

## CHE 101– Chapter 8 – Study Guide

Terms: Products, reactants, chemical equation vs. balanced equation, activation energy, combination reaction, displacement reactions (single and double), decomposition reactions, exothermic vs. endothermic, heat of reaction, activation energy.

1. Things you should know/memorize for the exam. They will help you to write chemical reactions. For details see the Reaction Flow Chart.
  - a. Diatomic atoms – 7
  - b. Metalloids – 7
  - c. States for typical compounds (liquid – 2 and gaseous - 11 elements)
  - d. Common Gases – 11
  - e. Common Acids (H at the beginning) and Bases (anything with OH)
  - f. The three decomposition reactions:
    - i.  $\text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2 (\text{g})$
    - ii.  $\text{NH}_4\text{OH} \rightarrow \text{H}_2\text{O} + \text{NH}_3 (\text{g})$
    - iii.  $\text{H}_2\text{SO}_3 \rightarrow \text{H}_2\text{O} + \text{SO}_2 (\text{g})$
2. Chemical Equations:
  - a. Understand the meaning of all symbols in a chemical equation. (Table 8.1)
  - b. Be able to balance equations.
  - c. Convert descriptions of chemical reactions into chemical equations.
    - i. Names  $\rightarrow$  Chemical Formula's (Ionic and Molecular)
    - ii. Balancing charges
    - iii. Diatomics
    - iv. States (Solubility Table)
3. Types of Reactions: The Reaction Flowchart provides most of the information to study.
  - a. Combination reactions
  - b. Decomposition reactions
  - c. Single-displacement reactions - Understand Activity series and how to use it to predict reactions
  - d. Double replacement reactions
    - i. Formation of precipitates- Be able to predict formation based on solubility tables.
    - ii. Formation of a gas (Unstable compounds like  $\text{H}_2\text{CO}_3$ ,  $\text{H}_2\text{SO}_3$ ,  $\text{NH}_4\text{OH}$ ).
  - e. Acid/Base reactions
    - i.  $\text{Acid} + \text{Base} \rightarrow \text{Salt} + \text{Water} + \text{Heat}$
    - ii. Recognize common acids and bases
  - f. Combustion reactions  $\text{C}_x\text{H}_y\text{O}_z + \text{O}_2 \rightarrow \text{H}_2\text{O} (\text{l}) + \text{CO}_2 (\text{g}) + \text{Heat}$
4. Steps to Complete a Reaction – Be able to fill in the missing products or reactants for chemical reactions
  - a. Identify the type of reaction
  - b. Determine the reaction mechanism
  - c. Determine if the reaction will occur
    - i. Combination, Decomposition, Acid/Base and Combustion reactions are presumed to always occur.
    - ii. SD – Use the activity series
    - iii. DD – Change in state (formation of solid or gas from aqueous reactants), Temperature change, or formation of slightly ionized compound (water), or formation of one of the three compounds that spontaneously decompose.
  - d. Balance the compounds (for charge, and diatomics)
  - e. Balance the reaction (conservation of mass and energy)
  - f. Add states to the reactions
5. Heat:
  - a. Be able to identify exothermic and endothermic reactions.
  - b. Understand heat of reaction and activation energy.