

# 1 • Matter and Measurement

## BLUFFER'S GUIDE

### 1. Matter

Normally exists in 3 physical states:

#### Liquid-

Fixed volume, Fluid; Takes on the shape of lower part of container; well-defined surface

#### Solid

Rigid Shape; very little volume change as temperature and pressure change

#### Gas

Volume expands to fill the container; volume varies according to temperature and pressure

#### Kinetic Molecular Theory

The idea that matter consists of molecules or atoms that are in constant, random motion.

**Kinetic Energy** = Energy of motion; higher temperature = *more* motion

**Macroscopic** – seen with the eyes.

**Microscopic** – seen with a microscope

**Particulate or Submicroscopic** – Structures at the atomic level (what we think about)

#### Mixtures

**Heterogeneous Mixture** – A mixture where the properties of the mixture vary throughout. (Like an Oatmeal cookie, the different components are visible)

**Homogeneous Mixture** – Also called a **solution**, where the components mix at a molecular level; different properties of the mixtures are unnoticeable.

**Purification** – The separation of a mixture into its components. (techniques: distillation, filtration, & chromatography)

### 2. Elements

A substance that cannot be decomposed further by chemical means

Names given by symbols: *Example: Helium = He, Gold = Au, Aluminum = Al*

### 3. Physical Properties

Properties of a lone sample (ex. mass, volume, boiling temp, melting temp, conductivity, etc.)

Density is the physical property that relates the mass of an object to its volume

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

**Extensive Property** – Properties, like mass and volume, that depend on the amount of substance

**Intensive Properties** – Properties like color and density; independent of the amount of substance

**Temperature** -- how hot a substance is; physical properties (like density) vary with temp

**Celsius** 0°C for freezing point of water and 100°C for melting point of water.

**Kelvin** – same scale as Celsius; 0°C = -273 K; 0 K = no motion; Celsius ° + 273 = Kelvin

### 4. Chemical Properties

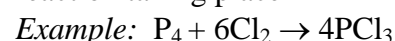
How substance *interacts* with other substances. Ex. forms gas with acid; burns in air, etc.

### 5. Physical and Chemical Change

**Physical Change** – where the identity of all the substances remain unchanged (melting, boiling, grinding, pounding into sheets, etc.)

**Chemical Change (Reaction)** – atoms rearrange to convert one substance into another

**Chemical Equation** – A representation of the chemical reaction taking place



### 6. Measurements/Calculations

**Accuracy** – how close to a “true value”; quantified by **percent error**.

**Precision** – how close measurements are to each other. Measured by **significant figures or ± notation**. [I assume you know metric system.]

**Dimensional Analysis** – use of a conversion factor to change units (ex: metric conversions, mass & volume, time units, etc.)