

**Outcome 1**  
**Topic 1 - The periodic table**

**The Elements -**

What is an **element**?

**Pure substance that cannot be broken down into other substances. Substance made up of only one type of atom.**

There are **115** building blocks called **elements**. These are simple substances that cannot be broken down into other substances.

There are **90** naturally occurring elements and **25** synthetic (man made) elements.

**The Periodic Table**

**Metals** - make up most of the elements

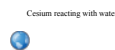
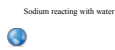
- 6 **physical** properes of metals

**Silver/gray in color**  
**Shiny**  
**Good conductors of heat/electricity**

**malleable**  
**ductile**  
**solids (except Hg)**  
*at room temp*

- **Chemical Properes** :  
*how they react*

Most metals are reavece with other maer. Some like **sodium** are highly reavece with air and water.



Others such as **planum** and **gold** are unreactive or **inert**, except with the most corrosive acids.

**Non - metals -**

Physical Properes

- 11 of the non-metals are **gases**.
- Bromine is a **liquid**.
- The other 5 non-metals are **solid**
- Some non-metals are colorless, others have vibrant colors like green, yellow and violet. Carbon is black.

Chemical Properes

- Some non-metals are highly reavece, like **fluorine**. Noble gases are **inert** (**unreactive**) and can exist as a single atom. Others need to be joined together to form **molecules**.

**Metalloids -**

Metalloids have properes of both the **metals** and the **non-metals**. Some conduct electricity, but not very well.

**The Staircase**

This is a line that separates the metals from the non-metals on the periodic table. The metals are one the le of the staircase and the non-metals on the right. The metalloids are on either side right next to the staircase.

<http://ed.ted.com/lessons/solving-the-puzzle-of-the-periodic-table-eric-rosado#review>



The periodic table is color-coded by groups and physical states. A callout box for oxygen (O) shows its atomic number (8), symbol (O), name (oxygen), and molar mass (16.00 g/mol). Another callout box shows an ion charge of 2-.

**Groups (or Families)**

Each vertical column forms a group or family of elements numbered **1** to **18**. These groups of elements have similar **physical** and **chemical** properties.

**a. Group 1: Alkali Metals**

- List of metals in Group 1: **Li, Na, K, Rb, Cs, Fr**
- Physical Properties of Group 1: **so**, **shiny**, **silver**
- Chemical Properties: **highly react with H<sub>2</sub>O and halogens**
- Hydrogen is not a metal but shares similar properties, so it is included in Group 1
- Reactivity of Group 1 increases as you move down the group. Most reactive is francium

**b. Group 2: Alkaline Earth Metals**

- List of metals in Group 2: **Be, Mg, Ca, Sr, Ba, Ra**
- Physical Properties of Group 2: **shiny**, **silver**, not as **so** as Group 1
- Chemical Properties: **all quite react (not as much as Group 1)**

**c. Groups 3 to 16: Transition Metals**

- The metals in these groups don't fit the rules as easily as Group 1, 2. We leave these until higher Chemistry courses.

**d. Group 17: Halogens**

- List of non-metals that are halogens: **F, Cl, Br, I**
- Physical Properties Shared:
- Chemical properties shared: **react easily with alkali metals to form salts**
- o Example: **sodium chloride**

**e. Group 18: Noble Gases**

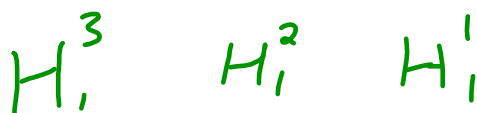
- Non-metals that are noble gases: **He, Ne, Ar, Kr, Xe, Rn**
- Physical Properties shared: **gases**
- Chemical Properties shared: **inert (unreactive)**

## Periods

- Periods are **horizontal** rows on the periodic table
- The periods are numbered **1** to **7**.
- **Hydrogen** and **Helium** make up the first period.

## Atomic Number

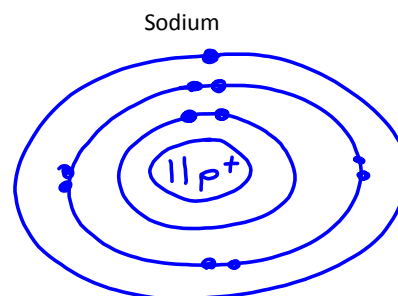
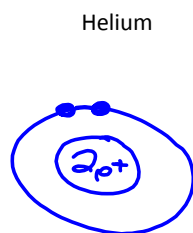
- This is the most convenient way that the periodic table is organized .
- The atomic number indicates the number of **protons that an atom** has.
- In an **atom** the number of **electrons equals the number of protons.**



## ATOMS

<http://ed.ted.com/lessons/just-how-small-is-an-atom#review>

- All atoms consist of 3 subatomic particles:
  - **Protons, electrons and neutrons**
- The **nucleus** consists of two of these particles, the proton and neutron. Together, these two particles make up most of the entire **mass** of the atom.
- The protons have a **positive** charge.
- In all **atoms**, the number of protons equals the number of electrons, so the atom is always neutral (no charge)
- The neutrons don't carry a charge, but still play an important role in the physical/chemical properties of an atom.
- The electrons carry a **negative** charge and exist in **energy levels** around the nucleus. These energy levels make up most of the **volume** of the atom.
- The number of electrons that can exist in each energy level varies
  - 1<sup>st</sup> level - can hold **2** electrons *closest to nucleus*
  - 2<sup>nd</sup> level - can hold **8** electrons
  - 3<sup>rd</sup> level - can hold **8** electrons
  - Electrons are **paired** in each level
- We commonly use the **Bohr Model** and **energy level diagrams** to illustrate the atoms of the first 20 elements.



- For the elements below, draw the Bohr Model

Calcium

Sulfur

Hydrogen

