Physics 102
Quiz # 2
Chapter 18

Name : Solution Id : Sec. # :

A copper slab has a thickness of 1.0 m and cross-sectional area 5.0 cm^2. One side of the slab is in thermal contact with ice at a temperature of 0 °C and the other side is in contact with boiling water at temperature of 100 °C. (Recall that the thermal conductivity of copper is 401 W/(m.K) and the heat of fusion of water is 333 J/g)

a) Find the rate at which heat is conducted along the slab.

$$H = \frac{kA\Delta T}{L} = \frac{401 \times 5 \times 10^{-4} \times 100}{1.0}$$

$$= 20 \text{ J/s}$$

b) Find the rate at which ice melts at the cold side.

$$H = \frac{Q}{t} = \frac{mL_f}{t}$$

$$\Rightarrow \frac{m}{t} = \frac{H}{L_f} = \frac{20 \text{ J/s}}{333 \text{ J/g}} = 0.06 \text{ g/s}$$