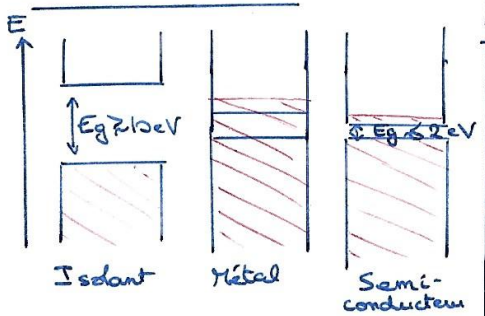
MP 18 : Semi-conducteurs

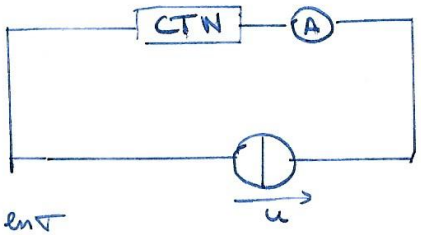
Introduction :

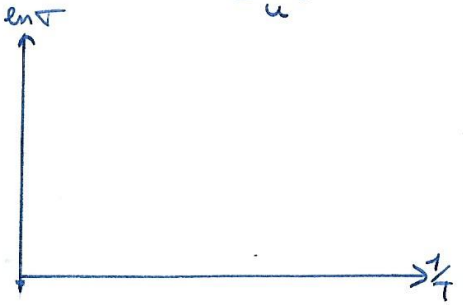


I Semi-conducteur pur :

la CTN

$$\nabla \sim e^{-\frac{E_g}{2k_B T}}$$





$\frac{E_g}{2k_B} =$ ± K

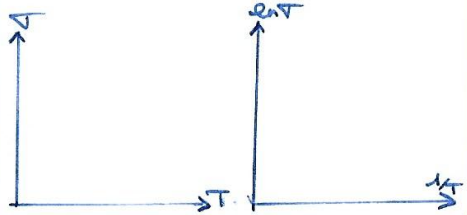
$\Rightarrow E_g =$ ± eV

$E_g > k_B T_{amb} = 25\,meV$

$\Rightarrow$ Dopage

II Semi-conducteur dopé

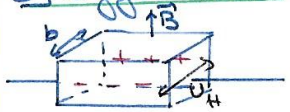
A] Conductivité



Saturation extrinsèque

Insaturation intrinsèque

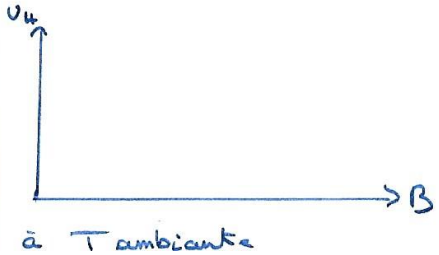
B] Effet Hall



$$U_H = \frac{i}{n_p . q . b} B$$

n_p : nombre de porteurs

q : leur charge



à T ambiante

$\Rightarrow \frac{c}{n_p q b} =$ ± $V.T^{-1}$

$\Rightarrow n_p =$ ± m^{-3}

avec

$$\nabla_{np} = \sqrt{\left(\frac{1}{qb\,pente}\right)^2 \nabla_I^2 + \left(\frac{I}{qb^2\,pente}\right)^2 \nabla_b^2 + \left(\frac{I}{qb\,pente^2}\nabla_{pente}\right)^2}$$

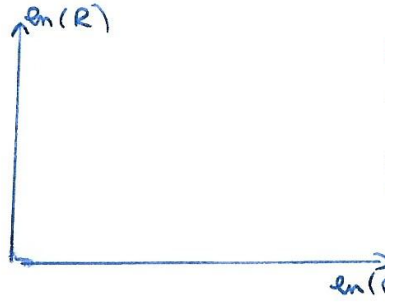
Influence de ∇ :

$\mu_H \propto (n \mu_{e^-}^2 - p \mu_{trou}^2)$

$\Rightarrow$ On retrouve le changement de régime

III Applications

A] Photoresistance



B] La diode laser

$\lambda =$ ± nm

$E_g = \frac{hc}{\lambda}$

$=$ ± eV