The structure and function of water in living organisms

Over two thirds of the Earth today is water , and living organisms are 80% water by mass, they must retain this to survive. Water is a vital solvent and reactant in everyday life.

The formula for water is H20. Compared to other molecules H20 is very small. Two hydrogen atoms are covalently bonded to one oxygen atom. Covalent bonds are formed by sharing electrons in outer energy levels of atoms. The large number of protons in the oxygen nucleus has a stronger attraction for shared electrons than the hydrogen nucleus. Oxygen therefore pulls electrons slightly closer to itself so that it develops a weak negative charge represented as ς- and hydrogen develops a slight positive charge represented as ς+. This means the charge distribution is unequal and it becomes a polar molecule. Adjacent molecules of water are attracted because the negatively charges O attracts a positively charged H. The bonds between the molecules are called hydrogen bonds and they make water very stable.

Water has many functions which are essential for its uses. It has a high specific heat capacity; this means that it takes a lot of heat to break the hydrogen bonds and for water to evaporate into a gaseous form. A lot of heat energy is needed to evaporate water from the surface of the skin. Having a high specific heat capacity enables water to act as a buffer. This mean s that it's essential in endothermic organisms that need to maintain a constant body

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Temperature in order to optimise enzyme activity and regulate metabolism. When water freezes it forms a solid, ice. This is lighter than warmer water and on a pond the ice will freeze on the top as an insulating layer. This enables fish and other living forms to survive beneath the ice. In ice the hydrogen bonds between the molecules are more regular so this makes it a semi crystalline solid.

Water is cohesive because the hydrogen bonds hold the molecules together; therefore it has a surface tension. This enables insects such as pond skaters to travel across the top layer of water. Their weight isn't great enough to break the surface tension and the waxy cuticle prevents it from getting wet. If a drop of water is dropped onto a polished surface, the drop will remain intact and it will not spread whereas a drop of alcohol would spread. This serves a vital function for plants. Cohesiveness and high surface tension means that long columns of water remain intact when travelling up capillaries such as xylem. The process of transpiration can carry water to the highest leaves on trees up to 30m high.

Water is also essential in sexual reproduction because it's needed to bring female and male gametes together. In pregnancy the foetus develops a water filled sack; this gives it physical and thermal stability.

Water is good for transporting material an example is in the uptake of minerals by plants from the soil, transpiration then occurs in the leaves.

The stability and solvent properties of water are essential in processes such as photosynthesis, respiration and excretion.

Water maintains the maximum surface area of the leaf.

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Water has many solvent properties; at normal temperature water is a liquid. This contrasts with molecules such as nitrous oxide and hydrogen sulphur because they have the same or greater m olecular masses as water but they are gases. Water is a liquid due to high polar nature. It is a good solvent because substances dissolve into it. Polar molecules such as water (H_2O) react with ionic compounds such as sodium chloride (NaCl). NaCl is made up of a positive sodium ion (Na^+) and a negative chlorine ion (Cl^-). When NaCl is added to H_2O they split into separate atoms and are rebounded because the force of attraction between O^- and Na^+ is greater, as is the force between H^+ and Cl^-. This process is called hydration.
Some molecules have strong intramolecular forces and they do not dissociate in water. They still have a charge so they attract a layer of H_2O. The molecules therefore remain dispersed which prevent them from joining together and this is called colloidal suspension.

Water is a solvent which is biologically important; in many living many organisms' biochemical reactions take place in the cytoplasm or other substances such as the blood. Water serves as a solvent which h olds ions such as potassium and chloride or other organic molecules such as glucose and proteins in a liquid phrase and these molecules are transported in the solution.

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Water also removes excretory products from the human body such as urea and ammonia.

The process of osmosis is when water moves in and out of cells depending on the concentration of solutes. Water will move from a high to a low concentration. When it enters the cell will swell until it becomes turgid.

In conclusion I can prove that the importance of water in living organisms is essential. Functions such as transport, chemical reactions, temperature control, support, movement and reproduction need water to happen. Its structure is so that it allows water to have many prop erties.

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