Physics 11 **Equations, Formulas, and Data Sheet**

For constant velocity:

$$v = \frac{\Delta d}{\Delta t}$$

For constant acceleration:

$$a = \frac{\Delta v}{\Delta t}$$

$$v = v_0 + at \qquad v^2 = v_0^2 + 2ad$$

$$d = v_0 t + \frac{1}{2}at^2 \qquad d = \frac{(v + v_0)}{2}t$$

Forces:

Dynamics

$F_{net} = ma$

In General:

$F_{net} = \sum F = \left(\sum m\right)a$

Gravity:
At the Earth's surface:
Weight=F_g=mg

Gravity:
In general:

$$F_g = \frac{Gm_1m_2}{d^2}$$

Hooke's Law: For elastic Forces:

$F = kx$

Friction:

$F_f = \mu F_N = \mu mg$

Momentum:

$$p = mv$$

$$impulse \equiv F\Delta t = \Delta p = \Delta mv = v\Delta m = m\Delta v$$

$$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$$

Percentage error:

$$\frac{|measured\ \ value - true\ \ value|}{true\ \ value} \times 100\%$$

Energy:

Gravitational Potential Energy:

$$E_p = mgh$$

Kinetic Energy:

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

Conservation of Energy:

$\Delta E_k = -\Delta E_p$

$$E_{before} = E_{after} = E_{pi} + E_{ki} = E_{pf} + E_{kf}$$

Work:

$W = Fd = \Delta E$

$W = Fd\cos\theta$

Work-Energy Theorem:

$W_{net} = F_{net}\, d = \Delta E_k$

$$P = \frac{W}{t} = \frac{\Delta E}{t} = Fv$$

$$E_h = mc\Delta T$$

$$E = mc^2$$

$$efficiency \equiv \frac{E_{out}}{E_{in}} \times 100\% = \frac{P_{out}}{P_{in}} \times 100\%$$

Waves and Light:

$$T = \frac{1}{f}$$

$$v = f\lambda$$

$$v = (332 + 0.6T)m/s$$

$$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_0}$$

$$M = \frac{h_i}{h_0} = -\frac{d_i}{d_0}$$

Centre of curvature:

$$c = 2f$$

$$n = \frac{v_{vacuum}}{v_{medium}}$$

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

Radioactive decay:

$N = N_0\left(\frac{1}{2}\right)^n$, where n=$t/\tau$ and $t \equiv$time elapsed and $\tau \equiv$1/2 life

Relativity:

$$t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$L = L_0\sqrt{1 - \frac{v^2}{c^2}}$$

$$m = \frac{m_o}{\sqrt{1 - \frac{v^2}{c^2}}}$$