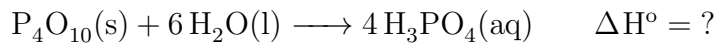


COMBINATION PROBLEM 4



$$Q = mc\Delta T$$

$$Q = 1\,000 \text{ g} \times 4.184 \frac{\text{J}}{\text{g}^\circ\text{C}} (19.93 - 15.03)^\circ\text{C}$$

$$Q = 20501.6 \text{ J}$$

$$Q = 20.502 \text{ kJ}$$

$$\frac{20.502 \text{ kJ}}{13.5 \text{ g P}_4\text{O}_{10}} \times \frac{283.88 \text{ g P}_4\text{O}_{10}}{1 \text{ mol P}_4\text{O}_{10}} = \frac{431.11 \text{ kJ}}{1 \text{ mol P}_4\text{O}_{10}}$$

$$\Delta H = -Q$$

$$\Delta H = -431.11 \text{ kJ}/1 \text{ mol P}_4\text{O}_{10}$$



$$\Delta H^\circ = [4\Delta H_{\text{H}_3\text{PO}_4(\text{aq})}^\circ] - [\Delta H_{\text{P}_4\text{O}_{10}}^\circ + 6\Delta H_{\text{H}_2\text{O}(\text{l})}^\circ]$$

$$-431.11 \text{ kJ} = [4\Delta H_{\text{H}_3\text{PO}_4(\text{aq})}^\circ] - [(-3012.48 \text{ kJ}) + 6(-285.77 \text{ kJ})]$$

$$-4\Delta H_{\text{H}_3\text{PO}_4(\text{aq})}^\circ = 4727.10 \text{ kJ} + 431.11 \text{ kJ}$$

$$\Delta H_{\text{H}_3\text{PO}_4(\text{aq})}^\circ = -1289.55 \text{ kJ}$$

For comparison to the answer given in the question, convert to kcal

$$-1289.55 \text{ kJ} \times \frac{1 \text{ kcal}}{4.184 \text{ kJ}} = -308.21 \text{ kcal}$$