18.12 (a) This portion of the problem asks that we calculate, for silver, the number of free electrons per cubic meter (*n*) given that there are 1.3 free electrons per silver atom, that the electrical conductivity is 6.8 x 10⁷ (Ω-m)⁻¹, and that the density (ρ'_{Ag}) is 10.5 g/cm³. (Note: in this discussion, the density of silver is represented by ρ'_{Ag} in order to avoid confusion with resistivity which is designated by ρ .) Since $n = 1.3N_{Ag}$, and N_{Ag} is defined in Equation 4.2 (and using the atomic weight of Ag found inside the front cover—viz 107.87 g/mol), then

$$n = 1.3N_{\text{Ag}} = 1.3 \left[\frac{\rho'_{\text{Ag}}N_{\text{A}}}{A_{\text{Ag}}} \right]$$
$$= 1.3 \left[\frac{(10.5 \text{ g/cm}^3)(6.023 \text{ x } 10^{23} \text{ atoms/mol})}{107.87 \text{ g/mol}} \right]$$
$$= 7.62 \text{ x } 10^{22} \text{ cm}^{-3} = 7.62 \text{ x } 10^{28} \text{ m}^{-3}$$

(b) Now we are asked to compute the electron mobility, μ_e . Using Equation 18.8

$$\mu_e = \frac{\sigma}{n \mid e \mid}$$

$$= \frac{6.8 \times 10^7 (\Omega - m)^{-1}}{(7.62 \times 10^{28} m^{-3})(1.602 \times 10^{-19} C)} = 5.57 \times 10^{-3} m^2/V - s$$

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