Avogadro's number	N_A	$= 6.02 \times 10^{23}$ molecules/mole
Boltzmann's constant	k	$= 1.38 \times 10^{-23}$ J/°K
		$= 8.62 \times 10^{-5}$ eV/°K
Electronic charge (magnitude)	q	$= 1.60 \times 10^{-19}$ C
Electronic rest mass	m_0	$= 9.11 \times 10^{-31}$ kg
Permittivity of free space	ε_0	$= 8.85 \times 10^{-14}$ F/cm
		$= 8.85 \times 10^{-12}$ F/m
Planck's constant	h	$= 6.63 \times 10^{-34}$ J-sec
		$= 4.14 \times 10^{-15}$ eV-sec
Room temperature value of kT	kT	$= 0.0259$ eV
Speed of light	c	$= 2.998 \times 10^{10}$ cm/sec

Prefixes:

1 Å (angstrom) $= 10^{-8}$ cm	milli-,	m- $= 10^{-3}$
1 μm (micron) $= 10^{-4}$ cm	micro-,	μ- $= 10^{-6}$
1 mil $= 10^{-3}$ in.	nano-,	n- $= 10^{-9}$
2.54 cm = 1 in.	pico-,	p- $= 10^{-12}$
1 eV $= 1.6 \times 10^{-19}$ J	kilo-,	k- $= 10^{3}$
	mega-,	M- $= 10^{6}$
	giga-,	G- $= 10^{9}$

A wavelength λ of 1 μm corresponds to a photon energy of 1.24 eV.

Si (300K): E_g=1.1eV, n_i=1.5x10^{10}cm^{-3}, E_i= Eg/2

TABLE 4-1. Mobility of electrons and holes for several semiconductors at 300°K. (Intrinsic only)

	μ_n (cm^2/V-sec)	μ_p (cm^2/V-sec)
Ge	3900	1900
Si	1350	480
GaAs	8500	400

ε_r for SiO_2 = 3.9

	n_i (in cm^{-3})	Eg (in eV)	ε_r
Ge	2.5×10^{13}	0.67	16
Si	1.5×10^{10}	1.11	11.8
GaAs	2×10^{6}	1.43	13.2
InP		1.35	12.4

$$\frac{\partial \delta n}{\partial t} = D_n \frac{\partial^2 \delta n}{\partial x^2} - \frac{\delta n}{\tau_n} \qquad L_p = \sqrt{D_p \tau_p}$$

$$\frac{\partial \delta p}{\partial t} = D_p \frac{\partial^2 \delta p}{\partial x^2} - \frac{\delta p}{\tau_p} \qquad L_n = \sqrt{D_n \tau_n}$$

$$\frac{\partial\, \delta n(t)}{\partial t} = -\frac{\delta n}{\tau_n} + g_{op}$$

$$\mathcal{E}(x) = -\frac{d\mathcal{V}(x)}{dx} = -\frac{d}{dx}\left[\frac{E_i}{(-q)}\right] = \frac{1}{q}\frac{dE_i}{dx}$$

$$I(x) = I_0 e^{-\alpha x} \qquad \delta n(t) = \Delta n\, e^{-\alpha_r p_0 t} = \Delta n\, e^{-t/\tau_n}$$

$$\delta n = \delta p = g_{op}\tau_n \qquad n = n_i e^{(F_n - E_i)/kT}$$

$$p = n_i e^{(E_i - F_p)/kT}$$

$$p_0 = \frac{1}{qR_H} = \frac{J_x B_z}{q\mathcal{E}_y} = \frac{(I_x/wt)B_z}{q(V_{AB}/w)} = \frac{I_x B_z}{qtV_{AB}}$$

$$f(E) = \frac{1}{1 + e^{(E-E_F)/kT}} \qquad p_0 = N_v e^{-(E_F - E_v)/kT}$$

$$n_0 = N_c e^{-(E_c - E_F)/kT} \qquad N_v = 2\left(\frac{2\pi m_p^* kT}{h^2}\right)^{\frac{3}{2}}$$

$$N_c = 2\left(\frac{2\pi m_n^* kT}{h^2}\right)^{\frac{3}{2}} \qquad n_0 p_0 = n_i^2$$

$$n_i = \sqrt{N_c N_v}\; e^{-E_g/2kT} \qquad p_0 + N_d^+ = n_0 + N_a^-$$

$$n_0 = n_i\, e^{(E_F - E_i)/kT} \qquad \sigma(t) = q[n(t)\mu_n + p(t)\mu_p]$$

$$p_0 = n_i\, e^{(E_i - E_F)/kT}$$

$$\mu_n = -\frac{\langle v_x \rangle}{\mathcal{E}_x} = \frac{q\bar{t}}{m_n^*} \qquad \delta p(x,t) = \left[\frac{\Delta P}{2\sqrt{\pi D_p t}}\right] e^{-x^2/4D_p t}\, e^{-t/\tau_p} \qquad \mathcal{E}_y = \frac{J_x}{qp_0}\; B_z = R_H J_x B_z \qquad \mu_p = \frac{\sigma}{qp_0} = \frac{1/\rho}{q(1/qR_H)} = \frac{R_H}{\rho}$$

$$\frac{\partial \delta p}{\partial t} = D_p \frac{\partial^2 \delta p}{\partial x^2} - \frac{\delta p}{\tau_p} \qquad L_n = \sqrt{D_n \tau_n}$$

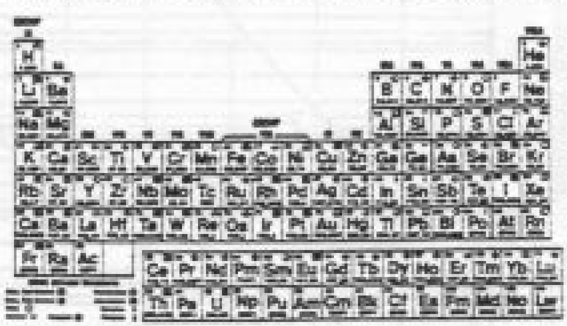
$$\delta p(x) = \Delta p\, e^{-x/L_p} \qquad \frac{D}{\mu} = \frac{kT}{q} \qquad \mathcal{E}_y = \frac{J_x}{qp_0}\; B_z = R_H J_x B_z$$

$$J_n(x) = q\mu_n n(x)\,\mathcal{E}(x) + qD_n \frac{dn(x)}{dx} \qquad D_p = \frac{(\Delta x)^2}{16 t_d}$$

drift diffusion

$$J_p(x) = q\mu_p\, p(x)\,\mathcal{E}(x) - qD_p \frac{dp(x)}{dx}$$

PERIODIC TABLE OF THE ELEMENTS



$$g(T) = \alpha_r n_i^2 = \alpha_r n_o p_o \qquad g(T) + g_{op} = \alpha_r n_o p_o + \alpha_r[(n_o + p_o)\,\delta n + \delta n^2] \qquad \tau = \frac{1}{\alpha_r(n_o + p_o)}$$