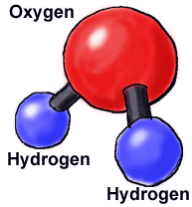


The Properties of Water and its role in living organisms

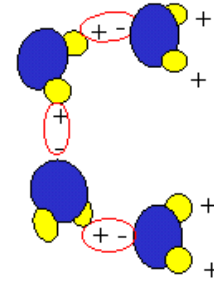
People regard water as being pretty ordinary as it is transparent, tasteless and odorless. However, it is one of the most remarkable substances.

Water seems, at first sight, to be a molecule which is very simple, consisting of just two hydrogen atoms attached to an oxygen atom. There are very few molecules that are smaller or lighter. However the size of the water molecule belies the complexity of its actions and its unique capabilities seem to ideally fit into the requirements of life an no other molecule can.



Water has three states. Below freezing water is a solid, between freezing and boiling water is a liquid, and above its boiling point water is a gas.

The name given to the fact that water is attracted to other water is called cohesion. Water can also be attracted to other materials. This is called adhesion. The oxygen end of water has a negative charge and the hydrogen end has a positive charge. Therefore the hydrogens of one water molecule are attracted to the oxygen of another water molecule. The attractive force is what gives water its cohesive and adhesive properties.



Surface tension is the name given to the cohesion of water molecules at the surface of a body of water.

Negatively charged oxygen atoms and positively charged atoms make water polar. Due to its polarity, water has been called a universal solvent, resulting in its ability to ionize substances easily.

Often, when reactions take place in organisms, substances must be in solution, and water is the solvent. Large starch molecules must be broken down into soluble sugars as the human digestive system will only dissolve soluble foods. Water is such a good solvent that oxygen gas dissolves in it, allowing many underwater organisms to survive.

Water plays a vital part in cells in the following ways:

- Hydrolysis, the break down of a substance by water
- A medium for chemical reactions, due to its properties as a solvent
- Diffusion and osmosis of substances eg, gaseous exchange, moist conditions required, exchange occurs in solution, therefore water is present in lungs.

On a much larger scale, water is also used for transport. Blood is used to transport food, hormones, urea and oxygen and it is mostly water. In plants, sap is used to transport food and other substances. These can only be transported as they can dissolve in water. Water is also used during fertilization. Sperm is transported in semen, which is mostly water.

Water surrounds many internal organs to give protection and lubrication, such as the pericardial fluid around the heart, and the brain contains cerebro-spinal fluid.

A growing fetus is protected and supported by amniotic fluid and mucus, lubricant mucus in the gut, allow easy passing of food.

Plant cells consist of a cell wall and cell membrane and when the cell becomes full of water due to osmosis, it doesn't burst. This is because a force equal to the osmotic force is exerted by the cell wall.

The physical and chemical properties of water allow it to act as an excellent solvent because of its polarity. Due to its cohesive forces within molecules, it is an excellent support mechanism.

All life evolved in water, and still relies on it.