Empirical Formulas: Chap. 7, Sec. 4

150. Determine the empirical formula for compounds that have the following analyses.
- **a.** 28.4% copper, 71.6% bromine
- **b.** 39.0% potassium, 12.0% carbon, 1.01% hydrogen, and 47.9% oxygen
- **c.** 77.3% silver, 7.4% phosphorus, 15.3% oxygen
- **d.** 0.57% hydrogen, 72.1% iodine, 27.3% oxygen

151. Determine the simplest formula for compounds that have the following analyses. The data may not be exact.
- **a.** 36.2% aluminum and 63.8% sulfur
- **b.** 93.5% niobium and 6.50% oxygen
- **c.** 57.6% strontium, 13.8% phosphorus, and 28.6% oxygen
- **d.** 28.5% iron, 48.6% oxygen, and 22.9% sulfur

152. Determine the molecular formula of each of the following unknown substances.
- **a.** empirical formula CH_2
  experimental molar mass 28 g/mol
- **b.** empirical formula B_2H_5
  experimental molar mass 54 g/mol
- **c.** empirical formula C_2HCl
  experimental molar mass 179 g/mol
- **d.** empirical formula C_6H_8O
  experimental molar mass 290 g/mol
- **e.** empirical formula C_3H_2O
  experimental molar mass 216 g/mol

Mixed Review

153. Determine the empirical formula for compounds that have the following analyses.
- **a.** 66.0% barium and 34.0% chlorine
- **b.** 80.38% bismuth, 18.46% oxygen, and 1.16% hydrogen
- **c.** 12.67% aluminum, 19.73% nitrogen, and 67.60% oxygen
- **d.** 35.64% zinc, 26.18% carbon, 34.88% oxygen, and 3.30% hydrogen
- **e.** 2.8% hydrogen, 9.8% nitrogen, 20.5% nickel, 44.5% oxygen, and 22.4% sulfur
- **f.** 8.09% carbon, 0.34% hydrogen, 10.78% oxygen, and 80.78% bromine

154. Sometimes, instead of percentage composition, you will have the composition of a sample by mass. Using the actual mass of the sample, determine the empirical formula for compounds that have the following analyses.
- **a.** a 0.858 g sample of an unknown substance is composed of 0.537 g of copper and 0.321 g of fluorine
- **b.** a 13.07 g sample of an unknown substance is composed of 9.48 g of barium, 1.66 g of carbon, and 1.93 g of nitrogen
- **c.** a 0.025 g sample of an unknown substance is composed of 0.0091 g manganese, 0.0106 g oxygen, and 0.0053 g sulfur

155. Determine the empirical formula for compounds that have the following analyses.
- **a.** a 0.0082 g sample contains 0.0015 g of nickel and 0.0067 g of iodine
- **b.** a 0.470 g sample contains 0.144 g of manganese, 0.074 g of nitrogen, and 0.252 g of oxygen
- **c.** a 3.880 g sample contains 0.691 g of magnesium, 1.824 g of sulfur, and 1.365 g of oxygen
- **d.** a 46.25 g sample contains 14.77 g of potassium, 9.06 g of oxygen, and 22.42 g of tin

156. Determine the empirical formula for compounds that have the following analyses:
- **a.** 60.9% As and 39.1% S
- **b.** 76.89% Re and 23.12% O
- **c.** 5.04% H, 35.00% N, and 59.96% O
- **d.** 24.3% Fe, 33.9% Cr, and 41.8% O
- **e.** 54.03% C, 37.81% N, and 8.16% H
- **f.** 55.81% C, 3.90% H, 29.43% F, and 10.85% N

157. Determine the molecular formulas for compounds having the following empirical formulas and molar masses.
- **a.** C_2H_4S; experimental molar mass 179
- **b.** C_2H_4O; experimental molar mass 176
- **c.** $C_2H_3O_2$; experimental molar mass 119
- **d.** C_2H_2O, experimental molar mass 254

158. Use the experimental molar mass to determine the molecular formula for compounds having the following analyses.
- **a.** 41.39% carbon, 3.47% hydrogen, and 55.14% oxygen; experimental molar mass 116.07
- **b.** 54.53% carbon, 9.15% hydrogen, and 36.32% oxygen; experimental molar mass 88
- **c.** 64.27% carbon, 7.19% hydrogen, and 28.54% oxygen; experimental molar mass 168.19

159. A 0.400 g sample of a white powder contains 0.141 g of potassium, 0.115 g of sulfur, and 0.144 g of oxygen. What is the empirical formula for the compound?

160. A 10.64 g sample of a lead compound is analyzed and found to be made up of 9.65 g of lead and 0.99 g of oxygen. Determine the empirical formula for this compound.

161. 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. What is the formula of the compound?

162. 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 60.68% carbon, 3.40% hydrogen, and 35.92% oxygen. What is the empirical formula for ninhydrin?

163. Histamine is a substance that is released by cells in response to injury, infection, stings, and materials that cause allergic responses, such as pollen. Histamine causes dilation of blood vessels and swelling due to accumulation of fluid in the tissues. People sometimes take *anti*histamine drugs to counteract the effects of histamine. A sample of histamine having a mass of 385 mg is composed of 208 mg of carbon, 31 mg of hydrogen, and 146 mg of nitrogen. The molar mass of histamine is 111 g/mol. What is the molecular formula for histamine?