

**17.24. Model:** We have a thermal interaction between the aluminum pan and the water.

**Solve:** The conservation of energy equation  $Q_{\text{Al}} + Q_{\text{water}} = 0 \text{ J}$  is

$$M_{\text{Al}} c_{\text{Al}}(T_f - T_{i \text{ Al}}) + M_{\text{water}} c_{\text{water}}(T_f - T_{i \text{ water}})$$

The pan and water reach a common final temperature  $T_f = 24.0^\circ\text{C}$

$$(0.750 \text{ kg})(900 \text{ J / kg K})(24.0^\circ\text{C} - T_{i \text{ Al}}) + (10 \times 10^{-3} \text{ m}^3)(1000 \text{ kg / m}^3)(4190 \text{ J / kg K})(24.0^\circ\text{C} - 20.0^\circ\text{C})$$

$$= (675.0 \text{ J / K})(24.0^\circ\text{C} - T_{i \text{ Al}}) + 167,600 \text{ J} = 0 \text{ J}$$

$$\Rightarrow T_{i \text{ Al}} = 272^\circ\text{C} = [(272) (9/5) + 32]^\circ\text{F} = 522^\circ\text{F}$$