Class12-Physics-CBSE-Exam-Formulas

October 20, 2025

Chapter	Concept	Formula / Key Point	Explanation of Variables
Electric Charges and Fields	Coulomb's Law	[$F = k\frac{q_1 q_2}{r^2}$] [$k = \frac{1}{4\pi\varepsilon_0}$]	F = force; q_1, q_2 = charges; r = distance; k = constant
	Electric Field	[$\vec{E} = \frac{\vec{F}}{q} = \frac{kQ}{r^2}$]	$\vec{E}$ = field; Q = source charge; q = test charge
	Electric Dipole	[$E_{\text{axial}} = \frac{1}{4\pi\varepsilon_0} \cdot \frac{2p}{r^3}$]	p = dipole moment; r = distance
Electrostatic Potential and Capacitance	Potential Due to Point Charge	[$V = \frac{kQ}{r}$]	V = potential; Q = charge; r = distance
	Capacitance	[$C = \frac{Q}{V}$] [$C_{\text{parallel plate}} = \varepsilon_0 \frac{A}{d}$]	C = capacitance; Q = charge; V = potential; A = area; d = separation
	Series & Parallel Capacitors	[$C_{\text{series}}^{-1} = C_1^{-1} + C_2^{-1} + ...$] [$C_{\text{parallel}} = C_1 + C_2 + ...$]	Capacitors combined in series and parallel
Current Electricity	Ohm's Law	[$V = IR$]	V = voltage; I = current; R = resistance
	Resistance & Resistivity	[$R = \rho\frac{l}{A}$]	R = resistance; ρ = resistivity; l = length; A = area
	Series & Parallel Resistors	[$R_{\text{series}} = R_1 + R_2 + ...$] [$R_{\text{parallel}}^{-1} = R_1^{-1} + R_2^{-1} + ...$]	Resistors combined in series and parallel
	Power	[$P = VI = I^2R = \frac{V^2}{R}$]	P = power
Moving Charges and Magnetism	Magnetic Force	[$F = qvB\sin\theta$] [$F = IlB\sin\theta$]	q = charge; v = velocity; B = magnetic field; θ = angle; I = current; l = length

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	Magnetic Field (Wire, Loop)	[Straight wire: $B = \frac{\mu_0 I}{2\pi r}$] [Loop: $B = \frac{\mu_0 I}{2R}$]	μ_0 = permeability; I = current; r, R = radius
	Ampere's Law	[$\oint \vec{B} \cdot d\vec{l} = \mu_0 I$]	Line integral of magnetic field around current I
Magnetism and Matter	Magnetic Dipole Moment	[$M = m \times 2l$] [$U = -\vec{M} \cdot \vec{B}$]	M = dipole moment; m = magnetic pole strength; l = half length; U = potential energy
	Gauss's Law for Magnetism	[$\vec{\nabla} \cdot \vec{B} = 0$] (No magnetic monopoles)	Divergence of magnetic field is zero
Electromagnetic Induction	Faraday's Law	[$e = -\frac{d\Phi}{dt}$]	e = induced emf; Φ = magnetic flux
	Lenz's Law	Direction of induced current opposes cause	Conservation of energy principle
	Self Inductance	[$e = -L\frac{di}{dt}$] Energy: [$U = \frac{1}{2}LI^2$]	L = inductance; I = current
Alternating Current	AC Voltage	[$V = V_0 \sin \omega t$] RMS: [$V_{\text{rms}} = \frac{V_0}{\sqrt{2}}$]	V_0 = peak voltage; ω = angular frequency
	Reactance & Impedance	[$X_L = \omega L,\ X_C = \frac{1}{\omega C}$] [$Z = \sqrt{R^2 + (X_L - X_C)^2}$]	X_L, X_C = inductive, capacitive reactance; Z = impedance
	Power in AC	[$P = VI \cos \phi$] ($\cos \phi$ = power factor)	ϕ = phase difference between voltage and current
Electromagnetic Waves	Speed of EM Waves	[$c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$] [$c = 3 \times 10^8$ m/s]	Speed of light in vacuum
	EM Spectrum	Radio < Microwave < Infrared < Visible < UV < X-rays < Gamma rays	Order of EM waves by wavelength
Ray Optics and Optical Instruments	Mirror Formula	[$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$] [$m = \frac{h'}{h} = \frac{-v}{u}$]	f = focal length; v, u = image and object distances; m = magnification
	Lens Formula	[$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$] [$m = \frac{v}{u}$]	Same as above
	Power of Lens	[$P = \frac{100}{f(\text{cm})}$]	P in diopters; f in cm
Wave Optics	Young's Double Slit Experiment	Fringe width: [$\beta = \frac{\lambda D}{d}$]	λ = wavelength; D = screen distance; d = slit separation

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	Diffraction	Central maximum width $[\frac{\lambda}{a}]$	a = slit width
	Polarization	Only transverse waves show polarization	Property of waves
Dual Nature of Radiation and Matter	De Broglie Wavelength	$[\lambda = \frac{h}{mv}]$	h = Planck's constant; m = mass; v = velocity
	Photoelectric Equation	$[E_k = h\nu - \phi]$	E_k = kinetic energy; ν = frequency; ϕ = work function
Atoms	Radius (Bohr Model)	$[r_n = n^2 \cdot a_0]$, $[a_0 = 0.529\ \text{Å}]$	n = energy level; a_0 = Bohr radius
	Energy Levels	$[E_n = -13.6\frac{Z^2}{n^2}\ \text{eV}]$	Z = atomic number
Nuclei	Binding Energy	$[BE = [Zm_p + (A-Z)m_n - m_{\text{nucleus}}]c^2]$	Z = proton number; A = mass number; m_p, m_n = proton/neutron masses
	Radioactive Decay	$[N = N_0 e^{-\lambda t}]$ $[t_{1/2} = \frac{0.693}{\lambda}]$	N = nuclei remaining; λ = decay constant
Semiconductors	Diode Current	$[I = I_0(e^{\frac{eV}{kT}} - 1)]$	I = current; V = voltage; k = Boltzmann constant; T = temperature
	Logic Gates	AND, OR, NOT, NAND, NOR — Truth tables	Basic logic gate operations