

Kinematics

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

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

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

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

Dynamics

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

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

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

Energy

$$W = |\vec{F}| |\vec{d}| \cos \theta \quad E_k = \frac{1}{2} m v^2$$

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

$$P = \frac{W}{t} \quad E_p = \frac{1}{2} k x^2$$

Waves and Simple Harmonic Motion

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

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

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

Constants

Acceleration Due to Gravity **or**

Gravitational Field Near Earth..... $|\vec{a}_g| = 9.81 \text{ m/s}^2$

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

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

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

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

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

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

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

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

Physics Principles

0 Uniform motion ($\vec{F}_{\text{net}} = 0$)

1 Accelerated motion ($\vec{F}_{\text{net}} \neq 0$)

2 Uniform circular motion (\vec{F}_{net} is radially inward)

3 Work-energy theorem

4 Conservation of energy

Trigonometry and Geometry

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

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

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

Area

Rectangle = lw

Triangle = $\frac{1}{2} ab$

Circle = πr^2

Circumference

Circle = $2\pi r$

Prefixes Used With SI Units

Prefix	Symbol	Exponential Value	Prefix	Symbol	Exponential Value
atto	a	10^{-18}	tera	T	10^{12}
femto	f	10^{-15}	giga	G	10^9
pico	p	10^{-12}	mega	M	10^6
nano	n	10^{-9}	kilo	k	10^3
micro	μ	10^{-6}	hecto	h	10^2
milli	m	10^{-3}	deka	da	10^1
centi	c	10^{-2}			
deci	d	10^{-1}			