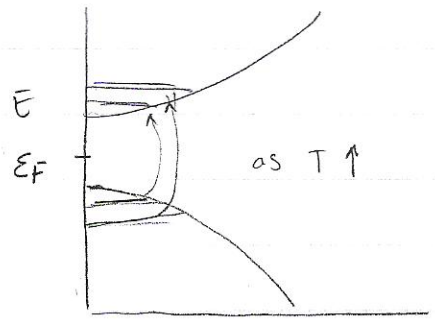
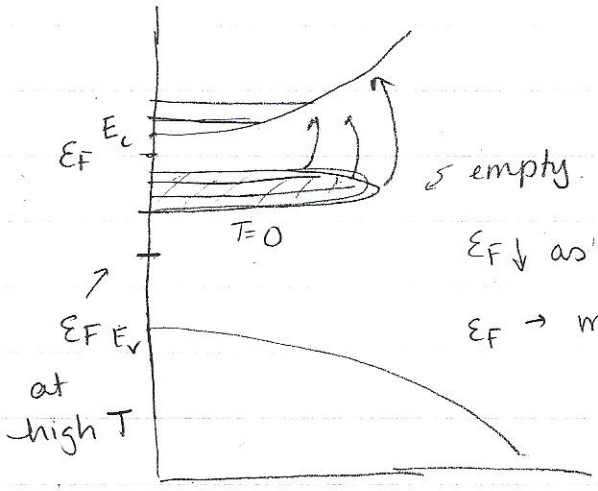
Intrinsic



$\varepsilon_F \neq f(T)$.

Extrinsic.

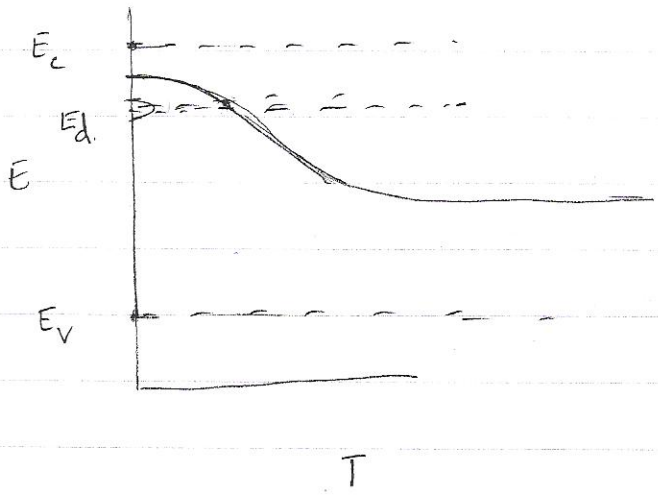


5 empty.

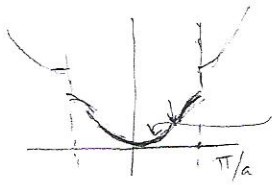
$\varepsilon_F \downarrow$ as T ↑

ε_F → middle of gap.

behaves as intrinsic.



Effective mass $\propto \left(\frac{d^2E}{dk^2}\right)^{-1}$



@ inflection, $\frac{d^2E}{dk^2} = 0$

$\Rightarrow m^* \to \infty$

past, $m^* < 0$

past π/a $m^* > 0$

Ionic conductors:

↙ ionic charge carriers.

again: $\sigma = \eta \, q \, \mu$

↖ ez — charge on the ion

previously evaluated $\underline{\underline{D}}$ diffusion coefficient

mass transport in response to chem drive force

now charge transpt in resp. to elect drive force

$\Rightarrow$ should be related

Can show:

$$\mu = \frac{ez \cdot D}{k_b T}$$

$$\Rightarrow \sigma = (ez) \cdot \eta \cdot \mu = \frac{(ez)^2 \cdot \eta \cdot D}{k_b \cdot T}$$

} requires some understanding of thermodynamics

Multiple charge carriers:

$$\sigma_{total} = \sum_i \sigma_i = \sum_i |ez_i| \, \eta_i \, \mu_i$$