(CHEMISTRY)

Air and Water

1. Air

- The region of air present around the earth is called **atmosphere**. Its main layers are :
  - i) Troposphere [upto about 10 km from surface of earth]
  - ii) Stratosphere [from 10 km upto about 60 km]
  - iii) Mesosphere [from 60 km to 80 km]
  - iv) Thermosphere [from upwards to about 320 km]
- Most of the atmospheric air is present in troposphere.
- The density of air is highest near the sea.
- Ozone layer is present in the stratosphere region of the atmosphere and consists of ozone gas.

2. Composition of air and the role of its components

S. N.	Component	Percentage by volume	Percentage by mass	Role of the component
1.	Nitrogen	78·090	75·5	Dilutes the air, and moderates respiration
2.	Oxygen	20·950	23·2	Essential for respiration and combustion
3.	Carbon dioxide	0·031	0·046	Photosynthesis
4.	Water vapours	0·4 – 4	0·4 – 4	Determines the climatic conditions
5.	Noble gases	0·940	1·920	No role in atmosphere
6.	Pollutants	Traces	Traces	Harmful effects on animals and plants.

3. Water

Water is the most abundant and widely distributed substance on earth.

The natural sources of water are : (1) Rains, (2) Rivers, (3) Springs and (4) Seas. On account of the great solvent power of water, it is never found pure in nature.

4. Properties of Water

- Water is the neutral oxide of hydrogen.
- It is colourless liquid under ordinary conditions.
- It is polar compound (dipole moment = 1·85D) and possesses a high dielectric constant (approx 81).
- It has abnormally high melting point and boiling point due to the association of H_2O molecules through hydrogen bonding.
- pH of water is 7.
- Co-valent molecules which are capable of forming hydrogen bonds with water molecules get dissolved *e.g.* lower alcohols, lower carboxylic acid, sugars are soluble in water due to hydrogen bond formation.
- Co-valent molecules which cannot form hydrogen bonds with water are not soluble in it *e.g.*, $CHCl_3$, CCl_4, benzene, alkanes etc.

5. Hard and Soft Water

Soft Water	Hard Water
1. With soap, it readily forms lather.	With soap, it hardly produces any lather.
2. Less soap is consumed during washing.	More soap is consumed while washing.
3. Soft water is not fit for drinking.	Hard water is safe for human consumption.

6. Types of Hardness in Water

(a) **Temporary hardness :** Temporary hardness of water is due to the presence of bicarbonates of calcium and magnesium, *i.e.*, $Ca(HCO_3)_2$ and $Mg(HCO_3)_2$. It is removed simply by boiling.

(b) **Permanent hardness :** Permanent hardness of water is due to the presence of soluble chlorides and sulphates of calcium and magnesium, *i.e.*, $CaCl_2$, $CaSO_4$, $MgCl_2$ and $MgSO_4$. This type of hardness is removed by washing soda, permutit and ion exchange methods.

Points to Remember

Role of Water in Plants :

- Water helps in the germination of seeds and growth of plants.
- Water helps in the preparation of food and also help in the transport of fertilizers and other nutrients to all the parts of plants.
- Water provides a habitat to a large variety of organism in the form of ponds, lakes and oceans etc.
- Water helps in maintaining the firmness and structure of plant parts by providing appropriate pressure to the plant tissues.

Role of Water in Human Body :

- Water is good solvent so it dissolves nutrients and salts which are then easily absorbed by the body.
- Water acts as a medium for all metabolic rections which takes place in the body.
- Water dissolves the waste material of the body and produces a good medium for exerting the body wastes.
- Water regulates body temperature.
- 70% of our body weight is water.

7. Heavy Water

- It is used in nuclear reactor as moderator because it slows down the fast moving neutrons.

Property	H_2O	D_2O
Freezing point	0°C	3·8°C
Boiling point	100°C	101.42°C
Temperature of maximum density	4°C	11·6°C
Dielectric constant	81	80
Solubility of substances	high	low