Metals, Nonmetals, and Metalloids: Another Look at the Periodic Table of the Elements

Scientists classify all the known elements into the Periodic Table of the Elements. There are presently 109 elements, written as symbols and listed by their atomic numbers. Today's classification system has 18 columns, called groups or families, and seven rows, called periods. Let's take another look at the Periodic Table and see what other information about the elements we can learn.

Most of the known elements are classified as metals. Metals have certain characteristics or properties in common. Most metals are shiny, and they are good conductors of heat and electricity. They can also be bent or hammered into many different shapes, so scientists say they are malleable.

Metals are found on the left side of the periodic table. They make up about 75 percent of the table. All of the metals are naturally found in their solid state at room temperature, except for mercury, which is liquid at room temperature.

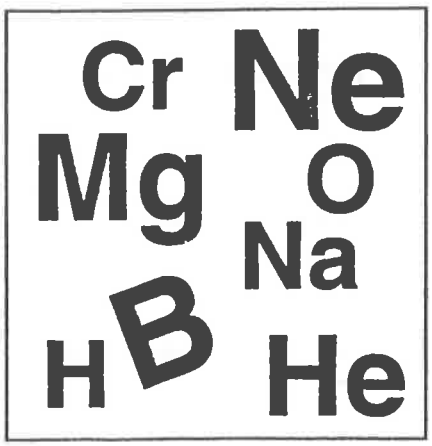
As scientists have learned more about the structure of atoms, they have found that electrons move around the atom's nucleus in various energy levels. Scientists have found that metals generally have three or fewer electrons in their outer shells or highest energy levels. Metals tend to give up electrons from these shells to form compounds.

Elements can also be classified as nonmetals. They also have certain characteristics in common. While metals are usually shiny, nonmetals are usually dull. Metals are good conductors of heat and electricity, but nonmetals are poor conductors. Metals are malleable, meaning they can change shape, but nonmetals are brittle, meaning that they do not change shape well.

Nonmetals are found on the right side of the Periodic Table, except for hydrogen, which is listed at the top of the left side. At room temperature, 10 nonmetals are solids, one is a liquid, and 11 are gases.

Metals tend to have three or fewer electrons in their outer shells. Nonmetals, however, seem to have five or more electrons in their outer energy levels. They are able to share these electrons or gain new ones as they form compounds.

Finally, elements may have some characteristics of both metals and nonmetals. These elements are known as metalloids. Some metalloids are shiny and many of them are conductors; however, they are poor conductors compared to metals.



Metalloids are found along the dotted stairstep line that separates the metals from the nonmetals in the table. The eight metalloids are boron, silicon, germanium, arsenic, antimony, tellurium, polonium, and astatine.

Two rows of the Periodic Table are separated from the rest of the table. The exact placement of the rows is shown by the solid and outlined diamonds in the table. These rows are removed so the table can be shorter and more easily read. The elements that are numbered from 57 to 71 are often known as the Rare Earth Elements and the elements from 89 to 103 are known as the Radioactive Rare Earth Elements.

Name _____ Date _____

For the Student:

1. What are three general characteristics of metals?

2. What are three general characteristics of nonmetals?

3. What are metalloids?

4. Are most elements metals, nonmetals, or metalloids?

5. How is mercury different from all of the other metals in the periodic table?

6. On which side of the table are nonmetals found?

7. What does the stairstep pattern on the Periodic Table of the Elements represent?

8. Why are two of the rows of the Periodic Table separated from the rest of the chart?

Name _____ Date _____

Student Research: Metal, Nonmetal, or Metalloid?

Using reference materials, complete the following chart. Write the correct symbol for each element as well as its atomic number. Determine if the element is a metal (M), nonmetal (N), or a metalloid (MD). List at least one use for each of the elements.

Element	Symbol	Atomic Number	Metal, Nonmetal, Metalloid	Use
1. aluminum				
2. arsenic				
3. carbon				
4. chlorine				
5. chromium				
6. copper				
7. fluorine				
8. germanium				
9. gold				
10. hydrogen				
11. iodine				
12. iron				
13. lead				
14. neon				
15. nitrogen				
16. oxygen				
17. silver				
18. sodium				
19. tin				
20. zinc				