WODSS SCIENCE
SCH 3UI

Name: _____
Date: _____

Acid-Base Theories

The Arrhenius Theory of Acids and Bases

- An acid is a substance that ionizes in water to produce one or more hydrogen ions (H^+ hydronium ion)

**** Acids are molecular compounds, however forms ions when dissolved in water, so we say they "_____" in water.****

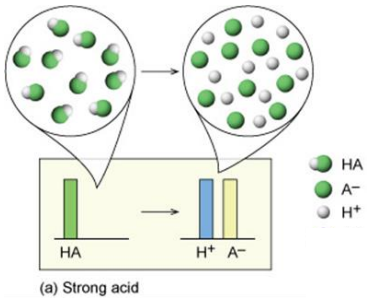
e.g.

- A base is a substance that dissociates in water to form one or more hydroxide ions (OH^-)

**** Bases are ionic compounds and form ions when dissolved in water, so we say they "_____" in water.****

e.g.

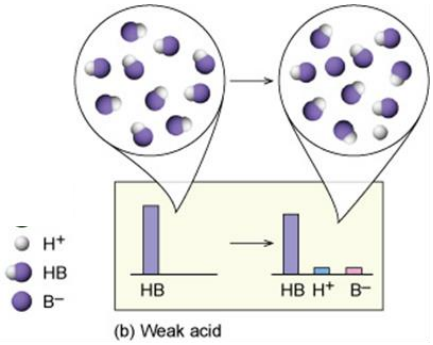
Strong and Weak Acids and Bases



Strong Acid – an acid that ionizes completely into ions in water

- $[H^+] = [A^-]$

e.g.



Weak Acid – an acid that ionizes very slightly in a water solution

- $[H^+] < [HB]$

e.g.

Strong Base – a base that dissociates completely into ions in water
e.g. NaOH, KOH

Weak Base – a base that dissociates/ionizes very slightly in a water solution
e.g. NH_3

The pH Scale

- the concentration of H^+ ions ($[H^+]$) in pure water is 1×10^{-7} mol/L
  - not very convenient
- pH scale was established so that $[H^+]$ could be expressed in a more convenient manner

1×10^{-1} M	1×10^{-7} M	1×10^{-14} M
1	7	14
acidic	neutral	basic

$pH = -\log[H^+]$

in pure water: $[H^+] = 1.0 \times 10^{-7}$ mol/L
pH =

Example. 1 What would the pH of a 2.5 x 10^{-4} mol/L solution of HCl?

Example. 2 Calculate the pH of a solution containing 5 x 10^{-5} M solution sodium hydroxide.

Example. 3 If the pH of a solution is 6.4 what is the $[H^+]$? What is the $[OH^-]$?

Acid Base Questions

1. Answer Q#1-6 on page 457.
2. Read Strong and Weak Versus Concentrated and Dilute, page 461 in your textbook and answer Q#7 and 8 on page 462.

pH Problems

1. Calculate the pH of the solutions that have the following H^+ concentrations.
   a) 1.00 x 10^{-3} M b) 6.59 x 10^{-10} M c) 1.00 x 10^{-6} M d) 7.01 x 10^{-5} M

2. What is the $[H^+]$ of each of the following solutions?
   a) pH = 6.61 b) pH = 6.15 c) pH = 2.52 d) pH = 10.20

3. Calculate the pH of each of the following solutions.
   a) pOH = 2.00 b. pOH = 9.71 c) pOH = 7.00 d) pOH = 4.98

4. Calculate the pH of the solutions that have the following $[OH^-]$?
   a) 1.00 x 10^{-6} M b) 3.45 x 10^{-8} M c) 2.64 x 10^{-13} M d) 2.93 x 10^{-2} M

Answers: 1.a)3.00 b)9.18 c)6.00 d)4.15 2.a)2.45x10^{-7}M b)7.08x10^{-7}M c)3.02x10^{-3}M d)6.31x10^{-11}M 3.a)12.00 b)4.29 c)7.00 d)9.02 4.a)8.00 b)6.54 c)1.4 d)12.47

1. If the **pH = 3.5** and you are asked to **find the $[H^+]$**
   (this is calculating an anti-log)

   Enter 3.5 (or any other pH you may be given)
   Press **+/- key** (this reverses the sign)
   Press 10^x **key** (pressing 2nd key and then pressing the log key)
   Ans 0.000316 or 3.16 x 10^{-4}

2. If the **$[H^+]$ = 3.16 x 10^{-4}** and you are asked to **find the pH**
   (this is calculating a -LOG).

   Enter 3.16 (the 3 significant digits of the $[H^+]$)
   a. on the **TI** press **EE key**
   b. on the **Casio** press the **EXP key**
   Press **+/- key** (this reverses the sign of the exponent you will enter)
   Enter **4** (this is the negative exponent of 10 in the $[H^+]$)
   Press **LOG key** (this actually calculates the LOG of the $[H^+]$ you enter)
   Press **+/- key** (this makes the LOG calculated a – LOG)
   Ans 3.5