Kinematics

$$\vec{v}_{ave} = \frac{\Delta \vec{d}}{\Delta t} \qquad \vec{d} = \vec{v}_f t - \frac{1}{2}\vec{a}t^2$$

$$\vec{a}_{ave} = \frac{\Delta \vec{v}}{\Delta t} \qquad \vec{d} = \left(\frac{\vec{v}_f + \vec{v}_i}{2}\right)t$$

$$\vec{d} = \vec{v}_i t + \frac{1}{2}\vec{a}t^2 \qquad \vec{v}_f{}^2 = \vec{v}_i{}^2 + 2\vec{a}\vec{d}$$

$$|\vec{v}_c| = \frac{2\pi r}{T} \qquad |\vec{a}_c| = \frac{\vec{v}^2}{r} = \frac{4\pi^2 r}{T^2}$$

Dynamics

$$\vec{a} = \frac{\vec{F}_{net}}{m} \qquad |F_g| = \frac{G m_1 m_2}{r^2}$$

$$|\vec{F}_f| = \mu\ |\vec{F}_N| \qquad |\vec{g}| = \frac{G m_1}{r^2}$$

$$\vec{F}_s = -k\vec{x} \qquad \vec{g} = \frac{\vec{F}_g}{m}$$

Energy

$$W = |\vec{F}||\vec{d}|\cos\theta \qquad E_k = \frac{1}{2}mv^2$$

$$W = \Delta E \qquad E_p = mgh$$

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

Waves and Simple Harmonic Motion

$$T = 2\pi\sqrt{\frac{m}{k}} \qquad v_{max} = A\sqrt{\frac{k}{m}}$$

$$T = 2\pi\sqrt{\frac{l}{g}} \qquad f = \left(\frac{v}{v \pm v_s}\right)f_s$$

$$T = \frac{1}{f} \qquad v = f\lambda$$

Constants

Acceleration Due to Gravity **or**
Gravitational Field Near Earth..... $|\vec{a}_g| = 9.81\ m/s^2$

Gravitational Constant..... $G = 6.67 \times 10^{-11}\ N \cdot m^2/kg^2$

Radius of Earth..... $r_e = 6.37 \times 10^{6}\ m$

Mass of Earth..... $M_e = 5.97 \times 10^{24}\ kg$

Speed of Light in Vacuum..... $c = 3.00 \times 10^{8}\ m/s$

Mass of an Alpha Particle..... $m_\alpha = 6.65 \times 10^{-27}\ kg$

Mass of an Electron..... $m_e = 9.11 \times 10^{-31}\ kg$

Mass of a Proton..... $m_p = 1.67 \times 10^{-27}\ kg$

Mass of a Neutron..... $m_n = 1.67 \times 10^{-27}\ kg$

Physics Principles

0 Uniform motion $(\vec{F}_{net} = 0)$
1 Accelerated motion $(\vec{F}_{net} \neq 0)$
2 Uniform circular motion $(\vec{F}_{net}$ is radially inward$)$
3 Work-energy theorem
4 Conservation of energy

Trigonometry and Geometry

$$\sin\theta = \frac{opposite}{hypotenuse} \qquad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\cos\theta = \frac{adjacent}{hypotenuse} \qquad c^2 = a^2 + b^2 - 2ab\cos\theta$$

$$\tan\theta = \frac{opposite}{adjacent} \qquad c^2 = a^2 + b^2 \qquad slope = \frac{\Delta y}{\Delta x}$$

Area
Rectangle = $l\ w$
Triangle = ½ ab
Circle = πr^2

Circumference
Circle = $2\pi r$

Prefixes Used With SI Units

Prefix	Symbol	Exponential Value
atto	a	10^{-18}
femto	f	10^{-15}
pico	p	10^{-12}
nano	n	10^{-9}
micro	μ	10^{-6}
milli	m	10^{-3}
centi	c	10^{-2}
deci	d	10^{-1}

Prefix	Symbol	Exponential Value
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
hecto	h	10^{2}
deka	da	10^{1}