

Classification of Matter

Unit 1

Classification Activity

- ▶ Working as a group, classify your items based on their properties.
- ▶ You should have at least 2 groups, but can have as many as you would like.
- ▶ When you have agreed as a group on how you would like to group the items, create a poster that outlines your classification scheme. Put all group members names on the poster.
- ▶ Posters are due before you leave class today.



Matter

- ▶ Matter is anything that has mass and takes up space
- ▶ Matter can be classified according to its:
 - ▶ Composition- what components it contains
 - ▶ Properties- what it looks like, how it acts

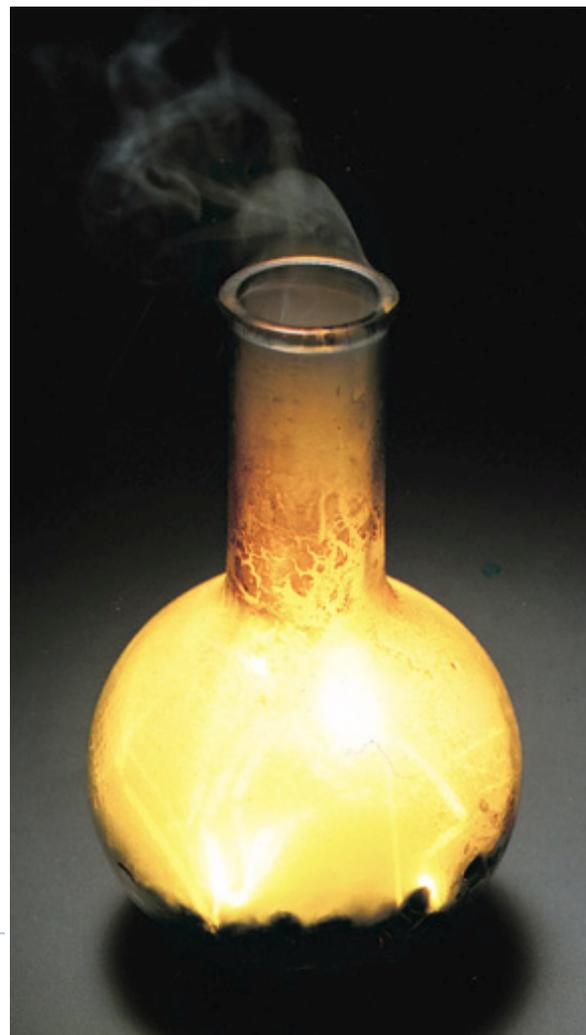


Chemical and Physical Properties



Chemical Properties

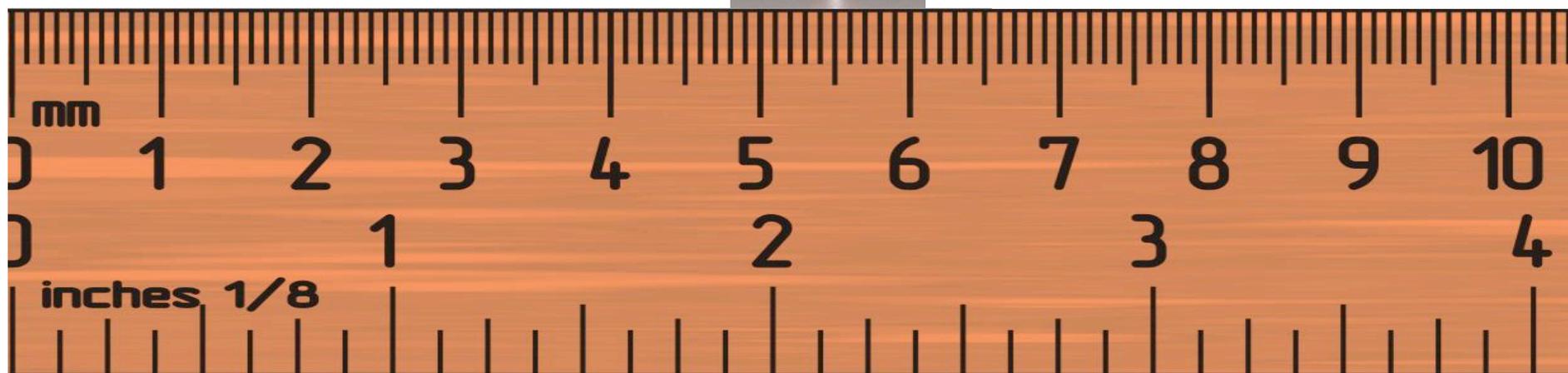
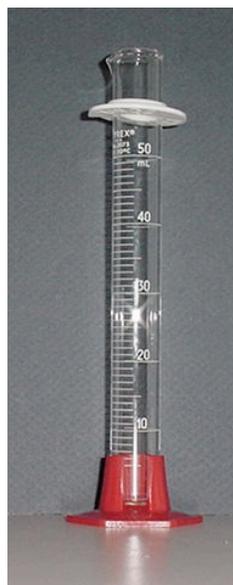
- ▶ The ability of a substance to combine with or change into one or more other substances
- ▶ Examples include:
 - ▶ Flammability
 - ▶ The ability to catch fire
 - ▶ Combustibility
 - ▶ How easily a substance will burn
 - ▶ Reactivity
 - ▶ Does it react with other substances



Physical Properties

▶ **Extensive Properties** depend on the amount of a substance present

- ▶ Mass
- ▶ Volume
- ▶ Length



Physical Properties

- ▶ **Intensive Properties stay the same regardless of amount present**
 - ▶ Density
 - ▶ State (solid, liquid, gas)
 - ▶ Melting Point (solid to liquid)
 - ▶ Boiling Point (liquid to gas)
 - ▶ Metallic Character
 - ▶ Scent

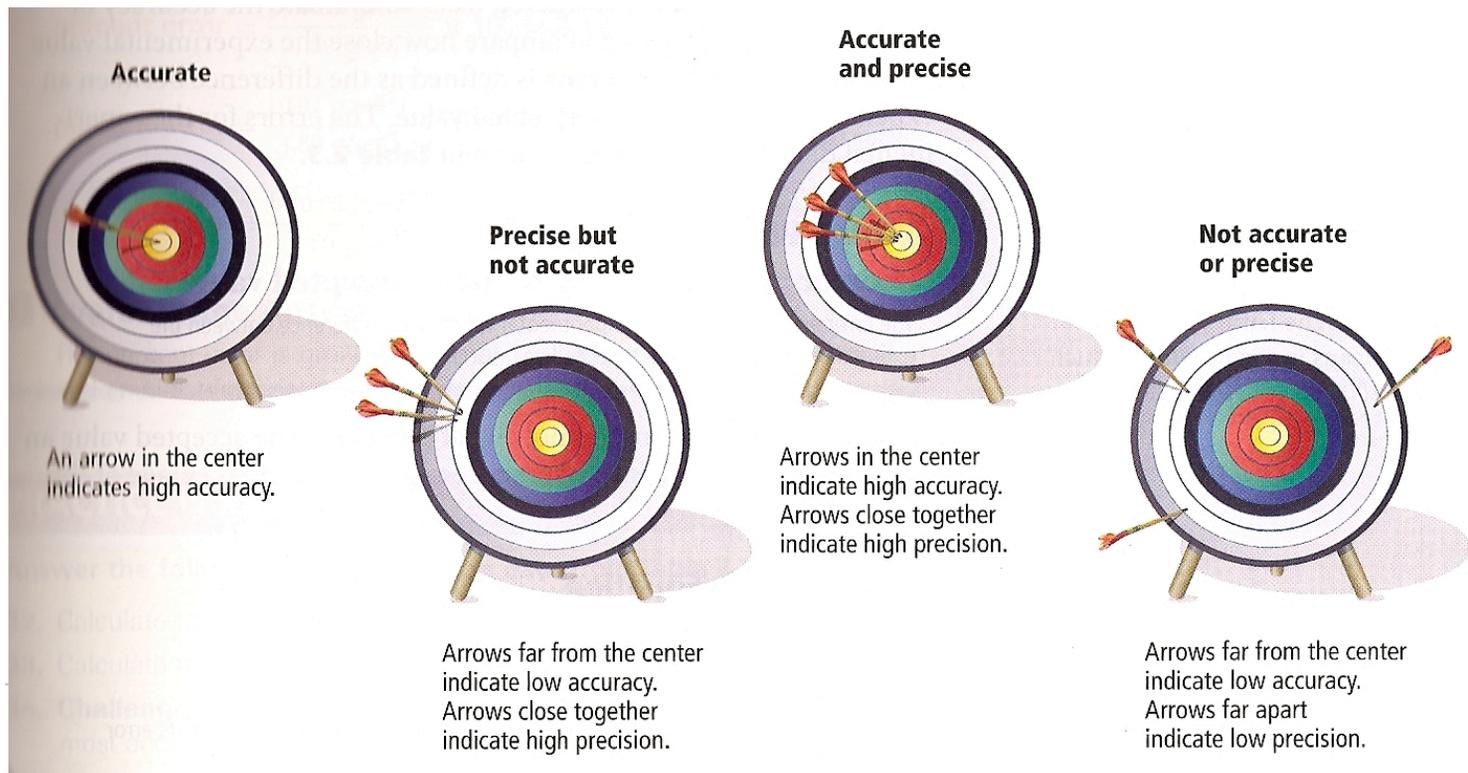


Measurement



Accuracy and Precision

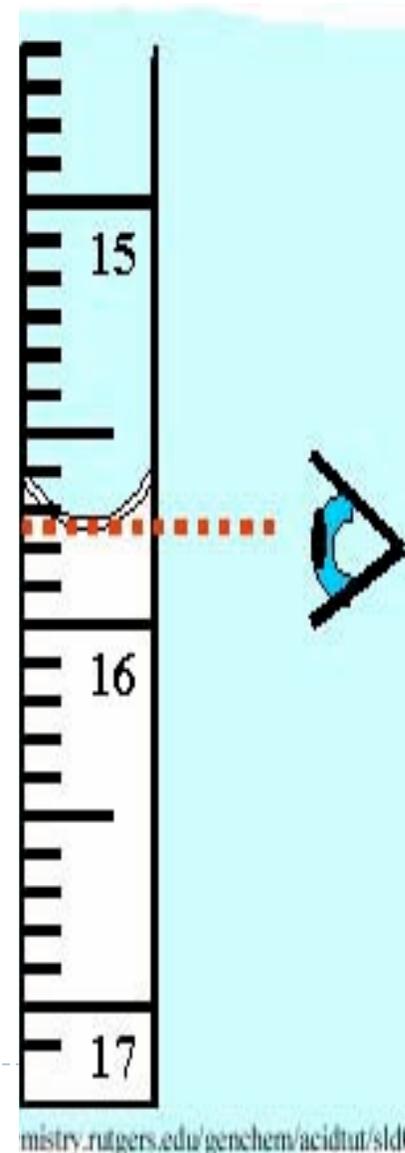
- ▶ Accuracy refers to how close a measured value is to an accepted value
- ▶ Precision refers to how close a series of measurements are to one another (repeatability)



Direct Measurements

- ▶ **Mass is the amount of matter an object contains**
 - ▶ Measured in grams
 - ▶ measured on a balance (not a scale)
 - ▶ Mass is not the same as weight
 - ▶ The balance estimates the last digit for you

- ▶ **Volume is the amount of space an object occupies**
 - ▶ Measured in mL (milliliters) or L (liters)
 - ▶ Measured using a graduated cylinder
 - ▶ Should be measured at the bottom of the meniscus
 - ▶ Estimate the last digit



Derived Measurements

- ▶ Density is a physical property of matter that is defined as the amount of mass per unit volume

- ▶ Formula:

$$D = \frac{m}{v}$$

- ▶ Units: g/mL



Calculating Density

- ▶ A block of unknown metal has a mass of 13.5g and a volume of 5.0mL. What is the density of the block?



Calculating Mass

- ▶ The density of aluminum is 2.7g/mL . The volume of a block of aluminum is 3.0mL . Find the mass of the block.



Calculating Volume

- ▶ What is the volume if a sample that has a mass of 20g and a density of 4g/mL?

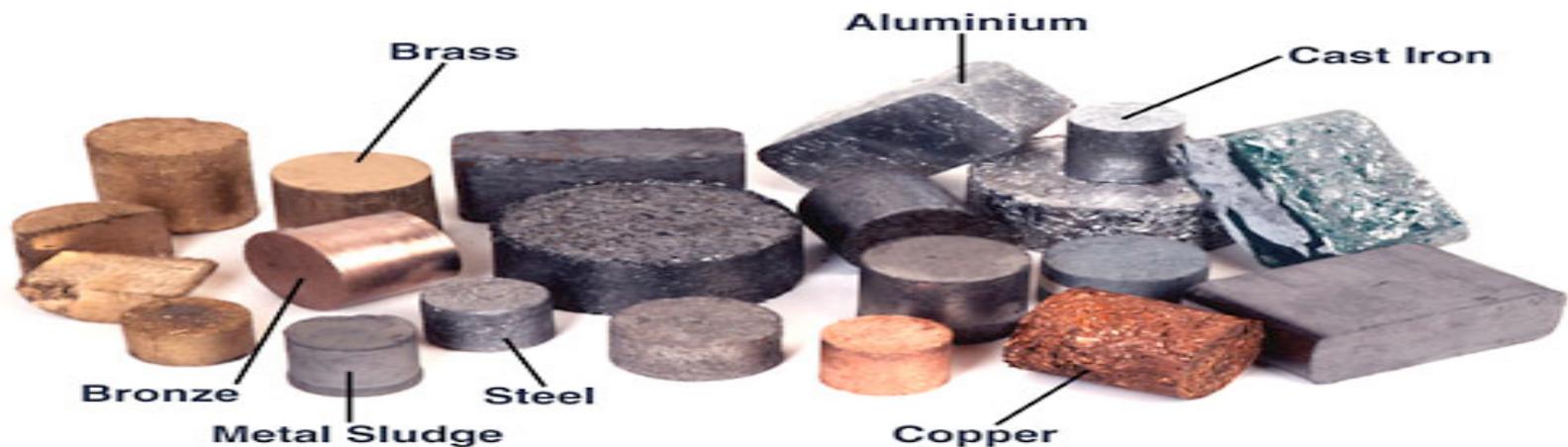


Metallic Character



Metals

- ▶ Shiny, red black or grey in color
- ▶ Solid at room temperature
- ▶ Malleable- easy to bend
- ▶ Most react with acid, but not all
- ▶ Most react with CuCl_2 , but not all
- ▶ Good conductors of electricity (conductors)



Non Metals

- ▶ Dull
- ▶ Powder or soft solid at room temperature
- ▶ Brittle- break easily
- ▶ Do not react with acid
- ▶ Do not react with CuCl_2
- ▶ Do not conduct electricity (non conductors)



Metalloids

- ▶ Shiny silver with black specks
- ▶ Solid at room temperature
- ▶ Brittle- break easily
- ▶ Do not react with acid
- ▶ Do not react with CuCl_2
- ▶ Do conduct electricity (conductors)



Changes in Matter



Physical Change

- ▶ alteration of a substance that does not effect its chemical composition

- ▶ Evidence of Physical Changes
 - ▶ Size changes- Breaking, crushing, cutting, etc.
 - ▶ Phase changes- Boiling, freezing, vaporizing, melting, condensing



Chemical Change

- ▶ process that involves one or more substances changing into new substances

- ▶ Evidence of Chemical Changes
 - ▶ Color change
 - ▶ Rust
 - ▶ Energy changes (burning, combustion, smoke)
 - ▶ Change of smell
 - ▶ Bubbles



The “Nuts and Bolts” of Matter

- ▶ Organize the bags at your table into three groups: “elements”, “compounds”, and “mixtures”. Mixtures would contain a combination of elements and compounds.



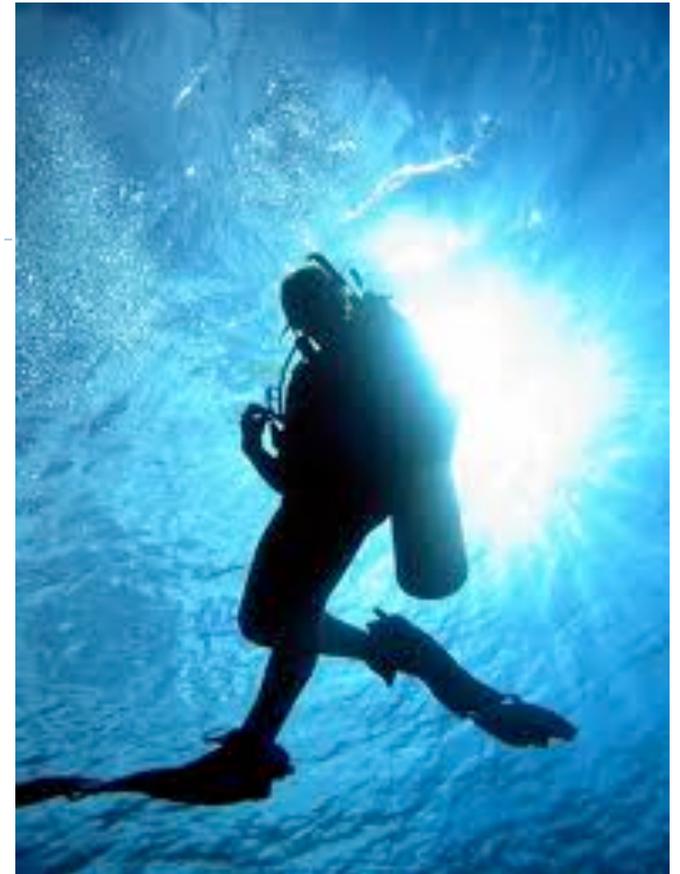
Homogeneous Mixtures

▶ Homogeneous Mixtures

- ▶ Constant composition throughout
- ▶ Also called a solution
- ▶ Examples: KoolAid, Coffee, Air

▶ Alloys

- ▶ Homogeneous mixtures of more than one metal
- ▶ Properties of metals combine to achieve greater strength and durability
- ▶ Examples: Steel, bronze, 14 karat gold



Heterogeneous Mixtures

- ▶ **Heterogeneous Mixtures**

- ▶ Do not blend smoothly throughout
- ▶ More than one phase present
- ▶ Examples: Sand in water



Heterogeneous Mixtures

▶ Suspension

- ▶ A heterogeneous mixture containing particles that settle out if left undisturbed
- ▶ Solute (dissolved) particles are too large to form a true solution
- ▶ Examples: corn starch in water, house paint



Heterogeneous Mixtures

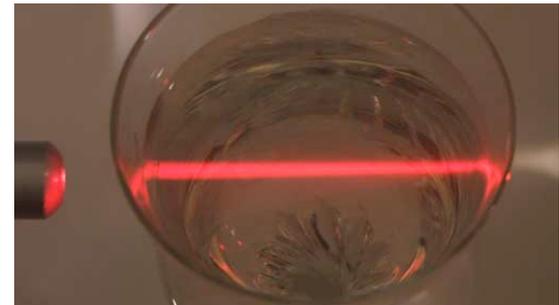
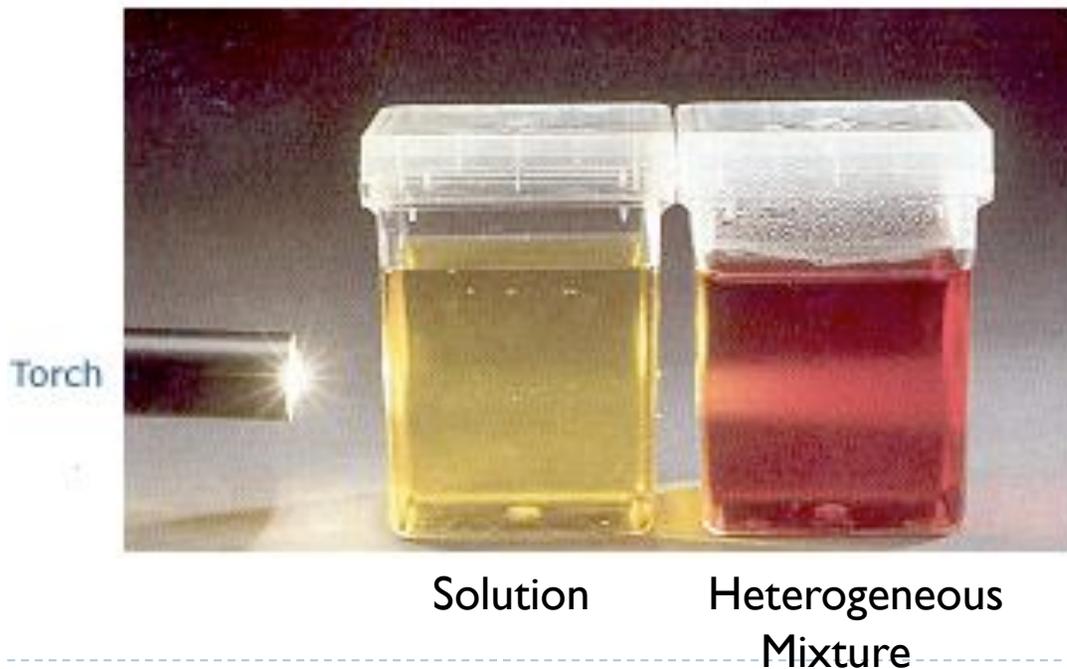
▶ Colloid

- ▶ A heterogeneous mixture containing particles that do not settle out if left undisturbed
- ▶ In between a solution and suspension
- ▶ Examples: Jello, Mayonnaise



Tyndall Effect

- ▶ The ability of a suspension or colloid to scatter light
- ▶ A solution DOES NOT exhibit the Tyndall effect
- ▶ A pure substance DOES NOT exhibit the Tyndall effect



Separating Mixtures



Separating Mixtures

- ▶ Using the properties of compounds in a mixture, you can separate mixtures into component parts
 - ▶ Density- does one of the components sink? Float?
 - ▶ Particle size- can you physically pick out the components? Will one of them stay behind if filtered?
 - ▶ Solubility- can one of the components be dissolved in water?
 - ▶ Boiling point- is one of the components boiling point higher than the other?



Distillation

- ▶ Uses boiling point and condensation to separate components that are dissolved in a solvent

