

Atoms, Bonding, and the Periodic Table (pages 150–156)

Valence Electrons and Bonding (pages 150–151)

Key Concept: The number of valence electrons in an atom of an element determines many properties of that element, including the ways in which the atom can bond with other atoms.

- The **valence** (VAY luns) **electrons** of an atom are the electrons in the highest energy level. These electrons are far away from the pull of the nucleus. So, an atom easily loses valence electrons.
- An **electron dot diagram** shows the number of valence electrons for an element. Each dot in the diagram stands for one valence electron. An element can have from one to eight valence electrons.
- Most atoms are stable when they have eight valence electrons. When atoms are stable, they do not react with other atoms.
- When some atoms react, they gain electrons from another atom to increase their number of valence electrons to eight. Other atoms give up their valence electrons to other atoms to get eight valence electrons.
- When atoms lose, share, or gain electrons, the atoms react, or join together chemically. A **chemical bond** is the pulling force between two atoms that holds them together.

Answer the following questions. Use your textbook and the ideas above.

1. Is the following sentence true or false? The valence electrons of an atom are the electrons in the lowest energy level closest to the nucleus. _____

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2. Look at the electron dot diagrams for sodium (Na), carbon (C), and oxygen (O). Draw a line from each element to its number of valence electrons.

Element	Number of Valence Electrons
Na•	a. 6
•C•	b. 4
•O•	c. 1

3. Circle the letter of each sentence that is true.
- Atoms with eight valence electrons easily react with other atoms.
 - Atoms lose or gain electrons when they react with other atoms so that the atoms will have eight valence electrons.
 - When atoms form chemical bonds with other atoms, the atoms have joined together chemically.

How the Periodic Table Works (pages 152–156)

Key Concept: The periodic table gives you information about the arrangement of electrons in atoms. The elements within a group have similar properties because they all have the same number of valence electrons in their atoms.

- The periodic table shows the elements arranged in a certain way. The arrangement of elements tells you which elements will combine and how.
- As you look across a period, or row, you can see that the atomic numbers increase from left to right. As the atomic number increases, the number of electrons also increases. This pattern is the same for every period. This pattern means that the elements within a group always have the same number of valence electrons.

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- Most of the elements of Group 18—the noble gases—have eight valence electrons. Atoms with eight valence electrons are unlikely to give up electrons to other atoms. As a result, the noble gases do not react easily with other elements.
- Elements of Group 1 react very easily. They can become stable by losing just one valence electron. Elements of Group 17 also react very easily. They can become stable by gaining just one electron.
- How reactive a metal is depends on how easily its atoms lose valence electrons. Among Groups 1 and 2, reactivity increases from top to bottom.
- Elements in the green section of the periodic table are the nonmetals. Most nonmetals are gases at room temperature.
- Metalloids lie along the zigzag line. These elements can behave as either metals or nonmetals.
- Hydrogen is located in Group 1, but it is considered to be a nonmetal.

Answer the following questions. Use your textbook and the ideas on page 71 and above.

4. Circle the letter of why elements within a group on the periodic table have similar properties.
 - a. They all have the same number of neutrons in their atoms.
 - b. They all have the same number of valence electrons in their atoms.
 - c. They all can behave as metals or nonmetals.
5. Is the following sentence true or false? How reactive a metal is depends on how easily its atoms lose valence electrons. _____