Introduction to Chemistry Quiz #4

DIRECTIONS: Use concepts, methods, and techniques from this course to complete these problems. For credit, show your work, give explanations, use the factor-units method, and pay attention to significant figures. No work and explanations shown = no credit.

1. (20 points) Classify and balance each of the chemical reactions below.

(a) \( \text{Ni(NO}_3\text{)}_2 + \text{As}_2\text{S}_3 \rightarrow \text{As(NO}_3\text{)}_3 + \text{NiS} \)

(b) \( (\text{NH}_4\text{)}_2\text{CO}_3 \rightarrow \text{NH}_3 + \text{H}_2\text{O} + \text{CO}_2 \)

2. (20 points) Last summer, Colleen Ramsey, an Eckerd College student, worked at NASA studying how \( \text{CH}_3\text{OH} \) (methanol) decomposes into \( \text{CO} \) by the following reaction: \( \text{CH}_3\text{OH} \rightarrow \text{CO} + 2 \text{H}_2 \)

How much \( \text{CO} \) is formed by the destruction of 0.0127 g \( \text{CH}_3\text{OH} \), assuming 100.0% yield?
3. (20 points) Nibbler, whose photo is shown here, has a spaceship equipped with hydrogen fuel cells. These allow the controlled combination of H₂ and O₂ to make water, with energy being released in the process according to the reaction below:

\[ 2 \text{ H}_2 + \text{ O}_2 \rightarrow 2 \text{ H}_2\text{O} + \text{ energy} \]

If 172 g of H₂O forms in the spaceship, how much O₂ must have been consumed, assuming 68.4% yield?

4. (20 points) If 45.77 g of sulfur-containing coal burns to make 4.86 g SO₂ according to \( \text{S} + \text{ O}_2 \rightarrow \text{SO}_2 \), then what was the percent sulfur in the original sample?

5. (20 points) This is the set of exercises due last Wednesday.

**BONEPILE OF ATOMIC WEIGHTS**

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\begin{align*}
\text{H} &= 1.008 \\
\text{C} &= 12.01 \\
\text{O} &= 16.00 \\
\text{S} &= 32.06
\end{align*}
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