CHEMICAL AND PHYSICAL PROPERTIES OF WATER

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Abstract - All living things depend on water because of its special chemical and physical properties. Solid water floats over liquid water, which is a well-known fact. A liquid contracts as it gets colder and reaches its densest point. The distinction between water and other liquids makes it special. Water expands once it reaches 4°C and then contracts again until it reaches 0°C, where it expands once more until it freezes. Ice floats in soft drinks, oceans, and ponds due to its lower density, while lakes freeze from the top down, allowing aquatic life to flourish in the below-freezing waters.

Key Words: Chemical, Physical, Properties

INTRODUCTION
Water molecules contain one oxygen atom and two hydrogen atoms. This underlying structure is what gives water its remarkable properties. Two electrons are shared by each hydrogen and oxygen atom to form their chemical bond. In the shared pair between the hydrogen and oxygen atoms in water, there is a difference in the distribution of electrons. Whatever the reason, oxygen attracts electrons in the oxygen-hydrogen connection more than hydrogen does. Due to the unequal distribution of electrons in the O-H bond, hydrogen has a positive charge (+) and oxygen has a negative charge (-). Water bends because the H-O-H bond angle is 104.5 degrees. Due to its curved geometry and the accumulation of electrons on the oxygen side of the molecule, the water molecule has a negative charge on the oxygen side and a positive charge on the hydrogen side. When a molecule has both positive and negative regions, it is said to have polarity. It is common knowledge that water molecules are polar.

At the point when two polar particles come into contact, they are drawn together. The oxygen molecule's negative locale is pulled to the hydrogen particle's positive district, bringing about the fascination. It's undeniably true that opposites are drawn toward each other. Water particles have an incredible liking for one another. Therefore, hydrogen particles joined to an oxygen iota have a significant positive charge in light of its serious areas of strength for oxygen for electrons. There is a lot of positive charge stuffed into these little hydrogen iotas. Hydrogen and oxygen particles are drawn to one another all the more emphatically in light of the concentrated positive charge. A particular term for this peculiarity has been begat: hydrogen holding. Hydrogen bonds in water have energy of about 20 kJmol⁻¹, which is about a 10th of the strength of a commonplace common electron bond inside a particle. For a material with so little particles, water has a high limit.

Contrasted with other normal fluids, water has the second-most noteworthy surface strain. The particular intensity of water is remarkably high. More energy is expected than for some other fluid to raise its temperature by one degree Celsius for a gram of water.

Sources of water -
The different sources of water accessible can be arranged into the accompanying classifications –
1. Surface water – Surface sources are water sources where the water flows over the earth’s surface and is immediately accessible for water supplies (Carstairs C, Elder R., 2008).

The significant resources for surface water are:

**Flowing water** - These include rivers, streams, and the sea. Streams are unsuitable for water supply schemes because they typically have very little water available.

The most crucial source of water for surface water supply plans is Rivers. River water contains dissolved minerals like sodium, magnesium, calcium, and iron as well as chlorides, sulphates, and bicarbonates. Additionally, it has organic matter and suspended sand, rock, and other impurities. River water's chemical makeup is not always consistent. However, because of the dissolved CO2 and weak organic acids, it has a slight acidity (Leonard L. Ciaccio, 1971). Its contact with the soil determines how much impurity is dissolved in it. The soil minerals will be more soluble in it the longer the contact period. Additionally, the untreated sewage disposal into it runs the risk of contaminating their water. Additionally, it has some bacteria, iron stains, and tiny rock and sand particles suspended in it.

Sea water is too impure due to two reasons – In addition to being too salty for most industrial uses aside from cooling and contamination, continuous evaporation raises the content of dissolved impurities, which is further increased by the impurities thrown by rivers as they join the sea.

Still water: Ponds, lakes, and reservoirs are included. Because of the decay of plants and animals, the pond water contains organic impurities. (Douglas WA, 1959) The composition of the water from this source varies from location to location.

2. Underground water –

Underground water is defined as the water that seeps into a groundwater reservoir through infiltration. Due to the natural filtration that occurs when water percolates through soil pores, this water is typically pure. These waters are rich in dissolved salts, minerals, gases, etc., but are less likely to contain bacteria.

The important underground water resources are –

**Springs:** - Sometime, natural processes like springs bring groundwater to the surface. The amount of salts and minerals in a spring depends on how far down it travels and how many mineral salts it comes into contact with along the way.

**Wells:** - The underground water can be drained artificially by constructing wells and lifting water from them. It fulfills the demands of water for irrigation and municipal needs. (Fawell J, Bailey K, Chilton J, Dahi E, Fewtrell L, Magara Y, 2006) This water is clearer but contains more of dissolved salts.

**Tube Well:** - The open well's discharge is typically minimal. Large discharge tubes, which are long pipes of tube, are obtained by drilling and boring deeply into the earth.

3. Rain Water: - Rainwater is produced when water on the surface evaporates. The purest form of natural water is likely rainwater, but as it descends through the atmosphere, it dissolves organic and inorganic suspended particles as well as a sizable amount of industrial gases like CO2, SO2, NO2, and others. It costs money to collect rainwater, and the supply is inconsistent.

**Water Distribution on Earth**

The hydrosphere is the collective mass of water found on, beneath, and above the surface of a planet. The approximate water volume of the Earth (the world's total water supply) is 1,338,000,000 km3 (321,000,000 mi3). Water bodies that contain liquid water include the ocean, sea, lake, river, stream, canal, pond, or puddle. (Griffin, SO; Regnier, E; Griffin, PM; Huntley, V., 2007) The vast majority of water on the planet is sea water. Water exists in the atmosphere in solid, liquid, and vapour forms. It is also found in aquifers as groundwater.

**Water cycle:** -

The water cycle (known scientifically as the hydrologic cycle) refers to the continuous exchange of water within the hydrosphere, between the atmosphere, soil water, surface water, groundwater, and plants.

Water moves perpetually through each of these regions in the water cycle consisting of following transfer processes:

- Evaporation from oceans and other water bodies into the air and transpiration from land plants and animals into air.
- Precipitation, from water vapor condensing from the air and falling to earth or ocean.
- Runoff from the land usually reaching the sea.

The different water sources of the earth get their water supply from precipitation, while this precipitation in itself is the evaporation from these sources. Water is lost to the atmosphere as vapour from the earth; (Handa, B.K) it condenses and then precipitates back in the form of rain, snow, hail, dew, frost or sleet. This is the hydrologic cycle that continues forever thereby maintaining a balance between the two.

**Factor influencing the purity of the water**
Only 33,400 m$^3$ of the estimated 1,011 million km$^3$ total water present on Earth is available for drinking, agriculture, domestic, and industrial consumption. The remaining water is trapped in oceans as salt water, polar ice caps and glaciers, and underground. Water supply demand has increased dramatically as a result of increased industrialization on the one hand and an exploding population on the other. (Hellwig E, Lennon AM) Furthermore, sewage, industrial waste, and a wide range of synthetic chemicals pollute a significant portion of this limited amount of water. Water-borne diseases and epidemics continue to pose a threat to people's health, particularly in developing and underdeveloped countries. The hazard of water borne illnesses pandemics actually compromises the prosperity of populace, especially in immature and non-industrial nations. Hence, the quality as well as the amount of clean water supply is of essential importance for the government assistance of humanity.

REFERENCES: