

MATTER

What is it?

CLASSIFYING MATTER

What is matter?

-Anything that has mass and takes up space

You are matter

The wall is matter

Light and sound are NOT matter

CLASSIFYING MATTER

There are 3 types of Matter:

Elements

Compounds

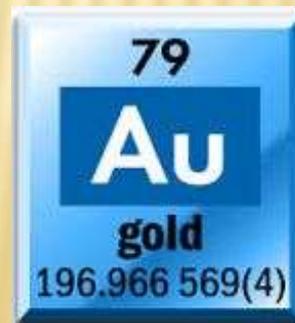
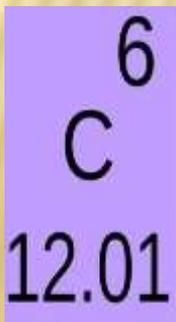
Mixtures

ELEMENTS

An element is a substance that cannot be broken down into simpler substances by chemical means.

An atom is the smallest, simplest unit of an element

Each element is made of just ONE kind of atom



COMPOUNDS

A substance made up of atoms of different elements

Represented by formulas

-Water (H_2O) -Carbon Dioxide (CO_2) Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)

Compounds will **ALWAYS** have the same proportions

(Water will always have a multiple
of 2 Hydrogen and 1 Oxygen)

MOLECULES

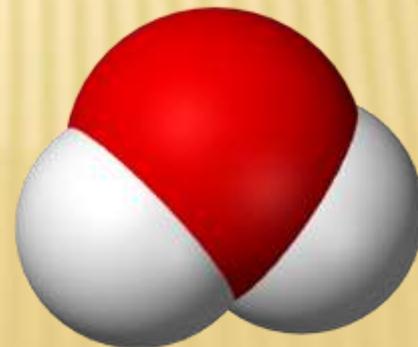
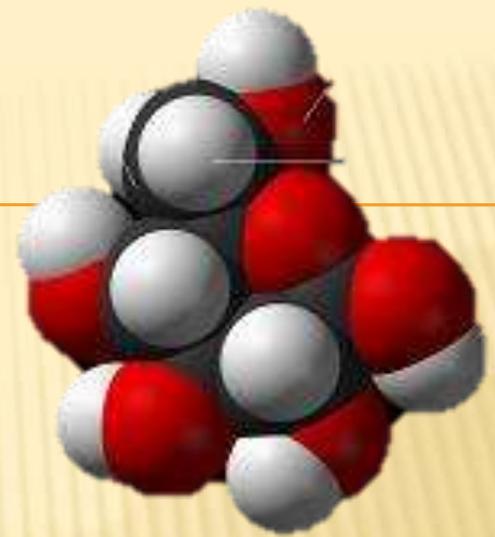
Made up of elements

They are the smallest unit of a substance that behaves like the substance

EX: Water (H_2O)

Carbon Dioxide (CO_2)

Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)



PURE SUBSTANCES VS MIXTURES

Pure Substance- often thought of as “not mixed with anything.” Parts of a pure substance are chemically combined and cannot be separated (Elements and compounds are pure substances)

Mixture- an aggregate of two or more substances that are not chemically united and that exist in no fixed proportion to each other.

CLASSIFICATION OF MIXTURES

Homogeneous or Heterogeneous

How well do the component substances mix?

Heterogeneous- substances are not evenly distributed. (Salad, a taco)



CLASSIFICATION OF MIXTURES

Homogeneous or Heterogeneous

How well do the component substances mix?

Homogeneous- Even distribution of substances

(Kool aid Gasoline)



PROPERTIES OF MATTER

There are two main subsets of the properties of matter

PHYSICAL

&

CHEMICAL

PHYSICAL PROPERTIES

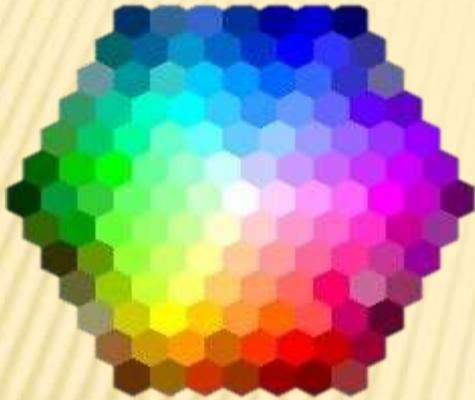
Properties that can be observed without changing the Identity of the substance.

These properties CAN be measured

They help us Identify substances

PHYSICAL PROPERTIES

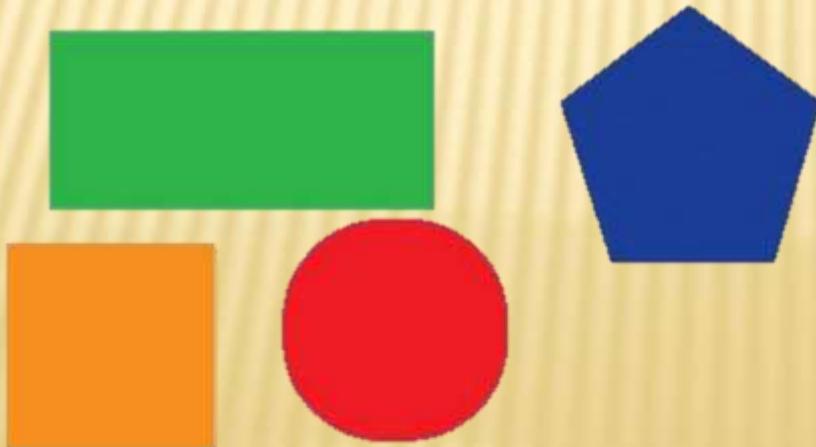
COLOR



MASS



SHAPE



PHYSICAL PROPERTIES

Although it may seem as if they should be chemical properties, melting and boiling points are also physical properties. (Why?)

They do not change the nature of the substance!

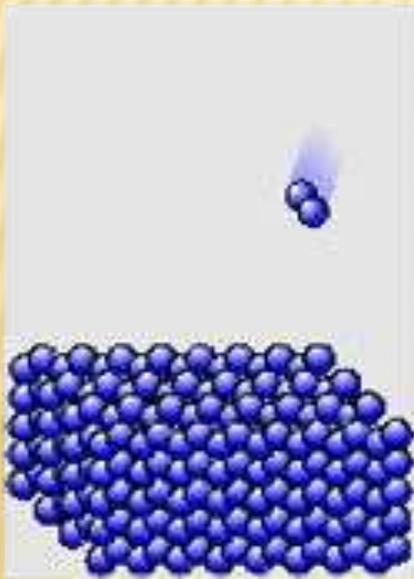
For pure substances, the melting and boiling points remain constant.

PHYSICAL PROPERTIES

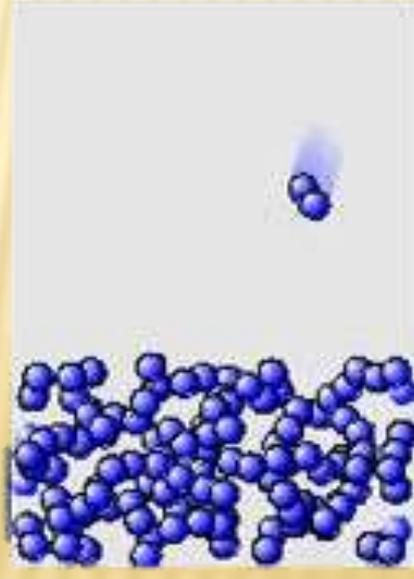
STATES OF MATTER

There are 3 (that we will deal with) states of matter

SOLID



LIQUID



GAS



PHYSICAL PROPERTIES

Strength, Hardness and Magnetism are also physical properties!



HOW DO WE USE PHYSICAL PROPERTIES?

Are your socks clean?



Will your clothes fit in your suitcase?



Do your clothes match?



ONE LAST PHYSICAL PROPERTY

DENSITY

A measure of how much matter is contained in a specific volume of a substance

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

$$D = \text{heart}$$

$$\text{Units: } \left(\frac{g}{cm^3}\right)$$

DENSITY

Example:

What is the density of water if there are 10 grams of water in a 15 cm³ container?

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

$$D = \frac{10g}{15cm^3}$$

$$D = 0.67g/cm^3$$

DENSITY IS NOT WEIGHT!!!

Material	Density (g/cm ³)	Material	Density (g/cm ³)
Aluminum	2.64	Iron (cast)	7.21
Brass	8.55	Iron (wrought)	7.77
Brick (red, common)	1.92	Lead	11.34
Coal (anthracite)	1.51	Marble	2.56
Concrete	2.37	Paraffin (wax)	0.72
Copper (cast)	8.68	Quartz	2.64
Copper (rolled)	8.91	Rubber	1.52
Cork	0.24	Steel (cast)	7.85
Feldspar	2.56	Steel (rolled)	7.93
Glass (window)	2.58	Wood (dry) - red cedar	0.38
Gneiss	2.87	Wood (dry) - Douglas fir	0.53
Granite	2.69	Wood (dry) - hickory	0.85
Gold (pure, 24 kt)	19.29	Wood (dry) - maple	0.70
Ice	0.92	Wood (dry) - red oak	0.70
Ivory	1.84	Wood (dry) - yellow pine	0.70

CHEMICAL PROPERTIES

Describes how a substance changes into a new substance either by combining with other elements or by breaking apart into new substances

Flammability or Reactivity

CHEMICAL PROPERTIES

Flammability: The ability to burn



CHEMICAL PROPERTIES

Reactivity: the capacity of a substance to combine with another substance.

(i.e. iron rusting when exposed to oxygen)



CHEMICAL PROPERTIES

You can observe physical properties of an object without changing the object in any way. However, chemical properties can **ONLY** be observed after a change.

CHANGES OF MATTER

Physical Change: affects one or more physical properties of a substance WITHOUT changing the identity. (Melting, cutting, crushing, dissolving)

Chemical Change: occurs when one or more substances are changed into entirely new substances that have different properties.
(Batteries, your body, ripening fruit)

CHANGES OF MATTER

How can a chemical change be detected?

Change in color (Leaves in the fall)

Unexpected temperature change.

New substances formed (erosion on a battery)

Fizzing or foaming (Acid on metal)



BREAKING DOWN MIXTURES AND COMPOUNDS

Mixtures can be separated by physical change. Some as easy as picking the olives out of salad or mushrooms off a pizza. Others as hard as evaporating salt water to clean drinking water.

Compounds **MUST** be broken down by chemical change. (Breaking down the chemicals on a match for fire.)

ENERGY AND CHANGES

All changes involve a change in energy.

Exothermic – Energy of reactants is greater than energy of products. (Excess energy is released – surroundings feel warmer.)

Endothermic – Energy of products is greater than energy of reactants. (Energy is absorbed & converted – surrounding feels cooler.)