EGEE 470: Molar vs. Mass Balances 'refresher'

Typical lowest and highest-rank coals have the following mass-based composition (see relevant template):

- **Low Rank**:
  - C: 75.9
  - H: 5.1
  - O: 17.0
  - N: 1.6
  - S: 0.4
  - Heat content: ~100 MWh/ton
  - Weight: ~7000-10000 lb/ton

- **High Rank**:
  - C: 87.0
  - H: 4.0
  - O: 5.0
  - N: 1.5
  - S: 2.5
  - Heat content: ~12000-14000 lb/ton

Determine their molecular formulas and compare them to those of NG (~CH₄) and oil (~CH₂).

\[
\begin{align*}
\frac{H}{C} &= \frac{5.1 \text{ g H}}{75.9 \text{ g C}} \\
\text{(mol H)} &= \frac{1.2 \text{ g C}}{1 \text{ mol C}} \\
\text{mol H/mol C} &= 0.81 \\
\end{align*}
\]

\[
\begin{align*}
\frac{H}{C} &= \frac{4.0 \text{ g H}}{87.0 \text{ g C}} \\
\text{(mol H)} &= \frac{12}{1} \\
\text{mol H/mol C} &= 0.55 \\
\end{align*}
\]

\[
\begin{align*}
\frac{O}{C} &= \frac{17.0}{75.9} \\
\text{vs.} \quad \frac{5.0}{87.0} \\
\end{align*}
\]

30% NG; 40% oil; 30% coal

\[
\begin{align*}
\text{Etc.}
\end{align*}
\]

\[
\begin{align*}
\text{30% NG; 40% oil; 30% coal}
\end{align*}
\]

\[\frac{2}{1}\]

\[\text{Is } \sim \text{CH}_4 \text{ a good assumption in Problem 1.26 (textbook)? Yes!}\]

\[\text{e.g., } 0.3(\frac{4}{1}) + 0.4(\frac{2}{1}) + 0.3(\frac{0.8}{1}) = \frac{2}{1}\]