

## Example of Heat Calculation - Solving for Final or Initial Temp

27.4 grams of water was given 1.43 kcal of energy.  
If the initial temp was  $19.4^{\circ}\text{C}$ , what is final Temp?

sys:  $\text{H}_2\text{O}$

$$T_I = 19.4^{\circ}\text{C}$$

$$\Delta T = T_F - T_I \Rightarrow T_F = \Delta T + T_I \quad (\text{you have 2 unknowns \& only one equation so need to calculate } \Delta T \text{ first}).$$

$$\Delta T = 52.18^{\circ}\text{C}$$

$$T_F = 52.18^{\circ}\text{C} - 19.4^{\circ}\text{C} \\ = 32.78^{\circ}\text{C} = \boxed{32.8^{\circ}\text{C}}$$

Calculating  $\Delta T$

$$m_{\text{H}_2\text{O}} = 27.4 \text{ g}$$

$$\Delta H = +1.43 \text{ kcal}$$

$$c_{\text{H}_2\text{O}} = \frac{1.00 \text{ cal}}{\text{g} \cdot ^{\circ}\text{C}}$$

$$\rightarrow \Delta H = (+1.43 \text{ kcal}) \left( \frac{1000 \text{ cal}}{1 \text{ kcal}} \right) \\ = +1.43 \times 10^3 \text{ cal}$$

By Dimensional Analysis

$$(1.43 \text{ kcal}) \left( \frac{1000 \text{ cal}}{1 \text{ kcal}} \right) \left( \frac{1 \text{ g} \cdot ^{\circ}\text{C}}{1.00 \text{ cal}} \right) \left( \frac{1}{27.4 \text{ g}} \right) = \\ = 52.18^{\circ}\text{C}$$

By Equation

$$\Delta H = (m)(\Delta T)(C)$$

$$\Delta T = \frac{\Delta H}{(m)(C)}$$

$$\Delta T = \frac{+1.43 \times 10^3 \text{ cal}}{(27.4 \text{ g}) \left( \frac{1.00 \text{ cal}}{\text{g} \cdot ^{\circ}\text{C}} \right)}$$

$$\Delta T = 52.18^{\circ}\text{C}$$