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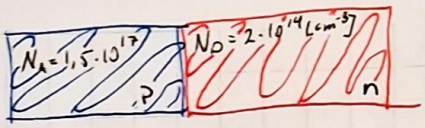
Tarea 1.-



a) $n_i^2 = 1,1 \cdot 10^{20} [cm^{-6}]$

Asumiendo ionización completa en el semiconductor:

$n_p + N_A = P_p \qquad n_i^2 = n_p P_p$

$1,1 \cdot 10^{20} = P_p^2 - N_A P_p \iff P_p^2 - N_A P_p - 1,1 \cdot 10^{20} = 0.$

$\iff P_p^2 - 1,5 \cdot 10^{17} P_p - 1,1 \cdot 10^{20} = 0.$

$P_p = \dfrac{1,5 \cdot 10^{17} \pm \sqrt{2,25 \cdot 10^{34} + 4,4 \cdot 10^{20}}}{2}$

$P_p \approx 1,5 \cdot 10^{17}.$ $\quad W_p = 0,73 \cdot 10^{3}.$

$n_p = 730$

Ahora con el del tipo N:

$n_n = P_n + N_D \qquad n_i^2 = n_n P_n$

$n_n - N_D = P_n \qquad 1,1 \cdot 10^{20} = n_n^2 - N_D n_n$

$n_n^2 - 2 \cdot 10^{14} n_n - 1,1 \cdot 10^{20} = 0$

$n_n \approx 2 \cdot 10^{14}$

$\dfrac{n_i^2}{n_n} = P_n \iff P_n = 0,55 \cdot 10^{6}.$

$V_T = \dfrac{K_B T}{q}$ donde: $K_B = 1,38 \cdot 10^{-23} \left[\frac{J}{K}\right]$

$q = 1,6 \cdot 10^{-19} [C].$

asumiendo $T = 300 [K].$ $\quad V_T = 25,85 [mV] \approx 26 [mV].$

$V_0 = V_T \ln\left(\dfrac{n_n}{n_p}\right)$

$= 26 \cdot 10^{-3} \ln\left(\dfrac{2 \cdot 10^{14}}{730}\right)$

$= 26 \cdot 10^{-3} \ln\left(2,739 \cdot 10^{11}\right)$

$= 26 \cdot 10^{-3} (1,007 + 25,33)$

$= 26 \cdot 10^{-3} (26,34)$

$= 684,72 \cdot 10^{-3} [V]$

$V_0 = 0,685 [V].$ //