

Q.01 A uniform wire of length l and radius r has a resistance of 100Ω . It is recast into a wire of radius $\frac{r}{2}$. The resistance of new wire will be : **[Online April 9, 2017]**
(a) 1600Ω (b) 400Ω (c) 200Ω (d) 100Ω

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

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

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

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

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

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

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