

CHE 101 Chapter 4 - Study Guide

Terms: Physical property, Chemical property, Reactant, Product, Law of Conservation of Mass, Energy, Potential Energy, Kinetic Energy, Heat, Law of Conservation of Energy.

1. Chemical vs. Physical properties: Understand and be able to differentiate between chemical and physical properties of elements and compounds.
 - a. Physical – associated with physical existence, can be determined w/o altering composition, nondestructive.
Ex: Color, taste, odor, state (s, l, g), melting point, boiling point, density.
 - b. Chemical – ability of a substance to form new substances via a chemical reaction – alters composition, destructive.
Ex: combustibility, chemical reactions.
2. Chemical vs. Physical changes: Understand and be able to differentiate between chemical and physical changes in elements and compounds.
 - a. Physical – change in physical property w/o altering composition, generally reversible (includes changes of states)
 - b. Chemical – change in composition, with different physical and chemical properties, generally nonreversible
3. Chemical Equations: Understand the notation and symbols used in chemical equations and what they represent.
 - a. Subscripts = number of atoms in a molecule
 - b. Numbers before element = number of molecules present
 - c. States (s, l, g) in parentheses
 - d. Reactants (Left side of the equation)
 - e. Reaction Arrow (separates reactants and products, contains miscellaneous information.
 - f. Products (Right side of the equation).
4. Conservation of Mass
 - a. Can neither create nor destroy matter (except in nuclear reactions)
 - b. Number and type of atoms on both sides of a chemical equation must be the same.
 - c. Mass of the reactants and products must be the same.
5. Energy: Know a few examples.
 - a. The capacity to do work
 - b. Types - mechanical, chemical, electrical, heat, nuclear, radiant, light energy
 - c. PE: stored energy or energy due to position
 - d. KE: energy due to motion
6. Heat vs. Temperature
 - a. Heat = Measure of the amount of energy in an object (Unit = Joules or calories) - Extrinsic
 - b. Temperature = Measure of the intensity of energy in an object (Unit = °C, °F, or K) – Intrinsic
7. Conservation of Energy
 - a. Energy is not created nor destroyed but can be transformed (except in nuclear reactions)
 - b. Energy is one tool we can use to understand chemical reactions

8. Exothermic and Endothermic reactions: Understand and be able to differentiate between them. Categorize examples as either exothermic or endothermic. (Figure 4.6). Know a few examples.
- Exothermic: Gives off energy ($E_{\text{react}} > E_{\text{prod}}$) Extra energy is given off as heat (mostly)
 - Endothermic: Absorbs energy ($E_{\text{react}} < E_{\text{prod}}$) Heat is required for the reaction to occur.
9. Problems involving heat transfer.
- Heat = mass \times specific heat \times change in temperature
 - $q = ms\Delta t$
 - Units!
 - $4.184 \text{ J} = 1 \text{ cal}$
 - Specific heat of water ($4.184 \text{ J/g } ^\circ\text{C} = 1.00 \text{ cal/g } ^\circ\text{C}$).
 - Be able to solve problems involving heat like those assigned as homework. Do not memorize the specific heat of any compounds other than water.