FORMÜLLER

$$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$$

$$m = \gamma m_0$$

$$\Delta t = \gamma \Delta t_0$$

$$L = \frac{L_0}{\gamma}$$

$$x' = \gamma(x - vt))$$

$$y' = y$$

$$z' = z$$

$$t' = \gamma\left(t - \left(\frac{v}{c^2}\right)x\right)$$

$$u_x' = \frac{u_x - v}{1 - \frac{u_x v}{c^2}}$$

$$u_y' = \frac{u_x}{\gamma(1 - \frac{u_x v}{c^2})}$$

$$E_0 = mc^2$$

$$E = \gamma mc^2 = K + mc^2$$

$$\vec{p} = m\vec{v}$$

$$E^2 = (pc)^2 + (mc^2)^2$$

$$K_{maks} = eV_s = hf - \phi$$

$$\frac{1}{\lambda} = R\left(\frac{1}{m^2} - \frac{1}{n^2}\right).....n \succ m$$

$$\Delta\lambda = \lambda - \lambda' = \frac{h}{m_o c}(1 - \cos\theta)$$

$$E = h\nu = \frac{hc}{\lambda}$$

$$\vec{L} = |\vec{r} \times \vec{p}| = mvr = \frac{nh}{2\pi}......n = 1,2,3...$$

$$r_n = n^2 a_o$$

$$E_n = -\frac{13,6}{n^2} eV$$

$$r_n = \frac{4\pi\varepsilon_0 n^2 \hbar^2}{me^2} \equiv n^2 a_0$$

$$E_n = -\frac{E_o}{n^2}$$

$$\lambda = \frac{h}{p}$$

$$P(r) = |\psi^2| 4\pi r^2$$

$$P(r)dr = |\psi^2| dV$$

$$-\frac{\hbar^2}{2m}\frac{d^2\psi}{dx^2} + U(\psi) = E(\psi)$$

$$E_n = \frac{n^2 h^2}{8mL^2}$$

$$\int_{-\infty}^{+\infty} |\psi\psi^*| dx = 1$$

SABİTLER

$e=1,6.10^{-19}$Coulomb	$1eV=1,6.10^{-19}$ Joule	$m_e=9,1.10^{-31}$kg
$c=3.10^{8}$m/s	$h=6,63.10^{-34}$Joule.s	$m_p=1,67.10^{-27}$kg
$R=1,097.10^{7}m^{-1}$	$a_0=0,53.10^{-10}$m	$\varepsilon_0=8,85.10^{-12}C^2/Nm^2$
$k_e=9.10^{9}Nm^2/C^2$	$k = 1,38.10^{-23}$ J / K	hc=1240eV.nm
$N=6.023.10^{23}$atom/mol)		

$L=\hbar[l(l+1)]^{1/2}$

$$U=-\frac{A}{r^m}+\frac{B}{r^n}$$

$$U=-\alpha\frac{1}{4\pi\varepsilon_0}\frac{e^2}{r}+\frac{B}{r^m}n$$

$$g(E)=\frac{8\pi\sqrt{2}m^{*3/2}}{h^3}E^{1/2}$$

$$f=\frac{1}{1+e^{(E-E_F)/kT}}$$

$$E_F=\frac{h^2}{8m}\left(\frac{3}{\pi}\frac{N}{V}\right)^{2/3} \qquad n=\frac{N}{V}$$

$$\bar{E}=\frac{3}{5}E_F$$

$$\frac{N}{V}=n=\int_0^{E_F} g(E)dE =$$

$$\int_0^{\infty}\frac{m}{h^3}\sqrt{2mE}\,8\pi e^{-(E-E_F)/kT}.dE$$

$$n=\int_{E_C}^{\infty}\frac{m}{h^3}\sqrt{2mE}\,8\pi e^{-(E-E_F)/kT}.dE$$

$$n=2\left(\frac{2\pi m_e^* kT}{h^2}\right)^{3/2}\exp\left(-\frac{E_C-E_F}{kT}\right)=$$

$$=N_C\exp\left(-\frac{E_C-E_F}{kT}\right)$$

N_c İletkenlik bandındaki efektif durum yoğunluğu

$N_C=4{,}83.10^{21}(T.m_e^*)^{3/2}$

$$E_C-E_F=kT\ln\frac{N_c}{N_d}$$

$$p=\int_0^{E_V}\frac{m}{h^3}\sqrt{2mE}\,8\pi e^{-(E-E_F)/kT}.dE$$

$$p=2\left(\frac{2\pi m_b^* kT}{h^2}\right)^{3/2}\exp\left(-\frac{E_F-E_V}{kT}\right)=$$

$$=N_V\exp\left(-\frac{EF-E_V}{kT}\right)$$

N_V valans banddaki efektif durum yoğunluğu

$N_V=4{,}83.10^{21}(T.m_b^*)^{3/2}$

$$n_0(E)=g(E)f(E)=\frac{8\sqrt{2}\pi m}{h^3}^{3/2}\frac{E^{1/2}}{e^{(E-E_F)/kT}+1}$$

$$v_F=\sqrt{\frac{2E_F}{m}}$$

$T_F=\frac{E_F}{k}$ k:Boltzman sabiti

$$R=\frac{\rho L}{A}$$

$\sigma=\frac{1}{\rho}=nq\mu$ μ, mobilite

$$\sigma=nq\mu_e+pq\mu_n$$

$$n.p=n_i^2$$

$$n_i=\sqrt{N_C.N_V}.e^{-E_g/2kT}$$

(n_i, katkısız yarıiletkendeki elek. yoğ.)

n tipi yarıiletken $n\approx N_d$

p tipi yarıiletken $p\approx N_a$

Kompanse olmuş malzeme

(donor sayısı>akseptör sayısı) $n\approx N_d-N_a$

(akseptör sayısı>donör sayısı) $p\approx N_a-N_d$

Nd; İyonize donör atomu sayısı,

Na; İyonize akseptör atomu sayısı

Diyot denklemi $I=I_{sat}\left(e^{qV_a/kT}-1\right)$

SABİTLER

$e=1{,}6.10^{-19}$Coulomb	$1eV=1{,}6.10^{-19}$ Joule	$m_e=9{,}1.10^{-31}$kg
$\hbar=1{,}054.10^{-34}$Joule.s	$h=6{,}63.10^{-34}$Joule.s	$N=6.023.10^{23}$atom/mol
$R=1{,}097.10^7m^{-1}$	$a_0=0{,}53.10^{-10}$m	$\varepsilon_0=8{,}85.10^{-12}C^2/Nm^2$
$k_e=9.10^9Nm^2/C^2$	$k=1{,}38.10^{-23}J/K$	hc=1240eV.nm