Answer on Question #73564, Physics / Molecular Physics | Thermodynamics

Question. A slab having a thickness of $4\ cm$ and measuring $25\ cm$ on a side has a $40\ °C$ temperature difference between its faces. How much heat flows through its per hour? $k = 0.0025\ \frac{cal}{(cm \cdot s \cdot °C)}$.

Given. $\Delta l = 4\ cm; S = 25 \times 25\ cm; \Delta T = 40\ °C; k = 0.0025\ \frac{cal}{(cm \cdot s \cdot °C)}; t = 3600\ s.$

Find. Q

Solution.

According to the equation of thermal conductivity

$$Q = k \cdot \frac{\Delta T}{\Delta l} \cdot S \cdot t$$

we have

$$Q = k \cdot \frac{\Delta T}{\Delta l} \cdot S \cdot t = 0.0025 \cdot \frac{40}{4} \cdot (25 \times 25) \cdot 3600 = 56.25\ kcal.$$

Answer. $Q = 56.25\ kcal.$