

# Chapter 7 Lesson 1: Using the Periodic Table

## Vocabulary

-Periodic table

-Group

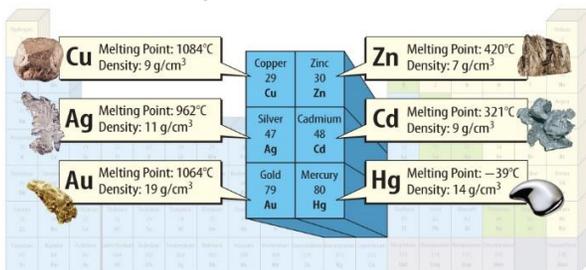
-Period

What is the periodic table?

- The **periodic table** is a chart of the elements arranged into rows and columns according to their physical and chemical properties.
- Used to determine relationship among elements.

Developing a Periodic Table

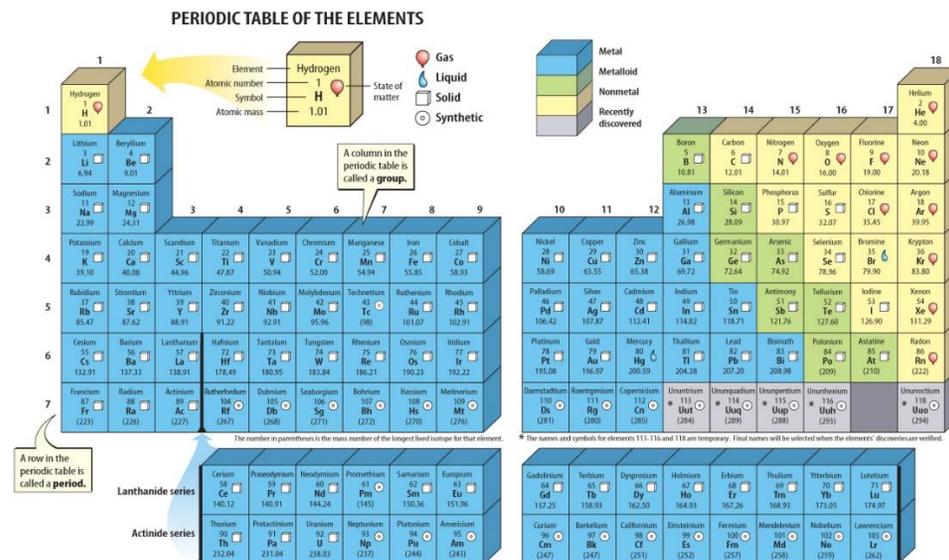
- When Russian chemist Dimitri Mendeleev was working on classifying the elements, he placed his list of elements into a table and arranged them in rows of increasing atomic mass.
- Elements with similar properties were grouped in the same column.
- Mendeleev noticed that melting point is one property that shows a repeating pattern.
- Boiling point and reactivity also follow a periodic pattern.
- Mendeleev believed that the atomic masses of certain elements must be invalid because the elements appeared in the wrong place on the periodic table.
- He placed elements whose properties resembled each other's closer together in the table.



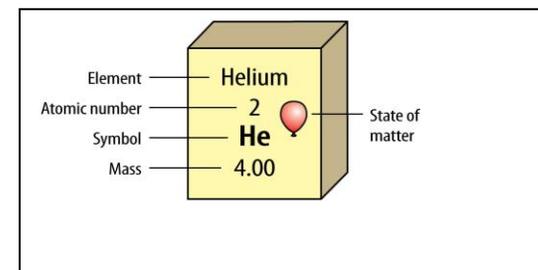
- A scientist Henry Moseley solved the problem with Mendeleev's table. When Moseley listed the elements according to atomic number, columns contained elements with similar properties, such as copper, silver, and gold.

Today's Periodic Table

- You can identify many of the properties of an element from its placement on the periodic table.
- The table is organized into columns, rows, and blocks, which are based on certain patterns of properties.



- The element key shows an element's chemical symbol, atomic number, and atomic mass. The key also contains a symbol showing the state of matter at room temperature.



- A **group** is a column on the periodic table.
  - Elements in the same group have similar chemical properties and react with other elements in similar ways.
- The rows on the periodic table are called **periods**.
  - The atomic number of each element increases by one as you read from left to right across each period.

- Metals are on the left side and in the middle of the periodic table.
- With the exception of hydrogen, nonmetals are located on the right side of the periodic table.
- Between the metals and the nonmetals on the periodic table are the metalloids.

#### How Scientists Use the Periodic Table

- Even today, new elements are created in laboratories, named, and added to the present-day periodic table.
- Scientists can use the periodic table to predict the properties of new elements they create.
- The periodic table contains more than 100 elements, each with its unique properties.

## Chapter 7 Lesson 2: Metals

#### Vocabulary

-metal	-ductility	-alkali metal	-transition element
-luster	-malleability	-alkaline earth metal	

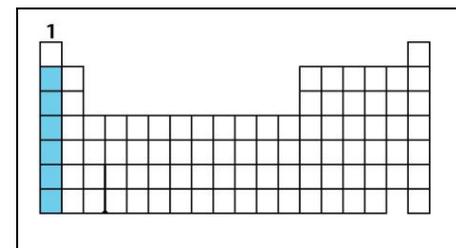
#### What is a metal?

- More than  $\frac{3}{4}$  of the elements on the periodic table are metals.
- With the exception of hydrogen, all of the elements in groups 1-12 on the periodic table are metals.
- Some of the elements in groups 13-15 are metals
- To be a metal, an element must have certain properties.
- A metal is an element that is generally shiny. It is easily pulled into wires or hammered into thin sheets. A metal is a good conductor of electricity and thermal energy.
- Luster describes the ability of a metal to reflect light.
- Ductility is the ability to be pulled into thin wires.

- Malleability is the ability of a substance to be hammered or rolled into sheets.
- Gold is so malleable that it can be hammered into thin sheets.
- In general the density, strength, boiling point, and melting point of a metal are greater than those of other elements.

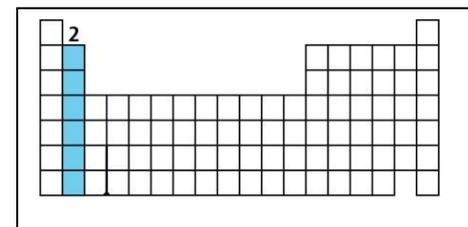
#### Group 1: Alkali Metals

- The elements in group 1 are called alkali metals.
- The alkali metals include lithium, sodium, potassium, rubidium, cesium, and francium.
- Alkali metals react quickly with other elements, such as oxygen and in nature, occur only in compounds.
- Alkali metals react violently with water. They also are soft enough to be cut with a knife.



#### Group 2: Alkaline Earth Metals

- The elements in group 2 are called alkaline earth metals.
- These are beryllium, magnesium, calcium, strontium, barium, and radium.
- Pure alkaline earth metals do not occur naturally but instead combine with other elements and form compounds.



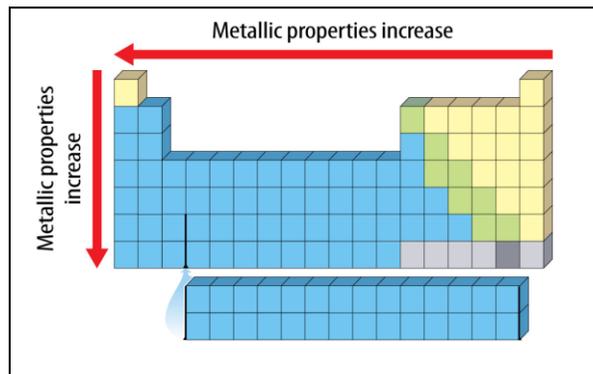
#### Groups 3-12: Transition Elements

- The elements in groups 3-12 are called transition elements.
- Transition elements are in a block at the center and two rows at the bottom of the periodic table.
- Many colorful materials contain small amounts of transition elements.
- All transition elements are metals with higher melting points, greater strength, and higher densities than the alkali metals and the alkaline earth metals.

- Because of their high densities, strength, and resistance to corrosion, transition elements make good building materials.
- Two rows of transition elements – the lanthanide and actinide series – were removed from the main part of the table so that periods 6 and 7 were not longer than the other periods.

### Patterns in Properties of Metals.

- Metallic properties include luster, malleability, and electrical conductivity.



## Chapter 7 Lesson 3: Nonmetals and Metalloids

### Vocabulary

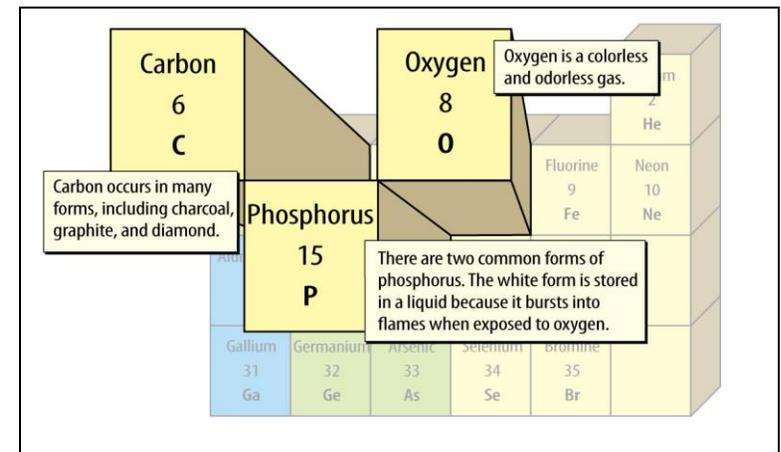
- nonmetal
- noble gas
- semiconductor
- halogen
- metalloid

### The Elements of Life

- More than 96% of the mass of the human body comes from four nonmetals – oxygen(65%), carbon(18.5%), hydrogen(9.5%), and nitrogen(3.3%).
- **Nonmetals** are elements that have no metallic properties.
- The four elements that make up most of the human body, along with phosphorus and sulfur, are the six elements in proteins, fats, nucleic acids, and other large molecules in your body and all other living things.

### How are nonmetals different from metals?

- Nonmetals have properties that are different from metals
- Many nonmetals are gases at room temperature and those that are solid at room temperature have a dull surface, which means they have no luster.
- Because nonmetals are poor conductors of electricity and thermal energy, they are good insulators.
- Phosphorus and carbon are dull, brittle solids that do not conduct thermal energy or electricity.



- An element in group 17 of the periodic table is called a [halogen](#).
- The term halogen refers to an element that can react with a metal and form a salt.
- Halogens react readily with other elements and form compounds.
- Halogens can only occur naturally in compounds.
- In general, halogens are less reactive as you move down the group.

- The elements in group 18 are known as the [noble gases](#).
- Unlike halogens, the only way elements in this group react with other elements is under special conditions in a laboratory.

- Of all the elements, hydrogen has the smallest atomic mass and is the most common element in the universe.
- Hydrogen is most often classified as a nonmetal because it has many properties like those of nonmetals.
- However, hydrogen also has some properties similar to those of the group 1 alkali metals.
- Under conditions on Earth, hydrogen usually behaves as a nonmetal.

## Metalloids

-Between the metals and the nonmetals on the periodic table are elements known as metalloids.

- A [metalloid](#) is an element that has physical and chemical properties of both metals and nonmetals.
- The elements boron, silicon, germanium, arsenic, antimony, tellurium, polonium, and astatine are metalloids.
- Silicon is the most abundant metalloid in the universe.
- A property of metalloids is the ability to act as a semiconductor.
- A [semiconductor](#) conducts electricity at high temperatures, but not at low temperatures.
- Silicon is used in making semiconductor devices for computers and other electronic products.

## Metals, Nonmetals, and Metalloids

- An element's position on the periodic table tells you a lot about the element.
- Understanding the properties of elements can help you decide which element to use in a given situation.