Unit 5
Physical and Chemical Properties and Changes

Section 10.1 and 12.1
The Nature of Matter
Level 3

- Can identify chemical and physical properties of matter. And give examples of each.
- Can identify whether a change is either a chemical or physical change.
- Can distinguish between pure substances and mixtures.
- Can identify mixtures as either Homogeneous or Heterogeneous.
- Can, based on chem. formulas, identify a pure substance as either an element, compound or molecule.
- Can state whether a material has high or low values of the below properties: TERMS
- Lab: when given an object can determine its volume.
- Can determine the density of an object from the slope of a mass vs. volume graph.
- Can identify which term (accuracy, precision and resolution) applies to a given lab/measurement situation or example.
- Can give examples of objects that have a mass of 1gm, a volume of 1ml and a length of 1cm.
Chemical and physical properties
Matter

• Every element/compound is unique in some way from all others.
• If you know enough about a substance, you can figure out what it is.
• If you know what a substance is, you can know all types of things about it.
Matter

• All matter has 2 types of properties:
  – Physical properties
  – Chemical properties.
Physical properties

• A **physical property** is a characteristic of a substance that can be observed without changing the substance into another substance.
  – (You can see it without changing what you’re looking at into something else.)
Physical Properties

- Physical properties can be extensive or intensive:
  - **Extensive properties** depend on the amount of a substance that you have.
  - **Intensive properties** don’t depend on how much you have.
Physical Properties - Examples

- **Examples** of extensive physical properties include:
  - Volume
  - Mass
  - Weight
  - Size
Physical Properties - Examples

• **Examples** of intensive physical properties include:
  – Density
  – Melting point
  – Boiling point
Physical Properties - Examples

- Other physical properties include:
  - Color
  - Hardness
  - Odor
  - Taste
  - State of matter
  - Texture
  - Luster (shine)
  - Heat conductivity
  - Electrical conductivity
  - Solubility (ability to dissolve in water.)
  - Shape
  - Viscosity
  - Ductility
  - Malleability
Chemical properties

- A **Chemical property** is a characteristic of a substance that can only be observed by changing it into a different substance.
Chemical properties - Examples

- **Examples** of chemical properties include:
  - The ability to burn
  - Ability to tarnish
  - Ability to rust
  - Ability to decompose
  - Ability to react with other chemicals
  - Instability
  - Ability to do acid/base reactions
Chemical and physical changes
Physical Change

- A **Physical change** is a change in a substance that does not change what the substance is.
Physical Change - examples

- **Examples** of physical change include:
  - Change in shape
  - Change in size
  - Change in phase
    - Melting (solid to liquid)
    - Boiling (liquid to gas)
    - Evaporation (liquid to gas)
    - Condensation (gas to liquid)
    - Freezing (liquid to solid)
    - Sublimation (solid to gas)
    - Deposition (gas to solid)
Physical Change

- Physical changes might be caused by:
  - Grinding
  - Cutting
  - Crushing
  - Bending
  - Breaking
  - Heating/cooling
    - (change in phase)
  - Squishing
Physical Change

• Evidence that a physical change has occurred might include:
  – Change in shape
  – Change in form
  – Change in size
  – Change in **phase** (This is always a physical change!)
  – **Physical changes are usually reversible**
Physical change

• What could you do to these items to cause a physical change to occur?
A chemical change is a change in which a substance is changed into a different substance. (You’ve changed what it is.)
Chemical change

- Examples of chemical changes include:
  - Burning
  - Rusting
  - Tarnishing
  - Decomposing
  - Polymerization
Chemical change

- Chemical changes occur when a chemical reaction causes bonds between atoms to break or to form.
Chemical Change: Evidence

- Evidence that a chemical change has occurred might include:
  - A color change
  - An odor change
  - Formation of a precipitate (you mix two liquids and make a solid)
  - Gas is formed (bubbles)
  - Changes in physical properties.
Physical and Chemical change

- During a chemical change **energy can be released** in the form of:
  - Heat
  - Light
Chemical change – Chemical reactions

• When a chemical change occurs, energy is either released or absorbed.
A chemical reaction that releases energy in the form of heat is called **exothermic**.

- Heat comes OUT
  - Exo = out
  - Thermic = heat
- It will feel HOT.
A chemical reaction that absorbs energy in the form of heat is called **endothermic**.

- Heat goes IN
  - Endo = in
  - Thermic = heat
- It will feel COLD