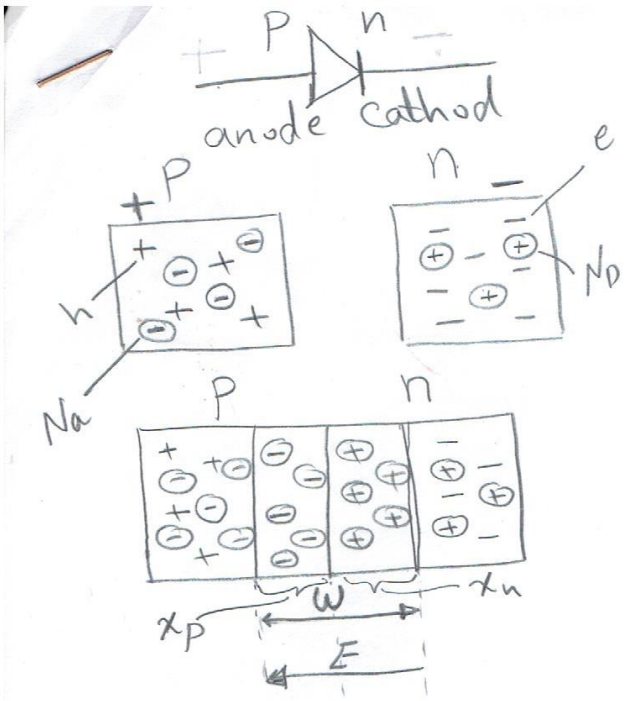


Zero applied bias

$$V_{bi} = \frac{KT}{e} \ln \frac{N_a N_d}{n_i^2}$$

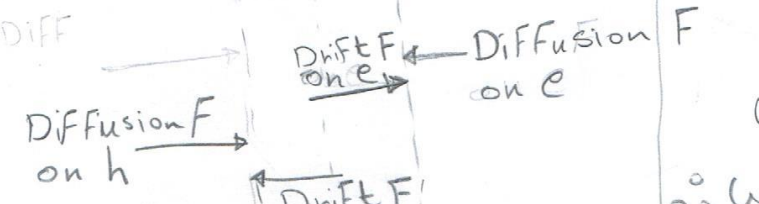
$$\mathcal{E}_{max} = \frac{-eN_d x_n}{\varepsilon_s} = \frac{-eN_a x_p}{\varepsilon_s}$$

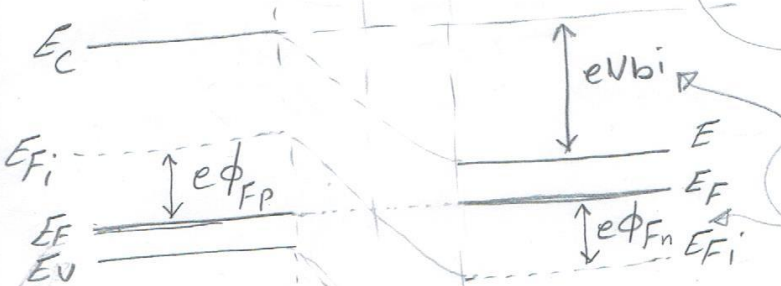
$$x_n = \left\{ \frac{2\varepsilon_s V_{bi}}{e} \left[\frac{N_a}{N_d} \right] \left[\frac{1}{N_a + N_d} \right] \right\}^{1/2}$$

$$x_p = \left\{ \frac{2\varepsilon_s V_{bi}}{e} \left[\frac{N_d}{N_a} \right] \left[\frac{1}{N_d + N_a} \right] \right\}^{1/2}$$

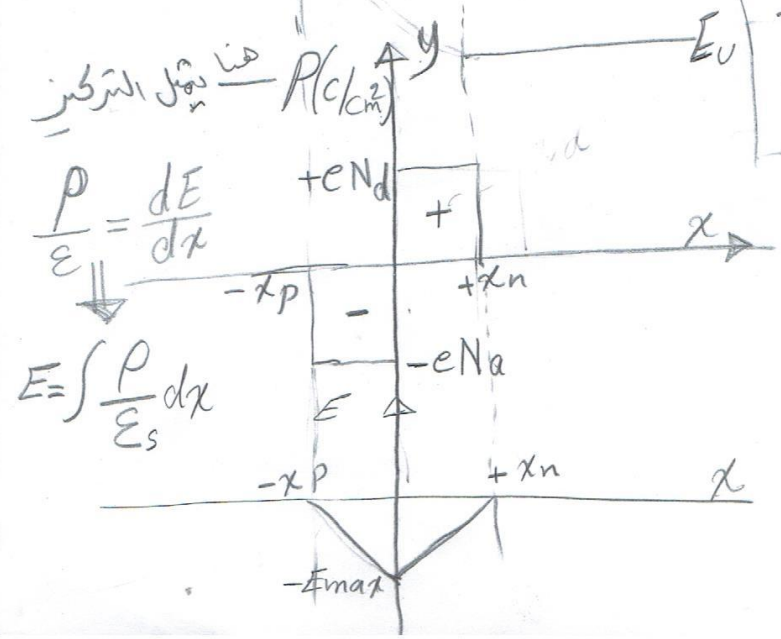
$$W = x_n + x_p$$

$$\therefore W = \left\{ \frac{2\varepsilon_s V_{bi}}{e} \left[\frac{N_a + N_d}{N_a N_d} \right] \right\}^{1/2}$$





$$V_{bi} = |\phi_{Fn} + \phi_{Fp}|$$



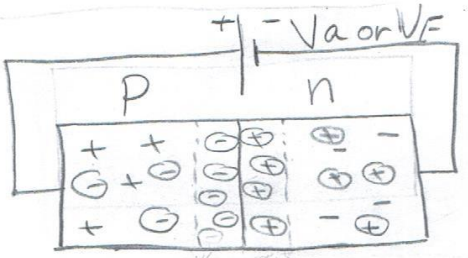
Thermal equilibrium

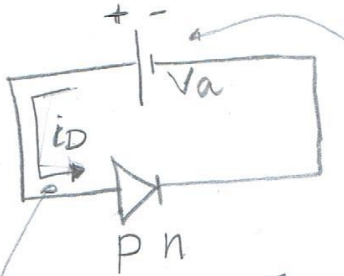
DiFFusion F = Drift F

$$\frac{\rho}{\varepsilon} = \frac{dE}{dx}$$

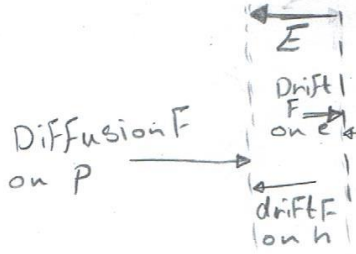
$$E = \int \frac{\rho}{\varepsilon_s} dx$$

Forward Bias

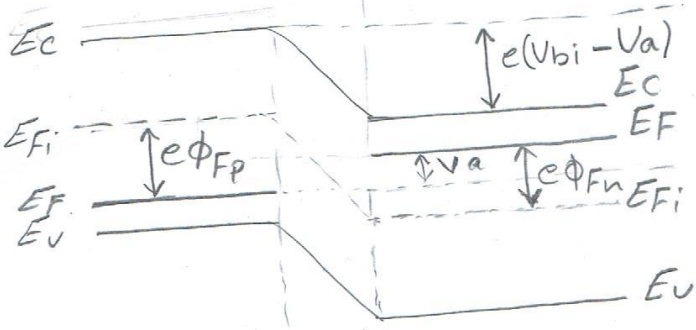


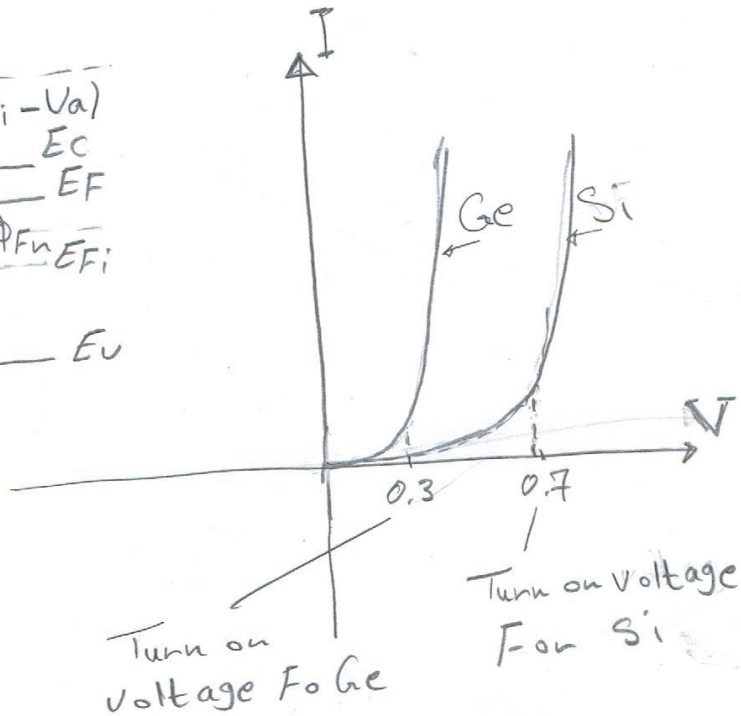


$$i_D = I = I_S\left[\exp\left(\frac{eV}{KT}\right) - 1\right]$$

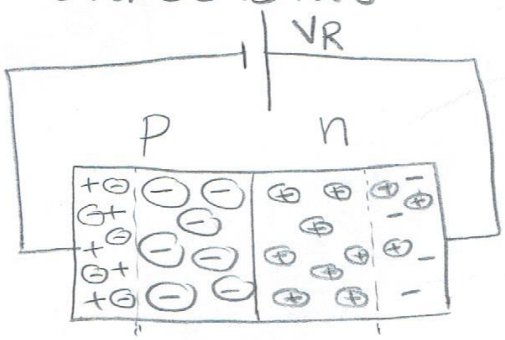


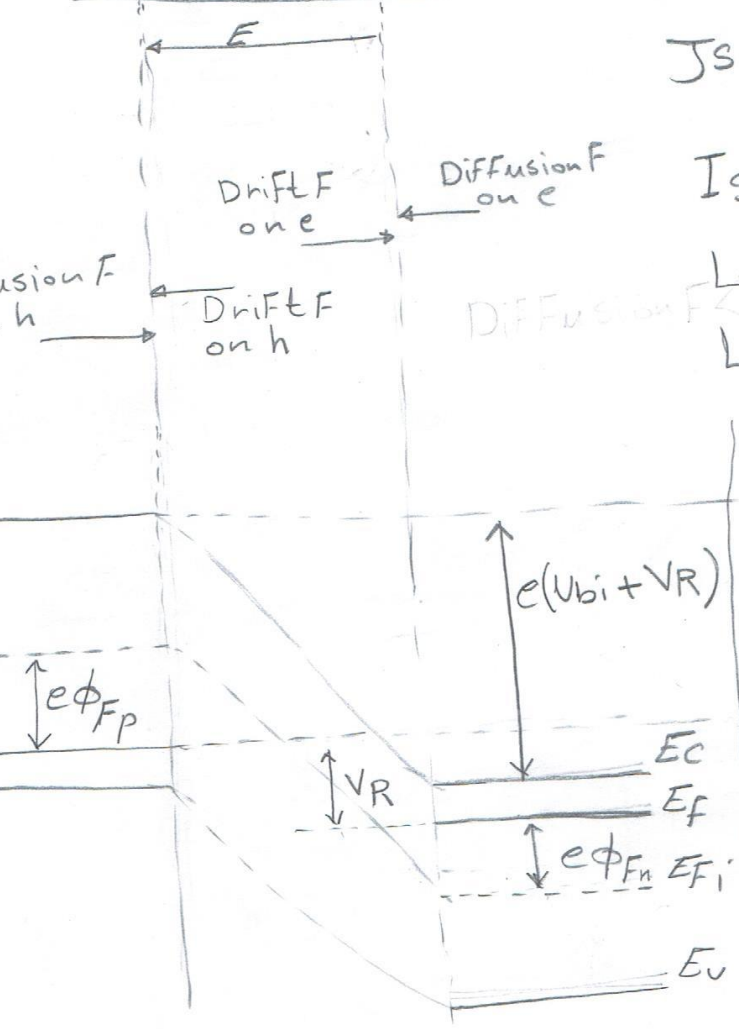
Diffusion F > Drift F

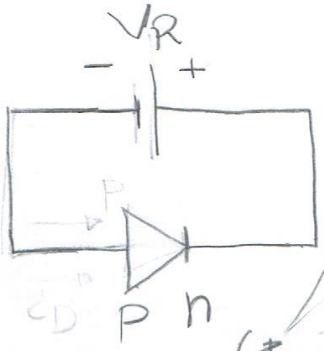




Reverse Bias







Called Saturation current or reverse current

(Is فقط)

$$J_S = e\left[\frac{D_p P_n}{L_p} + \frac{D_n n_p}{L_n}\right]$$

$$I_S = J_S * A$$

$$L_n = \sqrt{D_n \tau}$$

$$L_p = \sqrt{D_p \tau}$$

$$D = \frac{\mu}{39}$$

$$\text{or } D = \frac{kT}{e}\mu$$

$$W = \left\{\frac{2\varepsilon_s(V_{bi}+V_R)}{e}\left[\frac{N_a+N_d}{N_a N_d}\right]\right\}^{1/2}$$

V_{bi} = نفس القانون السابق

$$C' = \left\{\frac{2\varepsilon_s N_a N_d}{2(V_{bi}+V_R)(N_a+N_d)}\right\}^{1/2}$$

$$C' = \frac{\varepsilon_s}{W}$$

$C' \Rightarrow F/m^2$

$C = C' * A \Rightarrow F$