Physics Equations

Newtonian Mechanics

$(constant\ velocity)\ v = \frac{d}{t}$

$v = v_0 + at$

$d = v_0 t + \frac{1}{2}at^2 \qquad h = \frac{1}{2}gt^2$

$v^2 = v_0^2 + 2ad$

$(Net\ Force)\ F_{net} = ma \qquad (Weight)\ F_g = mg$

$(Gravitational\ Field\ Strength)\ g = \frac{F}{m}$

$(Force\ of\ Friction)\ F_f = \mu F_N$

$(Centripetal\ Force)\ F_C = \frac{mv^2}{r} \qquad a_c = \frac{v^2}{r}$

$(Force\ of\ Universal\ Gravitation)\ F_G = G\frac{mm}{r^2}$

$(Force\ on\ a\ Spring)\ F_S = kx$

$(Gravitational\ Potential\ Energy)\ U_g = mgh$

$(Kinetic\ Energy)\ K = \frac{1}{2}mv^2$

$(Elastic\ Potential\ Energy)\ U_S = \frac{1}{2}kx^2$

$(Work)\ W = Fd = \Delta K$

(Power) $P = \frac{w}{t} = Fv$

$(momentum)\ p = mv$

$(Impulse)\ \Delta p = F\Delta t$

$T_S = 2\pi\sqrt{\frac{l}{g}} \qquad T_P = 2\pi\sqrt{\frac{m}{k}}$

$(Period)\ T = \frac{1}{f}$

$x = R\cos\theta \qquad y = R\sin\theta$

Fluid Mechanics and Thermal Physics

$(density)\ \rho = \frac{m}{V}$

$(Pressure)\ P = \frac{F}{A}$

$(Absolute\ Pressure)\ P = P_0 + \rho gh$

$(Force\ of\ Bouancy) F_B = \rho Vg$

$A_1 v_1 = A_2 v_2$

$Volume\ Rate\ of\ Flow = \frac{Vol}{t} = Av$

$P + \rho gh + \frac{1}{2}\rho v^2 = P + \rho gh + \frac{1}{2}\rho v^2$

$\Delta L = \alpha L_0 \Delta T \qquad \Delta V = \beta V_0 \Delta$

$K_{avg} = \frac{3}{2}kT$

$v_{rms} = \sqrt{\frac{3RT}{M}}$

$PV = nRT$

$W_{on\ the\ gas} = -P\Delta V$

$\Delta U = \frac{3}{2}nR\Delta T$

$\Delta U = Q + W_{on}$

$Q = mC\Delta T \qquad Q = mL$

Constants

$g = 9.8\frac{m}{s^2} or\ approximately\ 10\ m/s^2$

$G = 6.67\ x\ 10^{-11} N \cdot \frac{m^2}{kg^2}$

$P_0 = 1.0\ x\ 10^5 Pa = 1\ atm$

$R = 8.31\frac{J}{mol \cdot K} = 0.0821\frac{L \cdot atm}{mol \cdot K}$

Physics Equations

Electricity and Magnetism

$(Coulomb's\ Law)\ F_E = k\frac{q_1 q_2}{r^2}$

$(Electric\ Field\ Strength)\ E = \frac{F_E}{q}$

$(Electric\ Potential\ Energy)\ U_E = qV = k\frac{q_1 q_2}{r}$

$(Potential\ Difference)\ V = Ed = k\sum\frac{q}{r}$

$(Capacitance)\ C = \frac{Q}{V} = \frac{\epsilon_0 A}{d}$

$(Current)\ I = \frac{\Delta Q}{\Delta t}$

$(Resistance)\ R = \frac{\rho l}{A}$

$(Voltage\ or\ Potential\ Difference)\ V = IR$

$(Power)\ P = IV$

$R_{series} = \sum R$

$\frac{1}{R_{parallel}} = \sum\frac{1}{R}$

$(Force\ of\ Magnetism)\ F_B = qvB = BIl$

$(Magnetic\ Field\ Strength)\ B = \frac{\mu_0 I}{2\pi r}$

$(Magnetic\ Flux)\ \emptyset = BAcos\theta$

$\varepsilon mf = V = \frac{\Delta\emptyset}{\Delta t} = Blv$

Constants

$k = 9\ x\ 10^9\ \frac{N\cdot m^2}{C^2}$

$q_{electron} = -1.6\ x\ 10^{-19}$

$q_{proton} = +1.6\ x\ 10^{-19} C$

Waves and Optics

$v = \lambda f$

$(index\ of\ refraction)\ n = \frac{c}{v} = \frac{\lambda_{air}}{\lambda_{medium}}$

$(Snell's\ Law)\ n_i sin\theta_i = n_r sin\theta_r$

$(cricital\ angle)\ sin\theta_c = \frac{n_2}{n_1}$

$(Thin\ Lens\ Equation)\ \frac{1}{s_i} + \frac{1}{s_0} = \frac{1}{f}$

$Magnification = \frac{h_i}{h_o} = -\frac{s_i}{s_0}$

$(focal\ point)\ f = \frac{Radius\ or\ Center}{2}$

$(Young's\ Double\ Slit\ Experiement)\ x = \frac{\lambda L}{d}$

Atomic and Nuclear

$c = \lambda f \qquad E = hf$

$K_{max} = hf - \phi$

$K = \frac{1}{2}mv^2$

$\lambda_{deBroglie} = \frac{h}{p} = \frac{h}{mv}$

$E = mc^2$

Constants

$h = 6.63\ x\ 10^{-34} J\cdot sec = 4.14\ x\ 10^{-15} eV\cdot sec$

$c = 3\ x\ 10^8\ m/sec$

$1\ eV = 1.6\ x\ 10^{-19} J$

$m_{electron} = 9.11\ x\ 10^{-31} kg$

$m_{proton} = m_{neutron} = 1.67\ x\ 10^{-27} kg$