December 11, 2018

7th Grade Acids and Bases Review

***Vocabulary***

* **Solution**: a mixture of two or more substances
* **Solute**: the substance that is present in the smaller amount when a solution is prepared
	+ This substance is typically a solid, but not always
	+ This is the substance that is *dissolved*
	+ When we did the dilutions in lab #2, the HCl was the solute because we mixed 1 little milliliter of HCl into 9 mL of water
* **Solvent**: the substance that is present in the larger amount when a solution is prepared
	+ This substance is typically a liquid
	+ This is the substance that *causes the dissolving*
	+ In lab #2, the solvent was *water* because we mixed only a little bit of HCl into a lot of water
		- Ex. in a salt water solution, salt is the solute and water is the solvent
* **Concentration**: the amount of solute compared to the volume of solvent
	+ Concentration = solute/solvent OR grams/milliliters OR mass/volume
	+ Ex. concentration of H+ = how many H+ ions are dissolved into water
* **Dilution**: when a concentrated solution is prepared by adding more solvent
	+ Adding more solvent, usually water, to lower the concentration or make the solution “weaker”
	+ Ex. in our labs, we diluted HCl by adding more water
* **Dissociate**: when a chemical compound is dissolved in a solvent and separates into two or more ions
	+ *When a compound breaks down into ions*
	+ Ex. HCl → H+ + Cl-
		- HCl *dissociates* into H+ and Cl-
* **Ion**: a chemical compound that has a negative or a positive charge
	+ Ex. H+ and OH- are both ions
* **Hydrogen ion**: H+
	+ When an acid is mixed with water, the acid breaks down into a negatively charged ion and H+
		- Ex. HCl 🡪 H+ + Cl-
		- The presence of H+ makes acids acidic
* **Acid**: a chemical compound that produces H+ ions when mixed with water
	+ Acids contain high H+ concentrations
	+ Acids turn litmus paper (pH paper) RED
	+ Acids are very chemically reactive
	+ Strongest acids have the *lowest* pH
		- The greater the concentration of H+, the *lower* the pH and the *more* acidic
* **Hydroxide ion**: OH-
	+ When a base is mixed with water, it dissociates into a positively charged ion and an OH–
	+ NaOH 🡪 Na+ + OH-
	+ The presence of OH- makes bases basic
* **Base**: a chemical compound that produces OH- ions when mixed with water
	+ Bases contain low H+ concentrations and high OH- concentrations
	+ Bases turn litmus paper BLUE
	+ Strongest bases have the *highest* pH
		- The greater the concentration of OH-, the *higher* the pH and the *more* basic
	+ Basic-ity = **alkalinity**
* **pH scale**: used to describe whether a compound is an acid or a base
	+ A scale from 0 to 14 that measures the hydrogen ion (H+) concentration
	+ A low pH means there is MORE H+, which means pH numbers below 7 are acids
	+ A high pH means there is MORE OH-, which means pH numbers above 7 are bases
	+ A pH of **7 is neutral**
	+ pH is a chemical property
* **Logarithmic scale**: each whole number on the scale is either 10 times greater or 10 times less than the numbers immediately around it
	+ pH is measured on a logarithmic scale(“log” scale)
		- A pH of 7 is 10 times more acidic than a pH of 8
		- A pH of 9 is 100 times more basic than a pH of 7
* **Neutralization**: when an acid and a base react to form a water molecule and a salt
	+ Acid + Base → H2O and a salt
	+ OH- binds to H+ to create H2O! Water is a neutral pH, thus *neutralization* reaction
		- The remaining + and – ions interact to make a salt
		- NaOH + HCl 🡪 H2O + NaCl



* **Stomach acid**: hydrochloric acid, or HCl
	+ Human stomachs are lined with cells that produce HCl (acid) to aid digestion
	+ Our stomachs also have cells that produce mucus to protect our stomachs from the HCl
	+ Excessive stomach acid can cause acid reflux, heartburn, or ulcers
	+ Antacids help with heartburn! “Anti-acid”

***Focus Questions***

*What properties make acids and bases chemically reactive?*

* Acids release H+ ions when they are mixed with water
* Bases release OH- ions and combine with H+ ions when they are mixed with water

*What is the relationship between the concentration of H+ ions in a solution and the chemical reactivity of strong and weak acids?*

* Strong acids release more H+ ions when mixed with water, resulting in a higher concentration of H+ ions
	+ More H+ ions means the acid is *more reactive*
* Weak acids release fewer H+ ions, resulting in a lower concentration of H+ ions
	+ Fewer H+ ions means the acid is *less reactive*

*What is the relationship between the concentration of OH- ions in a solution and the chemical reactivity of strong and weak bases?*

* Strong bases release more OH- ions when mixed with water, resulting in a higher concentration of OH- ions
	+ More OH- ions means the base is *more reactive*
* Weak bases release fewer OH- ions, resulting in a lower concentration of OH- ions
	+ Fewer OH- ions means the base is *less reactive*

*What is the relationship between the pH of a solution and the concentration of hydrogen ions (H+)?*

* As the pH of a solution increases, the concentration of H+ ions decreases
	+ An increase of 1 pH unit *decreases the H+ concentration 10 times*
* As the pH of a solution decreases, the concentration of H+ ions increases
	+ A decrease of 1 pH unit *increases the H+ concentration 10 times*

*What is the relationship between the pH of a solution and the concentration of hydrogen ions (OH-)?*

* As the pH of a solution increases, the concentration of OH- ions increases
	+ An increase of 1 pH unit *increases the OH- concentration 10 times*
* As the pH of a solution decreases, the concentration of OH- ions decreases
	+ A decrease of 1 pH unit *decreases the OH- concentration 10 times*

*What happens to the concentration of hydrogen ions (H+) when an acid and a base react?*

* When an acid and a base are mixed, H+ ions and OH- ions react to produce water and a salt
	+ Ex. 2HCl + Mg(OH)2 🡪 2H2O + MgCl2 (MgCl2 is the salt)
	+ Ex. HBr + KOH 🡪 H2O + KBr (KBr is the salt)
* This decreases the concentration of free H+ and OH- ions, resulting in a more neutral solution
* Water is neutral!! Water has a pH of 7

Acids

* pH < 7
* taste sour
* neutralize bases
* release H+

Bases

* pH > 7
* taste bitter
* feel slippery
* neutralize acids
* release OH-