

AP[®] PHYSICS 1 TABLE OF INFORMATION

CONSTANTS AND CONVERSION FACTORS

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

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							
θ	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[®] 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
 ℓ = 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
 α = angular acceleration
 μ = coefficient of friction
 θ = angle
 ρ = density
 τ = torque
 ω = 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
 ℓ = length
 P = power
 q = charge
 R = resistance
 r = separation
 t = time
 V = electric potential
 ρ = resistivity

WAVES

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

f = frequency
 v = speed
 λ = 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
 ℓ = length
 w = width
 r = radius

Right triangle
 $c^2 = a^2 + b^2$
 $\sin \theta = \frac{a}{c}$
 $\cos \theta = \frac{b}{c}$
 $\tan \theta = \frac{a}{b}$

