p 404 9 - 17 odd, 18

(9) $\Delta Q = mc\Delta T$

$$c = \frac{\Delta Q}{m\Delta T} = \frac{135 \times 10^3 \text{ J}}{(5.1 \text{ kg})(31.5 - 18\ ^\circ\text{C})} = 2.0 \times 10^3 \text{ J kg}^{-1}\text{C}^{\circ -1}$$

(11) $Q_{loss} = Q_{gain}$

$m_w C_w \Delta T_w = m_g C_g \Delta T_g$

$C_{water} = 4186 \text{ J kg}^{-1}\text{C}^{\circ -1}$

$C_{glass} = 840 \text{ J kg}^{-1}\text{C}^{\circ -1}$

$$\Delta T_w = \frac{m_g C_g \Delta T_g}{m_w C_w} = \frac{(0.035 \text{ kg})(840 \text{ J kg}^{-1}\text{C}^{\circ -1})(39.2 - 21.6\ ^\circ\text{C})}{(0.135 \text{ kg})(4186 \text{ J kg}^{-1}\text{C}^{\circ -1})}$$

$\Delta T_w = 0.9156$

$T_{initial} = 39.2^\circ\text{C} + 0.9156 = \underline{40.1\ ^\circ\text{C}}$

(13) $Q_{loss} = Q_{gain}$

$C_{Fe} = 450 \text{ J kg}^{-1}\text{C}^{\circ -1}$

$m_H C_{Fe} \Delta T_H = m_w C_w \Delta T_w + m_{Fe} C_{Fe} \Delta T_{Fe}$

$$\Delta T_H = \frac{m_w C_w \Delta T_w + m_{Fe} C_{Fe} \Delta T_{Fe}}{m_H C_{Fe}}$$

$$= \frac{(1.35 \text{ kg})(4186 \text{ J kg}^{-1}\text{C}^{\circ -1})(25 - 20^\circ\text{C}) + (0.30 \text{ kg})(450 \text{ J kg}^{-1}\text{C}^{\circ -1})(25 - 20^\circ\text{C})}{(0.40 \text{ kg})(450 \text{ J kg}^{-1}\text{C}^{\circ -1})}$$

$\Delta T_H = 160.725\ ^\circ\text{C}$

$T_{initial} = 160.725 + 25\ ^\circ\text{C} = \underline{190^\circ\text{C}}$

(15) $Q = m_w C_w \Delta T_w + m_{Al} C_{Al} \Delta T_{Al}$

$C_{Al} = 900 \text{ J kg}^{-1}\text{C}^{\circ -1}$

$= (0.75 \text{ kg})(4186 \text{ J kg}^{-1}\text{C}^{\circ -1})(100 - 8^\circ\text{C}) + (0.36 \text{ kg})(900 \text{ J kg}^{-1}\text{C}^{\circ -1})(100 - 8^\circ\text{C})$

$= 318\ 642 \text{ J}$

$$\text{Power} = \frac{\text{Energy}}{t}$$

$$t = \frac{E}{\text{Power}} = \frac{318\ 642 \text{ J}}{750 \text{ W}} = \underline{430 \text{ s}}$$

Hilroy

(17) $Q_{loss} = Q_{gain}$

$m_{Fe} C_{Fe} \Delta T_{Fe} = m_g C_g \Delta T_g + m_{Al} C_{Al} \Delta T_{Al}$

$C_{Fe} = 450\ J\,kg^{-1}C^{o-1}$

$C_{Al} = 900\ J\,kg^{-1}C^{o-1}$

$$C_g = \frac{m_{Fe} C_{Fe} \Delta T_{Fe} - m_{Al} C_{Al} \Delta T_{Al}}{m_g \Delta T_g}$$

$$= \frac{(0.29\,kg)(450\,J\,kg^{-1}C^{o-1})(180 - 38^{\circ}C) - (0.095\,kg)(900\,J\,kg^{-1}C^{o-1})(38 - 10^{\circ}C)}{(0.25\,kg)(38 - 10^{\circ}C)}$$

$C_g = \underline{2300\ J\,kg^{-1}C^{o-1}}$

(18) $Q = mc\Delta T$

$E_k = \frac{1}{2}mv^2 = \frac{1}{2}(1.20\,kg)(6.5\,ms^{-1})^2 = 25.35\,J = Q$

25.35 J per hammer blow

10 hammer blows, so $Q = 253.5\,J$

$C_{Fe} = 450\ J\,kg^{-1}C^{o-1}$

$$\Delta T = \frac{Q}{mc} = \frac{253.5\,J}{(0.014\,kg)(450\,J\,kg^{-1}C^{o-1})}$$

$= \underline{40.2^{\circ}C}$