Got heartburn? Get "Rolaids, Tums, Alka-seltzer ...antacids.

Why? Heartburn is due to acid reflux (backup) into the esophagus, causing a burning sensation near the heart. Antacids are bases that solve the problem by **neutralizing** the acid.



Aim: How do bases neutralize acids?

1) **neutralization** - is a double replacement reaction in which an acid combines with a base to form a salt plus water.

ACID + BASE ====> SALT + WATER

For examples, let's turn to Table K and L:

 $H^+Cl^-(aq) + Na^+OH^-(aq) === Na^+Cl^-(aq + HOH(l))$

Remember these compounds consist of ions when dissolved in water. So, what happens is they just "switch partners". (It's better to write the formula for water as HOH so you can see what contributes to its formation.)

Let's do some more examples:



OK, Let's do some multiple choice questions on what we just covered. Refer to today's handout; questions 1 to 5.

		A	в		
1)	Which type of reaction will occur when volumes of 0.1 M(HC) and 0.1 M(NaOH) are mixed?				
	 neutralization B) hydrolosis 	C)	electrolysis	D) ionization	
2)	Given the reaction:				
	$\begin{array}{c} A \\ HCl(aq) + LiOH(aq) \\ \end{array} \rightarrow HOH(\ell) + LiCl(aq) \\ \end{array}$				
	The reaction is <i>best</i> described as				
	A) synthesis	9	neutralization		
	B) oxidation-reduction	D)	decomposition		
3)	Vhat are the products of a reaction between KOH(aq) and HCl(aq)? Double Replacement				
	A) H ₂ and KCIO (D) H ₂ O and KCI	C)	KH and HCIO	D) KOH and HC	
4)	Which equation represents a neutralization reaction?		A B	5 41	
	A) NaCl + AgNO ₃ → AgCl + NaNO ₃	C)	$H_2SO_4 + Mg(OH)_2 \rightarrow MgSO_4 + 2H_2O$		
	B) $Na_2CO_3 + CaCl_2 \rightarrow 2NaCl + CaCO_3$	D)	$Ni(NO_3)_2 + H_2S \rightarrow NiS + 2HNO_3$		

2) When adding acid to base or vice versa, how do we determine how much to add of each? We need a formula that incorporates their concentrations and volumes. It's called the titration formula.

MacidVacid = MbaseVbase

Refer to today's handout. Let's do some titration problems.

 $\{ M_A \cdot V_A = M_B \cdot V_B$ 3 1. How many (ml) of (2.5 M) NaOH will be neutralized by (50. ml) of (2.0 M) HCl? MA·VA = MB·VB 2,0 (50.) = 2,5 (VB) $V_{B} = 40. \text{ mL}$ V_{B} 0.50 MHCl are needed to neutralize (40. ml) of (0.10 M) NaOH? 2. How many MA. VA = MB. VB 0.50 (VA) = 0.10 (40.) VA = 8.0 ML 3. A(2.0 ml) of sample of KOH is exactly neutralized by (4.0 ml) of a 3.0 M)HNO3 solution. What is the concentration of the KOH solution? MB=7 MA MA·VA = MB·VB 3.0 (4.0) = MB (2.0) MA = 6.0 M

IF TIME PERMITS

3) What's the basis of the titration formula?

If we **cross out** the ions that don't change **("spectator" ions**), we'll get the **net ionic** equation,

H⁺(aq) + OH⁻(aq) ====> HOH(*l*)

Therefore, to be neutral, the moles H^+ = moles OH^- .

And, since we are dealing with volumes of solutions with specific molarities,

 $\begin{array}{rcl} \mathsf{M}_{\mathsf{ACID}} &= & \underbrace{\mathsf{moles} \ \mathsf{Acid}}_{\mathsf{V}_{\mathsf{ACID}}} & \xrightarrow{} & \mathsf{M}_{\mathsf{ACID}} \mathsf{V}_{\mathsf{ACID}} &= & \mathsf{M}_{\mathsf{BASE}} \mathsf{V}_{\mathsf{BASE}} \end{array}$