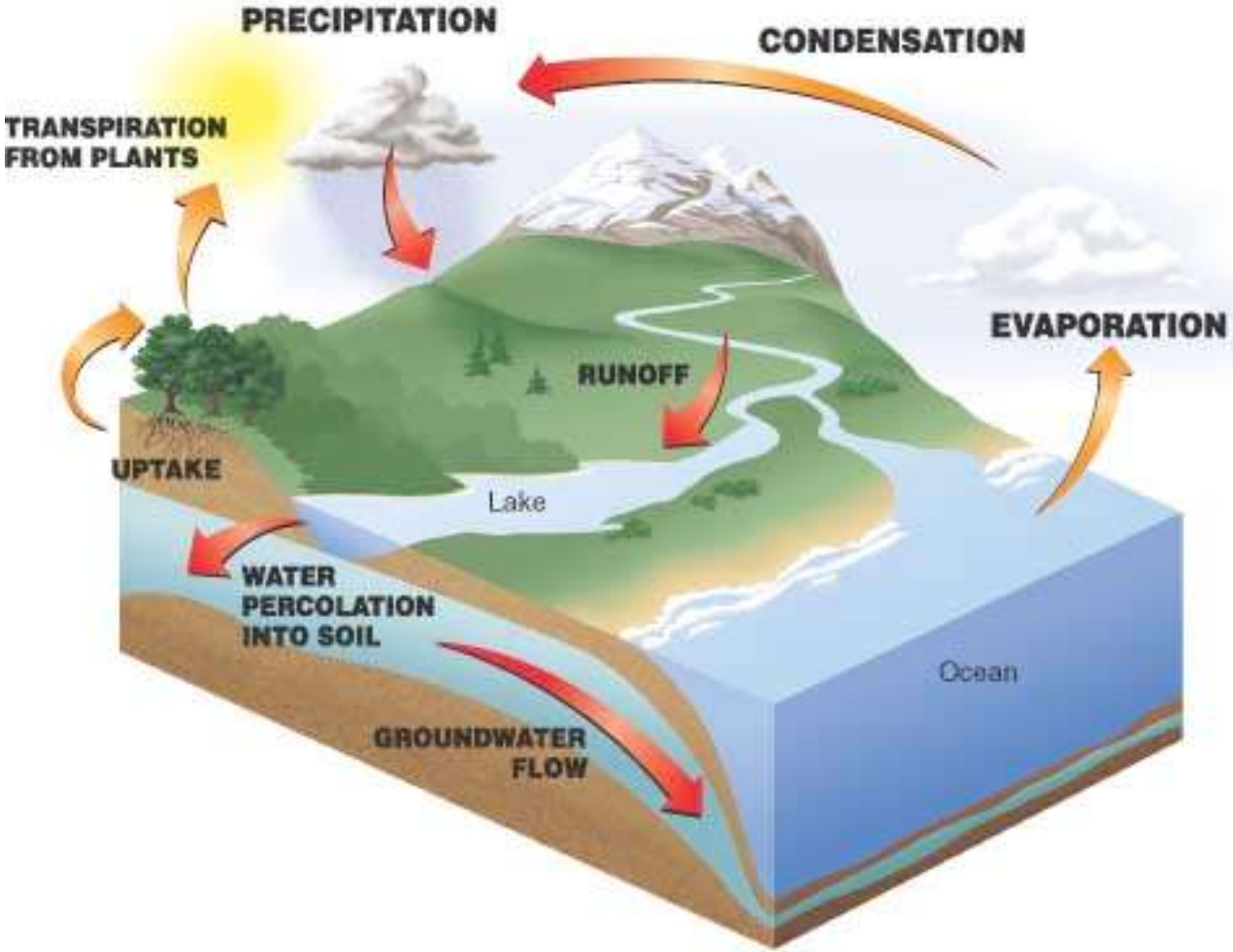
Please get out your notes from Yesterday, *"The Unique Nature of Pure Water"*

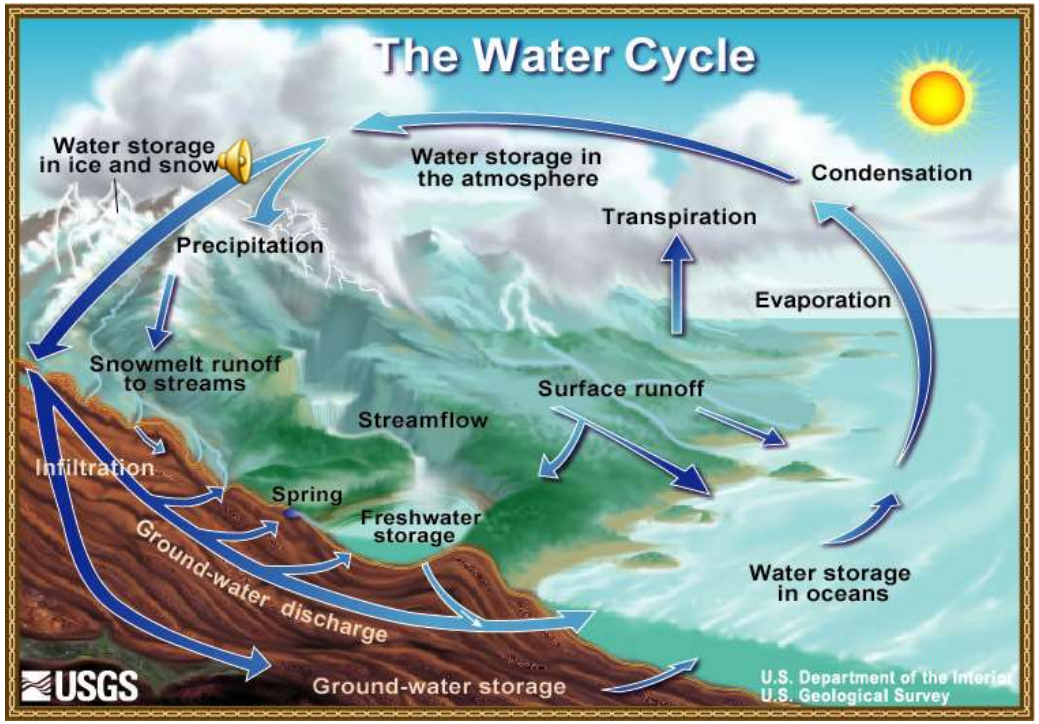


The cycle of water

The Water Budget

Evaporation
Condensation
Precipitation
Transpiration

- Ocean- 97% of all water on Earth
- Determines Sea Level
- Has changed in the last 12,000 years (last Ice Age)



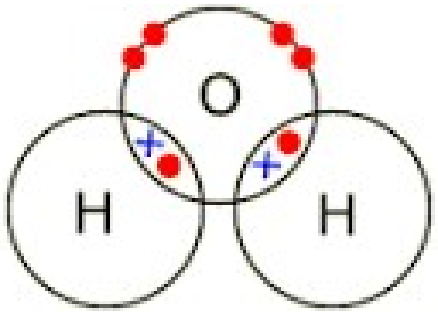
What is the molecular structure of Water?

Molecule - Two or more atoms chemically combined into larger particle

A water molecule is made up of one oxygen atom and two hydrogen atoms.

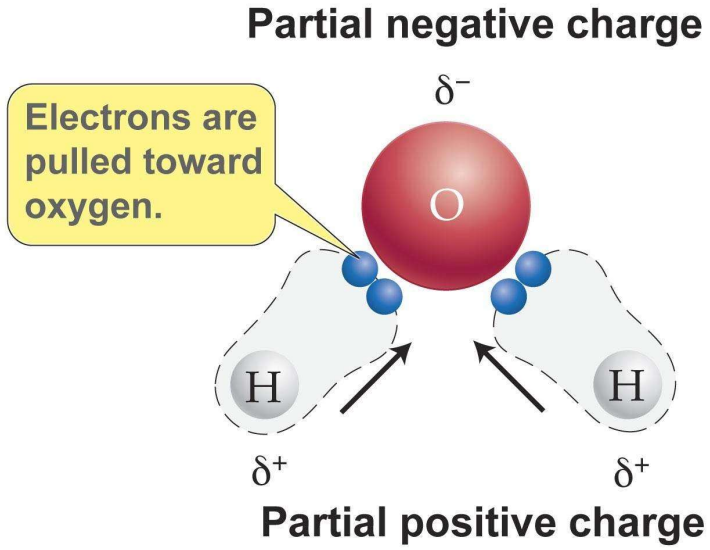
Covalent Bond between oxygen and hydrogen

- The hydrogen and oxygen are held together by sharing electrons. This is called a covalent bond.



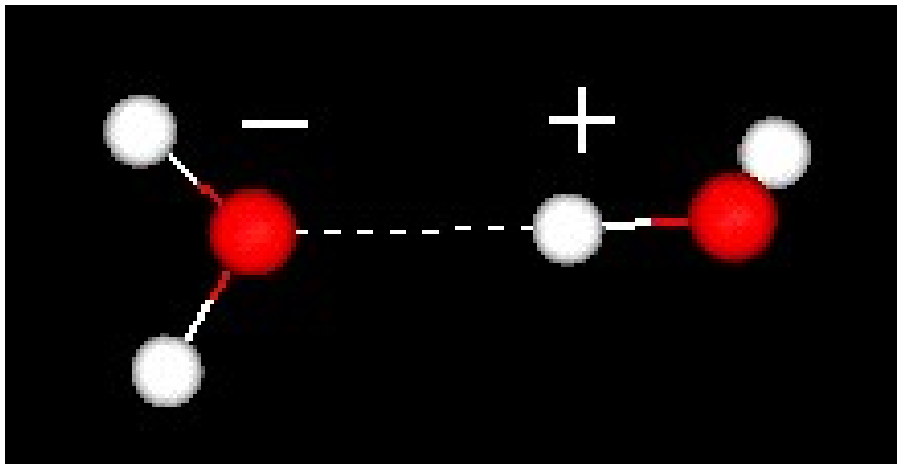
Polar (dipolar) molecule

- The hydrogen end has a positive charge and the oxygen end has a negative charge.
- This allows water to bond with other water molecules via hydrogen bonds

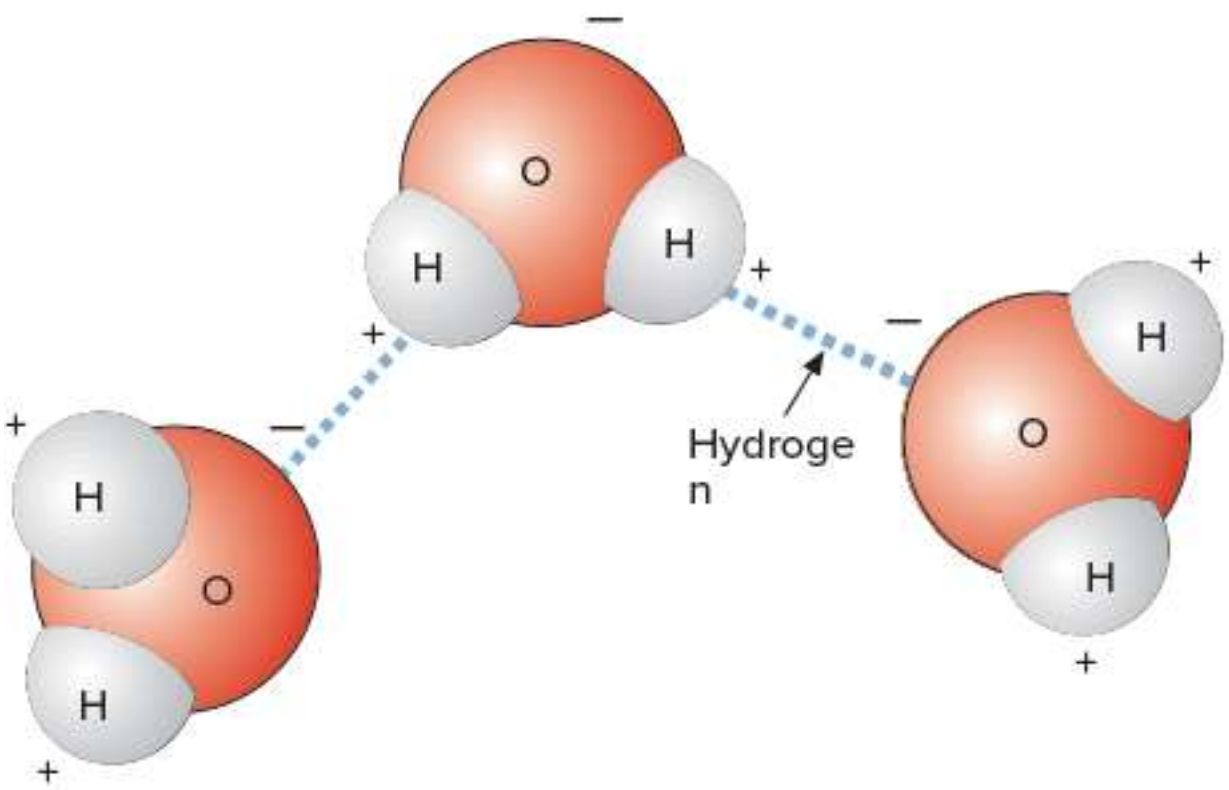


HYDROGEN BONDS

- **The negative oxygen side of a water molecule is attracted to the positive hydrogen side of another molecule. This holds water together.**



Hydrogen Bonding

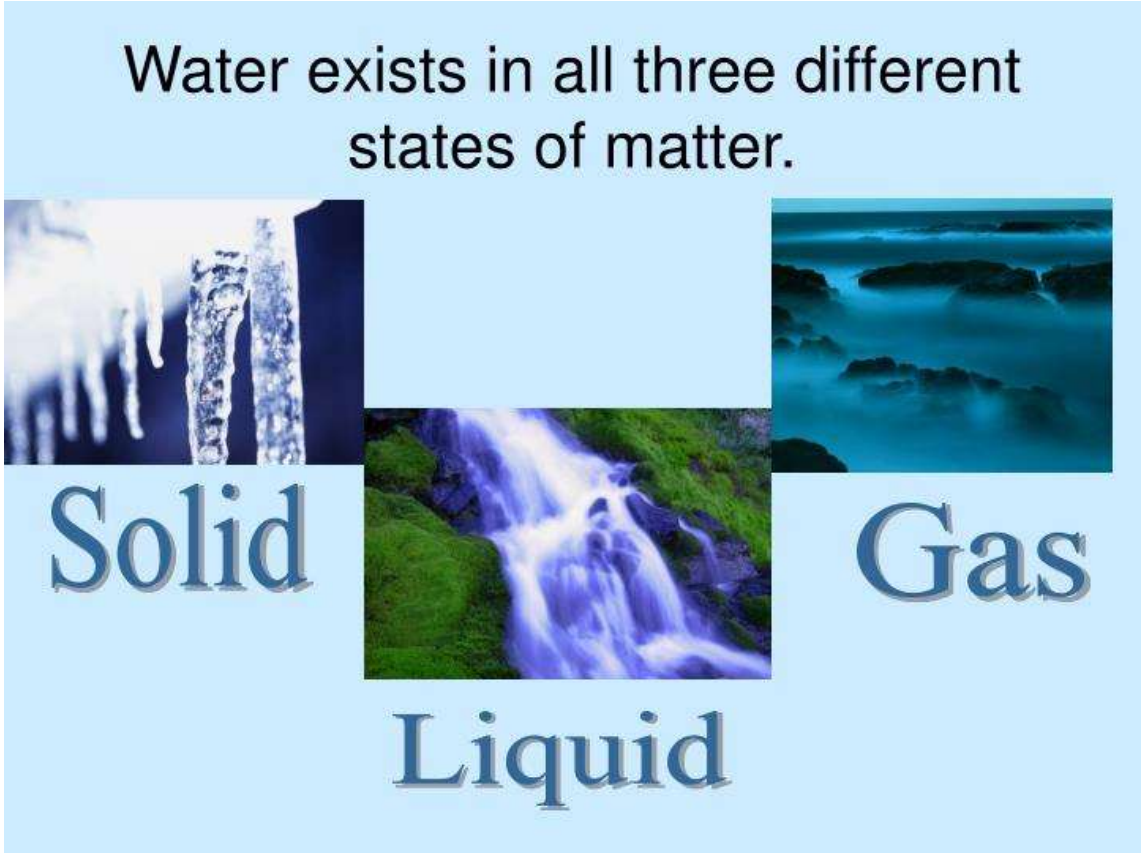


Temperature and Heat

- Temperature – the average kinetic energy of the particles
  - How fast are the particles moving? The faster they are moving, the higher the temperature
- Heat – the total kinetic energy of all the particles in a substance.
  - Measured in calories - The amount of heat necessary to raise the temperature of one gram of water 1 degree Celsius.
  - Heat is transferred from a substance of higher temperature to a substance of lower temperature.

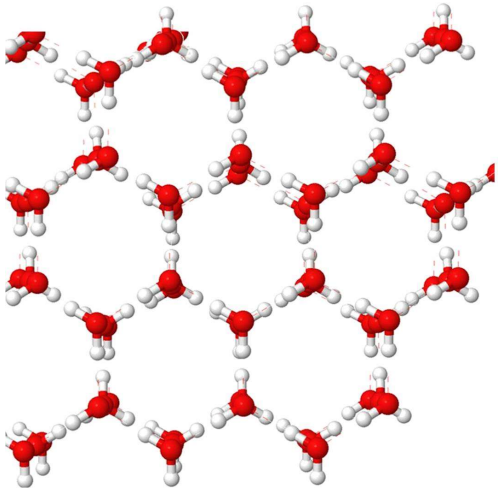
Three States of Water – Solid, Liquid, Gas

Water is the only substance that naturally occurs in all three states on Earth. It resists changes in temperature because of the hydrogen bonds.

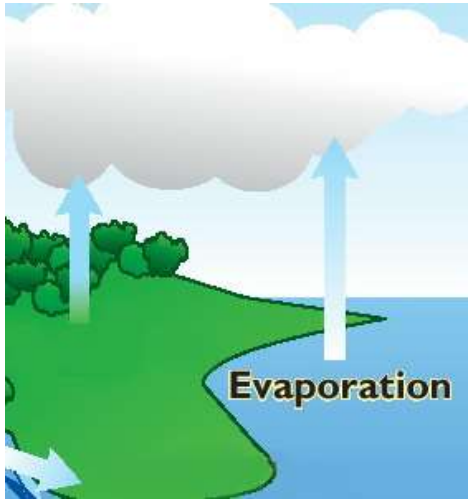


Water Changing State

Freezing – water molecules slow enough that hydrogen bonds take over, locking the molecules into a crystal

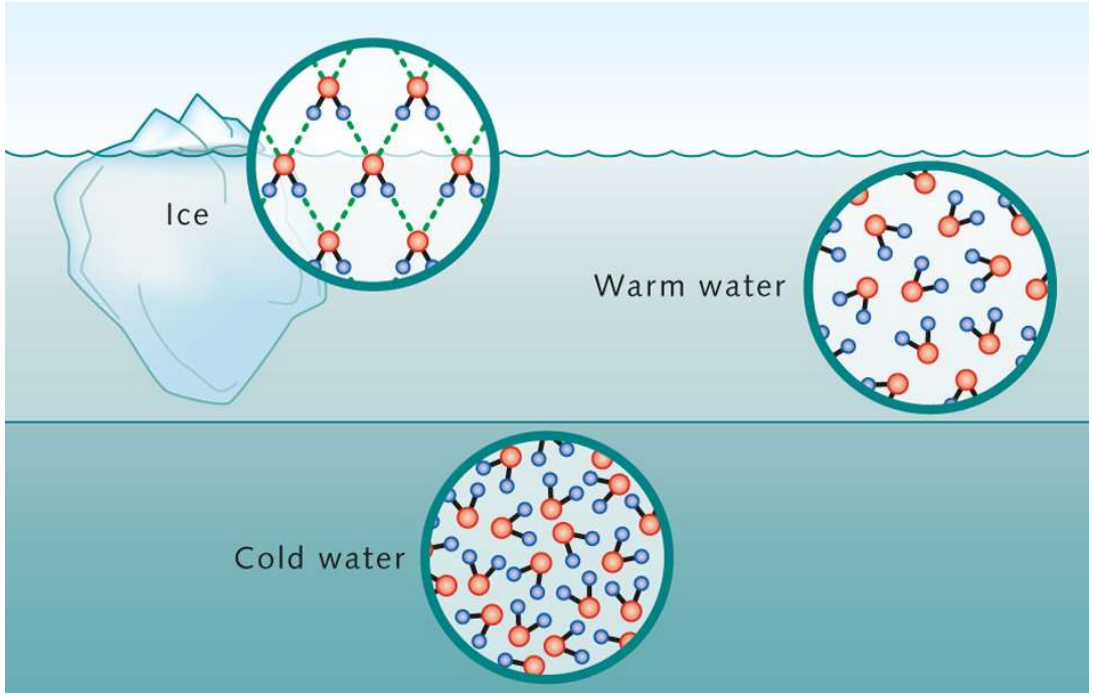


Evaporation – a molecule moves fast enough to break free of the hydrogen bonds



Water's Density

- Above 4ºC-Density increases w/ decreasing Temperature
- 4ºC & below- reverses
- At 0ºC molecules form a crystal structure-
- **Ice Floats!!!!**



Three States of Water

- Water is extremely unusual in being less dense as a solid than as a liquid.
- A floating layer of ice insulates the water below it so that it doesn't freeze.
- Organisms can live in the liquid water below the layer of ice.

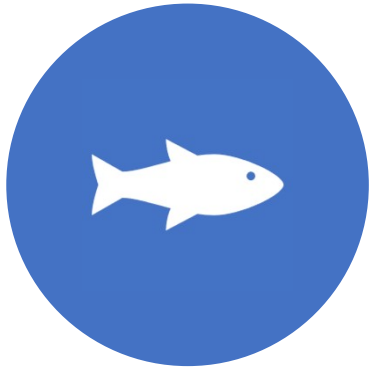
Specific Heat

- Ice melts at a much higher temperature than similar substances because of its hydrogen bonds.
- Ice also absorbs a lot of heat when it melts because of hydrogen bonding. Water has a high specific heat.
- Specific heat is the amount of energy required to raise a mass of substance one degree Celsius.

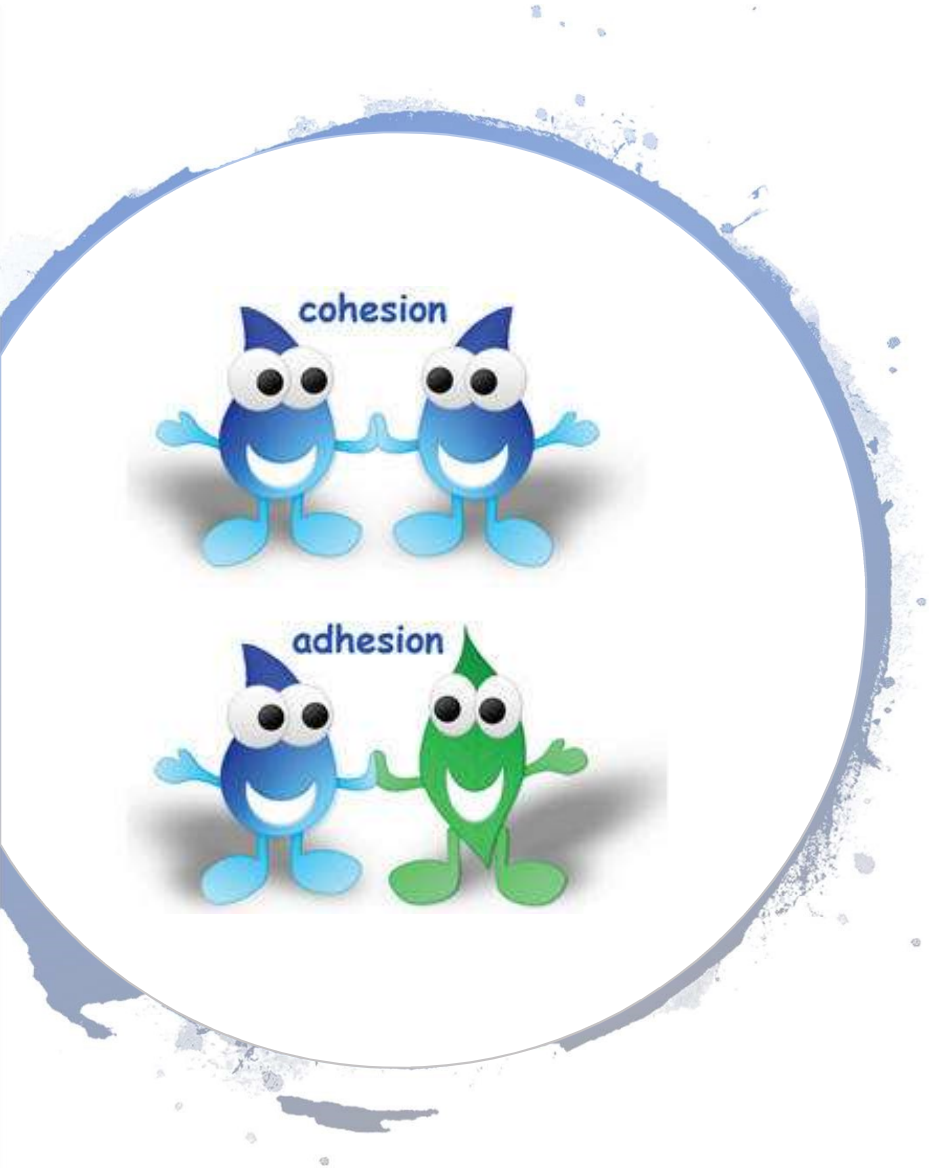
Heat Capacity

THE AMOUNT OF HEAT NEEDED TO RAISE A SUBSTANCE'S TEMPERATURE BY A GIVEN AMOUNT IS ITS HEAT CAPACITY..

WATER HAS ONE OF THE HIGHEST HEAT CAPACITIES OF ANY NATURALLY OCCURRING SUBSTANCE.



WATER'S HEAT CAPACITY PROTECTS MARINE ORGANISMS FROM RAPID AND DRASTIC TEMPERATURE CHANGES.



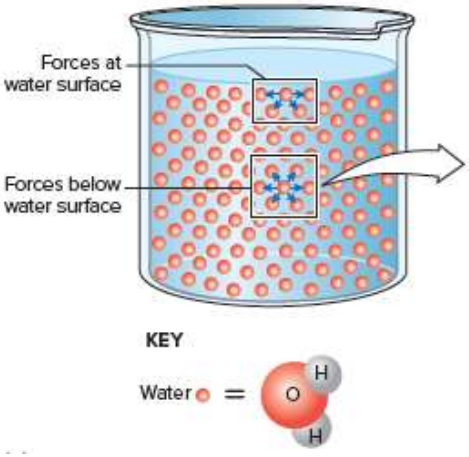
Cohesion

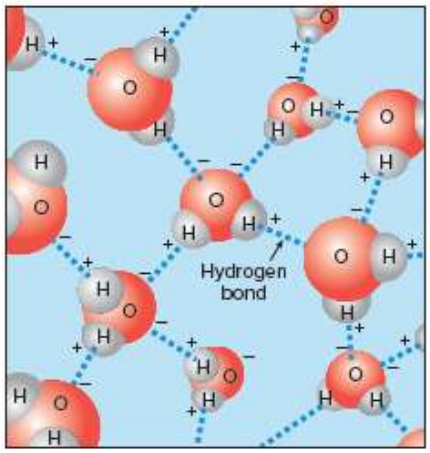
- Cohesion is the sticking together of particles of the same substance.
- Because water contains a large number of hydrogen bonds, water has more cohesion than other liquids.

Adhesion

- the property of water molecules being attracted to **OTHER** types of molecules.
- Causes "capillary action" The ability of water to crawl up a very skinny tube.
- This is because the water molecules are being attracted to the molecules of the glass tube.
- https://www.youtube.com/watch?v=oAY3yISf-24

Surface Tension





- Surface tension – water's resistance to objects attempting to penetrate its surface. It is a strong, flexible "film" over water surface caused by cohesion.

https://www.youtube.com/watch?v=5NCOnr3VSAY

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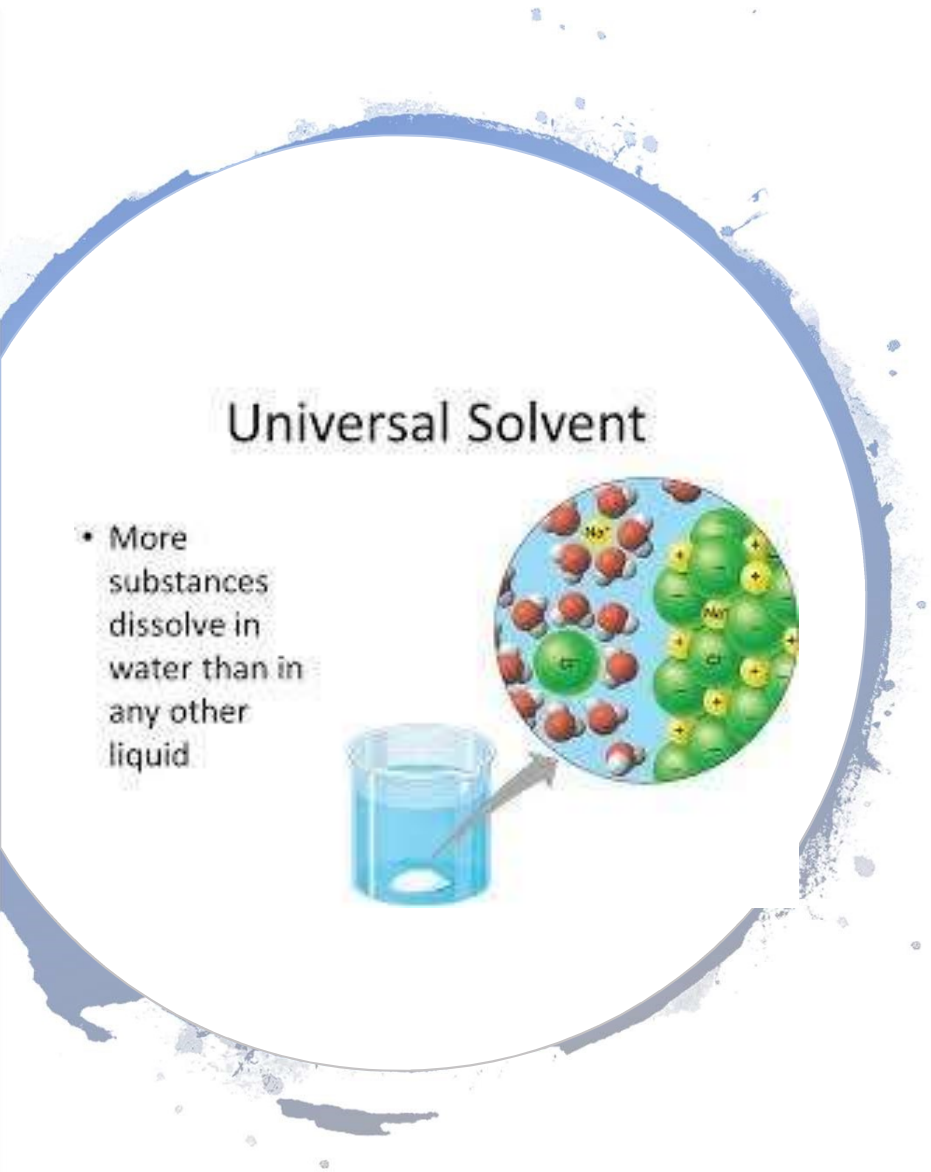
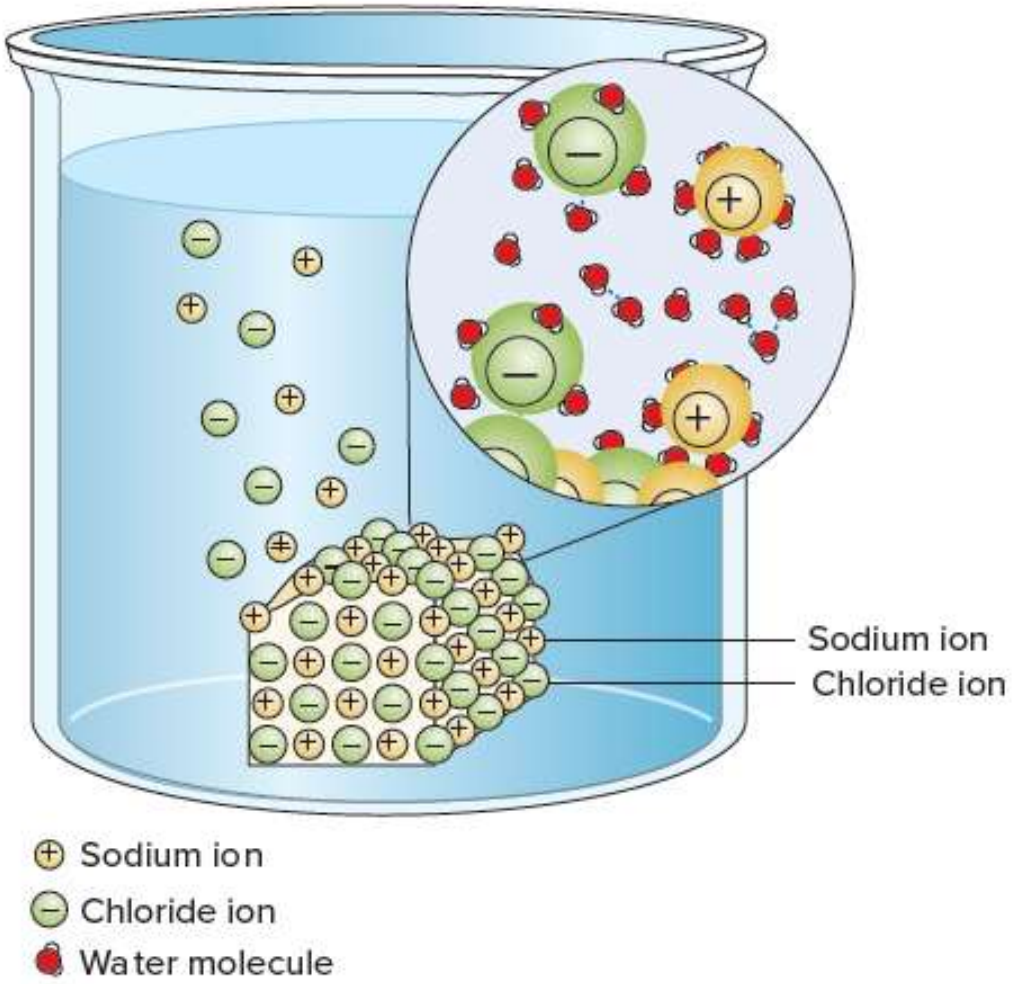


Water as a Solvent

- Water also acts as a solvent, which means that substances can dissolve in water. Water is known as the universal solvent.
- Water is good at dissolving salts, which are made of ions (electrically charged particles).
- The ions in salt pull apart, or dissociate, when the salt dissolves in water.

Table Salt Dissociating in Water



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