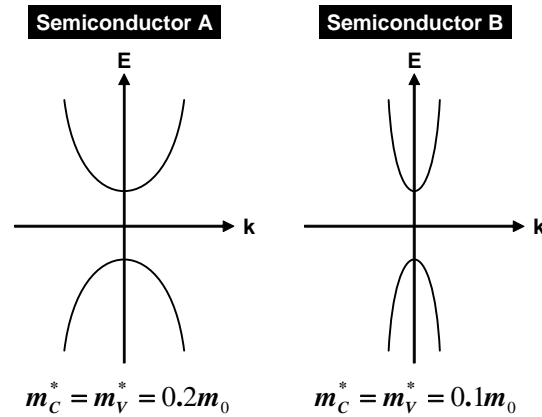


HW #3

Due October 3 (Tuesday) in class

1. Problem 9.6 in Chuang.
2. Consider two semiconductors with the following energy band diagrams:



Both semiconductors have the same bandgap energy (1 eV) and the same optical matrix elements.

- Which semiconductor has larger absorption coefficient for a photon energy of 1.1 eV? Explain your answer.
- If both semiconductors are forward biased such that the electron and hole concentrations are $N = P = 5 \times 10^{18} \text{ cm}^{-3}$, which semiconductor has a wider gain bandwidth? Explain your answer.
- In Part b), which semiconductor has higher peak gain at $T = 0 \text{ K}$? Explain your answer.
- Compare the bias voltages required to achieve the condition in Part b), which semiconductor requires larger forward bias? Explain your answer.