Physics I & II Formulas

TEXAS A&M UNIVERSITY CORPUS CHRISTI | CASA CENTER FOR ACADEMIC STUDENT ACHIEVEMENT

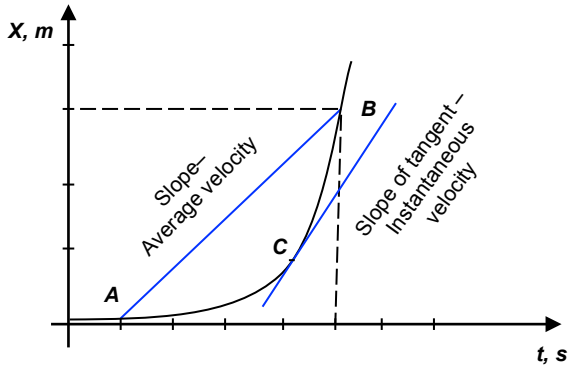
Kinematics

$$v_{av} = \frac{\Delta d}{\Delta t} = \frac{v_1 + v_2}{2} \qquad a_{av} = \frac{v_2 - v_1}{\Delta t}$$

$$\Delta d = \frac{(v_1 + v_2)\Delta t}{2} \qquad \Delta d = v_2\Delta t - \frac{1}{2}a\Delta t^2$$

$$v_2 = v_1 + a\Delta t \qquad \Delta d = v_1\Delta t + \frac{1}{2}a\Delta t^2$$

$$v_2^2 = v_1^2 + 2a\Delta d$$



Dynamics

$$F_{net} = ma \qquad F_g = mg \qquad F_g = \frac{Gm_1m_2}{\Delta d^2} \qquad F_f = \mu F_N \qquad F = kx$$

$$a_c = \frac{v^2}{r} \qquad F_c = ma_c = \frac{mv^2}{r} \qquad a_c = \frac{4\pi^2 r}{T^2} = 4\pi^2 rf^2 \qquad \frac{F_1}{F_2} = \frac{m_1}{m_2}\left(\frac{d_2}{d_1}\right)^2$$

$$g = \frac{GM}{R^2} \qquad v_{esc} = \sqrt{\frac{2GM}{r}} \qquad \frac{r^3}{T^2} = \frac{GM}{4\pi^2} \qquad v^2 = \frac{Gm_E}{r}$$

Energy, Momentum & Power

$$W = F\Delta d\cos\theta \qquad E_g = mgh = -\frac{GMm}{r} \qquad E_k = \frac{1}{2}mv^2 \qquad E_{th} = F_f\Delta d$$

$$E_{elastic} = \frac{1}{2}kx^2 \qquad T = 2\pi\sqrt{\frac{m}{k}} \qquad P = \frac{W}{\Delta t} = \frac{F\Delta d}{\Delta t} = Fv_{av}$$

$$p = mv \qquad p = p' \qquad J = F\Delta t = m\Delta v = \Delta p \qquad \text{efficiency} = \frac{W_{output}}{W_{input}} \times 100\%$$

<u>Important</u>

NO displacement, NO work

When work is done ON the system, work is POSITIVE

When work is done BY the system, work is NEGATIVE

The information for this handout was compiled from the following sources:
Serway, R. A., &Vuille, C. (2011). *College physics.* Boston: Brooks/Cole
Physics Equation Sheet (n.d.): Retrieved from http://img.docstoccdn.com/thumb/orig/123491963.png
Physics Land (2012). Electricity and magnetism equations. Retrieved from http://www.physicsland.org/electricity-and-magnetism-equations/

Physics I & II Formulas

TEXAS A&M UNIVERSITY CORPUS CHRISTI | CASA CENTER FOR ACADEMIC STUDENT ACHIEVEMENT

Waves

$$v = \lambda f$$

$$L = \frac{n\lambda}{2}$$

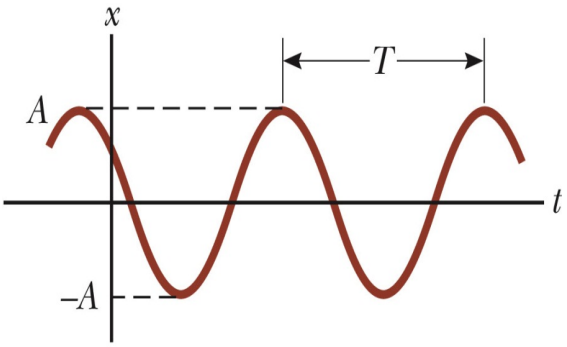
$$L = \frac{(2n-1)\lambda}{4}$$

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

$$\sin\theta_c = \frac{1}{n}$$

$$n\lambda = d\sin\theta$$

v	Wave speed	[v] = m/s
λ	Wavelength	[λ] = m
A	Amplitude	[A] = m
f	Frequency	[f] = Hz
T	Period	[T] = s



$$x = A\cos(\omega t)$$

Amplitude — Angular frequency

Where v is also $v = \sqrt{\frac{F}{\mu}}$

Electricity and Magnetism Equations (Also suitable for AP Physics Exam) from PhysicsLand.com

$$F = \frac{kq_1q_2}{r^2}$$

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

$$U_E = qV = \frac{kq_1q_2}{r}$$

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

$$V = k\left(\frac{q_1}{r_1} + \frac{q_2}{r_2} + \frac{q_3}{r_3} + \ldots\right)$$

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

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

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

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

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

$$V = IR$$

$$P = IV$$

$$C_p = C_1 + C_2 + C_3 + \ldots$$

$$\frac{1}{C_s} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \ldots$$

$$R_s = R_1 + R_2 + R_3 + \ldots$$

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$$

$$F_B = qvB\sin\theta$$

$$F_B = BI\ell\sin\theta$$

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

$$\phi_m = BA\cos\theta$$

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

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

Where:

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

Speed Of Light

$$c = \frac{1}{\sqrt{\mu_0\varepsilon_0}} = 3.0\times10^8\ \text{m/s}$$

Permittivity Of Free Space

$$\varepsilon_0 = 8.85\times10^{-12}\ \text{C}^2/(\text{N}\cdot\text{m}^2)$$

Permeability Of Free Space

$$\mu_0 = 4\pi\times10^{-7}\ (\text{T}\cdot\text{m})/\text{A}$$

Acceleration Due To Gravity At Earth's Surface

$$g = 9.8\ \text{m/s}^2$$

Gravitational Constant

$$G = 6.67\times10^{-11}\ (\text{N}\cdot\text{m}^2)/\text{kg}^2$$

h-bar

$$\hbar = \frac{h}{2\pi}$$

Planck's Constant

$$h = 4.14\times10^{-15}\ \text{eV}\cdot\text{s}$$

Boltzmann's Constant

$$k = 1.38\times10^{-23}\ \text{J/(molecule}\cdot\text{K)}$$

Charge Of Electron

$$e = 1.6\times10^{-19}\ \text{C}$$

1 Atomic Mass Unit

$$1\ \text{amu} = 1.66\times10^{-27}\ \text{kg}$$

1 Electron Volt

$$1\ \text{eV} = 1.6\times10^{-19}\ \text{J}$$

Coulomb's Constant

$$k = \frac{1}{4\pi\varepsilon_0} = 8.99\times10^9\ \text{N}\cdot\text{m}^2/\text{C}^2$$

Mass Of Electron

$$m_e = 9.11\times10^{-31}\ \text{kg}$$

Mass Of Earth

$$m_E = 5.98\times10^{24}\ \text{kg}$$

Ideal Gas Constant

$$R = 8.31\ \text{J/(mol}\cdot\text{K)}$$

Avogadro's Number

$$N_A = 6.02\times10^{23}\ \text{molecules/mol}$$

Radius Of Earth

$$R_E = 6.38\times10^6\ \text{m}$$

Stefan-Boltzmann Constant

$$\sigma = 5.67\times10^{-8}\ \text{W/(m}^2\cdot\text{K}^4)$$

Physic Constants & Unit Conversion

Prefix	Symbol	Notation
tera	T	10^{12}
giga	G	10^9
mega	M	10^6
kilo	k	10^3
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

The information for this handout was compiled from the following sources:
Serway, R. A., &Vuille, C. (2011). *College physics.* Boston: Brooks/Cole
Physics Equation Sheet (n.d.): Retrieved from http://img.docstoccdn.com/thumb/orig/123491963.png
Physics Land (2012). Electricity and magnetism equations. Retrieved from http://www.physicsland.org/electricity-and-magnetism-equations/