

# Chemistry

## Empirical Formulas Worksheet

Name: \_\_\_\_\_

1. Write empirical formulas to match the following molecular formulas:

A.  $C_4H_{12}O_8$  \_\_\_\_\_

B.  $N_4O_{10}$  \_\_\_\_\_

C.  $Hg_2Cl_2$  \_\_\_\_\_

D.  $C_6H_{12}$  \_\_\_\_\_

2. A certain hydrocarbon has an empirical formula of  $CH_2$  and a molar mass of 56.12 g/mol. What is its molecular formula?

3. Hydrates are molecules that bind water molecules within their crystal structure when they precipitate. These hydrates can be heated to drive off those water molecules. Use the data table below of the dehydration of copper (II) sulfate to answer the following questions.

Mass of empty crucible	4.00 g
Mass of the crucible plus hydrate sample	4.50 g
Mass of the system after heating	4.32 g
Mass of the system after a second heating	4.32

A. Determine the mass percentage of water in the original sample.

B. The compound has the formula  $CuSO_4 \cdot xH_2O$ . Determine the value of x.

4. A certain ionic compound is found to contain 0.012 mol of sodium, 0.012 mol of sulfur, and 0.018 mol of oxygen. What is its empirical formula? Is this compound a sulfate, sulfite, or neither?
  
5. a. Gas X is found to be 24.0% carbon and 76.0% fluorine by mass. Determine the empirical formula of gas X.  
  
b. Given that the molar mass of gas X is 200.04 g/mol, determine its molecular formula.
  
6. Ninhydrin is a compound that reacts with amino acids and proteins to produce a dark-colored complex. It is used by forensic chemists and detectives to see fingerprints that might otherwise be invisible. Ninhydrin's composition is 60.08% carbon, 3.40 % hydrogen, and 35.92% oxygen. What is the empirical formula for ninhydrin?
  
7. A 2.65 g sample of a salmon-colored powder contains 0.70 g of chromium, 0.65 g of sulfur, and 1.30 g of oxygen. The molar mass is 392.2 g/mol. What is the formula of the compound?