Extra practice (like HW 7.24): Stoichiometry Conversions

Directions: Perform the following conversions. Show all work including problem set-up with conversion factors, units, and unrounded answers. Box or circle your final answers rounded to the correct significant figures with units.

Use the balanced equation below to answer the next three questions.

$$2 \text{PCl}_3 + 3 \text{H}_2\text{Se} \rightarrow \text{P}_2\text{Se}_3 + 6 \text{HCl}$$

1. How many moles of $\text{H}_2\text{Se}$ are reacted if 93.2 grams of HCl are produced?

$$\frac{93.2 \text{ g HCl}}{36.458 \text{ g HCl}} = 2.533 \text{ mol HCl} \\
1.008 + 2.533 = 3.541 \text{ mol HCl}$$

2. How many grams of $\text{H}_2\text{Se}$ are reacted if 1000.0 grams of $\text{PCl}_3$ are reacted?

$$\frac{1000.0 \text{ g PCl}_3}{137.2 \text{ g PCl}_3} = 7.277 \text{ mol PCl}_3 \\
80.976 \text{ mol H}_2\text{Se} = 885.3061224 \text{ g H}_2\text{Se}$$

3. How many grams of $\text{P}_2\text{Se}_3$ are produced if $8.15 \times 10^{23}$ molecules of $\text{H}_2\text{Se}$ are reacted?

$$\frac{8.15 \times 10^{23} \text{ molecules H}_2\text{Se}}{6.022 \times 10^{23} \text{ molecules H}_2\text{Se}} = 1.36 \text{ mol H}_2\text{Se} \\
\frac{1.36 \text{ mol H}_2\text{Se}}{3 \text{ mol P}_2\text{Se}_3} = \frac{2.98 \text{ g P}_2\text{Se}_3}{\text{mol P}_2\text{Se}_3} = 134.80477 \text{ g P}_2\text{Se}_3$$

Use the balanced equation below to answer the next three questions.

$$2 \text{Al(OH)}_3 \rightarrow \text{Al}_2\text{O}_3 + 3 \text{H}_2\text{O}$$

4. How many moles of $\text{Al(OH)}_3$ are reacted if 72.5 grams of $\text{H}_2\text{O}$ are produced?

$$\frac{72.5 \text{ g H}_2\text{O}}{18.016 \text{ g H}_2\text{O}} = 4.023 \text{ mol H}_2\text{O} \\
\frac{2 \text{ mol Al(OH)}_3}{3 \text{ mol H}_2\text{O}} = \frac{2.6828 \text{ mol Al(OH)}_3}{\text{mol Al(OH)}_3}$$
5. How many grams of Al(OH)₃ are reacted if 15.8 grams of Al₂O₃ are produced?

\[
\frac{15.8 \text{ g Al}_2\text{O}_3}{101.16 \text{ g Al}_2\text{O}_3} \times \frac{2 \text{ mol Al(OH)}_3}{1 \text{ mol Al}_2\text{O}_3} \times \frac{78.004 \text{ g Al(OH)}_3}{1 \text{ mol Al(OH)}_3} = 24.175 \text{ g Al(OH)}_3
\]

6. How many formula units of Al₂O₃ are produced if 0.208 moles of H₂O are produced?

\[
\frac{0.208 \text{ mol H}_2\text{O}}{1} \times \frac{1 \text{ mol Al}_2\text{O}_3}{3 \text{ mol H}_2\text{O}} \times \frac{6.022 \times 10^{23} \text{ form. units Al}_2\text{O}_3}{1 \text{ mol Al}_2\text{O}_3} = 4.175 \times 10^{22} \text{ form. units Al}_2\text{O}_3
\]

Use the balanced equation below to answer the next three questions.

\[2 \text{ C}_{10}\text{H}_{22} + 31 \text{ O}_2 \rightarrow 20 \text{ CO}_2 + 22 \text{ H}_2\text{O}\]

7. If 0.085 mol C₁₀H₂₂ is reacted, how many moles H₂O are produced?

\[
\frac{0.085 \text{ mol C}_1\text{H}_2\text{H}_2}{1} \times \frac{22 \text{ mol H}_2\text{O}}{2 \text{ mol C}_1\text{H}_2\text{H}_2} = 0.935 \text{ mol H}_2\text{O}
\]

8. If 92.5 grams H₂O are produced, how many grams of CO₂ are produced?

\[
\frac{92.5 \text{ g H}_2\text{O}}{1} \times \frac{1 \text{ mol H}_2\text{O}}{18.016 \text{ g H}_2\text{O}} \times \frac{20 \text{ mol CO}_2}{22 \text{ mol H}_2\text{O}} \times \frac{44.01 \text{ g CO}_2}{1 \text{ mol CO}_2} = 205.419 \text{ g CO}_2
\]

9. If 2.85 moles of C₁₀H₂₂ are reacted, how many molecules of H₂O are produced?

\[
\frac{2.85 \text{ mol C}_1\text{H}_2\text{H}_2}{1} \times \frac{22 \text{ mol H}_2\text{O}}{2 \text{ mol C}_1\text{H}_2\text{H}_2} \times \frac{6.022 \times 10^{23} \text{ mol H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 1.89 \times 10^{25} \text{ molecules H}_2\text{O}
\]