ADVANCED PLACEMENT PHYSICS B EQUATIONS FOR 1998

NEWTONIAN MECHANICS

$v = v_0 + at$

$s = s_0 + v_0 t + \frac{1}{2} at^2$

$v^2 = v_0^2 + 2a(s - s_0)$

$\sum \mathbf{F} = \mathbf{F}_{net} = m\mathbf{a}$

$F_{fric} \leq \mu N$

$a_c = \frac{v^2}{r}$

$\tau = rF \sin \theta$

$\mathbf{p} = m\mathbf{v}$

$\mathbf{J} = \mathbf{F}\Delta t = \Delta \mathbf{p}$

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

$\Delta U_g = mgh$

$W = \mathbf{F} \cdot \mathbf{s} = Fs \cos \theta$

$P_{avg} = \frac{W}{\Delta t}$

$P = Fv$

$\mathbf{F}_s = -k\mathbf{x}$

$U_s = \frac{1}{2} kx^2$

$T_s = 2\pi \sqrt{\frac{m}{k}}$

$T_p = 2\pi \sqrt{\frac{\ell}{g}}$

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

$F_G = -\frac{Gm_1 m_2}{r^2}$

$U_G = -\frac{Gm_1 m_2}{r}$

a = acceleration
F = force
f = frequency
h = height
J = impulse
K = kinetic energy
k = spring constant
ℓ = length
m = mass
N = normal force
P = power
p = momentum
r = distance
s = displacement
T = period
t = time
U = potential energy
v = velocity or speed
W = work
x = displacement
μ = coefficient of friction
θ = angle
τ = torque

ELECTRICITY AND MAGNETISM

$F = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2}$

$\mathbf{E} = \frac{\mathbf{F}}{q}$

$U_E = qV = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r}$

$E_{avg} = -\frac{V}{d}$

$V = \frac{1}{4\pi\epsilon_0} \sum \frac{q}{r}$

$C = \frac{Q}{V}$

$C = \frac{\epsilon_0 A}{d}$

$U_C = \frac{1}{2} QV = \frac{1}{2} CV^2$

$I_{avg} = \frac{\Delta Q}{\Delta t}$

$R = \frac{\rho \ell}{A}$

$V = IR$

$P = IV$

$C_p = \sum_i C_i$

$\frac{1}{C_s} = \sum_i \frac{1}{C_i}$

$R_s = \sum_i R_i$

$\frac{1}{R_p} = \sum_i \frac{1}{R_i}$

$F_B = qvB \sin \theta$

$F_B = BI\ell \sin \theta$

$B = \frac{\mu_0}{2\pi} \frac{I}{r}$

$\phi_m = \mathbf{B} \cdot \mathbf{A} = BA \cos \theta$

$\mathcal{E}_{avg} = -\frac{\Delta \phi_m}{\Delta t}$

$\mathcal{E} = B\ell v$

A = area
B = magnetic field
C = capacitance
d = distance
E = electric field
$\mathcal{E}$ = emf
F = force
I = current
ℓ = length
P = power
Q = charge
q = point charge
R = resistance
r = distance
t = time
U = potential (stored) energy
V = electric potential or potential difference
v = velocity or speed
ρ = resistivity
ϕ_m = magnetic flux

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THERMAL PHYSICS

$\Delta \ell = \alpha \ell_0 \Delta T$

$Q = mL$

$Q = mc\Delta T$

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

$pV = nRT$

$K_{avg} = \frac{3}{2} k_B T$

$v_{rms} = \sqrt{\frac{3RT}{M}} = \sqrt{\frac{3k_B T}{\mu}}$

$W = p\Delta V$

$Q = nc\Delta T$

$\Delta U = Q - W$

$\Delta U = nc_V \Delta T$

$e = \frac{W}{Q_H} = \frac{Q_H - Q_C}{Q_H}$

$e_C = \frac{T_H - T_C}{T_H}$

A = area
c = specific heat or molar specific heat
e = efficiency
F = force
K_{avg} = average molecular kinetic energy
L = heat of transformation
ℓ = length
M = molar mass
m = mass of sample
n = number of moles
p = pressure
Q = heat transferred
T = temperature
U = internal energy
V = volume
v_{rms} = root-mean-square velocity
W = work done by system
α = coefficient of linear expansion
μ = mass of molecule

WAVES AND OPTICS

$v = v\lambda$

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

$n_1 \sin \theta_1 = n_2 \sin \theta_2$

$\sin \theta_c = \frac{n_2}{n_1}$

$\frac{1}{s_i} + \frac{1}{s_0} = \frac{1}{f}$

$M = \frac{h_i}{h_0} = -\frac{s_i}{s_0}$

$f = \frac{R}{2}$

$d \sin \theta = m\lambda$

$x_m \approx \frac{m\lambda L}{d}$

d = separation
f = focal length
h = height
L = distance
M = magnification
m = an integer
n = index of refraction
R = radius of curvature
s = distance
v = speed
x = distance
λ = wavelength
v = frequency
θ = angle

ATOMIC AND NUCLEAR PHYSICS

$E = hv = pc$

$K_{max} = hv - \phi$

$\lambda = \frac{h}{p}$

$\Delta E = (\Delta m)c^2$

E = energy
K = kinetic energy
m = mass
p = momentum
λ = wavelength
v = frequency
ϕ = work function

GEOMETRY AND TRIGONOMETRY

Rectangle
$A = bh$
Triangle
$A = \frac{1}{2} bh$
Circle
$A = \pi r^2$
$C = 2\pi r$
Parallelepiped
$V = \ell wh$
Cylinder
$V = \pi r^2 \ell$
$S = 2\pi r\ell + 2\pi r^2$
Sphere
$V = \frac{4}{3} \pi r^3$
$S = 4\pi r^2$
Right Triangle
$a^2 + b^2 = c^2$
$\sin \theta = \frac{a}{c}$
$\cos \theta = \frac{b}{c}$
$\tan \theta = \frac{a}{b}$

A = area
C = circumference
V = volume
S = surface area
b = base
h = height
ℓ = length
w = width
r = radius