Q. 01 A uniform wire of length l and radius r has a resistance of $100\,\Omega$. It is recast into a wire of radius $\dfrac{r}{2}$. The resistance of new wire will be :

(a) $1600\,\Omega$ (b) $400\,\Omega$ (c) $200\,\Omega$ (d) $100\,\Omega$

1. **(a)** Given, $R_1 = 100\,\Omega$, $r' = r/2$, $R_2 = ?$

Resistivity of wire, $R = \dfrac{\rho l}{A}$ $\because$ Area $\times$ length $=$ volume

Hence, $R = \dfrac{\rho V}{A^2}$

Since, $\rho \rightarrow$ constant, $V \rightarrow$ constant

$R \propto \dfrac{1}{A^2}$

or $R \propto \dfrac{1}{r^4}$ $\because A = \pi r^2$

$\dfrac{R_2}{R_1} = 16 \Rightarrow R_2 = 16 \times 100 = 1600\,\Omega$, Resistance of new wire.