Physics Essentials Cheatsheet

A concise physics cheat sheet covering fundamental concepts, formulas, and laws across mechanics, thermodynamics, electromagnetism, and optics. Ideal for quick reference and exam preparation.

Mechanics

Kinematics

Displacement	\Delta x = x_f - x_i
Average Velocity	v_{avg} = \frac{\Delta x}{\Delta t}
Average Acceleration	a_{avg} = \frac{\Delta v}{\Delta t}
Constant Acceleration	v = v_0 + at
Constant Acceleration	x = x_0 + v_0t + \frac{1}{2}at^2
Constant Acceleration	v^2 = v_0^2 + 2a(x - x_0)
Projectile Motion (y)	y = v_{0y}t - \frac{1}{2}gt^2
Projectile Motion (x)	x = v_{0x}t

Dynamics

Newton's Second Law	\Sigma F = ma
Weight	W = mg
Friction (Kinetic)	f_k = \mu_k N
Friction (Static)	f_s \le \mu_s N
Centripetal Force	F_c = \frac{mv^2}{r}

Work and Energy

Work	W = Fd\cos\theta
Kinetic Energy	KE = \frac{1}{2}mv^2
Potential Energy (Gravitational)	PE_g = mgh
Potential Energy (Spring)	PE_s = \frac{1}{2}kx^2
Power	P = \frac{W}{\Delta t}
Work-Energy Theorem	W_{net} = \Delta KE

Thermodynamics

Basic Concepts

Temperature Conversion (Celsius to Kelvin)	T(K) = T(°C) + 273.15
Thermal Expansion (Linear)	\Delta L = \alpha L_0 \Delta T
Thermal Expansion (Volume)	\Delta V = \beta V_0 \Delta T

Heat and Specific Heat

Heat Transfer	Q = mc\Delta T
Latent Heat	Q = mL

Thermodynamic Processes

First Law of Thermodynamics	\Delta U = Q - W
Work (Isobaric Process)	W = P\Delta V
Adiabatic Process	PV^\gamma = constant

Electromagnetism

Electrostatics

Coulomb's Law	F = k \frac{|q_1q_2|}{r^2}
Electric Field	E = \frac{F}{q}
Electric Potential	V = \frac{k q}{r}
Potential Energy	U = qV

Circuits

Ohm's Law	V = IR
Power (Electrical)	P = IV = I^2R = \frac{V^2}{R}
Series Resistance	R_{eq} = R_1 + R_2 + ...
Parallel Resistance	\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + ...
Capacitance	C = \frac{Q}{V}

Magnetism

Magnetic Force on a Moving Charge	F = qvB\sin\theta
Magnetic Force on a Current-Carrying Wire	F = ILB\sin\theta

Optics

Wave Optics

Index of Refraction	n = \frac{c}{v}
Snell's Law	n_1 \sin\theta_1 = n_2 \sin\theta_2
Critical Angle	\theta_c = \sin^{-1}(\frac{n_2}{n_1})

Geometric Optics

Thin Lens Equation	\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}
Magnification	M = -\frac{d_i}{d_o}