

Answer on Question #84965, Physics Other

The bulb and stem of a thermometer contains $V_0 = 0.50$ ml of mercury up to zero mark. If the length of a degree on a scale is $\Delta l = 0.30$ cm what is the cross sectional area of the bore? (Apparent cubic expansivity of the mercury in glass is $\beta = 1.5 \times 10^{-4}$ 1/K).

Solution:

The change in volume of mercury under change of temperature

$$\Delta V = V_0 \beta \Delta T$$

From the other side

$$\Delta V = A \Delta l$$

Thus, an area of the bore

$$A = \frac{\Delta V}{\Delta l} = \frac{V_0 \beta \Delta T}{\Delta l}$$
$$= \frac{0.50 \text{ cm}^3 \times 1.5 \times 10^{-4} \frac{1}{\text{K}} \times 1 \text{ K}}{0.30 \text{ cm}} = 2.5 \times 10^{-4} \text{ cm}^2 = 2.5 \times 10^{-2} \text{ mm}^2$$

Answer: $2.5 \times 10^{-4} \text{ cm}^2 = 2.5 \times 10^{-2} \text{ mm}^2$

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