

Salt Lake Community College, Chemistry Department

Chem 1110 Workshop 6 - Part I

Topic: Chemical Equations

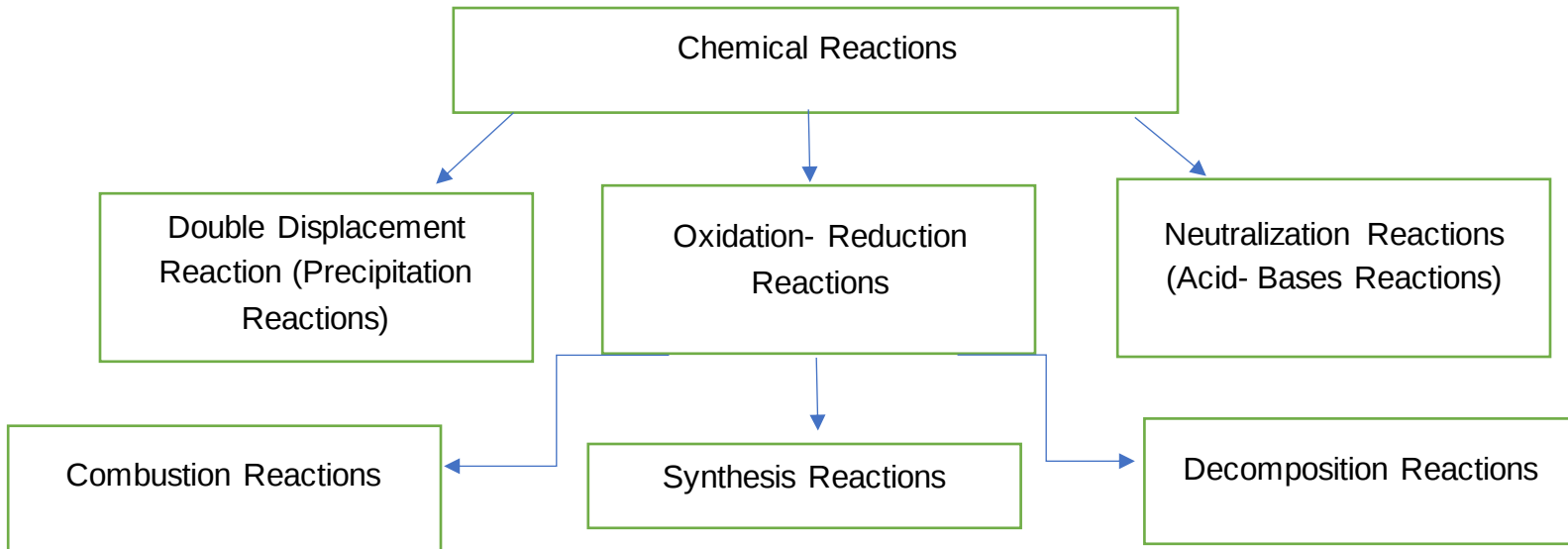
Objective:

- Balancing chemical reactions
- Ways to classify the chemical reactions
- Strong, weak and non-electrolytes

Balancing Chemical Reactions:

1. Remember mass balance!
2. Use the Periodic Table and a knowledge of polyatomic formulas and charges to select the ratios of ions and how they go together (Empirical Formula)
3. There is a difference between the subscripts in molecular formulas and the coefficients of balanced chemical equations

Ways to classify chemical Reactions:



Strong, weak and non-electrolytes:

1. Strong electrolytes - dissociate (ionize) ~100%. This includes all ionic compounds and strong acids and bases.
2. Weak electrolytes - dissociate less than 100%, usually 1-10% or less. The most common weak electrolytes are the organic acids

3. Nonelectrolytes - do not dissociate. This includes all covalent compounds except organic acids and bases

	strong electrolytes	weak electrolytes	non-electrolytes
general	all ionic compounds		nearly all organic compounds except organic acids and bases; most binary covalent compounds
acids	strong acids: HCl, HBr, HI, HNO ₃ , H ₂ SO ₄ , HClO ₄	weak acids: H ₂ O, HF, H ₃ PO ₄ , H ₂ CO ₃ , H ₂ SO ₃ , H ₂ S, all organic acids, usually any acid not named as a strong acid	
bases	strong bases: all Group I and Group II hydroxides	weak bases: ammonia (NH ₃), NH ₄ OH, amines, organic bases (usually contain C, H, N in molecular formula), usually any base not named as a strong base	

Practice Problems:

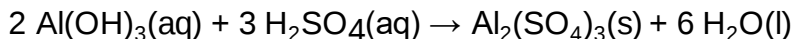
- Which statement regarding balanced chemical equations is **not** true?
 - The number of each kind of atom must be the same on each side.
 - Coefficients are used in front of formulas to balance the equation.
 - Subscripts may be changed to make an equation simpler to balance.
 - When no coefficient is written in front of a formula, the number "one" is assumed.
 - Reactants are written to the left of the arrow.
- Balance the following reactions:**
 - $\text{N}_2 (\text{g}) + \text{H}_2 (\text{g}) \rightarrow \text{NH}_3 (\text{g})$
 - $\text{Al} (\text{s}) + \text{O}_2 (\text{g}) \rightarrow \text{Al}_2\text{O}_3 (\text{s})$
 - $\text{C}_3\text{H}_8 (\text{g}) + \text{O}_2 (\text{g}) \rightarrow \text{CO}_2 (\text{g}) + \text{H}_2\text{O} (\text{g})$
 - $\text{N}_2 (\text{g}) + \text{H}_2 (\text{g}) \rightarrow \text{NH}_3 (\text{g})$
 - $\text{Fe}_2\text{O}_3 (\text{s}) + \text{CO} (\text{g}) \rightarrow \text{Fe} (\text{s}) + \text{CO}_2 (\text{g})$
- Which is the correct equation for the reaction of magnesium with hydrochloric acid to produce hydrogen and magnesium chloride?
 - $\text{Mg} + 2 \text{HCl} \rightarrow \text{H}_2 + \text{MgCl}_2$
 - $\text{Mg} + \text{HCl} \rightarrow \text{H} + \text{MgCl}$

- c) $2 \text{Mg} + 6 \text{HCl} \rightarrow 3 \text{H}_2 + 2 \text{MgCl}_2$
- d) $\text{Mg} + 2 \text{HCl} \rightarrow 2 \text{H} + \text{MgCl}_2$
- e) $\text{Mg} + 3 \text{HCl} \rightarrow 3 \text{H} + \text{MgCl}_2$

4. Which reaction is an example of an acid-base reaction?

- a) $\text{H}_2\text{CO}_3(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- b) $\text{H}_2\text{SO}_4(\text{aq}) + \text{Ca}(\text{OH})_2(\text{aq}) \rightarrow \text{CaSO}_4(\text{aq}) + 2 \text{H}_2\text{O}(\text{l})$
- c) $6 \text{HCl}(\text{aq}) + 2 \text{Al}(\text{s}) \rightarrow 2 \text{AlCl}_3(\text{aq}) + 3 \text{H}_2(\text{g})$
- d) $\text{FeCl}_3(\text{aq}) + 3 \text{KOH}(\text{aq}) \rightarrow \text{Fe}(\text{OH})_3(\text{s}) + 3 \text{KCl}(\text{aq})$
- e) $2 \text{Hg}(\text{l}) + \text{O}_2(\text{g}) \rightarrow 2 \text{HgO}(\text{s})$

5. The following reaction can be classified as what type(s) of reaction(s)?



- a) precipitation
- b) acid-base neutralization
- c) redox reaction
- d) combustion
- e) both A and B

6. Classify the following as a precipitation, an acid-base neutralization, or a redox reaction.

- a) $\text{Ca}(\text{OH})_2(\text{aq}) + 2 \text{HBr}(\text{aq}) \rightarrow 2 \text{H}_2\text{O}(\text{l}) + \text{CaBr}_2(\text{aq})$
- b) $\text{Pb}(\text{ClO}_4)_2(\text{aq}) + 2 \text{NaCl}(\text{aq}) \rightarrow 2 \text{PbCl}_2(\text{s}) + 2 \text{NaClO}_4(\text{aq})$
- c) $2 \text{AgNO}_3(\text{aq}) + \text{Cu}(\text{s}) \rightarrow 2 \text{Ag}(\text{s}) + \text{Cu}(\text{NO}_3)_2(\text{aq})$