

COMBINATION PROBLEM 1



$$Q = mc\Delta T$$

$$Q = 30\,000 \text{ g} \times 4.184 \frac{\text{J}}{\text{g}^\circ\text{C}} (23.94 - 20.00)^\circ\text{C}$$

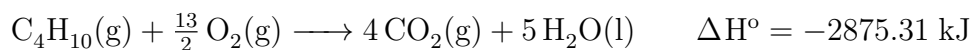
$$Q = 494548.8 \text{ J}$$

$$Q = 494.55 \text{ kJ}$$

$$\frac{494.55 \text{ kJ}}{10 \text{ g C}_4\text{H}_{10}} \times \frac{58.14 \text{ g C}_4\text{H}_{10}}{1 \text{ mol C}_4\text{H}_{10}} = \frac{2875.31 \text{ kJ}}{1 \text{ mol C}_4\text{H}_{10}}$$

$$\Delta H = -Q$$

$$\Delta H = -2875.31 \text{ kJ/1 mol C}_4\text{H}_{10}$$



$$\begin{aligned} \Delta H^\circ &= [4\Delta H_{\text{CO}_2(\text{g})}^\circ + 5\Delta H_{\text{H}_2\text{O}(\text{l})}^\circ] - [\Delta H_{\text{C}_4\text{H}_{10}(\text{g})}^\circ + \frac{13}{2}\Delta H_{\text{O}_2(\text{g})}^\circ] \\ -2875.31 \text{ kJ} &= [4(-393.5 \text{ kJ}) + 5(-285.8 \text{ kJ})] - [\Delta H_{\text{C}_4\text{H}_{10}}^\circ + \frac{13}{2}(0)] \end{aligned}$$

$$\Delta H_{\text{C}_4\text{H}_{10}(\text{g})}^\circ = -3003.0 \text{ kJ} + 2875.31 \text{ kJ}$$

$$\Delta H_{\text{C}_4\text{H}_{10}(\text{g})}^\circ = -127.69 \text{ kJ}$$

Please note that the textbook value (pg 799) for the heat of formation of  $\text{C}_4\text{H}_{10}$  is -125.6 kJ. This is definitely close enough!