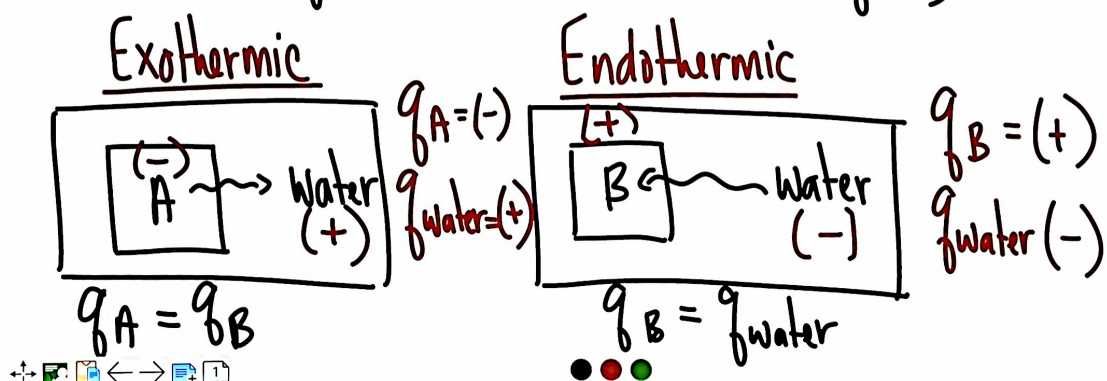


Calorimetry

Measuring heat transfer using specific heat
(normally using liquid water, $C = 4.184 \text{ J/g} \cdot ^\circ\text{C}$)



Calculating heat (q) using Calorimetry

Heat Transfer

$$q_A = -q_{\text{water}}$$

(opposite q signs)

Temp Change

$$\Delta T = T_{\text{Final}} - T_{\text{ini}}$$

$$T_{\text{final}} = T_{\text{ini}} + \Delta T$$

$$T_{\text{ini}} = T_{\text{final}} - \Delta T$$

$$q = +, \Delta T = +, \text{endo}$$

$$q = -, \Delta T = -, \text{exo}$$

Find $\Delta T, q, \text{ or } m$

$$q = C \cdot m \cdot \Delta T$$

$$\Delta T = \frac{q}{C \cdot m}$$

$$m = \frac{q}{C \cdot \Delta T}$$

Ex1: $q_A \rightarrow q_{\text{water}}$

Oct-05-2023 10:11 PM 3/4

$q_A = -1820 \text{ J}$
 $q_{\text{water}} = \underline{\hspace{2cm}} \text{ J}$
 $q_A = -q_{\text{water}}$
 $q_{\text{water}} = +1820 \text{ J}$
 (gain, endo)

$q_{\text{water}} = \underline{\hspace{2cm}} \text{ J}$ $C = 4.184 \text{ J/g} \cdot ^\circ\text{C}$
 $M_{\text{water}} = 30.0 \text{ g (mL)}, \Delta T = \underline{\hspace{2cm}} ^\circ\text{C}$
 $\Delta T = \frac{q}{C \cdot m} = \frac{+1820 \text{ J}}{4.184 \text{ J/g} \cdot ^\circ\text{C} \cdot 30.0 \text{ g}}$
 $\Delta T = \underline{14.50 ^\circ\text{C}}$
 (Water inc. T as q added)

Metal
 Fe, iron)
 100g
 (exo)

Ex2: $q_A \rightarrow \text{Water}$ ΔT_{Al}

Oct-05-2023 10:11 PM 4/4

$T_{\text{ini}} = 91.3 ^\circ\text{C}$ $T_{\text{final}} = 32.9 ^\circ\text{C}$
 $\Delta T = \underline{\hspace{2cm}} ^\circ\text{C}$
 $\Delta T = T_{\text{final}} - T_{\text{ini}}$
 $32.9 ^\circ\text{C} - 91.3 ^\circ\text{C}$
 $\Delta T = \underline{-58.4 ^\circ\text{C}}$

$M_{\text{Al}} = 20.0 \text{ g}$ $C_{\text{Al}} = 0.900 \text{ J/g} \cdot ^\circ\text{C}$
 $q_{\text{Al}} = \underline{\hspace{2cm}} \text{ J}$ $q_{\text{water}} = \underline{\hspace{2cm}} \text{ J}$
 $\Delta T = -58.4 ^\circ\text{C}$
 $q_{\text{Al}} = C_{\text{Al}} \cdot m \cdot \Delta T$
 $= 0.900 \text{ J/g} \cdot ^\circ\text{C} \cdot 20 \text{ g} \cdot -58.4 ^\circ\text{C}$
 $q_{\text{Al}} = \underline{-1051.2 \text{ J}}$
 $q_{\text{Al}} = -q_{\text{water}}$ $q_{\text{water}} = \underline{+1051.2 \text{ J}}$