Force and Energy

$F = ma$

$F = w = mg$

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

$F = \frac{k_e q_1 q_2}{d^2}$

$PE = mgh$

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

$W = \triangle KE$

F = force
m = mass
a = acceleration
w = weight
g = acceleration due to gravity
G = gravitational constant
d = distance
k_e = Coulomb's constant
q = charge
PE = potential energy
h = height
KE = kinetic energy
v = velocity
W = work

Motion

$s = \frac{\triangle d}{\triangle t}$

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

$p = mv$

$J = F\triangle t = m\triangle v$

s = speed
d = distance
t = time
a = acceleration
v = velocity
p = momentum
m = mass
J = impulse
F = force

Kepler's Laws

$$e = \frac{f}{d}$$

$$T^2 \propto R^3$$

$e = eccentricity$
$f = distance\ between\ foci\ of\ an\ ellipse$
$d = major\ axis\ length\ of\ an\ ellipse$
$T = orbital\ period$
$R = semi\text{-}major\ axis\ of\ an\ orbit$

Waves and Light

$$E = hf$$

$$v = f\lambda$$

$E = energy$
$h = Planck's\ constant$
$f = frequency$
$v = wave\ speed$
$\lambda = wavelength$

Experimental Design

$$\textbf{Percent Error} = \frac{\left|accepted\ value - experimental\ value\right|}{accepted\ value} \bullet 100$$

$$\textbf{Percent Yield} = \left(\frac{actual\ yield}{theoretical\ yield}\right) \bullet 100$$

Constants

Acceleration Due to Gravity: $g = 9.8\,\frac{m}{s^2}$

Avogadro's Number: $N_A = 6.02 \times 10^{23}\,\frac{\text{particles}}{\text{mol}}$

Charge of an Electron: $e = 1.60 \times 10^{-19}\,C$

Coulomb's Constant: $k_e = 9.00 \times 10^{9}\,\frac{N \cdot m^2}{C^2}$

Gravitational Constant: $G = 6.67 \times 10^{-11}\,\frac{N \cdot m^2}{kg^2}$

Mass of Earth: $M_E = 5.97 \times 10^{24}\,kg$

Planck's Constant: $h = 6.63 \times 10^{-34}\,J \cdot s$

Radius of Earth: $R_E = 6.37 \times 10^{6}\,m$

Speed of Light in a Vacuum: $c = 3.00 \times 10^{8}\,\frac{m}{s}$

Volume of a Gas at 0°C and 100 kPa: $V_m = 22.4\,\frac{L}{mol}$

Conversions

Calorie to Joule: $1\ cal = 4.184\,J$

Pressure: 1 atm = 760 Torr = 101.3 kPa

Units

Energy: $1\ J = 1\ N \cdot m$

Force: $1\ N = 1\,\frac{kg \cdot m}{s^2}$

Frequency: $1\ Hz = 1\,\frac{cycle}{s}$