The Classification of Matter

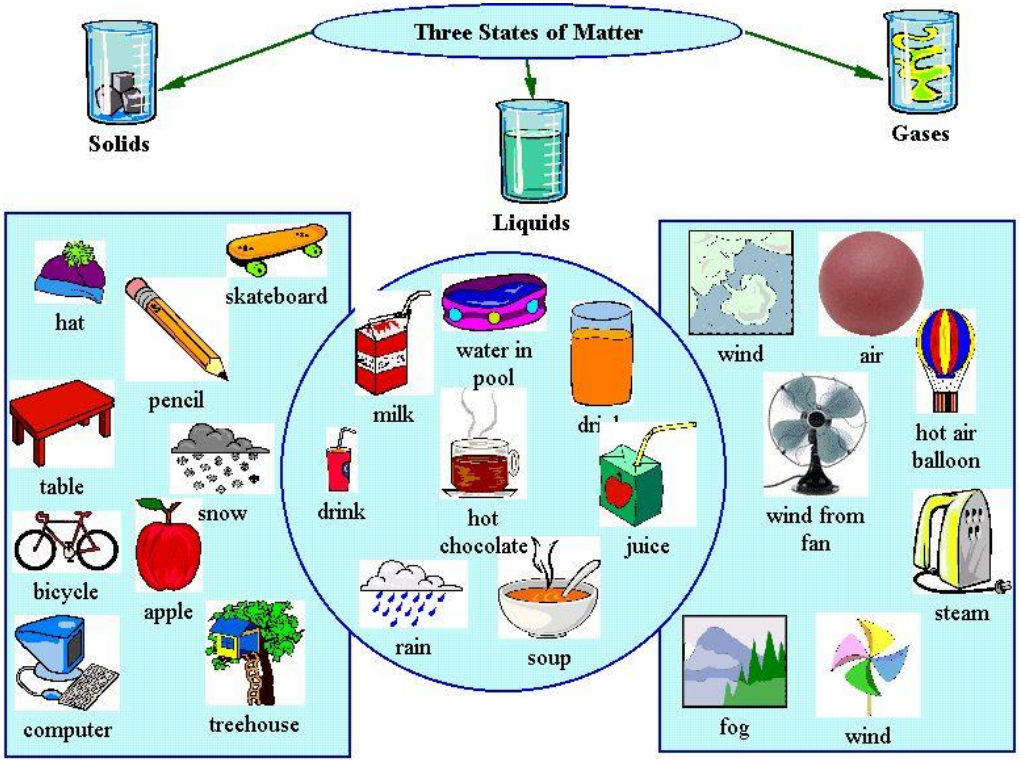
CHAPTER 5 - SECTION 1

What is Chemistry

Chemistry is the study of matter..

What is Matter?

Matter is anything that has **mass** and **volume**.



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What is Matter?

- **Mass** is the amount of matter in a substance or object.
  - Mass is often measured in grams or kilograms.

See page 16

What is Matter?

- **Volume** is the amount of space a substance or an object occupies.
  - Volume is often measured in litres.

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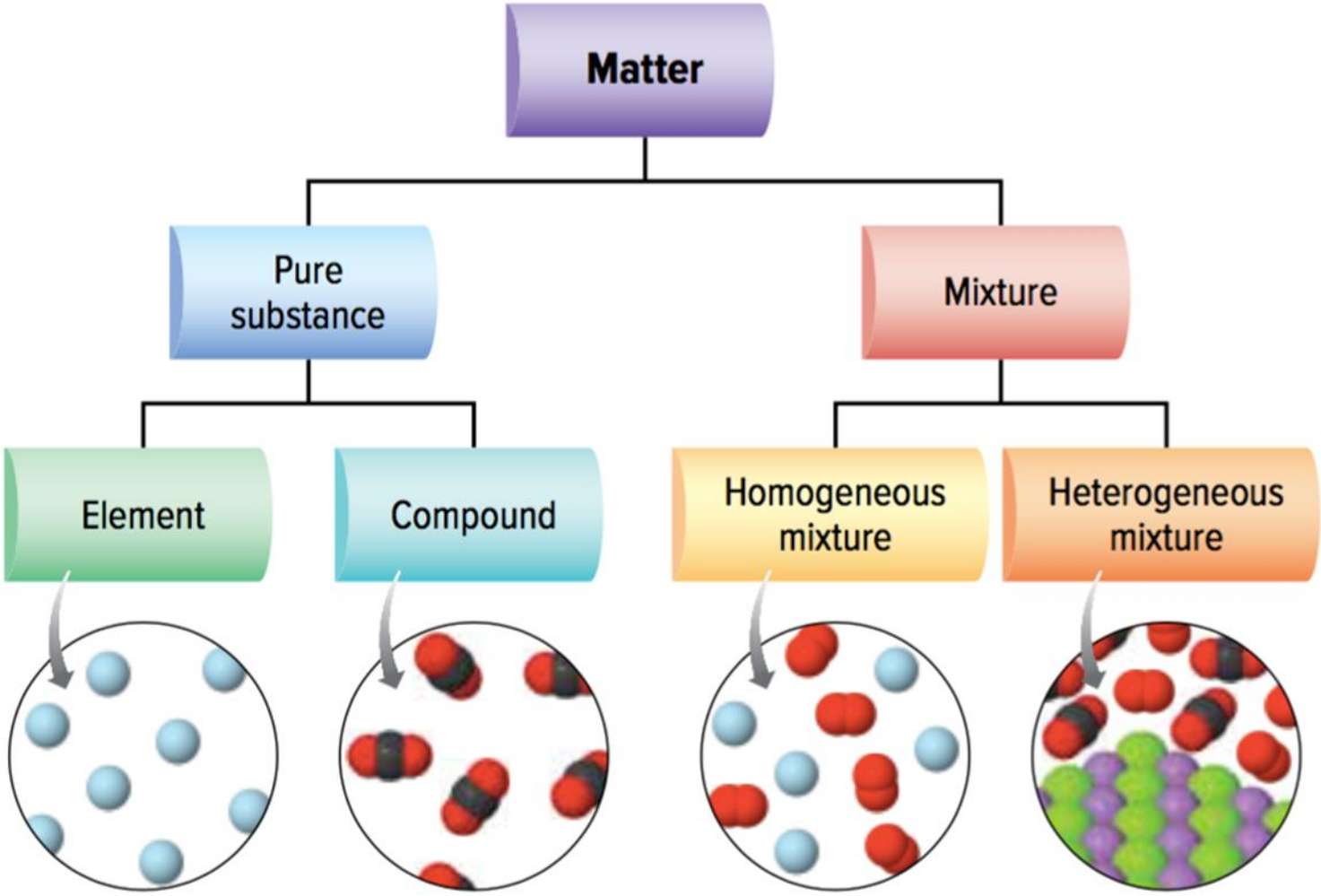
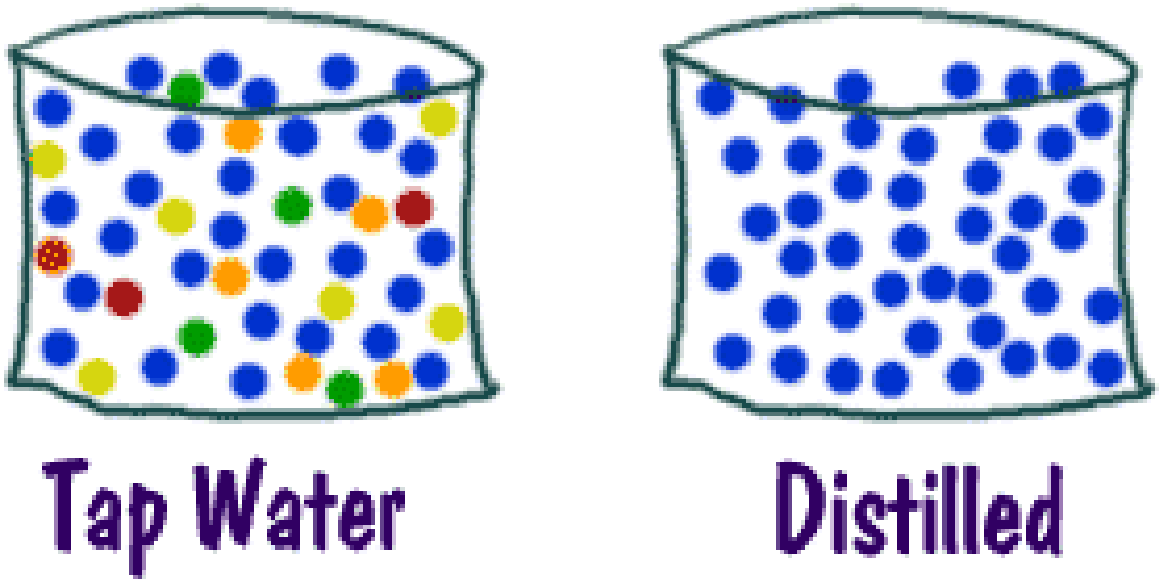

Matter
Pure substance
Mixture
Element
Compound
Homogeneous mixture
Heterogeneous mixture

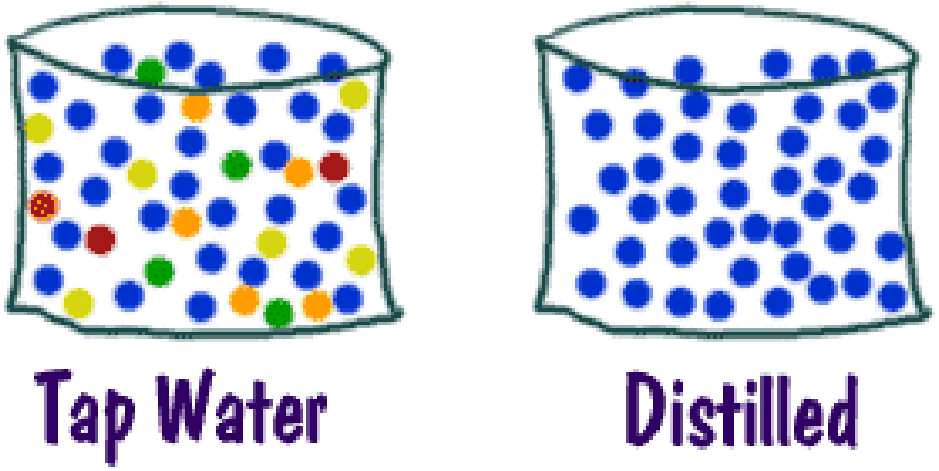
There are **two** types of Matter:

1. Pure Substance
2. Mixture



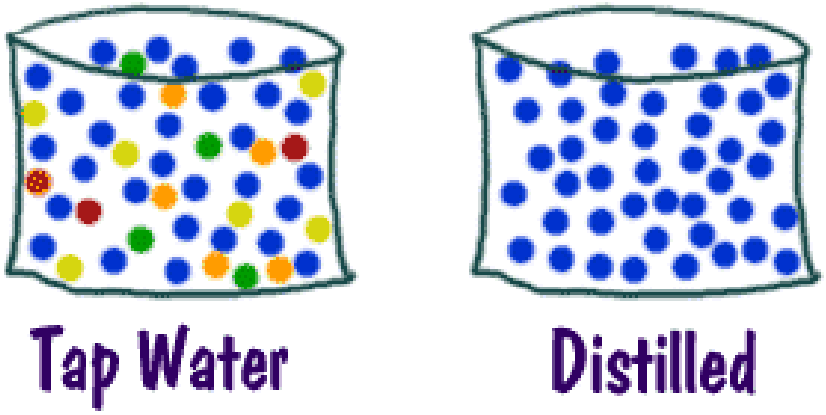
1. Pure Substance:
   - Is matter that contains only one type of particle. Cannot be separated by physical means

Example: distilled water, pure copper wire



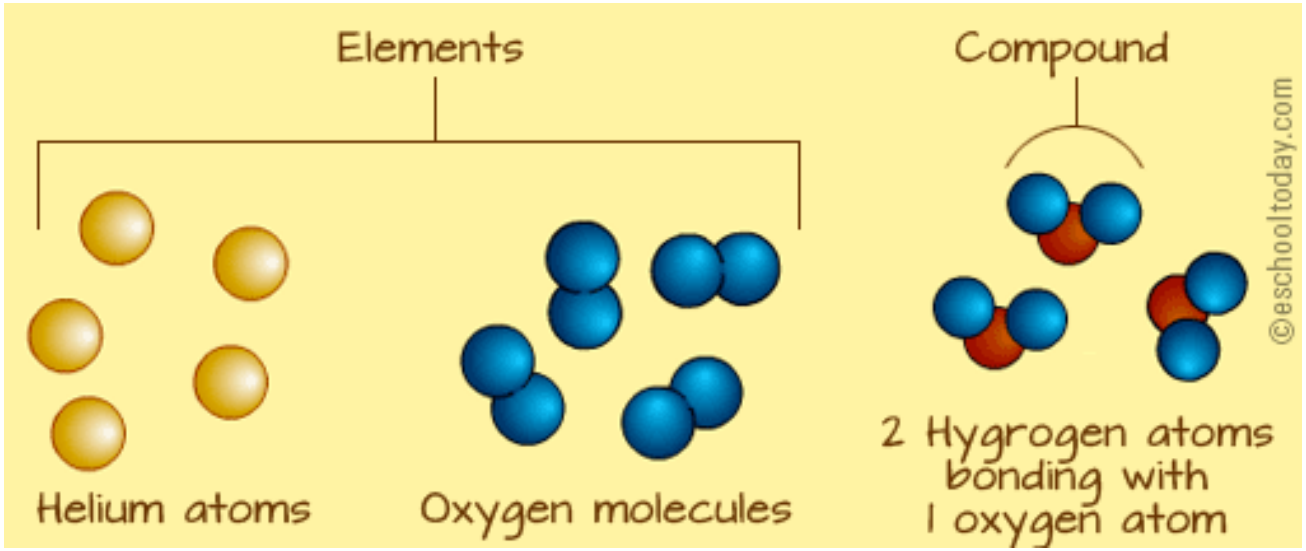
2. Mixture:
   - Contains two or more pure substances. Can be separated by physical means

Examples: tap water, table salt dissolved in water, iron mixed with sulfur



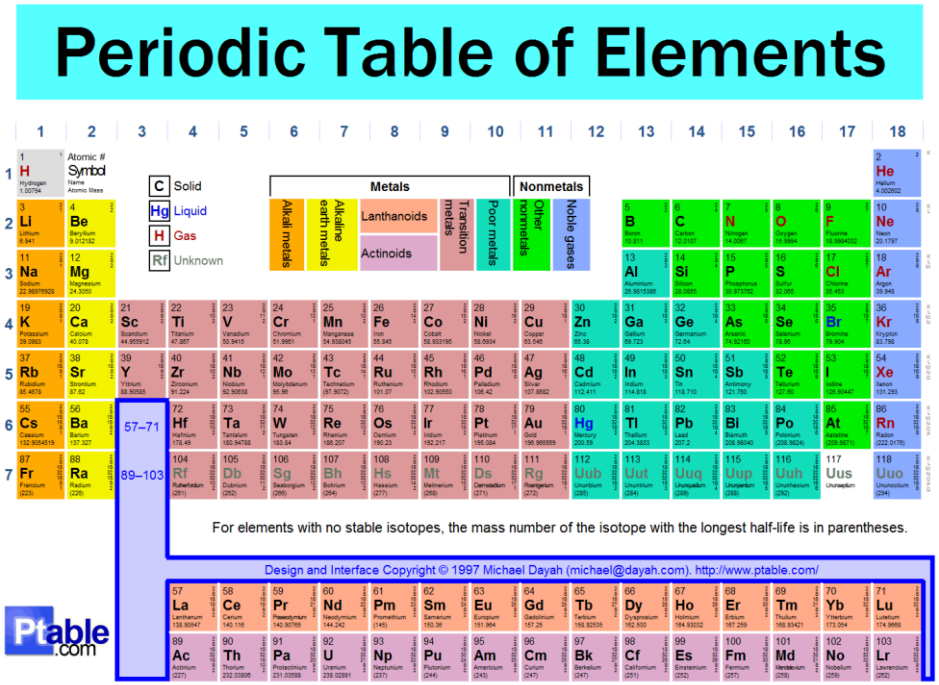
Pure Substances have **two** types

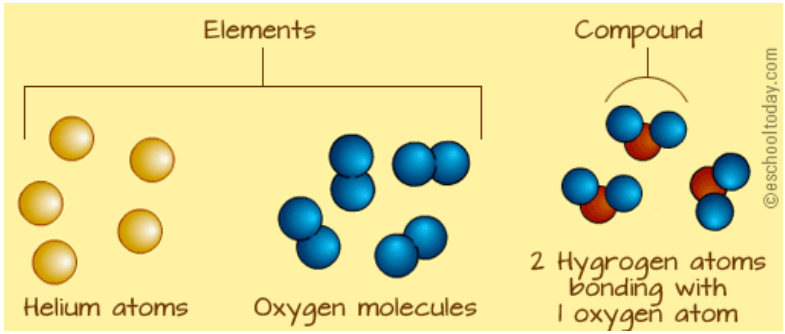
1. Elements
2. Compounds



1. Elements

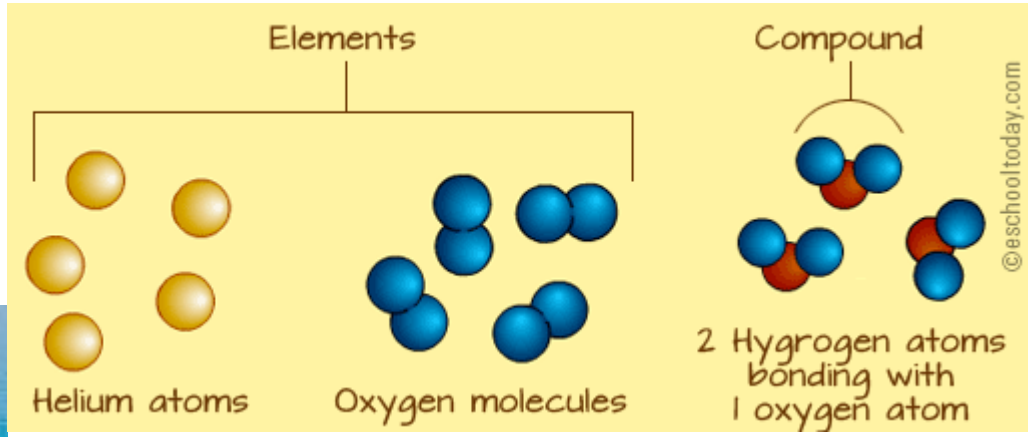
- Made up of one type of atom; cannot be broken down into simpler substances (example: gold)

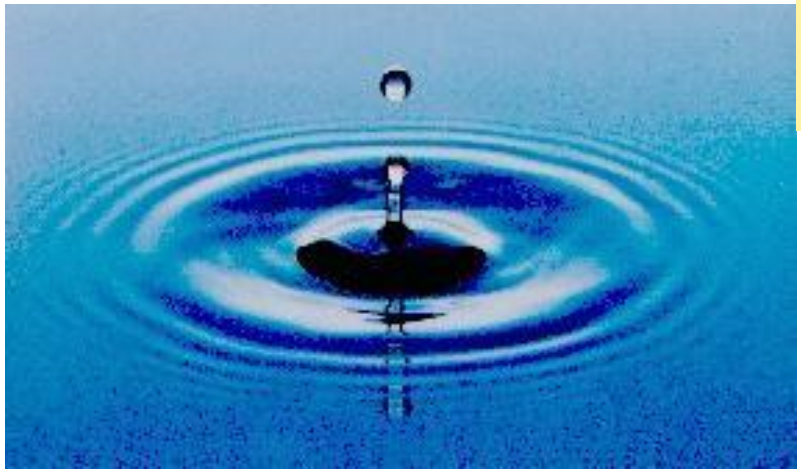




2. Compounds

- Made up of two or more elements; can be broken down into simpler substances (example: sodium chloride)





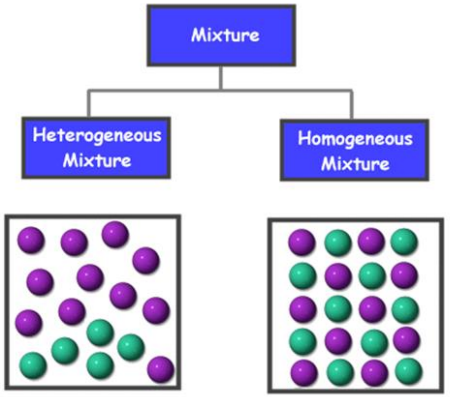
Lets talk about mixtures!

Mixtures are formed when two or more pure substances are put together

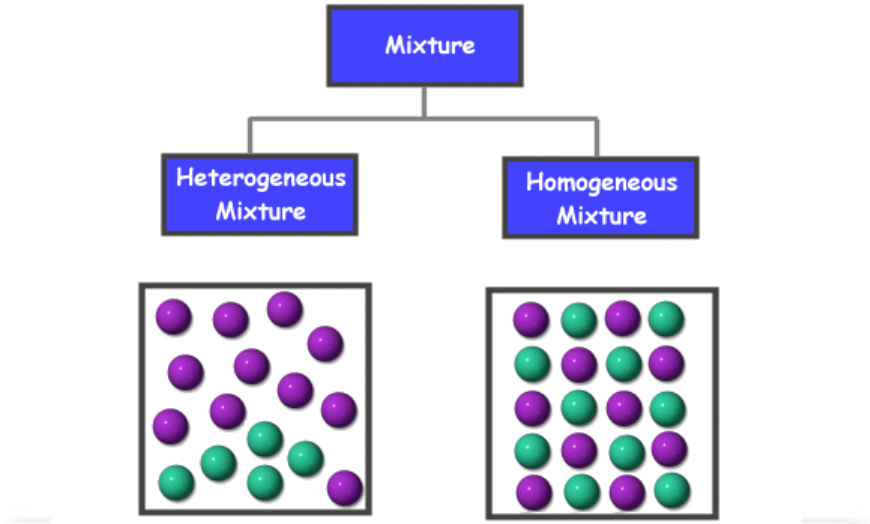
Mixtures – **two** types!

1. Heterogeneous mixtures
2. Homogenous mixtures

Mixtures – **two** types!

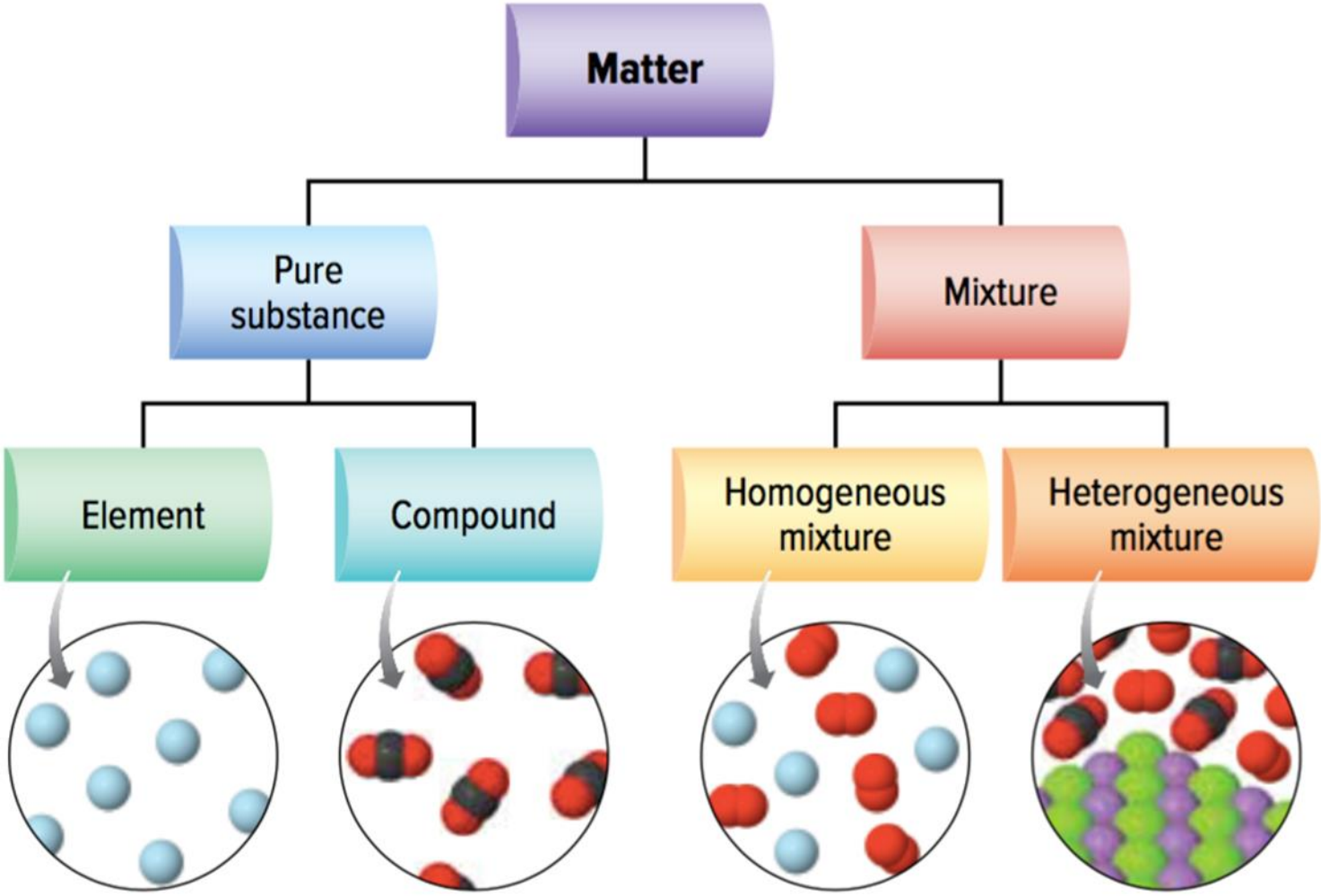


1. Heterogeneous mixtures
   - A mixture that is not uniform in its composition
   - have different components that you can see
   - The particles exist in large, visible clumps – they can be distinguished!
   - Example: beach sand, salad dressing, oil and water



2. Homogenous mixtures(Solutions)

- A mixture that is made of substances that are evenly mixed together
- You cannot see their components
- Example:
  - air (nitrogen, oxygen, hydrogen)
  - steel (iron and other elements)
  - sugar in pop
  - the air we breathe


Matter
Pure substance
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Element
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Homogeneous mixture
Heterogeneous mixture

Mixtures, Compounds, and Elements

This train runs on diesel fuel. Diesel is a mixture of chemical compounds made of the elements hydrogen and carbon.

The metal used to make the bridge is steel. Steel is a very strong solid mixture—an alloy—composed of iron and small amounts of other elements, such as carbon.

The rock of the hillside is a mixture that includes quartz, which is a compound made of the elements silicon and oxygen.

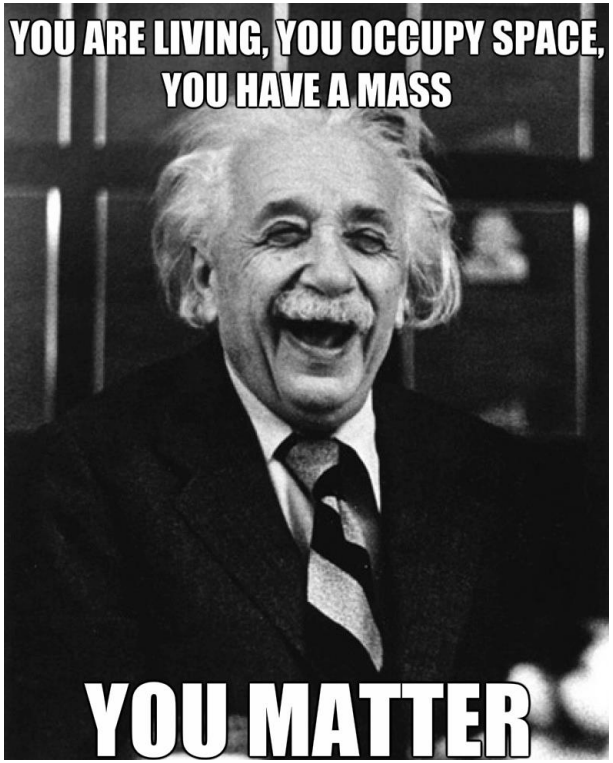
This river water is a mixture made up of the compound water, a variety of compounds and elements dissolved in the water, and suspended bits of rock.

Figure 2.2 This pair of railway bridges, called the Cisco bridges, is found at Siska, B.C. **Make a table to list the mixtures, compounds, and elements mentioned. Add one example not mentioned.**

Figure 2.2

Matter Tree Activity

Can you identify Pure Substances from Mixtures?



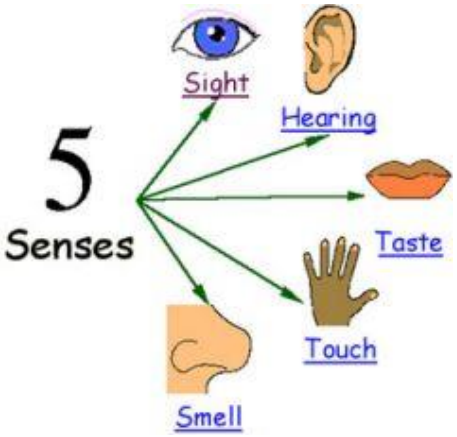
Properties

Properties = Characteristics or how we describe something

Properties of Matter

1. Physical Properties
2. Chemical Properties

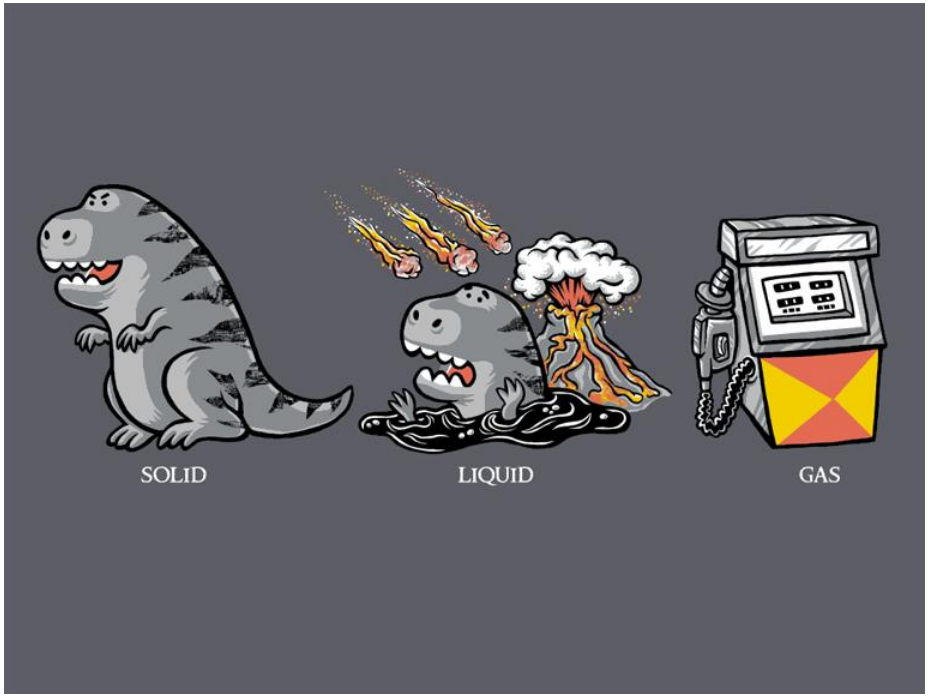
Physical Properties



Properties you can observe with your senses, measure or calculate

- Colour, hardness, density, melting temperature etc.

The most common physical property used to classify things = **STATE OF MATTER**



State of Matter

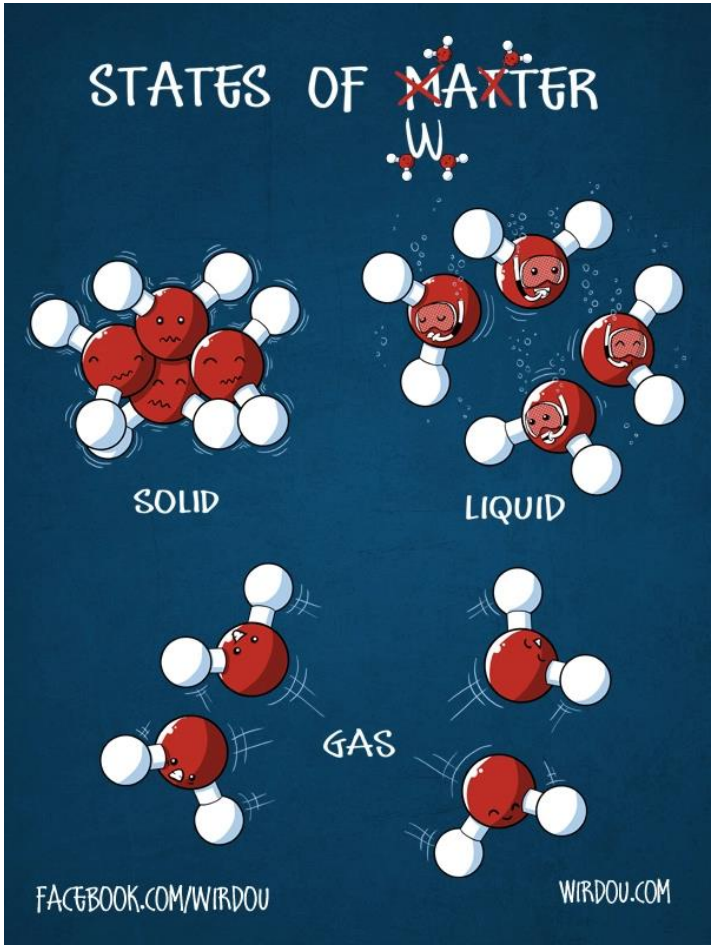
Substances can exists in more than one state

IMPORTANT: When it changes state it does not change into another substance

Example: Water (H_2O)

Three states:

- Solid, Liquid, Gas



Other Physical Properties

Malleability

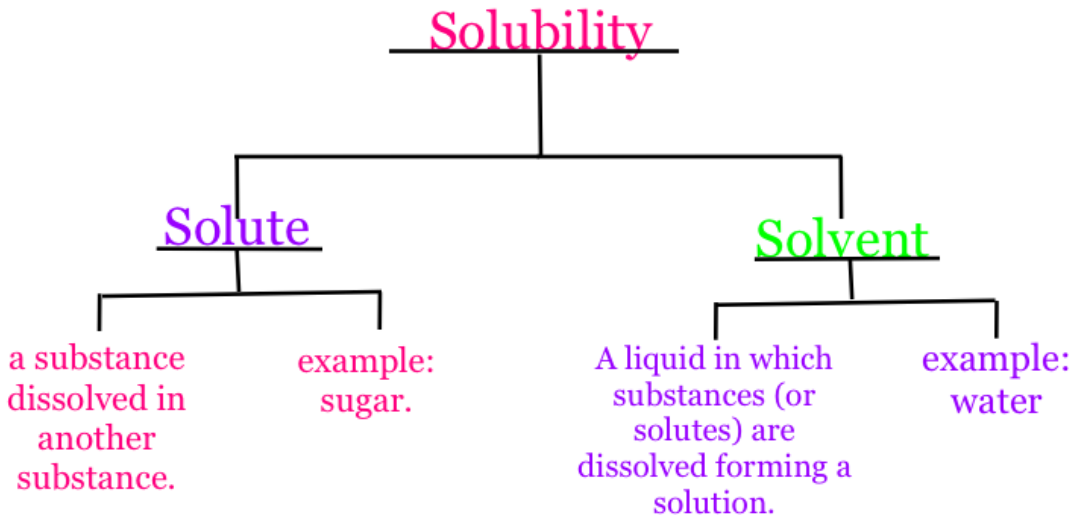
- Metals that can be beaten into thin sheets are considered to be malleable

Ductility

- Softer metals which can be “drawn” into wires – you can pull at opposite ends of a metal rod and it will become thinner

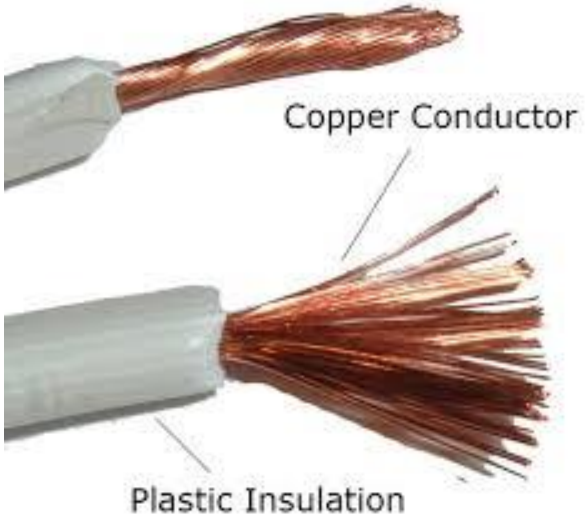
Solubility

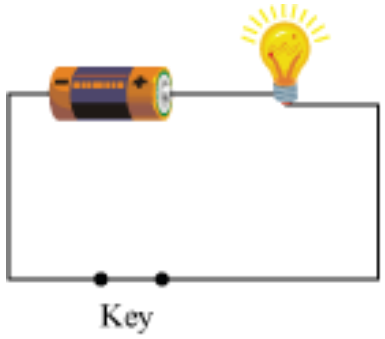
- Degree in which a substance will dissolve in a given amount of another substance



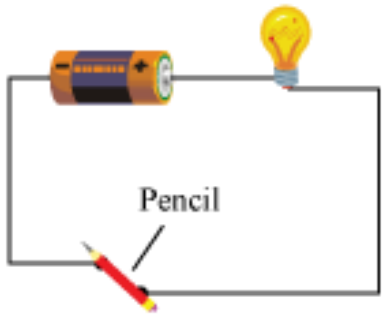
Conductivity

- Ability of a material to conduct electricity or heat





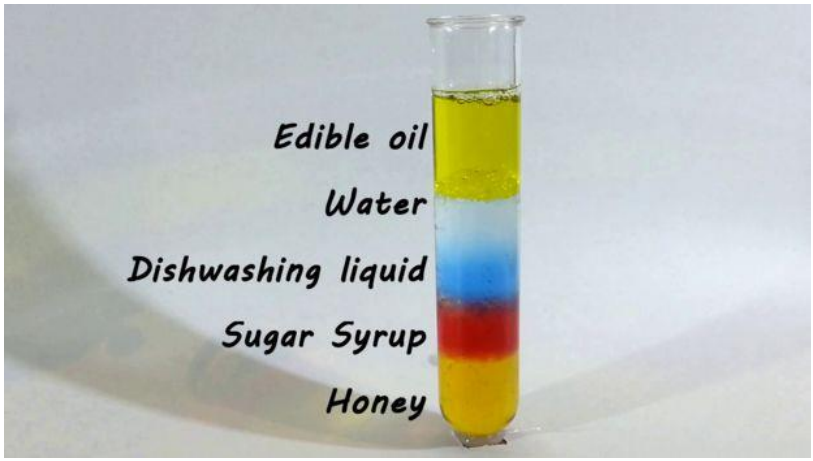
Key is a good conductor



Wood is a bad conductor

Density

- The mass per unit of volume of a substance
  - It is always constant- no matter how much of a substance you have
  - DENSITY = $\frac{\text{MASS}}{\text{Volume}}$



Chemical Properties

Describes the behaviour of a substance as it changes into a new substance

- Whether one substance will react with another substance
- Rate of reaction
- Amount of heat produced
- What proportion the substances react etc.

Common Chemical Properties

Flammability

- The rapid reaction of some substances with oxygen which result in the release of LOTS of energy

Common Chemical Properties

Corrosion

- The slow reaction of certain metals with oxygen to form metal oxides (oxidation) - RUST

Common Chemical Properties

Reactions with Acid

- Reaction of some metals that often produces gases
  - Limestone broken down by weak acid = Limestone caves

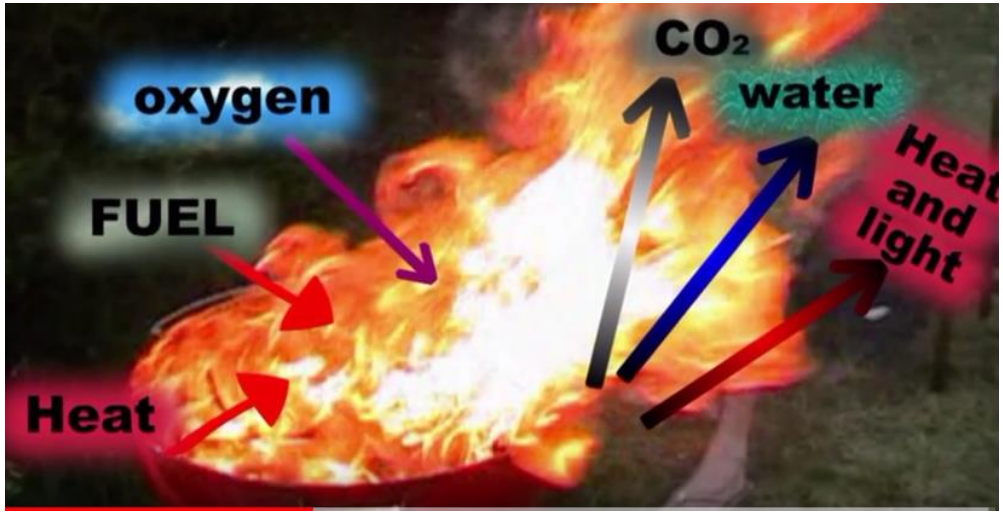
Physical and Chemical Properties

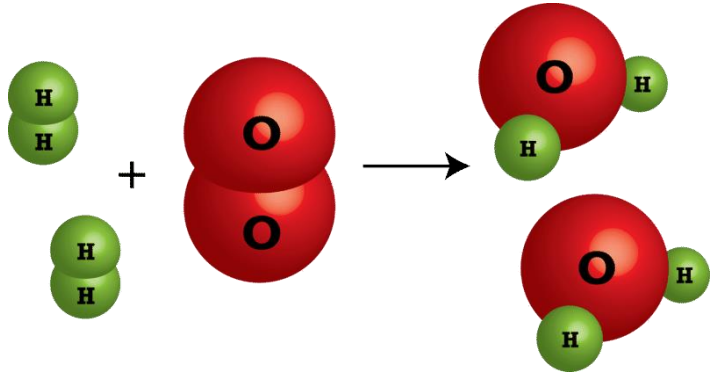
Table 2.1 Physical and Chemical Properties

Physical Properties		Chemical Properties
• colour • malleability • texture • viscosity • ability to conduct heat and electricity	• state of matter • melting point • boiling point • hardness • solubility	• combustibility • reactivity with acids • reactivity with oxygen • lack of reactivity

Chemical Reactions

- Chemical reaction
  - one or more pure substances interact to form a different substance or substances
- Elements can react to form compounds
- Compounds and elements can react to form new compounds
- Compounds can break apart to form elements and simpler compounds

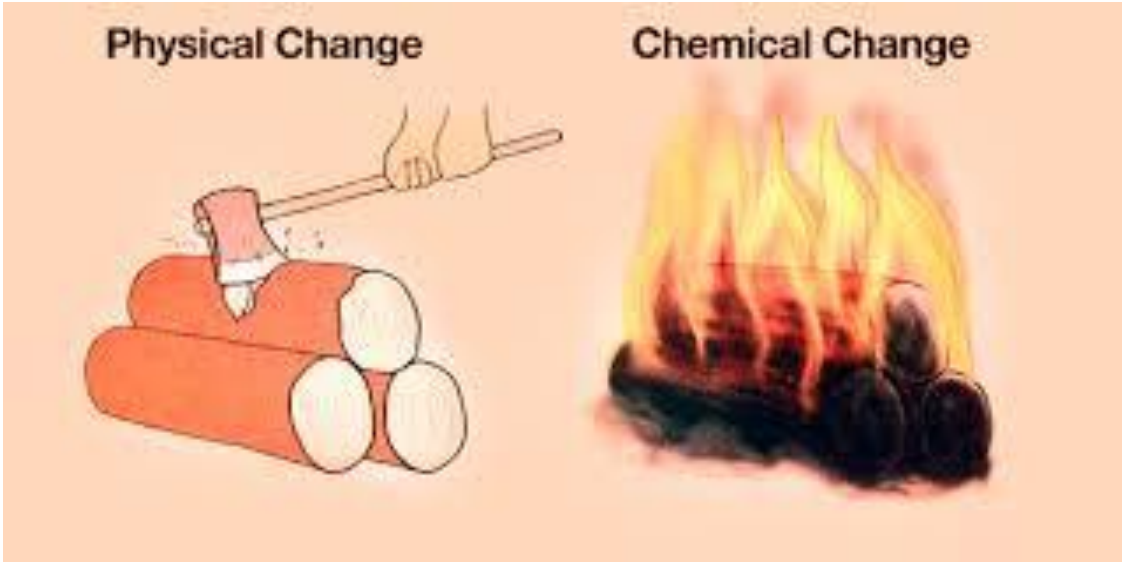




Chemical or Physical Change?

Chemical Change Check List:

1. The change is irreversible – you can't go back
2. A new substance forms
3. New properties are observed
4. An energy change may occur like heat or light given off or absorbed



Practice

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Physical and Chemical change handout