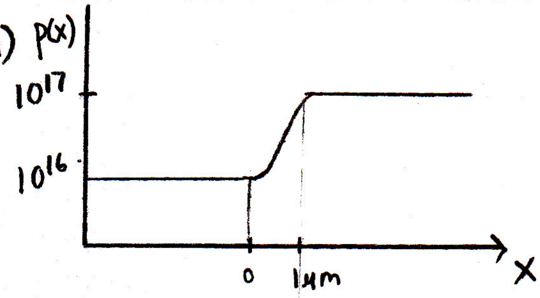
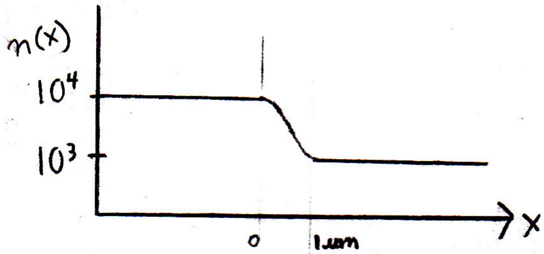
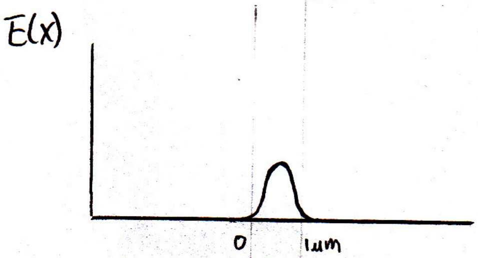
① $N_D = 0$ $N_A(x) = 10^{16}\,cm^{-3}$ for $x < 0$ $10^{17}\,cm^{-3}$ for $x > 1um$

a)

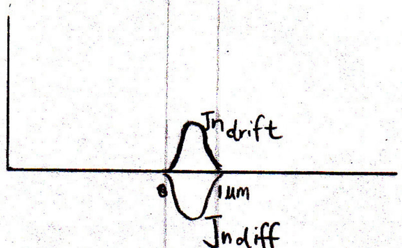




* $n(x)$ is very small compared with $p(x)$.

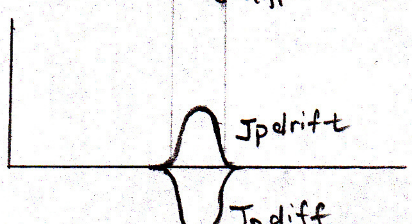


J_n



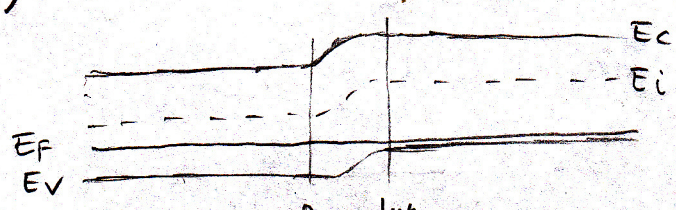
$J_{tot} = 0$

J_p



$J_{tot} = 0$

b)

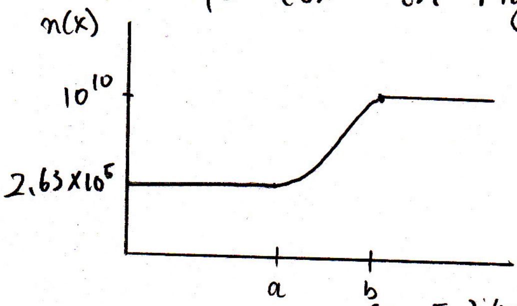


② a) $n(x) = N_c e^{(-(E_c - E_F)/KT)}$

$= 3.2 \times 10^{19} e^{((-(0.84)/0.0259)}$

$= 2.63 \times 10^{5}\ cm^{-3}$ on left side

$= 10^{10}\ cm^{-3}$ on right side

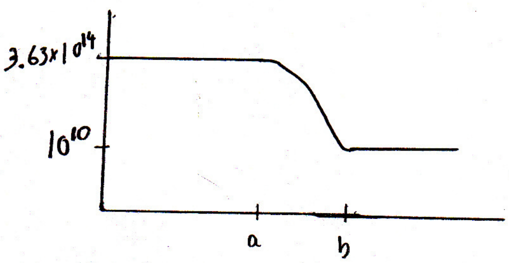


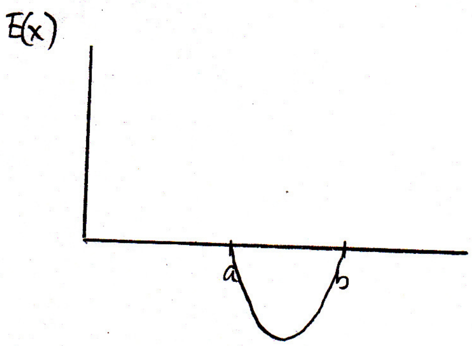
$p(x) = N_v e^{(-(E_F - E_v)/KT)}$

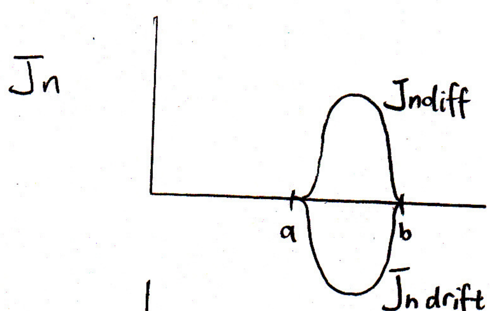
$= 1.8 \times 10^{19} e^{(-(0.28)/0.0259)}$

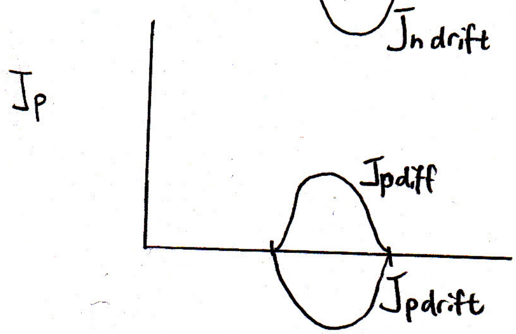
$= 3.63 \times 10^{14}\ cm^{-3}$ on left side

$= 10^{10}$ on right side









b) $N_A = p(x)$ on left

$= 3.63 \times 10^{14}\ cm^{-3}$

3) $n(x) = n_0 e^{-x/L_0}$

$n(x) = 10^{18} e^{-x/10^{-6}}$

$J_{ndrift} = q\mu_n \cdot n(x) \cdot \mathcal{E}(x)$

$= q\mu_n \cdot n(x) \frac{1}{q}\frac{dE}{dx}$

$J_{ndrift}(x) = \mu_n\left(\frac{-KT}{n}\right)\frac{dn}{dx} = -KT\mu_n\frac{dn}{dx}$

$= \frac{KT\mu_n}{L_0} n_0 e^{-x/L_0}$

4) From B.D. $E_c - E_F \simeq E_g/4$, constant.

$n(x) = N_c e^{(E_c-E_F)/(KT)}$

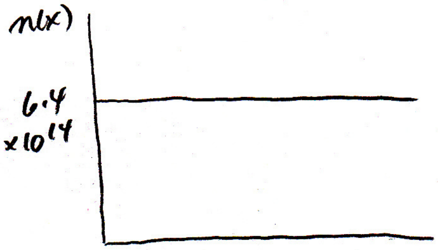
$= 3.2\times10^{19} e^{(-0.28)/0.0259}$

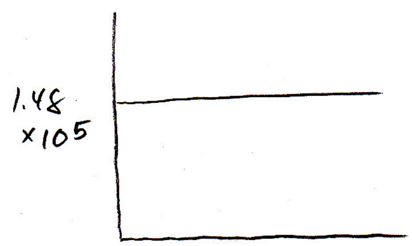
$= 6.457\times10^{14}\ cm^{-3}$

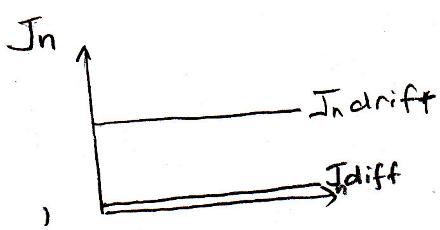
$p(x) = N_v e^{(E_v-E_F)/KT}$

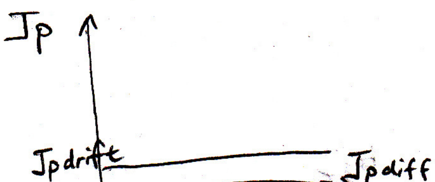
$= 1.8\times10^{19}\left(e^{-0.84/0.0259}\right)$

$= 1.48\times10^{5}\ cm^{-3}$









b) $N_D(x) \simeq n = 6.457\times10^{14}\ cm^{-3}$