

Example of Heat Calculation - Most Basic Calculation

How many Kcal do you need to give to 345g H₂O to raise the temperature from 41.5°C to 73.8°C?

sys: H₂O

$$m = 345_g \text{ H}_2\text{O}$$

$$T_I = 41.5^\circ\text{C}$$

$$T_F = 73.8^\circ\text{C}$$

$$\Delta T = T_F - T_I = 73.8^\circ\text{C} - 41.5^\circ\text{C} = 32.3^\circ\text{C}$$

$$c = 1.00 \frac{\text{cal}}{\text{g} \cdot ^\circ\text{C}}$$

$$\begin{aligned} \Delta H &= m \cdot \Delta T \cdot c = (345_g)(32.3^\circ\text{C})(1.00 \frac{\text{cal}}{\text{g} \cdot ^\circ\text{C}}) \\ &= 1.114 \times 10^4 \text{ cal} \left(\frac{1 \text{ Kcal}}{1000 \text{ cal}} \right) = 11.14 \text{ Kcal} \end{aligned}$$

Since ΔH is positive, means water $\longrightarrow$ +11.1 Kcal
absorbing energy

sys: H₂O

Dimensional Analysis

$$345_g \text{ H}_2\text{O}$$

$$T_I = 41.5^\circ\text{C}$$

$$T_F = 73.8^\circ\text{C}$$

$$\Delta T = T_F - T_I = 73.8^\circ\text{C} - 41.5^\circ\text{C} = 32.3^\circ\text{C}$$

$$c = 1.00 \frac{\text{cal}}{\text{g} \cdot ^\circ\text{C}}$$

$$\begin{aligned} (345_g)(32.3^\circ\text{C}) \left(1.00 \frac{\text{cal}}{\text{g} \cdot ^\circ\text{C}} \right) \left(\frac{1 \text{ Kcal}}{1000 \text{ cal}} \right) &= 11.14 \text{ Kcal} \\ &= \boxed{+11.1 \text{ Kcal}} \end{aligned}$$