

# Atoms, Bonding, and the Periodic Table

## Understanding Main Ideas

Look at the diagram below. Then answer the following questions in the space provided.



1. How many protons does a nitrogen atom have? \_\_\_\_\_
2. How many valence electrons does a nitrogen atom have? \_\_\_\_\_
3. Is nitrogen reactive or stable? \_\_\_\_\_
4. Neon (Ne), which has an atomic number of 10 is in Group 18 in the periodic table. To which group does nitrogen belong? \_\_\_\_\_
5. The element directly below nitrogen in the periodic table is phosphorous (P). How many valence electrons does phosphorous have? \_\_\_\_\_
6. Will the properties of nitrogen be more similar to the properties of neon or the properties of phosphorous? Explain. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## Building Vocabulary

If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.

7. \_\_\_\_\_ An element's reactivity is determined by the number of protons found in an atom of the element.
8. \_\_\_\_\_ The force of attraction that holds two atoms together is called a chemical bond.
9. \_\_\_\_\_ In a(n) periodic table, dots around an element's symbol indicate the number of valence electrons in an atom.

## Lesson Quiz

# Atoms, Bonding, and the Periodic Table

If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.

1. \_\_\_\_\_ An atom's valence electrons are those electrons that have the highest energy.
2. \_\_\_\_\_ Atoms tend to be stable and nonreactive if they have six valence electrons.
3. \_\_\_\_\_ In the periodic table, the number of valence electrons in each element decreases from left to right across each period.
4. \_\_\_\_\_ The reactivity of a metal depends on how easily it loses its valence electrons.
5. \_\_\_\_\_ Within each period in the periodic table, elements have similar properties because they have the same number of valence electrons.

Fill in the blank to complete each statement.

6. The number of \_\_\_\_\_ in the atom of an element determines its chemical properties.
7. The columns in the periodic table are called \_\_\_\_\_.
8. A(n) \_\_\_\_\_ shows the number of valence electrons in an atom in pictorial fashion.
9. The attractive force that holds two atoms together is called a(n) \_\_\_\_\_.
10. Because it can either lose or share electrons when it combines with other elements, each \_\_\_\_\_ has some of the properties of metals and some of the properties of nonmetals.

**Review and Reinforce**

# Ionic Bonds

### Understanding Main Ideas

Fill in the blank to complete each statement.

1. Negative ions form when atoms \_\_\_\_\_ valence electrons.
2. In the formation of an ionic compound, a metal atom is most likely to \_\_\_\_\_ valence electrons.
3. Ionic compounds form because \_\_\_\_\_ charges attract.

Answer the following questions in the spaces provided. You may use a periodic table.

4. A potassium ion has a charge of 1+. A sulfide ion has a charge of 2-.  
What is the chemical formula for potassium sulfide?

\_\_\_\_\_

5. Name the following compound: MgO.

\_\_\_\_\_

### Building Vocabulary

Write a definition for each of these terms on a separate piece of paper.

6. ion
7. polyatomic ion
8. ionic bond
9. ionic compound
10. chemical formula

Fill in the following table:

Chemical Name	Cation (+)	Anion (-)	Chemical Formula
sodium iodide			
lithium oxide			
aluminum sulfide			
potassium oxide			
silver bromide			
tin hydroxide			
lithium arsenide			
calcium bromide			
zinc nitride			
sodium nitrate			

## Lesson Quiz

# Ionic Bonds

Write the letter of the correct answer on the line at the left.

- \_\_\_\_ Ionic bonds form between two ions that have  
A ionic compounds  
B negative charges  
C positive charges  
D opposite charges
- \_\_\_\_ Ions that are made of more than one atom are called  
A ionic compounds  
B crystals  
C polyatomic atoms  
D ionic bonds
- \_\_\_\_ Which is most likely to form a negative ion?  
A an element from Group 17  
B a metal  
C an element from Group 1  
D an element with atoms that have eight valence electrons
- \_\_\_\_ Which of the following is the correct name for  $\text{MgCl}_2$ ?  
A magnesium chlorine  
B magnesium dichlorine  
C magnesium chloride  
D magnesium dichloride

Fill in the blank to complete each statement.

- A(n) \_\_\_\_\_ is an atom or group of atoms that has an electric charge.
- The attraction between oppositely charged ions is called a(n) \_\_\_\_\_.
- When an atom loses a valence electron, it becomes a(n) \_\_\_\_\_ ion.
- In order to have a stable arrangement of 8 valence electrons, metal atoms are likely to \_\_\_\_\_ electrons.
- In an ionic compound, the total positive charge of all the positive ions \_\_\_\_\_ the total negative charge of all the negative ions.
- Because the force of attraction between the positive and negative ions is so strong, ionic compounds have \_\_\_\_\_ melting points.

Review and Reinforce

# Covalent Bonds

## Understanding Main Ideas

Answer the following questions in the spaces provided. Use the diagram at right to answer questions 1–5.

1. Circle all of the covalent bonds in the electron dot diagrams.



2. Which bond(s) shown are double bonds?

\_\_\_\_\_



3. Which bond(s) shown are triple bonds?

\_\_\_\_\_

4. Which molecule(s) shown have polar bonds?

\_\_\_\_\_

5. Compare and contrast  $\text{O}_2$  and  $\text{F}_2$ .

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

- |                        |  |
|------------------------|--|
| 6. ____ molecule       | a. the chemical bond formed when two atoms share electrons |
| 7. ____ double bond    | b. a neutral group of atoms joined by covalent bonds       |
| 8. ____ nonpolar bond  | c. a bond in which electrons are shared unequally          |
| 9. ____ polar bond     | d. a bond in which electrons are shared equally            |
| 10. ____ covalent bond | e. a bond in which four electrons are shared               |

## Lesson Quiz

# Covalent Bonds

Write the letter of the correct answer on the line at the left.

1. \_\_\_\_ In an electron dot diagram, two pairs of shared electrons represents a  
A single bond  
B double bond  
C triple bond  
D quadruple bond
2. \_\_\_\_ A nitrogen molecule ( $N_2$ ) has one triple bond. How many electrons do the nitrogen atoms share?  
A 1  
B 3  
C 4  
D 6
3. \_\_\_\_ Compared to ionic compounds, molecular compounds generally have  
A good conductivity  
B greater densities  
C more chemical bonds  
D a low boiling point
4. \_\_\_\_ Compared to ionic compounds, molecular compounds generally have  
A stronger chemical bonds  
B poor conductivity  
C a high melting point  
D lower densities

If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.

5. \_\_\_\_\_ The chemical bond formed when two atoms share electrons is called a(n) ionic bond.
6. \_\_\_\_\_ Covalent bonds usually form when a nonmetal combines with a(n) metal.
7. \_\_\_\_\_ A(n) ion is a neutral group of atoms joined by covalent bonds.
8. \_\_\_\_\_ If a molecule contains polar bonds, the molecule may or may not be polar overall.
9. \_\_\_\_\_ In a(n) polar bond, one atom pulls on the shared electrons more than the other atom.
10. \_\_\_\_\_ The forces between molecules are much stronger than the forces between ions.

## Bonding Basics Review

Name \_\_\_\_\_

1. Complete the chart using your knowledge of atoms.

Element	Atomic Symbol	Total # of Electrons	# of Valence Electrons	# of Electrons Gained or Lost	Oxidation Number
Bromine					
Lithium					
Calcium					
Sulfur					
Boron					
Silicon					
Phosphorus					

2. Ionic Bonds - Draw the Lewis structures for each atom, draw arrows to show the transfer of electrons, write the charge for each ion, and then write the chemical formula.

(A) Potassium + Iodine

(B) Magnesium + Oxygen

(C) Lithium + Nitrogen

3. Covalent Bonds – Draw the Lewis structures for each atom, draw circles to show the electrons that are shared, and then write the bond structure and chemical formula.

(A) Fluorine + Fluorine

(B) 3 Hydrogen + 1 Phosphorus

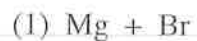
(C) 2 Hydrogen + 1 Sulfur

## Bonding Basics Practice Page

Name \_\_\_\_\_

Follow the steps provided by your teacher to complete each bond.

**Ionic Bonds** - Draw the Lewis structures for each atom, then show the transfer of electrons and charge for each ion. Write the chemical formula for each compound.



**Covalent Bonds** - Draw the Lewis structures for each atom, then draw circles to show the electrons that are shared. Write the chemical formula for each compound.

