Exam this Friday

1. \( \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} \)

<table>
<thead>
<tr>
<th>Glucose (18.24 g)</th>
<th>? g</th>
</tr>
</thead>
<tbody>
<tr>
<td>mol glucose</td>
<td>mol O(_2)</td>
</tr>
</tbody>
</table>

How many g O\(_2\) does it take to react with 18.24 g glucose?

- \( \text{mass glu} \rightarrow \text{mol glu} \rightarrow \text{mol O}_2 \rightarrow \text{mass O}_2 \)
- \( \text{mass in bal. eqn} \)
- molar mass = g/mol converts between g & mol
- Coefficients convert between mols of different compounds

\[
\frac{18.24 \text{ g glu}}{180.154 \text{ g glu}} \times \frac{1 \text{ mol glu}}{180.154 \text{ g glu}} \times \frac{6 \text{ mol O}_2}{1 \text{ mol glu}} \times \frac{32.00 \text{ g O}_2}{1 \text{ mol O}_2} = 19.44 \text{ g O}_2
\]

\( \text{C}_6\text{H}_{12}\text{O}_6 = \text{glu} \)

Molar mass = 6(12.01) + 12(1.008) + 6(16.00)

\[
= 180.154 \text{ g/mol} \quad \frac{180.154 \text{ g}}{1 \text{ mol}}
\]

Molar mass O\(_2\) = 2(16.00) = 32.00 g/mol
\[
\frac{2\text{LiOH (s)} + \text{CO}_2 (g)}{\rightarrow \text{Li}_2\text{CO}_3 (s) + \text{H}_2\text{O (l)}}
\]

What mass of \text{CO}_2 (g) can \(1.00\) kg lithium hydroxide react with?

Molar mass \text{LiOH} = 6.939 + 14.00 + 1.008 = 23.947 g/mol

\text{""" CO}_2 = 12.01 + 2(14.00) = 44.01 g/mol

\[
\frac{1000 \text{ g LiOH}}{(1\text{ kg})} \times \frac{1 \text{ mol LiOH}}{23.947 \text{ g LiOH}} \times \frac{1 \text{ mol CO}_2}{2 \text{ mol LiOH}} \times \frac{44.01 \text{ g CO}_2}{1 \text{ mol CO}_2} = 919.9 \text{ g CO}_2
\]

What if you're given masses of more than 1 compound?

If you're given masses of \(2\) reactants and asked for mass of a product, you must figure out which reactant is used up first. (consumed)
Cheese sandwich analogy

1 slice cheese + 2 slices bread → 1 sandwich

If you have 3 slices cheese / 4 slices bread, how many whole sandwiches can you make?
What’s left over?

How many sandwiches can each “reactant” make?

\[
\begin{align*}
3 \text{ cheese} \times \frac{1 \text{ sandwich}}{1 \text{ cheese}} &= 3 \text{ sandwiches} \\
4 \text{ bread} \times \frac{1 \text{ sandwich}}{2 \text{ bread}} &= 2 \text{ sandwiches}
\end{align*}
\]

How many moles of \( C_3H_8 \) and \( SO_2 \) are present?

\[
\begin{align*}
0.218 \text{ mol} \ C_3H_8 \\
0.431 \text{ mol} \ SO_2
\end{align*}
\]

\[
\begin{align*}
\text{ limiting reactant } &= \text{ consumed first} \\
C_3H_8 + 5O_2 &\rightarrow 3CO_2 + 4H_2O
\end{align*}
\]

- \( 218 \text{ mol } C_3H_8 \) x \( \frac{4 \text{ mol } H_2O}{3 \text{ mol } CO_2} \) = \( 0.654 \text{ mol } CO_2 \)
- \( 0.431 \text{ mol } O_2 \) x \( \frac{3 \text{ mol } CO_2}{5 \text{ mol } O_2} \) = \( 0.259 \text{ mol } CO_2 \)

\( O_2 \) is the limiting reactant!