

$$q = m \times c \times \Delta T$$

$q$  = total heat flow

$m$  = mass

$c$  = specific heat

$\Delta T$  = change in temp.

**Example 91:** Calculate the number of Joules required to warm 100.0 g of water from 21.0°C to 80.0°C.

$$q = m \times c \times \Delta T$$

$$q = (100.0 \text{ g}) \times (4.184 \text{ J/g}\cdot^\circ\text{C}) \times (80.0^\circ\text{C} - 21.0^\circ\text{C}) = 24,811.2 \text{ J} = 2.5 \times 10^4 \text{ J}$$

**Example 92:** Calculate the number of Joules released when 72.5 grams of water at 95.0°C, cools to 28.0°C.

$$q = m \times c \times \Delta T$$

$$q = (72.5 \text{ g}) \times (4.184 \text{ J/g}\cdot^\circ\text{C}) \times (28.0^\circ\text{C} - 95.0^\circ\text{C}) = -23,213.7 \text{ J} = -2.3 \times 10^4 \text{ J}$$

#### Exercise Problems

1. Calculate the heat required to warm 21.1 grams of water from 14.0°C to 22.0°C?  
Answer:  $q = 996 \text{ J}$
2. Determine the heat released when 75.0 grams of water are cooled from 100.0°C to 22.0°C.  
Answer:  $q = -2.27 \times 10^4 \text{ J}$
3. The specific heat of gold is 0.128 J/g·°C. How much heat would be needed to warm 150.0 grams of gold from 25.0°C to 100.0°C?  
Answer:  $q = 1.40 \times 10^3 \text{ J}$
4. The specific heat of zinc is 0.386 J/g·°C. How much heat would be released when 454 grams of zinc at 95.0°C were cooled to 28.0°C?  
Answer:  $q = -1.28 \times 10^4 \text{ J}$