1. $\rho = 10.5\ g/cm^3$, $M = 107.87\ g/mol$ $\quad n = \frac{N}{V} = \frac{mN_A}{MV} = \frac{\rho N_A}{M}$ $\quad \therefore E_F = \frac{\hbar^2}{2m_e}(3\pi^2 n)^{\frac{2}{3}} = 5.44\ eV$

$T_F = \frac{E_F}{k_B} = 6.31 \times 10^4 K$ $\quad k_F = (3n\pi^2)^{\frac{1}{3}} = 1.20 \times 10^{10}\ m^{-1}$ $\quad v_F = \frac{\hbar k_F}{m_e} = 1.38 \times 10^6\ m/s$

$S = \pi k_F^2 \sin\theta = 4.52 \times 10^{20} \sin\theta\ m^{-2}$ $\quad \rho_f(295K) = 1.61 \times 10^{-6}\ \Omega \cdot cm$ $\quad \rho_f(20K) = 0.038 \times 10^{-6}\ \Omega \cdot m$

$\therefore \sigma = \frac{1}{\rho_f} = \frac{ne^2\tau}{m_e}$ $\quad \bar{\lambda} = v_F \bar{\tau} = \frac{m_e v_F}{ne^2\rho_f}$ $\quad$ 当 $295K$, $\bar{\lambda} = 5.28 \times 10^{-8} m$ $\quad 20K$, $\bar{\lambda} = 2.60 \times 10^{-6} m$

2. $-\frac{e}{\hbar}\vec{E} \cdot \nabla_k f(\vec{k}) = -\frac{f - f_0}{\tau(\vec{k})}$ $\quad \therefore f = f_0 + \frac{e\tau}{\hbar}\vec{E} \cdot \nabla_k f_0(\vec{E}) = f_0\left(\vec{k} + \frac{e\tau}{\hbar}\vec{E}\right)$

3. 散射 $\vec{k}' - \vec{k} = \pm\vec{q} \pm \vec{G_n} = \pm q$ $\quad 2k_F \sin\frac{\theta_m}{2} = qD$

电子：$k_F = (3n\pi^2)^{\frac{1}{3}}$

声子：$qD = (6\pi^2 n)^{\frac{1}{3}}$ $\quad \sin\frac{\theta_m}{2} = 2^{-\frac{2}{3}}$，$\theta_m = 78.1°$