Reactions in Aqueous Solutions Where a Solid Forms

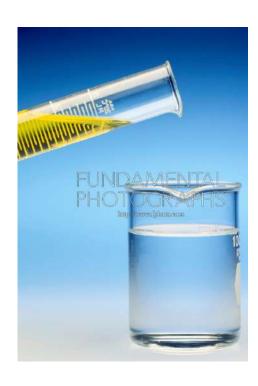
7.1-7.2

Predicting Whether a Rxn Will Occur

- "Driving forces" pull reactants to form products
 - Formation of solid
 - Formation of water
 - Transfer of electrons
 - Formation of a gas
- When 2+ chemicals brought together if any of these can occur, a chemical change likely to take place.
- Help us predict what products will form

Reactions Forming a Solid

- Precipitation- formation of a solid (precipitate)
- Ex. K₂CrO₄ (aq) (yellow) reacts w. Ba(NO₃)₂
 (aq) (colorless)





Ionic Compounds in Solution

- When ionic compounds dissolves ion separate
- Know ions are present b/c conducts electricity (pure water doesn't)
- Strong electrolyte- when each unit of substance that dissolves in water produces separated ions
 - Ba(NO₃)₂ and K₂CrO₄ strong electrolytes

- Can write: $K_2CrO_4 + Ba(NO_3)_2$ (aq) \rightarrow products or $2K^+$ (aq) $+ CrO_4^{2-}$ (aq) $+ Ba^{2+}$ (aq) $+ 2NO_3^-$ (aq) \rightarrow products
- *** Solid Compound has net charge = 0
- Possible products

- Which would produce yellow solid?
- KNO₃ (white solid) CrO₄²⁻ ion yellow so BaCrO₄
 precipitate KNO₃ left in solution as ions
- $K_2CrO_4 + Ba(NO_3)_2$ (aq) \rightarrow BaCrO₄ (s) + KNO₃ (aq)

Solubility Rules

- 1. Most nitrate salts = soluble
- 2. Most salts of Na⁺, K⁺, NH₄⁺ = soluble
- 3. Most chloride salts = soluble

(exceptions: AgCL, PbCl₂, Hg₂Cl₂)

4. Most sulfate salts = soluble

(exceptions: BaSO₄, PbSO₄, CaSO₄)

5. Most hydroxide compounds only slightly soluble (exceptions: NaOH, KOH)

(Ba(OH)₂, Ca(OH)₂ moderately soluble)

6. Most sulfide (S^{2-}), carbonate (CO_3^{2-}) and phosphate PO_4^{3-} only slightly soluble

Predicting Precipitates Steps

- 1. Write reactants as exist before rxn occurs
- 2. Consider various solids possible (exchange anions)
- 3. use solubility rules to decide whether solid forms
 - If not soluble- solid

Practice

Predict whether a solid will form when the following pairs of solutions are mixed. If so, identify the solid and write the balanced equation for the reaction.

- 1. $Ba(NO_3)_2$ (aq) and NaCl (aq)
- 2. Na₂S (aq) and Cu(NO₃)₂ (aq)
- 3. NH_4Cl (aq) and $Pb(NO_3)_2$ (aq)