Kinematics

$v = \frac{x}{t}$

$v_f = v_i + at$

$x = v_i t + \frac{1}{2}at^2$

$x = \frac{1}{2}(v_i + v_f)t$

$v_f^{\ 2} = v_i^{\ 2} + 2ax$

$x = \frac{-2v_i^{\ 2}\sin\theta\cos\theta}{g}$

$F_{net} = ma$

$F_f = \mu F_N$

$F_f = \mu F_N$

$W_{net} = Fd \text{ or } W_{net} = Fd\cos\theta$

$W_{net} = \Delta KE = KE_f - KE_i$

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

$PE = mgh$

$KE_i + PE_i = KE_f + PE_f$

$P = \frac{W}{t} = \frac{Fd}{t} = F\bar{v}$

$p = mv$

$impulse = \Delta p = F\Delta t = m\Delta v$

$m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$

Circular Motion

$v_t = \frac{2\pi r}{T}$

$a_c = \frac{v_t^2}{r} = \frac{4\pi^2 r}{T^2}$

$F_c = ma_c = \frac{mv_t^2}{r} = \frac{m4\pi^2 r}{T^2}$

$F_g = G\frac{m_1 m_2}{r^2}$

$g = G\frac{m_{center}}{r^2}$

Kinematics

v = constant velocity
v_f = final velocity
v_i = initial velocity
x = displacement
t = time
a = constant acceleration
g = acceleration of gravity
θ = angle (degree)
F = force
M = mass
F_f = friction force
F_N = normal force
μ = coefficient of friction
d = overall displacement
W = work
KE = kinetic energy
PE = potential energy
h = height above zero
P = power
p = momentum

Circular Motion

r = distance from center
v_t = tangential velocity
T = period
a_c = centripetal acceleration
F_c = centripetal force
G = Universal Gravitational Constant
$G = (6.673 \times 10^{-11}\ N\bullet m^2/kg^2)$

Fluid Mechanics

ρ = density
V = volume of fluid
F_B = buoyant force
P = pressure
A = area
P_o = pressure above fluid
^oF = degree Fahrenheit
^oC = degree Celsius
K = Kelvin temperature
h = height of fluid above
v = velocity of fluid
T = temperature
n = number of moles of a gas
N = number of particles of a gas
R = Gas Constant
8.31 J/mol• K
K = Boltzmann's Constant
1.38×10^{-23} J/K

Heat

Q = heat
C_p = specific heat
ΔT = change in temperature
L_f = latent heat of fusion
L_v = latent heat of vaporization

Fluid Mechanics

$\rho = \frac{m}{V}$

$F_B = F_g(displaced\ fluid) = m_f(g)$

$F_B = F_g(object) = m_o(g) = \rho gV$

$\frac{\rho_f}{\rho_o} = \frac{V_o}{V_f}$ *when floating*

$\frac{F_g(object)}{F_B} = \frac{\rho_o}{\rho_f}$ *when submerged*

$P = \frac{F}{A}$

$\frac{F_1}{A_1} = \frac{F_2}{A_2}$

$P = P_o + \rho gh$

$^oF = \frac{9}{5}{}^oC + 32$

$K = {}^oC + 273.15$

$A_1 v_1 = A_2 v$

$P_1 + \frac{1}{2}\rho v_1^2 + \rho gh_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho gh_2$

$PV = nRT$

$PV = NkT$

$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

Heat

$Q = mc_p\Delta T$

$(mc_p\Delta T)_{gained} = -(mc_p\Delta T)_{lost}$

$Q = mL_f$

$Q = mL_v$

Simple Harmonic Motion and Waves

$F_{(elastic)} = -kx$

$PE_{(elastic)} = \frac{1}{2}kx^2$

$f = \frac{1}{T}$ or $T = \frac{1}{f}$

$T_{(P)} = 2\pi\sqrt{\frac{L}{g}}.$

$T_{(S)} = 2\pi\sqrt{\frac{m}{k}}$

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

$\lambda_{(s)} = \frac{2L}{n} \quad n = 1, 2, 3,...$

Standing wave on a String/Spring

$f_{(s)} = n\frac{v}{2L} \quad n = 1, 2, 3, ...$

Standing wave in Open and Closed Pipe

$f_{(s)} = n\frac{v}{2L} \quad n = 1, 2, 3,...$

$f_{(s)} = n\frac{v}{4L} \quad n = 1, 3, 5,...$

$\text{intensity} = \frac{p}{4\pi r^2}$

$f_{beat} = \Delta f = f_1 - f_2$

Simple Harmonic Motion and Waves

k=spring constant
f=frequency
T=period
λ=wavelength

Light and Optics

c=3.00x10^8 m/s (speed of light)
f=*focal length*
p=object distance
q=image distance
M=magnification
h'=height of image
h=height of object
n=index of refraction
d=distance between slits
m=order # for interference eq

Electricity

q = charge
N = number of particles
e = elementary charge (1.60x10^{-19}C)
F_E = electric force
k_C = columb's constant (8.99x10^9 N•m^2/C^2)
E = electric field
I = current
t = time
V = potential difference
v=velocity
R = resistance
R_{eq}=Equilivent Resistance
P = Power

Subatomic Physics

E_0 = rest energy
E_{bind} = binding energy
Δm = mass defect
u = atomic mass unit
N = number of unstable nuceli
ΔN = number of decayed nuclei
λ = decay constant
$T_{1/2}$ = Half-Life
n = number of half-lifes
1 u=1.660502 x 10^{-27} kg
Or
1 u converted to energy =931MeV
1 Ci=3.7 x 10^{10} Bq

Light and Optics

$c = \lambda f$

$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$

$M = \frac{h'}{h} = -\frac{q}{p}$

$n = \frac{c}{v}$

$n_i(\sin\theta_i) = n_r(\sin\theta_r)$

$\sin\theta_c = \frac{n_r}{n_i}$

$d(\sin\theta) = m\lambda \quad m = 0,\pm1,\pm2,...$

$d(\sin\theta) = (m + \frac{1}{2})\lambda \quad m = 0,\pm1,\pm2,...$

Electricity

$q = Ne$

$F_E = k_C\frac{q_1q_2}{r^2}$

$E = \frac{F}{|q_o|} = k_C\frac{|q|}{r^2}$

$I = \frac{q}{t}$

$V = IR$

$P = IV = I^2R = \frac{V^2}{R}$

$R_{eq-s} = R_1 + R_2 + R_3 + ...$

$\frac{1}{R_{eq-p}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + ...$

$F_{magnetic} = qvB$

Subatomic Physics

$E_0 = mc^2$

$E_{bind} = \Delta mc^2$

$\Delta N = -\lambda N\Delta t$

$Activity = -\Delta N/\Delta t = \lambda N$

$T_{1/2} = \frac{0.693}{\lambda}$

$Fraction\,Undecayed = \frac{1}{2^n}$