Force and Energy

$F = ma$

$F = w = mg$

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

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

$PE = mgh$

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

$W = \Delta KE$

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

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

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

$\rho = mv$

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

s = speed
d = distance
t = time
a = acceleration
v = velocity
ρ = 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

$E = hf$

$v = f\lambda$

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