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COVALENT BONDING

Vocabulary Review

Select the term from the following list that best matches each description.

- |                          |              |                           |
|--------------------------|--------------|---------------------------|
| polyatomic ion           | VSEPR theory | bonding molecular orbital |
| coordinate covalent bond | sigma bond   | van der Waals forces      |
| hybridization            | molecule     | bond dissociation energy  |
| hydrogen bond            |              |                           |

- a bond in which one atom contributes both bonding electrons to a covalent bond  
Coord. covalent bond
- the total energy required to break the bond between two covalently bonded atoms  
bond dissociation energy
- a molecular orbital whose energy is lower than that of the atomic orbitals from which it is formed  
bonding molecular orbital
- molecular orbital that lies along the axis connecting two atomic nuclei  
sigma bond
- states that because electron pairs repel, molecules adjust their shapes so that valence-electron pairs are as far apart as possible  
VSEPR
- a process in which several atomic orbitals mix to form the same number of equivalent hybrid orbitals  
hybridization
- a tightly bound group of atoms that behaves as a unit and carries a charge  
polyatomic ion
- a term that collectively refers to dispersion forces and dipole interactions  
vander Waals force
- a relatively strong intermolecular attraction in which a hydrogen that is covalently bonded to a very electronegative atom is also weakly bonded to an unshared pair of electrons of another electronegative atom  
H-bond
- a tightly connected group of two or more atoms of nonmetallic elements that behave as an electrically neutral unit  
molecule

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Chapter Quiz

Choose the best answer and write its letter on the line.

- a 1. A bond in which each atom contributes two electrons is 8.2  
 a. a double covalent bond. c. a polar covalent bond.  
 b. an ionic bond. d. a coordinate covalent bond.
- c 2. The electron dot structure for hydrogen sulfide, H<sub>2</sub>S, is 8.2  
 a.  $\text{H}::\underset{\text{H}}{\text{S}}::$  c.  $\text{H}::\underset{\text{H}}{\text{S}}::$   
 b.  $\text{H}::\text{S}::\text{H}$  d.  $\text{H}::\text{H}::\underset{\text{H}}{\text{S}}::$
- b 3. Which electron dot structure represents a nonpolar molecule? 8.2  
 a.  $\text{H}::\underset{\cdot\cdot}{\text{O}}::\text{H}$  c.  $\text{H}::\underset{\cdot\cdot}{\text{Cl}}::$   
 b.  $:\text{Cl}::\text{Cl}:$  d.  $\text{H}::\text{C}::\text{C}::\text{F}$
- a or d 4. Bond dissociation energy 8.2  
 a. is the energy required to break a single bond.  
 b. of a C—H bond is high.  
 c. of a C—C bond is high.  
 d. all of the above
- b 5. A covalent bond formed between two elements that have an 8.4  
 electronegativity difference of 1.6 would be  
 a. a nonpolar bond. c. a moderately polar bond.  
 b. a very polar bond. d. an ionic bond.
- c 6. You would expect a bond formed between a silicon atom and an 8.4  
 oxygen atom to be  
 a. an ionic bond. c. a polar covalent bond.  
 b. a coordinate covalent bond. d. a nonpolar covalent bond.

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

- ST 7. Molecular orbitals involve pi bonding. 8.3
- NT 8. An antibonding orbital is a molecular orbital whose energy is lower 8.3  
 than that of the atomic orbitals from which it is formed.
- ST 9. A three-atom molecule is bent. 8.3
- ST 10. Sigma and pi bonds are found in the same molecule. 8.3
- ST 11. A molecule contains two atoms. 8.1