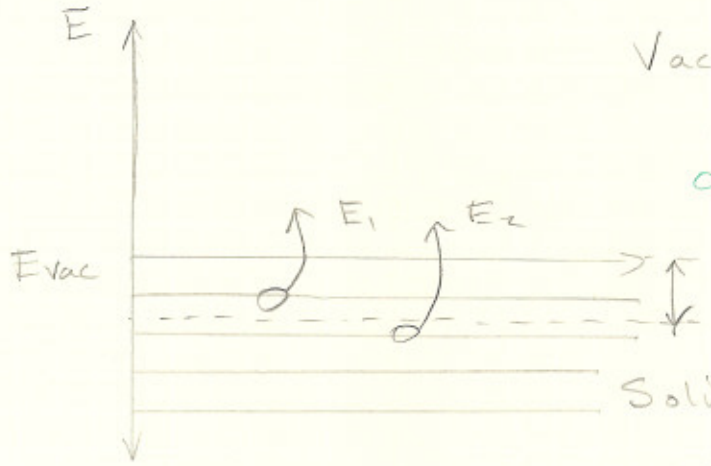
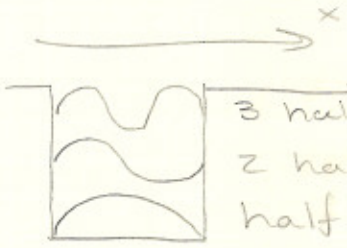


continuous value of energy for electron

the value of an electron has a discrete value.



discrete value of energy of electron in solid state.

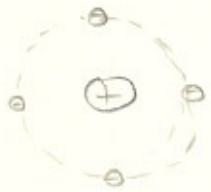
the electron can not take on a continous value.

it takes a specific ammount of energy to raise each electron to the vacuum energy level

since we have so many electrons in our solid state crystal, we use an average work function (ϕ) to express the

silicon crystal

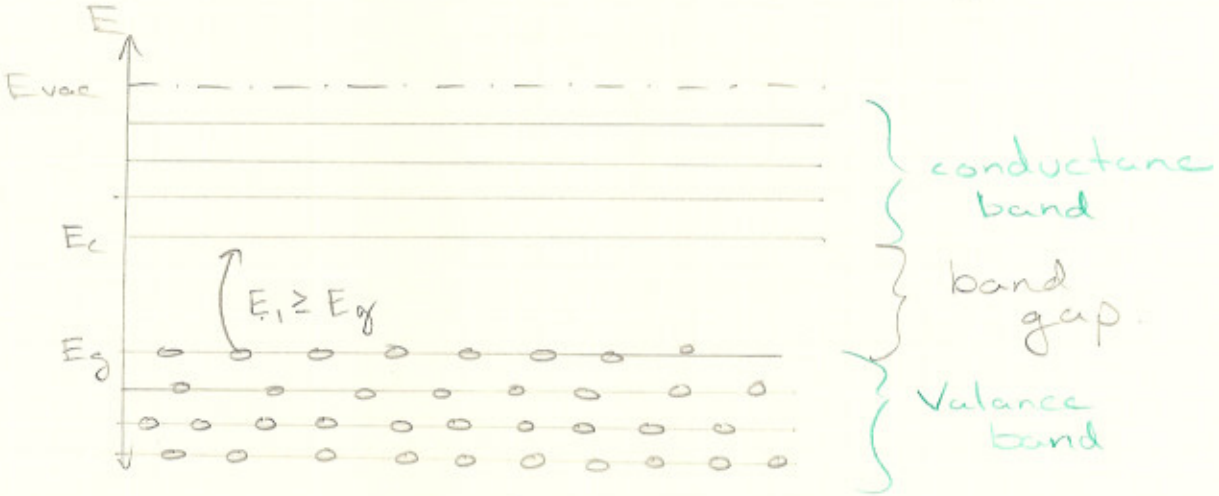
silicon atom



conductance band.

each cloud of electrons between 2 neuculi keeps the corisponding neuculi together.

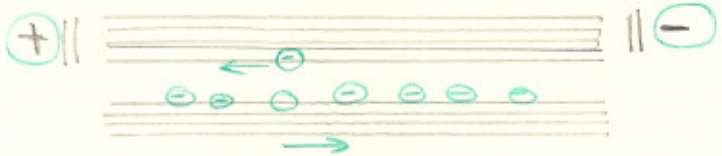
with semiconductors there is a bandgap.



there are usually many electrons in the valance band

in order for the electrons to go to the conductance band we must apply energy which must be greater then the energy band gap (E_g)

now we are interested in applying a voltage to the crystal.



the free seat/hole moves to the negative charge and the electron in the conductance band moves towards the positive particle.

$j_n = \sigma_n \mathcal{E}$

$j_p = \sigma_p \mathcal{E}$

$\sigma_n = q \cdot n \cdot (\mu_n)$

$\sigma_p = q \cdot p \cdot (\mu_p)$

$j = j_n + j_p$

$\mathcal{E}$ = electron feild strength

σ_n: electron conductivity.

σ_p: pole, conductivity.

j_n: drift current. (electrons)

j_p: drift current. (poles)

n: # of electrons.

q: electron charge.

$-\mu_n$: electron mobility.

usually the number of electrons is the same as number of poles.

$$n = p = n_i$$

$$\therefore \quad j = q n_i (\mu_p + \mu_n) \mathcal{E}$$