25. (a) According to Appendix F the molar mass of silver is 107.870 g/mol and the density is 10.49 g/cm^3. The mass of a silver atom is

$$\frac{107.870 \times 10^{-3}\,\text{kg/mol}}{6.022 \times 10^{23}\,\text{mol}^{-1}} = 1.791 \times 10^{-25}\,\text{kg} .$$

We note that silver is monovalent, so there is one valence electron per atom (see Eq. 42-2). Thus, Eqs. 42-4 and 42-3 lead to

$$n = \frac{\rho}{M} = \frac{10.49 \times 10^3\,\text{kg/m}^3}{1.791 \times 10^{25}\,\text{kg}} = 5.86 \times 10^{28}\ \text{m}^{-3} .$$

(b) The Fermi energy is

$$\begin{aligned} E_F &= \frac{0.121h^2}{m}\, n^{2/3} = \frac{(0.121)(6.626 \times 10^{-34}\,\text{J·s})^2}{9.109 \times 10^{-31}\,\text{kg}}\,(5.86 \times 10^{28}\,\text{m}^{-3})^{2/3} \\ &= 8.80 \times 10^{-19}\,\text{J} = 5.49\ \text{eV} . \end{aligned}$$

(c) Since $E_F = \frac{1}{2}mv_F^2$,

$$v_F = \sqrt{\frac{2E_F}{m}} = \sqrt{\frac{2(8.80 \times 10^{-19}\,\text{J})}{9.109 \times 10^{-31}\,\text{kg}}} = 1.39 \times 10^6\ \text{m/s} .$$

(d) The de Broglie wavelength is

$$\lambda = \frac{h}{mv_F} = \frac{6.626 \times 10^{-34}\,\text{J·s}}{(9.109 \times 10^{-31}\,\text{kg})(1.39 \times 10^6\,\text{m/s})} = 5.23 \times 10^{-10}\ \text{m} .$$