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8 COVALENT BONDING

Practice Problems

In your notebook, solve the following problems.

SECTION 8.1 MOLECULAR COMPOUNDS

1. Classify each of the following as an atom or a molecule.
   - **a.** Be
   - **b.** CO_2
   - **c.** N_2
   - **d.** H_2O
   - **e.** Ne
2. Which of the following are diatomic molecules?
   - **a.** CO_2
   - **b.** N_2
   - **c.** O_2
   - **d.** H_2O
   - **e.** CO
3. What types of elements tend to combine to form molecular compounds?
4. What information does a molecule's molecular structure give?
5. How do ionic compounds and molecular compounds differ in their relative melting and boiling points?

SECTION 8.2 THE NATURE OF COVALENT BONDING

1. Draw the electron dot structure for hydrogen fluoride, HF.
2. Draw the electron dot structure for phosphorus trifluoride, PF_3.
3. Draw the electron dot structure for nitrogen trichloride, NCl_3.
4. Draw the electron dot configuration for acetylene, C_2H_2.
5. How many resonance structures can be drawn for CO_3^{2-}? Show the electron dot structures for each.

SECTION 8.3 BONDING THEORIES

1. Predict the shape and bond angle for the compound carbon tetrafluoride, CF_4.
2. Predict the shape and bond angle for phosphorus trifluoride, PF_3.
3. Predict the type of hybridized orbitals involved in the compound boron trichloride, BCl_3.
4. What types of hybrid orbitals are involved in the bonding of the silicon atoms in silicon tetrafluoride, SiF_4?
5. Predict the shape and bond angle of fluorine monoxide, F_2O.

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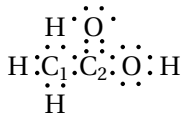
6. Predict the shape of the CH_2CF_2 molecule. What hybridization is involved in the carbon-carbon bonds?

7. How many sigma and pi bonds are used by each of the carbon atoms in the following compound?



SECTION 8.4 POLAR BONDS AND MOLECULES

1. What type of bond—nonpolar covalent, polar covalent, or ionic—will form between each pair of atoms?

   a. Na and O **b.** O and O **c.** P and O

2. Explain why most chemical bonds would be classified as either polar covalent or ionic.

3. Would you expect carbon monoxide and carbon dioxide to be polar or nonpolar molecules?

4. Draw the structural formulas for each molecule and identify polar covalent bonds by assigning the slightly positive ($\delta+$) and slightly negative ($\delta-$) symbols to the appropriate atoms.

   a. NH_3 **b.** CF_3

5. Which would you expect to have the higher melting point, CaO or CS_2?