

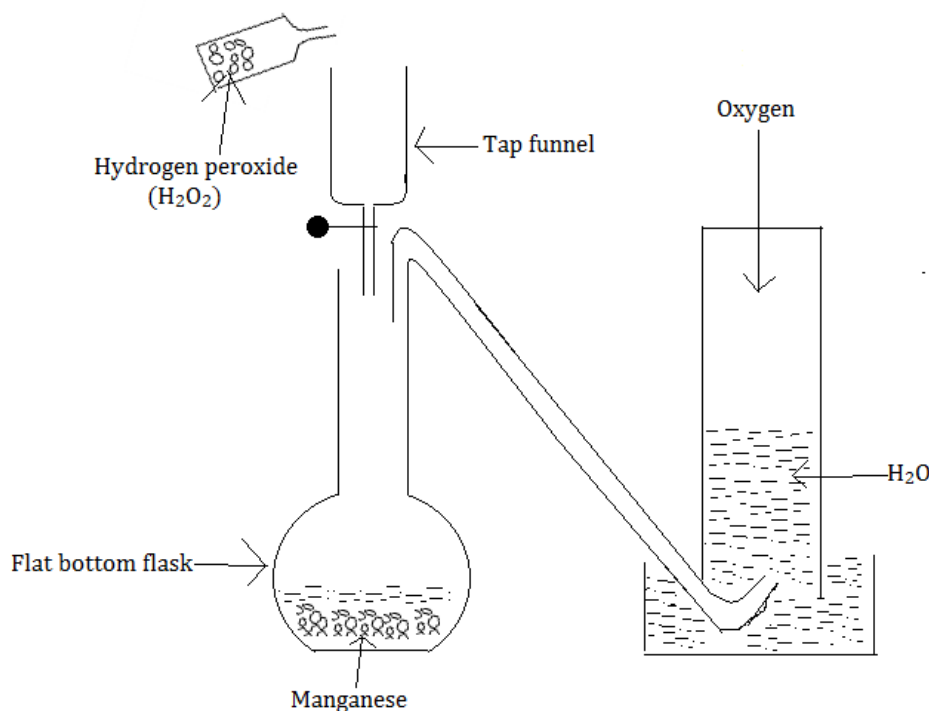
CHAPTER FOURTEEN

GASES:

Oxygen:

- This is the part of the air which supports life and burning.
- For without it, burning of items cannot occur .
- By volume, it forms about 21% of the air.

Laboratory preparation:

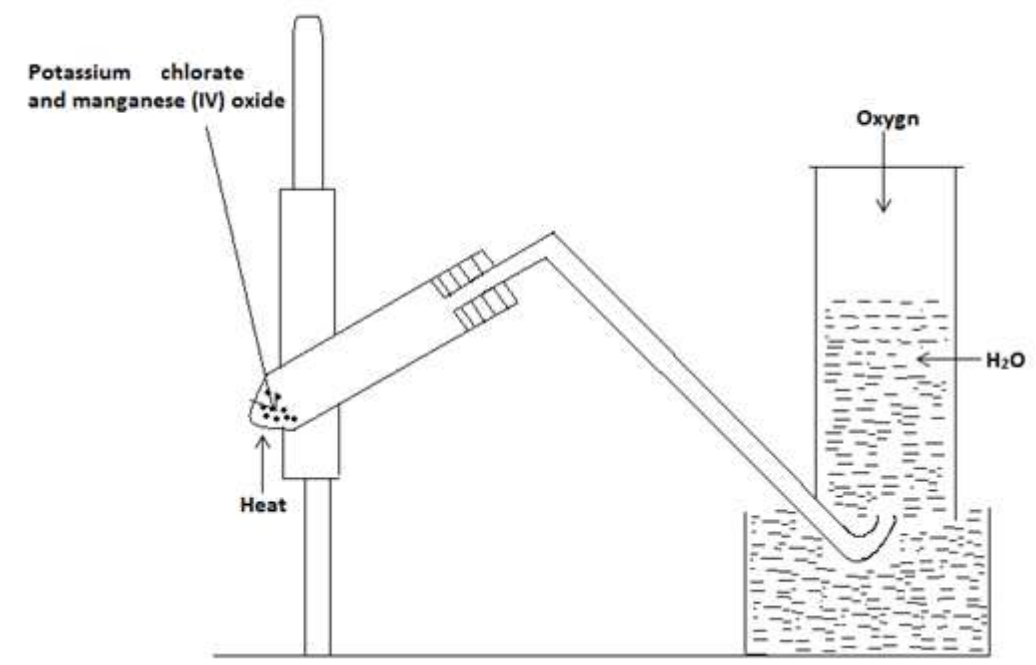


- This is by means of the breaking down or the decomposition of hydrogen peroxide(H₂O₂).
- In order to ensure the rapid or fast decomposition of the H₂O₂, manganese dioxide (manganese (IV) oxide) is used as a catalyst.
- A catalyst is a substance which enables a chemical reaction to occur very fast, but does not take part in the reaction.
- The manganese dioxide is placed into the flat bottom flask, and by means of the tap funnel, hydrogen peroxide is added drop by drop to the manganese dioxide.

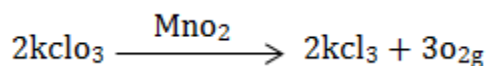
- As the drops of the hydrogen peroxide come into contact with the manganese (IV) oxide, oxygen gas is evolved or released which is collected over water.

Method 2:

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



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



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

- It is a neutral gas.

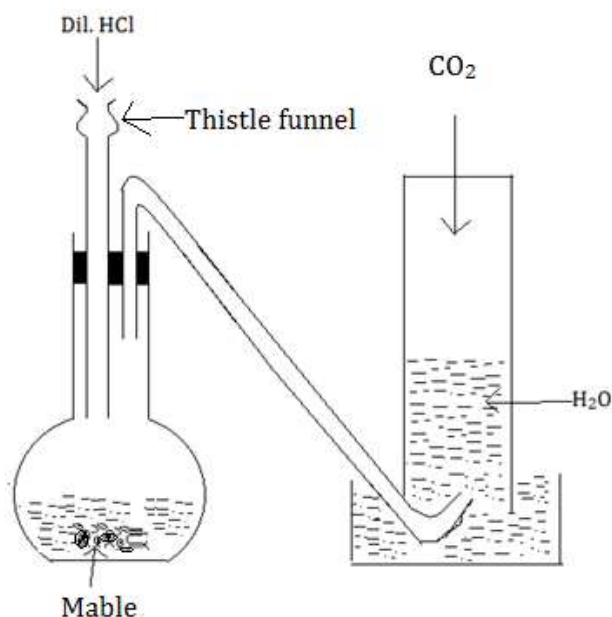
Uses:

- (1) Liquid oxygen is used to burn fuel in rockets.
- (2) It is used in the oxyacetylene flame, which is used for welding and the 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 (CO₂):

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

Preparation in the laboratory:



- Pieces of marble (CaCO₃) 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 released colourless gas which is carbon dioxide, is collected over water.
- The equation for the reaction is $\text{CaCO}_3 + \text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$.

Uses:

- (1) It is used to manufacture a type of effervescing drink 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.

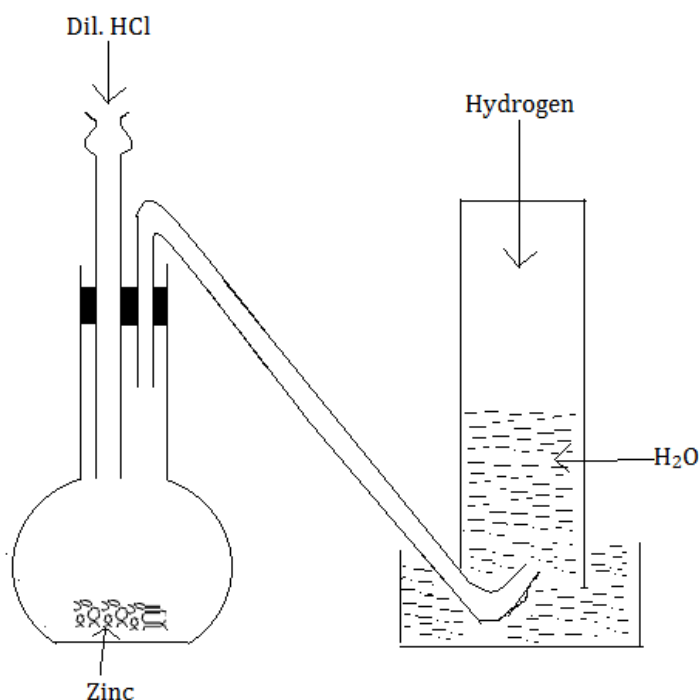
Test for CO_2 :

- 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 preparation:



- 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 for filling balloons.
- It is used in the “hardening” of oil to make margarine.
- It is used in the conversion of coal to synthetic “petrol”.
- It is used in the manufacture of hydrochloric acid.
- It is used in the oxyhydrogen flame, which is used for cutting and welding.

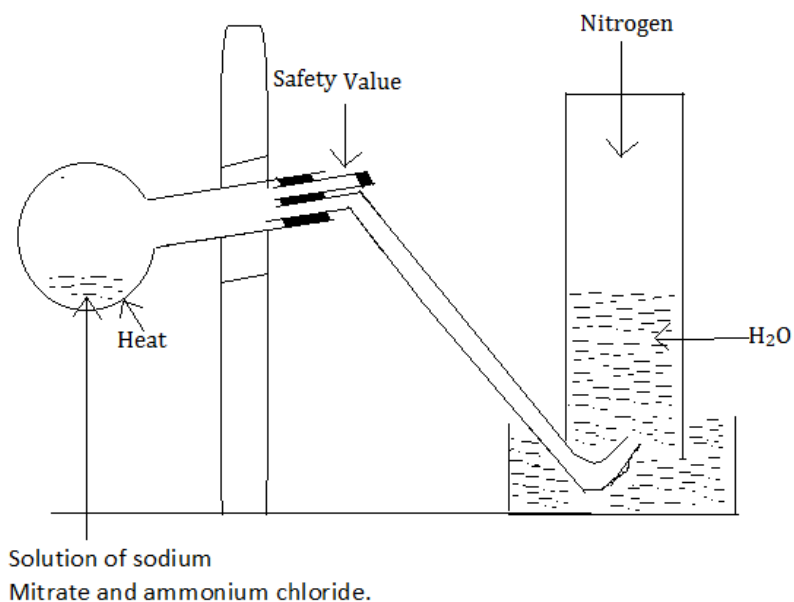
Test for hydrogen:

- Place a glowing wooden splint into a sample of the gas within a test tube.
- If a pop sound is heard, then the gas is hydrogen.
- Also if hydrogen is mixed with air and the resulting mixture is heated, it explodes.

Nitrogen:

- It forms about four-fifth of the atmosphere.

Preparation:



- A solution of ammonium nitrate readily decomposes when heated slightly to give nitrogen.
- 14g of sodium nitrate and 11g of ammonium chloride are weighed and combined.
- The mixture is placed in round bottom flask and 350cm³ of water is added.
- Heat is then applied gently and effervescence occurs.
- The nitrogen gas evolved is called over water.

Test for nitrogen:

To test for nitrogen, one must perform a series of tests and if the gas is nitrogen, then it must

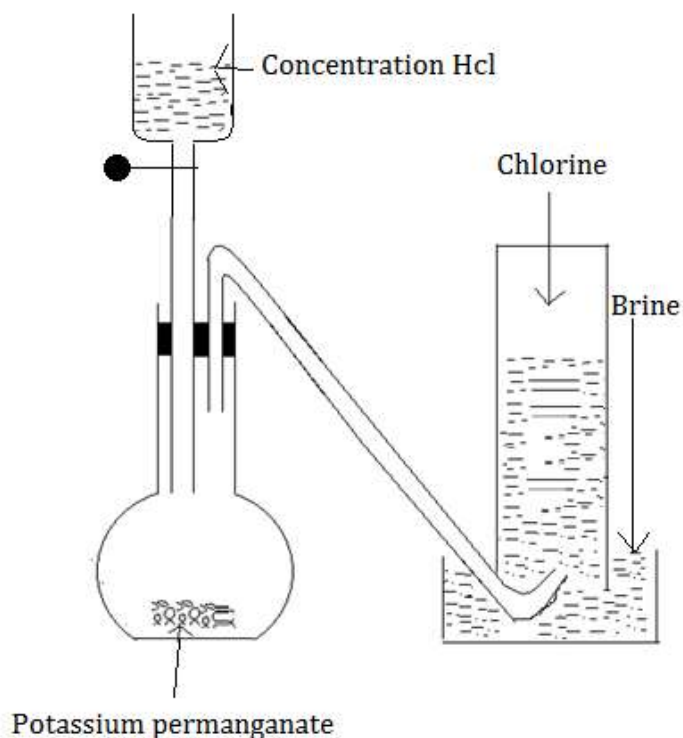
- (i) extinguish or put off a lighted splint placed in it.
- (ii) it must not turn lime water milky white.

Properties of nitrogen:

- It is a colourless and odourless gas.
- It is slightly less dense than air and only slightly soluble in water.
- Under ordinary conditions, the gas is inert.

Chlorine: This is a very reactive gas and for this reason, it is found in nature in the compound or the combined state. This implies that chlorine is found combined with other elements. It normally occurs in common salt or sodium chloride.

Preparation:



Solid potassium permanganate is placed in a flat bottom flask, and concentrated hydrochloric acid is dropped on it, from a tap funnel. As each of acid reaches the

permanganate, the corresponding quantity of chlorine is evolved and this is collected over brine or salt water.

Properties:

- It is a greenish-yellowish gas.
- It has an unpleasant or irritating smell.
- It bleaches damp litmus paper or damp red litmus paper colourless.

Uses:

- It is used in making polyvinyl chloride or p.v.c tubes, which are used in making pipes.
- It is used in the manufacture of bleaches, weed killers and pesticides such as D.D.T.
- It is used in water sterilization for domestic and industrial use.
- It is combined with bromine to form chlorofluorocarbon (C.F.C), which is used in refrigerators, air conditions and in many mosquito sprays.

The effect of C.F.C:

The earth is surrounded by a layer of a type of oxygen called ozone i.e. O_3 . This ozone stops harmful rays or radiation from the sun, reaching the earth. The problem posed by C.F.C is that it reacts with part of the ozone, creating holes within the ozone layer. Harmful ultraviolet rays pass through these holes to get to the earth. Those rays cause cancer in man. For being capable of causing such damage to the ozone layer, the amount of C.F.C being used is now being reduced.

Test of chlorine:

If the gas is greenish-yellowish in colour and can bleach damp litmus paper, then it is chlorine.