17. When 5V potential difference is applied across a wire of length 0.1 m, the drift speed of electrons is 2.5×10^{-4} ms^{-1}. If the electron density in the wire is 8×10^{28} m^{-3}, the resistivity of the material is close to:

(1) 1.6×10^{-8} Ωm (2) 1.6×10^{-7} Ωm (3) 1.6×10^{-6} Ωm (4) 1.6×10^{-5} Ωm

Answer: we know that drift velocity and current are related by the formula

$i = neAV_d \rightarrow (1)$

$also\ i = \frac{V}{R}\ and\ R = \rho\frac{l}{A}$

$therefore\ i = \frac{VA}{\rho l}$

$putting\ in\ equation(1)\ we\ get\ \frac{VA}{\rho l} = neAV_d$

$or\ \rho = \frac{V}{lnev_d} = \frac{5}{0.1\times8\times10^{28}\times1.6\times10^{-19}\times2.5\times10^{-4}} = 1.5625 \times 10^{-5} \approx 1.6 \times 10^{-5}$ Ωm

Correct option is (4) 1.6×10^{-5} Ωm