

17.15. Model: The removal of heat from the ice reduces its thermal energy and its temperature.

Solve: The heat needed to change an object's temperature is $Q = Mc\Delta T$. The mass of the ice cube is

$$M = \rho_{\text{ice}} V = (920 \text{ kg/m}^3)(0.06 \times 0.06 \times 0.06) \text{ m}^3 = 0.199 \text{ kg}$$

The specific heat of ice from Table 17.2 is $c_{\text{ice}} = 2090 \text{ J/kg K}$, so

$$Q = (0.199 \text{ kg})(2090 \text{ J/kg K})(243 \text{ K} - 273 \text{ K}) = -12,500 \text{ J}$$

Thus, the energy removed from the ice block is 12,500 J.

Assess: The negative sign with Q means loss of energy.