Example of Heat Calculation - Where sign of ΔH matters

What is the temperature change (ΔT) of 4.52 kg of water that releases 6.31 kcal of energy?

sys: H_2O

$m = 4.52\,kg\left(\frac{1000\,g}{1\,kg}\right) = 4.52 \times 10^3\,g$

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

$\Delta H = -6.31\,kcal\left(\frac{1000\,cal}{1\,kcal}\right) = -6.31 \times 10^3\,cal$

("−" sign means system is losing energy)

$\Delta T = ?$

$\Delta H = m \cdot \Delta T \cdot c \Rightarrow \Delta T = \frac{\Delta H}{m \cdot c}$

$= \frac{-6.31 \times 10^3\,cal}{(4.52 \times 10^3\,g)\left(1.00\,\frac{cal}{g \cdot {}^\circ C}\right)}$

$\Delta T = -1.396\,^\circ C = -1.40\,^\circ C$

("−" sign means final temp is less than initial Temp)

Dimensional Analysis

Sys: H_2O

$m = 4.52\,kg$

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

$\Delta H = -6.31\,kcal$

$\Delta T = ?$

$(-6.31\,kcal)\left(\frac{1000\,cal}{1\,kcal}\right)\left(\frac{1\,g \cdot {}^\circ C}{1.00\,cal}\right)\left(\frac{1}{4.52\,kg}\right)\left(\frac{1\,kg}{1000\,g}\right) = -1.396\,^\circ C$

$= \boxed{-1.40\,^\circ C}$