

Ch 21 HW: Sec Rev 19-22,40-45,73,76

Sec 21.1

obj: Calculate the Normality of a solution.

Equivalents

- The amount of an acid or base that produces 1 mole of H^+ or OH^- .

* Number of ionizable H^+ or OH^- equals the # of equivalents per mole of the acid or base.

$HCl \rightarrow 1$ equivalent / mole of HCl

$H_2CO_3 \rightarrow 2$ equivalents / mole of H_2CO_3

$Al(OH)_3 \rightarrow 3$ equivalents / mole of $Al(OH)_3$

- The mass of an acid or base that is equal to 1 equivalent is called the gram equivalent mass. (gem)

$HBr \rightarrow gem = gfm = 81g$

$KOH \rightarrow gem = gfm = 56g$

$H_2SO_3 \rightarrow gem = \frac{1}{2} gfm = 41g$

- To find the mass of any # of equivalents must know the formula for the acid or base and the amount of the acid or base used.

<u>Given</u> 23g of HF <u>Want</u> # eq=?	$\frac{23g HF}{20g HF} \left \frac{1 mol HF}{1 mol HF} \right \frac{1 eq HF}{1 mol HF}$
<u>Given</u> 4 eq of H ₂ S	$\frac{4 eq H_2S}{2 eq H_2S} \left \frac{1 mol H_2S}{1 mol H_2S} \right \frac{34g H_2S}{1 mol H_2S}$
<u>Wanted</u> mass=?	

- Normality - The concentration of an acid or base related to the # of equivalents per Liter of Solution.

$$N = \frac{\# eq}{L \text{ of Solution}}$$

- Molarity & Normality are related.

* Difference is the # of equivalents per mole of the acid or base

$$N = M \cdot \# eq \left(\frac{\text{moles}}{L} \right) \left(\frac{eq}{\text{mole}} \right)$$

<u>Given</u> 1.7 M H ₃ PO ₄	$\frac{1.7 \text{ moles H}_3\text{PO}_4}{L} \left \frac{3 eq H_3PO_4}{1 mol H_3PO_4} \right $
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Want
 N=?

- Normal Solutions are treated the same as Molar Solutions.

* Dilutions from Stock Solutions

$$N_s V_s = N_n V_n$$

* Titrations - Titrations w/ Acids + Bases are most commonly done w/ normality.

$$N_a V_a = N_b V_b$$

Equivalence pt.

Given

25 mL .48N NaOH

.85N HCl

Wanted

V = HCl