

Chapter Six: The Periodic Table and Periodic Law

Section 1: Development of the Modern Periodic Table

Antoine Lavoisier:

- French scientist
- <https://www.youtube.com/watch?v=YCScpxkg1gA>
- He compiled a list of all elements that were known at the time
 - It contained 33 elements that he organized into 4 categories
 - Gases, metals, nonmetals, and Earths
 - Gases: light, heat, air...
 - Metals: Ag, As, Co, Cu, Sn, Fe, Mn Au...
 - Nonmetals: Sulphur, phosphorus, charcoal...
 - Earths: chalk, clay...

Dmitri Mendeleev:

- Russian chemist
- Demonstrated a connection between atomic mass and elements' properties
- Arranged the elements in order of increasing atomic mass
- Predicted the existence and properties of undiscovered elements
- He organized the elements according to their atomic masses and found similarities in their chemical properties at regular intervals...this repeating pattern is known as *periodic*
- He created a table where elements were grouped together according to their similarities...periodic table

Henry Moseley:

- English scientist
- Discovered that atoms contain a unique number of protons called the atomic number
- Arranged elements in order of increasing atomic number, which resulted in a periodic pattern of properties
- He found that when the elements that were organized by increasing atomic number (number of protons), the elements fit into a better pattern
- His discovery led to the modern definition of atomic number and the modern periodic table

Periodic Law: the statement that there is a periodic repetition of chemical and physical properties of the elements when they are arranged by increasing atomic number

Groups: vertical columns in the periodic table

- 18 Groups
- Also known as families

Period: horizontal rows in the periodic table

- 7 Periods

Representative elements: the elements in Groups 1-2 *and* Groups 13-18

- Make up the s- and p-blocks
- 8 valence electrons
- Also called *main group elements*

Transition elements: the elements in Groups 3-12

3 Types of elements:

1. **Metals:** elements that are generally shiny when smooth and clean, solid at room temperature, and good conductors of heat and electricity

a. Malleable (pounded into thin sheets) and ductile (drawn into wires)

b. **Alkali metals:** Group 1 elements (except for Hydrogen)

i. So reactive that they exist as compounds with other elements in nature

ii. Soft enough to cut with a knife

iii. React strongly with water

c. **Alkaline-earth metals:** Group 2 elements

i. Highly reactive but not as reactive as group 1

ii. Still too reactive to exist in nature alone

d. **Transition metals (elements):** Groups 3-12

i. Has many familiar metals (Au, Fe, Hg, Ag, Cu...)

ii. **Inner transition metals**

1. **Lanthanide series:** Cerium to Lutetium

2. **Actinide series:** Thorium to Lawrencium

3. To save space, the lanthanides and actinides are usually set off below the main portion of the periodic table

2. **Nonmetals:** elements that are generally gases or brittle, dull-looking solids

a. Poor conductors of heat and electricity

b. **Halogens:** Group 17 elements that are highly reactive that are often found with other elements in nature

c. **Noble gases:** Group 18 elements that are extremely unreactive

3. **Metalloids:** the elements that border the stair step line in the p-block (B, Si, Ge, As, Sb, Te, Po, At)
- have physical and chemical properties of both metals and nonmetals

Crash Course: The Periodic Table

<https://www.youtube.com/watch?v=0RRVV4Diomg&t=0s&list=PL8dPuuaLjXtPHzzYuWy6fYEaX9mQQ8oGr&index=5>