# 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**
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**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.**