Answer on Question #52578-Physics-Other

A heater is sphere 2 cm in diameter with an e= .6. How much heat does it give off in 1 hour if it is kept at 127C in a room at 18C?

Solution

The flow rate of heat radiation is

$$\frac{dQ}{dt} = esA(T_1^4 - T_2^4).$$

Thus,

$$Q = \frac{dQ}{dt}t = esA(T_1^4 - T_2^4)t$$
$$= 0.6 \cdot 5.67 \cdot 10^{-8} \frac{W}{(m^2 \cdot K^4)} \cdot \frac{4\pi(0.02)^2}{4}\Big(\big((127 + 273)\,K\big)^4 - \big((18 + 273)\,K\big)^4\Big)3600s$$
$$= 2836\,J.$$

Answer: $2836\,J$.