# Properties of Water

## Water Molecule

- Oxygen and hydrogen atoms held together by strong covalent bonds
- Polar – valence electrons not shared equally
  - Oxygen has a slight – charge
  - Hydrogen has a slight + charge
- Each $O^-$ atom on one water molecule will form a weak hydrogen bond with a $H^+$ atom on another water molecule.
- The polar nature and hydrogen bonds give water its unique properties.

## Universal Solvent

- Water can dissolve more solutes than any other solvent
- Hydrophilic – likes water (polar + ionic things)
- Hydrophobic – doesn't like water (non-polar – Fats and oils)
- Phospholipids – cell membrane – hydrophilic polar phosphate head and two non-polar hydrophobic fatty acid tails.

## Adhesion

- Polar nature allows water to stick to other substances

## Cohesion

- Hydrogen bonds allows water to stick to itself (spherical drops)

## Surface Tension

- Cohesion forces from a barrier at the surface of water
- Adhesion, cohesion, and surface tension create meniscus.

## Capillary Action

- The movement of water up a tube due to cohesion and adhesion
- Plants – as water evaporates out of stomata in the leaves, water is pulled up the xylem tubes in the stems, from the roots.

## High Heat Capacity

- Hydrogen bonds in water allow water to absorb a lot of heat before it increases in temperature.
- Addition of heat causes the water molecules to vibrate, which breaks the hydrogen bonds between the water molecules.
- The temperature of the water will not increase until most of the hydrogen bonds have been broken.

## Less Dense as a Solid

- **When heat is removed (cools), vibration of water molecules slow down, allowing hydrogen bonds to form. As water solidifies, the hydrogen bonds hold the water molecules apart from one another, making ice less dense than liquid water.**
- **When a pond or lake freezes, the ice floats on top of the water, protecting the water underneath from getting colder.**