PHYSICS FORMULAS

SCIENTIFIC NOTATION

Prefix	Symbol	Power of ten	E notation	Decimal form
tera	T	10 ^ 12	E + 12	1,000,000,000,000
giga	G	10 ^ 9	E + 09	1,000,000,000
mega	M	10 ^ 6	E + 06	1,000,000
kilo	k	10 ^ 3	E + 03	1,000
hecto	h	10 ^ 2	E + 02	100
deka	da	10	E + 01	10
deci	d	10 ^ -1	E – 01	0.1
centi	c	10 ^ -2	E – 02	0.01
mili	m	10 ^ -3	E – 03	0.001
micro	μ	10 ^ -6	E -- 06	0.000001
nano	n	10 ^ -9	E – 09	0.000000001
pico	p	10 ^ -12	E – 12	0.000000000001
femto	f	10 ^ -15	E -- 15	0.000000000000001
atto	a	10 ^ -18	E -- 18	0.000000000000000001

KINEMATIC FORMULAS

Magnitude: $||R|| = \sqrt{(Rx^2 + Ry^2)}$

Direction: $\tan\theta = \frac{Ry}{Rx}$

$V_o\theta = (V_0 \cos\theta, V_o \sin\theta)$

Velocity: $V_{av} = \left(\frac{d}{t}\right)$: d = distance, t = elapsed time

$V_{BA} = V_{BE} - V_{AE}$: relative velocity

$V_{av} = (\frac{\Delta X}{\Delta T}) = \left(\frac{X-Xo}{T-To}\right)$: Velocity average

$V = \left(\frac{dx}{dt}\right)$: Instantaneous velocity

Acceleration: $A_{av} = \left(\frac{v}{t}\right)$: v = velocity , t = elapsed time

$A_{av} = \left(\frac{\Delta v}{\Delta t}\right) = \left(\frac{V-Vo}{T-To}\right)$: Acceleration average

$A = \left(\frac{dv}{dt}\right)$: Instantaneous acceleration

Constant acceleration: $x = \frac{1}{2}a_o t^2 + v_o t + x_o \rightarrow \theta = \frac{1}{2}\alpha t^2 + \omega_o t + \theta_o$

$v = a_o t + v_o \rightarrow \omega = \alpha t + \omega_o$

$v^2 - {v_o}^2 = 2a(\Delta x) \rightarrow \omega^2 - {\omega_o}^2 = 2\alpha(\Delta\theta)$

PHYSICS FORMULAS

Newton 2nd law: $\sum F = ma \rightarrow \sum T = I\alpha$: F = force , m = mass , a = acceleration

: T = torque , I = moment of inertia , α = rotational acceleration

Work : $W = F \cdot \Delta x$ **:** w = work , F = force , Δx = distance

$Wnet = \int F dx$

Universal Gravitation: $F = G\frac{m_1 \cdot m_2}{r^2}$: F = force of attraction , $m_1 \cdot m_2 = product\ of\ masses$

G = grav const r = radial distance between 2 masses

Centripetal Force: $F = \frac{m \cdot v^2}{r}$: F = centipal force , m = mass , v = velocity , r = radius

Pendulum: $T = 2\pi\sqrt{\frac{l}{g}}$: T = period , l = length , g = acceleration of gravity

Mechanical heat: $W = J \cdot Q$: W = work , Q = heat , J= mech equiv of heat

ENERGY RELATIONSHIPS

Kinetic Energy $KE = \frac{1}{2}m \cdot v^2$: KE = kinetic energy , m = mass , v = velocity

Potential Energy $U = m \cdot g \cdot \Delta y$: U = potential energy , m = mass , g = acceleration of gravity

Conservation of energy $\sum E_{in} = \sum E_{out}$: $E_{in} = energy\ in$, $E_{out} = energy\ out$

OPTICAL RELATIONSHIPS

Wave formula: $v = f \cdot \lambda$:v = wave speed , f = frequency, wave length

Images: $\frac{S_o}{S_i} = \frac{D_o}{D_i}$: So = object size , Si = image size, Do = object

Focal length: $\frac{1}{f} = \frac{1}{D_o} + \frac{1}{D_i}$: f = focal length , Do = object , Di = image distance

Snells law: $n_1 \sin\theta_2 = n_2 \sin\theta_2$: n1 = refractive index , θ = angle between ray to surface

ELECTRICTY AND MAGNETISM

Electric current: $I = \frac{q}{t}$: I = current , q = charge , t = time

Coulombs law: $F = k\frac{q_1 q_2}{d^2}$: F = force , k = columbs constant, q = charge , d = dist

Capacitance: $C = \frac{q}{v}$: C = capacitance , V = potential difference , q = charge

Ohms law: $E = I \cdot R$: E = emf of source , I = Current , R = resistance

Induced EMF: $E = -N\frac{d\Phi}{dt}$: N = number of turns, $\frac{d\Phi}{dt}$ = change in flux

Induced EMF: $E = B \cdot L \cdot V$: E = induced emf , l = length , v = velocity

Instantaneous voltage: $e = E_{max} \sin\theta$: e = instantaneous voltage, $E_{max} = \max voltage$

Instantaneous current: $i = I_{max} \sin\theta$: I = instantaneous current , $I_{max} = \max current$