Exercise 1

An n-type semiconductor has a graded impurity concentration along the x-axis given by $N_d = 10^{22} - 10^{24}x$ per m$^3$. Find the electric field at $x = 0$ at room temperature.

(Ans. 2.6 V)

Exercise 2

(i) For the semiconductor in the above exercise, calculate the diffusion coefficient at 300 K if the electron mobility is 1500 cm$^2$/V-s. 
(ii) Calculate the diffusion current density. Explain the direction of diffusion current.
(Ans. (i) $3.9 \times 10^{-3}$ m$^2$/s (ii) 624 A/m$^2$)

(Hint: Use Einstein relation to find $D_n$)