



$L = 7\text{cm}$
diameter, d
Tungsten

Bulb dissipates 100W when the potential across the filament is $\Delta V = 120\text{V}$

So:

$$P = 100\text{W} = I^2 R = \frac{\Delta V^2}{R}$$

$$\text{So: } R = \frac{\Delta V^2}{P} = 144 \Omega$$

Now:

$$R = \frac{\rho L}{A} = \frac{\rho L}{\pi r^2}$$

$$\begin{aligned} \therefore r &= \sqrt{\frac{\rho L}{\pi R}} = 1.18 \times 10^{-5} \text{m} & \rho &= 9 \times 10^{-7} \Omega \cdot \text{m} \\ & & & \text{for Tungsten} \\ & & & = 11.8 \text{mm} \end{aligned}$$

$$\therefore \underline{d = 23.6 \mu\text{m}}$$