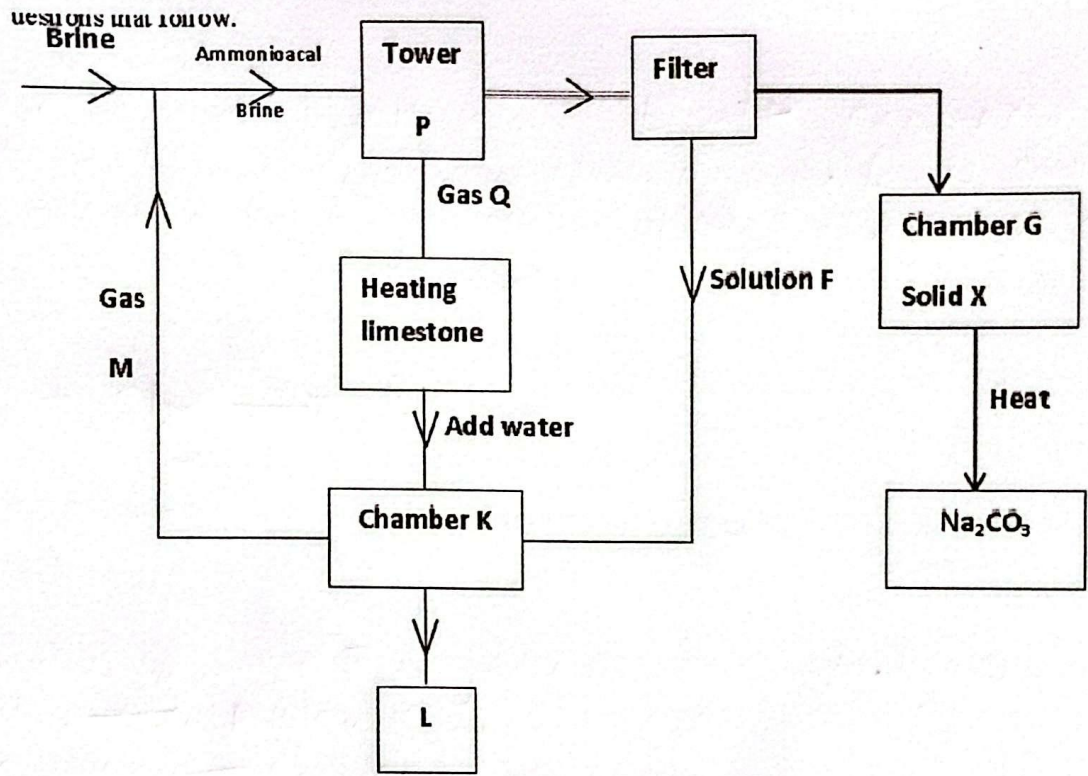
Atomic radius of G is greater than that of B due to addition of one more energy level down the group.

f) The oxides of B and D are separately dissolved in water. State the effect of each product on litmus paper. 2marks

Solution of oxides of B changes ^{red} litmus paper blue and has no effect on blue litmus paper.

Solution of oxide of D changes blue litmus paper red.

2. The flow chart below is for the manufacture of sodium carbonate using Solvay process. Use it to answer the questions that follow.



(a) Name (3mks)

(i) Gas M..... Ammonia gas.....

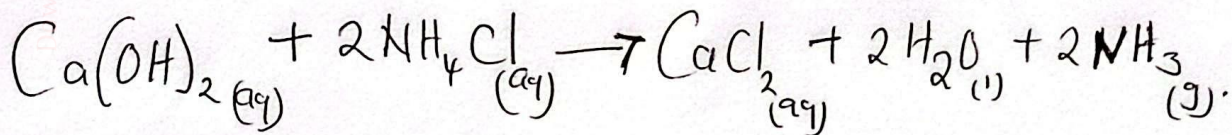
(ii) Solution F..... Ammonium Chloride.....

(iii) Solid X..... Sodium hydrogen Carbonate.....

(iv) The product L..... Calcium Chloride / water.....

(b) Write an equation for the reaction in chamber K.

(2mks)



(c) Name two raw materials used in Solvay process.

(2mks)

- Ammonia
- CaCO₃ (limestone)
- CO₂
- Brine

(d)(I) Name one substance recycled in Solvay process.

(1mk)

- CO_2
- NH_3
- Water

(ii) Give two reasons why carbon (IV) oxide is used as fire extinguisher.

(2mks)

- Is denser than air
- Does not support Combustion

(iii) Explain why lead carbonate is not reacted with dil. H_2SO_4 in preparation of carbon (IV) oxide in the laboratory.

(2mks)

- There is formation of lead II sulphate which is insoluble.
- The PbSO_4 coats PbCO_3 which stop further reaction

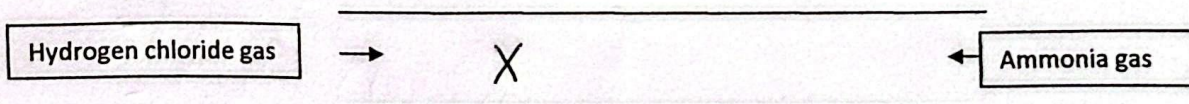
3. A) State Graham's law of diffusion.

(2 mark)

Under similar conditions ~~and~~ of temperature and pressure, the rate of diffusion of a gas is inversely proportional to the square root of its density.

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b) An experiment was carried out to compare the rates of diffusion of chlorine gas and hydrogen supplied gas. ($\text{H}=1$, $\text{N}=14$, $\text{Cl}=35.5$)



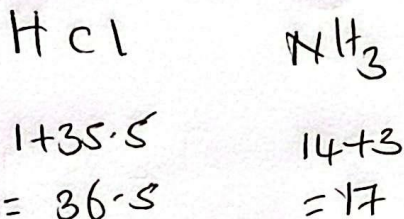
1) what observation was made in the combustion tube?

(1 mark)

White solid deposited.

ii) Indicate where the observation in (i) above would occur.

(1 mark)



Near to HCl.

iii) It takes 15 seconds for 45cm³ of Ammonia to diffuse through the combustion tube. How long will it take?

135cm³ of HCl gas supplied to diffuse under similar conditions?

(3 marks)

If 45cm³ → 15 seconds
then 135cm³.

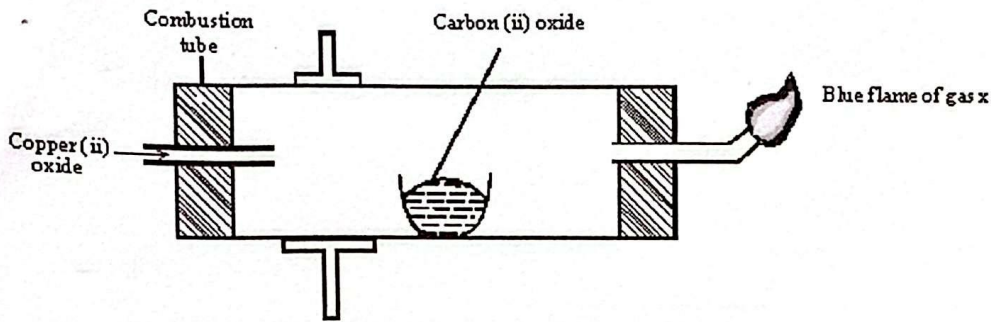
$$\frac{135 \times 15}{45} = 45 \text{ seconds}$$

$$\frac{T_{\text{NH}_3}}{T_{\text{HCl}}} = \sqrt{\frac{R_{\text{MMNH}_3}}{R_{\text{MMHCl}}}}$$

$$\frac{15 \text{ sec}}{T_{\text{HCl}}} = \sqrt{\frac{17}{36.5}}$$

$$T_{\text{HCl}} = \underline{\underline{30.71}}$$

4. The diagram below shows an experiment set-up to investigate a property of carbon (ii) oxide. Study it and answer the questions that follow.



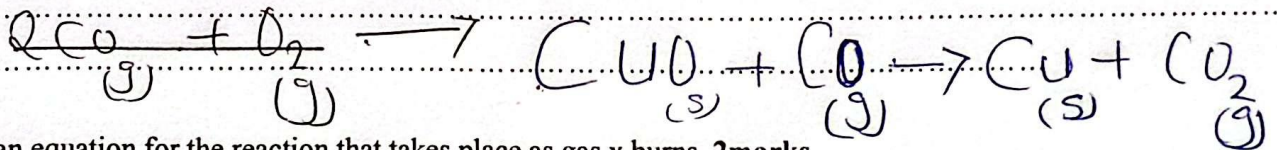
- a) Name one condition that is missing in the set up that must be present if the experiment to proceed. **1mark**

Heat Copper II oxide

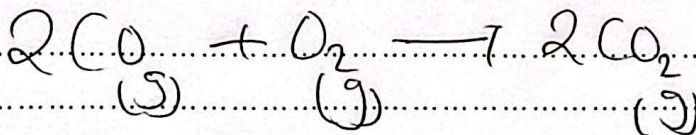
- b) If the experiment was carried out properly. What observation would be made in the combustion tube? **2mark**

Black solid in the combustion tube would turn brown.

- c) Give an equation for the reaction that occurs in the combustion tube. **2 mark**



- d) Give an equation for the reaction that takes place as gas x burns. **2marks**



- e) Why is it necessary to burn gas x? **1mk**

- it is poisonous.

g) Name the reducing and oxidizing agent. 2marks

i. Reducing agent

Carbon II oxide

ii. Oxidising agent

Copper II oxide

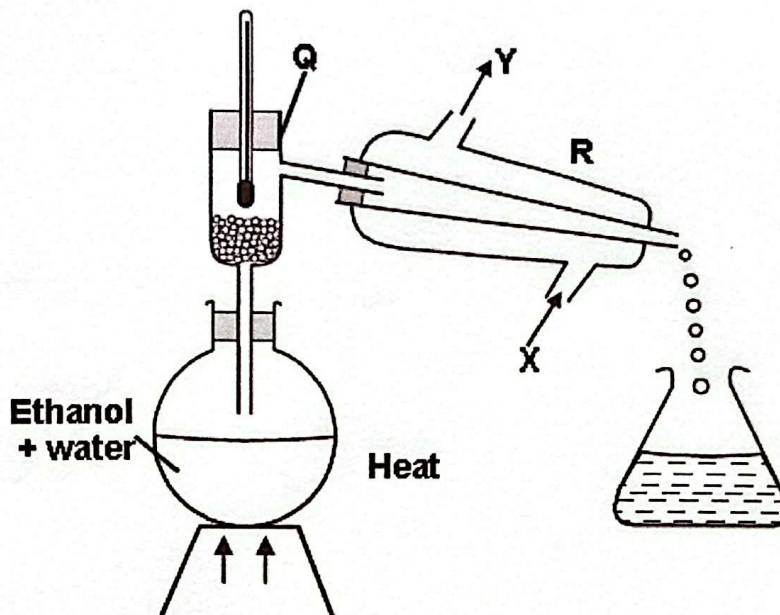
h) Identify any other substance that would have the same effect on copper (ii) oxide as carbon (ii) oxide. 1mark

Hydrogen

i) What would happen if copper (ii) oxide was replaced with sodium oxide? Explain 2mark

- There will be no observable change, because sodium is higher than carbon in the reactivity series and therefore has higher affinity of oxygen.

5. The diagram below shows a set-up of apparatus used to separate a mixture of ethanol (B.P=78.0°C) and water (B.P = 100.0°C)



a) Name the parts labelled Q and state its function.

(2 marks)

Fractionating Column

It enhance successive condensation and evaporation

b) Name the apparatus R.

(1 mark)

Liebig Condenser

c) At what point should apparatus R be connected with water?

(1 mark)

Point X

d) Name the distillate that was collected first.

(1 mark)

ethanol

e) State the purpose of the thermometer.

(1 mark)

To measure The temperatures

6. In an experiment to determine the percentage of impurity in sodium carbonate .1.8g of impure sodium carbonate was reacted with excess 2M hydrochloric acid. 340cm³ of dry cabin (IV) oxide gas was collected during experiment at room temperature and pressure. (Na=23'O=16, C=12)Molar gas volume at rtp=24dm³

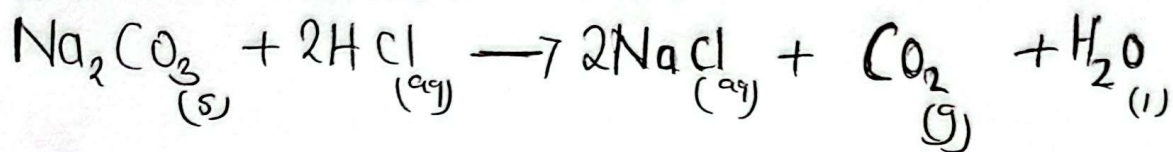
(a)Why 2M hydrochloric acid used was in excess.

(1mk)

To ensure all the carbonates ^{have} reacted.

(b) Write an equation for the reaction that produced carbon (IV) oxide

(2mk)



(c) Calculate

(I) the number of moles of CO₂ produced

$$\begin{array}{l} 1 \text{ Mole} \rightarrow 24000 \text{ cm}^3 \\ ? \rightarrow 340 \text{ cm}^3 \end{array}$$

$$\frac{340 \text{ cm}^3 \times 1}{24000 \text{ cm}^3} = 0.0142 \text{ moles} \quad (2\text{mks})$$

(ii) The number of moles of sodium carbonate that reacted with the acid

$$= 0.0142 \text{ moles} \quad (2\text{mks})$$

Mole ratio is 1:1

hence the moles of Na₂CO₃ used is 0.0142 moles



(iii) The mass of sodium carbonate that reacted with the acid.

(2mks)

$$\text{mass} = \text{moles} \times \text{molar mass}$$

$$= 0.0142 \times 106$$

$$= 1.5052 \text{ g}$$

(iv) The percentage of impurities in the sample of sodium carbonate.

(2mks)

$$\frac{\text{mass of impurity}}{\text{Total mass}} \times 100$$

$$\begin{array}{l} \text{mass of impurity} = 1.8 - 1.5052 \\ = 0.2948 \end{array}$$

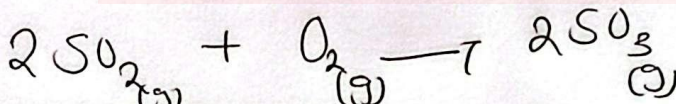
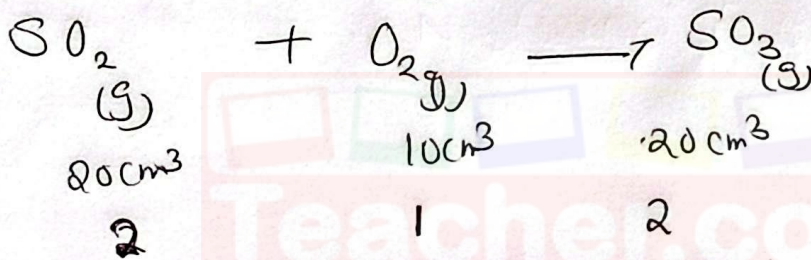
$$\frac{0.2948}{1.8} \times 100 = 16.38\%$$

(e) (I) state the Gay Lussacs' law (2mks)

Gases react in volumes that bears a simple ratio to one another and to the volume of the product if gaseous, temperature and pressure remaining constant.

(ii) in an experiment 20cm³ of sulphur(II)oxide are found to react completely with 10cm³ of oxygen to produce 30cm³ of sulphur(IV)oxide. Determine the equation for reaction. (3mks)

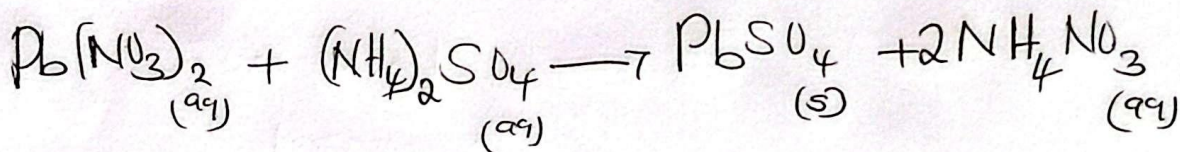
Sulphur(IV)oxide + Oxygen \longrightarrow Sulphur(VI)oxide



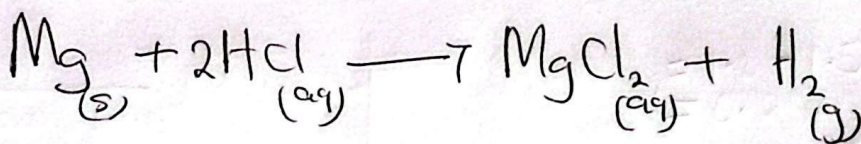
7. (a) Write an equation for the following reactions

(I) solution of lead nitrate with ammonium sulphate

(2mks)



(ii) Magnesium reacting with dilute hydrochloric acid (2mks)

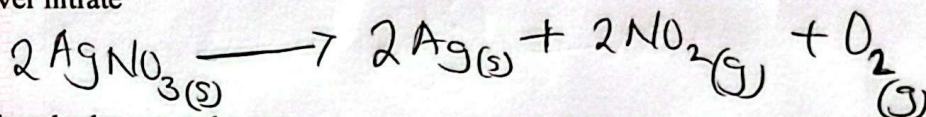


b) YOU are provided with zinc powder and dilute nitric acid. Describe how a solid sample of zinc nitrate can be prepared in the lab. (3mks)

- Measure about 200cm³ of dilute nitric acid and transfer it into a beaker
- Add zinc powder a little at a time as you stir, Continue adding zinc powder until in excess. Filter the solution and pour the filtrate into an evaporating dish. Evaporate the solution to saturation.

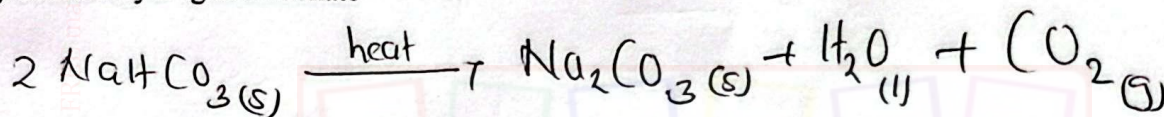
(c) Write a chemical equation for the action of heat of the following salts.

(i) silver nitrate



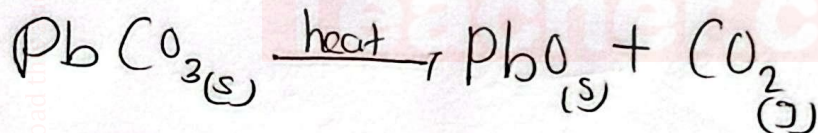
(2mks)

(ii) Sodium hydrogen carbonate



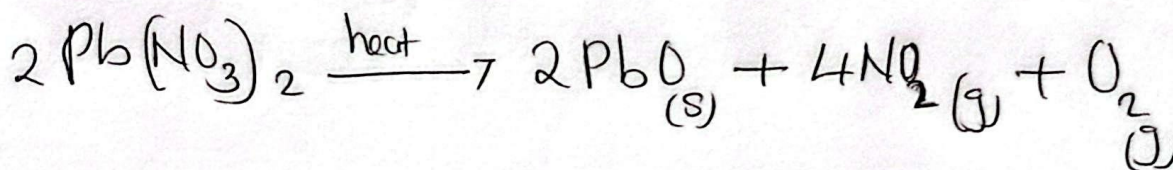
(2mks)

(iii) Lead (ii) carbonate



(2mks)

(iv) Lead (ii) nitrate



(2mks)