Specific Heat and Calorimetry 2

The formula $q = mC\Delta T$ measures energy associated with temperature changes.

Example:

How much energy would it take to heat 2.50 kg of water from 5.0 °C to 85.5 °C?

Example 2:

If a 25.0 L tank of water at 21.5 ^{o}C were heated with 3.2 x 10^{3} kJ of energy, what would the final temperature of the water be?

Assuming a closed system (no energy lost to the surroundings), any energy lost by the system must be gained by the surroundings and visa versa. In other words...

$$q_{sys} = - q_{sur}$$

or

$$-q_{sys} = q_{sur}$$

For example, if something hot (like a piece of metal) is placed in something cooler (like water), the energy gained by the water will have to equal the energy lost by the metal.

energy lost by system = energy gained by surroundings

$$-q_{metal} = q_{water}$$

Example 3a:

How much energy would be lost if a 25.0 g piece of iron at 85.0 °C were cooled by water to a final temperature of 22.2 °C?

Example 3b:

What mass of water at 20.0 °C would be needed to cool the iron to that same final temperature that the two substances arrive at?

$$-q_{metal} = q_{water}$$

Example 3c:

Determine the final temperature when a 25.0 g piece of iron at 85.0 °C is placed into 75.0 g of water at 20.0 °C.

energy gained by water = energy lost by iron

Problems that involve a temperature gain causing a temperature loss are known as "q = q" problems

Specific Heat and Calorimetry #1

q = q Problems