

9/9/05

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CHM 123 - Lecture (Friday 10:30am)

- EXAM 1 - September 15th, 7-8:15 pm.
- Exam will cover material through Monday's lecture.

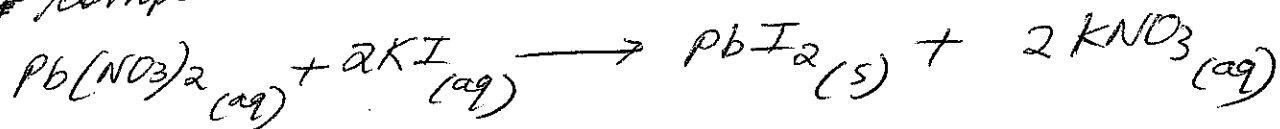
Aqueous Solutions and Stoichiometry

Properties of Aqueous solutions

- Electrolytic Properties
 - Ionic - conduct electricity (electrolytes)
 - Non-Ionic - do not conduct electricity (non electrolytes)
- Ionic compounds in water
 - electrolytes
 - dissociate when dissolved in water.
- Molecular compounds in water
 - non electrolytes
 - do not dissociate when dissolved in water
 - exceptions those ~~are~~ that react with water (e.g. NH_3 , HCl).
- Strong and weak electrolytes
 - strong - dissociate completely
 - weak - dissociate partially

Precipitation Reactions

- Occur when the mixed solutions contain a combination of ions which form a sparingly soluble (or insoluble) ~~salt~~ compound.



Solubility Guidelines for Ionic Compounds

- solubility: amount of substance that can be dissolved in 1L of water at 25°C.
- substances with solubility $< 0.1\text{g/L}$ are partially soluble (or insoluble)

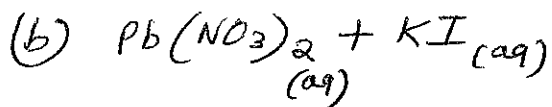
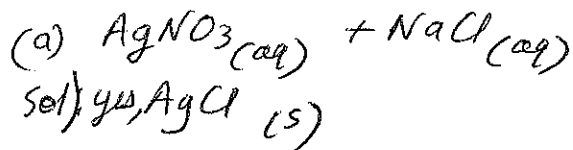
Exchange Reactions

- also known as metathesis
- cations exchange with each other
- driving force for exchange
 - formation of a precipitate
 - generation of a gas
 - production of a weak electrolyte
 - production of a nonelectrolyte



Example 1

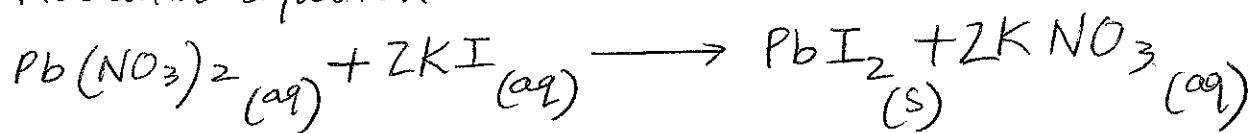
Predict whether or not a precipitate will form when the following two solutions are mixed:



(sol) yes, PbI

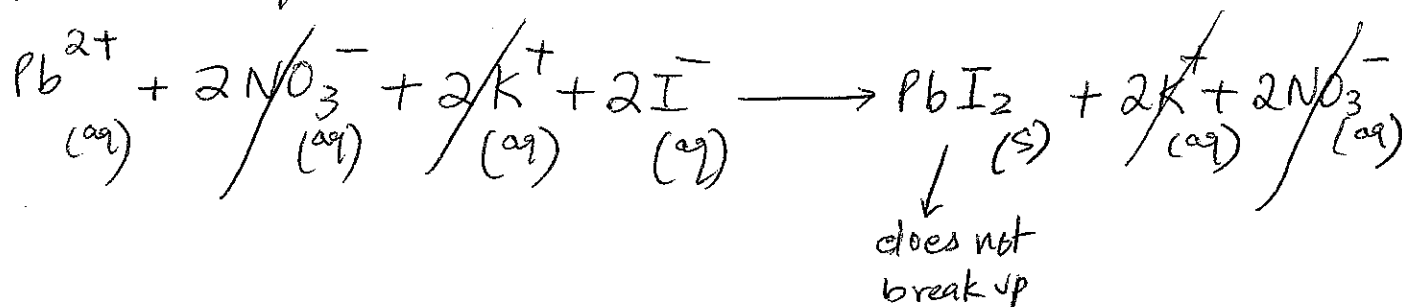
Ionic Equations

Molecular equation



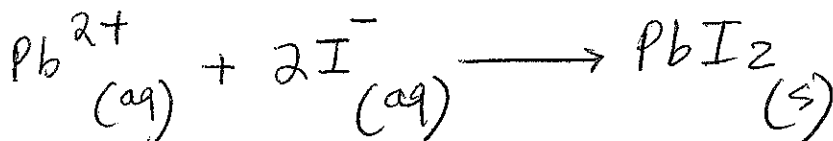
Complete Ionic Equation

- split all aqueous compounds into ions:



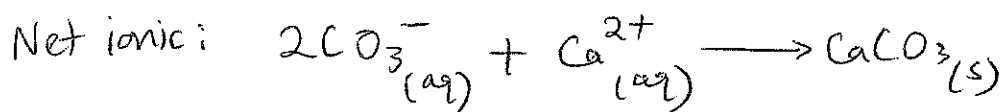
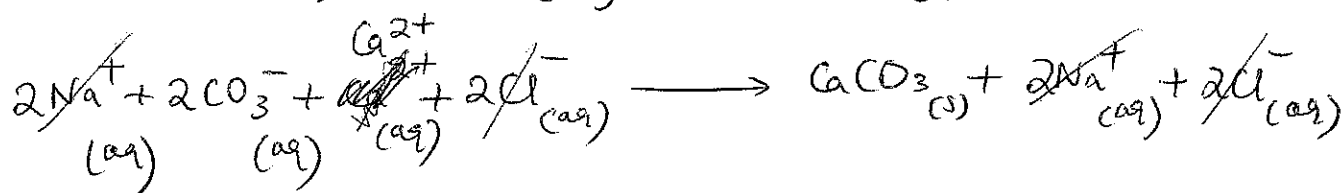
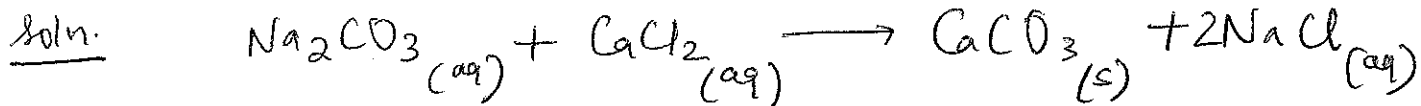
- Cancel out ions that exist on both sides - spectator ions.

- Net ionic equation: shows the ions that participate in a reaction.



Example 2

An aqueous solution of sodium carbonate is mixed with an aqueous solution of calcium chloride. A white precipitate forms immediately. Write a net ionic equation and identify spectator ions.



spectator ions:
 $\text{Na}^{+}, \text{Cl}^{-}$

Acid and Base reactions

Acids:

- Substances that ionize or react ~~with~~ⁱⁿ water to increase concentration of H^+ ions (protons).
- HCl and HNO_3 - monoprotic acids
- H_2SO_4 - diprotic acid
- Strong acids (need to know)
 - HCl , HNO_3 , H_2SO_4 , $HClO_4$, HBr , HI , $HClO_3$
- Weak acids
 - All others including (but not limited to) HF , CH_3COOH .

Bases:

- H^+ ion acceptors
- react with H^+ ions to form water.

$$H^+_{(aq)} + OH^-_{(aq)} \longrightarrow H_2O_{(l)}$$
- increase $[OH^-]$ when dissolved in water.

$$NaOH_{(aq)} \longrightarrow Na^+_{(aq)} + OH^-_{(aq)}$$
- Strong bases:
 - $NaOH$, KOH