1. Determine the molar mass of the following compounds:

   a. \( \text{Na}_2\text{CO}_3 \)
      
      SOLUTION 1: \((23.0\text{g/mol}) + (12.0\text{g/mol}) + (16.0\text{g/mol}) = 51.0\text{g/mol}\)
      
      SOLUTION 2: \(2(23.0\text{g/mol}) + (12.0\text{g/mol}) + 3(16.0\text{g/mol}) = 106.0\text{g/mol}\)

   b. \( \text{Ca}_3(\text{PO}_4)_2 \)
      
      SOLUTION 1: \(3(40.1\text{g/mol}) + 2(31.0\text{g/mol}) + 8(16.0\text{g/mol}) = 310.3\text{g/mol}\)
      
      SOLUTION 2: \(3(40.1\text{g/mol}) + (31.0\text{g/mol}) + 8(16.0\text{g/mol}) = 279.3\text{g/mol}\)

   c. \( \text{CaCl}_2 \)
      
      SOLUTION 1: \(2 (40.1\text{g/mol}) + 2(35.5\text{g/mol}) = 151.2\text{g/mol}\)
      
      SOLUTION 2: \((40.1\text{g/mol}) + 2(35.5\text{g/mol}) = 111.1\text{g/mol}\)

   d. \( \text{NH}_4\text{NO}_3 \)
      
      SOLUTION 1: \(4(14.0\text{g/mol}) + 4(1.0\text{g/mol}) + 3(14.0\text{g/mol}) + 3(16.0\text{g/mol}) = 150.0\text{g/mol}\)
      
      SOLUTION 2: \((14.0\text{g/mol}) + 4(1.0\text{g/mol}) + (14.0\text{g/mol}) + 3(16.0\text{g/mol}) = 80.0\text{g/mol}\)

2. A pop can contains around \(3.34 \times 10^{23}\) aluminum atoms. How many moles of aluminum are contained in a pop can?

   SOLUTION 1:
   
   \[
   3.34 \times 10^{23} \text{ atoms} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atoms}} = 5.55 \times 10^{45} \text{ mol of Al}
   \]

   SOLUTION 2:
   
   \[
   3.34 \times 10^{23} \text{ atoms} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atoms}} = 0.555 \text{ mol of Al}
   \]
3. The average glass of water contains 235.8 g of water molecules. How many moles of water molecules are in the average glass of water?

**SOLUTION 1:**
\[
\frac{235.8 \text{ g}}{18.0 \text{ g}} \times 1 \text{ mol} = 13.08 \text{ mol } H_2O
\]

**SOLUTION 1:**
\[
\frac{18.0 \text{ g}}{235.8 \text{ g}} \times 1 \text{ mol} = 0.07634 \text{ mol } H_2O
\]

4. Iron (Fe) is a common building material. A standard 2-inch finishing nail contains about \(8.55 \times 10^{21}\) iron atoms. What is the mass of a finishing nail?

**SOLUTION 1:**
\[
\frac{8.55 \times 10^{21} \text{ atoms}}{55.8 \text{ g}} \times 6.02 \times 10^{23} \text{ atoms mol}^{-1} = 9.22 \times 10^4 \text{ g Fe}
\]

**SOLUTION 1:**
\[
\frac{8.55 \times 10^{21} \text{ atoms}}{6.02 \times 10^{23} \text{ atoms mol}^{-1}} \times \frac{55.8 \text{ g}}{1 \text{ mol}} = 0.793 \text{ g Fe}
\]

5. An underground cavern is completely filled with 8198 g of methane gas (CH\(_4\)). What is the volume (in L) of the underground cavern? (Assume the gas is at STP conditions)

**SOLUTION 1:**
\[
\frac{8198 \text{ g}}{16 \text{ g}} \times \frac{1 \text{ mol}}{1 \text{ mol}} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 1.148 \times 10^4 \text{ L}
\]

**SOLUTION 1:**
\[
\frac{8198 \text{ g}}{22.4 \text{ L}} \times \frac{16 \text{ g}}{1 \text{ mol}} = 5.856 \times 10^3 \text{ L}
\]