

Show Why Water Is Biologically Important In Living Organisms And Why It's Important As An Environment For Them.

Water is essential to life itself, with out water, life on earth would not exist. Water is a major component of cells, normally forming between 70 and 95% of a cell. This means that we are made from approximately 80% water and some creatures such as jellyfish are made of up to 96% water. Water also provides an environment for organisms to live in, 75% of the earth is covered in water.

Only 1% of the world's water is usable to us. About 97% is salty seawater, and 2% is frozen in glaciers and polar ice caps. Thus that 1% of the world's water supply is a precious commodity necessary for our survival. Dehydration will kill us faster than starvation. Since the plants and animals we eat also depend on water, lack of it could cause both dehydration and starvation.

Water itself is a simple molecule made up of 2 hydrogen atoms and one oxygen atom, H₂O. The hydrogen and oxygen atoms are bonded covalently. The electrons are not shared equally, the oxygen molecules gets more than its fair share so is slightly negatively charged and the hydrogen gets less than its fair share so has a slightly positive charge. This unequal distribution of charge is called a dipole. The negative charge of the oxygen is attracted to the positive charge of the hydrogen. This is called a hydrogen bond which is much weaker than a covalent bond but still very effective.

The hydrogen bonding makes the molecules more difficult to separate. The hydrogen bonds make it possible for water to be a liquid at normal room temperature where as other small molecules would exist as a gas.

Water is an unusual substance, mostly due to its hydrogen bonds; its properties allow it to act as a solvent, a reactant, as a molecule with cohesive properties, as an environment and as a temperature stabiliser.

Water can dissolve ions and polar molecules and can keep them in solution because of water's own polar properties. Substances that dissolve in water are known as hydrophilic substances. Substances such as sodium chloride are made up of positive and negative ions. Sodium chloride is held its structure by the strong attraction between its positive sodium ions and negative chloride ions. These attractions need a lot of energy to break but when put in water the negative oxygen in the water molecules surround the positive sodium ions and the positive hydrogen atoms surround the negative chloride ions. The attraction between the positive sodium and negative chloride ions is weakened as the ions separate.

Water can also separate covalently bonded molecules e.g. glucose and sucrose. Water's properties as a solvent are vital to life as most biochemical reactions such as respiration occur in solution. This is why cell cytoplasm contains about 90% water.

Water also has many thermal properties as a temperature stabiliser. Water has a boiling point of 100 degrees C and a melting point of 0 degrees C. This is unusual for a molecule of its size because other molecules of a similar size, are gases at room temperature when water is a liquid. This is due to the hydrogen bonds, which hold the water molecules in a liquid state. It takes a lot of energy to raise the temperature of water significantly, but once warm it cools slowly. Large bodies of water stay at almost the same temperature with only a very gradual change that makes it easier to achieve a stable body temperature.

Water is described as having a high latent heat of evaporation because of the large number of bonds holding water molecules together, it takes a large amount of energy to separate them and turn the water to gas. Animals use this to cool their bodies, as in

sweating and panting, by using excess body heat to evaporate water from their surfaces, resulting in them transferring a lot of energy into the environment.

Water is unusual because ice, the solid form of water is less dense than the liquid. Below 4 degrees C, the density of water decreases and so the ice floats on the water and insulates the water and the life underneath it. This is vital for the cytoplasm in cells, which is made of a high percentage of water because when it is frozen the cell would be destroyed; therefore the aquatic life would be destroyed. As there are many solutes in cytoplasm the water will not freeze until well below 0 degrees C and the cells are protected until the temperature gets extremely low.

The changes in the density of water with temperature, maintains the circulation of nutrients in the oceans because of the currents it causes.

Water is the transport medium in the blood, in the lymphatic, excretory and digestive systems of animals and vascular tissues in plants. Water's solvent properties are essential.

Photosynthesis uses water as a source of hydrogen atoms that are needed to produce glucose, which is then stored in the plant cells as starch or used for respiration. Without water these two essential reactions would not occur and life would not be able to continue on earth. An important property of water is also its transparency; it allows sunlight to pass through it so aquatic plants can photosynthesis.

Water molecules are highly cohesive because of the hydrogen bonds between the molecules. This means that they stick together. The cohesive properties of water allows plants to pull up water through vascular tissue from the roots to the leaves, and is an important property in cells.

The water molecules form an elastic film known as surface tension on the water surface. This allows some small organisms like pond skaters to use the water surface as a habitat, permitting them to move across the surface of the water without sinking as they have hydrophobic feet, which stops them from breaking the surface tension.

Good water is essential to body cleansing. Making up almost three-fourths of the body, every cell is regulated, monitored and dependent on an efficient flow of water. Not one of the processes in our bodies could take place without water. Water is something that we take for granted. When you get enough water fluid retention decreases, and gland and hormone functions improve. Water regulates the body temperature, maintains the equilibrium and helps the liver break down and release more fat. Water carries every nutrient, mineral, vitamin, protein, hormone and chemical messenger in your body to its destination. Proteins and enzymes, the basis for your body's healing capacity, function efficiently only when you have enough water. Our daily energy depends on water, because your body's chemical reactions are water-dependent. The brain tissue is 85% water. It lubricates and flushes wastes and toxins from all cells. It cleanses the internal organs. It helps eliminate toxins from the bloodstream. In conclusion water's unique properties make it perhaps the most biologically important substance on the planet. No other substance shares similar properties to water and in the way that one single molecule can possess such varied and essential characteristics.