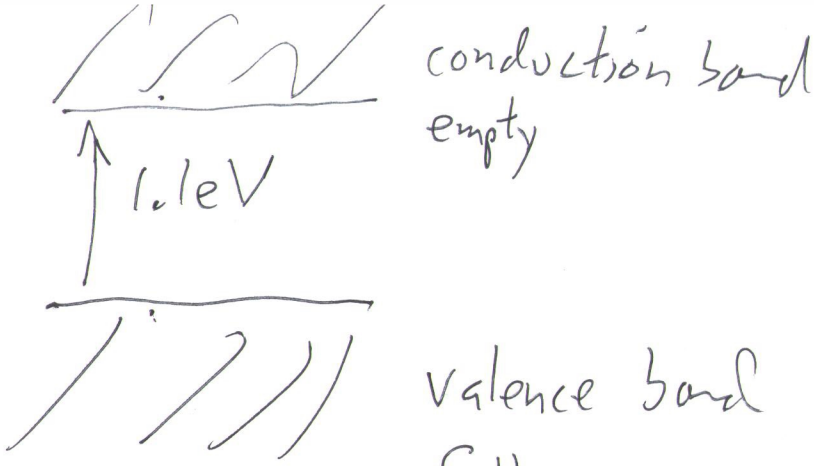
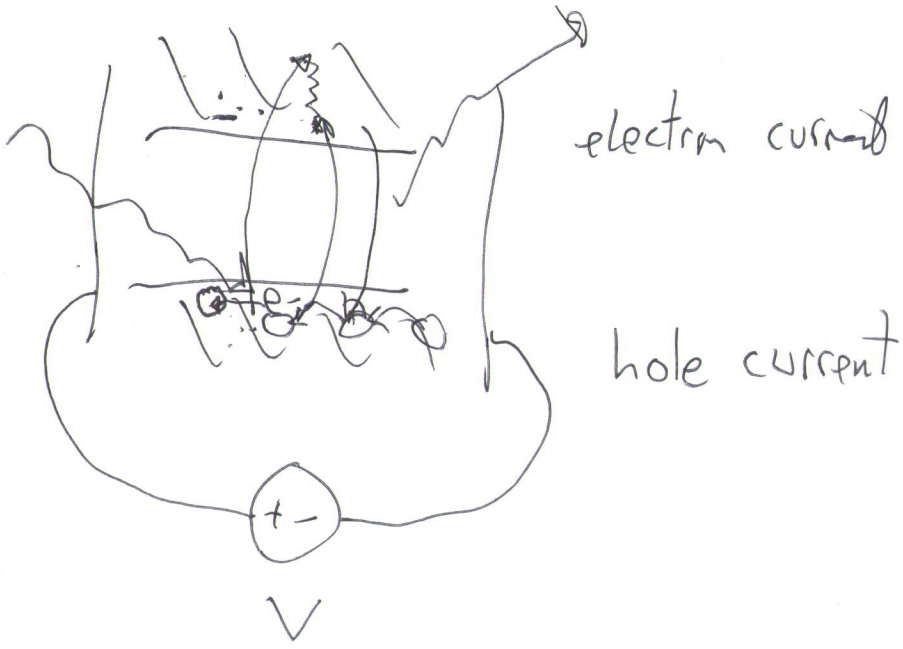
Oh After class 144 MA
quiet until 12:30 please!

Semiconductors

Electrons absorb & radiate photons

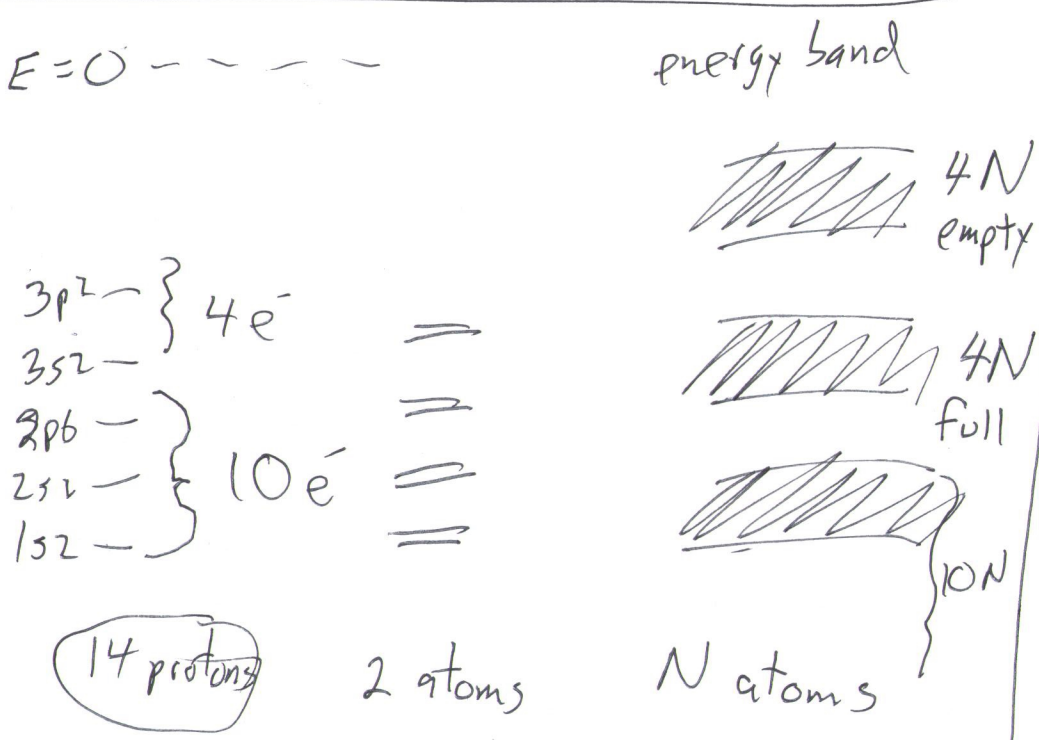
photon energy $E = h\nu = h\frac{c}{\lambda}$



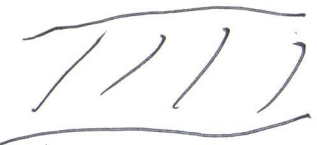


thermal excitation

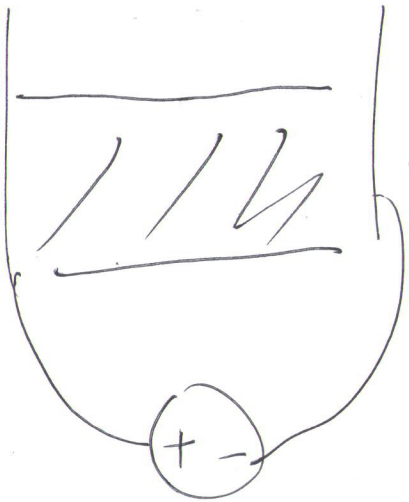
photon



contrast w/ metals

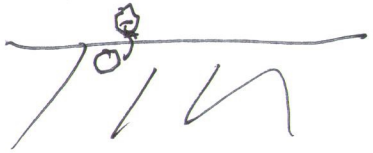


partly overlapping



← partly full

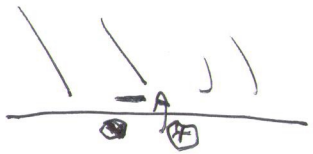
empty



full

Add boron
hole
positive conductor
p-type material

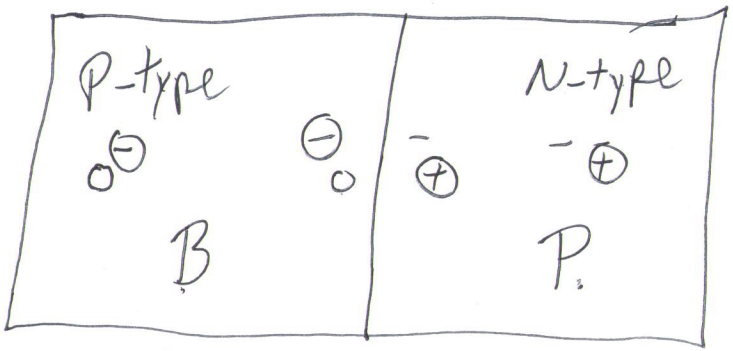
Doping

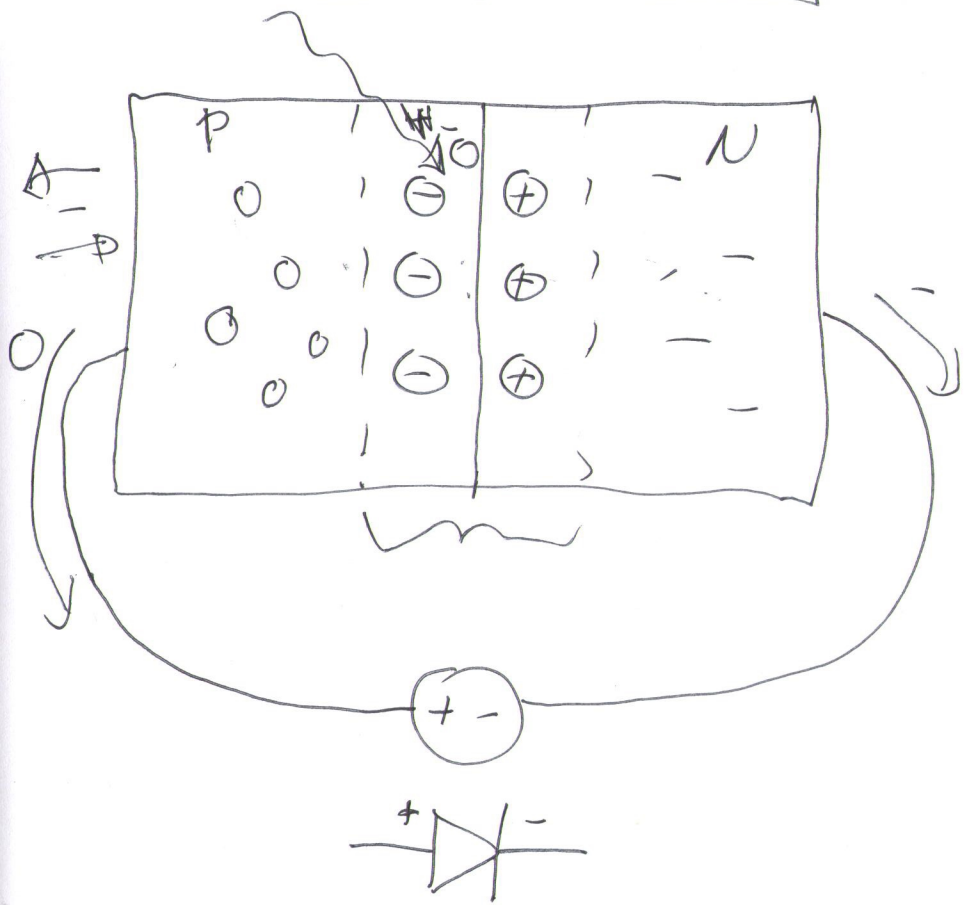


empty

full

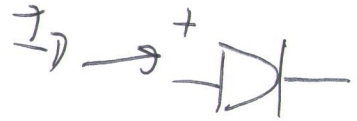
add phosphorous
negative conductor
N-type





positive voltage - reduces barrier
- big current

negative voltage - increases barrier
- no current



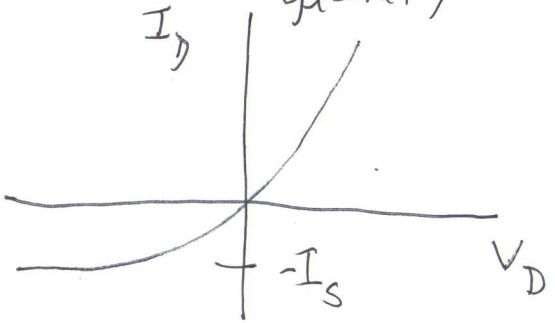
$$I_D = I_S\left(e^{V_D/V_{TH}} - 1\right)$$

I_S: materials geometry

$\frac{K_B T}{q}$ thermal voltage

$V_{TH} = 26\,mV$

10x increase in I_D for 60mV increase in V_D



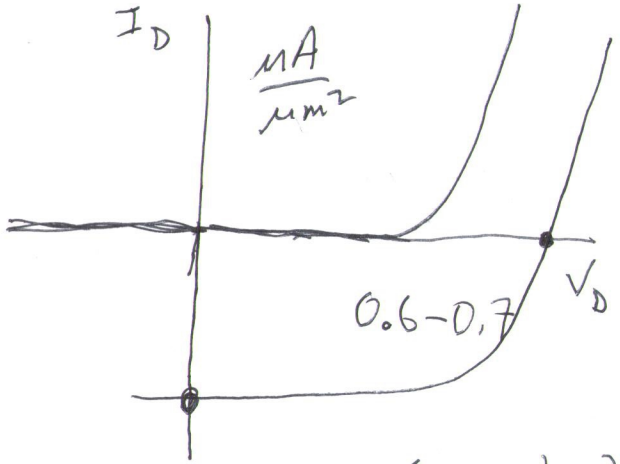
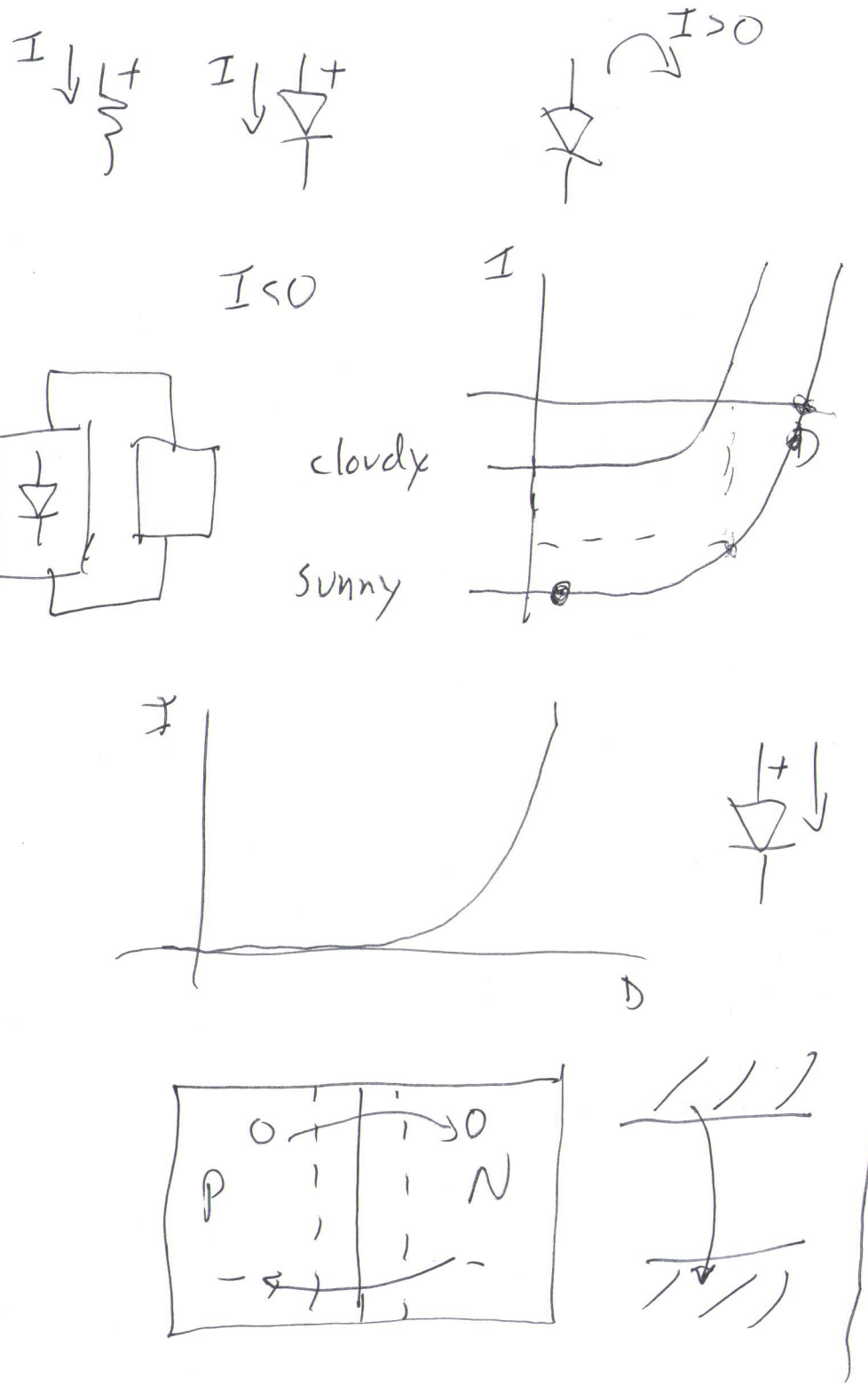
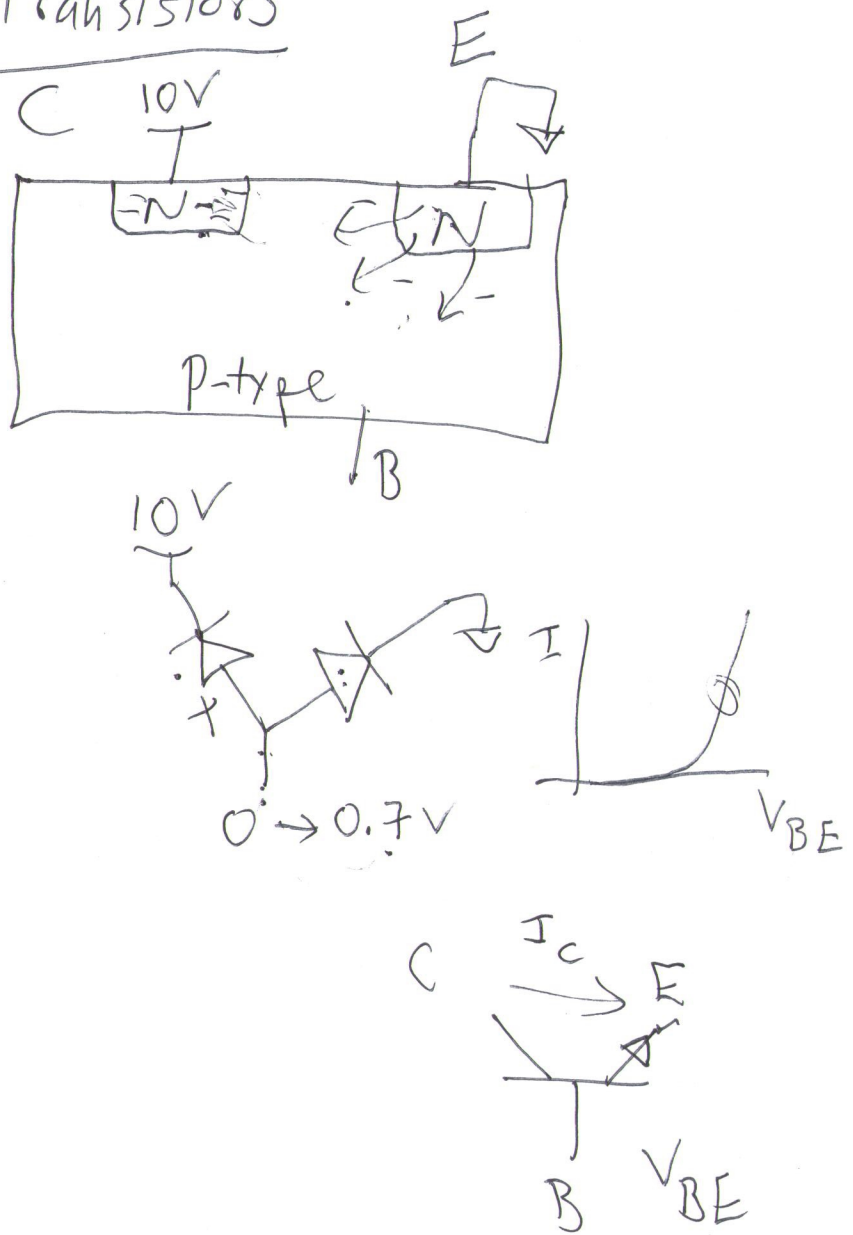
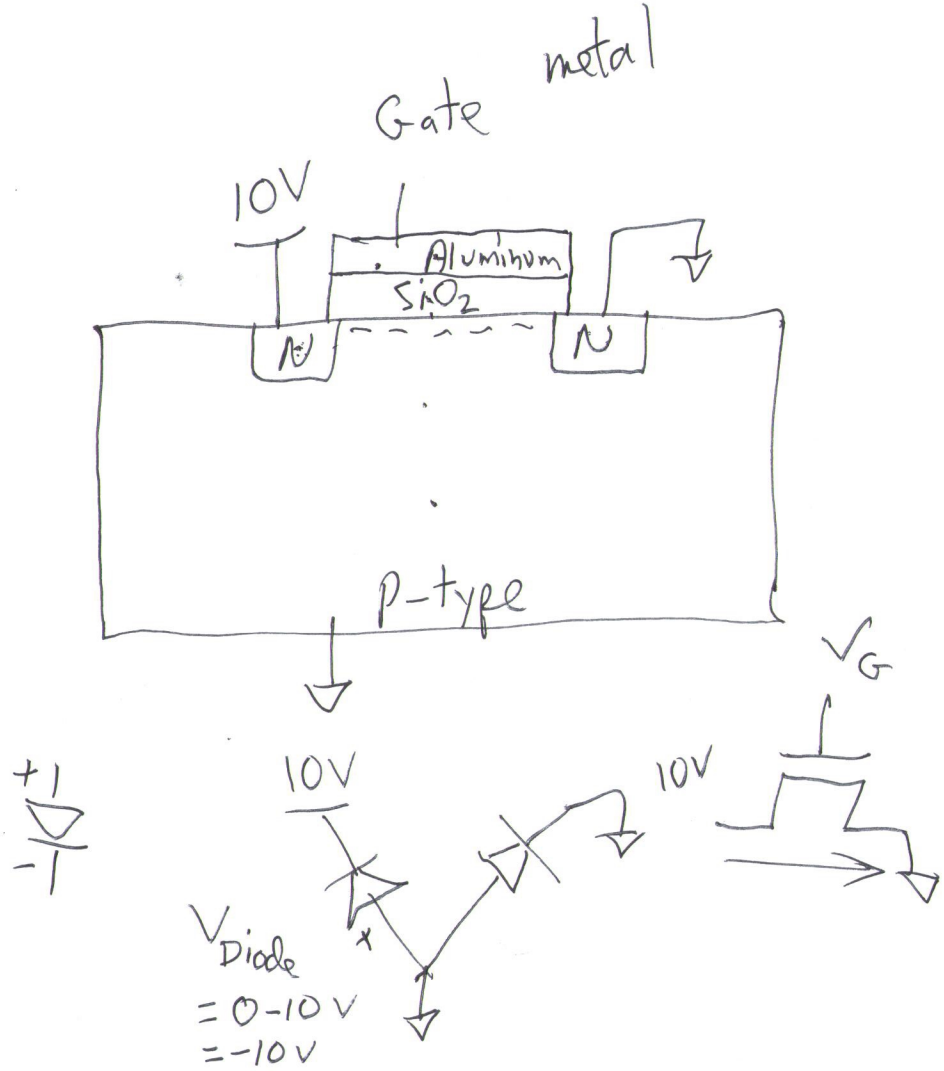


photo-induced (generated) current negative.



transistors





1925 Lilienfield

Fabrication