

12. We reproduce the calculation of Exercise 6: Combining Eqs. 42-2, 42-3 and 42-4, the number density of conduction electrons in gold is

$$n = \frac{(19.3 \text{ g/cm}^3)(6.02 \times 10^{23} / \text{mol})}{(197 \text{ g/mol})} = 5.90 \times 10^{22} \text{ cm}^{-3} = 59.0 \text{ nm}^{-3} .$$

Now, using the result of Exercise 3 in Chapter 39, Eq. 42-9 leads to

$$E_F = \frac{0.121(hc)^2}{(m_e c^2)} n^{2/3} = \frac{0.121(1240 \text{ eV} \cdot \text{nm})^2}{511 \times 10^3 \text{ eV}} (59.0 \text{ nm}^{-3})^{2/3} = 5.52 \text{ eV} .$$