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Physics Equations & Answers (Quick Study Academic)

QUICK STUDY ACADEMIC **PHYSICS EQUATIONS & ANSWERS**

Essential tool for Physics Learners, Concepts, Variables and Equations including... Sample Problems... Common Prefixes and SI-Units

A. Units for Physical Quantities			B. Fundamental Physical Constants			C. Common Prefixes and alternate units		
Base Units	Symbol	Unit	Base Units	Symbol	Unit	Unit	Description	
Length	L, l	Meter	Mass of electron	m_e	9.11×10^{-31} kg	Angle	°/degrees	$360^\circ = 2\pi$ rad
Mass	m, M	Kilogram	Mass of proton	m_p	1.67×10^{-27} kg	Energy	J/Joule	$1 \text{ J} = 1 \text{ kg m}^2/\text{s}^2$ $1 \text{ erg} = 10^{-7} \text{ J}$
Temperature	T	Kelvin	Avogadro Constant	N_A	$6.02 \times 10^{23} \text{ mol}^{-1}$	Energy	KWh	$1 \text{ kWh} = 3.6 \times 10^6 \text{ J}$
Time	t	Second	Elementary charge	e	$1.60 \times 10^{-19} \text{ C}$	Energy	Calorie	$1 \text{ cal} = 4.18 \times 10^3 \text{ J}$
Electric Current	I	Ampere	Faraday constant	F	$96,485 \text{ C/mol}$	Force	Newton	$1 \text{ N} = 1 \text{ kg m/s}^2$
Derived Units	Symbol	Unit	Speed of light	c	$3 \times 10^8 \text{ m/s}$	Force	Dyne	$1 \text{ dyne} = 10^{-5} \text{ N}$
Acceleration	a	m/s^2	Molar Gas Constant	R	$8.314 \text{ J mol}^{-1} \text{ K}^{-1}$	Volume	Cubic	$1 \text{ L} = 1 \text{ dm}^3$
Ang. Accel.	α	rad/s^2	Stefan-Boltzmann Constant	σ	$5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$	Pressure	Pascal	$1 \text{ Pa} = 1 \text{ N/m}^2$
Ang. Momentum	L	$\text{kg m}^2/\text{s}$	Gravitational Constant	G	$6.67 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$	Length	Angstrom	$1 \text{ \AA} = 10^{-10} \text{ m}$
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	$8.85 \times 10^{-12} \text{ F/m}$			
Capacitance	C	Farad						
Charge	Q, q	Coulomb						
Density	ρ	kg/m^3						
Displacement	s, Δx	meter						
Electric Field	E	V/m						
Electric Flux	Φ_E	V m						
Electromotive Force (EMF)	\mathcal{E}	Volt						
Energy	E, U, K, E, k	Joule						
Entropy	S	J/K						
Force	F	Newton						
Frequency	f, ν	Hertz						
Heat	Q	Joule						
Magnetic Field	B	Tesla						
Magnetic Flux	Φ_B	Wb						
Momentum	p	kg m/s						
Potential	V	Volt						
Power	P, P	Watt						
Pressure	P	Pascal						
Resistance	R	Ohm						
Temperature	T	Kelvin						
Velocity	v	m/s						
Volume	V	m^3						
Wavelength	λ	meter						
Work	W	Joule						

MATHEMATICAL CONCEPTS	
<p>1. Vector Algebra</p> <p>a. Vector: Directed distance along x, y, z components by \vec{A}</p> <p>b. Unit vectors: \hat{i} along x, \hat{j} along y, \hat{k} along z</p> <p>c. Vector $\vec{A} = A_x \hat{i} + A_y \hat{j} + A_z \hat{k}$</p> <p>d. Length of $\vec{A} = \sqrt{A_x^2 + A_y^2 + A_z^2}$</p> <p>e. Addition of vectors \vec{A} & \vec{B}: add components</p> <p>$\vec{A} = A_x \hat{i} + A_y \hat{j} + A_z \hat{k}$, $\vec{B} = B_x \hat{i} + B_y \hat{j} + B_z \hat{k}$</p> <p>f. Sample Addition and Length Calculations</p> <p>$\vec{A} = 3\hat{i} + 4\hat{j}$, $\vec{B} = 2\hat{i} + 3\hat{j}$</p> <p>$\vec{A} + \vec{B} = (3+2)\hat{i} + (4+3)\hat{j} = 5\hat{i} + 7\hat{j}$</p> <p>$\vec{A} + \vec{B} = \sqrt{5^2 + 7^2} = \sqrt{25 + 49} = \sqrt{74} \approx 8.60$</p> <p>$\vec{A} - \vec{B} = (3-2)\hat{i} + (4-3)\hat{j} = \hat{i} + \hat{j}$</p> <p>$\vec{A} - \vec{B} = \sqrt{1^2 + 1^2} = \sqrt{2} \approx 1.41$</p> <p>g. Note: $\vec{A} + \vec{B} \neq \vec{A} + \vec{B}$</p> <p>h. Dot or scalar product: $\vec{A} \cdot \vec{B} = A_x B_x + A_y B_y + A_z B_z$</p> <p>i. Note: θ is the angle between \vec{A} and \vec{B}</p> <p>$\vec{A} \cdot \vec{B} = \vec{A} \vec{B} \cos \theta$</p> <p>j. Sample: Scalar product</p> <p>$\vec{A} = 3\hat{i} + 4\hat{j}$, $\vec{B} = 2\hat{i} + 3\hat{j}$</p> <p>$\vec{A} \cdot \vec{B} = 3 \times 2 + 4 \times 3 = 6 + 12 = 18$</p> <p>$\vec{A} = \sqrt{3^2 + 4^2} = 5$, $\vec{B} = \sqrt{2^2 + 3^2} = \sqrt{13} \approx 3.61$</p> <p>$\cos \theta = \frac{18}{5 \times 3.61} \approx 0.98$</p> <p>$\theta = \cos^{-1}(0.98) \approx 11^\circ$</p>	<p>k. Cross or Vector Product</p> <p>$\vec{C} = \vec{A} \times \vec{B} = \vec{A} \vec{B} \sin \theta \hat{n}$</p> <p>l. \hat{n} = angle between \vec{A} and \vec{B}, vector \hat{n} perpendicular to \vec{A} and \vec{B}</p> <p>m. $\vec{A} \times \vec{A} = \vec{0}$, $\vec{B} \times \vec{B} = \vec{0}$</p> <p>n. Sample: Vector Product</p> <p>$\vec{A} = 3\hat{i} + 4\hat{j}$, $\vec{B} = 2\hat{i} + 3\hat{j}$</p> <p>$\vec{C} = \vec{A} \times \vec{B} = (3 \times 3 - 4 \times 2)\hat{k} = 1\hat{k}$</p> <p>o. \vec{A} and \vec{B} are in xy-plane, $\vec{C} = \vec{A} \times \vec{B}$ is along the z-direction</p> <p>p. θ is the angle between \vec{A} and \vec{B}</p> <p>$\vec{C} = \vec{A} \times \vec{B} = (3 \times 3 - 4 \times 2)\hat{k} = 1\hat{k}$</p> <p>$\vec{C} = \sqrt{1^2} = 1$</p> <p>q. The Right-hand rule gives the orientation of vector \vec{C}</p> <p>r. Trigonometry</p> <p>s. Basic relations for a triangle $\triangle ABC$</p> <p>$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$</p> <p>t. Values of \sin, \cos and \tan</p> <p>u. $\sin^2 \theta + \cos^2 \theta = 1$</p> <p>v. $\tan \theta = \frac{\sin \theta}{\cos \theta}$</p> <p>w. $\sin(90^\circ - \theta) = \cos \theta$</p> <p>x. $\cos(90^\circ - \theta) = \sin \theta$</p> <p>y. $\sin(180^\circ - \theta) = \sin \theta$</p> <p>z. $\cos(180^\circ - \theta) = -\cos \theta$</p> <p>aa. $\sin \theta = \sin(180^\circ - \theta)$</p> <p>ab. $\cos \theta = -\cos(180^\circ - \theta)$</p> <p>ac. $\tan \theta = -\tan(180^\circ - \theta)$</p>



Synopsis

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

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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.

GREAT

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well organized, lots of information, a little too much at times to see what you are looking for since its so busy

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