Precipitation Notes

1)Using the solubility table mark with an X which ionic salts will form a precipitate and a "?" for those that might

Table1: Precipitates that should form using solubility table on page 155

	Br^-	OH^-	SO_4^{2-}	PO_4^{3-}
K^+				
Cu^{2+}		**ppt**		**ppt**
Ag^+	**ppt**	**ppt**	**ppt?**	**ppt**
Ba^{2+}		**ppt?**	**ppt**	**ppt**
Fe^{3+}		**ppt**		**ppt**
Mg^{2+}		**ppt**		**ppt**
Pb^{2+}	**ppt**	**ppt**	**ppt**	**ppt**

Write Molecular, total Ionic and Net Ionic equation for all reactions that produce a precipitate

Example

Molecular: $Fe(NO_3)_3(aq) + 3\ NaOH(aq) \rightarrow Fe(OH)_3(s) + 3NaNO_3(aq)$

Total Ionic: $Fe^{3+} + 3\ NO_3^- + 3\ Na^+ + 3\ {}^-OH \rightarrow Fe(OH)_3(s) + 3Na^+ + 3\ NO_3^-$

Net Ionic: $Fe^{3+} + 3\ {}^-OH \rightarrow Fe(OH)_3(s)$

2) Identifying Electrolytes, Weak Electrolytes and use of the Van't Hoff factor (i)

Electrolytes are strong acids/ strong bases and soluble ionic compounds (i = # of ions)
The Van't Hoff Factor (i) indicates the number of particles that will be found in solution
Weak electrolytes are compounds that partially dissociate like weak acids and weak bases (1 < i < 2)
Non-electrolytes are all molecular compounds and insoluble compounds (i = 1)

Strong Acids	Strong Bases
HCl	All group 1 and Group 2
HBr	Metal Hydroxides
HI	
HNO_3	
H_2SO_4	
$HClO_3$	
$HClO_4$	

Fill in the table below

Compound	Electrolyte (Strong/ Weak/ Non)	Van't Hoff factor
$BaSO_4$	**Non (insoluble)**	**1**
HCl	**Strong**	**2**
CH_3COOH (acetic acid)	**Weak**	**1 < i < 2**
NaOH	**Strong**	**2**
Na_2SO_4	**Strong**	**3**
Ammonia (NH_3) weak base	**Weak**	**1 < i < 2**
$C_6H_{12}O_6$	**Non**	**1**

2) Using the following equation: **2 $FePO_4$ + 3 Na_2SO_4 → $Fe_2(SO_4)_3$ + 2 Na_3PO_4**

A. If 250 mL of 5.0 M iron (III) phosphate reacts with 250 mL of 5.00 M sodium sulfate, how many grams of iron (III) sulfate could be made?

0.417 mol x 399.7 g/mol =166.7 g

B. If a 65.0% yield is obtained, how many grams of sodium phosphate were made?

$$\frac{65}{100} = \frac{X}{136.8} \qquad X = 88.92 \text{ g}$$

C. What is the concentration of all reagents and products in solution?

0.852 mol/ L $FePO_4$ 0.834 mol/L $Fe_2(SO_4)_3$ 1.67 mol/ L Na_3PO_4

	2 $FePO_4$	**+ 3 Na_2SO_4**	→	**$Fe_2(SO_4)_3$**	**+ 2 Na_3PO_4**
Molarity or **MM**	**5 mol/ L**	**5 mol/ L**		**399.7 g/ mol**	**164 g/ mol**
Amount	**0.25 mL**	**0.25 mL**			
Moles Gram/ MM or Molarity x L	**5 mol/ L x 0.25 L=** **1.25 mol**	**5 mol/ L x 0.25 L=** **1.25 mol**			
Moles/rxn (divide moles by SC)	**0.625 mol**	**0.417 mol**			
React (Least Mol/ Rxn)	**-0.417 mol**	**-0.417 mol**		**+ 0.417 mol**	**+ 0.417 mol**
Final Mole/ Rxn	**0.208 mol**	**0**		**0.417 mol**	**0.417 mol**
Final Moles (SC x final mol/ rxn)	**0.416 mol**	**0**		**0.417 mol**	**0.834 mol**
Final Amt (final moles x MM) or Concentration (final mols/ total volume)	**0.426 mol/ 0.5L =** **0.852 mol/ L**	**0**		**0.417 mol x 399.7 g/mol =166.7 g** **0.417mol / 0.5 L = 0.834 mol/ L**	**0.834 mol x 164 g/mol =136.7 g** **0.834 mol/ 0.5 L = 1.67 mol/ L**

4) Using the equation: **$Ca(OH)_{2(aq)}$ + 2 $HCl_{(aq)}$ → 2 $NaCl_{(aq)}$ + 2 $H_2O_{(l)}$**

A. How many liters of 0.100 M HCl would be required to react completely with 5.00 grams of calcium hydroxide?
Information about 1 reactant to find out about the other

$$0.135 \text{ mol} \times \frac{1 \text{ L}}{0.1 \text{ mol}} = 1.35 \text{ L}$$

	HAVE (-) **$Ca(OH)_{2(aq)}$**	NEED (+) **+ 2 $HCl_{(aq)}$**	→	**$CaCl_{2(aq)}$**	**2 $H_2O_{(l)}$**
Molarity or **MM**	**74 g/mol**	**0.1 mol/ L**			
Amount	**5 grams**				
Moles Gram/ MM or Molarity x L	**5g / 74 g/mol =** **0.0676 mol**				
Moles/rxn (divide moles by SC)	**0.0676 mol**				
React (Least Mol/ Rxn)	**-0.0676 mol**	**+ 0.0676 mol**			
Final Mole/ Rxn	**0**	**0.0676 mol**			
Final Moles (SC x final mol/ rxn)	**0**	**0.135 mol**			
Final Amt (final moles x MM) or Concentration (final mols/ total volume)					

B. If 15.0 grams of calcium hydroxide is combined with 75.0 mL of 0.500 M HCl, how many grams of calcium chloride would be formed? **20.87g**

	HAVE (-) $Ca(OH)_{2(aq)}$	NEED (+) $+ 2\ HCl_{(aq)}$	→	$CaCl_{2(aq)}$	$2\ H_2O_{(l)}$
Molarity or **MM**	**74 g/mol**	**0.5 mol/ L**		**111g /mol**	
Amount	**15 grams**	**0.75 L**			
Moles Gram/ MM or Molarity x L	**15g / 74 g/mol =** **0.2 mol**	**0.5 mol/L x 0.75L =** **0.375 mol**			
Moles/rxn (divide moles by SC)	**0.2 mol**	**0.188 mol**			
React (Least Mol/ Rxn)	**-0.188 mol**	**-0.188 mol**		**+0.188 mol**	+0.188 mol
Final Mole/ Rxn	**0.012 mol**	**0**		**0.188 mol**	
Final Moles (SC x final mol/ rxn)	**0.012 mol**	**0**		**0.188 mol**	
Final Amt (final moles x MM) or Concentration (final mols/ total volume)	**0.012 mol x 74 g/ mol =** **0.89 g**			**0.188 mol x 111 g/ mol=** **20.87g**	

C. How many grams of the excess reagent will be left over after the reaction is complete?

0.89 g