

35. The mass $m = 0.100$ kg of water, with specific heat $c = 4190$ J/kg·K, is raised from an initial temperature $T_i = 23^\circ\text{C}$ to its boiling point $T_f = 100^\circ\text{C}$. The heat input is given by $Q = cm(T_f - T_i)$. This must be the power output of the heater P multiplied by the time t ; $Q = Pt$. Thus,

$$t = \frac{Q}{P} = \frac{cm(T_f - T_i)}{P} = \frac{(4190 \text{ J/kg}\cdot\text{K})(0.100 \text{ kg})(100^\circ\text{C} - 23^\circ\text{C})}{200 \text{ J/s}} = 160 \text{ s} .$$