

# ECE 340: Quiz #2, V2

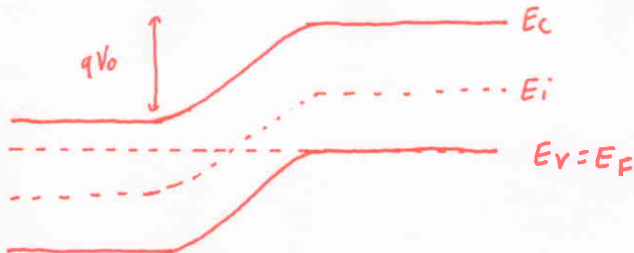
Name: Solution

1) Consider a N-P<sup>+</sup> junction shown below:

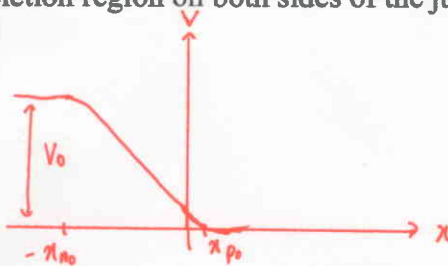


$P^+ \rightarrow E_v \approx E_F$   
 $N_0, n\text{-side} < N_A, p\text{-side}$

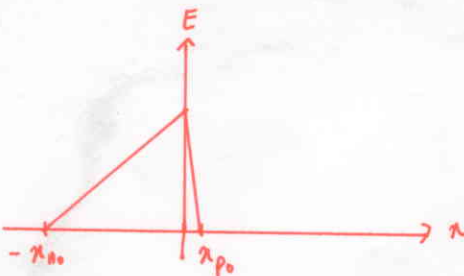
a) Draw the energy band diagram at equilibrium and indicate schematically the position of  $E_i$ ,  $E_F$ ,  $E_c$  and  $E_v$ . (4 points)







b) Sketch the junction potential and electric field, and indicate the relative extension of the depletion region on both sides of the junction. (2 points)



$N_A > N_D \rightarrow x_{n0} > x_{p0}$



c) Represent schematically the direction of the drift and diffusion electron and hole currents by an arrow and their relative magnitude by the length of the arrows. (4 points)

	Drift	Diffusion
Electrons		
Holes		

$$\left. \begin{array}{l} J_{n, \text{drift}} + J_{n, \text{diff}} = 0 \\ J_{p, \text{drift}} + J_{p, \text{diff}} = 0 \end{array} \right\} \text{equilibrium}$$

$$\left. \begin{array}{l} |J_{n, \text{drift}}| < |J_{p, \text{drift}}| \\ |J_{n, \text{diff}}| < |J_{p, \text{diff}}| \end{array} \right\} N_A > N_D$$

