Monday, May 13, 2019

Go over LeChatelier's Principle homework

$\_N_2 (g) + \underline{3} H_2 (g) \leftrightarrow 2 NH_3 (g) + 22.0$ kcal

	Stress	Equilibrium Shift	$[N_2]$	$[H_2]$	$[NH_3]$	K
1	add N_2	right	---	decreases	increases	same
2	add H_2	right	decr.	---	incr.	
3	add NH_3	left	incr.	incr.	---	
4	remove N_2	left	---	incr.	decr.	
5	remove H_2	left	incr.	---	decr.	
6	remove NH_3	right	decr.	decr.	---	
7	increase temp. increase heat	left	incr.	incr.	decr.	
8	decrease temp.	right	decr.	decr.	incr.	
9	increase pressure smaller # of moles	right	decr.	decr.	incr.	
10	decrease pressure	left	incr.	incr.	decr.	

12.6 kcal $+ H_2 (g) + I_2 (g) \leftrightarrow 2 HI (g)$

	Stress	Equilibrium Shift	$[H_2]$	$[I_2]$	[HI]	K
1	add H_2	right	---	decreases	increases	same
2	add I_2	right	decr	---	incr	
3	add HI	left	incr	incr	---	
4	remove H_2	left	---	incr	decr	
5	remove I_2	left	incr	---	decr	
6	remove HI	right	decr	decr	---	
7	increase temp.	right	decr	decr	incr	
8	decrease temp.	left	incr	incr	decr	
9	increase pressure	no shift	same	same	same	
10	decrease pressure	no shift	same	same	same	

$NaOH (s) \leftrightarrow Na^{+1} (aq) + OH^{-1} (aq) + 10.6 kcal$

	Stress	Equilibrium Shift	Amount of NaOH (s)	$[Na^{+1}]$	$[OH^{-1}]$	K
1	add NaOH	no shift	---	same	same	
2	add NaCl (adds Na^{+1})	left	incr	---	decr	
3	add KOH (adds OH^{-1})	left	incr	decr	---	
4	add H^{+1} (removes OH^{-1})	right	decr	incr	---	
5	increase temp.	left	incr	decr	decr	
6	decrease temp.	right	decr	incr	incr	
7	increase pressure	no shift	same	same	same	
8	decrease pressure	no shift	same	same	same	

Begin Unit 14 – Acids & Bases

ARRHENIUS THEORY OF ACIDS & BASES NOTES

Acids increase concentration of hydrogen ions in aqueous solution.
- ~ Acids have more H^+ ions than OH^- ions.
- ~ Formulas for acids begin with H.

Bases increase concentration of hydroxide ions in aqueous solution.
- ~ Bases have more OH^- ions than H^+ ions.
- ~ Formulas for bases end with OH

NAMING ACIDS NOTES

Binary acids (H + one element)
1. "hydro-"
2. root of name of second element
3. "-ic"

Practice:
- HF hydrofluoric acid
- H_2S hydrosulfuric acid

Oxyacids (H + more than 1 element) (polyatomic ion)
1. root of polyatomic ion
2. a. If negative ion ends with "-ate", use "-ic" ending
   b. If negative ion ends with "-ite", use "-ous" ending

I ate something icky.

- HNO_3 nitric acid
- $HClO_2$ chlorous acid

ClO_2^- = chlorite

MONOPROTIC & POLYPROTIC ACIDS NOTES

~ How many hydrogens does each type contain?

* MONOPROTIC = 1 H's   * DIPROTIC = 2 H's   * TRIPROTIC = 3 H's

NEUTRALIZATION REACTIONS

~ ACID + BASE → H_2O (water) + Salt (pos⁺ neg⁻)

~~H~~$^+$neg$^-$ + pos$^+$~~OH~~$^-$

~ salt: any compound that is not an acid (H) or a base (OH)

==

Proton p^+ (H^+) = proton

pH and pOH

pH and pOH NOTES

Self-Ionization of Water: $H_2O + H_2O \leftrightarrow H_3O^+ + OH^-$

- Water molecules have the ability to self-ionize.
- This is a naturally-occurring phenomenon.
- In one liter of pure water at 25 °C,

  the concentration of H_3O^+ or simply H^+ = 0.0000001 moles/liter

  the concentration of OH^- = 0.0000001 moles/liter

  or

  $[H_3O^+] = [H^+] = 1.0 \times 10^{-7}$ moles/L

  $[OH^-] = 1.0 \times 10^{-7}$ moles/L

pH: the negative log of the hydrogen ion concentration $[H^+]$

pOH: the negative log of the hydroxide ion concentration $[OH^-]$

- Solve for the pH of pure water:

$pH = -\log[H_3O^+]$	$pOH = -\log[OH^-]$
$pH = -\log[1.0 \times 10^{-7}]$	$pOH = -\log[1.0 \times 10^{-7}]$
$pH = 7$	$pOH = 7$

- Equations that will be helpful when solving pH and pOH problems:

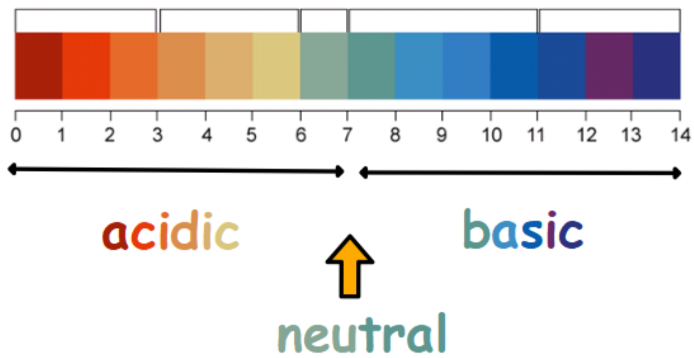
$pH = -\log[H^+]$ $[H^+] = 10^{-pH}$

$pOH = -\log[OH^-]$ $[OH^-] = 10^{-pOH}$

$pH + pOH = 14$

$K_w = [H^+] \cdot [OH^-] = 1 \times 10^{-14}$

pH scale



The pH scale represents the relative concentration of H^{+1} ions and OH^{-1} ions.

Acids have a higher concentration of H^{+1} than OH^{-1}.

Bases have a higher concentration of OH^{-1} than H^{+1}.

[ ] = "concentration of"; units are usually molarity (M).

Because the $[H^{+1}] = 1 \times 10^{-7}$ M and $[OH^{-1}] = 1 \times 10^{-7}$ M in a neutral solution...

$$[H^{+1}] \cdot [OH^{-1}] = 1 \times 10^{-14} \text{ M}$$

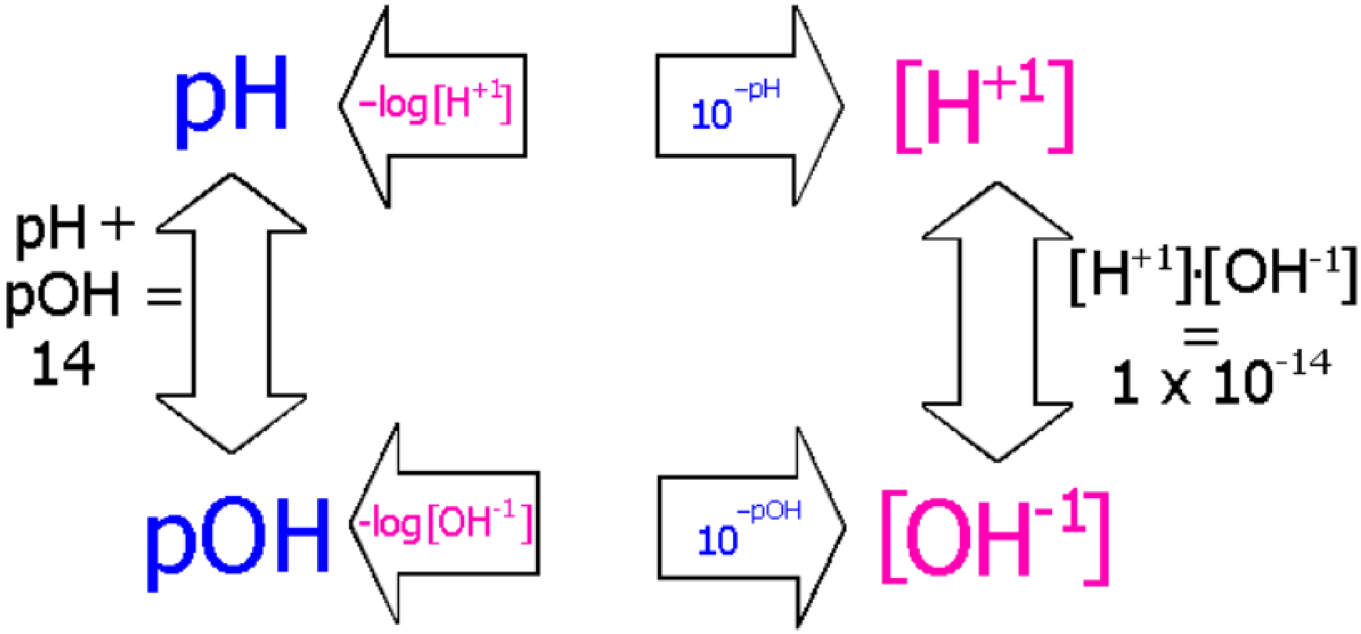
NOTE: All of these equations can be found on page 3 of the Reference Tables.

$pH = -\log [H^{+1}]$ $\quad\quad$ $[H^{+1}] = 10^{-pH}$

$pOH = -\log [OH^{-1}]$ $\quad\quad$ $[OH^{-1}] = 10^{-pOH}$

$pH + pOH = 14$

$K_W = [H^{+1}] \cdot [OH^{-1}] = 1 \times 10^{-14}$



What is the pH of a solution whose $[H^{+1}] = 2.65 \times 10^{-4}$ M?

answer = 3.58

What is the $[H^{+1}]$ of a solution with a pH = 9.41?

answer = 3.89×10^{-10} M

From homework sheet:

pH	pOH	$[H^{+1}]$	$[OH^{-1}]$
3.68	14 - 3.68 = 10.32	$10^{-3.68}$ = 2.09×10^{-4} M	$10^{-10.32}$ = 4.79×10^{-11} M
14-4.07 9.93	-log[OH-] = 4.07	$10^{-9.93}$ = 1.17×10^{-10} M	8.60×10^{-5} M

Finish worksheet for homework.