ChemQuest 22

Covalent Bonding

Name: _____

Date: _____

Hour: _____

Information: Terminology

Recall that an ionic bond results from the combination of a metal and a nonmetal. A covalent bond is the type of bond between two nonmetals. Covalent bonds are formed by neutral atoms that share electrons rather than by charged ions. When a compound is formed by sharing electrons, the compound is called a molecule or molecular compound. It is important to note that ionic compounds are not called molecules. The largest class of molecules are called organic molecules. Carbon is the distinguishing mark of organic compounds.

Critical Thinking Questions

1. Circle any of the following compounds that would properly be called a "molecule".

   a) H_2O b) CO_2 c) NaCl d) Mg_3P_2 e) N_2O_5

Information: Naming Covalent Compounds

There are several prefixes used to name molecules. The name "carbon oxide" is not sufficient because carbon and oxygen sometimes form CO_2 and sometimes CO. Prefixes are necessary to distinguish between them.

Formula	Name
N_2O_4	dinitrogen tetraoxide
SF_6	sulfur hexafluoride
$XeCl_5$	xenon pentachloride
SO_3	sulfur trioxide
CO	carbon monoxide

Critical Thinking Questions

2. Fill in the table to indicate which prefix is used to represent the numbers. The first one is done for you.

Number	Prefix
1	mono
2	
3	
4	
5	
6	

3. Name each of the following molecules using the appropriate prefixes.
   a) N_2O_5 b) CF_4 c) SCl_3 d) SO

4. Which of the above compounds would be classified as "organic"?

Information: Empirical Formulas

Molecules can be represented by using either a molecular formula or an empirical formula. The molecular formula tells you exactly how many atoms of each element are in the compound. For example, in the table below, compound #2 has exactly 4 carbons and 8 hydrogens in each molecule. Observe the table below that shows four organic molecules along with a molecular and empirical formula for each one:

Molecule	Molecular Formula	Empirical Formula
#1	C_2H_4	CH_2
#2	C_4H_8	CH_2
#3	C_3H_8	C_3H_8
#4	C_8H_{18}	C_4H_9

Critical Thinking Questions

5. What is an empirical formula?

6. How can molecules #1 and #2 have the same empirical formula even though they are different molecules?

7. Given the empirical formula for a compound is it possible to determine the molecular formula? If so, explain how.

8. Given the molecular formula for a compound is it possible to determine its empirical formula? If so, explain how.

9. Give the empirical formula for each of the molecules below:
   a) N_2O_6 b) $C_2H_4O_2$ c) C_4H_{14} d) C_3H_5