$$0 \leq E_D \leq \infty$$

$$P(E_D) = \frac{e^{-\beta E_D}}{Z}$$

$$Z = \int_0^\infty e^{-\beta E_D} \, dE_D = \left. \frac{e^{-\beta E_D}}{-\beta} \right|_0^\infty$$

$$= 1/\beta$$

$$P(E_D) = \beta e^{-\beta E_D}$$

$$\overline{E}_D = \int_0^\infty E_D \, P(E_D) \, dE_D$$

$$\frac{d}{d\beta} e^{-\beta E_D} = -E_D e^{-\beta E_D}$$

$$= \int_0^\infty \beta E_D \, e^{-\beta E_D} \, dE_D$$

$$= \beta \left(-\frac{d}{d\beta} \int_0^\infty e^{-\beta E_D} \, dE_D \right) = \beta \left(-\frac{d}{d\beta} 1/\beta \right)$$

$$= \beta \left(1/\beta^2 \right) = \frac{1}{\beta}$$

$$\overline{E}_D = \frac{1}{\beta} = k_B T$$

$$\beta = \frac{1}{k_B T}$$

$$\boxed{u_E = \frac{hc}{2L}}$$

$$T = \frac{1}{k_B \beta}$$

$$\boxed{u_T = u_E / k_B}$$

$$\bar{E}_D / u_E = \frac{k_B T}{u_E} = T^*$$

$$T^* = T / u_T$$

$$\bar{E}_D^* = T^*$$

$$P(E_D)\, dE_D = \beta e^{-\beta E_D} dE_D \, u_E / u_E$$

$$P(E_D^*)\, dE_D^* = \frac{1}{T^*} e^{-E_D^*/T^*} dE_D^*$$

$$\beta u_E = u_E / k_B T = \frac{1}{T/(u_E/k_B)} = \frac{1}{T^*}$$

$$\bar{E} = 1.2 \frac{4\pi L^2 T^3}{(hc)^2} k_B^3 \qquad u_E = \frac{hc}{2L}$$

$$\bar{E}^* = \frac{E}{u_E} = 1.2 k_B^3 \frac{4\pi L^2 T^3}{(hc)^2} \frac{2L}{hc}$$

$$= 1.2\pi \frac{T^3}{u_E^3 / k_B^3} = 1.2\pi T^{*3}$$

$$N(\varepsilon) = \frac{2\pi L^2}{(hc)^2} \frac{\varepsilon}{e^{\varepsilon/k_B T} - 1}$$

$$N(\varepsilon)\, d\varepsilon = N(\varepsilon^*)\, d\varepsilon^*$$

$$\varepsilon^* = \varepsilon / u_E \,, \quad u_E = \frac{hc}{2L}$$

$$N(\varepsilon)\, d\varepsilon = \frac{2\pi L^2}{(hc)^2} \frac{\varepsilon\, d\varepsilon}{e^{\varepsilon/k_B T} - 1} \frac{u_E^2}{u_E^2}$$

$$= \frac{\pi}{2} \frac{\varepsilon^* d\varepsilon^*}{e^{\varepsilon^*/T^*} - 1}$$