<div align="center">**Enthalpy Calculation worksheet.**</div>

Determine the H_{rxn} for the combustion of propane.

$$C_3H_8 + 5\,O_2 \quad \rightarrow \quad 3CO_2 \;+\; 4H_2O$$
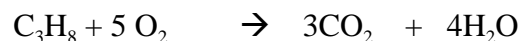
According to Hess, you can do it by any path you would like. We will use two: H_f^o and bond energies.
- For H_f^o use Appendix K and $H^o{}_{rxn} = \;$ n $H_f^o{}_{prod}$ - n $H_f^o{}_{reac}$
- For BE use the tables below and $H^o{}_{rxn} = \;$ BE reactants - BE products

Path one. ΔH_f^o The path is through the elements in their standard states $(C_s, O_{2(g)}, H_{2(g)})$

$$C_3H_8 + 5\,O_2 \;\text{-----}\rightarrow\; 3CO_2 \;+\; 4H_2O \qquad\qquad H^o{}_{rxn} \;=\; ?????$$
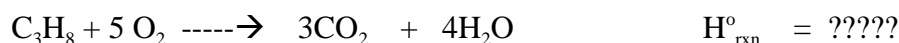
Path two. BE. The path is through breaking all bonds to form gas phase atoms (C_g, H_g, O_g).

What about Entropy? Note that just because we know H, we can't say for sure whether the reaction is spontaneous. For that we need to look at the value of S. Can you make a good guess as to whether entropy increases or decreases in the combustion reaction?

What about Free Energy? With this information, what can be said about G and the spontaneity of the reaction?