Physics 11 Formula Sheet (revised Oct. 2014)

Kinematics:

$v_{avg} = \frac{\Delta d}{\Delta t}$ $a_{avg} = \frac{\Delta v}{\Delta t}$ $d = \left(\frac{v_0 + v}{2}\right) \cdot t$ $v = v_0 + at$ $d = v_0 t + \frac{1}{2} a t^2$ $v^2 = v_0^2 + 2ad$

Dynamics:

$F_g = mg$ $F_g = \frac{G m_1 m_2}{r^2}$ $F = kx$ $F_f = \mu F_N$ $F_{NET} = ma$

Momentum:

$p = mv$ $\Delta p = F_{NET} \cdot \Delta t$ $\Delta p_{total} = 0$ $p_{T\,before} = p_{T\,after}$ $m_1 v_1 + m_2 v_2 = m_1 v_1' + m_2 v_2'$

Energy, Work, Power:

$W = Fd$ $P = \frac{W}{t}$ $\Delta E_P = mg\Delta h$ $E_K = \frac{1}{2} m v^2$ $\Delta E_H = mC\Delta T$ $W_{NET} = \Delta E_K$

$W = \Delta E$ $\Delta E_p + \Delta E_k + \Delta E_H = 0$ or in general: $\Delta E_T = 0$ (in a closed system)

Waves and Refraction:

$T = \frac{1}{f}$ $v = \lambda f$ $n_{rel} = \frac{v_1}{v_2}$ $\frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$ $n_{rel} = \frac{n_2}{n_1}$ $n_{rel} = \frac{\sin\theta_i}{\sin\theta_r}$ $\sin\theta_c = \frac{1}{n}$

$n_1 \sin\theta_1 = n_2 \sin\theta_2$ $n_{vacuum} = n_{air} = 1.00$

Ray Optics:

$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$ $MAG = \frac{h_i}{h_o} = -\frac{d_i}{d_o}$

Special Relativity:

$t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ $L = L_0 \sqrt{1 - \frac{v^2}{c^2}}$ $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ $E = mc^2$

Constants:

$G = 6.67 \times 10^{-11} \frac{Nm^2}{kg^2}$ $g = 9.80 \frac{m}{s^2} = 9.80 \frac{N}{kg}$ (near the surface of Earth) $c = 3.00 \times 10^8 \frac{m}{s}$

$m_{earth} = 5.98 \times 10^{24} kg$ $r_{earth} = 6.38 \times 10^6 m$