4.5 Percentage Composition

Percent Composition from Experimentation

- Used to determine the percent of an element in a compound from experimental data.
- Eg. A 27.0 g sample of a compound contains 7.20 g of carbon, 2.20 g of hydrogen, and 17.6 g of oxygen. Calculate the percentage composition of the compound.

  $m_C = 7.20$ g
  $m_H = 2.20$ g
  $m_O = 17.6$ g
  $m_{compound} = 27.0$ g

  $\%C = (m_C/m_{compound}) \times 100 = (7.2 \text{ g}/27.0 \text{ g}) \times 100 = 26.7\%$
  $\%H = (m_H/m_{compound}) \times 100 = (2.2 \text{ g}/27.0 \text{ g}) \times 100 = 8.1\%$
  $\%O = (m_O/m_{compound}) \times 100 = (17.6 \text{ g}/27.0 \text{ g}) \times 100 = 65.2\%$

Percentage Composition from a Formula

- Used to determine the percent of an element in a compound from theoretical data.
- Eg. Calculate the percentage composition by mass of sulfuric acid, $H_2SO_{4(aq)}$, used in car batteries.

  $m_H = 1.01$ u
  $m_S = 32.06$ u
  $m_O = 16.00$ u
  $m_{H2SO4} = 98.08$ u

  $\%H = 2 \times (m_H/m_{H2SO4}) \times 100 = 2 \times (1.01 \text{ u}/98.08 \text{ u}) \times 100 = 2.0\%$
  $\%S = 1 \times (m_S/m_{H2SO4}) \times 100 = 1 \times (32.06 \text{ u}/98.08 \text{ u}) \times 100 = 32.7\%$
  $\%O = 4 \times (m_O/m_{H2SO4}) \times 100 = 4 \times (16.00 \text{ u}/98.08 \text{ u}) \times 100 = 65.3\%$

Homework

- Read 4.5
- Practice: 1-3, 5-8
- Section: 1-5