# Chapter 11 – Foundations of Chemistry

# Lesson 1 – Classifying Matter

**Matter** – is anything that has mass and takes up space.

Everything you see (and somethings you can’t see) is made up of matter.

Ex: Air is matter but you cannot see it.

**Atom** – small particle of element that has all the properties of the element.

- center of atom is the **nucleus**

- nucleus is made up of **protons (+ charge)** and **neutrons (NO charge).**

**- electrons** – have a (-) charge and are found moving around the nucleus in the electron cloud.

2 main Classifications of Matter:

1. Substances
2. Mixtures
3. Substance – matter with a composition that is always the same.

There are 2 types of Substances:

1. Elements
2. Compounds

**Elements** – a substance that consist of just one type of atom.

There are 118 known elements – found on the Periodic Table of Elements.

Each atom of an element contains a different number of protons. (atomic #)

Example: Aluminum has 13 protons = atomic # 13

- Most elements exist as a single atom:

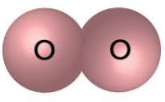
Examples: Aluminum Atom

**Al**

Iron Atom

**Fe**

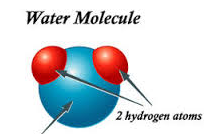
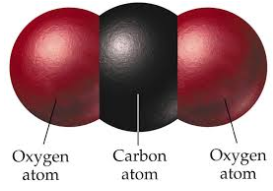
- Some elements exist in groups of atoms

Example: Oxygen O2 

Oxygen molecule – it is an element because it is only made up of one type of atom.

**Compounds** – a type of substance containing atoms of two or more different elements chemically bonded together.

Examples:

H2O (Water)   CO2 – Carbon Dioxide

In a compound the atoms are always combined the same way = substance.

**Chemical Formula** – shows how the atoms combine. A shorthand way of writing a compounds name.

CO2  Small 2 is called a subscript and tells us the number of atoms for that element.

Carbon Atoms (1)

Oxygen Atoms (2)

**Properties of Compounds**

A compound often has different properties from the individual elements that make it up.

Example: Carbon is a black solid.

Oxygen is a clear gas that is flammable.

These two elements combine to produce CO2 which is a gas used to put out fires.

**Mixtures**

Mixture is matter that can vary in composition. Two or more substances that are physically blended.

Can separate mixtures:

* Sorting chromatography
* Filtering evaporation

**2 Types of Mixtures:**

1. Heterogeneous Mixture
2. Homogeneous Mixture
3. **Heterogeneous Mixture**

– type of mixture in which the individual substances are not evenly mixed.

- 2 samples of the same mixture can have different amount of substances.

Example: A handful of trail mix

One handful will not have the same number of peanuts, raisins, M&M’s as the next.

1. **Homogeneous Mixture**

- type of mixture in which the individual substances are evenly mixed.

- particles of individual substances are so small and well-mixed, that they are not visible.

Example: Ocean Water, Lemonade

A homogenous mixture can also be known as a **solution** (when one substance dissolves in another).

Solvent – substance that does the dissolving (ie: water)

Solvent – substance that dissolves (ie: lemonade crystals)

2 samples of the same solution will have the same amount of each substance.