Answer on Question #69988 Physics / Other

The length of the mercury column of a mercury thermometer are $l(t_1) = 1.06$ cm and $l(t_2) = 20.86$ cm respectively at the standard fixed points. What is the temperature of body, which produces $l = 7.0$ cm of this mercury column?

Solution:
The length of the mercury column is linear depend on temperature. So

$$l(t) = at + b$$

The standard fixed points are 0℃ and 100℃.

From the initial condition we find

$$\begin{cases} 1.06 = a \cdot 0℃ + b \\ 20.86 = a \cdot 100℃ + b \end{cases}$$

$$b = 1.06, \qquad a = \frac{20.86 - 1.06}{100} = 0.198$$

Therefore the length of the mercury column 7.0 cm correspond to the temperature

$$t = \frac{l - b}{a} = \frac{7.0 - 1.06}{0.198} = 30℃.$$

Answer: $t = 30℃$.

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