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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, l	Meter - m	Mass of electron	m_e	9.11×10^{-31} kg	Angle	degrees $360^\circ = 2\pi$ rad
Mass	m, 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	Kilowatt Hour $1 \text{ kWh} = 3.6 \times 10^6 \text{ J}$
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	$8.314 \text{ J mol}^{-1} \text{ K}^{-1}$	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	$6.67 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$		
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, q	Coulomb C (A s)					
Density	ρ	kg/m^3					
Displacement	x, d, s	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, ΔS	J/K					
Force	F	Newton - N kg m/s^2					
Frequency	f, ν	Hertz - Hz (cycles/s)					
Heat	Q	Joule - J					
Magnetic Field	B	Tesla (T) $\text{kg m}^2/\text{A s}^2$					
Magnetic Flux	Φ_B	Weber Wb $\text{kg m}^2/\text{A s}^2$					
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)					
Temperature	T	Kelvin - K					
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. $A + B = (A_x + B_x, A_y + B_y)$ e. Sample Addition and Length Calculations: $A = 3\hat{i} + 4\hat{j}$, $B = 2\hat{i} + 3\hat{j}$ $A + B = 5\hat{i} + 7\hat{j}$ $ A + B = \sqrt{5^2 + 7^2} = \sqrt{74} \approx 8.60$ f. Subtraction: $A - B = (A_x - B_x, A_y - B_y)$ $A - B = \hat{i} - 1\hat{j} = \hat{i} - \hat{j}$ $ A - B = \sqrt{1^2 + 1^2} = \sqrt{2} \approx 1.41$ g. Dot product: $A \cdot B = A B \cos\theta$ $A = 3\hat{i} + 4\hat{j}$, $B = 2\hat{i} + 3\hat{j}$ $A \cdot B = 3(2) + 4(3) = 6 + 12 = 18$ $ A = 5$, $ B = \sqrt{13}$ $\cos\theta = \frac{18}{5\sqrt{13}} \approx 0.98$ $\theta \approx \cos^{-1}(0.98) \approx 11.3^\circ$ h. Cross product: $A \times B = A B \sin\theta \hat{n}$ $A = 3\hat{i} + 4\hat{j}$, $B = 2\hat{i} + 3\hat{j}$ $A \times B = (3(3) - 4(2))\hat{k} = (9 - 8)\hat{k} = \hat{k}$ $ A \times B = 1$	2. Trigonometry a. Right triangle: $\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$, $\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$, $\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$ b. Pythagorean theorem: $a^2 + b^2 = c^2$ c. Law of Sines: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ d. Law of Cosines: $c^2 = a^2 + b^2 - 2ab\cos C$ e. Area of triangle: $\text{Area} = \frac{1}{2}ab\sin C$ f. Radian measure: $1 \text{ rad} = \frac{180^\circ}{\pi}$ g. Arc length: $s = r\theta$ h. Area of sector: $A = \frac{1}{2}r^2\theta$ i. Unit circle: $\sin\theta = y$, $\cos\theta = x$ j. Double angle formulas: $\sin 2\theta = 2\sin\theta\cos\theta$ $\cos 2\theta = \cos^2\theta - \sin^2\theta$ $\tan 2\theta = \frac{2\tan\theta}{1 - \tan^2\theta}$ k. Sum and difference formulas: $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$ $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$ l. Half angle formulas: $\sin \frac{\theta}{2} = \pm \sqrt{\frac{1 - \cos\theta}{2}}$ $\cos \frac{\theta}{2} = \pm \sqrt{\frac{1 + \cos\theta}{2}}$ $\tan \frac{\theta}{2} = \frac{1 - \cos\theta}{\sin\theta} = \frac{\sin\theta}{1 + \cos\theta}$



Synopsis

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

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Customer Reviews

This study guide is a nice reference to have in my backpack for physics class. Seeing examples of mathematical concepts and theories really helps me learn the material, and the pamphlet format of these study guides is convenient and accessible for referencing when needed.

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Well made and designed.

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