

9.25 USING THE FACT THAT  $\left(\frac{N}{V}\right)_{Ag} = 5.86 \times 10^{28} \text{ m}^{-3}$ , FIND  
 a)  $E_F$  AND b)  $u_F$  FOR SILVER.

a) USING (9.42), THE FERMI ENERGY IS

$$\begin{aligned} E_F &= \frac{h^2}{8m} \left( \frac{3}{\pi} \frac{N}{L^3} \right)^{2/3} \\ &= \frac{(6.63 \times 10^{-34})^2}{8(9.11 \times 10^{-31})} \left( \frac{3}{\pi} 5.86 \times 10^{28} \right)^{2/3} \\ &= (6.031 \times 10^{-38}) (5.596 \times 10^{28})^{2/3} \end{aligned}$$

$$\boxed{E_F = 8.824 \times 10^{-19} \text{ J} = 5.51 \text{ eV}}$$

b) THE FERMI VELOCITY IS FOUND FROM

$$\begin{aligned} \frac{1}{2} m u_F^2 &= E_F \\ \Rightarrow u_F &= \sqrt{\frac{2E_F}{m}} = \sqrt{\frac{2(8.824 \times 10^{-19})}{9.11 \times 10^{-31}}} \end{aligned}$$

$$\boxed{u_F = 1.39 \times 10^6 \frac{\text{m}}{\text{s}}} \quad \underline{\underline{2,111!}}$$

$u_F = 0.46\% c$ , SO IT'S ALLOWED.

THE MB VELOCITY AT 300K IS

$$v_{\text{RMS}} = \sqrt{\frac{3kT}{m}} = \sqrt{\frac{3(1.38 \times 10^{-23})(300)}{9.11 \times 10^{-31}}}$$

$$\boxed{v_{\text{RMS}} = 1.17 \times 10^5 \frac{\text{m}}{\text{s}}} \quad \left( \text{SO MB STAYS FAR AWAY AT } \sim 0.1 v_F! \right)$$