Silver has a density of 10.5 g/cm³ and an atomic mass of 108. Assume that silver has one free charge carrier per atom. If a silver wire of diameter 2.300 mm carries a current of 10.7 A, find

(a) the current density;
(b) the number of charge carriers per cubic meter for silver;
(c) the drift velocity.

\[ \mathbf{J} = \frac{I}{S} = \frac{\pi R^2}{\pi (\frac{D}{2})^2} = \frac{10.7}{\frac{3.14 \times (\frac{2.300 \times 10^{-3}}{2})^2}{2.300 \times 10^{-3}}} = 2.56 \times 10^6 \text{ A/m}^2 \]

\[ n = \frac{\rho V}{m} = 10.5 \text{ g/cm}^3 \times 1 \text{ m}^3 \times 10^6 \text{ cm}^3 / \text{m}^3 = 10.5 \times 10^6 \text{ g/cm}^3 \]

\[ n = \frac{1 \times 10^{-8}}{10^{-8}} \times 6.02 \times 10^{23} = 0.58 \times 10^{29} \]

\[ \mathbf{v} = \frac{n e \mathbf{J}}{\rho} = \frac{2.56 \times 10^6}{0.58 \times 10^{29} \times 1.6 \times 10^{-19}} = 2.76 \times 10^{-4} \text{ m/s} \]