PREPARATION OF H2O, O2, N2 & CO2

OXYGEN

Oxygen is one of the most important and basic elements found in the earth's atmosphere. All living animals need oxygen in the air to survive. Without oxygen, there would be no trace of life on earth.

Laboratory Preparation of Oxygen

The most common ways of **preparation of oxygen** is
by simply treating hydrogen peroxide in a particular manner so that it decomposes to form water and oxygen from which then, the oxygen can be extracted. The equation can be expressed as:

- Hydrogen Peroxide → Water + Oxygen

- $2H_2O_2(aq) \rightarrow 2H_2O(L) + O_2(g)$

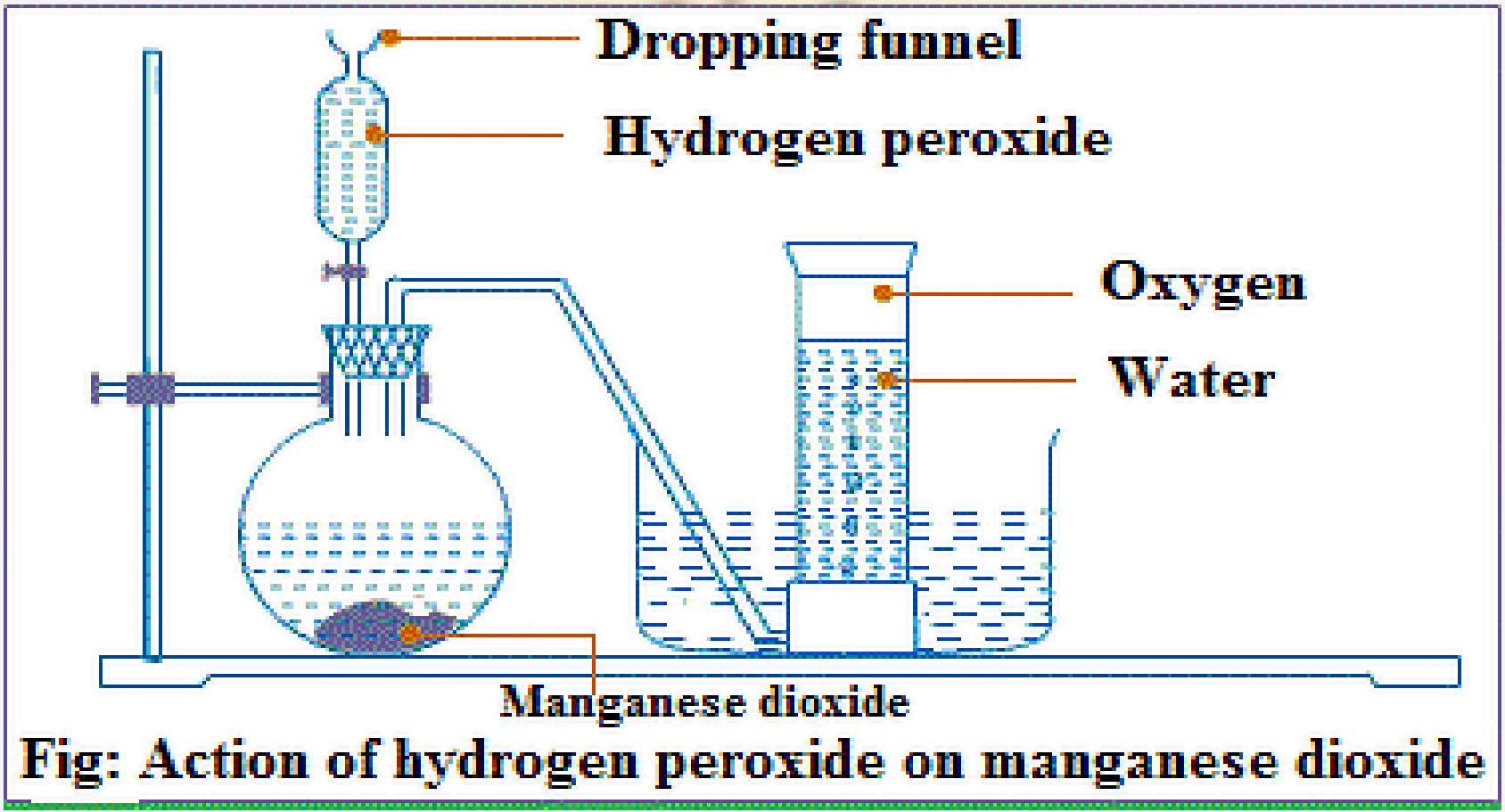


Fig: Action of hydrogen peroxide on manganese dioxide

- The main uses of oxygen are:
- Mandatory for living beings to live on earth as it is used for respiration.
- Oxygen is stored and carried in compressed oxygen tanks that are used by mountaineers for proper breathing in high-altitude areas where there is a distinct shortage of oxygen in the air.
- Used to support the breathing for surgical patients in hospitals (supplementary oxygen).
- Used to in welding torches in industries.
- Used to degrade hydrocarbon compounds which are further use for the manufacturing of propylene, ethylene, and hydrocarbons acetylene.
- Oxygen is essential in water purification processes.
- Used for the treatment of sewage.

Hydrogen

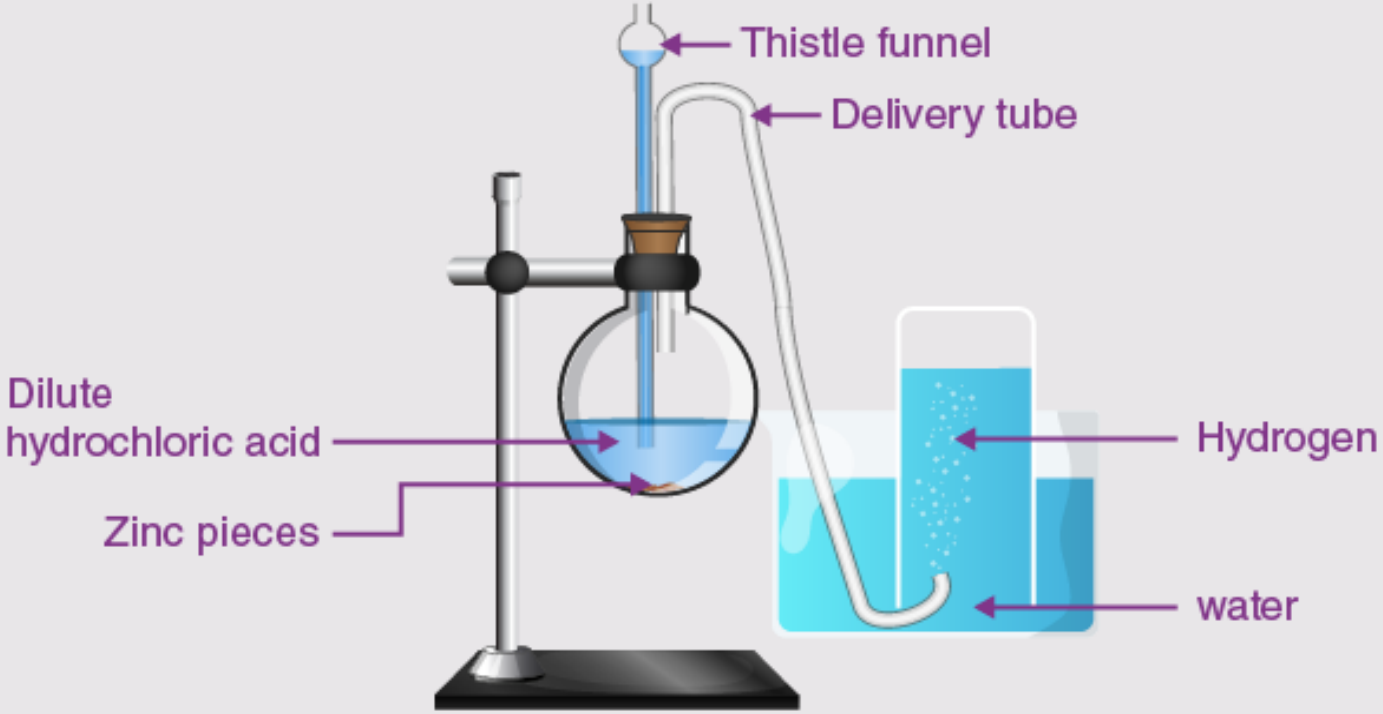
Physical properties of hydrogen

- Hydrogen is colourless, tasteless, and odourless.
- It is a combustible gas.
- Hydrogen is lighter than air.
- It is not soluble in water.
- It is composed of three isotopes, and they are similar to each other in consideration of their chemical properties. These isotopes differ when the physical properties are considered.

Laboratory preparation of hydrogen gas

Hydrogen is usually produced by the reaction of zinc with dilute hydrochloric acid. It is best to use granulated zinc for the process of preparing hydrogen.

PREPARATION OF HYDROGEN GAS



The purpose for the preparation of hydrogen gas

There are several uses of hydrogen gas for which hydrogen gas is produced.

- It is used to produce Vanaspati fat.
- Hydrogen chloride is manufactured with the help of hydrogen gas.
- Methanol and several other organic chemicals are produced by using hydrogen.
- Ammonia is manufactured using hydrogen, which further helps in manufacturing nitric acid.
- It is used as rocket fuel.
- Hydrogen helps in generating electric energy through fuel cells.
- Hydrogen torches are used for welding purposes.

Nitrogen as an Element in Chemistry

Nitrogen (N_2) is a colorless and odorless gas that comprises 78% of our atmosphere.

Laboratory preparation of Nitrogen-

Nitrogen is generated in the chemistry or any other laboratory by heating a saturated solution of ammonium chloride (NH4Cl) and sodium nitrite in a saturated measured quantity.
The chemical equation for the laboratory preparation of Nitrogen is-

- $NH_4Cl + NaNO_2 \rightarrow NaCl + NH_4NO_2$
- $NH_4NO_2 \rightarrow N_2$ (gaseous form) + $2H_2O$

Uses of Nitrogen

1. It improves the quality of green leafy vegetables as well as fodder crops.
2. An important component of chlorophyll, proteins, enzymes and amino acids.
3. It stimulates the growth of root uptake and the development of cations.
4. By diluting the oxygen in the air, thus, combustion becomes slower.
5. In the form of liquid Nitrogen, it is used for refrigeration.
6. In the production of various essential chemicals such as ammonia, nitric acid, and calcium cyanamide.

Figure 11.3 Uses of Nitrogen

Carbon dioxide

Physical Properties of Carbon dioxide

- Carbon dioxide is a colourless acidic gas.
- Carbon dioxide is smelled less (Odourless).
- It is 53% heavier than the air. Due to this, it finds more near the earth's surface.
- The solid carbon dioxide is called dry ice.

The structure of carbon dioxide is LINEAR.

Methods of preparation

Carbon dioxide is produced by reacting the carbonates with acids. So, for industrial preparation methods, the calcium carbonate reacts with hydrochloric acid.

$$CaCO_3 + \text{dil } 2HCl \rightarrow CaCl_2 + CO_2\uparrow + H_2O$$

$C + O_2 \rightarrow CO_2 + Heat$

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

$CaCO_3 \rightarrow CaO + CO_2$

Here is your answer ➜

1) CO_2 are used by plant to prepare food
2) CO_2 is used to control the combustion
3) CO_2 is used in refrigerator as coolant
4) CO_2 is used in soda drink
5) and it is also used as dry ice