Each bound state can at most contain a pair of electrons with anti-parallel spins, and the number of these bound states is $\frac{N}{2}$. When $T=0$, all the bound states are filled up and there are no free electrons. At low temperatures, some electrons are excited into the conduction band.

(a) $$D(\varepsilon) = \frac{4\pi}{(2\pi\hbar)^3}(2m)^{3/2}\sqrt{\varepsilon}$$

(b,c) The problem is the same as I.4. where $N_0 = \frac{N}{2}$ and $E_d = \varepsilon_0$

$$N_f = \sqrt{N 2\left(\frac{2\pi m T}{(2\pi\hbar)^3}\right)^{3/2}} e^{-\frac{E_d}{2T}}$$

$$\mu = \frac{T}{2}\ln\left[\frac{N}{2\left(\frac{2\pi m T}{(2\pi\hbar)^3}\right)^{3/2}}\right] - \frac{E_d}{2}$$