(#8-6)

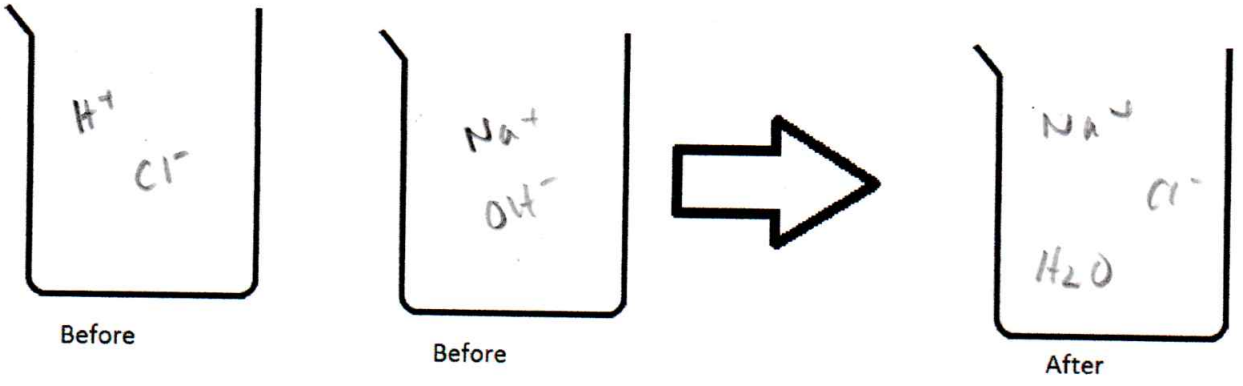
What happens when you mix acids and bases?

Neutralization Reactions

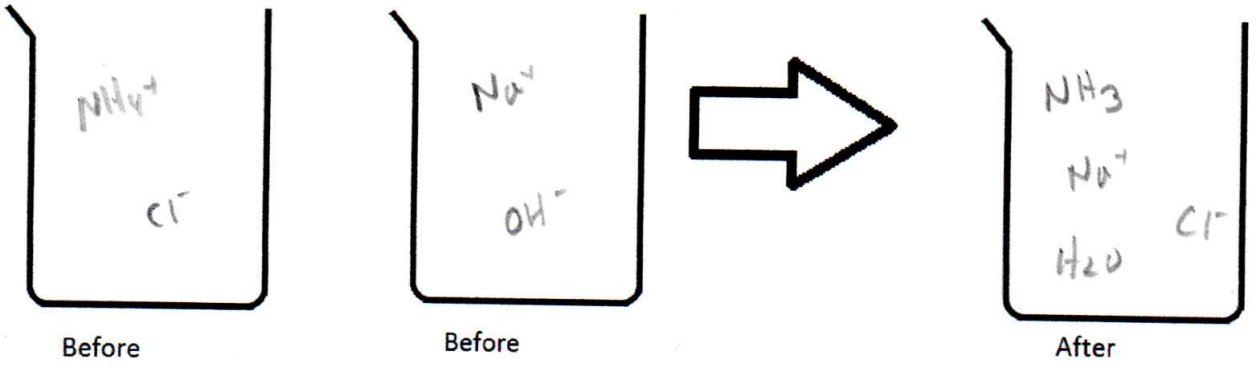
Complete the products of each neutralization reaction. (All acids and bases are considered strong)

Reactants	Molecular reaction	Net-ionic reaction
1. $HCl + NaOH \rightarrow$	$HCl + NaOH \rightarrow NaCl + H_2O$	$H^+ + OH^- \rightarrow H_2O$
2. $HCN + KOH \rightarrow$	$HCN + KOH \rightarrow KCN + H_2O$	$HCN + OH^- \rightarrow CN^- + H_2O$
3. $NH_4Cl + NaOH \rightarrow$	$NH_4Cl + NaOH \rightarrow NH_3 + NaCl + H_2O$	$NH_4^+ + OH^- \rightarrow NH_3 + H_2O$

4. 10mL of 0.1M HCl has 0.1M NaOH added to it.
   a. How much volume is needed to reach the equivalence point? 10mL
   b. Draw a picture of each beaker below at equivalence.
   c. Is the final beaker (acidic/basic/neutral) Note: Strongs produce neutral conjugates ☺



5. 10mL of 0.1M NH_4Cl has 0.1M NaOH added to it. Ka = 5.6E-10 (NH_4^+)
   d. How much volume is needed to reach the equivalence point? 10mL
   e. Draw a picture of each beaker below at equivalence. Ignore spectators and water.
   f. Is the final beaker (acidic/basic/neutral)



6. The first beaker below has 20mL of 0.05M NH_3(aq). If a 0.05M HCl is added to this beaker.

a. How much HCl is needed to reach the half equivalence? 10mL

b. Create an ISE table of the moles for the neutralization shown above.

$M = \frac{mol}{L}$

$0.05 = \frac{x}{.02L}$

$x = .001$ mol

	NH_3	+ HCl	→ NH_4Cl
I	.001	.0005	
S	-.0005	-.0005	+.0005
E	.0005	0	.0005

$.05 = \frac{x}{.01}$

$x = .0005$

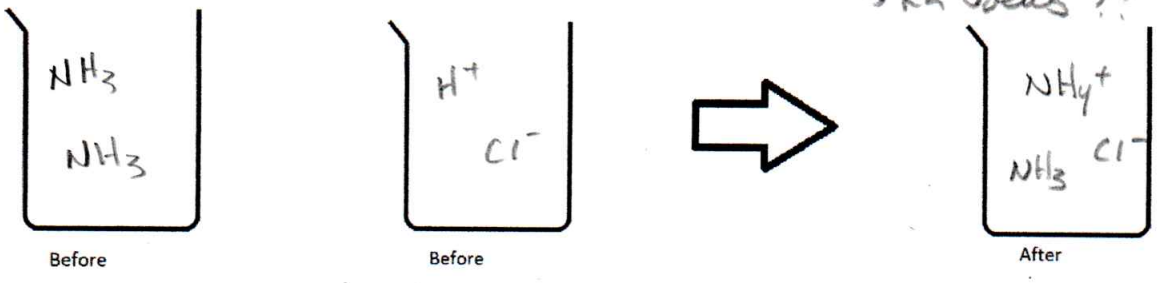
c. Calculate the molarity of each reactant before and after neutralization. (Divide moles by new volume. .03L ← 30mL

	Before	After
$[NH_3]$	.05	.0005/.03 = 0.016M
$[NH_4^+]$	0	.0005/.03 = 0.016M
$[Cl^{-1}]$	.05	.001/.03 = 0.03M

Spectator

d. Student hypothesis: Since concentrations of each ion are equal the beaker must be neutral?

Justify or nullify? Nullify, 2 factors affect pH → Conc. (equal) → Ka values??



Before Before After

7. The beakers below contain 10mL of 0.1M NH_4Cl and NaOH (0.05M)

a. How much volume of NaOH is required to reach equivalence? 20mL

$.1 = \frac{x}{.01L}$

$x = .001$ mol

b. Create an ISE table of the moles for the neutralization shown above.

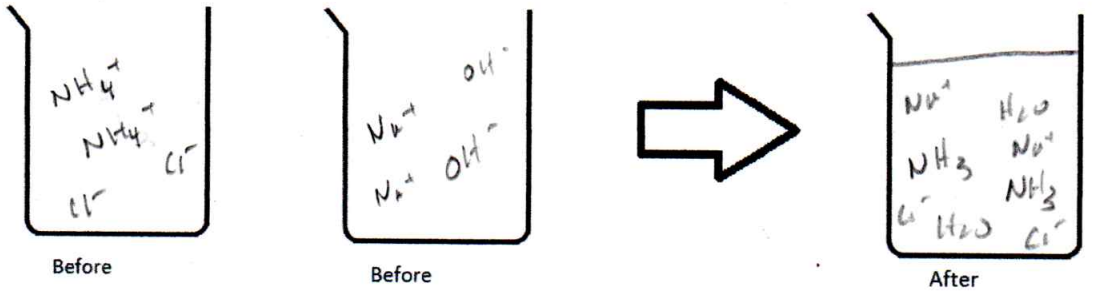
	NH_4^+	+ OH^-	→ NH_3	+ H_2O
I	.001	.001		
S	-.001	-.001	+.001	+.001
E	0	0		

c. Calculate the concentration of each ion before and after the neutralization.

	Before	After
$[NH_3]$	0	.001/.03L = 0.033M
$[NH_4^+]$	.01	→ 0
$[Na^+]$	.05 } spectators	$m_1V_1 = m_2V_2$
$[Cl^{-1}]$	.01 } spectators	$.05 \cdot 20 = x \cdot 30$ $x = 0.033$
		$.01 \cdot 10 = x \cdot 30$ $x = 0.033$

d. Student hypothesis: Since the reaction eliminated the NH_4^+ the final beaker must be ~~acidic~~? Basic

yes, NH_3 is basic & only item left. So must be basic.



Before Before After