Answer on Question #54610 – Chemistry – General chemistry

An ice bag containing 299 g of ice at 0∘C was used to treat sore muscles. When the bag was removed, the ice had melted and the liquid water had a temperature of 27.0 ∘C. (For water, 80. cal (334 J) is needed to melt 1 g of ice or must be removed to freeze 1 g of water.) How many kilojoules are absorbed?

Solution:

The ice will melting and then warming to the final temperature 27 °C.

Specific heat capacity, water: c_{water} = 4.187 kJ/kg-K

The heat of fusion (or specific enthalpy of fusion) of ice is L = 334 J/g =334 kJ/kg.

The energy to heat up the ice is the sum of the following

$$q_{ice} = Lm_{ice} + c_{water}\, m_{ice}\, \Delta t = m_{ice}\,(L + c_{water}\,(27 - 0))$$

Thus,

$$q_{ice} = 0.299 * (334 + 4.187 * 27) = 133.67 \text{ kJ}$$

Answer: 133.67 kJ