Hw 1.1 ch. 1 7, 16, 25, 29

1.7) $Q = ?$ Given: $k = .8\ w/(m^\circ C)$, $T_1 = 30^\circ C$ $T_2 = 20^\circ C$, $A = 1m^2$, $L = .5cm$

$Q = kA\frac{\Delta T}{L}$

$Q = (.8\ w/(m^\circ C))(1m^2)\left[\frac{30^\circ C - 20^\circ C}{.005m}\right]$

$Q = 1600w$

or

$Q = 1.6kW$

1.16) Given: $h = 100\ w/m^2{}^\circ C$, $T_i = 15^\circ C$ $T_f = 110^\circ C$, $L = 5m$

Find: $Q = ?$

Solution: $Q = hA\Delta T$

$Q = (100\ w/m^2(^\circ C))(2\pi \cdot .005m)(110^\circ C - 15^\circ C)$

$Q = 314w$

1.25) Given: $q'' = 1000\ w/m^2$ $A = 4\text{-}m^2$ $T = 2hours$ absorb 80 %

Find: radiation energy absorbed

Solution:

$q_{abs} = \alpha q_{inc}$

$= (1000\ w/m^2)(.8)$

$q_{abs} = 800\ w/m^2$

$E = (800\ w/m^2)(4\text{-}m^2)(2 \times 60 min \times 60 sec)$

$E = 8640000\ J$

1-29) Given: $T_i = 150°C$ $T_\infty = 15°C$ $k = 1\ W/m·C$ $T_o = 75°C$ $T_i = 15°C$ $b = 10cm$

Find: $h = ?$

$$Q_{cond} = Q_{conv}$$

$$\frac{T_i - T_o}{\frac{b}{kA} + \frac{1}{hA}} = hA(T_o - T_\infty)$$

$$\frac{130°C - 15°C}{\frac{.1}{1} + \frac{1}{h}} = h(75°C - 15°C)$$

$$60h\left(.1 + \frac{1}{h}\right) = 135$$

$$6h + 60 = 135$$

$$h = 12.5\ W/m^2·C$$