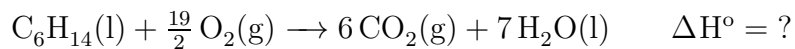


COMBINATION PROBLEM 3



$$Q = mc\Delta T$$

$$Q = 25\,000 \text{ g} \times 4.184 \frac{\text{J}}{\text{g}^\circ\text{C}} (31.925 - 25.000)^\circ\text{C}$$

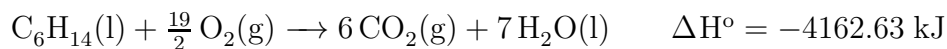
$$Q = 724355 \text{ J}$$

$$Q = 724.36 \text{ kJ}$$

$$\frac{724.36 \text{ kJ}}{15 \text{ g C}_6\text{H}_{14}} \times \frac{86.20 \text{ g C}_6\text{H}_{14}}{1 \text{ mol C}_6\text{H}_{14}} = \frac{4162.63 \text{ kJ}}{1 \text{ mol C}_6\text{H}_{14}}$$

$$\Delta\text{H} = -Q$$

$$\Delta\text{H} = -4162.63 \text{ kJ}/1 \text{ mol C}_6\text{H}_{14}$$



$$\begin{aligned} \Delta\text{H}^\circ &= [6\Delta\text{H}_{\text{CO}_2(\text{g})}^\circ + 7\Delta\text{H}_{\text{H}_2\text{O}(\text{l})}^\circ] - [\Delta\text{H}_{\text{C}_6\text{H}_{14}(\text{l})}^\circ + \frac{19}{2} \Delta\text{H}_{\text{O}_2(\text{g})}^\circ] \\ -4162.63 \text{ kJ} &= [6(-393.5 \text{ kJ}) + 7(-285.8 \text{ kJ})] - [\Delta\text{H}_{\text{C}_6\text{H}_{14}}^\circ + \frac{19}{2} (0)] \end{aligned}$$

$$\Delta\text{H}_{\text{C}_6\text{H}_{14}(\text{l})}^\circ = -4361.6 \text{ kJ} + 4162.63 \text{ kJ}$$

$$\Delta\text{H}_{\text{C}_6\text{H}_{14}(\text{l})}^\circ = -198.97 \text{ kJ}$$

Please note that the textbook value (pg 799) for the heat of formation of  $\text{C}_6\text{H}_{14}$  is -198.7 kJ. This is definitely close enough!