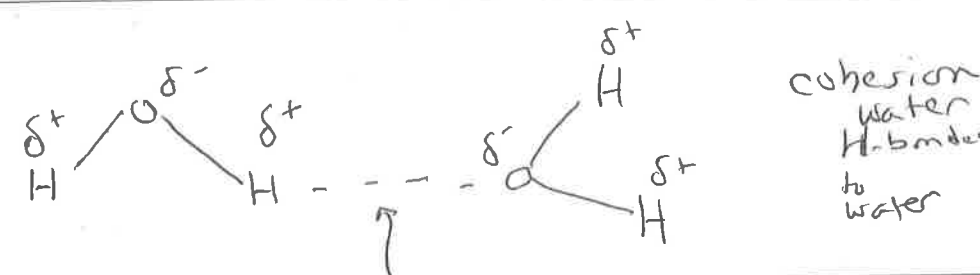


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RAD Guide — Chapter 2.2

Section 2	Properties of Water (p. 40-44)			
Learning Goals	I can explain the properties of water and how water supports life. I can explain the pH scale and how relates to acids and bases.			
Key Terms	Pre-Reading (√-, √, √+)	Key Terms	Post-Reading (√-, √, √+)	
	Hydrogen bond			
	adhesion			
	cohesion			
	homogeneous mixture of solute & solvent	mixture - 2 or more substances		unbonded combined
		solution		
		solute		
		solvent		
		suspension - heterogeneous mixture of solute & solvent		
		pH scale		
acid				
base				
buffer				
<p><b>The Water Molecule</b></p> <p>What is a "polar" molecule?</p> <p>Why is water considered a polar molecule?</p> <p>How does the structure of water contribute to its unique properties?</p> <p>What is a hydrogen bond?</p> <p>Draw a diagram of two water molecules bound by a hydrogen bond.</p>		<p>A molecule having covalent bonds between atoms with low and high electronegativity. Electrons are shared unequally.</p>		
	<p>O attracts electrons more strongly than H, so O develops a <math>\delta^-</math> and H a <math>\delta^+</math> charge                      O is more electronegative than H</p>			
	<p>It is bent so that the O end is <math>\delta^-</math> &amp; H end is <math>\delta^+</math></p> $\delta^+ \text{H} - \text{O}^{\delta-} - \text{H}^{\delta+}$			
	<p>The attraction of the <math>\delta^+</math> H in one polar covalent compound to a <math>\delta^-</math> N or O in a nearby different polar covalent molecule</p>			
	 <p>Hydrogen bond</p> <p>cohesion water H-bonded to water</p>			

What is the difference between cohesion and adhesion? Give an example of each.

cohesion - water using H bonds to "stick to" another water

adhesion - water using  $\delta^-$  &  $\delta^+$  poles to attract itself to a different kind of substance

Explain how water's heat capacity can help regulate the temperature of a cell.

1 cal/g °C

heat capacity - how many heat energy calories required to raise the temperature of one gram  $H_2O$  by 1°C

**Solutions and Suspensions**

What is the different between a solute and a solvent?

solute - what's dissolved  
solvent - more abundant, what dissolves

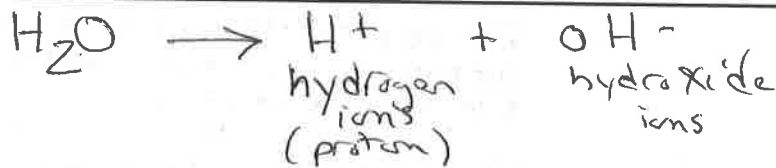
How does water's polarity influence its properties as a solvent?

Temperature increases as kinetic energy (speed) of molecules increases; since heat added to water needs to be used to ~~increase~~ break H bonds before it can be used to increase speed, that water can absorb lots of heat or release lots of heat w/o big changes in temperature.

Like dissolves like -  $H_2O$  can dissolve (be a solvent for) any other polar covalent or ionic substance.

**Acids, Bases, and pH**

Write the chemical equation that shows how water molecules can form ions.

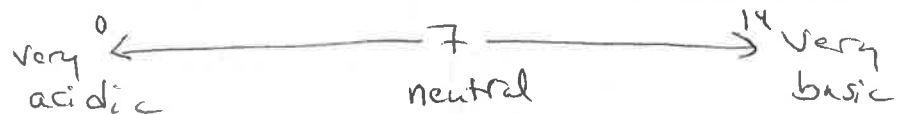


Why is pure water neutral?

555 million  $H_2O$  molecules ~~dissociate~~ form ions

What is the pH scale? (Draw a diagram)

Concentration  $H^+ =$  concentration  $OH^-$   
 $1 \times 10^{-7} M H^+ = 1 \times 10^{-7} M OH^-$



What is an acid? Give an example.

$H^+$  donor - increases the concentration of  $H^+$  in water because the acid solute dissociates:  $HCl \rightarrow H^+ + Cl^-$

What is a base? Give an example.

$H^+$  acceptor - decreases the concentration of  $H^+$  in water when it is a solute  
 $NH_3 + H-O-H \rightarrow NH_4^+ + OH^-$

What is a buffer?

Weak acid or base which prevents dramatic shifts in pH

Why is it important for cells to buffer solutions against rapid changes in pH?

homeostasis! body pH (blood) must remain about 7.4 or cells die