

# AP<sup>®</sup> PHYSICS 1 TABLE OF INFORMATION

## CONSTANTS AND CONVERSION FACTORS

Proton mass, $m_p = 1.67 \times 10^{-27}$ kg Neutron mass, $m_n = 1.67 \times 10^{-27}$ kg Electron mass, $m_e = 9.11 \times 10^{-31}$ kg Speed of light, $c = 3.00 \times 10^8$ m/s	Electron charge magnitude, $e = 1.60 \times 10^{-19}$ C Coulomb's law constant, $k = 1/4\pi\epsilon_0 = 9.0 \times 10^9$ N·m <sup>2</sup> /C <sup>2</sup> Universal gravitational constant, $G = 6.67 \times 10^{-11}$ m <sup>3</sup> /kg·s <sup>2</sup> Acceleration due to gravity at Earth's surface, $g = 9.8$ m/s <sup>2</sup>
---	--

UNIT SYMBOLS	meter, m	kelvin, K	watt, W	degree Celsius, °C
	kilogram, kg	hertz, Hz	coulomb, C	
	second, s	newton, N	volt, V	
	ampere, A	joule, J	ohm, Ω	

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

VALUES OF TRIGONOMETRIC FUNCTIONS FOR COMMON ANGLES							
$\theta$	0°	30°	37°	45°	53°	60°	90°
$\sin \theta$	0	1/2	3/5	$\sqrt{2}/2$	4/5	$\sqrt{3}/2$	1
$\cos \theta$	1	$\sqrt{3}/2$	4/5	$\sqrt{2}/2$	3/5	1/2	0
$\tan \theta$	0	$\sqrt{3}/3$	3/4	1	4/3	$\sqrt{3}$	∞

The following conventions are used in this exam.

- I. The frame of reference of any problem is assumed to be inertial unless otherwise stated.
- II. Assume air resistance is negligible unless otherwise stated.
- III. In all situations, positive work is defined as work done on a system.
- IV. The direction of current is conventional current: the direction in which positive charge would drift.
- V. Assume all batteries and meters are ideal unless otherwise stated.

# AP<sup>®</sup> PHYSICS 1 EQUATIONS

## MECHANICS

$$v_x = v_{x0} + a_x t$$

$$x = x_0 + v_{x0} t + \frac{1}{2} a_x t^2$$

$$v_x^2 = v_{x0}^2 + 2a_x(x - x_0)$$

$$\vec{a} = \frac{\sum \vec{F}}{m} = \frac{\vec{F}_{net}}{m}$$

$$|\vec{F}_f| \leq \mu |\vec{F}_n|$$

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

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

$$\Delta\vec{p} = \vec{F} \Delta t$$

$$K = \frac{1}{2} m v^2$$

$$\Delta E = W = F_{\parallel} d = F d \cos \theta$$

$$P = \frac{\Delta E}{\Delta t}$$

$$\theta = \theta_0 + \omega_0 t + \frac{1}{2} \alpha t^2$$

$$\omega = \omega_0 + \alpha t$$

$$x = A \cos(2\pi f t)$$

$$\vec{\alpha} = \frac{\sum \vec{\tau}}{I} = \frac{\vec{\tau}_{net}}{I}$$

$$\tau = r_{\perp} F = r F \sin \theta$$

$$L = I \omega$$

$$\Delta L = \tau \Delta t$$

$$K = \frac{1}{2} I \omega^2$$

$$|\vec{F}_s| = k |\vec{x}|$$

$$U_s = \frac{1}{2} k x^2$$

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

$a$  = acceleration  
 $A$  = amplitude  
 $d$  = distance  
 $E$  = energy  
 $f$  = frequency  
 $F$  = force  
 $I$  = rotational inertia  
 $K$  = kinetic energy  
 $k$  = spring constant  
 $L$  = angular momentum  
 $\ell$  = length  
 $m$  = mass  
 $P$  = power  
 $p$  = momentum  
 $r$  = radius or separation  
 $T$  = period  
 $t$  = time  
 $U$  = potential energy  
 $V$  = volume  
 $v$  = speed  
 $W$  = work done on a system  
 $x$  = position  
 $y$  = height  
 $\alpha$  = angular acceleration  
 $\mu$  = coefficient of friction  
 $\theta$  = angle  
 $\rho$  = density  
 $\tau$  = torque  
 $\omega$  = angular speed

$$\Delta U_g = m g \Delta y$$

$$T = \frac{2\pi}{\omega} = \frac{1}{f}$$

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

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

$$|\vec{F}_g| = G \frac{m_1 m_2}{r^2}$$

$$\vec{g} = \frac{\vec{F}_g}{m}$$

$$U_G = -\frac{G m_1 m_2}{r}$$

## ELECTRICITY

$$|\vec{F}_E| = k \left| \frac{q_1 q_2}{r^2} \right|$$

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

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

$$I = \frac{\Delta V}{R}$$

$$P = I \Delta V$$

$$R_s = \sum_i R_i$$

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

$A$  = area  
 $F$  = force  
 $I$  = current  
 $\ell$  = length  
 $P$  = power  
 $q$  = charge  
 $R$  = resistance  
 $r$  = separation  
 $t$  = time  
 $V$  = electric potential  
 $\rho$  = resistivity

## WAVES

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

$f$  = frequency  
 $v$  = speed  
 $\lambda$  = wavelength

## GEOMETRY AND TRIGONOMETRY

**Rectangle**  
 $A = bh$

**Triangle**  
 $A = \frac{1}{2} bh$

**Circle**  
 $A = \pi r^2$   
 $C = 2\pi r$

**Rectangular solid**  
 $V = \ell wh$

**Cylinder**  
 $V = \pi r^2 \ell$   
 $S = 2\pi r \ell + 2\pi r^2$

**Sphere**  
 $V = \frac{4}{3} \pi r^3$   
 $S = 4\pi r^2$

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

