

Unless otherwise specified, each question is worth 4 points.

1. Calculate the molar mass for each of the following compounds:

a. CH₄

$$12.01 + 4 \times 1.008 = \boxed{16.04 \text{ g/mol}}$$

b. Fe(NO₃)₂

$$55.85 + 2 \times 14.01 + 6 \times 16.00 = \boxed{179.87 \text{ g/mol}}$$

2. Kevlar, the material used in making bulletproof vests, has an empirical formula of C₇H₅NO. Determine the percent (by mass) of carbon in Kevlar.

(ASSUME 1 mol)

$$\frac{7 \times C}{C_7H_5NO} = \frac{7 \times 12.01}{7 \times 12.01 + 5 \times 1.008 + 14.01 + 16.00}$$

$$= \frac{84.07}{84.07 + 5.040 + 14.01 + 16.00} = \frac{84.07}{119.12} = 0.7058$$

$$\times 100\% = \boxed{70.58\% \text{ C}}$$

3. Determine the empirical formula for butane, given the following information:

- composition by mass: C=82.66%; H=17.34%

(ASSUME 100g)

$$\left. \begin{aligned} 82.66 \text{ g C} \times \frac{1 \text{ mol C}}{12.01 \text{ g C}} &= 6.883 \text{ mol C} \\ 17.34 \text{ g H} \times \frac{1 \text{ mol H}}{1.008 \text{ g H}} &= 17.20 \text{ mol H} \end{aligned} \right\} \div 6.883 = \begin{aligned} &1.000 \text{ mol C} \\ &2.499 \text{ mol H} \end{aligned}$$

$$= \boxed{C_2H_5}$$

