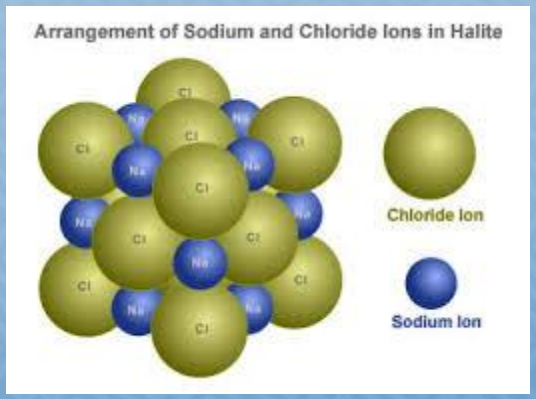
Matter and Change

What is Chemistry?

Chemistry is the study of the composition, structure, and properties of matter and the changes it undergoes.



What is a chemical?

A chemical is a substance produced by or used in a chemical process.

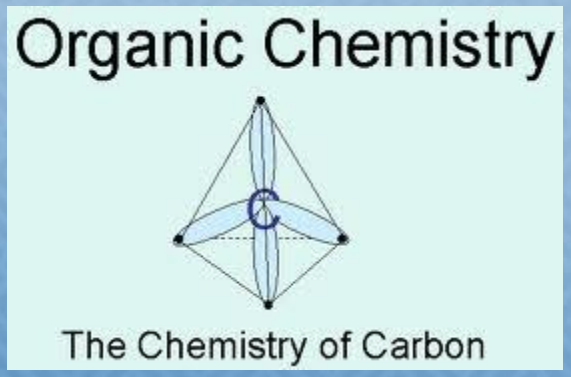
How does chemistry affect our everyday life?

How many of our activities involve chemistry?

Branches of Chemistry

Organic Chemistry - the study of most carbon containing compounds.

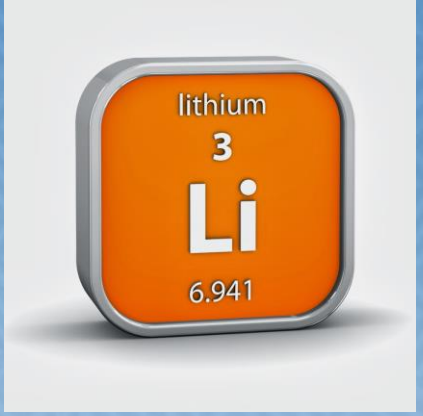
Inorganic Chemistry - the study of all substances not classified organic, mainly those compounds that do not contain carbon.



Physical Chemistry - the study of the properties and changes of matter and their relation to energy.

Analytical Chemistry - the identification of the components and composition of materials.

Biochemistry - the study of the substances and processes occurring in living things.

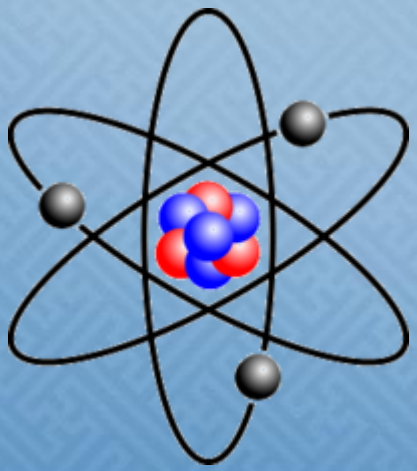


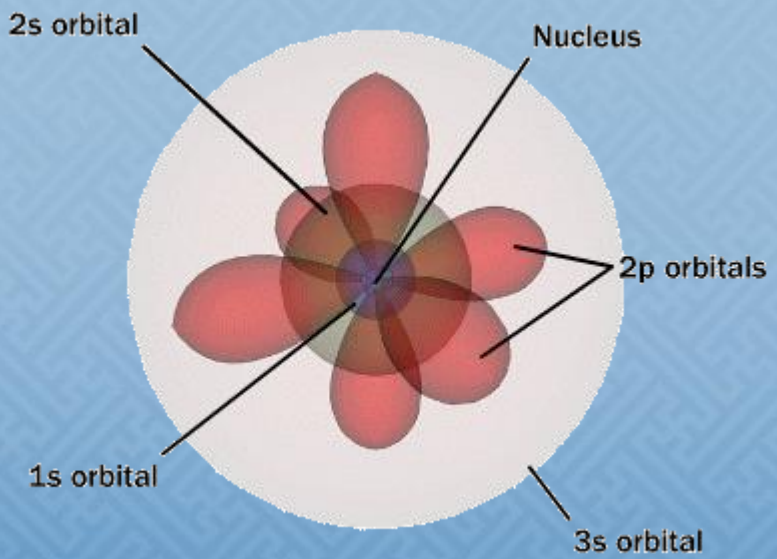
Matter and Its Properties

Basic building blocks of matter:

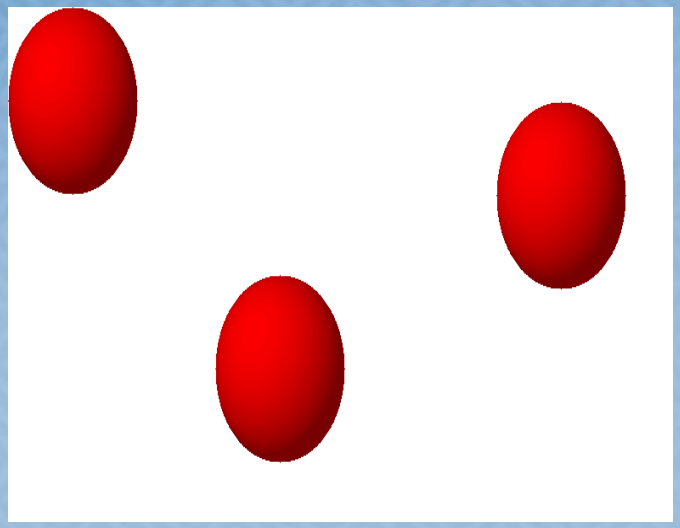
<u>atom</u> - the smallest unit of an element that maintains the properties of that element.

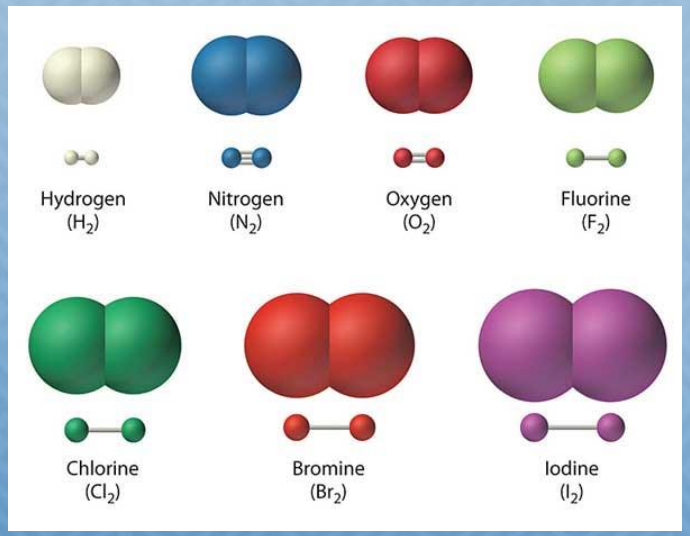
<u>element</u> - a pure substance made of only <u>one kind of atom</u>.

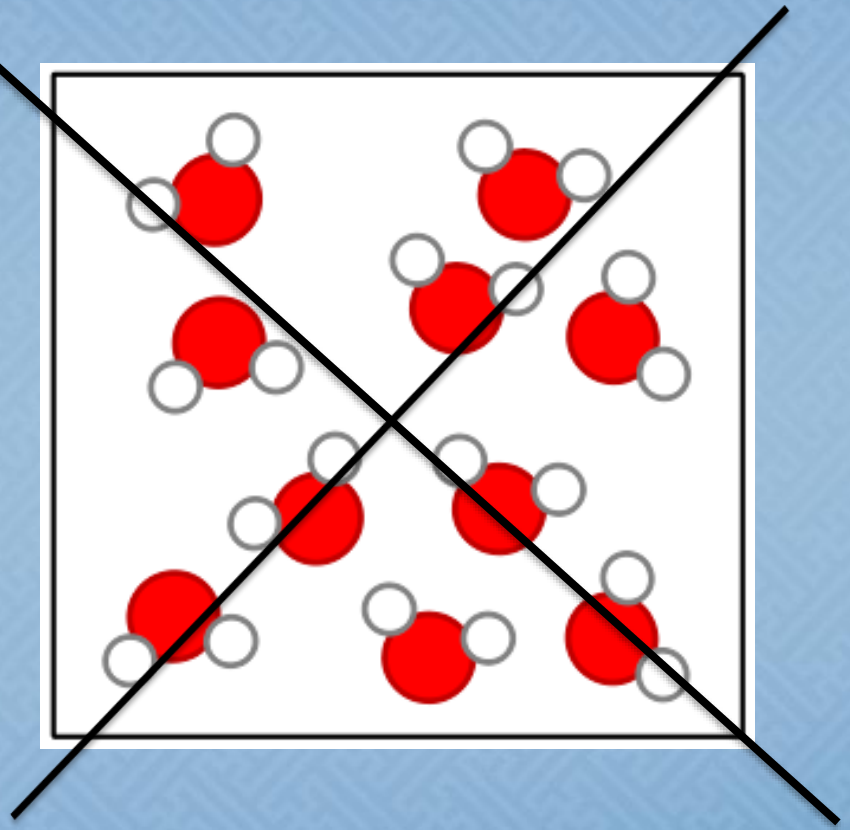




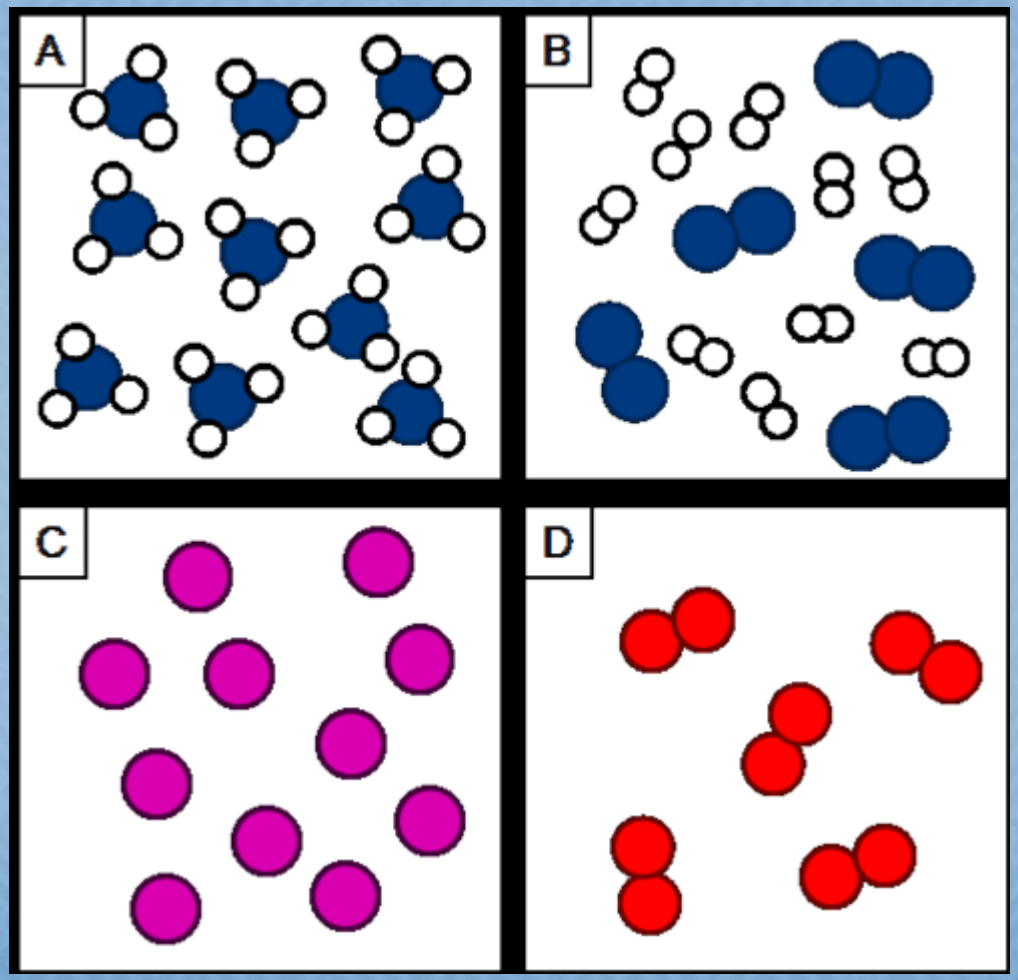
Particle Visualization of an Element:







Which one of these is an element?



Formula Representation of an Element:

H

S_8

Fe

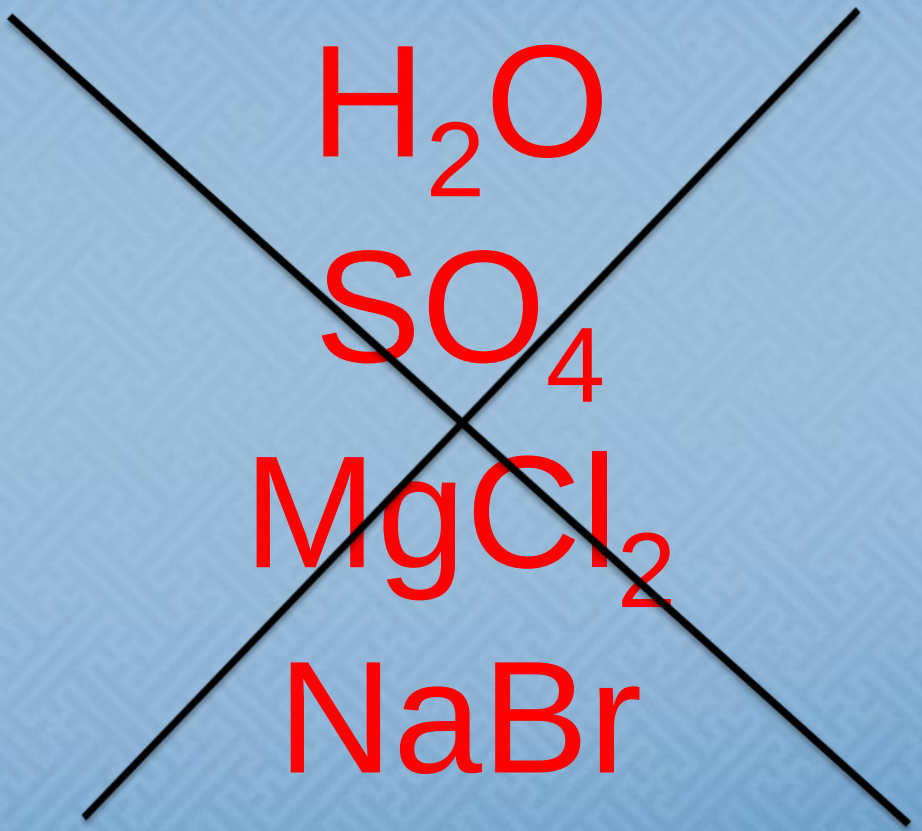
Br_2

H_2O

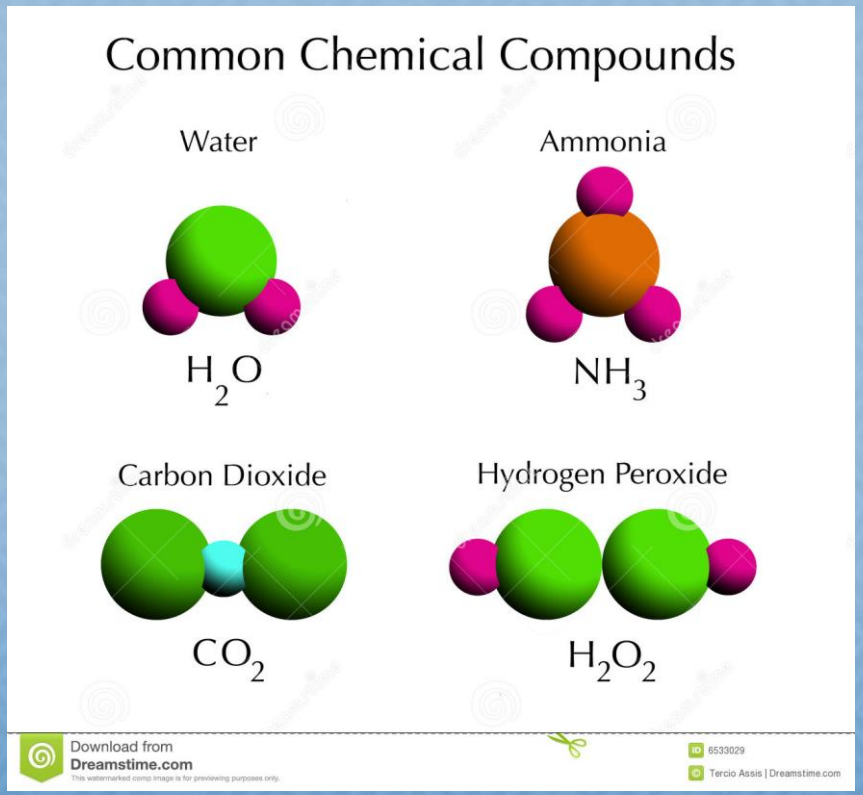
SO_4

$MgCl_2$

NaBr



compound - a substance that is made from the atoms of <u>two or more</u> elements that are chemically bonded.



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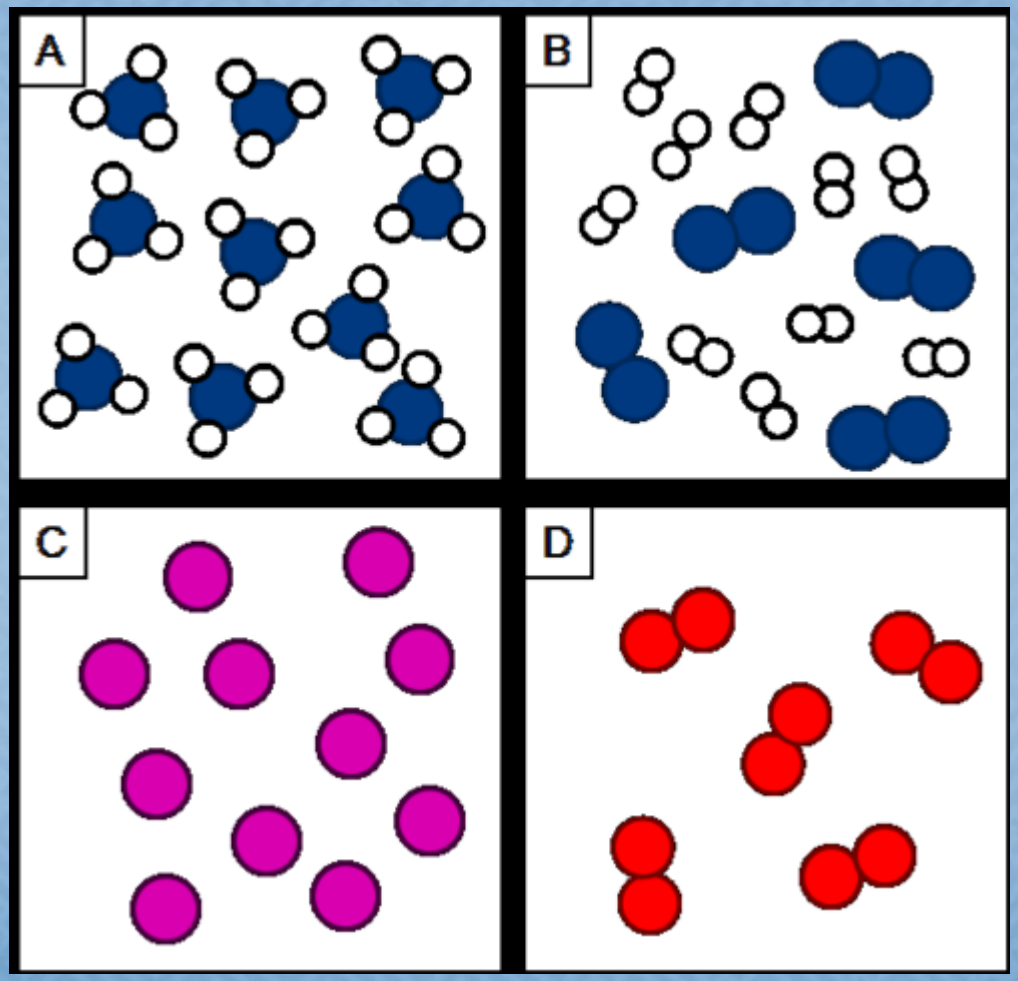
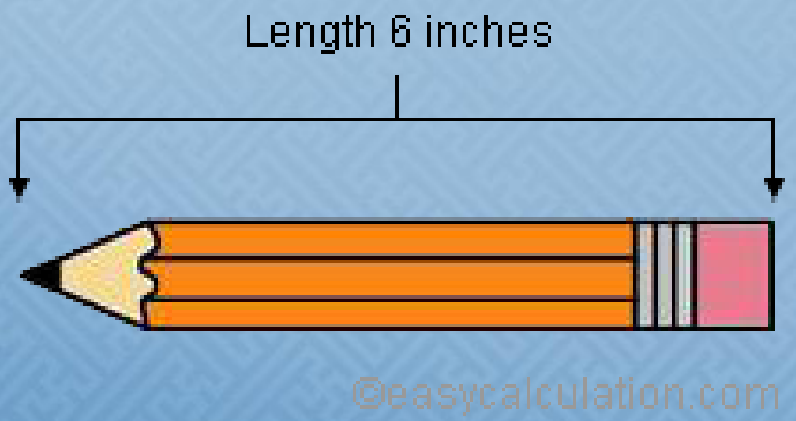


Properties and changes in matter:

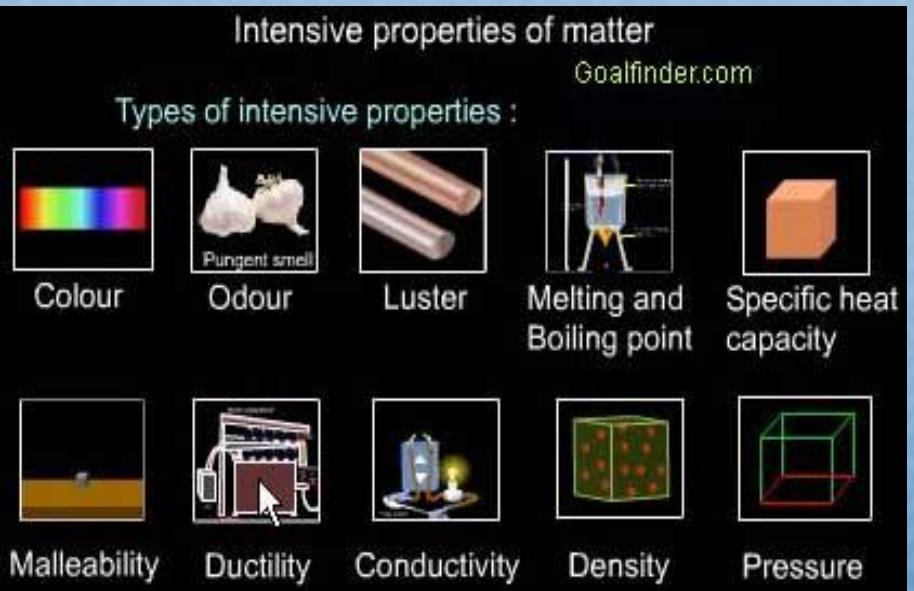
<u>Extrinsic properties</u> - depend on the amount of matter that is present.

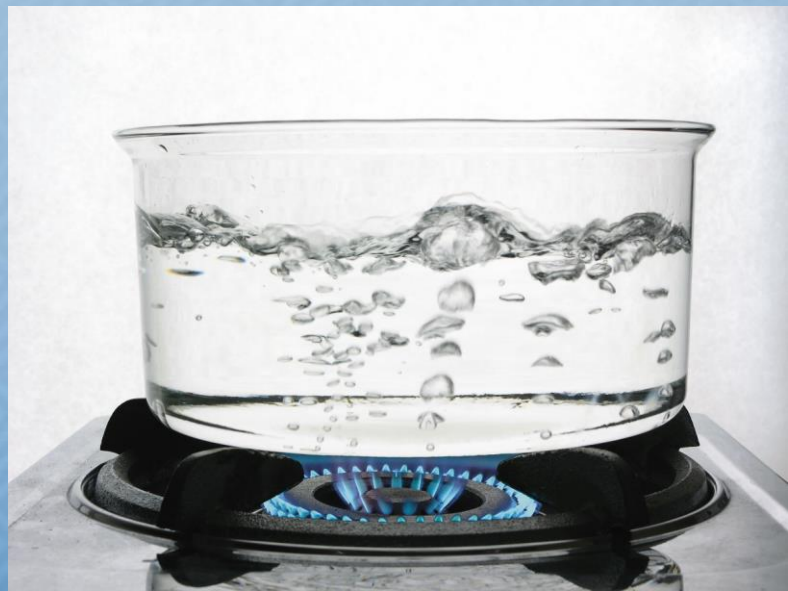
Examples : volume, mass, amount of energy in a substance



Intrinsic properties - do not depend on the amount of matter present.

Examples : melting point, boiling point, density, ability to conduct heat and electricity.





Physical property - a characteristic that can be observed without changing the identity of the substance.

Physical change - a change in the substance that **does not** involve a change in the identity of the substance.

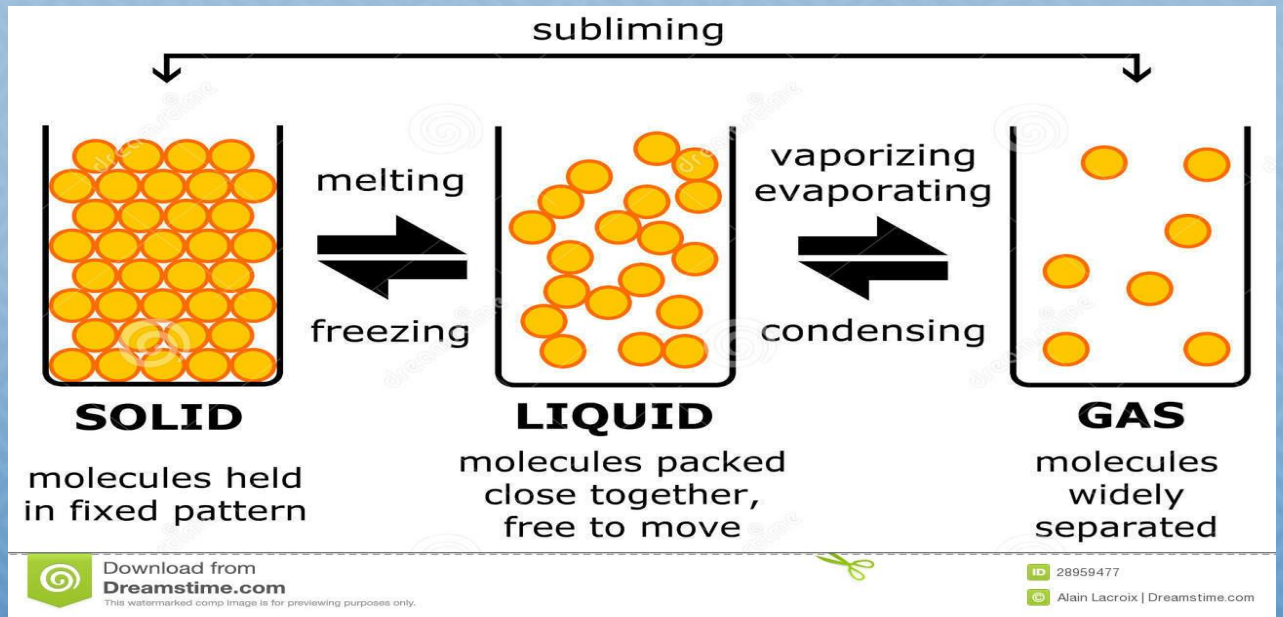
A change of state is a physical change from one state to another.

Solid - definite volume and definite shape

Liquid - definite volume but indefinite shape

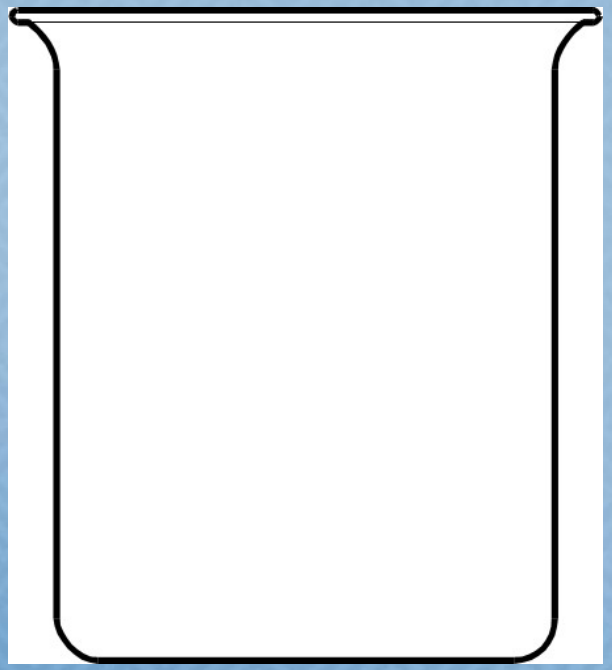
Gas - indefinite volume and indefinite shape

Plasma - high temperature physical state in which atoms lose their electrons



Particle Drawing of a Physical Change:

Water Before Boiling:



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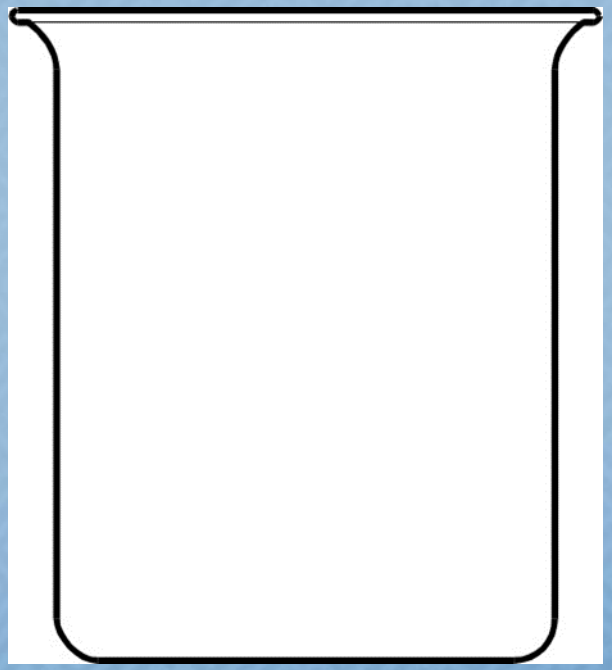
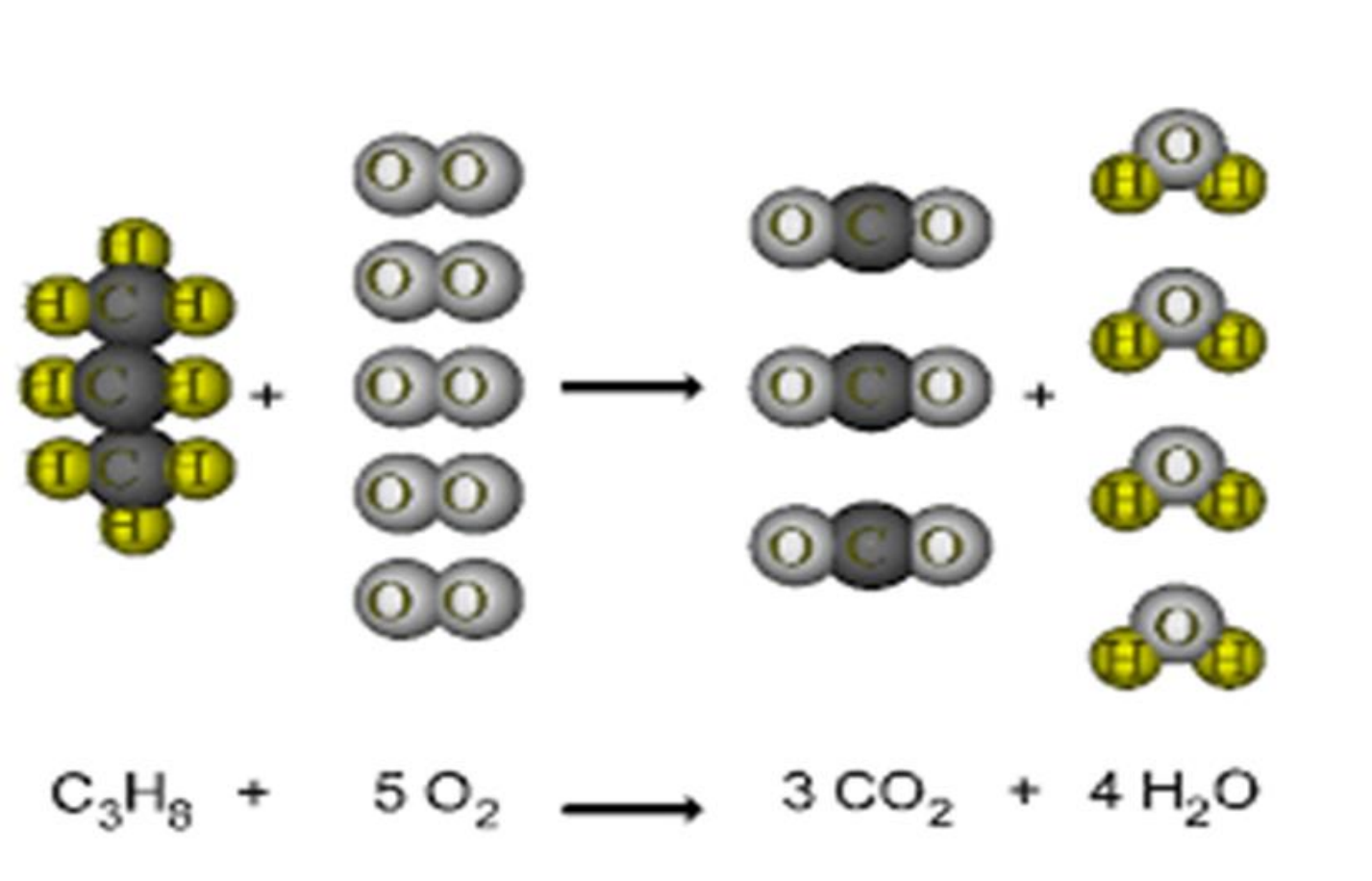


Chemical properties and chemical changes:

Chemical property - a substance's ability to undergo changes that transforms it into different substances.

Chemical change or chemical reaction - a change in which one or more substances are converted into different substances.

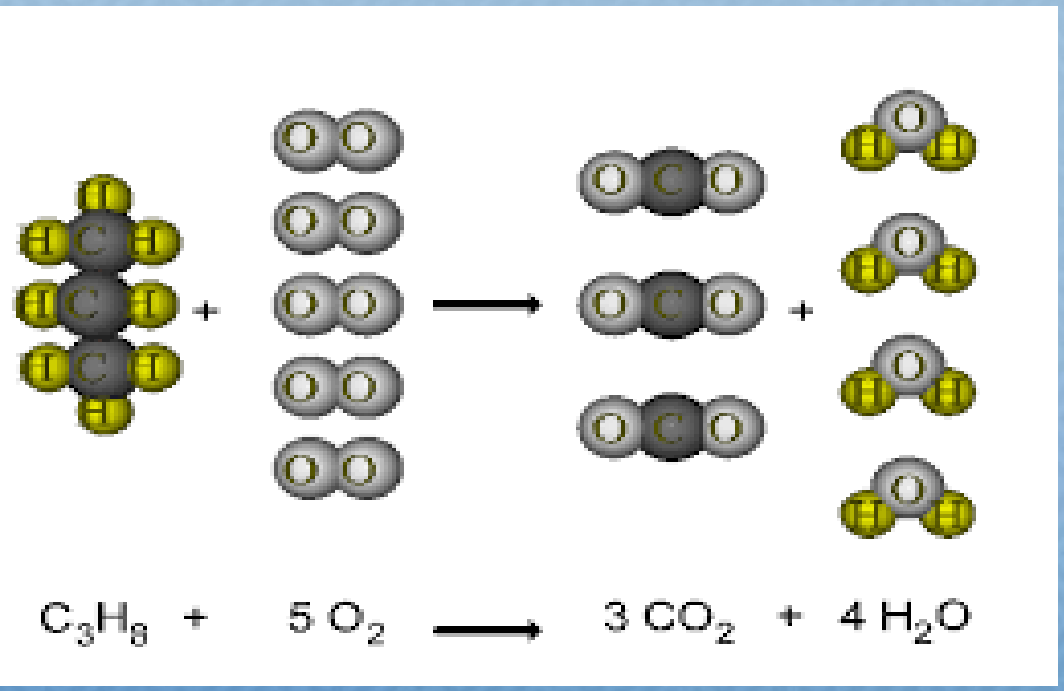
Particle Drawing of a Chemical Change:



Reactants - substances that react in a chemical change.

Products - substances that are formed by the chemical change.

Reactants → Products



Chemical changes do not affect the amount of matter present.

Chemical and physical changes are always accompanied by energy changes.

Energy may be released or absorbed.

Exothermic - a process that releases heat

Endothermic - a process that absorbs heat

Indications of a chemical reaction:

1.)Evolution of heat and light.

(Heat alone may not be a chemical reaction.)

2.) Change in color

3.) Production of a gas.

4.) Formation of a precipitate.

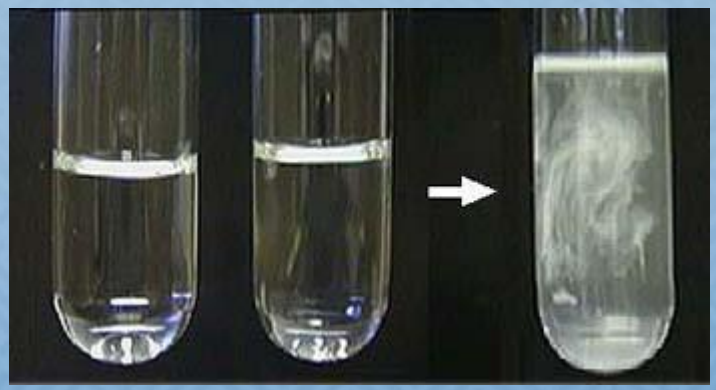
(A solid that separates from a solution.)

Change in color
Bleaching hair changes its color.

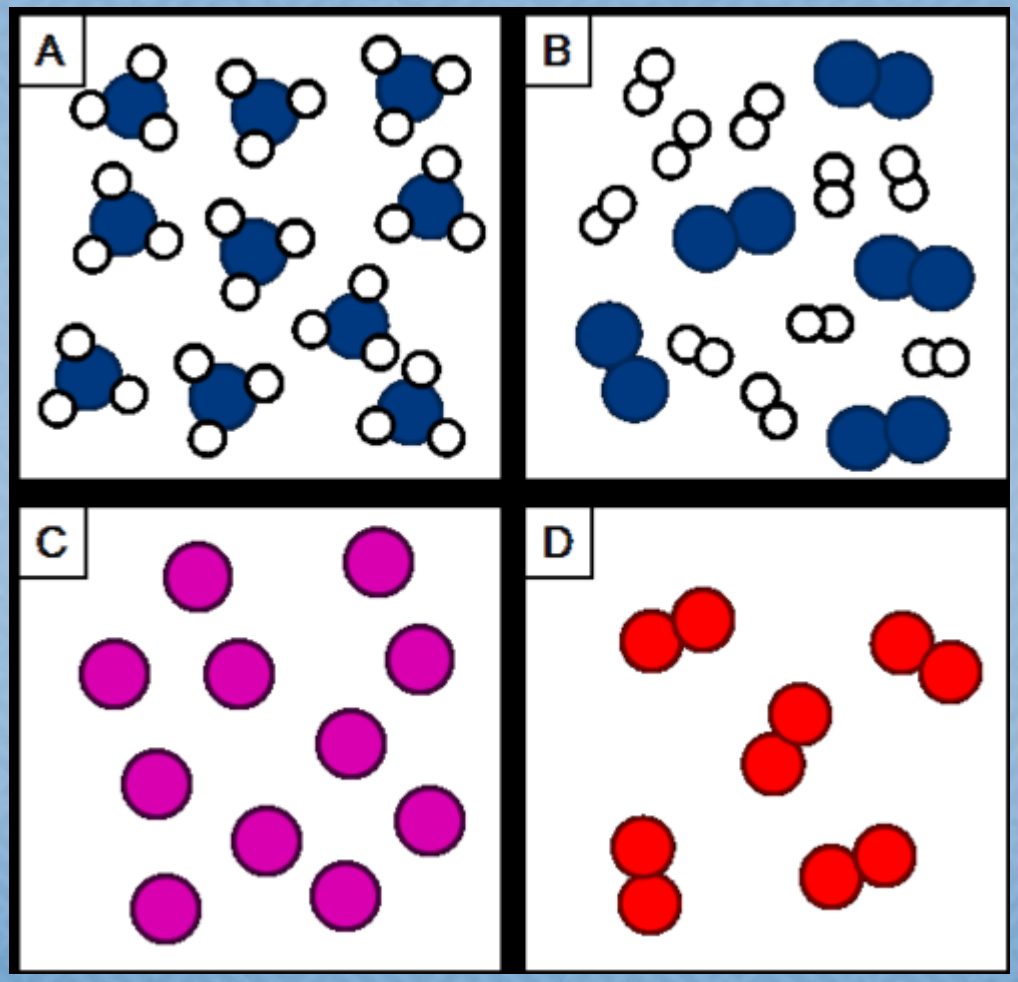
Change in temperature
Burning wood produces heat.

Production of a gas
Dissolving an antacid tablet in water produces gas bubbles.

Production of a solid
Adding acid to milk produces solid curds of cottage cheese



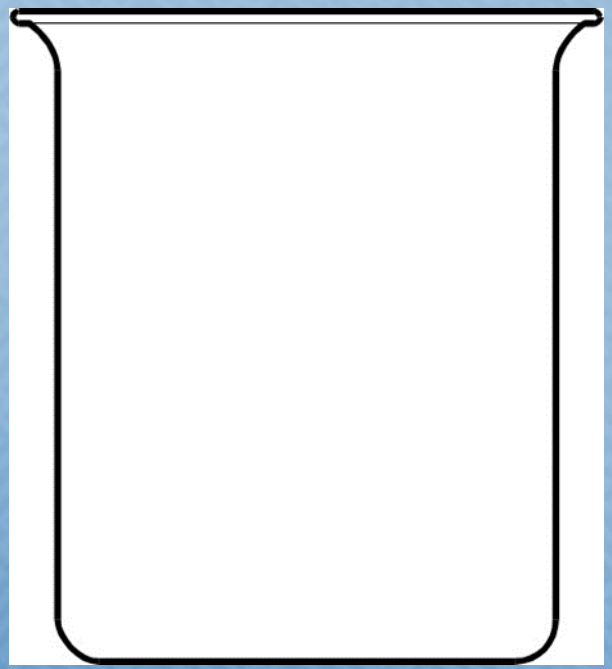
Wait, what the heck is B?



How would you write/draw a mixture:

Salt Water

Particle Drawing of a mixture:



Formula of a mixture:

Classification of Matter

mixture - a blend of two or more kinds of matter, each of which retains its own identity and properties.

Homogeneous - uniform in composition

Homogeneous mixtures are also known as solutions.

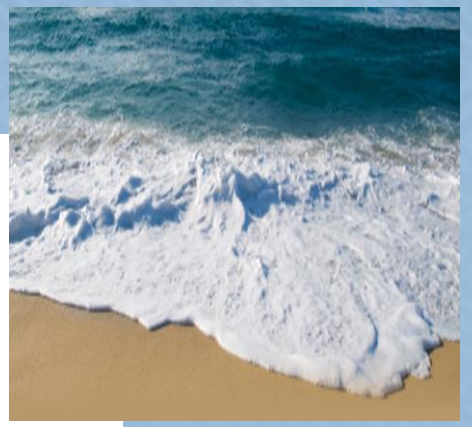
Heterogeneous - not uniform throughout.

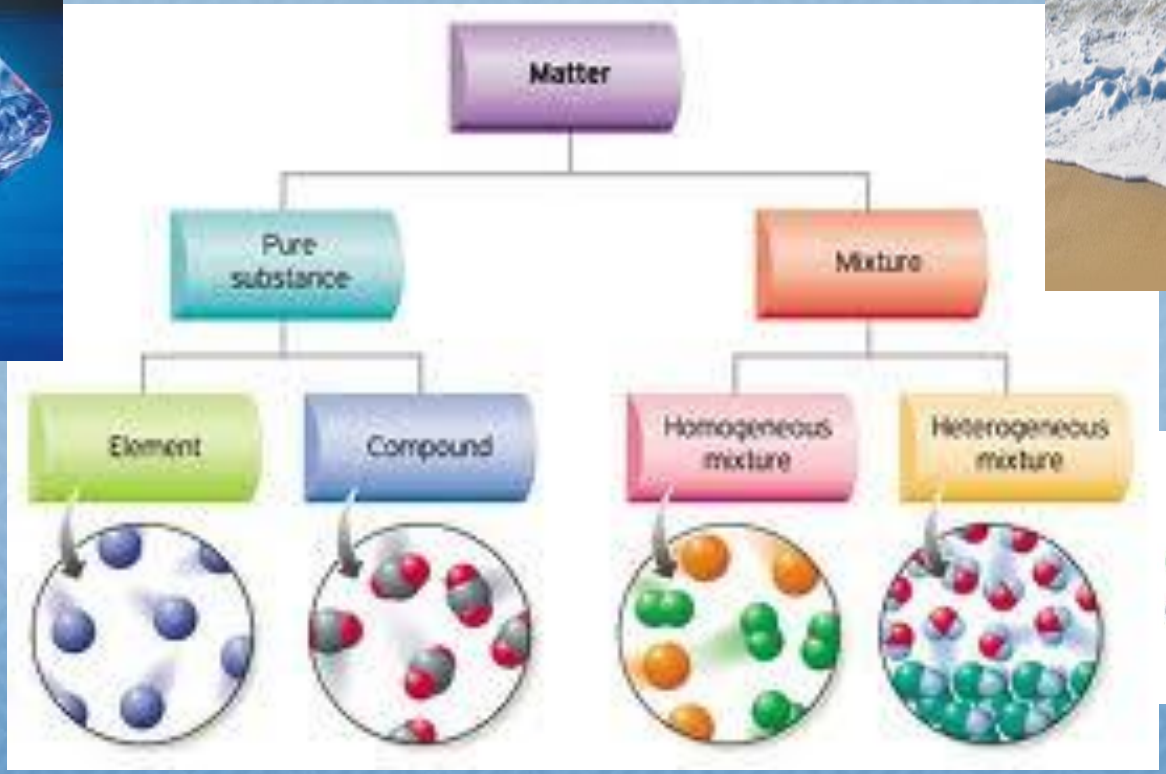


Pure substance - Has a fixed composition

1. Every sample of a given pure substance has exactly the same characteristic properties.

2. Every sample of a given pure substance has exactly the same composition.

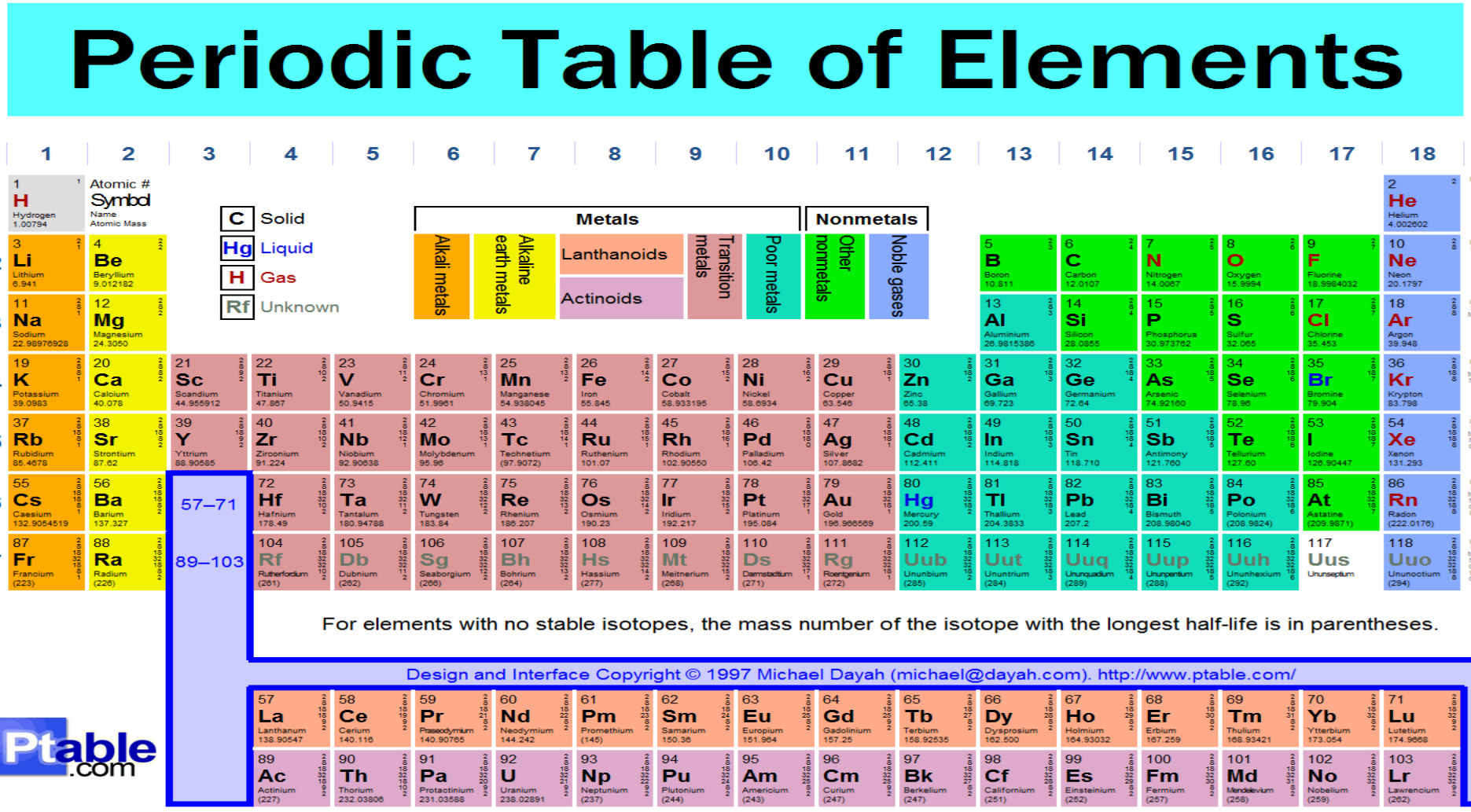




The Periodic Table

groups or families - vertical columns

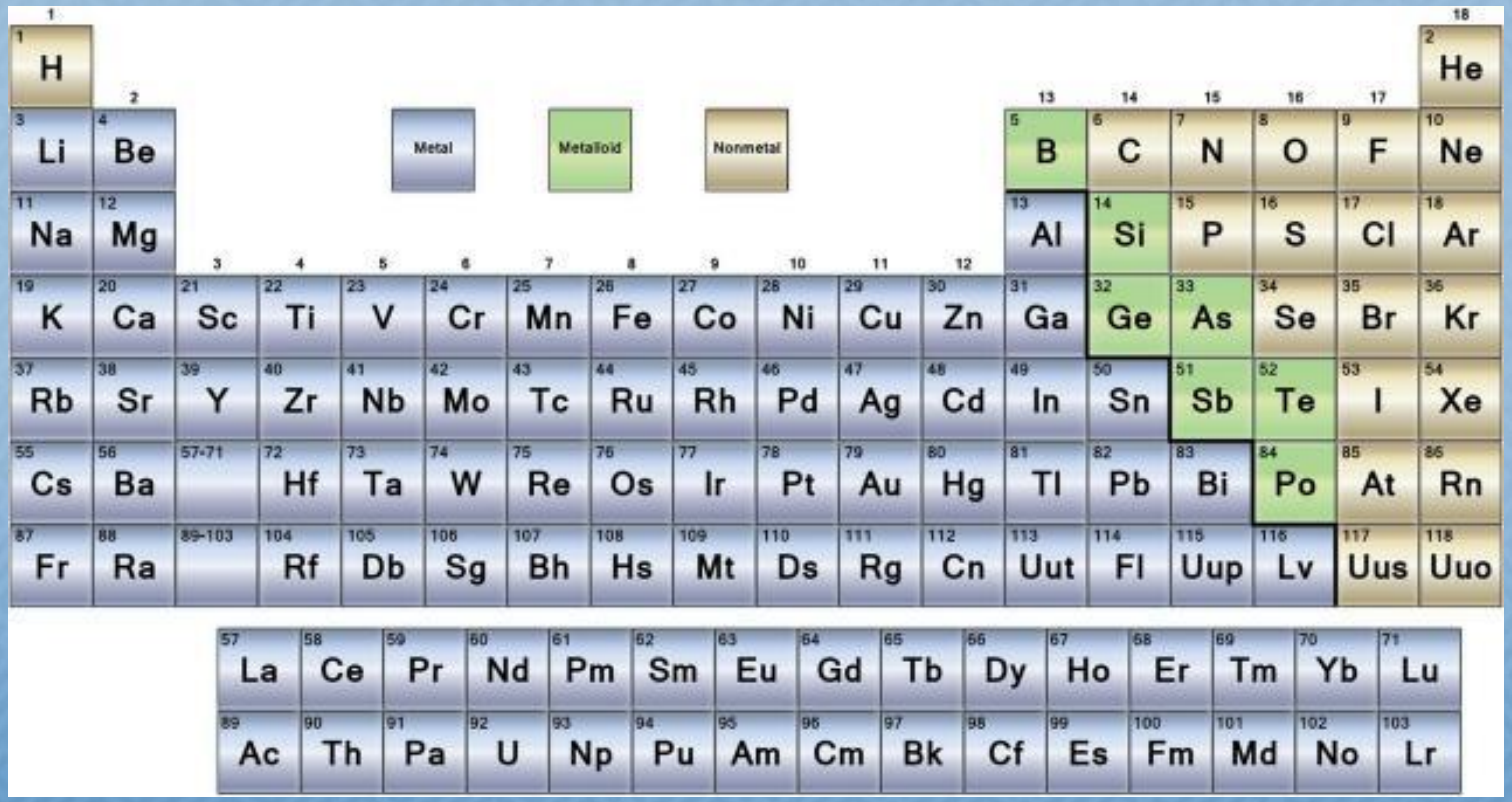
periods - horizontal rows



Types of elements:

Metal - good conductors of heat and electricity, malleable, ductile, lustrous and high tensile strength.

Nonmetal - poor conductor of heat and electricity.



Metalloid - has some characteristic properties of metals and some characteristic properties of nonmetals. They tend to be semiconductors.

Noble Gases - group 18 of the periodic table