

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

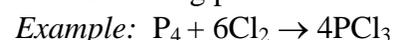
How substance *interacts* with other substances. Ex. forms gas with acid; burns in air, etc.

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.)