Types of solution

There are three types of solutions on the basis of solute concentration:

1. Isotonic solution
2. Hypertonic solution
3. Hypotonic solution

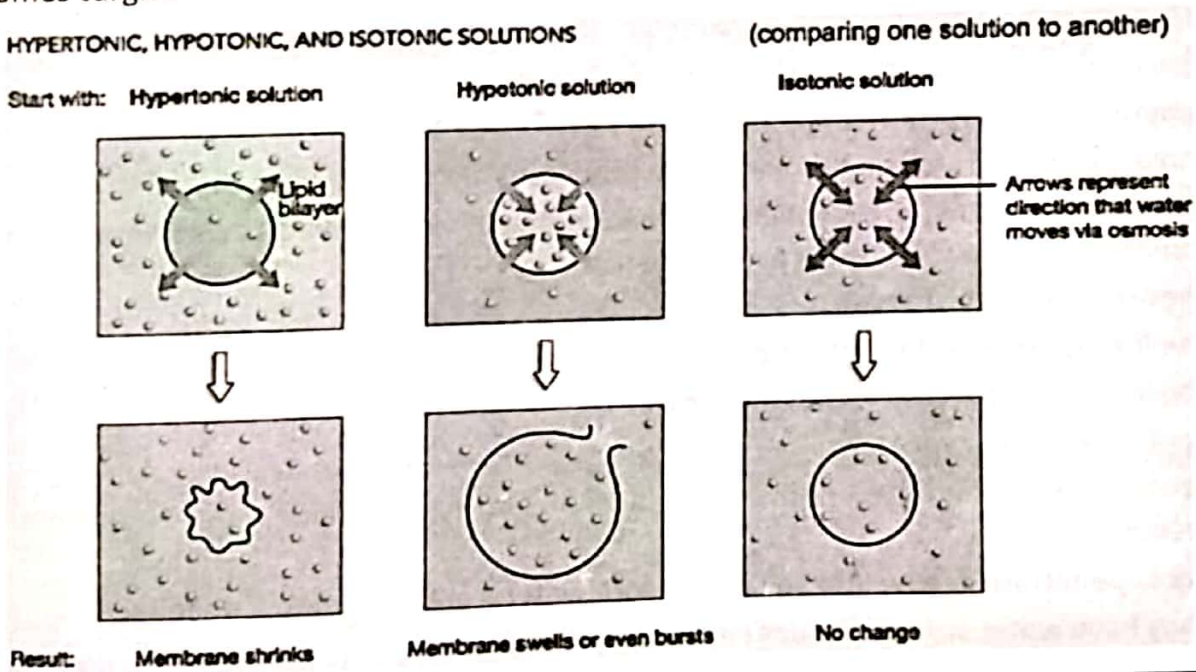
1. **Isotonic solution:** A type of solution in which concentration of dissolved solutes in intracellular (inside cell) and extracellular (outside cell solution) environment is same, it is called isotonic solution.

   When cell is placed in isotonic solution, nothing will happen to the cell due to the same solutes concentration in and outside the cell.

2. **Hypertonic solution:** A type of solution in which extracellular environment is more concentrated (more solutes and less water) than intracellular environment. When cell is placed in hypertonic solution, exosmosis of water occurs and results in shrinkage of protoplasm (plasmolysis).

3. **Hypotonic solution:** A type of solution in which intracellular environment is more concentrated (more solutes and less water) than extracellular environment (more water and less solutes) is called hypertonic solution e.g. fresh water.

   When cell is placed in hypotonic solution, endosmosis of water to the cell occurs. As a result cell becomes turgid.



Homeostasis in plants

The tendency of an organism to keep its internal environment constant or nearly constant is called homeostasis or the protection of internal environment of cell/ organism from the fluctuations in external environment is called homeostasis.

Homeostasis in plants: As plants are exposed to the environment where external condition changes from time to time which cause change in the internal environment of plant. However, plants exist there changes to present change in the composition of tissues fluid. This resistance is called homeostasis.

Homeostasis does not mean to keep the internal environment fixed, however it means to keep it in narrow limit, b/c slight changes are necessary from plant physiology

Types

(i) Thermoregulation: It is maintenance of Temperature

(ii) Osmoregulation: It is maintenance of water and salts

Osmoregulation or osmotic regulation: The control of gain or loss of water and salts is called osmoregulation.

On the basis of osmoregulation plants are classified into FOUR groups:

1. **Hydrophytes:** Hydro= water, phyte= plant
   - Those plants which are found in water are called hydrophytes.
   - Hydrophytes are further divided into three groups:

   i. **Sub-merged hydrophytes:** They grow below the surface of water. They have no stomata and root hairs. They absorb water through general body surface
   e.g. *Hydrilla*, *Vallisneria* and *Potamogeton* etc.

   ii. Free floating hydrophytes: They float freely on the surface of water and not attached with soil.

   iii. Free floating with rhizome rooted in the mud: There leaves occur on the surface of water and their rhizome is anchored in the soil e.g. Lotus

2. **Mesophytes:** Meso= middle, phyte = Plants
   - Mesophytes grow in moderate conditions i.e. neither wet nor dry conditions. These are ordinary land plants e.g. Rose, *Dalbergia*, Mulberry *Citrus*, pea, peach etc.

3. **Xerophytes:** Xero= dry , phyte = Plant
   - Those plants w/c grow in day and sandy conditions are called xerophytes.
   - These plants grow in externally hot environment, so to maintain its internal environment constant, they have following adaptations.
   - They have sunken stomata.
   - The leaves are modified into thorns.
   - The leaves are covered with think cuticle.
   - Roots are of two types
   - Roots grown on surface around and grown at the region where water is available i.e. surface feeder.
   - Roots penetrate deeply into soil and absorb water from soil depth = deep feeder
   - They have water storage tissues i.e. succulent tissues.
   - xerophytes grown in physical drought (less no water)

   e.g. *Cactus, Opuntia, Aloe, Ruscus, Acacia, Zizyphus* and *Calotropis* etc.

4. **Halophytes (Halo= salt, phyte= plant)**
   - Halophytes grow in soil with high salts concentration.
   - Halophytes are not salt lover but salt tolerant plants.
   - Halophytes grow in physiological drought.
   - Halophytes possess xerophytic characters i.e.
   - Leaves contain water storage tissues.

- Leaves are covered with thick cuticle.
- Mangrove plants are the characteristic halophytes.
- They possess negatively geotropic respiratory roots known as pneumatophores.
- Helophytes have high osmotic potential cells.
- Vivipary: The germination of seed still in fruit in parent plant. After enough generation, it fall on the ground e.g. *Salsola* (Saltwort) and *Rhizophora* etc.

Adaptation of plants to low and high temperature

hermoregulation: The tendency of organism to maintain its normal (optimum) temperature is called hermoregulation. Temperature is one of the most important factor for growth of an organism.

Low temperature: Low temperature affects plant physiology.

At 0^0C water freezes and ice crystal formation occurs which damage plant tissues.

High temperature: High temperature denatures proteins and enzymes.

Low Temperature adaptations

hose plants which grow in low temperature regions show the following adaptations.

They have thick and hard stems which can with stand low temperature.

They have scale like leaves.

They have short life cycle.

They reduce rate of transpiration to avoid cooling effect.

They cause changes in solute potential to prevent ice crystal formation.

High Temperature adaptations

High temperature is harmful for plants as it dentures proteins and enzymes, so plants living in hot environment show the following adaptations:

i. They have well developed roots which absorb the available small amount of water.
ii. Leaves are modified into spines to reduce rate of transpiration.
iii. They absorb water in short rainy season and store in water storage tissues.
iv. The leaves are reduced in size which reduce rate of transpiration.
v. They have sunken stomata.
vi. They have extensive aerial branches which prevent evaporation of water beneath soil.