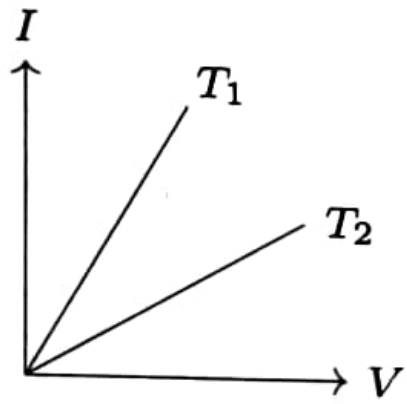
True False Type

Q. 02 The current-voltage graphs for a given metallic wire at two different temperatures T_1 and T_2 are shown in the figure. The temperature T_2 is greater than T_1.

(1985)



Sol. Let R_1 and R_2 be the resistances of the metallic wire at temperature T_1 and T_2, respectively. Ohm's law, $V = IR$, gives the slope of the I-V graph as $\mathrm{d}I/\mathrm{d}V = 1/R$. In the given graph, slope at T_1 is greater than the slope at T_2 i.e., $1/R_1 > 1/R_2$ or $R_1 < R_2$. The resistance of the metallic wire varies with the temperature as

$$R_1 = R_0(1 + \alpha(T_1 - T_0), \quad (1)$$

$$R_2 = R_0(1 + \alpha(T_2 - T_0), \quad (2)$$

where $\alpha > 0$ is the thermal coefficient of resistance and R_0 is the resistance at temperature T_0. Substitute R_1 and R_2 from equations (1) and (2) into the inequality $R_1 < R_2$ to get $T_1 < T_2$.

Ans. T ⊡