Answer on Question #48428-Physics-Molecular Physics-Thermodynamics

The temperature at which the tungsten filament of 12v and 36w lamp operates is 1730^0c. If the temperature coefficient of resistance of tungsten is 6 x 10^-3/k, find the resistance of the lamp at a room temperature of 20^0c

Solution

The resistance of the lamp at $1730℃$ is

$$R = \frac{V^2}{P} = \frac{(12\ \mathrm{V})^2}{36\ \mathrm{W}} = 4\ Ohm.$$

The resistance of the lamp at a room temperature of $20℃$ is

$$R_1 = R(1 + \alpha\Delta T) = 4(1 + 6 \cdot 10^{-3} \cdot (1730 - 20)) = 45 Ohm.$$

Answer: $45\ Ohm$.