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

q = total heat flow
m = mass
c = specific heat
ΔT = change in temp.

Example #1: Calculate the number of Joules required to warm 100.0 g of water from 25.0°C to 80.0°C.

$q = m\,c\,\Delta T$
$q = (100.0\ g)(4.184)(80.0\ ^\circ C - 25.0\ ^\circ C) = 23{,}012\ J = 2.30 \times 10^4\ J$

Example #2: Calculate the number of Joules released when 72.5 grams of water at 95.0°C cools to 28.0°C.

$q = m\,c\,\Delta T$
$q = (72.5g)(4.184)(28.0\ ^\circ C - 95.0\ ^\circ C) = -20323.784 = -2.03 \times 10^4\ J$

Practice Problems:

1. Calculate the heat required to warm 25.5 grams of water from 14.0°C to 22.5°C?
Answer: q = 906 J

2. Determine the heat released when 73.0 grams of water are cooled from 100.0°C to 27.5°C.
Answer: $q = -2.21 \times 10^4$ J

3. The specific heat of gold is 0.128 J/g°C. How much heat would be needed to warm 250.0 grams of gold from 25.0°C to 100.0°C?
Answer: $q = 2.40 \times 10^3$ 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 98.0°C were cooled to 28.0°C?
Answer: $q = -1.23 \times 10^4$ J