

## Salt Lake Community College, Chemistry Department

### Chem 1110 Workshop 6- part II

#### Topic: Chemical Equations

##### **Objective:**

- To be able to determine oxidation numbers of atoms and determine which substances are being reduced and which oxidized in a reaction
- To be able to recognize spectator ions and write net ionic equations

##### **Solubility Rules:**

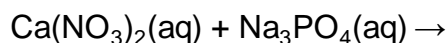
- **Rule 1:** ionic compounds with Group I cations ( $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Li}^+$ ) and ammonium ion ( $\text{NH}_4^+$ ) are always soluble. Regardless of anion, if an ionic compound has one of these cations, it will *\*always\** be soluble.
- **Rule 2:** ionic compounds with acetate ion ( $\text{C}_2\text{H}_3\text{O}_2^-$ ), nitrate ion ( $\text{NO}_3^-$ ), and perchlorate ( $\text{ClO}_4^-$ ) as anions are always soluble.
- **Rule 3:** ionic compounds with halogens (group 7A) as anions are always soluble unless the cation is  $\text{Ag}^+$ ,  $\text{Hg}^{2+}$ , or  $\text{Pb}^{2+}$  \*\*\*\*\*Note: Don't forget these exceptions!
- **Rule 4:** ionic compounds with sulfate ( $\text{SO}_4^{2-}$ ) as an anion are always soluble unless the cation is  $\text{Ag}^+$ ,  $\text{Hg}^{2+}$ ,  $\text{Pb}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ , or  $\text{Ba}^{2+}$ .
- **Rule 5:** ionic compounds with carbonate ( $\text{CO}_3^{2-}$ ), phosphate ( $\text{PO}_4^{3-}$ ), sulfide ( $\text{S}^{2-}$ ), and hydroxide ( $\text{OH}^-$ ) as anions are always insoluble unless the cation is a Group 1 cation or ammonium ion or unless the compound is a strong base.

##### **Molecular, Ionic and net ionic equations:**

- a) Chemical equations are a shorthand way of describing a chemical reaction
- b) There are different types of chemical equations
  1. Molecular equations - all reactants and products are written as complete molecules even though they may exist as ions in solution
  2. Complete ionic equations - strong electrolytes are written as ions if they are in aqueous solution
  3. Net ionic equations - spectator ions are canceled and the actual reaction that takes place is left

**Practice Problems:**

1. Which of the following is **not** soluble in water?
  - a) potassium sulfide
  - b) iron(II) bromide
  - c) iron(III) hydroxide
  - d) iron(III) nitrate
  - e) ammonium sulfate
2. Complete and balance the following reactions.



**Molecular equation:**

**Ionic Equation:**

**Net Ionic Equation:**

3. Write and balance the following acid-base neutralization reaction:



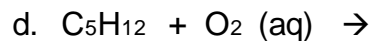
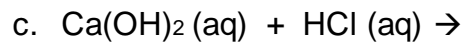
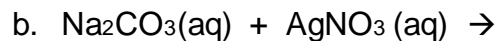
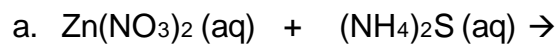
**Molecular equation:**

**Ionic Equation:**

**Net Ionic Equation:**

4. An aqueous solution of calcium chloride is allowed to react with an aqueous solution of sodium carbonate, and a precipitate forms. Identify the solid in the balanced equation.

5. Complete and balance each of these reactions? If no reaction occurs write "no reaction."



6. The oxidation number of iron in the compound  $\text{FeBr}_3$  is

- a) -2.
- b) -1.
- c) +1.
- d) +2.
- e) +3.

7. The oxidation number of sulfur in calcium sulfate,  $\text{CaSO}_4$ , is

- a) +6.
- b) +4.
- c) +2.
- d) 0.
- e) -2.