

8.4

POLAR BONDS AND MOLECULES

Section Review

Objectives

- Describe how electronegativity values determine the charge distribution in a polar bond
- Describe what happens to polar molecules when placed between oppositely charged metal plates
- Distinguish intermolecular attractions from ionic bonds and from covalent bonds
- Identify the reason network solids have high melting points or decompose without melting

Vocabulary

- nonpolar covalent bond
- polar covalent bond
- polar bond
- polar molecule
- dipole
- van der Waals forces
- dipole interactions
- dispersion forces
- hydrogen bonds
- network solids

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 like atoms are joined by a covalent bond, the bonding electrons are shared **1**, and the bond is **2**. When the atoms in a bond are not the same, the bonding electrons are shared **3**, and the bond is **4**. The degree of polarity of a bond between any two atoms is determined by consulting a table of **5**. The attractions between opposite poles of polar molecules are called **6**. Another strong intermolecular attractive force is the **7**, in which a hydrogen covalently bonded to a very **8** atom, such as **9**, is also weakly bonded to an unshared electron pair of another electronegative atom.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

Part B True-False

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

- _____ 10. In a polar covalent bond, the more electronegative atom has a slight positive charge.
- _____ 11. In general, the electronegativity values of nonmetallic elements are greater than the electronegativity values of metallic elements.
- _____ 12. A molecule with polar bonds is dipolar.
- _____ 13. Covalent compounds are network solids.
- _____ 14. If the electronegativity difference between two atoms is greater than 2.0, they will form an ionic bond.
- _____ 15. Dispersion forces are weaker than hydrogen bonds.

Part C Matching

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

Column A

- _____ 16. nonpolar covalent bond
- _____ 17. polar covalent bond
- _____ 18. polar molecule
- _____ 19. van der Waals forces
- _____ 20. network solid

Column B

- a. a substance in which all of the atoms are covalently bonded to each other
- b. a bond formed when the atoms in a molecule are alike and the bonding electrons are shared equally
- c. a term used to describe the weakest intermolecular attractions; these include dispersion forces and dipole interactions
- d. a bond formed when two different atoms are joined by a covalent bond and the bonding electrons are shared unequally
- e. a molecule in which one end is slightly positive and the other end is slightly negative

Part D Questions and Problems

Answer the following in the space provided.

21. Arrange the following intermolecular attractions in order of increasing strength: dipole interactions, dispersion forces, and hydrogen bonds.

22. State whether the following compounds contain polar covalent bonds, non-polar covalent bonds, or ionic bonds, based on their electronegativities.

- | | |
|--------------------|----------|
| a. KF | a. _____ |
| b. SO ₂ | b. _____ |
| c. NO ₂ | c. _____ |
| d. Cl ₂ | d. _____ |