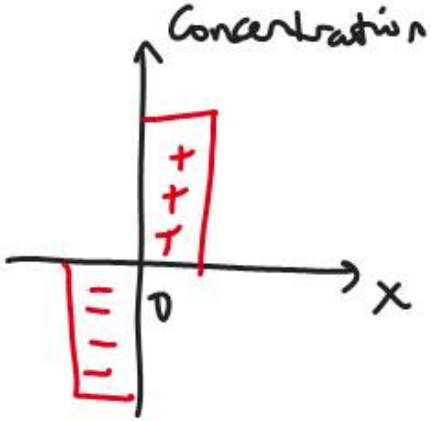
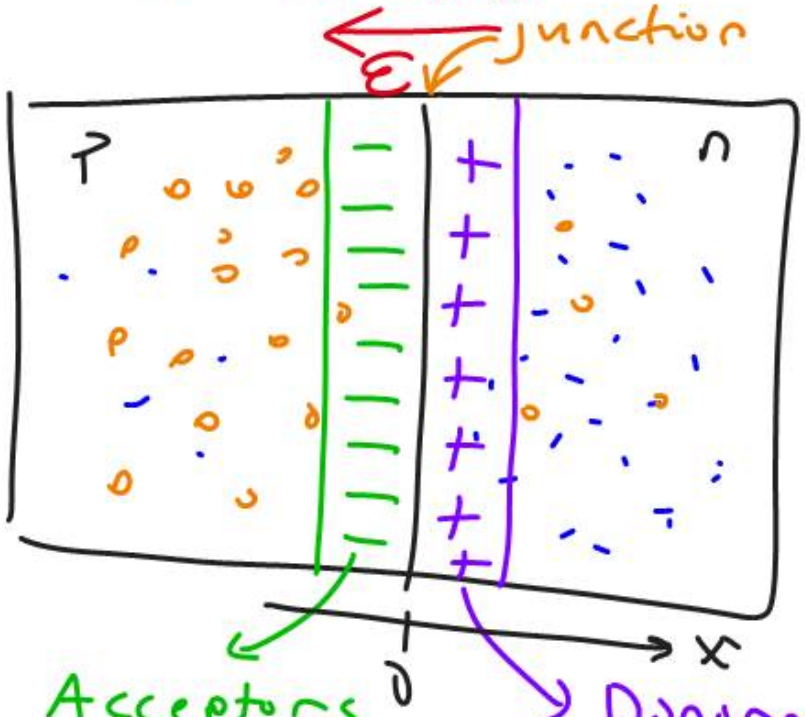
PN JUNCTION DIODE

21.02.2011





$\vec{\mathcal{E}}$

$\vec{F} = q(\vec{v} \times \vec{B} + \vec{\mathcal{E}})$

$\vec{F} = q\vec{\mathcal{E}}$

$q = 1.6 \times 10^{-19}\,C$

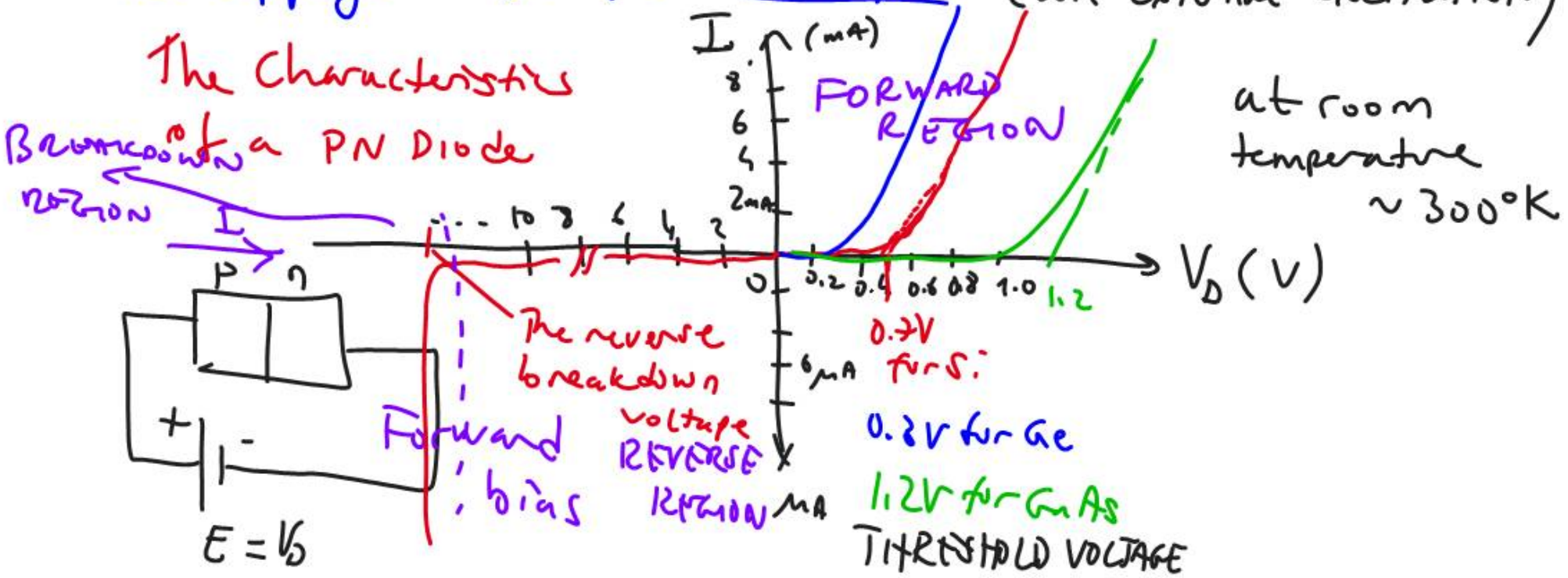
$F = -q\mathcal{E}$ for electrons → F_n

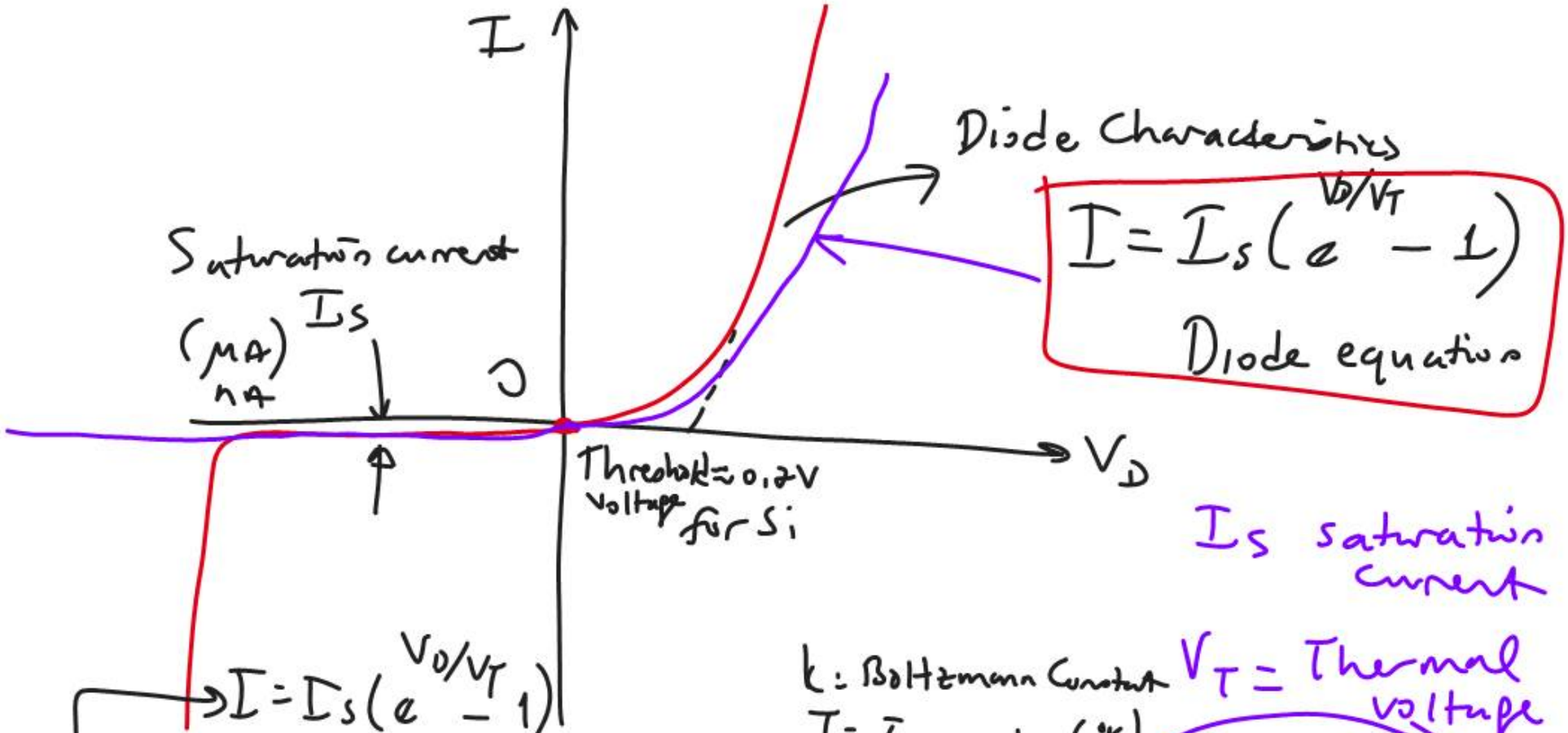
$F = q\mathcal{E}$ for holes ← F_p

form a space charge

If we have no output excitation there will be no carrier movement anymore when the built-in electric field ($\mathcal{E}$) is formed. No current passes.

To have current in a pn junction diode we have to apply a proper voltage (an external excitation)





I_s saturation current

V_T = Thermal voltage

$I = I_s(e^{V_D/V_T} - 1)$

k : Boltzmann Constant

T = Temperature (°K)

q = unit charge $(1.6 \times 10^{-19} C)$

$V_T = \frac{kT}{q}$

{ when $V_D = 0 \Rightarrow I = 0$

when $V_D < 0 \Rightarrow I \simeq -I_s$ at $T = 300\,°K$

$V_T = 26\,mV$