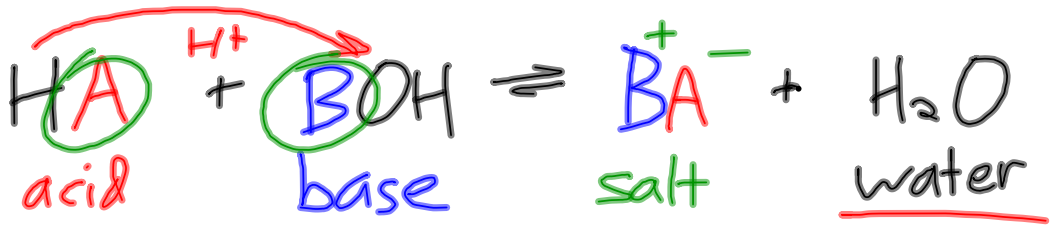
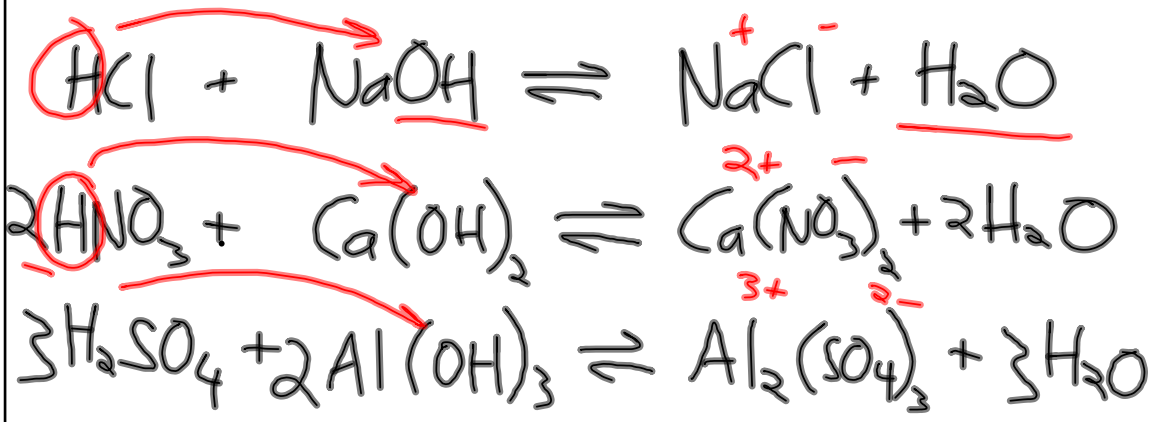
How an acid reacts with a base: (neutralization)





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	V_A	N_B	V_B
equivalents of acid	volume of acid	equivalents of base	volume of base

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

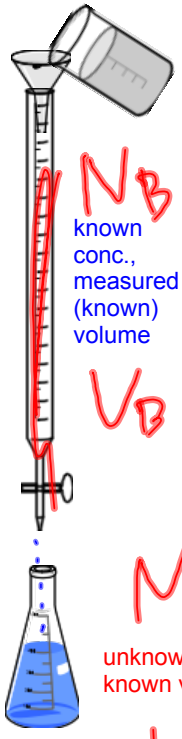
For some acids & bases, *N* is **not** the same as M:

1 M HCl = 1 N *(monoprotic)*

one proton

1 M H_2SO_4 = 2 N *(diprotic)*

1 M H_3PO_4 = 3 N *(triprotic)*



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:

$$N_A V_A = N_B V_B$$

N_B

V_B

$N_A = ?$

$V_A = 20\ mL$

2) $N_A = ?$

$N_A V_A = N_B V_B$

avg.

$$N_A = \frac{N_B V_B}{V_A} = \frac{(0.1\,M)(18\,mL)}{20\,mL}$$

$= 0.09\,M\,HCl$

p.623

If 35.0 mL of 0.20*N* hydrochloric acid are needed to neutralize 25.0 mL of an unknown base, what is the normality of the base?

V_A N_A V_B N_B

$N_A V_A = N_B V_B$

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

$= 0.28\,N$

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?

$$N_A V_A = N_B V_B$$

$$(0.2N)(20mL) = (?)(10\ mL)$$

$$N_B = 0.400\ N$$