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Physics Equations & Answers (Quick Study Academic)

BASICS			FUNDAMENTAL PHYSICAL CONSTANTS			CONVERSION FACTORS AND ALTERNATE UNITS	
Base Units	Symbol	Unit	Base Units	Symbol	Unit	Unit	Description
Length	L	Meter (m)	Mass of electron	m_e	9.11×10^{-31} kg	Angle	degrees $360^\circ = 2\pi$ rad
Mass	M	Kilogram (kg)	Mass of proton	m_p	1.67×10^{-27} kg	Energy	Erg $1 \text{ erg} = 10^{-7} \text{ J}$
Temperature	T	Kelvin (K)	Avogadro Constant	N_A	$6.02 \times 10^{23} \text{ mol}^{-1}$	Energy	Erg $1 \text{ erg} = 10^{-7} \text{ J}$
Time	t	Second (s)	Elementary charge	e	$1.60 \times 10^{-19} \text{ C}$	Energy	Electron Volt $1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$
Electric Current	I	Ampere (A) (C/s)	Faraday constant	F	$96,485 \text{ C/mol}$	Force	Dyne $1 \text{ dyne} = 10^{-5} \text{ N}$
Derived Units	Symbol	Unit	Speed of light	c	$3 \times 10^8 \text{ m/s}$	Volume	Cubic meter $1 \text{ m}^3 = 10^3 \text{ L}$
Acceleration	a	m/s^2	Molar Gas Constant	R	$8.314 \text{ J/mol}^\circ \text{K}$	Pressure	Dyn $1 \text{ dyn} = 10^{-5} \text{ Pa}$
Ang. Accel.	α	rad/s^2	Boltzmann Constant	k	$1.38 \times 10^{-23} \text{ J/K}$	Length	Angstrom $1 \text{ \AA} = 10^{-10} \text{ m}$
Ang. Momentum	L	$\text{kg m}^2/\text{s}$	Gravitational Constant	G	$6.67 \times 10^{-11} \text{ m}^3/\text{kg s}^2$		
Ang. Velocity	ω	rad/s	Permeability of Space	μ_0	$4\pi \times 10^{-7} \text{ N/A}^2$		
Angle	θ	radian	Permittivity of Space	ϵ_0	$8.85 \times 10^{-12} \text{ C}^2/\text{N m}^2$		
Capacitance	C	Farad (F) (C/V)					
Charge	Q	Coulomb (C) (A s)					
Density	ρ	kg/m^3					
Displacement	x	meter (m)					
Electric Field	E	V/m					
Electric Flux	Φ_E	V m					
Electromotive Force (EMF)	$\mathcal{E}$	Volt (V)					
Energy	E, U, K	Joule (J) ($\text{kg m}^2/\text{s}^2$)					
Entropy	S	J/K					
Force	F	Newton (N) (kg m/s^2) (2 dyn)					
Frequency	f, ν	Hertz (Hz) (s^{-1}) (cycles/s)					
Heat	Q	Joule (J)					
Magnetic Field	B	Tesla (T) ($\text{kg}/\text{A s}^2$)					
Magnetic Flux	Φ_B	Weber (Wb) (T m^2) ($\text{kg m}^2/\text{A s}^2$)					
Moment	μ	J/T					
Momentum	p	kg m/s					
Power	P	Watt (W) (J/s)					
Pressure	P	Pascal (Pa) (N/m^2)					
Resistance	R	Ohm (Ω) (V/A)					
Torque	τ	N m					
Velocity	v	m/s					
Volume	V	m^3					
Wavelength	λ	meter (m)					
Work	W	Joule (J) (N m)					

MATHEMATICAL CONCEPTS	
1. Vector Algebra a. Vector: Directed line segment having magnitude and direction. b. Unit vector: A vector of unit length in the direction of a vector A. c. Length of A: $ A = \sqrt{A_x^2 + A_y^2}$ d. Addition of vectors A & B: add components. $A + B = (A_x + B_x)\hat{i} + (A_y + B_y)\hat{j}$ e. Sample Addition and Length Calculations: $A = 3\hat{i} + 4\hat{j}$, $B = 4\hat{i} + 3\hat{j}$ $A + B = 7\hat{i} + 7\hat{j}$ $ A + B = \sqrt{7^2 + 7^2} = 9.9$ f. Subtraction: $A - B = (A_x - B_x)\hat{i} + (A_y - B_y)\hat{j}$ $A - B = -\hat{i} + \hat{j}$ $ A - B = \sqrt{1^2 + 1^2} = 1.41$ g. Dot product: $A \cdot B = A B \cos\theta$ $A \cdot B = (A_x B_x + A_y B_y)$ $A \cdot B = 3(4) + 4(3) = 24$ $\cos\theta = \frac{A \cdot B}{ A B } = \frac{24}{5 \times 5} = 0.96$ $\theta = \cos^{-1}(0.96) = 16.3^\circ$ h. Cross product: $A \times B = A B \sin\theta \hat{n}$ $A \times B = (A_x B_y - A_y B_x)\hat{k}$ $A \times B = (3 \times 3 - 4 \times 4)\hat{k} = -7\hat{k}$ $ A \times B = 7$	2. Trigonometry a. Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ b. Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$ c. Area of triangle: $\text{Area} = \frac{1}{2}bc \sin A$ d. Height rule: $a \sin B = b \sin A$ e. Sample calculations: Given: $a = 5$, $b = 7$, $C = 60^\circ$ $c^2 = a^2 + b^2 - 2ab \cos C$ $c^2 = 5^2 + 7^2 - 2(5)(7)\cos 60^\circ$ $c^2 = 25 + 49 - 35 = 39$ $c = 6.24$ f. Area: $\text{Area} = \frac{1}{2}ab \sin C = \frac{1}{2}(5)(7)\sin 60^\circ = 14.7$



Synopsis

Essential tool for physics laws, concepts, variables and equations, including sample problems, common pitfalls and helpful hints.

Book Information

Series: Quick Study Academic

Pamphlet: 6 pages

Publisher: QuickStudy; Lam Crds edition (February 14, 2006)

Language: English

ISBN-10: 1423201906

ISBN-13: 978-1423201908

Product Dimensions: 8.5 x 11 x 0.1 inches

Shipping Weight: 0.3 ounces (View shipping rates and policies)

Average Customer Review: 4.6 out of 5 stars 67 customer reviews

Best Sellers Rank: #12,689 in Books (See Top 100 in Books) #6 in [Books > Science & Math >](#)

Physics > Mathematical Physics #14 in Ã Â Books > Science & Math > Reference #46

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Well made and designed.

GREAT

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