

Table of Values

Quantity	Symbol	Value	CGS	SI
Velocity of light	c	2.997925	10^{10} cm s ⁻¹	10^8 m s ⁻¹
Proton charge	e	1.60219	—	10^{-19} C
		4.80325	10^{-10} esu	—
Planck's constant	h	6.62620	10^{-27} erg s	10^{-34} J s
	$\hbar = h/2\pi$	1.05459	10^{-27} erg s	10^{-34} J s
Avogadro's number	N	6.02217×10^{23} mol ⁻¹	—	—
Atomic mass unit	amu	1.66053	10^{-24} g	10^{-27} kg
Electron rest mass	m	9.10956	10^{-28} g	10^{-31} kg
Proton rest mass	M_p	1.67261	10^{-24} g	10^{-27} kg
Proton mass/electron mass	M_p/m	1836.1	—	—
Reciprocal fine structure constant $\hbar c/e^2$	$1/\alpha$	137.036	—	—
Electron radius e^2/mc^2	r_e	2.81794	10^{-13} cm	10^{-15} m
Electron Compton wavelength \hbar/mc	λ_e	3.86159	10^{-11} cm	10^{-13} m
Bohr radius \hbar^2/me^2	r_0	5.29177	10^{-9} cm	10^{-11} m
Bohr magneton $e\hbar/2mc$	μ_B	9.27410	10^{-21} erg G ⁻¹	10^{-24} J T ⁻¹
Rydberg constant $me^4/2\hbar^2$	R_∞ or Ry	2.17991	10^{-11} erg	10^{-18} J
		13.6058 eV		
1 electron volt	eV	1.60219	10^{-12} erg	10^{-19} J
	eV/h	2.41797×10^{14} Hz	—	—
	eV/hc	8.06546	10^3 cm ⁻¹	10^5 m ⁻¹
	eV/k _B	1.16048×10^4 K	—	—
Boltzmann constant	k_B	1.38062	10^{-16} erg K ⁻¹	10^{-23} J K ⁻¹
Permittivity of free space	ϵ_0	—	1	$10^7/4\pi c^2$
Permeability of free space	μ_0	—	1	$4\pi \times 10^{-7}$

Source: B. N. Taylor, W. H. Parker, and D. N. Langenberg, Rev. Mod. Phys. 41, 375 (1969). See also E. R. Cohen and B. N. Taylor, Journal of Physical and Chemical Reference Data 2(4), 663 (1973).

TABLE I. ELECTRONIC PROPERTIES OF THE 2DEG IN GaAs-AlGaAs HETEROSTRUCTURES AND Si INVERSION LAYERS

		GaAs(100)	Si (100)	UNITS
Effective Mass	m	0.067	0.19	$m_e = 9.1 \times 10^{-28} \text{ g}$
Spin Degeneracy	g_s	2	2	
Valley Degeneracy	g_v	1	2	
Dielectric Constant	ϵ	13.1	11.9	$\epsilon_0 = 8.9 \times 10^{-12} \text{ F m}^{-1}$
Density of States	$\rho(E) = g_s g_v (m/2\pi\hbar^2)$	0.28	1.59	$10^{11} \text{ cm}^{-2} \text{ meV}^{-1}$
Electronic Sheet Density ^a	n_s	4	1-10	10^{11} cm^{-2}
Fermi Wave Vector	$k_F = (4\pi n_s / g_s g_v)^{1/2}$	1.58	0.56-1.77	10^6 cm^{-1}
Fermi Velocity	$v_F = \hbar k_F / m$	2.7	0.34-1.1	10^7 cm/s
Fermi Energy	$E_F = (\hbar k_F)^2 / 2m$	14	0.63-6.3	meV
Electron Mobility ^a	μ_e	10^4 - 10^6	10^4	$\text{cm}^2/\text{V}\cdot\text{s}$
Scattering Time	$\tau = m\mu_e/e$	0.38-38	1.1	ps
Diffusion Constant	$D = v_F^2 \tau / 2$	140-14000	6.4-64	cm^2/s
Resistivity	$\rho = (n_s e \mu_e)^{-1}$	1.6-0.016	6.3-0.63	k Ω
Fermi Wavelength	$\lambda_F = 2\pi/k_F$	40	112-35	nm
Mean Free Path	$l = v_F \tau$	10^2 - 10^4	37-118	nm
Phase Coherence Length ^b	$l_\phi = (D\tau_\phi)^{1/2}$	200-...	40-400	$\text{nm}(T/\text{K})^{-1/2}$
Thermal Length	$l_T = (\hbar D/k_B T)^{1/2}$	330-3300	70-220	$\text{nm}(T/\text{K})^{-1/2}$
Cyclotron Radius	$l_{\text{cycl}} = \hbar k_F / eB$	100	37-116	$\text{nm}(B/\text{T})^{-1}$
Magnetic Length	$l_m = (\hbar/eB)^{1/2}$	26	26	$\text{nm}(B/\text{T})^{-1/2}$
	$k_F l$	15.8-1580	2.1-21	
	$\omega_c \tau$	1-100	1	(B/T)
	$E_F/\hbar\omega_c$	7.9	1-10	(B/T) ⁻¹

^aA typical (fixed) density value is taken for GaAs-AlGaAs heterostructures, and a typical range of values in the metallic conduction regime for Si MOSFETs. For the mobility, a range of representative values is listed for GaAs-AlGaAs heterostructures, and a typical "good" value for Si MOSFETs. The variation in the other quantities reflects that in n_s and μ_e .

^bRough estimate of the phase coherence length, based on weak localization experiments in laterally confined heterostructures²³⁻²⁷ and Si MOSFETs.^{28,29} The stated $T^{-1/2}$ temperature dependence should be regarded as an indication only, since a simple power law dependence is not always found (see, for example, Refs. 30 and 25). For high-mobility GaAs-AlGaAs heterostructures the phase coherence length is not known, but is presumably³¹ comparable to the (elastic) mean free path l .

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