

Q. 02 When 5V potential difference is applied across a wire of length 0.1 m, the drift speed of electrons is  $2.5 \times 10^{-4} \text{ ms}^{-1}$ . If the electron density in the wire is  $8 \times 10^{28} \text{ m}^{-3}$ , the resistivity of the material is close to : [2015]

- (a)  $1.6 \times 10^{-6} \Omega\text{m}$                       (b)  $1.6 \times 10^{-5} \Omega\text{m}$   
(c)  $1.6 \times 10^{-8} \Omega\text{m}$                       (d)  $1.6 \times 10^{-7} \Omega\text{m}$

2. (b)  $V = IR = (neAv_d)\rho \frac{\ell}{A}$

$$\therefore \rho = \frac{V}{V_d l n e}$$

Here V = potential difference

l = length of wire

n = no. of electrons per unit volume of conductor.

e = no. of electrons

Placing the value of above parameters we get resistivity

$$\rho = \frac{5}{8 \times 10^{28} \times 1.6 \times 10^{-19} \times 2.5 \times 10^{-4} \times 0.1}$$
$$= 1.6 \times 10^{-5} \Omega\text{m}$$