# CH2.2 Properties of Water

**KEY CONCEPT: Life depends on water and its properties**

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| **Objectives** | **Vocabulary** | |
| * **Recognize the importance of hydrogen bonding** * **Explain why many compounds dissolve in water** * **Compare acids and bases** | * **Hydrogen bond** * **Cohesion** * **Adhesion** * **Solution** * **Solvent** * **Solute** | * **Acid** * **Base** * **pH** * **Hydrogen ion** |

**Life depends on hydrogen bonds in water.**

* Water is the only common substance found naturally in all three common states of matter and it is essential for all life on Earth
* What kind of bonds are holding these 2 hydrogen atoms to the oxygen in this compound?
* Oxygen does not share the electrons equally with the hydrogen atoms. Electrons spend more time on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ side than the hydrogen side. What kind of charge will oxygen have?
* Water is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecule. Polar molecules have slightly \_\_\_\_\_\_\_\_\_\_\_ regions.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecules do not have charged regions.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form between slightly positive   hydrogen atoms and slightly negative atoms.
* Hydrogen bonds are responsible for three important properties of water.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Specific Heat Capacity**

* Specific Heat is the amount of heat per unit mass required to raise the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by \_\_\_\_ degree Celsius
* Water has a high specific heat capacity
  + This means it requires a lot of heat energy to raise the temperature of water
  + This allows water to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by buffering large fluctuations in temperature
    - Because water can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from the air when its hotter, and release the heat when its cooler outside

**Heat of Vaporization**

* The energy required to transform a given quantity of a substance from a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ into a \_\_\_\_\_\_\_\_\_\_\_
* Water has a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ heat of vaporization
* Organisms exploit this in a process called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + As water evaporates it absorbs heat from the environment, leaving it cooler

**Capillary Action and Surface Tension are products of adhesion & cohesion**

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| Cohesion | Adhesion |
|  |  |

What is surface tension?

What is Capillary Action?

**Many compounds dissolve in water.**

* A solution is formed when one substance dissolves in another.
  + A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a homogeneous mixture.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dissolve other substances.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dissolve in a solve
  + Polar solvents dissolve \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ solutes.
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: water loving
  + Nonpolar solvents dissolve \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ solutes.
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: water fearing
  + Polar substances and nonpolar substances generally remain separate.

**Some compounds form acids or bases.**

* An \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ releases a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ion (\_\_\_\_\_) when it dissolves in water.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ H+ concentration
  + pH less than \_\_\_\_\_\_\_\_\_\_\_
* A base removes hydrogen ions from a solution.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ H+ concentration
  + pH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than 7
* A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ solution has a pH of 7

1. **What causes a molecule to be polar?**
2. **How do polar molecules form hydrogen bonds?**
3. **What are waters properties**
4. **How do organisms depend on waters properties to survive**
5. **What determines whether a compound will dissolve in water**
6. **Make a chart that compares acids and bases**

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| --- | --- |
| Acids | Bases |
|  |  |

1. **How do polar molecules differ from nonpolar molecules? How does this difference affect their interaction?**
2. **Describe an example of cohesion or adhesion that you might observe in your daily life**
3. **When sugars are broken down to produce usable energy a large amount of heat is released. Explain how the water inside a cell helps to keep the cells temperature constant.**