

**Directed Reading B** *continued*

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**18.** The first energy level of any atom can hold only **2** \_\_\_\_\_ electrons.

**19.** Why is it uncommon for noble gases to form chemical bonds?

All except Helium already have an octet and do not need to share any valence electrons. Helium already has 2 electrons and does not need to share.

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**20.** Which is more likely to form bonds, an atom with 8 valence electrons or an atom with fewer than 8 valence electrons?

An atom with less than 8 valence electrons needs to share electrons with other atoms and form covalent bonds.

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**21.** How can atoms with fewer than 8 valence electrons fill their outermost energy level? Use either sulfur or magnesium to explain the process.

Magnesium can lose or donate its two valence electrons by giving them to Sulfur. Sulfur will go from 6 to 8 valence electrons (octet) and Magnesium will go from 2 in the third orbital (by shedding its valence) now it will have 8 electrons in the second orbital = octet. This kind of bonding is not covalent. It is called ionic.

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## Skills Worksheet

**Directed Reading B****Section: Ionic Bonds** (pp. 230–235)**FORMING IONIC BONDS**

1. A chemical bond that forms when electrons are transferred from one atom to another is a(n) **ionic bond**.
2. Charged particles that form when atoms gain or lose electrons are called **ions**.
3. A transfer of electrons between atoms changes the number of electrons in an atom, but the number of **protons** stays the same.
4. Why is an atom neutral?

An atom is neutral when the number of electrons is equal to the number of protons.

5. Why are ions charged particles and thus no longer neutral?

Ions have unequal numbers of electrons and protons, therefore they are either positive or negatively charged. They carry a net charge due to imbalance of charged particles.

**FORMING POSITIVE IONS**

**positively charged**

6. When an atom loses electrons through an ionic bond, it becomes
  - a. positively charged.
  - b. neutral.
  - c. negatively charged.
  - d. uncharged.
7. Most metals have few **valence electrons** and form positive ions.
8. If an aluminum atom loses its three valence electrons to another atom, the aluminum atom becomes an aluminum **ion**.
9. An aluminum ion has a charge of **+3**.
10. The chemical symbol for an aluminum ion is **Al +3**.

**Directed Reading B** *continued*

11. Pulling electrons away from atoms requires **energy**.

12. Where does the energy needed to take electrons from metal atoms come from?

The valence of the stealing atom that will gain the octet.

**FORMING NEGATIVE IONS**

**negative charge** 13. Some atoms gain electrons during chemical changes and acquire a(n)

- a. positive charge.
- b. negative charge.
- c. neutral charge.
- d. chemical charge.

**2** 14. The symbol for the oxide ion is  $O^{2-}$ . How many electrons must an oxygen atom gain to become an oxide ion?

- a. 0
- b. 1
- c. 2
- d. 3

**-ide** 15. What ending is used for the names of negative ions?

- a. *-ion*
- b. *-ade*
- c. *-ide*
- d. *-ite*

16. Atoms of Group **17 the Halides** elements give off the most energy when they gain an electron.

17. When is energy given off by most nonmetals?

When the nonmetals gain a complete octet, they release the most amount of energy.

18. What conditions are required for an ionic bond to form between a metal and a nonmetal?

The nonmetal must gain enough electrons to make an octet. The metal must lose enough electrons to shed it's valence and have an octet. Then the positive metal will be attracted to the negative nonmental.

**Directed Reading B** *continued*

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**FORMING IONIC COMPOUNDS**

**19.** Why does the compound formed by an ionic bond have a neutral charge even though the ions that bond are charged?

For example, Mg +2 and S -2, is magnesium sulfide.  
When they are next to each other they are held together by electrostatic attraction.  
The +2 balances the -2 and the overall MgS ,is a neutral solid.

**IONIC COMPOUNDS**

**20.** When ions bond, they form a repeating three-dimensional pattern called

a(n) **crystal lattice** \_\_\_\_\_.

**21.** List three properties of ionic compounds.

1. they dissociate in water to become the aqueous phase (aq).
2. When they are in aq phase they conduct electric current.
3. They are brittle solid salts that have a very high melting point.  
brittle means breaks apart easily like chalk.