

8.2

THE NATURE OF COVALENT BONDING

Section Review

Objectives

- State a rule that usually tells how many electrons are shared to form a covalent bond
- Describe how electron dot formulas are used
- Predict when two atoms are likely to be joined by a double or a triple covalent bond
- Distinguish between a single covalent bond and other covalent bonds
- Describe how the strength of a covalent bond is related to its bond dissociation energy
- Describe how resonance structures explain bonding
- Identify some exceptions to the octet rule

Vocabulary

- single covalent bond
- structural formulas
- unshared pairs
- double covalent bonds
- triple covalent bonds
- coordinate covalent bond
- polyatomic ion
- bond dissociation energy
- resonance structures

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

When atoms share electrons to gain the 1 configuration **1.** _____
of a noble gas, the bonds formed are 2. A 3 pair of **2.** _____
valence electrons constitutes a 4 covalent bond. Pairs of **3.** _____
valence electrons that are not shared between atoms are called **4.** _____
5. Sometimes two or three pairs of electrons may be shared **5.** _____
to give 6 covalent bonds. In some cases, only one of the **6.** _____
atoms in a bond provides the pair of bonding electrons; this is a **7.** _____
7. 8 is required to break covalent bonds between **8.** _____
atoms. The total energy required to break the bond between two **9.** _____
covalently bonded atoms is known as the 9. **10.** _____

When it is possible to write two or more valid electron dot
formulas for a molecule or ion, each formula is referred to as a 10.

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- _____ 11. The modern interpretation of resonance is that electron pairs rapidly flip back and forth between the various electron dot structures.
- _____ 12. The compound NH_3 contains two double covalent bonds.
- _____ 13. The chemical formulas of molecular compounds show the number and type of atoms in each molecule.
- _____ 14. A molecule of bromine has six unshared pairs of electrons.
- _____ 15. Carbon forms four single covalent bonds with other atoms.
- _____ 16. A bond in which one atom contributes both bonding electrons is called a polyatomic covalent bond.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A

- _____ 17. single covalent bond
- _____ 18. structural formula
- _____ 19. bond dissociation energy
- _____ 20. polyatomic ion
- _____ 21. coordinate covalent bond

Column B

- a. a chemical formula that shows the arrangement of atoms in a molecule or a polyatomic ion
- b. the amount of energy required to break a covalent bond between atoms
- c. a tightly bound group of atoms that has a positive or negative charge and behaves as a unit
- d. a covalent bond in which one atom contributes both bonding electrons
- e. a chemical bond in which only one pair of electrons is shared by two bonded atoms

Part D Questions and Problems

Answer the following in the space provided.

22. Draw electron dot structures for each of the following compounds
- a. Br_2
- b. HCN
- c. NH_4^+