5) a) diffusive equil.: $\mu_1 = \mu_2$.

$$\mu_1 = \tau \log\left(\frac{n_1}{n_Q}\right) - e\phi$$

$$\mu_2 = \tau \log\left(\frac{n_2}{n_Q}\right)$$

$$\frac{n_1}{n_2} = \exp\left(\frac{e\phi}{\tau}\right) = \frac{N_1}{N_2}$$

$$\Rightarrow \frac{N_1}{N_1+N_2} = \left(1+\frac{N_2}{N_1}\right)^{-1} = \frac{1}{1+\exp\left(-\frac{e\phi}{\tau}\right)}$$

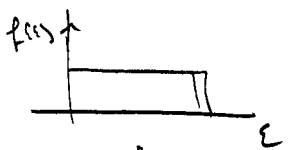
b) $$\frac{P_1}{P_2} = \frac{N_1}{N_2}$$

$$\Rightarrow \exp\left(\frac{e\phi}{\tau}\right) = 3$$

$$\Rightarrow e\phi = \tau \log(3).$$

6) a) $\tau \to 0 \Rightarrow$ slowed down less effectively, because only ~~water~~ particles with $\varepsilon_F - \varepsilon \geq \varepsilon_{water}$ can scatter.

b)



only particles around the ~~sur~~ fermi surface contribute.

$$N = \int_0^{p_F} p^2 dp \sim p_F^3$$

$$N_{fermi\text{-}surface} \sim p_F^2$$

$\Big\} \sim$ scales like $N^{2/3}$