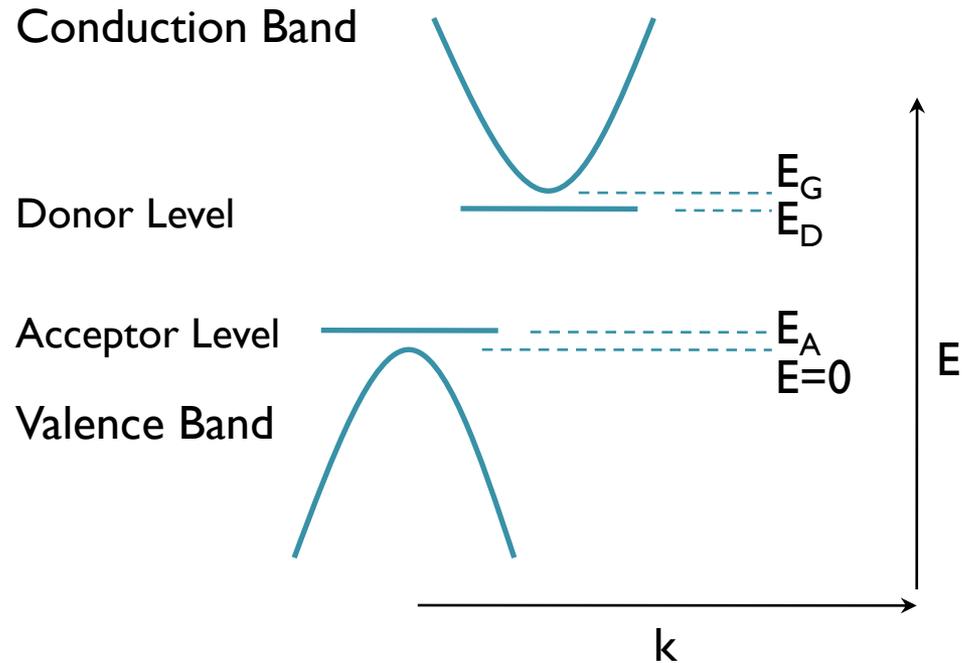


Charge Carrier Population (Extrinsic Semiconductors)

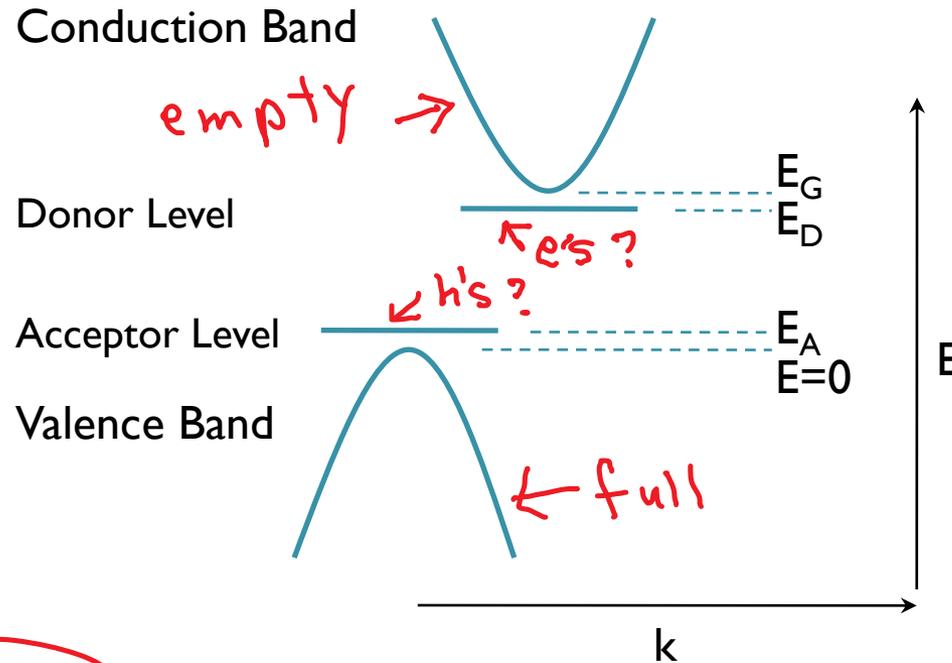


At $T = 0$

- Conduction Band A. is full B. is empty C. can have some electrons
- Valence Band is full
- Donors may have some electrons to spare, acceptors holes

Charge Carrier Population

(General) ← for intrinsic semiconductors as well for

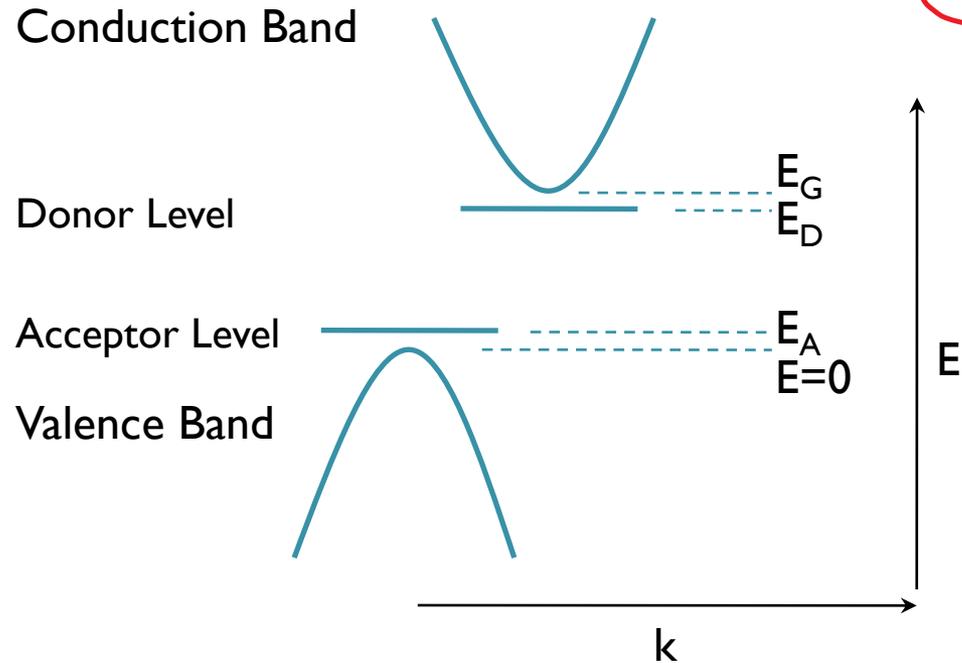


At $T = 0$

- Conduction Band is empty
- Valence Band is full
- Donors may have some electrons to spare, acceptors holes

Charge Carrier Population

- Where is Chemical Potential at T=0?

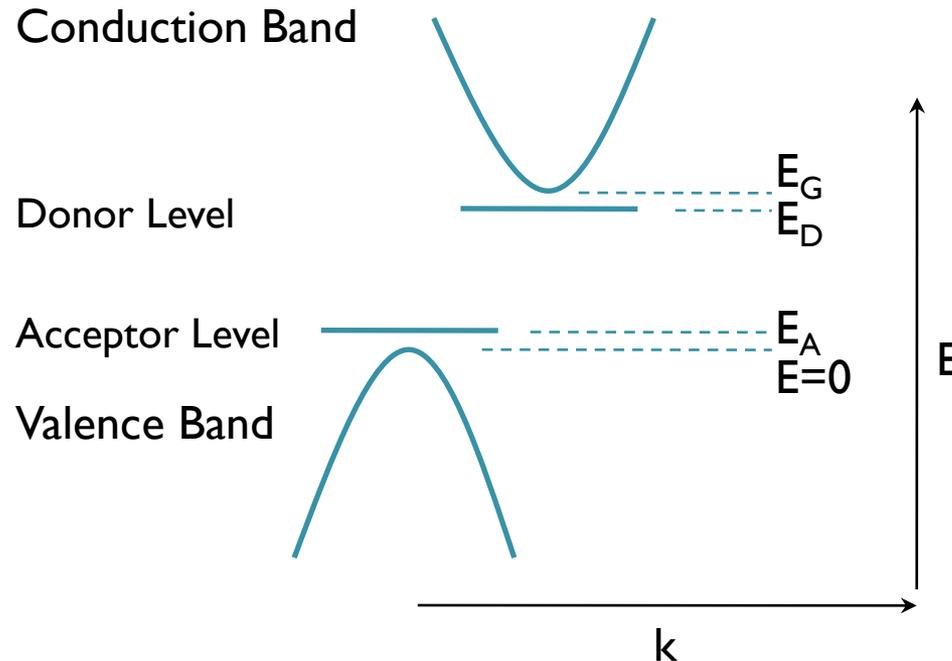


- Common n-type (More donors than acceptors; majority carriers are electrons from donors, and minority carriers are holes from acceptors):
A. $E_G/2$ B. E_D C. E_A
- Common p-type: E_A
- Pure n-type: A. $E_G/2$ B. E_D C. $(E_G+E_D)/2$
- Pure p-type: $E_A/2$
- Intrinsic: $E_G/2$

ANS on next page

Charge Carrier Population

- Where is Chemical Potential at T=0?



- Common n-type (More donors than acceptors; majority carriers are electrons from donors, and minority carriers are holes from acceptors): $E_G - E_D$
- Common p-type: E_A
- Pure n-type: $(E_G + E_D)/2$ ← UNCOMMON
- Pure p-type: $E_A/2$ ← UNCOMMON
- Intrinsic: $E_G/2$