

Question: Explain how the structure and properties of water relate to the role water plays as a medium of life.

Water is a colorless, tasteless, and odorless liquid at room temperature. It is composed of the elements Hydrogen and Oxygen. Both Oxygen and Hydrogen atoms combine to form a v-shaped molecule. This v-shaped molecule is electrically neutral, yet the oxygen atom holds a small negative charge and the two hydrogen atoms hold small positive charges. These properties make water a unique substance.

The importance of water as a medium of life relates to its properties which include its solvent properties, heat capacity, surface tension, adhesion, cohesion and heat of vaporization and freezing properties.

Water is often called the universal solvent because water can dissolve more substances than any other liquid. Water combines with certain salts to form hydrates. It reacts with metal oxides to form acids. It also acts as a catalyst in many important chemical reactions. The properties of water make it an ideal medium for cellular life. Water is an excellent solvent for polar molecules, some of which dissociate in solution to form ions (ionization). Water repels non-polar molecules.

Another very interesting and important property of water is its high specific heat capacity. This means it takes a lot of energy to raise the temperature of water. Water's greater latent heat and thermal capacity as compared with other liquids are the reasons that bodies of water heat up and cool off more slowly than does the land. Because of these unique thermal properties of water, the temperature differences between summer and winter or between night and day remain constantly within limits such that human beings and other living things can survive. If the surface of our world had less water than it does land, the temperature differences between night and day would have been much greater, large regions of land would have been desert, and life might have been impossible or, at the very least, much more difficult. Similarly, if the thermal properties of water had been different from what

they are, the result would have been a planet unsuitable for life.

The surface tension of water is much higher than that of any other known liquid. Some of the biological consequences of this are crucial and this is particularly evident in the case of plants. Plants are able to convey water from the depths of the soil many meters into the air without pumps. This is made possible by surface tension. The channels in the roots and stems of plants are designed to take advantage of water's high surface tension. These channels grow thinner the higher they reach and quite literally cause water to "creep up" on its own.

Another important result of water's high surface tension is the breakup of rock. Because its surface tension is so high, water is able to penetrate into the deepest recesses of rock through the tiniest of cracks where it freezes when the temperature drops below zero. Water is unusual in that it expands when it freezes. This expansion exerts interior forces upon rock that causes it eventually to break up. This process is vitally important because it releases the minerals trapped in rock into the environment and also contributes to the formation of soil. The hydrogen bonding between water molecules causes stickiness to each other. This is what holds water together.

From the content presented, it is obvious how the thermal, physical, chemical, and viscosity properties of water are exactly what they must be in order for life to exist. Water is so perfectly designed for life that, in some cases, the very laws of nature are suspended to make it so. The best example of this is the unexpected and inexplicable expansion that takes place in water's volume when its temperature falls below 4°C: if that didn't happen ice wouldn't float, the seas would freeze all but solid, and life would be impossible.

Water is "just right" for life to a degree that cannot be compared with any other liquid. The larger part of this planet, a world whose other attributes (temperature, light, electromagnetic spectrum, atmosphere, surface, etc) are all suitable for life, has been filled with just the right amount of water necessary for life. It should be

obvious that this cannot all be accidental and that there must instead be intentional design.

To put it another way, all the physical and chemical properties of water show us that it is created especially for life. The earth, purposefully created for mankind to live in, was brought to life with this water that was specially created to form the basis of human life.

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