

TABLE OF INFORMATION FOR 2006 and 2007

CONSTANTS AND CONVERSION FACTORS		UNITS		PREFIXES																																			
		Name	Symbol	Factor	Prefix	Symbol																																	
1 unified atomic mass unit,	$1 \text{ u} = 1.66 \times 10^{-27} \text{ kg}$ $= 931 \text{ MeV}/c^2$	meter	m	10^9	giga	G																																	
Proton mass,	$m_p = 1.67 \times 10^{-27} \text{ kg}$	kilogram	kg	10^6	mega	M																																	
Neutron mass,	$m_n = 1.67 \times 10^{-27} \text{ kg}$	second	s	10^3	kilo	k																																	
Electron mass,	$m_e = 9.11 \times 10^{-31} \text{ kg}$	ampere	A	10^{-2}	centi	c																																	
Electron charge magnitude,	$e = 1.60 \times 10^{-19} \text{ C}$	kelvin	K	10^{-3}	milli	m																																	
Avogadro's number,	$N_0 = 6.02 \times 10^{23} \text{ mol}^{-1}$	mole	mol	10^{-6}	micro	μ																																	
Universal gas constant,	$R = 8.31 \text{ J}/(\text{mol}\cdot\text{K})$	hertz	Hz	10^{-9}	nano	n																																	
Boltzmann's constant,	$k_B = 1.38 \times 10^{-23} \text{ J/K}$	newton	N	10^{-12}	pico	p																																	
Speed of light,	$c = 3.00 \times 10^8 \text{ m/s}$	pascal	Pa	VALUES OF TRIGONOMETRIC FUNCTIONS FOR COMMON ANGLES <table border="1"> <thead> <tr> <th>θ</th> <th>$\sin \theta$</th> <th>$\cos \theta$</th> <th>$\tan \theta$</th> </tr> </thead> <tbody> <tr> <td>0°</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>30°</td> <td>1/2</td> <td>$\sqrt{3}/2$</td> <td>$\sqrt{3}/3$</td> </tr> <tr> <td>37°</td> <td>3/5</td> <td>4/5</td> <td>3/4</td> </tr> <tr> <td>45°</td> <td>$\sqrt{2}/2$</td> <td>$\sqrt{2}/2$</td> <td>1</td> </tr> <tr> <td>53°</td> <td>4/5</td> <td>3/5</td> <td>4/3</td> </tr> <tr> <td>60°</td> <td>$\sqrt{3}/2$</td> <td>1/2</td> <td>$\sqrt{3}$</td> </tr> <tr> <td>90°</td> <td>1</td> <td>0</td> <td>∞</td> </tr> </tbody> </table>				θ	$\sin \theta$	$\cos \theta$	$\tan \theta$	0°	0	1	0	30°	1/2	$\sqrt{3}/2$	$\sqrt{3}/3$	37°	3/5	4/5	3/4	45°	$\sqrt{2}/2$	$\sqrt{2}/2$	1	53°	4/5	3/5	4/3	60°	$\sqrt{3}/2$	1/2	$\sqrt{3}$	90°	1	0	∞
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Planck's constant,	$h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$ $= 4.14 \times 10^{-15} \text{ eV}\cdot\text{s}$ $hc = 1.99 \times 10^{-25} \text{ J}\cdot\text{m}$ $= 1.24 \times 10^3 \text{ eV}\cdot\text{nm}$	joule	J																																				
Vacuum permittivity,	$\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N}\cdot\text{m}^2$	watt	W																																				
Coulomb's law constant,	$k = 1/4\pi\epsilon_0 = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$	coulomb	C																																				
Vacuum permeability,	$\mu_0 = 4\pi \times 10^{-7} (\text{T}\cdot\text{m})/\text{A}$	volt	V																																				
Magnetic constant,	$k' = \mu_0/4\pi = 10^{-7} (\text{T}\cdot\text{m})/\text{A}$	ohm	Ω																																				
Universal gravitational constant,	$G = 6.67 \times 10^{-11} \text{ m}^3/\text{kg}\cdot\text{s}^2$	henry	H																																				
Acceleration due to gravity at Earth's surface,	$g = 9.8 \text{ m/s}^2$	farad	F																																				
1 atmosphere pressure,	$1 \text{ atm} = 1.0 \times 10^5 \text{ N/m}^2$ $= 1.0 \times 10^5 \text{ Pa}$	tesla	T																																				
1 electron volt,	$1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$	degree																																					
		Celsius	$^\circ\text{C}$																																				
		electron-volt	eV																																				

The following conventions are used in this exam.

- I. Unless otherwise stated, the frame of reference of any problem is assumed to be inertial.
- II. The direction of any electric current is the direction of flow of positive charge (conventional current).
- III. For any isolated electric charge, the electric potential is defined as zero at an infinite distance from the charge.
- *IV. For mechanics and thermodynamics equations, W represents the work done on a system.

*Not on the Table of Information for Physics C, since Thermodynamics is not a Physics C topic.

ADVANCED PLACEMENT PHYSICS B EQUATIONS FOR 2006 and 2007

NEWTONIAN MECHANICS

$v = v_0 + at$	$a =$ acceleration
$x = x_0 + v_0t + \frac{1}{2}at^2$	$F =$ force
$v^2 = v_0^2 + 2a(x - x_0)$	$f =$ frequency
$\Sigma \mathbf{F} = \mathbf{F}_{net} = m\mathbf{a}$	$h =$ height
$F_{fric} \leq \mu N$	$J =$ impulse
$a_c = \frac{v^2}{r}$	$K =$ kinetic energy
$\tau = rF \sin \theta$	$k =$ spring constant
$\mathbf{p} = m\mathbf{v}$	$\ell =$ length
$\mathbf{J} = \mathbf{F}\Delta t = \Delta \mathbf{p}$	$m =$ mass
$K = \frac{1}{2}mv^2$	$N =$ normal force
$\Delta U_g = mgh$	$P =$ power
$W = F\Delta r \cos \theta$	$p =$ momentum
$P_{avg} = \frac{W}{\Delta t}$	$r =$ radius or distance
$P = Fv \cos \theta$	$T =$ period
$\mathbf{F}_s = -k\mathbf{x}$	$t =$ time
$U_s = \frac{1}{2}kx^2$	$U =$ potential energy
$T_s = 2\pi\sqrt{\frac{m}{k}}$	$v =$ velocity or speed
$T_p = 2\pi\sqrt{\frac{\ell}{g}}$	$W =$ work done on a system
$T = \frac{1}{f}$	$x =$ position
$F_G = -\frac{Gm_1m_2}{r^2}$	$\mu =$ coefficient of friction
$U_G = -\frac{Gm_1m_2}{r}$	$\theta =$ angle
	$\tau =$ torque

ELECTRICITY AND MAGNETISM

$F = \frac{1}{4\pi\epsilon_0} \frac{q_1q_2}{r^2}$	$A =$ area
$\mathbf{E} = \frac{\mathbf{F}}{q}$	$B =$ magnetic field
$U_E = qV = \frac{1}{4\pi\epsilon_0} \frac{q_1q_2}{r}$	$C =$ capacitance
$E_{avg} = -\frac{V}{d}$	$d =$ distance
$V = \frac{1}{4\pi\epsilon_0} \sum_i \frac{q_i}{r_i}$	$E =$ electric field
$C = \frac{Q}{V}$	$\mathcal{E} =$ emf
$C = \frac{\epsilon_0 A}{d}$	$F =$ force
$U_c = \frac{1}{2}QV = \frac{1}{2}CV^2$	$I =$ current
$I_{avg} = \frac{\Delta Q}{\Delta t}$	$\ell =$ length
$R = \frac{\rho \ell}{A}$	$P =$ power
$V = IR$	$Q =$ charge
$P = IV$	$q =$ point charge
$C_p = \sum_i C_i$	$R =$ resistance
$\frac{1}{C_s} = \sum_i \frac{1}{C_i}$	$r =$ distance
$R_s = \sum_i R_i$	$t =$ time
$\frac{1}{R_p} = \sum_i \frac{1}{R_i}$	$U =$ potential (stored) energy
$F_B = qvB \sin \theta$	$V =$ electric potential or potential difference
$F_B = BI\ell \sin \theta$	$v =$ velocity or speed
$B = \frac{\mu_0 I}{2\pi r}$	$\rho =$ resistivity
$\phi_m = BA \cos \theta$	$\theta =$ angle
$\mathcal{E}_{avg} = -\frac{\Delta \phi_m}{\Delta t}$	$\phi_m =$ magnetic flux
$\mathcal{E} = B\ell v$	

ADVANCED PLACEMENT PHYSICS B EQUATIONS FOR 2006 and 2007

FLUID MECHANICS AND THERMAL PHYSICS

$P = P_0 + \rho gh$	$A = \text{area}$
$F_{buoy} = \rho Vg$	$e = \text{efficiency}$
$A_1 v_1 = A_2 v_2$	$F = \text{force}$
$P + \rho gy + \frac{1}{2} \rho v^2 = \text{const.}$	$h = \text{depth}$
$\Delta \ell = \alpha \ell_0 \Delta T$	$H = \text{rate of heat transfer}$
$H = \frac{kA \Delta T}{L}$	$k = \text{thermal conductivity}$
$P = \frac{F}{A}$	$K_{avg} = \text{average molecular kinetic energy}$
$PV = nRT = Nk_B T$	$\ell = \text{length}$
$K_{avg} = \frac{3}{2} k_B T$	$L = \text{thickness}$
$v_{rms} = \sqrt{\frac{3RT}{M}} = \sqrt{\frac{3k_B T}{\mu}}$	$M = \text{molar mass}$
$W = -P \Delta V$	$n = \text{number of moles}$
$\Delta U = Q + W$	$N = \text{number of molecules}$
$e = \left \frac{W}{Q_H} \right $	$P = \text{pressure}$
$e_c = \frac{T_H - T_C}{T_H}$	$Q = \text{heat transferred to a system}$
	$T = \text{temperature}$
	$U = \text{internal energy}$
	$V = \text{volume}$
	$v = \text{velocity or speed}$
	$v_{rms} = \text{root-mean-square velocity}$
	$W = \text{work done on a system}$
	$y = \text{height}$
	$\alpha = \text{coefficient of linear expansion}$
	$\mu = \text{mass of molecule}$
	$\rho = \text{density}$

ATOMIC AND NUCLEAR PHYSICS

$E = hf = pc$	$E = \text{energy}$
$K_{max} = hf - \phi$	$f = \text{frequency}$
$\lambda = \frac{h}{p}$	$K = \text{kinetic energy}$
$\Delta E = (\Delta m) c^2$	$m = \text{mass}$
	$p = \text{momentum}$
	$\lambda = \text{wavelength}$
	$\phi = \text{work function}$

WAVES AND OPTICS

$v = f \lambda$	$d = \text{separation}$
$n = \frac{c}{v}$	$f = \text{frequency or focal length}$
$n_1 \sin \theta_1 = n_2 \sin \theta_2$	$h = \text{height}$
$\sin \theta_c = \frac{n_2}{n_1}$	$L = \text{distance}$
$\frac{1}{s_i} + \frac{1}{s_o} = \frac{1}{f}$	$M = \text{magnification}$
$M = \frac{h_i}{h_o} = -\frac{s_i}{s_o}$	$m = \text{an integer}$
$f = \frac{R}{2}$	$n = \text{index of refraction}$
$d \sin \theta = m \lambda$	$R = \text{radius of curvature}$
$x_m \sim \frac{m \lambda L}{d}$	$s = \text{distance}$
	$v = \text{speed}$
	$x = \text{position}$
	$\lambda = \text{wavelength}$
	$\theta = \text{angle}$

GEOMETRY AND TRIGONOMETRY

Rectangle	$A = \text{area}$
$A = bh$	$C = \text{circumference}$
Triangle	$V = \text{volume}$
$A = \frac{1}{2} bh$	$S = \text{surface area}$
Circle	$b = \text{base}$
$A = \pi r^2$	$h = \text{height}$
$C = 2\pi r$	$\ell = \text{length}$
Parallelepiped	$w = \text{width}$
$V = \ell wh$	$r = \text{radius}$

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
$a^2 + b^2 = c^2$

$$\sin \theta = \frac{a}{c}$$

$$\cos \theta = \frac{b}{c}$$

$$\tan \theta = \frac{a}{b}$$

