

**Answer on Question #72146-Physics-Other**

An iron rod is 1.58m long at 0°C. What must be the length of a brass rod at 0°C if the difference between the lengths of the two rods is to remain the same at all temperatures.

Linear expansivity of iron =  $1.2 \times 10^{-5} \text{ K}^{-1}$

Linear expansivity of brass =  $1.9 \times 10^{-5} \text{ K}^{-1}$

**Solution**

$$L_2 - L_1 = \text{const}$$

Thus,

$$\Delta L_2 = \Delta L_1$$

$$\alpha_2 \Delta T L_2 = \alpha_1 \Delta T L_1$$

$$\alpha_2 L_2 = \alpha_1 L_1$$

The length of a brass rod at 0°C is

$$L_2 = \frac{\alpha_1}{\alpha_2} L_1 = \frac{1.2 \cdot 10^{-5}}{1.9 \cdot 10^{-5}} 1.58 = 1.00 \text{ m.}$$

**Answer: 1.00 m.**

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