Chemistry I
Chapter 2 – Matter and Change

Learning Goals:
1. **Students will understand how matter can be identified by properties.** 2. **Students will understand the difference between pure substances and mixtures and be able to classify matter based on those characteristics.** 3. **Students will be able to apply the Law of Conservation of Mass to chemical reactions occurring between samples of matter.**

2.1 Properties of Matter

- Review … what is *matter*?

- How can we describe/identify matter?
  *PROPERTIES

Extensive vs. *Intensive*

Physical vs. *Chemical*

*STATES

Solids have a definite shape and volume because particles are tightly packed

Liquids have an indefinite shape and a definite volume because particles are condensed, but can move around each other

Gases (aka *Vapor*) are indefinite in shape and volume because particles move freely

- *Physical change* involves changing properties of a material without changing the composition. (Ex. Boiling, freezing, melting, breaking, cutting, crushing, etc.)

2.2 Mixtures

- How can *matter* be classified?

Pure substance vs. *Mixture*

- *Heterogeneous mixtures* are not uniform in composition (ex. vinegar + oil, pizza, etc.)
- *Homogeneous mixtures* (aka solutions) are uniform in composition (ex. Vinegar, air, soda, etc.)
- How can we physically separate a mixture?

Depends on the mixture!

Filtration separates a solid from a liquid

Distillation separates homogeneous mixtures

2.3 Elements and Compounds

Now that we know something about *mixtures*, how do we look at *pure substances*?

- Pure substances, as stated earlier on this page, can be elements or compounds.

    *What is unique about them? How are they different from *mixtures*?

- *Elements* are the simplest form of matter that has a unique set of properties
  (ex. Al, Cu, O, Na)
- *Compounds* are composed of 2 or more elements chemically combined in a fixed proportion
  (ex. NaCl, $C_6H_{12}O_6$, H_2O, etc)
- *Chemical changes* produce something new
  (ex. Burning, rust, rot, decompose, explode, etc)
    - Figure 2.11 on p.44 represents the "Classification of Matter" Breakdown

- The *Periodic Table of Elements* continues to breakdown *matter* based on repeating properties.

    **Periodic* means "repeated in a pattern"

    Can you think of some things in nature that repeat in a pattern?

- Periodic Table basics:

    Periods

    Groups

2.4 Chemical Reactions

One more time … what is *matter*? How can we *identify* it? How can it be *classified*?

- If a substance has the ability to undergo a chemical change, we say it has that *chemical property*.
- When a chemical change occurs, a *chemical reaction* takes place
- A *chemical reaction* changes one or more substances into one or more new substances

    Two parts of all chemical reactions:

    Reactant –

    Product –

Ex.

- What are some indicators that a chemical reaction has taken place?

- Whenever a reaction takes place, even though the type of matter is changing, the actual amount does not.

- The *Law of Conservation of Mass* states that mass/matter is neither created nor destroyed during a chemical reaction