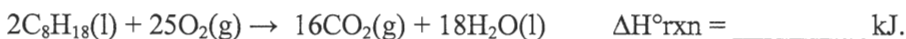


SHOW ALL WORK TO RECEIVE CREDIT

1. (5 Pts) Octane (
- C_8H_{18}
-) undergoes combustion according to the following thermochemical equation:

Given: $\Delta H^\circ_f[CO_2(g)] = -393.5 \text{ kJ/mol}$; $\Delta H^\circ_f[H_2O(l)] = -285.8 \text{ kJ/mol}$; $\Delta H^\circ_f[C_8H_{18}(l)] = -210 \text{ kJ/mol}$ Determine the value of ΔH° for the reaction.

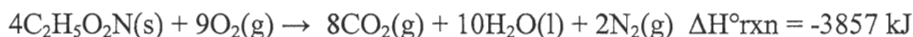
$$\begin{aligned} \Delta H^\circ_{rxn} &= \sum n \Delta H^\circ_{products} - \sum n \Delta H^\circ_{reactants} \\ &= [16(-393.5) + 18(-285.8)] - [2(-210) + 25(0)] \\ &= -11020 \text{ kJ} = -1.1 \times 10^4 \text{ kJ} \end{aligned}$$

2. (5 Pts) Copper metal has a specific heat of
- $0.385 \text{ J/g}^\circ\text{C}$
- . Calculate the amount of heat required to raise the temperature of
- 42.8 g
- of Cu from
- 20.0°C
- to
- 895°C
- .

$$\frac{0.385 \text{ J}}{\text{g}^\circ\text{C}} \times \frac{42.8 \text{ g}}{1} \times \frac{875^\circ\text{C}}{1} = 14400 \text{ J}$$

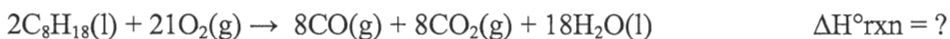
$$14.4 \text{ kJ}$$

3. (5 Pts) Glycine
- $C_2H_5O_2N$
- is important for biological energy. The combustion reaction of glycine is given by the equation

Given that $\Delta H^\circ_f[CO_2(g)] = -393.5 \text{ kJ/mol}$, and $\Delta H^\circ_f[H_2O(l)] = -285.8 \text{ kJ/mol}$. Calculate the enthalpy of formation ΔH°_f per mole of glycine.

$$\begin{aligned} \Delta H^\circ_{rxn} &= \sum n \Delta H^\circ_{products} - \sum n \Delta H^\circ_{reactants} \\ -3857 \text{ kJ} &= (8(-393.5) + 10(-285.8) + 2(0)) - [4(x) + 9(0)] \\ x &= -537.25 \text{ kJ} \end{aligned}$$

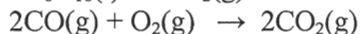
4. (5 Pts) Calculate the enthalpy change for the reaction



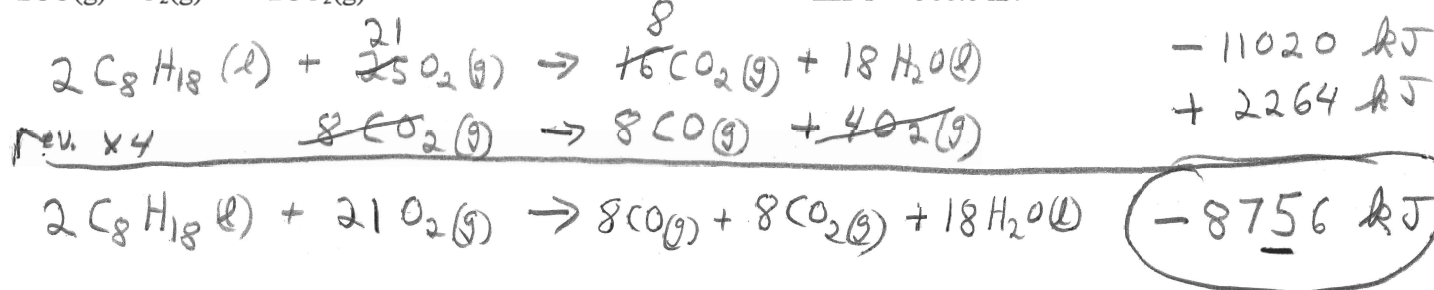
Given:



$$\Delta H^\circ_{rxn} = -11,020 \text{ kJ.}$$



$$\Delta H^\circ_f = -566.0 \text{ kJ.}$$



5. (5 Pts) Given the thermochemical equation:
- $2SO_2 + O_2 \rightarrow 2SO_3 \quad \Delta H^\circ_{rxn} = -198 \text{ kJ.}$

What is the enthalpy change (ΔH°) for the decomposition of 3.5 moles of SO_3 ?

$$\begin{array}{rcl} 3.5 \text{ mol } SO_3 & | & -198 \text{ kJ} \\ \hline & | & 2 \text{ mol } SO_3 & = -346.5 \text{ kJ} \\ & & & -350 \text{ kJ} \end{array}$$