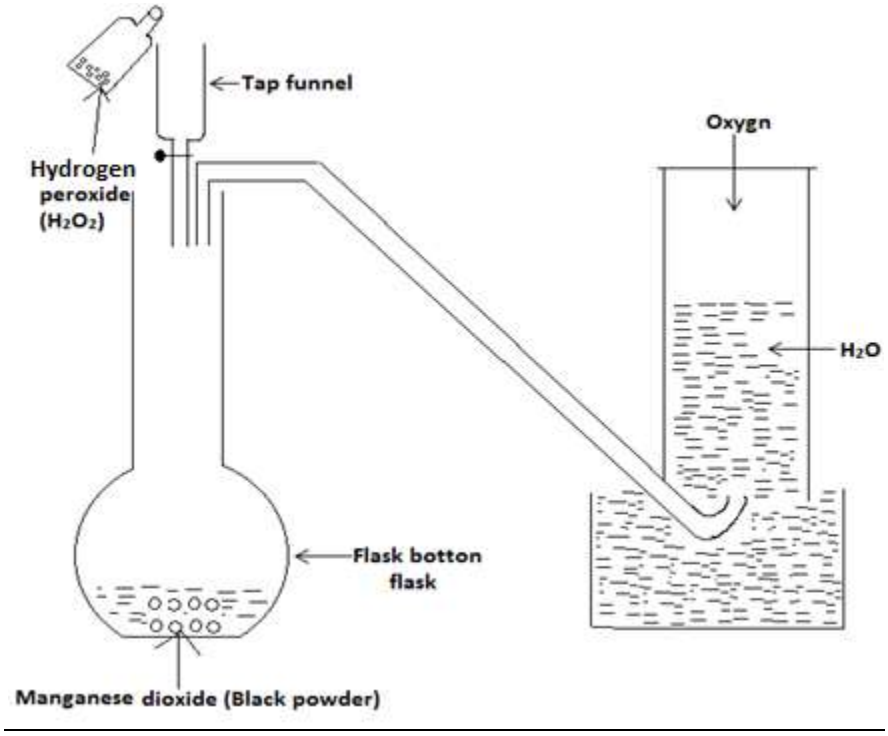
Chapter Eleven

Gases:

Oxygen:

- This is the part of the air which supports life and burning.
- For without it, burning of items cannot occur and no living thing can live.
- By volume, it forms about 21% of the air.

Laboratory Preparation:



- This is by means of the breaking down or the decomposition of hydrogen peroxide (H_2O_2).
- In order to ensure the rapid or fast decomposition of the H_2O_2, manganese dioxide (manganese IV) oxide is used as a catalyst.
- A catalyst is a substance which enables a chemical reaction to occur very fast, but does not take part in the reaction.
- The manganese dioxide is placed into the flat bottom flask, and by means of the thistle funnel, the hydrogen peroxide is added drop by drop to the hydrogen peroxide.
- As the drops of the hydrogen peroxide comes into contact with the manganese (IV) oxide, oxygen gas is evolved or released, which is collected over water

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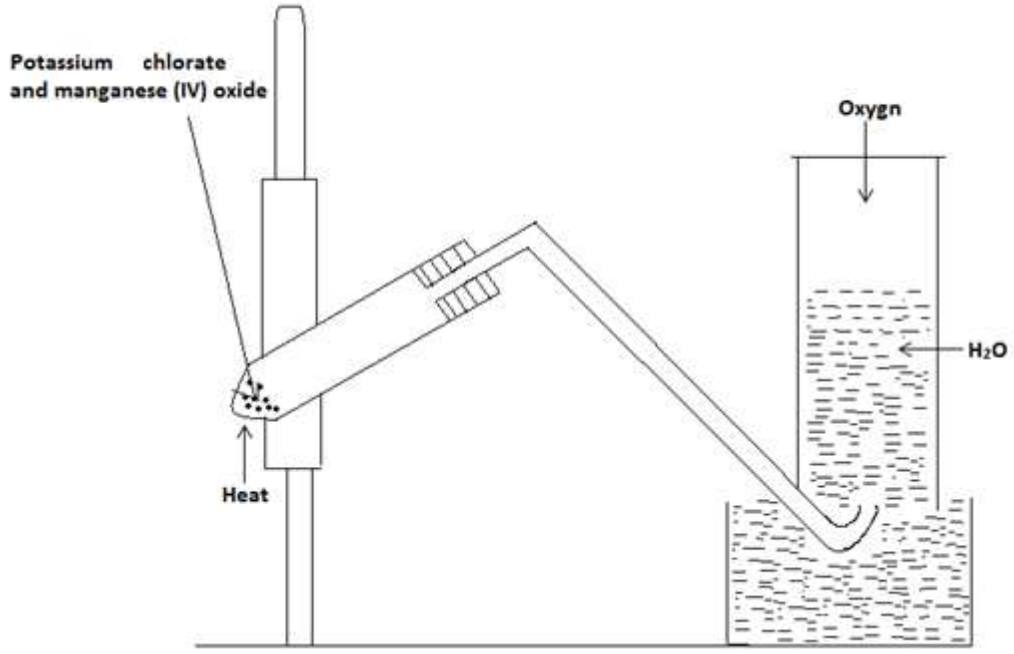
Method 2:

Laboratory preparation of oxygen from potassium trioxochlorate (VI) or potassium chlorate:



- Take 20g of potassium chlorate and 5g of manganese (IV) oxide.
- Grind them together and heat the mixture.
- The oxygen gas which is evolved is collected over water.

$$2kcl_3\ (S) \xrightarrow{MnO_2} 2kcl_3 + 3O_2g$$

Test for oxygen:

- If a gas has no smell and it rekindles a splint of wood, then it is oxygen.

Properties of oxygen:

- It is a colourless and an odourless gas.
- It is slightly soluble in water.
- Its density is almost the same as that of air.
- It is a neutral gas.

Uses:

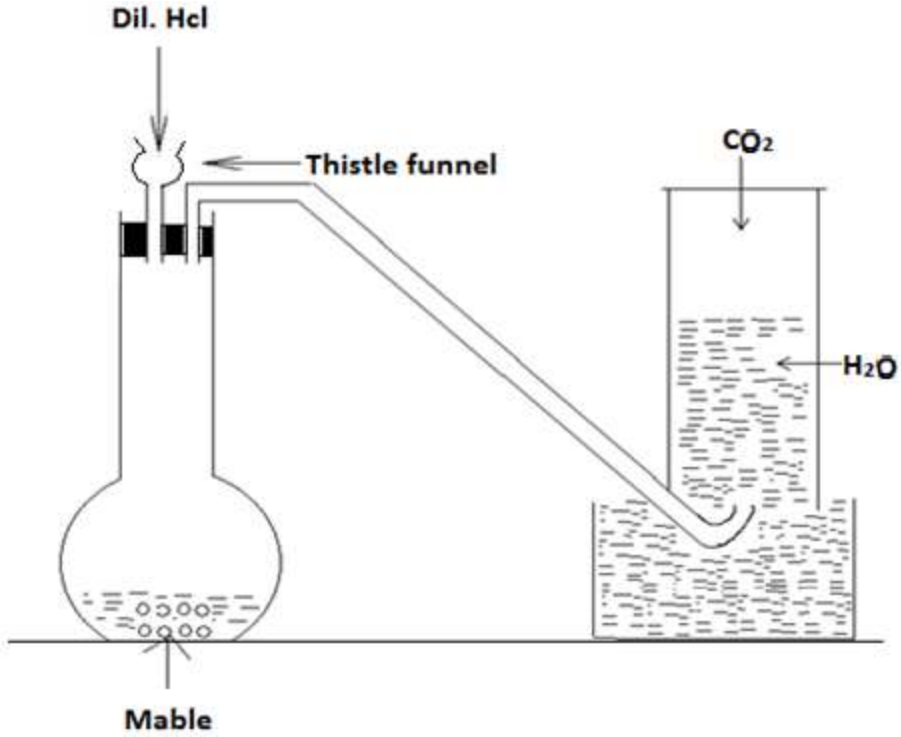
(1) Liquid oxygen is used to burn fuel in rockets.
(2) It is used in the oxyacetylene flame, which is used for welding and cutting of metals.

(3) It is used as an aid in breathing, when the natural supply of oxygen is not sufficient e.g. high altitude flying or climbing (mountaineers).

Carbon Dioxide (CO_2):

- This is also referred to as carbon (IV) oxide.

Preparation in the laboratory;



- Pieces of mable ($CaC0_3$) are placed into a flat bottom flask, and dilute hydrochloric acid is added to the marble by means of a thistle funnel.
- Effervescence occurs and a colourless gas which is carbon dioxide, is collected over water.
- The equation for the reaction is $CaC0_3 + Hcl \rightarrow CaCl_2 + H_2O + CO_2$.

Uses:

(1) It is used to manufacture effervescing drinks called mineral water, since a solution of carbon dioxide in water has a pleasant taste.

(2) It is used in fire extinguishers since it does not support burning.

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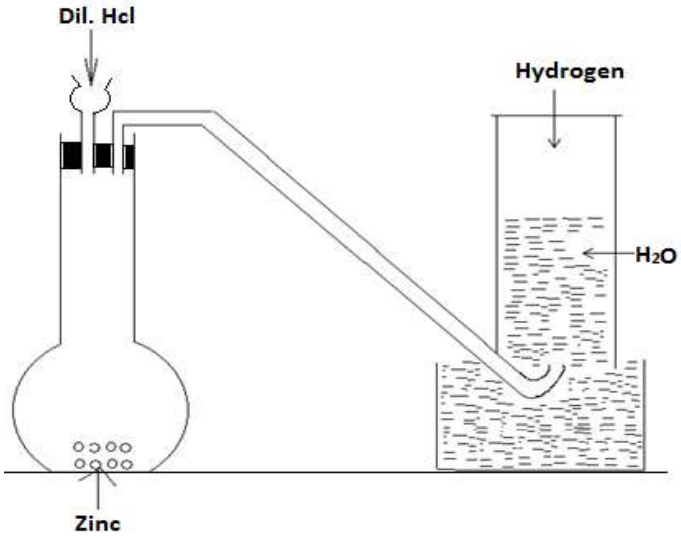
Test for CO_2:

- In order to determine whether a gas is carbon dioxide, the gas is first passed into lime water.
- If the lime water becomes milky white in colour, then the gas is carbon dioxide.

Hydrogen;

- It is an important gas found within the atmosphere.

Laboratory preparatory:



- Pieces of zinc are placed into a flat bottom flask and dilute hydrochloric acid is added to the zinc, by means of the thistle funnel.
- There is effervescence and the hydrogen gas evolved, is collected over water.

Properties:

- It is a colourless gas which has no smell.
- It is a neutral gas and it is less dense than air.

- It burns in air to form water.

Uses:

- It is used in filling balloons.
- It is used in the “hardening” of oils to make margarine.
- It is used in the manufacture of ammonia.
- It is used in the manufacture of hydrochloric acid.
- It is used in the oxyhydrogen flame, which is used for cutting and welding