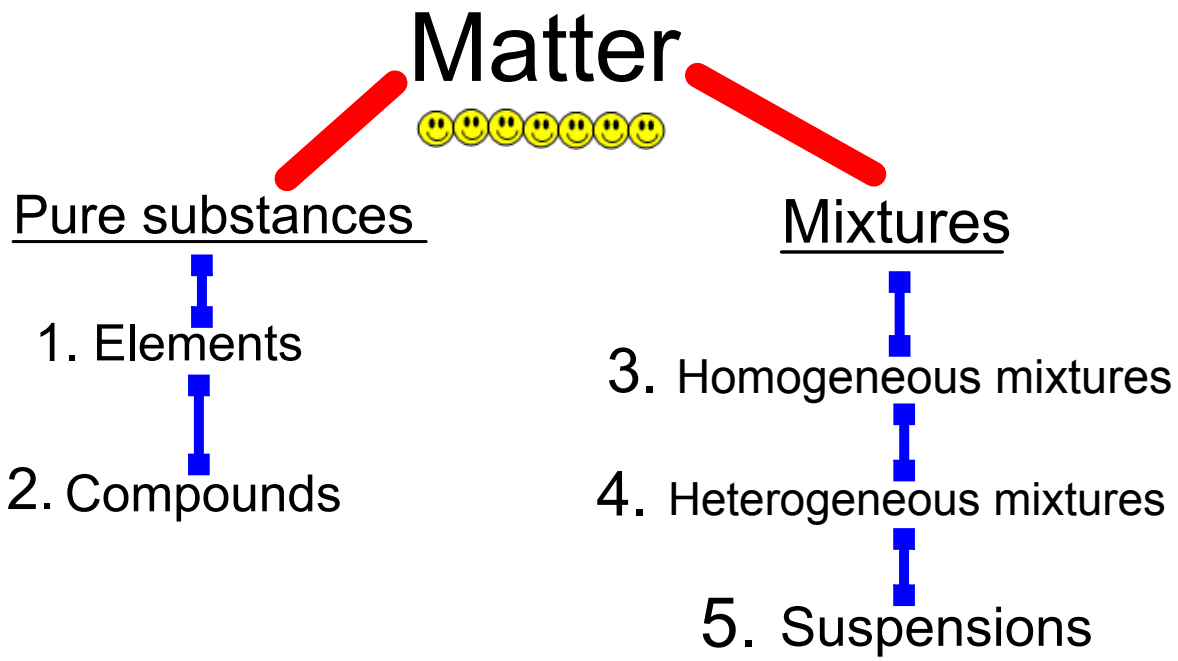
Today we will be learning how to classify different substances as one of the following: element, compound, homogeneous mixture, heterogeneous mixture, or suspension.



Classification of Matter

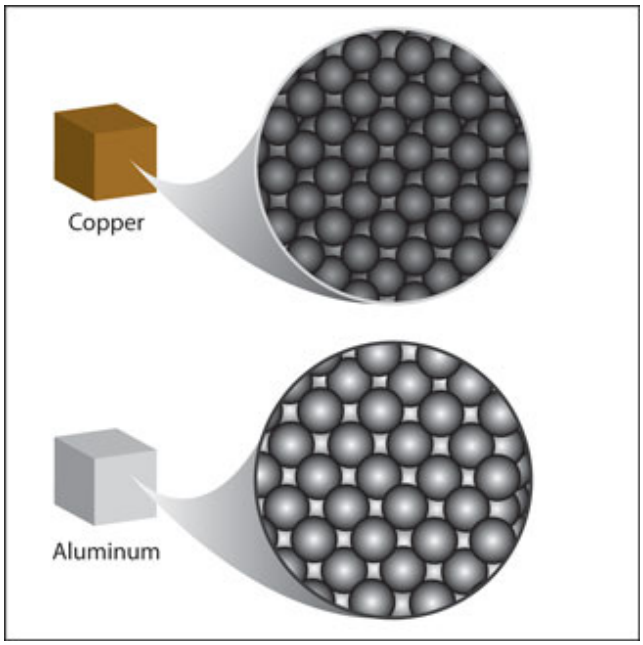
Element: refers to the substances on the periodic table. A sample of an element contains atoms which are all the same.

e.g. 100% pure copper wire

Cu

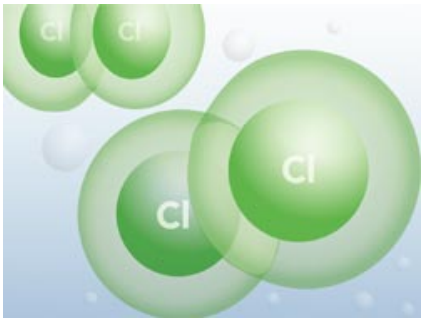
e.g. gold ingot

Au



In a sample of an element all of the atoms are the same!

Cl_2 (gas)



e.g. iron nails **Fe**

e.g. tin roof **Sn**

e.g. oxygen gas

O_2

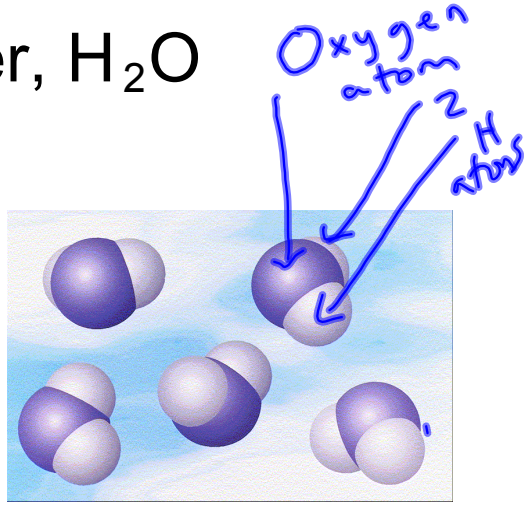
e.g. helium gas

He

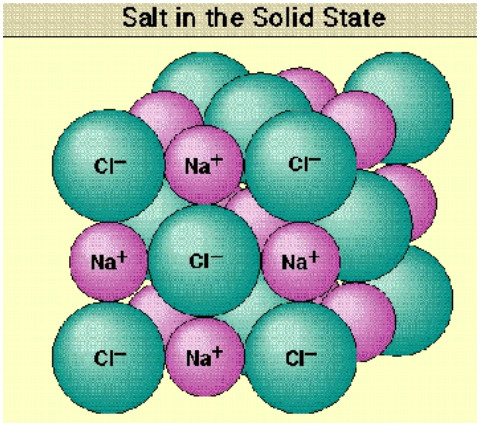
Compound: refers to a substance which contains molecules consisting of different kinds of atoms.

In a compound all of the molecules are the same.

e.g. water, H_2O

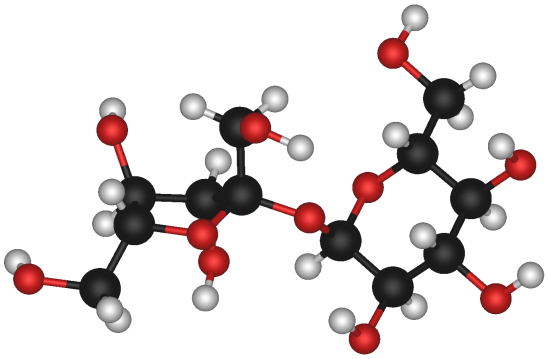


e.g. Salt, NaCl



e.g. table sugar (sucrose), $C_{12}H_{22}O_{11}$

One sucrose molecule:



Mixtures: contain two or more different elements or compounds, just physically mixed together.

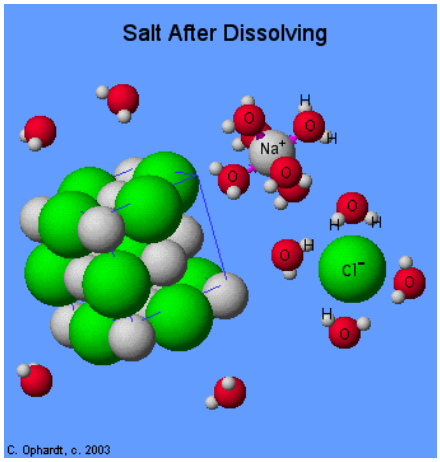
Two types of mixtures:

1. Homogenous mixtures

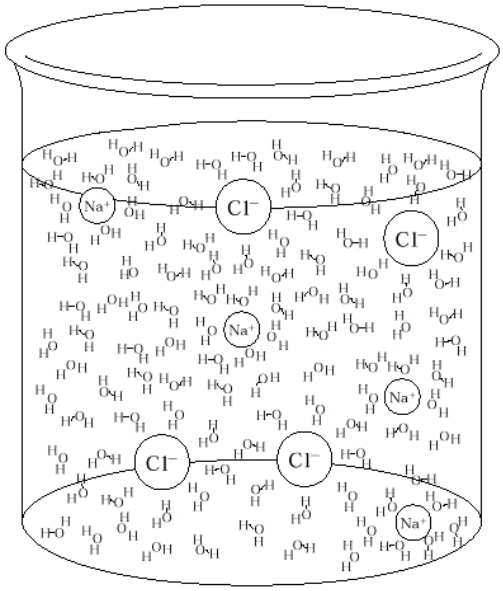
Same

To the eye this mixtures looks like one substance. It looks uniform throughout.

e.g. seawater



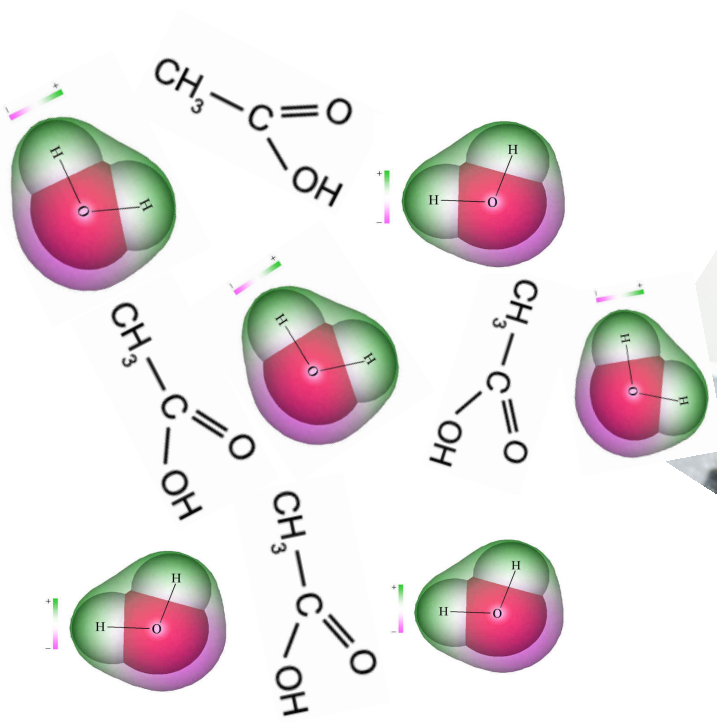
e.g. salt water
It is a mixture of two compounds, water and salt, but to the eye it looks like it is just water. You can't see the salt when it dissolves. Salt water is completely clear, just like pure water.



e.g. vinegar

vinegar is a mixture of acetic acid (CH_3COOH) and water (H_2O).

5% acetic acid, 95% water (by volume)



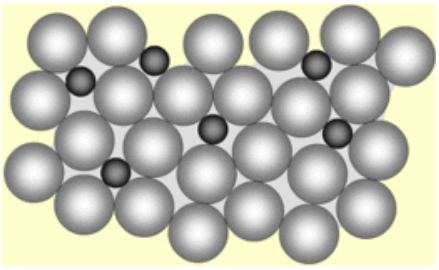
e.g. brass

Alloy: a metal made by melting two or more different metal elements together.

Brass is an alloy. It is made by melting copper and zinc together. It is used for decoration for its bright gold-like appearance; for applications where low friction is required such as locks, gears, bearings, doorknobs, ammunition, and valves; for plumbing and electrical applications; and extensively in musical instruments such as horns and bells for its acoustic properties. It is also used in zippers. Because it is softer than most other metals in general use, brass is often used in situations where it is important that sparks not be struck, as in fittings and tools around explosive gases.

Brass has a muted yellow color which is somewhat similar to gold. It is relatively resistant to rusting, and is often used as decoration and for coins. In antiquity, polished brass was often used as a mirror.

Atoms in an alloy more than one kind of atom mixed! :



More examples of alloys:

Sterling silver:
contains 92.5% silver
and 7.5% copper
This alloy has
a bright surface!

Dental amalgam

contains silver, tin, copper, and mercury

This alloy is easily worked!

Plumber's solder

contains lead and tin

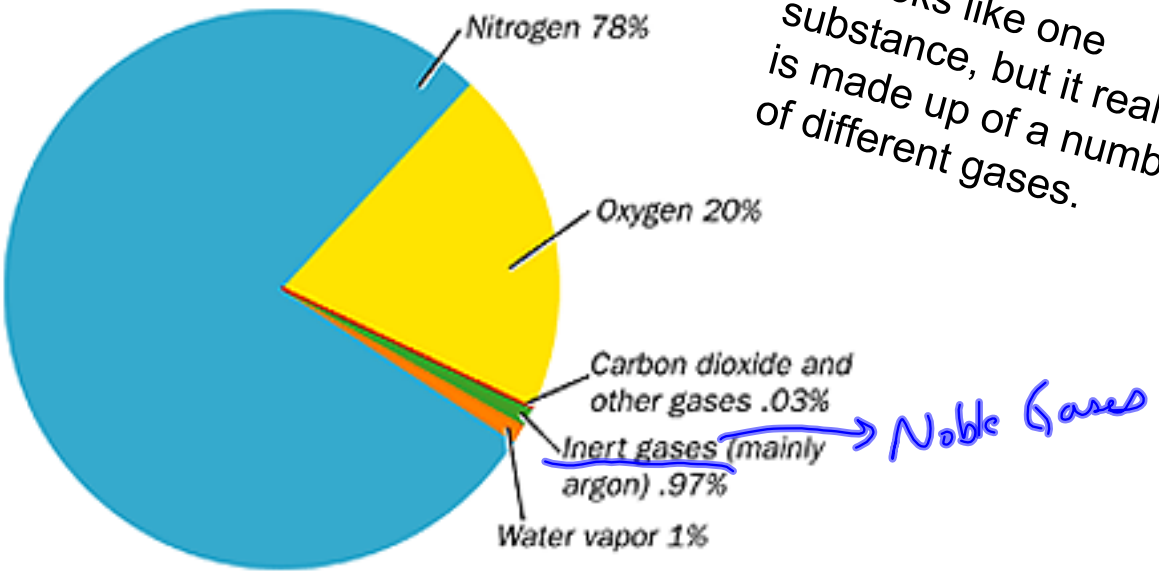
This alloy has a low melting point (275 deg C)

Stainless steel

is an alloy of iron, carbon, chromium, and nickel

This alloy resists rusting! :

Another very interesting homogenous mixture: AIR !!!



Air looks like one substance, but it really is made up of a number of different gases.

2. Heterogeneous mixtures

To the eye this mixture looks like two or more different substances.

e.g.

More examples of heterogeneous mixtures:

asphalt (used to pave roads)

garden soil

concrete
(contains cement
gravel, and sand)

McFlurry

strawberry milkshake

Italian salad dressing

fruitcake

Last category: **Suspensions**

A suspension is a homogeneous liquid mixture.... with "flecks" added!

The classic suspension examples:

OJ

tomato juice

Now let's practice! Draw a line to match each substance with its proper category term!

pure distilled water

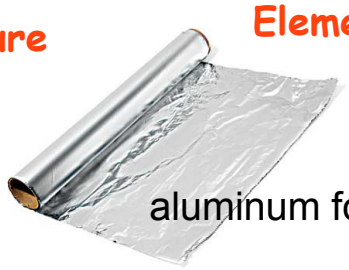
Compound

Suspension

Heterogeneous mixture

trail mix

Element



aluminum foil

Homogeneous mixture

14 K gold ring, which is an alloy containing 58% gold and the rest is silver and copper.

And let's do it again!

Homogeneous mixture

Heterogeneous mixture

Baking soda is sodium bicarbonate, $NaHCO_3$

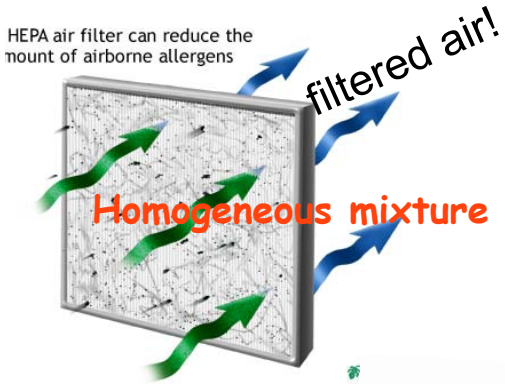
Element

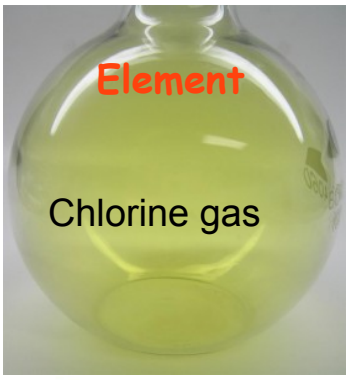
Largest polished diamond (solid carbon) in the world: The Golden Jubilee (109grams)

Suspension

Compound

And again!





freshly squeezed lemonade

Now try to label these on your own:

1. garden soil Heterogeneous mixture
2. filtered sea water Homogenous
3. 100% copper element
4. tomato juice suspension
5. brass (alloy of copper and zinc) Homogeneous
6. strawberry milkshake het. mix
7. 24 carat gold bracelet (pure gold) (Au) element
8. sugar water homogeneous
9. mineral water homogeneous
10. ethyl alcohol (ethanol) (CH_3CH_2OH) Compound