ELETTRONICA ANALOGICA 24/03/2020

POTENZA REGIME SINUSOIDALE

$$V(t) = V \sin(\omega t) \qquad I(t) = I \sin(\omega t + \varphi)$$

$\sin(\alpha+\beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$

(cc $P = V \cdot I$)

$$p(t) = V(t) \cdot I(t) = V I \sin(\omega t) \cdot \sin(\omega t + \varphi)$$

$$p(t) = V I \left[\sin^2(\omega t)\cos\varphi + \sin(\omega t)\cos(\omega t)\sin\varphi \right]$$

$$P_m = \frac{1}{T}\int_0^T p(t)\,dt$$

$$P_m \cdot t = E$$

$$= V \cdot I \left[\int_0^T \sin^2(\omega t)\cos\varphi\,dt + \int_0^T \sin(\omega t)\cos(\omega t)\sin\varphi\,dt \right]$$

$= 0$ scambio energia Reattori L, C.

$$P_m \propto \cos\varphi$$

$$\cos\varphi = \frac{R}{|Z|}$$

$P = R i^2$

$S = |V \cdot I|$ Potenza apparente

↳ P dissipata ⇒ R

Q scambiata ⇒ L, C

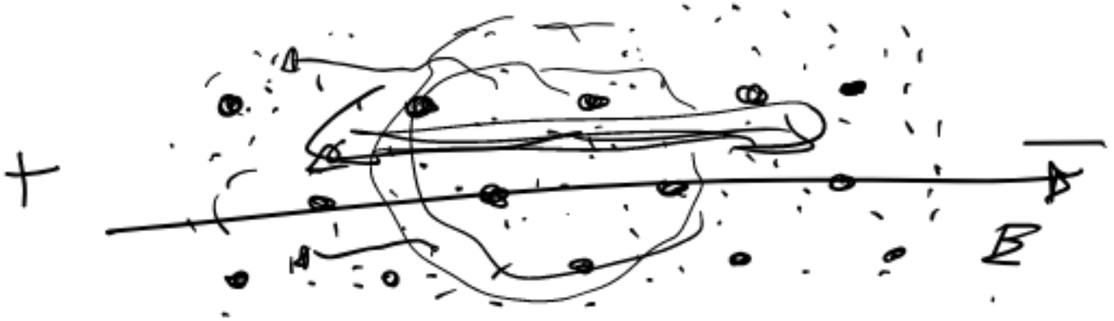
Gen ⇒ L, C

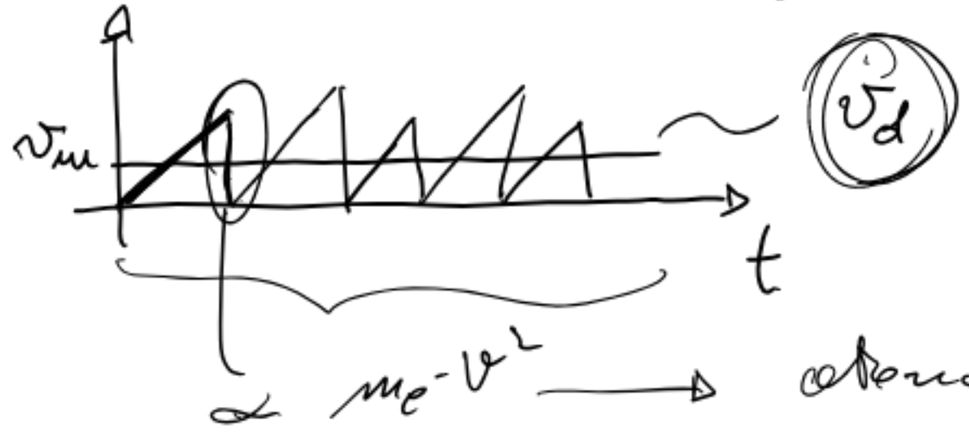
} Potenza impegnata ciclo / immagazzinata

SEMICONDUTTORI

CONDUTTORI : e^- banda conduzione = **LIBERI**

MODELLO GAS e^-





$\vec{v}_d$

$E = cost$

$\propto m_e \cdot v^2$ ⟶ aborsi ⟶ aumento T ⟹ $P = RI^2$

$(R(T) \nearrow T)$ e^-

$n = 10^{28}\ e^-/m^3$

ISOLANTI : No e^- liberi $\quad n = 10^{7}\ e^-/m^3$

SEMICONDUTTORI

ρ

$\rho_{ISO} < \rho_{SEMI} < \rho_{COND}$

e^- NON LIBERI

e^- VALENZA

e^- LIBERI

Si / Ge

Si STRUTTURA CRISTALLINA TETRAVALENTE

$T \simeq 0\ K$

R T

ISOLANTE

LEGAME COVALENTE

$\bar{e}_{LIBERO}$

$T \simeq$ ambiente.

CONDUTTORE

LACUNA

COPPIE $\bar{e}$ - LACUNA

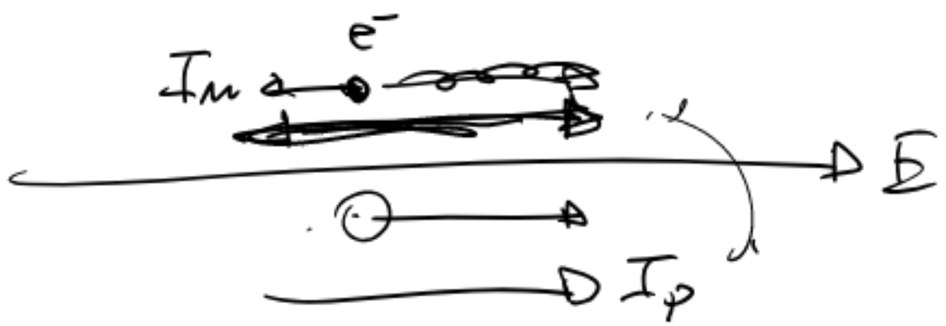
T aumenta $\Rightarrow$ aumenta conduttività

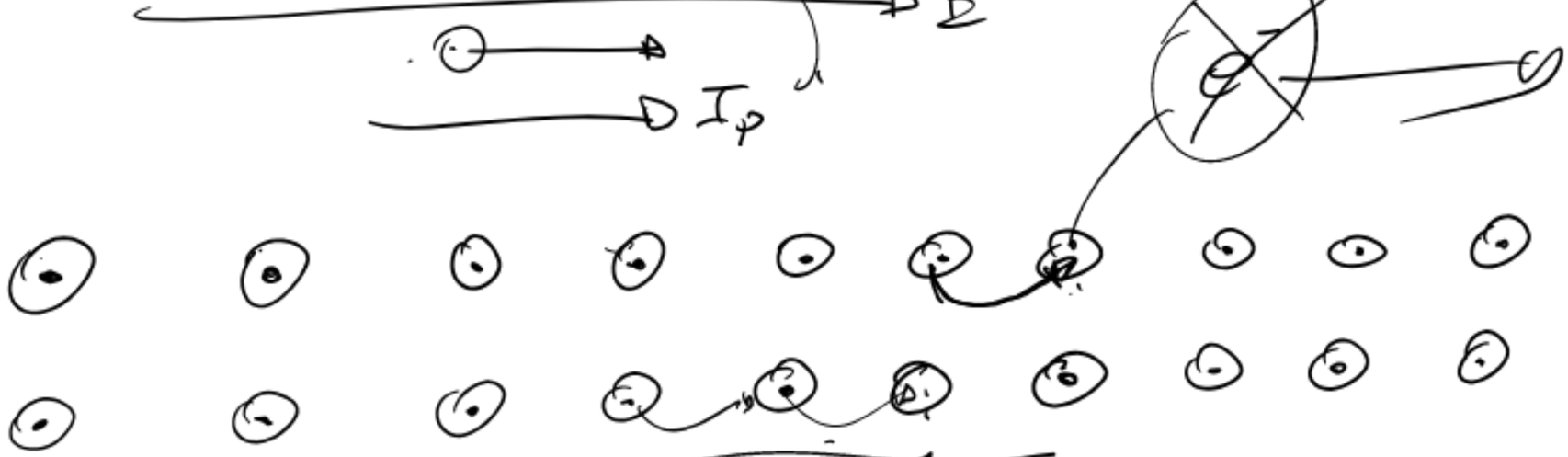
e^- ⇒ portatore carico ⇒ corrente el. I_n ⇒ (n) (5)

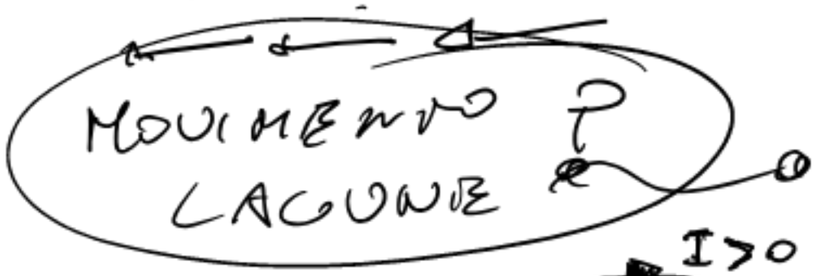
LACUNA → p ⇒ portatore carico + ⇒ corrente el I_p ⇒ (p)

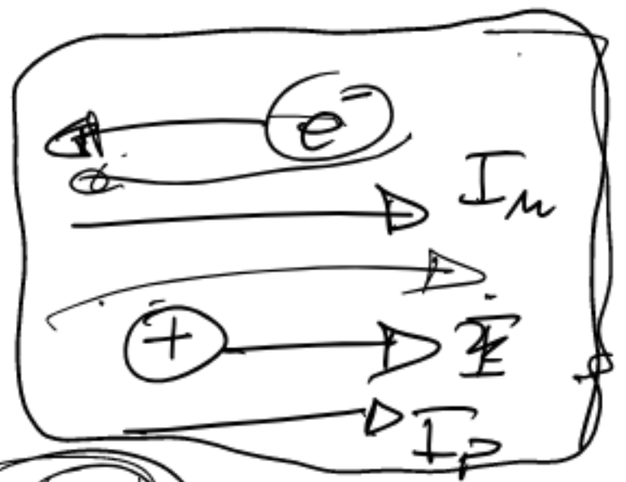
LIBERO

$$I = I_n + I_p$$









$$I = \frac{dq}{dt}$$

Concentrazioni $n = p$

→ SEMICOND INTRINSECO

SEMICONDUTTORI DROGATI

intrinseco

$M_i^2 = P_i$

$M \cdot P = M_i^2$

Si TETRAVALENTE

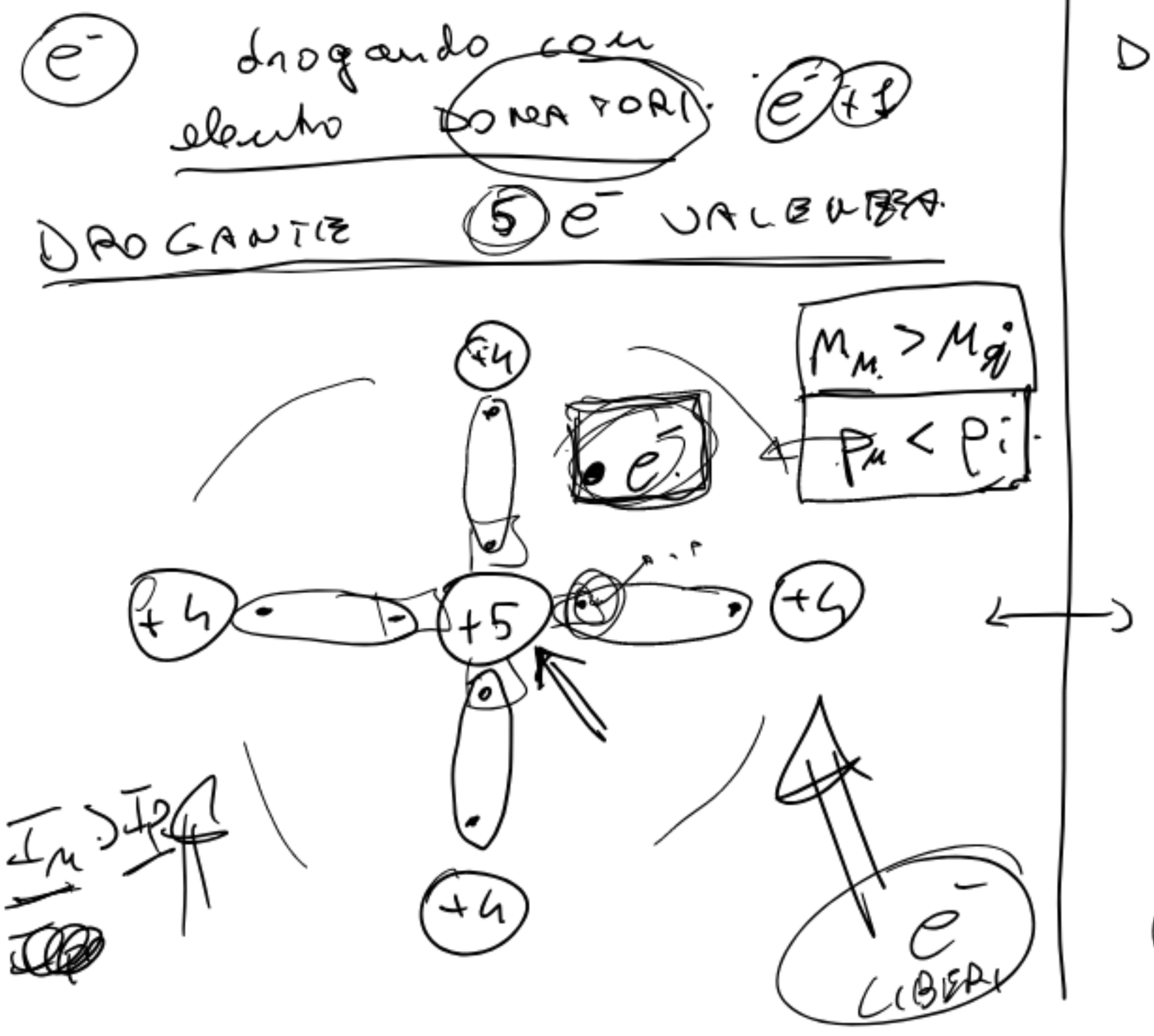
TIPO N

e^- drogando con elemento DONATORI e^- +1

DROGANTE (5) e^- VALENZA

$M_M > M_i$

$P_M < P_i$



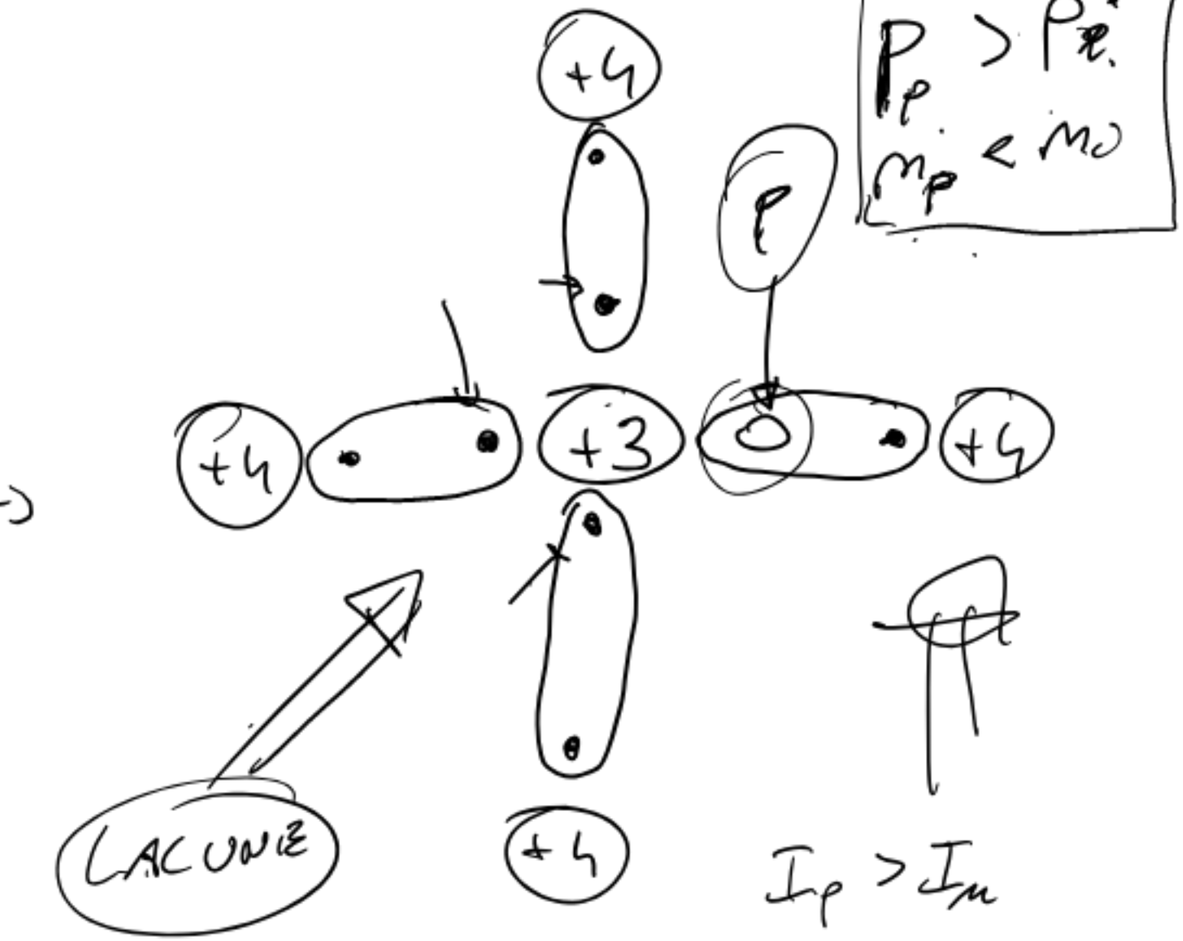
TIPO P

DROGANTE ACCETTATORE (Al) e^-

TRIVALENTE

$P_P > P_i$

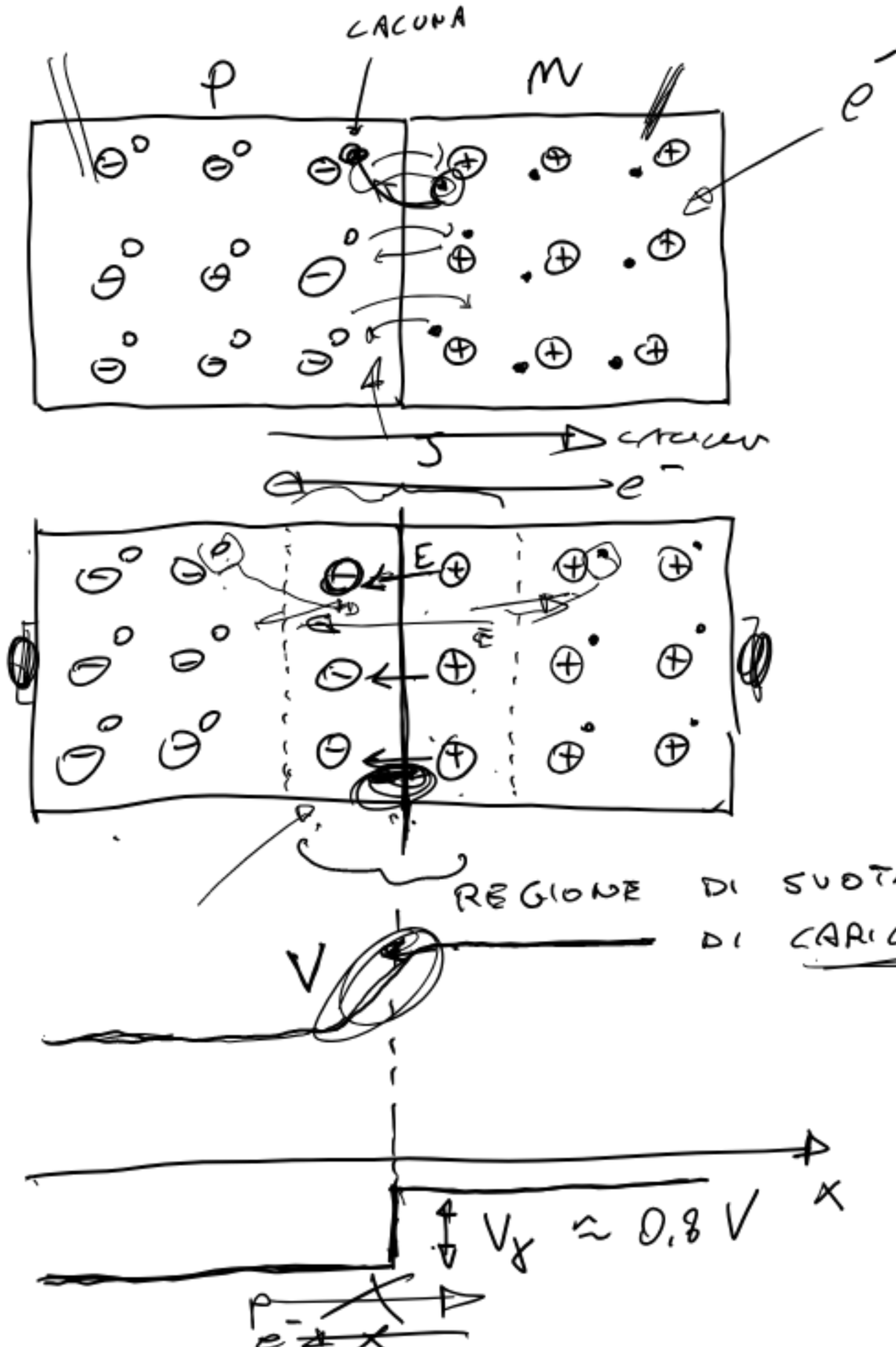
$M_P < M_i$



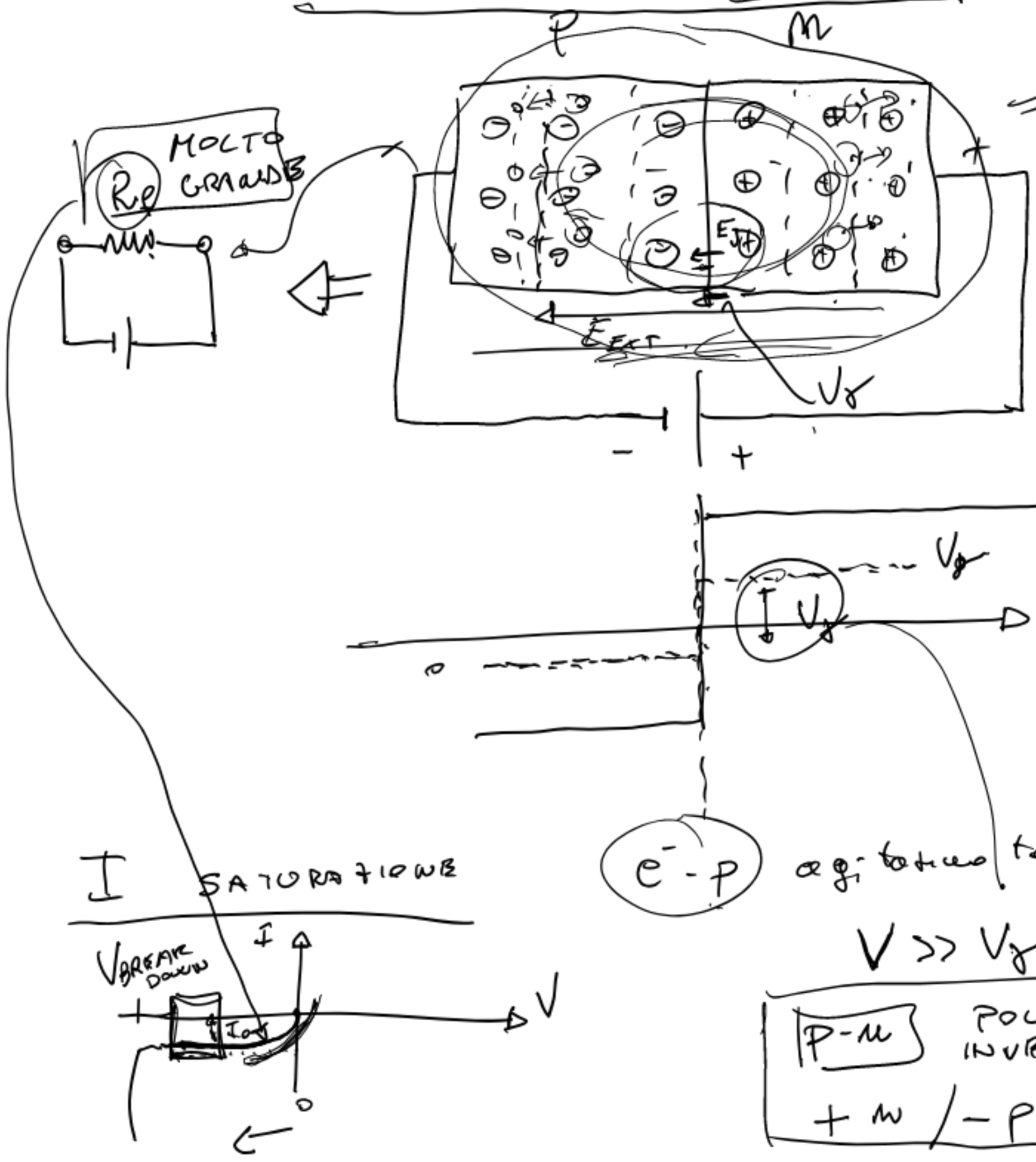
GIUNZIONE P-N

INIZIALE

EQUILIBRIO



POLARIZZAZIONE INVERSA J PN



E_{EXT}, E_J CONCORDI

$I \simeq 0$

$I_0 < \mu A$

$V \gg V_\gamma$

5/10 V $\Rightarrow$ μA

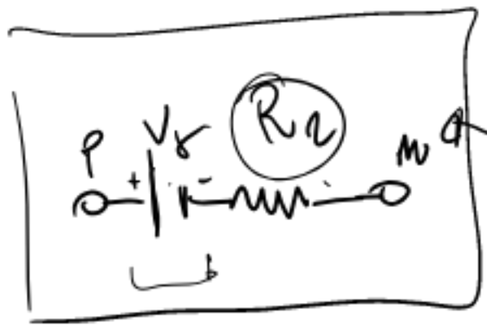
P-N POL INVERSAMENTE $\Rightarrow$ R_ℓ

+ N / − P

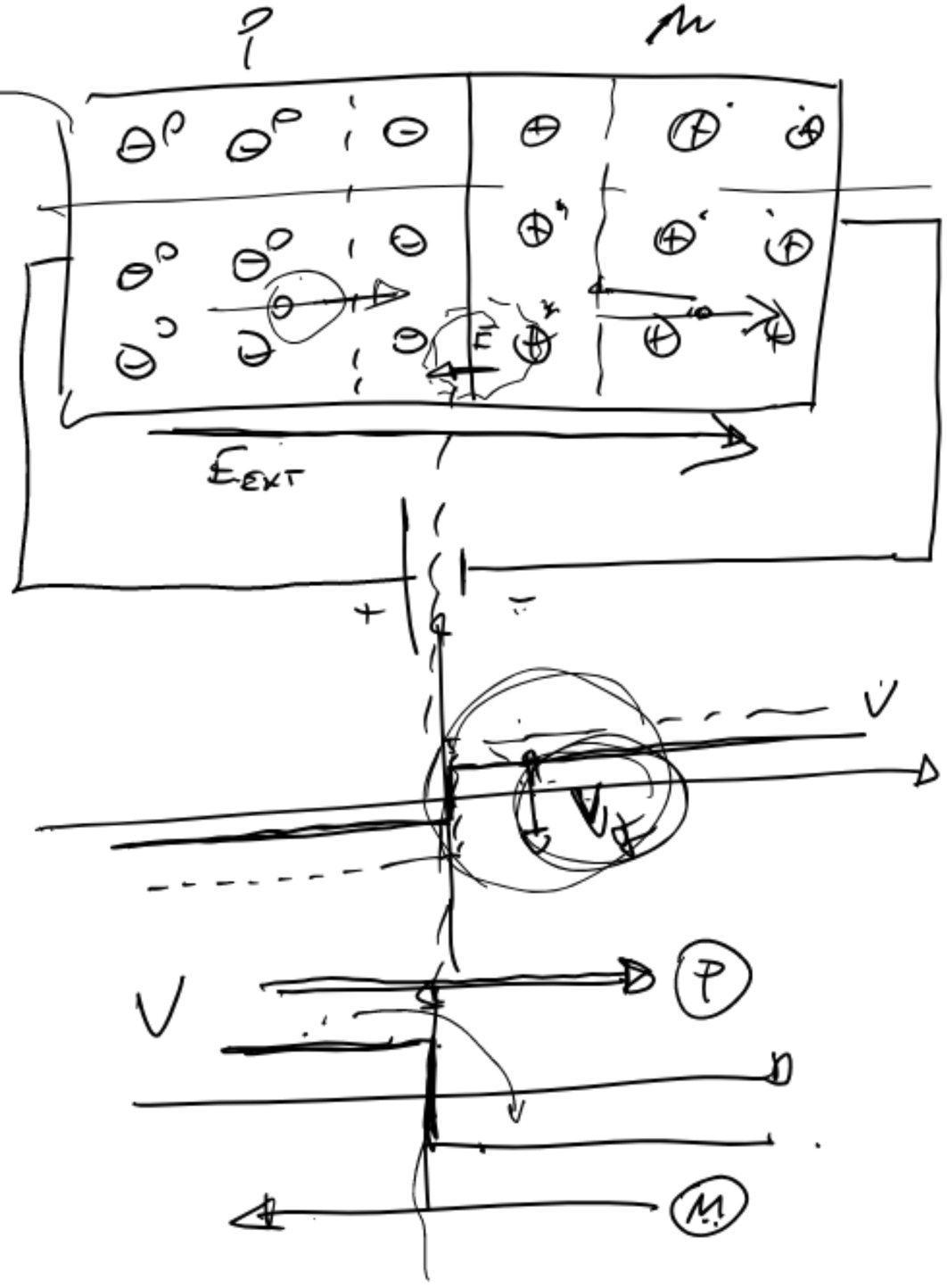
$M\Omega$ R_ℓ GRANDE

I SATURAZIONE

POLARIZZAZIONE DIRETTA J P-N

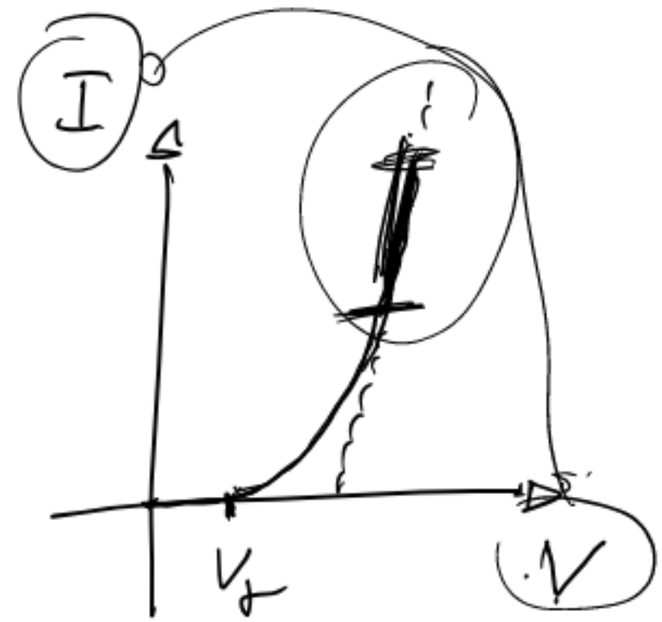


$R_2 \simeq 10/15\ \Omega$



$E_{EXT} < E_J$

$E_{EXT} > E_J$

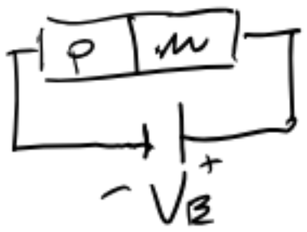


$I = I_0 (e^{V/\alpha} - 1)$

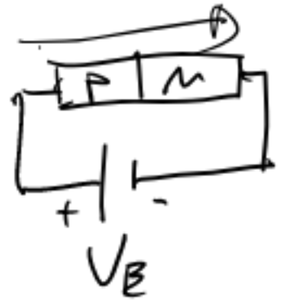
$I = I_M + I_P$

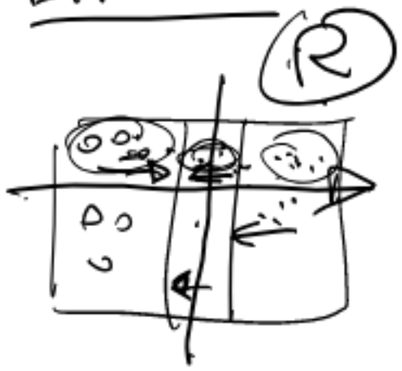
DIODO : giunzione p-n

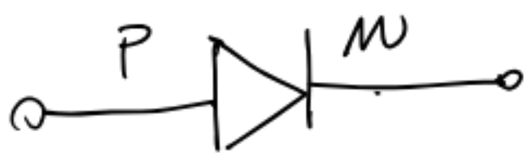
POLAR. INVERSA



POLAR DIRETTA







$R_{INV} \Rightarrow M\Omega$

$I \approx 0$

NON CONDUCE

$V_E \gg V_\gamma$

$I \neq 0$

CONDUCE

R_{DIR}

R_{DIR} MODELLO LINEARE A TRATTI

CIRCOLA CORRENTE

NON CIRCOLA

CIRCUITO CHIUSO

CIRCUITO APERTO

V:

Ponti raddrizzatori