

103. Let  $m_w = 14$  kg,  $m_c = 3.6$  kg,  $m_m = 1.8$  kg,  $T_{i1} = 180^\circ\text{C}$ ,  $T_{i2} = 16.0^\circ\text{C}$ , and  $T_f = 18.0^\circ\text{C}$ . The specific heat  $c_m$  of the metal then satisfies

$$(m_w c_w + m_c c_m)(T_f - T_{i2}) + m_m c_m (T_f - T_{i1}) = 0$$

which we solve for  $c_m$ :

$$\begin{aligned} c_m &= \frac{m_w c_w (T_{i2} - T_f)}{m_c (T_f - T_{i2}) + m_m (T_f - T_{i1})} \\ &= \frac{(14 \text{ kg})(4.18 \text{ kJ/kg}\cdot\text{K})(16.0^\circ\text{C} - 18.0^\circ\text{C})}{(3.6 \text{ kg})(18.0^\circ\text{C} - 16.0^\circ\text{C}) + (1.8 \text{ kg})(18.0^\circ\text{C} - 180^\circ\text{C})} \\ &= 0.41 \text{ kJ/kg}\cdot\text{C}^\circ . \end{aligned}$$