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	$M = -\frac{d_i}{d_o}$