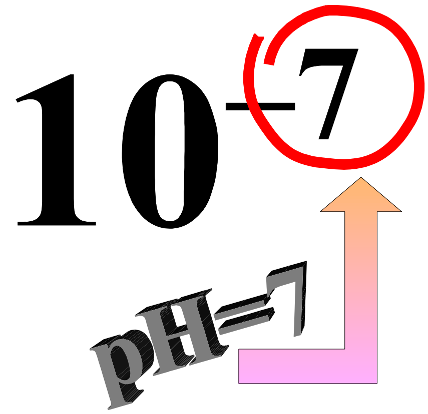
Chemistry: Form WS9.3.1A Name ______________________________

ACIDS, BASES, AND SALTS Date _________________ Period _____

Interpreting pH



The term "pH" means ***p**ower of **h**ydrogen*. It refers to hydrogen released by acids when they ionize to form hydronium ions.

> *Example:* $HCl(g) + H_2O(\ell) \rightarrow Cl^-(aq) + H_3O^+(aq)$

The more hydrogen a substance releases, the more hydronium it forms, and the stronger an acid it is. Substances that form the most hydronium ions have the greatest power of hydrogen. Strangely enough, however, the stronger the acid is and the greater its power of hydrogen, the lower the pH is.

Pure water has a hydronium ion concentration $[H_3O]$ of 10^{-7} M. The negative exponent tells the pH. When $[H_3O] = 10^{-7}$ M, pH = 7. When $[H_3O] = 10^{-4}$, pH = 4. As $[H_3O^+]$ increases, the negative exponent decreases and pH goes down. In pure water, the hydroxide ion concentration $[OH^-]$ is also 10^{-7} M, because the concentration of hydroxide and hydronium are equal. $[OH^-] = [H_3O^+]$.

Remember, as $[H_3O^+]$ increases, $[OH^-]$ decreases. The product of the two is constant. $[H_3O^+][OH^-]=10^{-14}$. When the concentration of each is 10^{-7} M, this is so because $10^{-7} \times 10^{-7} = 10^{-14}$. If $[H_3O^+]$ increases from 10^{-7} M to 10^{-6} M, then $[OH^-]$ must decrease from 10^{-7} M to 10^{-8} M so, again, the product is 10^{-14}. ($10^{-6} \times 10^{-8} = 10^{-14}$) Notice the negative sum of the exponents is always 14. If $[OH^-] = 10^{-4}$ M, then $[H_3O^+] = 10^{-10}$ M, and the pH is 10.

Answer the questions below based on the reading above and on your knowledge of mathematics and chemistry.

1. Which is a higher concentration, 10^{-9} M or 10^{-8}M? Explain. ____

   ____

2. What is the pH in each of the following cases:

a. $[H_3O^+] = 10^{-12}$ M? ________	d. $[H_3O^+] = 10^{-5}$ M? ________	g. $[H_3O^+] = 10^{-6}$ M? ________
b. $[H_3O^+] = 10^{-2}$ M? ________	e. $[H_3O^+] = 10^{-14}$ M? ________	h. $[H_3O^+] = 10^{-9}$ M? ________
c. $[H_3O^+] = 10^{-7}$ M? ________	f. $[H_3O^+] = 10^{-3}$ M? ________	i. $[H_3O^+] = 10^{-13}$ M? ________

3. What is the **concentration of hydronium** in each of the following cases:

a. $[OH^-] = 10^{-12}$ M? _________	d. $[OH^-] = 10^{-5}$ M? _________	g. $[OH^-] = 10^{-6}$ M? _________
b. $[OH^-] = 10^{-2}$ M? _________	e. $[OH^-] = 10^{-14}$ M? _________	h. $[OH^-] = 10^{-9}$ M? _________
c. $[OH^-] = 10^{-7}$ M? _________	f. $[OH^-] = 10^{-3}$ M? _________	i. $[OH^-] = 10^{-13}$ M? _________

4. What is the pH in each of the following cases:

a. $[OH^-] = 10^{-12}$ M? _________	d. $[OH^-] = 10^{-5}$ M? _________	g. $[OH^-] = 10^{-6}$ M? _________
b. $[OH^-] = 10^{-2}$ M? _________	e. $[OH^-] = 10^{-14}$ M? _________	h. $[OH^-] = 10^{-9}$ M? _________
c. $[OH^-] = 10^{-7}$ M? _________	f. $[OH^-] = 10^{-3}$ M? _________	i. $[OH^-] = 10^{-13}$ M? _________

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