PHYS 225 **Marie Lopez del Puerto**

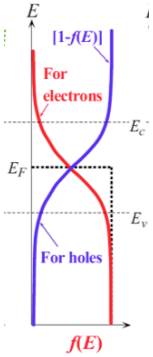
HW #26

1. a) What happens at the PN junction when an N-type and P-type semiconductor are joined (when no voltage is applied)? (check all that apply)

   Electrons near the junction move from the P to the N-type.
   Electrons near the junction move from the N to the P-type.
   Electrons near the junction do not move.

   b) If some electrons re-adjust at the PN junction by moving from one to the other, why don't all electrons move? That is, what stops them all from moving? (Hint, think about the forces acting on the electrons)

2. We defined the Fermi energy as the energy for which the average occupation is ½ (i.e. when f(E) = ½). For an intrinsic semiconductor, the Fermi energy lies in the middle of the gap:



   a) For an n-type semiconductor, is the Fermi energy in the middle of the gap, closer to the conduction band, or closer to the valence band? Explain your reasoning.
   b) For an p-type semiconductor, is the Fermi energy in the middle of the gap, closer to the conduction band, or closer to the valence band? Explain your reasoning.
   c) At relatively high temperatures, both donor and acceptor-doped semiconductors exhibit intrinsic behavior. Make a schematic plot of Fermi energy vs. temperature for an n-type semiconductor up to a temperature at which it becomes intrinsic.