

Precipitation Notes

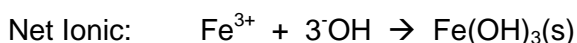
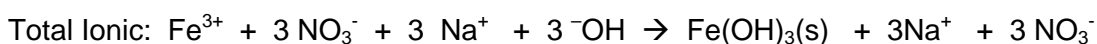
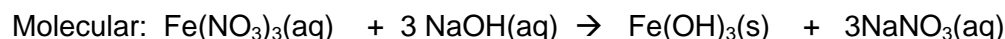
1) Using the solubility table mark with an X which ionic salts will form a precipitate and a “?” for those that might

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



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 ₂ SO 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 ₃ COOH (acetic acid)	Weak	1 < i < 2
NaOH	Strong	2
Na ₂ SO ₄	Strong	3
Ammonia (NH ₃) weak base	Weak	1 < i < 2
C ₆ H ₁₂ O ₆	Non	1

2) Using the following equation: $2 \text{FePO}_4 + 3 \text{Na}_2\text{SO}_4 \rightarrow \text{Fe}_2(\text{SO}_4)_3 + 2 \text{Na}_3\text{PO}_4$

- 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?

$$0.417 \text{ mol} \times 399.7 \text{ g/mol} = 166.7 \text{ g}$$

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

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

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

0.852 mol/ L FePO_4 0.834 mol/L $\text{Fe}_2(\text{SO}_4)_3$ 1.67 mol/ L Na_3PO_4

	2 FePO_4	+ 3 Na_2SO_4	→	$\text{Fe}_2(\text{SO}_4)_3$	+ 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: $\text{Ca}(\text{OH})_{2(\text{aq})} + 2 \text{HCl}_{(\text{aq})} \rightarrow 2 \text{NaCl}_{(\text{aq})} + 2 \text{H}_2\text{O}_{(\text{l})}$

- 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 (-)	NEED (+)	→		
	$\text{Ca}(\text{OH})_{2(\text{aq})}$	+ 2 $\text{HCl}_{(\text{aq})}$		$\text{CaCl}_{2(\text{aq})}$	2 $\text{H}_2\text{O}_{(\text{l})}$
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 (-)	NEED (+)	→		
Molarity or MM	Ca(OH)_{2(aq)} 74 g/mol	+ 2 HCl_(aq) 0.5 mol/ L		CaCl_{2(aq)} 111g /mol	2 H₂O_(l)
Amount	15 grams	0.75 L			
Moles Gram/ MM or Molarity x L	$15\text{g} / 74 \text{g/mol} =$ 0.2 mol	$0.5 \text{mol/L} \times 0.75\text{L}$ $=$ 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)	$0.012 \text{ mol} \times 74 \text{ g/}$ $\text{mol} =$ 0.89 g			$0.188 \text{ mol} \times 111 \text{ g/}$ $\text{mol} =$ 20.87g	

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

0.89 g