

HW #1

p458 Problem 44

Online - Heat Flow Through Rod

p458 - Problem

(3)

44) snow igloo hemisphere

r = 1.5m

thick = .36m

k = 1/2 ice = .218 W/m°C

H = ?

T<sub>out</sub> = -10°C

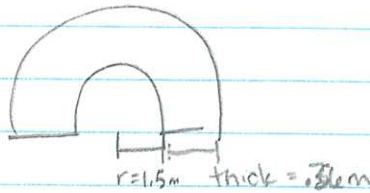
T<sub>in</sub> = 10°C

H =  $\frac{k A \Delta T}{L}$

=  $\frac{(.218 \frac{W}{m^\circ C}) \times 2\pi (1.5m)^2 (20^\circ C)}{.36m}$

A hemisphere =  $2\pi r^2$

H = 171 W



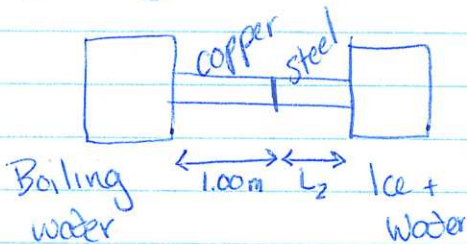
total ~~orig~~ r when use thickness of igloo too

r plus 1/2 thick

①

# - Online - Heat Flow through Sectional Rod

a) long rod



$$A_{\text{rod}} = 4.00\text{ cm}^2 = 4 \times 10^{-4}\text{ m}^2$$

$$T_{\text{junction}} = 65^\circ\text{C} \text{ when steady state}$$

$$K_{\text{copper}} = 385 \frac{\text{W}}{\text{mK}}$$

$$K_{\text{steel}} = 50.2 \frac{\text{W}}{\text{mK}}$$

Find boilwater to copper

$$H = \frac{Q}{\Delta t} = \frac{K A \Delta T}{L} = \frac{385 \frac{\text{W}}{\text{mK}} \left( \frac{4.00 \times 10^{-4}\text{ m}^2}{1.00\text{ m}} \right) (100^\circ\text{C} - 65^\circ\text{C})}{1.00\text{ m}}$$

$$= 5.39\text{ W}$$

b) length  $L_2$  steel (same heat flow)

$$A_{\text{rod}} = 4 \times 10^{-4}\text{ m}^2$$

$$T_{\text{junct}} = 65^\circ\text{C}$$

$$K_{\text{steel}} = 50.2 \text{ W/mK}$$

$$l = ?$$

$$H = \frac{K A \Delta T}{L}$$

$$L = \frac{K A \Delta T}{H}$$

$$= \frac{(50.2 \frac{\text{W}}{\text{mK}}) (4.00 \times 10^{-4}\text{ m}^2) (65^\circ\text{C} - 0^\circ\text{C})}{5.39\text{ W}}$$

$$= .242\text{ m}$$