**Topics for the Quiz on acids, bases. and pH.**
**(This quiz will only be entered in your grade if it brings your grade UP)**

Study Worksheets 20.1 through 20.5*, and the calculation part of the cabbage lab.
*Problems like 2e, 2f, and 2m on WS 20.5 will not be covered on the quiz, though they could come up on the final exam.

Reactions involving acids and bases, like on WS 20.1

Classify solutions as acidic, basic, or neutral, based on the pH value.

Classify inorganic substances as acids, bases, or neutral based on the formula of the compound, like #6 on WS 20.1. (acids contain $H^{+1}$ ion, bases contain $OH^{-1}$ ion, or $CO_3^{-2}$ ion, and $NH_3$ is a base)

Write a reaction showing why carbonate ion is basic, and why ammonia are basic.
Know that ammonia is $NH_3$, and that carbonate ion is $CO_3^{-2}$.
Classify organic substances as acid, base, or neutral based on the formula or structure of the compound.
(like #5 on WS 20.2)
Qualitative properties of acids and bases (for example, acids are sour, bases are slippery... see top of WS 20.2)

Know (and be able to use) the three pH equations to calculate pH, $[H^{+1}]$, or $[OH^{-1}]$ .
$pH = -\log[H^{+1}]$ $[H^{+1}] = 10^{-pH}$ $[H^{+1}][OH^{-1}] = Kw = 1.00 \times 10^{-14}$

Titration Problems: $M_aV_a = M_bV_b$. (when do you need a 2 or 3, and on which side?)
What is an indicator? What is a standard solution?

General pH stuff.. what does it mean to have low pH, high pH... why is it a "logarithmic" scale/ what happens to the $[H^{+1}]$ if the pH drops by 3 points, for example.

**WS 20.6** This worksheet is optional, but has some good acid/base/pH practice.
Problems like 1, 2c, 3b. and 5 will not be covered on the quiz, but could come up on the final exam.

**1.** Determine the pH of each solution

a) 1.00 grams of NaOH dissolved into 600. mL solution volume.

b) 2.00 grams of HCl dissolved into a total solution volume of 800. mL

c) A 0.000020 M solution of $Al(OH)_3$

**2**.a. Calcium carbonate, $CaCO_3$, is the active ingredient in TUMS, an antacid. Calcium carbonate is also the main compound found in limestone or marble statues, structures, etc. a. Write a balanced chemical equation for calcium carbonate reacting with acid rain (use nitric acid for the type of acid rain). Include subscripts.

b. Baking soda can also be used as an antacid. Write a balanced equation for sodium bicarbonate ($NaHCO_3$; baking soda) reacting with stomach acid (use HCl for the formula of stomach acid). Include subscripts.

c. As carbon dioxide levels in the atmosphere increase, global temperature increases, because carbon dioxide is transparent to visible light, but absorbs the _____ radiation leaving the earth.
Besides affecting the climate, the carbon dioxide also causes the ocean acidity to _____ (increase or decrease?)
This means the pH of the ocean water will _____ (increase or decrease?),
as the carbon dioxide reacts in the following reaction: $CO_{2(g)} + H_2O_{(l)} \text{ <-----> } H_2CO_{3(aq)}$

**3.** Potassium hydroxide is titrated with sulfuric acid and the following data is obtained.

| | |
|---|---|
| Volume of KOH solution in beaker: | 10.00 mL |
| Concentration of sulfuric acid (in buret): | 0.24 M |
| Initial buret reading for $H_2SO_4$ | 25.62 mL |
| Final buret reading for $H_2SO_4$ | 42.72 mL |

a. Determine the concentration of the potassium hydroxide.

b. If you take 150. mL of the sulfuric acid solution used in the titration, and then add water until the total volume of solution is 2.000 liters, what will be the new concentration of the acid solution, assuming that the solution is well mixed?

c. When you add water in step b, is the solution become more concentrated or more dilute? (which one?)

d. When you add water in step b, does the pH of the solution increase or decrease? (which one?)

**4.** A sample of acidic rain water has a pH of 3.4.
a. Calculate the concentration of hydrogen ion in this rain water.

b. Calculate the concentration of hydroxide ion in this rain water.

c. A sample of acidic stomach acid has a pH of 1.4.
Which has a higher concentration of hydrogen ion: the stomach acid, or the acid rain?_____ By what factor?___

**5.**a. A solution contains 3.0 grams of HBr per every 600.0 mL. Calculate the pH of the solution.
**b.** A solution contains 0.111 moles of Calcium hydroxide ($Ca(OH)_2$) per every 800.0 mL of solution. Calculate the pH.

6. Classify each substance as acidic, basic, or neutral.

| | | | | | | |
|---|---|---|---|---|---|---|
| $KNO_3$ | $Rb_2CO_3$ | $HNO_2$ | $C_2H_5COOH$ | $C_4H_9OH$ | $Sr(OH)_2$ | LiCl |
| $BaCO_3$ | NaBr | $H_2O$ | $H_2SO_3$ | CsOH | KI | $NH_3$ |

**Answers:**
1. a. 12.62 b. 1.16 c. 9.78
2. a. $CaCO_{3(s)} + 2\ HNO_{3(aq)} \text{----> } Ca(NO_3)_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$
b. $NaHCO_{3(s)} + HCl_{(aq)} \text{ ----> } NaCl_{(aq)} + CO_{2(g)} + H_2O_{(l)}$
c. infrared, increase, decrease
3a. 0.82 M b. 0.018 M c. more dilute d. increase
4. a. 0.00040 M b. $2.5 \times 10^{-11}$ M c. stomach acid has higher hydrogen ion concentration, by a factor of 100.
5. a. 0.86 b. 13.44
6. Row 1: neutral, base, acid, acid, neutral, base, neutral
Row 2: base, neutral, neutral, acid, base, neutral, base