

## Water –An Elixir of Life (A Review)



### CHEMISTRY

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### ABSTRACT

*Water can exist in all three states of matter solid, liquid and gas. Under ambient conditions it is liquid. Only 2.5% of the Earth's water is fresh water, and 98.8% of that water is in ice and groundwater. Less than 0.3% of all freshwater is in rivers, lakes, and the atmosphere, and an even smaller amount of the Earth's freshwater (0.003%) is contained within biological bodies and manufactured products. Water is most widely used chemical by all living beings, water has some unique properties, Life depends upon these unique properties of water ( Luck, 1985). Availability of water is one of the criteria used by Astronauts for searching existence of life on different planets. Water has large heat capacity, high thermal conductivity, high water content in organisms prevent local temperature fluctuations. Due to high latent heat of evaporation it is resistant to dehydration and considerable coolant. Water is an excellent solvent due to its polarity, high dielectric constant and small size, particularly for polar and ionic compounds and salts. Without water, biological processes particular metabolic processes could not exist.*

Human body contains from 55% to 78% water dependent on body size. The body's supply of Blood, Muscles Brain and bones are all created with water,

#### Special properties of water;

**Water is solvent** in which many of the body's solutes dissolve and as an essential part of many metabolic processes within the body. Metabolism is the sum total of anabolism and catabolism. In anabolism, water is removed from molecules in order to grow larger molecules (e.g. starches, triglycerides and proteins for storage of fuels and information). In catabolism, water is used to break bonds in order to generate smaller molecules (e.g. glucose, fatty acids and amino acids to be used for fuels for energy use or other purposes).

Water contributes to the planet's climate. Water vapours trap energy radiated from the surface of the planet (green house gas) and helps to keep the planet warm. On the other hand, clouds and ice fields on the surface reflect a good deal of the radiation from the sun, so this radiation does not reach the surface and warm it. The clouds and ice has a cooling effect on the planet.

Water has a special property of Hydrogen Bonding. Latimer and Rodebush (1920) first described hydrogen bonding in 1920. Each liquid water molecule is involved in about four hydrogen bonds these bonds are having less strength than covalent bond (Pimente & McClellan, 1960). The Hydrogen Bond is part (about 90%) electrostatic and part (about 10%) covalent (Isaacs et al., 2000). Hydrogen bonding (Eisenberg & Kauzmann, 1969) is responsible for the lower density of ice than of liquid water. When the solid melts, many of the hydrogen bonds are broken and the structure collapses, so liquid water is denser than the solid. Hydrogen bonding is also responsible for the six-fold symmetry of snowflakes. Hydrogen bond length of water increases with increase of temperature but decreases with pressure increase, hydrogen bond strength also depends almost linearly, outside extreme values, on the temperature and pressure (Dougherty, 1998)

As warm water has less density than cold water, so, warm water floats on the surface of lakes, rivers and the oceans insulating the main portion of the water bodies from being over-heated by the sun.

Water is fundamental to photosynthesis and respiration. Photosynthetic cells use the sun's energy to split off water's hydrogen from oxygen. Hydrogen is combined with CO<sub>2</sub> (absorbed from air or water) to form glucose and release oxygen. All living cells use such fuels and oxidize the hydrogen and carbon to capture the sun's energy and reform water and CO<sub>2</sub> in the process (cellular respiration).

The consumption of lesser quantity water can cause dehydration, which creates problem for flow of blood. As a result brain will function less and one is likely to suffer from tiredness. Consumption of less water can develop a range of kidney infections and even kidney stones. Water flushes out toxins of body and can benefit weight loss. Water is one of the best defences against aging. According to experts, to get the benefit one should drink eight glasses a day. But a lot of this can come from fruits, which contains a lot of water-and even a small amount of tea and coffee. Four or five glasses a day

Also Water is one of the only compounds that expand when it freezes. If it contracted as other compounds do, ice would sink and destroy life. Without this anomaly, ice would sink to the bottom of lakes, and the lakes in the temperate and arctic climates would be frozen from the bottom up.

Due to presence of high specific heat of water it acts as very good coolant. If water is frozen, its specific heat becomes half, so ice tends to warm easily. If it is liquid, it tends to be more difficult to raise the temperature. To boil, it requires a specific heat of 80. Because of this phenomenon, water tends to remain near the most desirable temperature for life on earth regardless of drastic changes in atmospheric temperatures. The anomalously high specific heat of water and the right quantity of water stabilizes earth's temperature.

Sound travels through sea water about 4.5 times as fast and much louder as it travels through air. This gives fishes an opportunity to escape danger, and enables many sea creatures such as dolphins and whales to communicate over very long distances, even thousands of kilometres..

TDS (total dissolved salts) in water determines quality of water.

**Hard water contains more calcium and magnesium salts. It decreases the performance of soap and/or detergent**

**Soft water** contains little or no dissolved salts of calcium or magnesium. It is good for washing purposes

Potable water (drinking water) is water which is fit for consumption by humans and other animals. Water may be naturally potable, as is the case with pristine springs, or it may need to be treated in order to be safe. In either instance, the safety of water is assessed with tests which look for potentially harmful contaminants.

#### CONCLUSION

Water possesses properties that are unique and are required for life-giving processes. These properties are brought about by the hydrogen bonded environment particularly in liq-

uid state. Water is an elixir of life it must not be wasted and should be used as a special gift from GOD.

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