

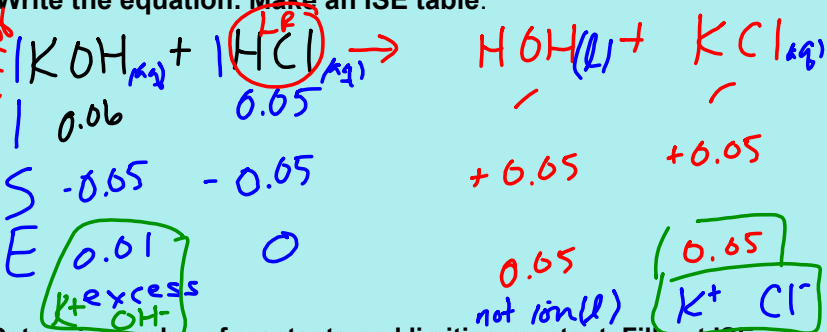
# Solution Stoichiometry

300 mL of 0.2 M KOH is poured into a beaker of 500 mL of 0.1 M HCl.

Write the equation, determine the limiting reactant.  
Determine the concentration of each ion after the reaction.

Write the equation. Make an ISE table.

neutralization  
50% by



Determine moles of reactants and limiting reactant. Fill out ISE.

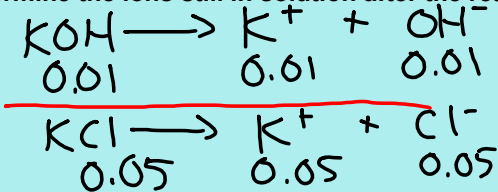
$n = \frac{\text{mol}}{L}$

KOH:  $0.2M = \frac{x \text{ mol}}{0.3}$   
 $x = 0.06 \text{ mol}$

HCl:  $0.1M = \frac{x \text{ mol}}{0.5L}$   
 $x = 0.05 \text{ mol}$

$1000 \text{ mL} = 1L$       $\frac{300 \text{ mL}}{1000 \text{ mL}} = 0.3L$

Determine the ions still in solution after the reaction.



Determine the molarity of the ions in solution after the reaction.

$\frac{300 \text{ mL}}{500 \text{ mL}} = \frac{800 \text{ mL}}{1000 \text{ mL}} = 0.8L$

$\frac{K^+}{0.01 + 0.05} = 0.06 \text{ mol}$	$\frac{OH^-}{0.01 \text{ mol}} = 0.0125M_{OH^-}$	$M = \frac{0.05 \text{ mol}}{0.8L} = 0.0625M_{Cl^-}$
$M = \frac{0.06 \text{ mol}}{0.8L} = 0.075M_{K^+}$		

300 mL of 0.2 M KOH is poured into a beaker of 500mL of 0.1 M HCl.  
Write the equation, determine the limiting reactant.  
Determine the concentration of each ion after the reaction.

**Write the equation. Make an ISE table.**

$\text{KOH(aq)} +$	$\text{HCl (aq)}$	$\longrightarrow$	$\text{HOH(l)}$	$+$	$\text{KCl(aq)}$
I 0.06 mol	0.05 mol				
S 0.05 mol	0.05 mol		0.05 mol		0.05 mol
E 0.01 mol excess	0		0.05 mol		0.05 mol

**Determine moles of reactants and limiting reactant. Fill out ISE.**

<p>KOH  <math>0.2 \text{ M} = \frac{x \text{ mol}}{0.3\text{L}}</math>  <math>x = 0.06 \text{ mol KOH}</math></p>	<p>HCl  <math>0.1 \text{ M} = \frac{x \text{ mol}}{0.5\text{L}}</math>  <math>x = 0.05 \text{ mol HCl}</math></p>
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HCl is the limiting reactant

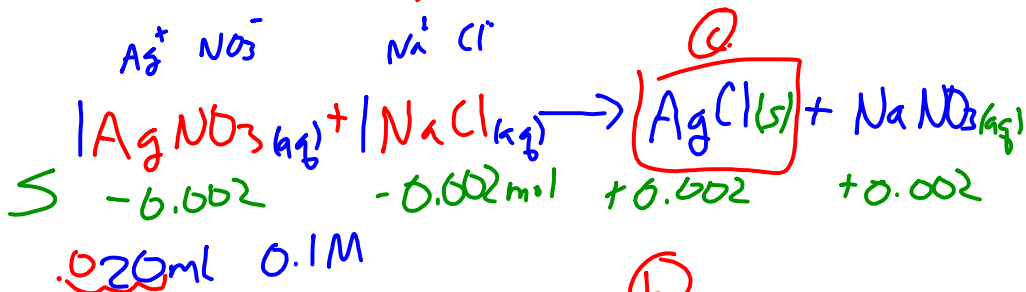
**Determine the ions still in solution after the reaction.**

<p>(excess) KOH <math>\rightarrow</math> K<sup>+1</sup> + OH<sup>-1</sup>  0.01 mol      0.01      0.01</p>
<p>aq. product: KCl <math>\rightarrow</math> K<sup>+1</sup> + Cl<sup>-1</sup>  0.05 mol      0.05      0.05</p>

**Determine the molarity of the ions in solution after the reaction.**

<p>final volume:  300mL  +500mL  800mL</p>	<p>K<sup>+1</sup>  <math>\frac{0.01+0.05 \text{ mol}}{0.8\text{L}} = 0.075\text{M}</math></p>	<p>OH<sup>-1</sup>  <math>\frac{0.01 \text{ mol}}{0.8\text{L}} = 0.0125\text{M}</math></p>	<p>Cl<sup>-1</sup>  <math>\frac{0.05 \text{ mol}}{0.8\text{L}} = 0.0625\text{M}</math></p>
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① 4 equivalence  
all reactant gone / no excess



$$M = \frac{\text{mol}}{L} \quad 0.1 \text{ M} = \frac{X \text{ mol}}{0.020 \text{ L}}$$

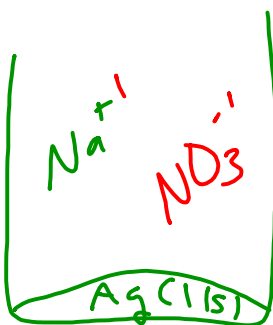
②  $X = 0.002 \text{ mol AgNO}_3$

③ 0.002 mol  $\text{AgNO}_3 \rightarrow$  need 0.002 mol  $\text{NaCl}$

$$0.05 \text{ M} = \frac{0.002 \text{ mol}}{X}$$

$$\frac{0.04 \text{ L}}{1000 \text{ mL}} = \frac{40 \text{ mL}}{1000 \text{ mL}}$$

$= \boxed{0.04 \text{ L NaCl}}$   
40 mL



$$\frac{0.05 X}{0.05} = \frac{0.002}{0.05}$$

$X = 0.04$   
NaCl  
0.002 mol

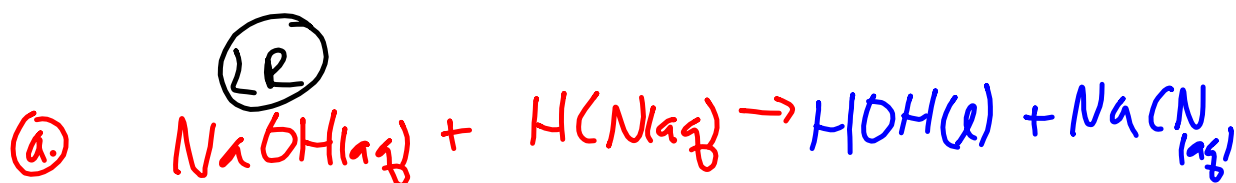
40 mL  
20 mL  
60 mL

$$\frac{0.002 \text{ mol}}{0.06 \text{ L}}$$

$$\frac{60 \text{ mL}}{1000 \text{ mL}} = 0.06$$

④  $\boxed{0.033 \text{ M Na}^+}$

$\boxed{0.033 \text{ M Cl}^-}$



ICE

0.664  
-0.664  
0

0.665  
-0.664  
0.001  
excess

+0.664 +0.664  
0.004 0.604

(b)  $0.2\text{M} = \frac{x \text{ mol}}{0.02\text{L}}$   
 $x = 0.004 \text{ mol NaOH}$

$0.1\text{M} = \frac{x \text{ mol}}{0.05\text{L}}$

$x = 0.005 \text{ mol HCN}$

(c) no solid (creating  $\text{H}_2\text{O(l)}$ )

(d) 0

20 mL of 0.5M  $\text{Na}_2\text{SO}_4$  reacts with completely with 25 mL of  $\text{Ca}(\text{NO}_3)_2$

What is the molarity of the  $\text{Ca}(\text{NO}_3)_2$ ?