



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

bond dissociation energy

molecule

1. a bond in which one atom contributes both bonding electrons to a covalent bond

coordinate covalent bond

2 the total energy required to break the bond between two covalently bonded atoms

bond dissociation energy

3. a molecular orbital whose energy is lower than that of the atomic orbitals from which it is formed

bonding molecular orbital

4. states that because electron pairs repel, molecules adjust their shapes so that valence-electron pairs are as far apart as possible

VSEPR theory

5. a tightly bound group of atoms that behaves as a unit and carries a charge

polyatomic ion

6. a tightly connected group of two or more atoms of nonmetallic elements that behave as an electrically neutral unit

molecule



COVALENT BONDING

Practice Problems

SECTION 8.1 MOLECULAR COMPOUNDS

- Classify each of the following as an atom or a molecule.
 - a. Be *atom*
 - b. CO₂ *mol*
 - c. N₂ *mol*
 - d. H₂O *mol*
 - e. Ne *atom*
- Which of the following are diatomic molecules?
 - a. CO₂
 - b. N₂
 - c. O₂
 - d. H₂O
 - e. CO
- What types of elements tend to combine to form molecular compounds? *nonmetals*
- What information does a molecule's molecular structure give? What does it NOT give? *# + types of atoms* *unshared pairs, orbitals, etc*
- How do ionic compounds and molecular compounds differ in their relative melting and boiling points? *high MP+BP* *low MP+BP*

SECTION 8.2 THE NATURE OF COVALENT BONDING

- Draw the electron dot structure for hydrogen fluoride, HF. → $\text{:}\ddot{\text{F}}\text{-H}$
- Draw the electron dot structure for phosphorus trifluoride, PF₃. $\text{:}\ddot{\text{F}}\text{-}\ddot{\text{P}}\text{(}\ddot{\text{F}}\text{)}\text{-}\ddot{\text{F}}\text{:}$
- Draw the electron dot structure for nitrogen trichloride, NCl₃. $\text{:}\ddot{\text{Cl}}\text{-}\ddot{\text{N}}\text{(}\ddot{\text{Cl}}\text{)}\text{-}\ddot{\text{Cl}}\text{:}$
- Draw the electron dot configuration for acetylene, C₂H₂. $\text{H-C}\equiv\text{C-H}$
- How many resonance structures can be drawn for CO₃²⁻? Show the electron dot structures for each and include the symbol that indicates resonance. *(there are 3 structures)*

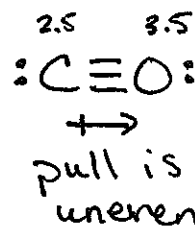
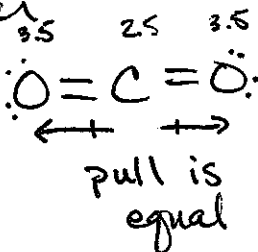
SECTION 8.4 POLAR BONDS AND MOLECULES

- What type of bond—nonpolar covalent, polar covalent, or ionic—will form between each pair of atoms?
 - a. Na and O *ionic*
 - b. O and O *nonpolar covalent*
 - c. P and O *polar covalent*
- Explain why most chemical bonds would be classified as either polar covalent or ionic. *Because most will have significant difference in electronegativity*
- Would you expect carbon monoxide and carbon dioxide to be polar or nonpolar molecules?

CO is polar

CO₂ is nonpolar

(linear)



* Both have polar bonds; but CO₂ has an equal pull in both directions making the molecule nonpolar