

Sub-topic: 2.1 – Chemical Elements and Water

- 2.1.1 1 State that the most frequently occurring chemical elements in living things are carbon, hydrogen, and oxygen.

The most frequent occurring chemical elements in living things are first oxygen, which is 65% of organisms, then carbon that is 18.5 % of organisms, and then hydrogen, which is 9.5%.

- 2.1.2 1 State that a variety of other elements are needed by living organisms including nitrogen, calcium, phosphorus, iron, and sodium.

A variety of other elements are needed by living organisms including nitrogen, calcium, phosphorus, iron, and sodium. Nitrogen is the fourth most needed element making up 3.3% of the organisms and the other elements named make up part of the 8% of trace elements.

- 2.1.3 1 State one role for each of the elements mentioned in 2.1.2.

Nitrogen is responsible for the synthesis of proteins from amino acids, and synthesis of coenzymes. Phosphorus is responsible for the synthesis of nucleic acids ATP and built into bone. Sulfur is responsible for the synthesis of proteins. Calcium is responsible for middle lamella formation between plant cells, a constituent of bone, used for muscle contraction and for impulse transmissions across synapse, and blood clotting. Iron is responsible because it is a constituent of hemoglobin and helps red blood cells gets oxygen.

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2.1.4 2 Outline the difference between an atom and an ion.

An atom is the smallest unit of matter that still retains the properties of an element. While an ion is an atom that has gained or lost electrons, thus acquiring a charge making it an ion instead of an atom.

2.1.5 2 Outline the properties of water that are significant to living organisms including transparency, cohesion, solvent, properties, and thermal properties.

Properties of Water

<u>Property</u>	<u>Benefit to life</u>
Liquid at room temperature, water dissolves more substances than any other common liquid.	Liquid medium for living things and for chemistry of life.
Much heat energy needed to raise the temperature of water.	Aquatic environment slow to change temperature.
Evaporation of water requires a lot of heat.	Evaporation causes cooling much heat lost by an evaporation of a small quantity of water.
Much heat has to be removed before water freezes.	Cell contents and water in aquatic environments are slow to freeze in cold weather.
Water is at maximum density at 4 degrees Celsius.	Ice forms on surface of water insulating the water below, allowing aquatic life to survive.
Surface water molecules orient with hydrogen bonds formed inwards.	Certain animals use this surface tension to move over water.
Water molecules slide past each other easily.	Water flows through narrow capillaries (low viscosity).
Water molecules adhere to surfaces.	Water molecules adhere to walls of plant vessels as it is drawn up the stem to the leaves from the roots.
Water is transparent.	Aquatic plants can photosynthesize.

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- 2.1.6 3 Explain the significance to organisms of water as a coolant, transport medium and habitat, in terms of its properties.

Water is significant as a coolant because water has such a high heat of vaporization which is the quantity of heat a liquid must absorb for 1 gram of it be converted from the liquid to the gaseous state. Water's high heat of vaporization helps moderate Earth's climate. As a liquid evaporates, the surface of the liquid that remains behind cools down. The evaporative cooling occurs because the hottest molecules, those with the greatest kinetic energy, are the most likely to leave as a gas. Evaporative cooling of water contributes to the stability of temperature in lakes and ponds and also provides a mechanism that prevents terrestrial organisms from overheating. Water is also significant as a transport medium because of evaporation from leaves pulls water upward from the roots. Cohesion due to hydrogen bonding helps hold together the column of water within a vessel. Adhesion of the water to the vessel wall also helps in resisting the downward pull of gravity. Water also is used as a transport in organisms because it is used to transport materials through the blood and water is what makes the blood run. Water also helps in habitats of the environment by freezing water on the top layer insulating the organisms inside. And also certain animals use water as a surface tension to move over water.