Force and Energy

$F = ma$

$F = w = mg$

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

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

$PE = mgh$

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

$W = Fd$

$F =$ 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-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

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

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

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