

The Role of Water

Water is the most abundant of the smaller molecules making up living things, and typically makes up about two-thirds of any organism. Water is a liquid at room temperature and many substances dissolve in it. It is a medium inside cells and for aquatic life. Water takes part in, and is a common product of,

many reactions. Water molecules are **polar** and have a weak attraction for each other and inorganic ions, forming large numbers of weak hydrogen bonds. It is this feature that gives water many of its unique properties, including its low viscosity and its chemical behavior as a **universal solvent**.

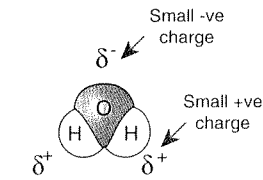
Important Properties of Water



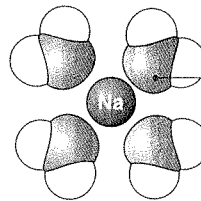
A lot of energy is required before water will change state so aquatic environments are thermally stable and sweating and transpiration cause rapid cooling.



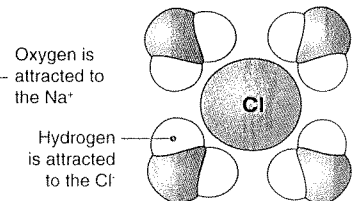
Water is colorless, with a high transmission of visible light, so light penetrates tissue and aquatic environments.



Water molecule
Formula: H_2O

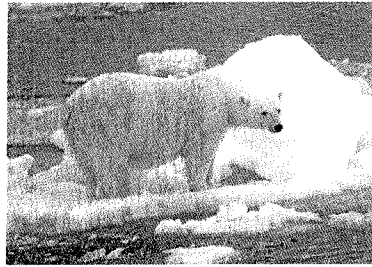


Water surrounding a positive ion (Na^+)

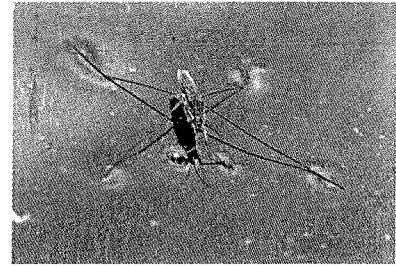


Water surrounding a negative ion (Cl^-)

The most important feature of the chemical behaviour of water is its dipole nature. It has a small positive charge on each of the two hydrogens and a small negative charge on the oxygen.



Ice is less dense than water. Consequently ice floats, insulating the underlying water and providing valuable habitat.



Water has low viscosity, strong cohesive properties, and high surface tension. It can flow freely through small spaces.

1. On the diagram above, showing a positive and a negative ion surrounded by water molecules, indicate the polarity of the water molecules (as shown in the example provided).

2. Explain the importance of the **dipole nature** of water molecules to the chemistry of life: _____

3. For (a)-(f), identify the important property of water, and describe an example of that property's biological significance:

(a) Property important in the clarity of seawater: _____

Biological significance: _____

(b) Property important in the transport of water in xylem: _____

Biological significance: _____

(c) Property important in the relatively stable temperature of bodies of water: _____

Biological significance: _____

(d) Property important in the transport of glucose around the body: _____

Biological significance: _____

(e) Property important in the cooling effect of evaporation: _____

Biological significance: _____

(f) Property important in ice floating: _____

Biological significance: _____