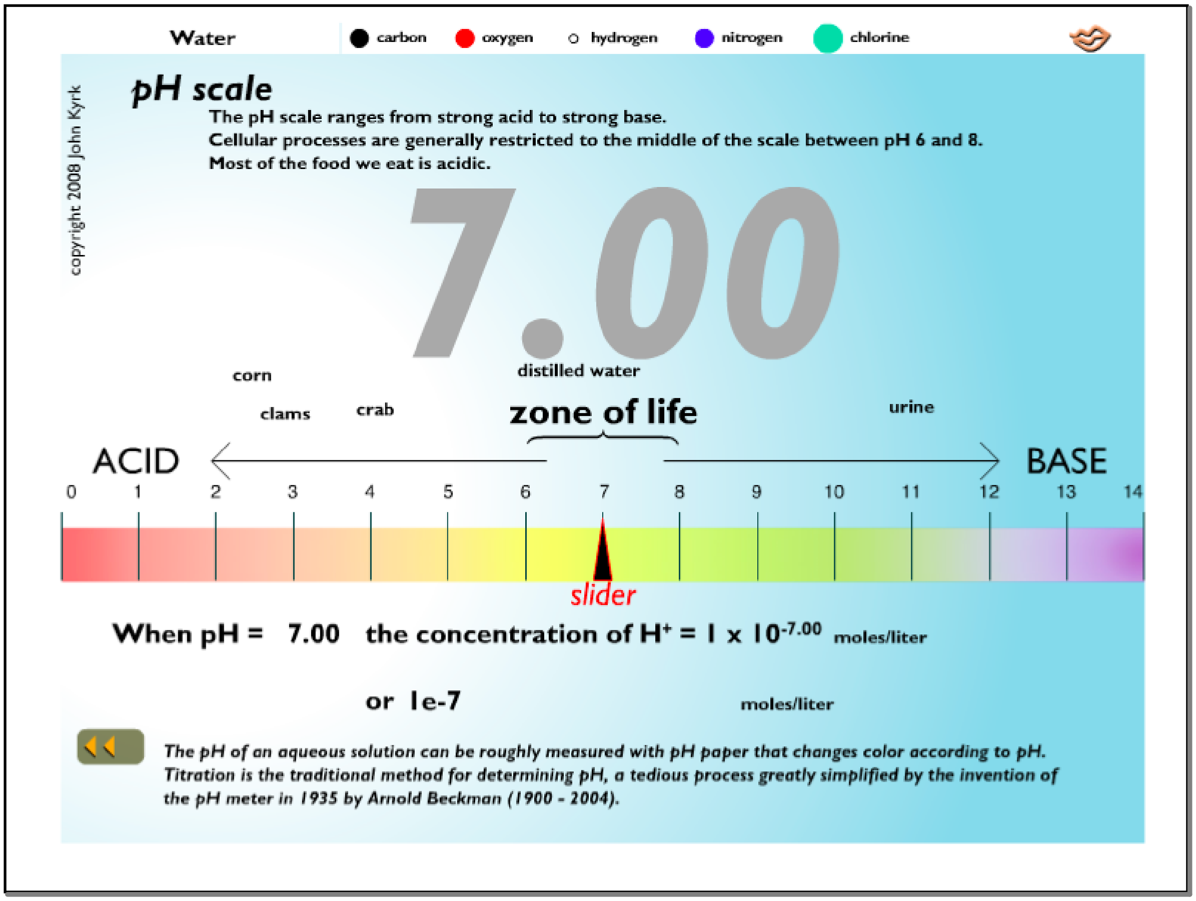


$$pH = -\log [H^+]$$

logarithms - count powers of 10

$\log(1000) = 3$

$1000 = 10^3$

$\log(10^3) = 3$

$\log(10) = 1$

$\log(1000000) = 6$

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

$$[H^+] = 5.7 \times 10^{-3} M$$

$$pH = ? = -\log(5.7 \times 10^{-3})$$

$$= 2.24$$

$$pH = 8.2 \qquad [H^+] = ?$$

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

$$= 10^{-8.2} = 6.3 \times 10^{-9} M$$

How an acid reacts with a base: (neutralization)

$$HA + BOH \rightleftharpoons B^{+}A^{-} + H_2O$$

acid (HA), base (BOH), salt ($B^{+}A^{-}$), water (H_2O); H^+ is transferred from the acid to the base

$$HCl + NaOH \rightleftharpoons Na^{+}Cl^{-} + H_2O$$

$$2HNO_3 + Ca(OH)_2 \rightleftharpoons Ca^{2+}(NO_3)^{-}_2 + 2H_2O$$

$$3H_2SO_4 + Al(OH)_3 \rightleftharpoons Al^{3+}_2(SO_4)^{2-}_3 + 3H_2O$$

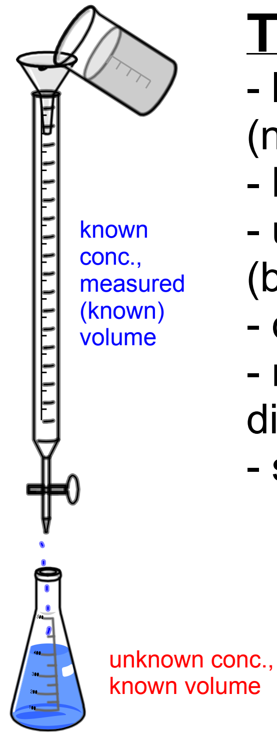
Neutralization Calculations

- instead of "molarity", we use *normality (N)*
- normality = # of equivalents per Liter (equiv/L)
- equivalent = one mole of H^+ (in acid) or OH^- (in base)

$$N_A V_A = N_B V_B$$

- N_A: equivalents of acid
- V_A: volume of acid
- N_B: equivalents of base
- V_B: volume of base

* for our purposes, *N* is the same as M *



Titration

- lab method of determining the concentration (normality) of an unknown acid or base
- known concentration goes in the buret (top)
- unknown concentration goes in the flask (bottom)
- dispense known solution using buret
- record how much known solution you dispense from the buret
- solve for unknown concentration using:

$$N_A V_A = N_B V_B$$

p.623

If 35.0 mL (V_A) of 0.20*N* (N_A) hydrochloric acid are needed to neutralize 25.0 mL (V_B) of an unknown base, what is the normality (N_B) of the base?

$$N_A V_A = N_B V_B$$

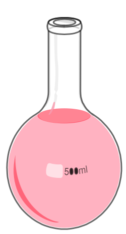
$$N_B = \frac{N_A V_A}{V_B} = \frac{(0.20N)(35.0mL)}{25.0mL}$$

$$= 0.28N$$

10.0 mL of an unknown concentration of NaOH was neutralized in titration by 20.0 mL of 0.200*N* HCl. What was the normality of the base?

For some acids & bases, *N* is **not** the same as M:

1 M HCl = 1 N *(monoprotic)*



1 M H_2SO_4 = 2 N *(diprotic)*

1 M H_3PO_4 = 3 N *(triprotic)*