

66. We assume (although this should be viewed as a “controversial” assumption) that the top surface of the ice is at  $T_C = -5.0^\circ\text{C}$ . Less controversial are the assumptions that the bottom of the body of water is at  $T_H = 4.0^\circ\text{C}$  and the interface between the ice and the water is at  $T_X = 0.0^\circ\text{C}$ . The primary mechanism for the heat transfer through the total distance  $L = 1.4$  m is assumed to be conduction, and we use Eq. 19-34:

$$\frac{k_{\text{water}}A(T_H - T_X)}{L - L_{\text{ice}}} = \frac{k_{\text{ice}}A(T_X - T_C)}{L_{\text{ice}}}$$

$$\frac{(0.12)A(4.0^\circ - 0.0^\circ)}{1.4 - L_{\text{ice}}} = \frac{(0.40)A(0.0^\circ + 5.0^\circ)}{L_{\text{ice}}}.$$

We cancel the area  $A$  and solve for thickness of the ice layer:  $L_{\text{ice}} = 1.1$  m.