Constants

Gravity, Electricity and Magnetism

Acceleration due to Gravity or Gravitational Field near Earth	a_g or g = -9.81 m/s^2 or 9.81 N/kg
Gravitational Constant	G = 6.67 x 10^{-11} Nm/kg^2
Mass of Earth	M_E = 5.98 x 10^{24} kg
Radius of Earth	R_E = 6.37 x 10^6 m
Coulomb's Law Constant	k = 8.99 x 10^9 Nm^2/C^2
Electron Volt	1 eV = 1.60 x 10^{-19} J
Elementary Charge	e = 1.60 x 10^{-19} C
Index of Refraction of Air	N = 1.00
Speed of Light in a Vacuum	c = 3.00 x 10^8 m/s

Atomic Physics

Energy of an Electron in the 1st Bohr Orbit of Hydrogen	E_1 = -2.18 x 10^{-18} J or -13.6eV
Planck's Constant	h = 6.63 x 10^{-34} Js or 4.14 x 10^{-15}eVs
Radius of 1st Bohr Orbit of Hydrogen	r_1 = 5.29 x 10^{-11} m
Rydberg's Constant for Hydrogen ...	R_H = 1.10 x 10^7 m^{-1}

Particles

	Rest Mass	Charge
Alpha Particle	m_α = 6.65 x 10^{-27} kg	α^{2+}
Electron	m_e = 9.11 x 10^{-31} kg	e^-
Neutron	m_n = 1.67 x 10^{-27} kg	n^0
Proton	m_p = 1.67 x 10^{-27} kg	p^+

Trigonometry and Vectors

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\sin\theta = \frac{opposite}{hypoteneuse}$$

$$\cos\theta = \frac{adjacent}{hypoteneuse}$$

$$\tan\theta = \frac{opposite}{adjacent}$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$c^2 = a^2 + b^2 - 2ab\cos C$$

For any Vector $\vec{R}$

$$R = \sqrt{{R_x}^2 + {R_y}^2}$$

$$\tan\theta = \frac{R_y}{R_x}$$

$$R_x = R\cos\theta$$

$$R_y = R\sin\theta$$

Prefixes Used With SI Units

Prefix	Symbol	Exponential Value	Prefix	Symbol	Exponential Value
Pico	p	..... 10^{-12}	tera	T	..... 10^{12}
Nano	n	..... 10^{-9}	giga	G	..... 10^9
Micro	μ	..... 10^{-6}	mega	M	..... 10^6
Milli	m	..... 10^{-3}	kilo	k	..... 10^3
Centi	c	..... 10^{-2}	hecto	h	..... 10^2
Deci	d	..... 10^{-1}	deka	da	..... 10^1

Equations

Kinematics

$$v_{ave} = \frac{d}{t} \qquad d = v_f t - \frac{1}{2}at^2$$

$$a = \frac{v_f - v_i}{t} \qquad d = \left(\frac{v_f + v_i}{2}\right)t$$

$$d = v_i t + \frac{1}{2}at^2 \qquad v_f^2 = v_i^2 + 2ad$$

$$v = \frac{2\pi r}{T} \qquad a_c = \frac{v^2}{r}$$

Dynamics

$$F = ma \qquad F_g = \frac{Gm_1 m_2}{r^2}$$

$$F\Delta t = m\Delta v \qquad g = \frac{Gm_1}{r^2}$$

$$F_g = mg \qquad F_c = \frac{mv^2}{r}$$

$$F_f = \mu F_N \qquad F_c = \frac{4\pi^2 mr}{T^2}$$

$$F_s = -kx$$

Momentum and Energy

$$p = mv \qquad E_K = \frac{1}{2}mv^2$$

$$W = Fd \qquad E_p = mgh$$

$$P = \frac{W}{t} = \frac{\Delta E}{t} = Fv \qquad E_p = \frac{1}{2}kx^2$$

$$W = \Delta E = Fd\cos\theta$$

Waves and Light

$$T = 2\pi\sqrt{\frac{m}{k}} \qquad \lambda = \frac{xd}{nl}$$

$$T = 2\pi\sqrt{\frac{l}{g}} \qquad \frac{\sin\theta_1}{\sin\theta_2} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2} = \frac{n_2}{n_1}$$

$$T = \frac{1}{f} \qquad \lambda = \frac{d\sin\theta}{n}$$

$$v = f\lambda \qquad m = \frac{h_i}{h_o} = \frac{-d_i}{d_o}$$

$$l = \frac{\lambda}{2}\,;\, l = \frac{\lambda}{4} \qquad \frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$f_0 = f_s\left(\frac{v \pm v_o}{v \mp v_s}\right) \qquad v = 331 + 0.6T$$

Atomic Physics

$$hf = E_{K_{max}} + W \qquad E = hf = \frac{hc}{\lambda}$$

$$W = hf_0 \qquad E_n = \frac{1}{n^2}E_1$$

$$E_{K_{max}} = qV_{stop} \qquad r_n = n^2 r_1$$

$$\frac{1}{\lambda} = R_H\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right) \qquad N = N_0\left(\frac{1}{2}\right)^n$$

Quantum Mechanics and Nuclear Physics

$$E = mc^2 \qquad p = \frac{h}{\lambda}$$

$$p = \frac{hf}{c}\,;\, E = pc$$

Electricity and Magnetism

$$F_e = \frac{kq_1 q_2}{r^2} \qquad V = IR$$

$$V = \frac{W}{q} \qquad q = Ne$$

$$|\vec{\varepsilon}| = \frac{kq_1}{r^2} \qquad P = IV$$

$$|\vec{\varepsilon}| = \frac{F_e}{q} \qquad I = \frac{q}{t}$$

$$|\vec{\varepsilon}| = \frac{V}{d} \qquad F_m = IlB_\perp$$

$$V = \frac{\Delta E}{q} \qquad F_m = qvB_\perp$$

$$\frac{N_p}{N_s} = \frac{V_p}{V_s} = \frac{I_s}{I_p} \qquad V = lvB_\perp$$

$$I_{eff} = 0.707\, I_{max}$$

$$V_{eff} = 0.707\, V_{max}$$

$$R = R_1 + R_2 + R_3$$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$