

7. What is the mass of 1 mol of atoms of each element?  
 (a) P (b) Pt (c) C (d) Cr
8. What is the mass of 1 mol of molecules of each compound?  
 (a) CO<sub>2</sub> (b) CH<sub>2</sub>Cl<sub>2</sub> (c) C<sub>12</sub>H<sub>22</sub>O<sub>11</sub> (d) SO<sub>2</sub>
10. Write the conversion factors between moles of each constituent element and moles of the compound for C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>.
11. You can use mass percent composition as a conversion factor between grams of a constituent element and grams of the compound. Write the conversion factor (including units) inherent in each mass percent composition.  
 (a) Water is 11.19% hydrogen by mass.  
 (b) Fructose, also known as fruit sugar, is 53.29% oxygen by mass.  
 (c) Octane, a component of gasoline, is 84.12% carbon by mass.  
 (d) Ethanol, the alcohol in alcoholic beverages, is 52.14% carbon by mass.
20. How many moles of atoms are in each elemental sample?  
 (a)  $4.6 \times 10^{24}$  Pb atoms (b)  $2.87 \times 10^{22}$  He atoms  
 (c)  $7.91 \times 10^{23}$  K atoms (d)  $4.41 \times 10^{21}$  Ca atoms
19. How many atoms are in each elemental sample?  
 (a) 3.4 mol Cu (b)  $9.7 \times 10^{-3}$  mol C  
 (c) 22.9 mol Hg (d) 0.215 mol Na
23. Consider these definitions.  
 1 doz = 12      1 gross = 144  
 1 ream = 500      1 mol =  $6.022 \times 10^{23}$
- Suppose you have 872 sheets of paper. How many \_\_\_\_\_ of paper sheets do you have?  
 (a) dozens (b) gross (c) reams (d) moles
23. How many moles of atoms are in each elemental sample?  
 (a) 1.34 g Zn (b) 24.9 g Ar  
 (c) 72.5 g Ta (d) 0.0223 g Li
23. A pure silver ring contains 0.0134 mmol (millimol) Ag. How many silver atoms does it contain?
- 
25. How many aluminum atoms are in 3.78 g of aluminum?
47. Determine the number of moles of molecules (or formula units) in each sample.  
 (a) 38.2 g sodium chloride  
 (b) 36.5 g nitrogen monoxide  
 (c) 4.25 kg carbon dioxide  
 (d) 2.71 mg carbon tetrachloride
51. A mothball, composed of naphthalene (C<sub>10</sub>H<sub>8</sub>), has a mass of 1.32 g. How many naphthalene molecules does it contain?
55. A sugar crystal contains approximately  $1.8 \times 10^{17}$  sucrose (C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>) molecules. What is its mass in milligrams?
59. Determine the number of moles of Cl in 2.7 mol CaCl<sub>2</sub>.
63. Determine the number of moles of C in each sample.  
 (a) 2.5 mol CH<sub>4</sub> (b) 0.115 mol C<sub>2</sub>H<sub>6</sub>  
 (c) 5.67 mol C<sub>4</sub>H<sub>10</sub> (d) 25.1 mol C<sub>8</sub>H<sub>18</sub>
68. Calculate the number of grams of sodium in 1.00 g of each sodium-containing food additive.  
 (a) NaCl (table salt)  
 (b) Na<sub>3</sub>PO<sub>4</sub> (sodium phosphate)  
 (c) NaC<sub>7</sub>H<sub>5</sub>O<sub>2</sub> (sodium benzoate)  
 (d) Na<sub>2</sub>C<sub>6</sub>H<sub>6</sub>O<sub>7</sub> (sodium hydrogen citrate)
71. A 2.45-g sample of strontium completely reacts with oxygen to form 2.89 g of strontium oxide. Use this data to calculate the mass percent composition of strontium in strontium oxide.
73. A 1.912-g sample of calcium chloride is decomposed into its constituent elements and found to contain 0.690 g Ca and 1.222 g Cl. Calculate the mass percent composition of Ca and Cl in calcium chloride.
75. Copper(II) fluoride contains 37.42% F by mass. Use this percentage to calculate the mass of fluorine in grams contained in 28.5 g of copper(II) fluoride.
87. A compound containing nitrogen and oxygen is decomposed in the laboratory and produces 1.78 g of nitrogen and 4.05 g of oxygen. Calculate the empirical formula of the compound.
- 
89. Samples of several compounds are decomposed, and the masses of their constituent elements are measured. Calculate the empirical formula for each compound.  
 (a) 1.245 g Ni, 5.381 g I (b) 1.443 g Se, 5.841 g Br  
 (c) 2.128 g Be, 7.557 g S, 15.107 g O
99. A compound containing carbon and hydrogen has a molar mass of 56.11 g/mol and an empirical formula of CH<sub>2</sub>. Determine its molecular formula.
- 
101. The molar masses and empirical formulas of several compounds containing carbon and chlorine are listed here. Find the molecular formula of each compound.  
 (a) 284.77 g/mol, CCl (b) 131.39 g/mol, C<sub>2</sub>HCl<sub>3</sub>  
 (c) 181.44 g/mol, C<sub>2</sub>HCl
105. A drop of water has a volume of approximately 0.05 mL. How many water molecules does it contain? (density of water = 1.0 g/cm<sup>3</sup>)
111. The rock in a particular iron ore deposit contains 78% Fe<sub>2</sub>O<sub>3</sub> by mass. How many kilograms of the rock must a mining company process to obtain  $1.0 \times 10^3$  kg of iron?
119. Butanedione, a component of butter and body odor, has a cheesy smell. Elemental analysis of butanedione gave the mass percent composition: C, 55.80%; H, 7.03%; O, 37.17%. The molar mass of butanedione is 86.09 g/mol. Determine the molecular formula of butanedione.
121. Nicotine, a stimulant found in tobacco, has the mass percent composition: C, 74.03%; H, 8.70%; N, 17.27%. The molar mass of nicotine is 162.26 g/mol. Find the molecular formula of nicotine.