NEET Physics Formula Sheet

23 chapters · 166 formulas · Class 11 and 12 · practise every chapter free at www.rankupp.in/neet-physics

Units and Measurements · Class 11 · NEET weightage 2–3%

$[F] = [M\ L\ T^{-2}]$	Dimensions of force
$[W] = [E] = [M\ L^{2}\ T^{-2}]$	Dimensions of work and energy
$[P] = [M\ L^{-1}\ T^{-2}]$	Dimensions of pressure, stress, modulus
$[h] = [L] = [M\ L^{2}\ T^{-1}]$	Planck's constant = angular momentum
$[G] = [M^{-1}\ L^{3}\ T^{-2}]$	Dimensions of gravitational constant
$x = a^{m}b^{n} \Rightarrow \Delta x/x = m\cdot\Delta a/a + n\cdot\Delta b/b$	Relative error in a product or power
$n_1u_1 = n_2u_2$	Converting a value between unit systems

Tip: Dimensional analysis checks an equation's form but cannot find dimensionless constants like 2π or ½ — NEET often asks which relation it cannot derive.

Practise MCQs: https://www.rankupp.in/neet-physics/units-and-measurements

Kinematics · Class 11 · NEET weightage 5–7%

$v = u + at$	1st equation of motion
$s = ut + \frac{1}{2}at^{2}$	2nd equation of motion
$v^{2} = u^{2} + 2as$	3rd equation of motion
$s_n = u + a(2n-1)/2$	Distance in nth second
$\text{Range } R = u^{2}\sin 2\theta / g$	Projectile range
$H_{max} = u^{2}\sin^{2}\theta / 2g$	Maximum height
$T = 2u\sin\theta / g$	Time of flight

Tip: Always resolve projectile motion into horizontal (uniform) and vertical (uniformly accelerated) components separately.

Practise MCQs: https://www.rankupp.in/neet-physics/motion-in-a-straight-line

Laws of Motion · Class 11 · NEET weightage 4–6%

$F = ma$	Newton's 2nd Law
$p = mv$	Linear momentum
$J = F\cdot\Delta t = \Delta p$	Impulse-momentum theorem
$F_{friction} = \mu N$	Friction force
$T = m(g + a)$	Tension in lift (going up)
$T = m(g - a)$	Tension in lift (going down)
$a = (m_1-m_2)g / (m_1+m_2)$	Atwood machine acceleration

Tip: In connected body problems, always draw free body diagrams for each mass separately before applying Newton's laws.

Practise MCQs: https://www.rankupp.in/neet-physics/laws-of-motion

Work, Energy & Power · Class 11 · NEET weightage 4–5%

W = F·d·cosθ	Work done
KE = ½mv²	Kinetic energy
PE = mgh	Gravitational potential energy
PE_spring = ½kx²	Elastic potential energy
P = W/t = F·v	Power
W_net = ΔKE	Work-energy theorem
η = (W_out / W_in) × 100%	Efficiency

Tip: The work-energy theorem (W_net = ΔKE) is the fastest approach to problems involving variable forces.

Practise MCQs: https://www.rankupp.in/neet-physics/work-energy-and-power

Rotational Motion · Class 11 · NEET weightage 6–8%

τ = Iα = r × F	Torque
L = Iω = mvr	Angular momentum
I = Σmr²	Moment of inertia
KE_rot = ½Iω²	Rotational kinetic energy
v_cm = Rω (rolling)	Rolling condition
KE_total = ½mv² + ½Iω²	Total KE in rolling
I_parallel = I_cm + md²	Parallel axis theorem

Tip: Most NEET rotational motion questions combine moment of inertia with energy conservation. Always check if rolling condition applies.

Practise MCQs: https://www.rankupp.in/neet-physics/system-of-particles-and-rotational-motion

Gravitation · Class 11 · NEET weightage 4–5%

F = Gm₁m₂/r²	Newton's Law of Gravitation
g = GM/R²	Acceleration due to gravity
g_h = g(1 − 2h/R)	g at height h (h << R)
v_escape = √(2gR) = 11.2 km/s	Escape velocity (Earth)
v_orbital = √(GM/r) = √(gR²/r)	Orbital velocity
T² ∝ r³ (Kepler's 3rd)	Kepler's third law
U = −GMm/r	Gravitational potential energy

Tip: Escape velocity (11.2 km/s) and orbital velocity (7.9 km/s) for Earth are constants NEET tests directly — memorize both.

Practise MCQs: https://www.rankupp.in/neet-physics/gravitation

Mechanical Properties of Solids · Class 11 · NEET weightage 1–2%

Stress = F / A	Stress (N m^{-2})
Strain = ΔL / L	Longitudinal strain (no unit)
Y = FL / (A·ΔL)	Young's modulus
B = −P / (ΔV/V)	Bulk modulus
G = (F/A) / θ	Shear modulus (modulus of rigidity)
k = 1 / B	Compressibility
U = ½ × stress × strain × volume	Elastic potential energy stored

Tip: Steel is 'more elastic' than rubber: it has the larger Young's modulus, so it deforms less for the same stress.

Practise MCQs: https://www.rankupp.in/neet-physics/mechanical-properties-of-solids

Mechanical Properties of Fluids · Class 11 · NEET weightage 2–3%

$P = P_0 + \rho gh$	Pressure at depth h
$A_1v_1 = A_2v_2$	Equation of continuity
$P + \frac{1}{2}\rho v^2 + \rho gh = \text{constant}$	Bernoulli's principle
$v = \sqrt{(2gh)}$	Speed of efflux (Torricelli's law)
$F = 6\pi\eta rv$	Stokes' law (viscous drag)
$v_t = 2r^2(\rho - \sigma)g / 9\eta$	Terminal velocity of a sphere
$h = 2S\cos\theta / (\rho gr)$	Capillary rise
ΔP = 2S/r (drop), 4S/r (soap bubble)	Excess pressure inside a drop and a bubble

Tip: A soap bubble has two surfaces, so its excess pressure (4S/r) is double that of a liquid drop of the same radius (2S/r).

Practise MCQs: https://www.rankupp.in/neet-physics/mechanical-properties-of-fluids

Thermal Properties of Matter · Class 11 · NEET weightage 2–3%

ΔL = αL·ΔT	Linear expansion
β = 2α, γ = 3α	Area and volume expansion coefficients
Q = mcΔT	Heat for a temperature change
Q = mL	Latent heat (change of state)
$H = KA(T_1 - T_2) / L$	Rate of heat conduction
$E = \sigma T^4$	Stefan–Boltzmann law (black body)
$\lambda_m \cdot T = b$ ($b \approx 2.9 \times 10^{-3}$ m K)	Wien's displacement law
$dT/dt = -k(T - T_0)$	Newton's law of cooling

Tip: Temperature stays constant during melting and boiling — all the heat goes into latent heat. Heating-curve graphs in NEET test exactly this.

Practise MCQs: https://www.rankupp.in/neet-physics/thermal-properties-of-matter

Thermodynamics · Class 11 · NEET weightage 7–9%

ΔU = Q − W	First Law of Thermodynamics
PV = nRT	Ideal gas equation
W = PΔV (isobaric)	Work in isobaric process
W = 0 (isochoric)	Work in isochoric process
η_Carnot = 1 − T_C/T_H	Carnot efficiency
COP = T_C / (T_H − T_C)	Refrigerator COP
C_p − C_v = R	Mayer's relation

Tip: Draw the PV diagram for every thermodynamic process. The area under the PV curve = work done by gas.

Practise MCQs: https://www.rankupp.in/neet-physics/thermodynamics-physics

Kinetic Theory of Gases · Class 11 · NEET weightage 2–3%

P = ⅓ ρ v_rms²	Pressure of an ideal gas
v_rms = √(3RT/M)	Root mean square speed
v_avg = √(8RT/πM)	Average speed
v_mp = √(2RT/M)	Most probable speed
KE_avg = (3/2) k_B T	Average KE of a molecule
½ k_B T per degree of freedom	Law of equipartition of energy
γ = Cp/Cv = 1 + 2/f	Ratio of specific heats (f = degrees of freedom)
λ = 1 / (√2 π d² n)	Mean free path

Tip: Always v_rms > v_avg > v_mp, in the ratio about 1.73 : 1.60 : 1.41. For γ: monatomic 5/3, diatomic 7/5.

Practise MCQs: https://www.rankupp.in/neet-physics/kinetic-theory

Oscillations (SHM) · Class 11 · NEET weightage 2–3%

x = A sin(ωt + φ)	Displacement in SHM
v = ω√(A² − x²)	Velocity at displacement x
a = −ω²x	Acceleration in SHM
T = 2π√(m/k)	Spring–mass time period
T = 2π√(L/g)	Simple pendulum time period
E = ½kA² = ½mω²A²	Total energy in SHM
Series: 1/k = 1/k₁ + 1/k₂ · Parallel: k = k₁ + k₂	Springs in series and parallel

Tip: Speed is maximum (ωA) at the mean position and acceleration is maximum (ω²A) at the extremes. A pendulum's period does not depend on its mass.

Practise MCQs: https://www.rankupp.in/neet-physics/oscillations

Waves & Sound · Class 11 · NEET weightage 4–6%

$v = f\lambda$	Wave velocity
$v_{sound} = \sqrt{(B/\rho)}$	Speed of sound in medium
$v_{string} = \sqrt{(T/\mu)}$	Speed on string
$f_n = nv/2L$ (closed: $nv/4L$)	Standing wave frequency
$\Delta f = f(v \pm v_s)/(v \pm v_o)$	Doppler effect
$\beta = f_1 - f_2$	Beat frequency
$I \propto A^2 \propto 1/r^2$	Intensity relations

Tip: In Doppler effect problems, remember: source approaching = frequency increases. Use the formula and plug in signs carefully.

Practise MCQs: https://www.rankupp.in/neet-physics/waves

Electrostatics · Class 12 · NEET weightage 6–8%

$F = kq_1q_2 / r^2$ ($k = 9\times10^9$)	Coulomb's Law
$E = kq / r^2$	Electric field (point charge)
$V = kq / r$	Electric potential
$C = Q / V$	Capacitance
$C_{parallel} = C_1 + C_2$	Capacitors in parallel
$1/C_{series} = 1/C_1 + 1/C_2$	Capacitors in series
$U = \frac{1}{2}CV^2 = Q^2/2C$	Energy stored in capacitor

Tip: Electric field is a vector — always add components. Electric potential is a scalar — add directly. This distinction solves many tricky questions.

Practise MCQs: https://www.rankupp.in/neet-physics/electric-charges-and-fields

Current Electricity · Class 12 · NEET weightage 6–8%

$V = IR$	Ohm's Law
$P = VI = I^2R = V^2/R$	Electrical power
$R = \rho L / A$	Resistance formula
$R_{series} = R_1 + R_2 + \ldots$	Series combination
$1/R_{parallel} = 1/R_1 + 1/R_2$	Parallel combination
$E = \varepsilon - Ir$	Terminal voltage
Wheatstone: $P/Q = R/S$	Wheatstone bridge balance

Tip: In Kirchhoff's Law problems, always assign current directions before writing equations. Consistency of direction is more important than guessing correctly.

Practise MCQs: https://www.rankupp.in/neet-physics/current-electricity

Magnetic Effects · Class 12 · NEET weightage 5–7%

$F = qvB\sin\theta$	Magnetic force on charge
$F = BIL\sin\theta$	Force on current-carrying wire
$r = mv/qB$	Radius of circular motion in B
$B = \mu_0 I/2\pi r$	Magnetic field (long wire)
$B = \mu_0 nI$	Solenoid magnetic field
$\tau = nBIA\sin\theta$	Torque on current loop
$\mu = nIA$	Magnetic moment

Tip: Use the right-hand rule for direction of magnetic force. F = qv × B — the cross product gives direction.

Practise MCQs: https://www.rankupp.in/neet-physics/moving-charges-and-magnetism

Magnetism and Matter · Class 12 · NEET weightage 1–2%

$B_{axial} = (\mu_0/4\pi)\cdot 2m / r^3$	Field on the axis of a short bar magnet
$B_{equatorial} = (\mu_0/4\pi)\cdot m / r^3$	Field on the equatorial line
$\tau = m \times B$	Torque on a magnetic dipole
$U = -m\cdot B$	Potential energy of a dipole in a field
$B = \mu_0(H + M)$	Magnetic field, intensity and magnetisation
$\chi = M / H,\ \mu_r = 1 + \chi$	Susceptibility and relative permeability
$\chi = C / T$	Curie's law (paramagnets)

Tip: Diamagnetic: χ small and negative. Paramagnetic: small and positive. Ferromagnetic: large and positive. Above the Curie temperature a ferromagnet turns paramagnetic.

Practise MCQs: https://www.rankupp.in/neet-physics/magnetism-and-matter

Electromagnetic Induction · Class 12 · NEET weightage 3–4%

$\Phi = BA\cos\theta$	Magnetic flux
$\varepsilon = -N\, d\Phi/dt$	Faraday's law with Lenz's rule
$\varepsilon = Bvl$	Motional EMF in a moving rod
$\varepsilon = \frac{1}{2}B\omega l^2$	EMF across a rod rotating about one end
$\varepsilon = -L\, dI/dt$	Self-induced EMF
$L = \mu_0 N^2 A / l$	Self-inductance of a long solenoid
$U = \frac{1}{2}LI^2$	Energy stored in an inductor
$\varepsilon = NBA\omega \sin\omega t$	EMF of an AC generator

Tip: Lenz's law is conservation of energy: the induced current always opposes the change in flux that causes it.

Practise MCQs: https://www.rankupp.in/neet-physics/electromagnetic-induction

Alternating Current · Class 12 · NEET weightage 3–4%

$I_{rms} = I_0/\sqrt{2}$, $V_{rms} = V_0/\sqrt{2}$	RMS values
$X_L = \omega L$, $X_C = 1/(\omega C)$	Inductive and capacitive reactance
$Z = \sqrt{R^2 + (X_L - X_C)^2}$	Impedance of a series LCR circuit
$\tan\varphi = (X_L - X_C) / R$	Phase difference
$\omega_0 = 1/\sqrt{LC}$	Resonant angular frequency
$P_{avg} = V_{rms} I_{rms} \cos\varphi$	Average power ($\cos\varphi$ = power factor)
$Q = \omega_0 L / R$	Quality factor
$V_s/V_p = N_s/N_p = I_p/I_s$	Ideal transformer

Tip: At resonance $X_L = X_C$, so $Z = R$, current is maximum and the power factor is 1. A pure L or C circuit uses no average power.

Practise MCQs: https://www.rankupp.in/neet-physics/alternating-current

Electromagnetic Waves · Class 12 · NEET weightage 1–2%

$c = 1/\sqrt{\mu_0\varepsilon_0}$	Speed of light in vacuum
$E_0 / B_0 = c$	Ratio of field amplitudes
$I_d = \varepsilon_0 d\Phi_E/dt$	Displacement current
$c = \nu\lambda$	Wave relation
$u_{avg} = \frac{1}{2}\varepsilon_0 E_0^2$	Average energy density (shared equally by E and B)
$p = U / c$	Momentum delivered (complete absorption)
Radio < Micro < IR < Visible < UV < X-ray < γ	Order of increasing frequency

Tip: Match-the-column on the EM spectrum is a NEET favourite: learn one use for each band (radar – microwaves, sterilisation – UV, bone imaging – X-rays).

Practise MCQs: https://www.rankupp.in/neet-physics/electromagnetic-waves

Optics (Ray & Wave) · Class 12 · NEET weightage 8–10%

$1/f = 1/v - 1/u$	Mirror/Lens formula
$m = -v/u = h_i/h_o$	Magnification
$1/f = (\mu-1)(1/R_1 - 1/R_2)$	Lensmaker's equation
$n = \sin i / \sin r$	Snell's Law
$\sin C = 1/n$	Critical angle (TIR)
$\beta = \lambda D / d$	Fringe width (YDSE)
$\Delta = d\sin\theta \approx d\theta$	Path difference (YDSE)

Tip: Use the sign convention consistently — all distances measured from the pole of mirror/lens. Incident ray direction is always positive.

Practise MCQs: https://www.rankupp.in/neet-physics/ray-optics-and-optical-instruments

Modern Physics · Class 12 · NEET weightage 10–12%

$E = hf = hc/\lambda$	Photon energy
$KE_{max} = hf - \varphi$	Photoelectric equation (Einstein)
$\lambda = h/mv = h/p$	de Broglie wavelength
$r_n = 0.529n^2/Z$ Å	Bohr radius (nth orbit)
$E_n = -13.6Z^2/n^2$ eV	Energy of nth orbit
$N = N_0 e^{-\lambda t}$	Radioactive decay law
$t_{1/2} = 0.693/\lambda$	Half-life formula

Tip: Modern Physics is the highest-ROI chapter for NEET Physics. Most questions are formula-direct. Master the Bohr model equations and radioactive decay thoroughly.

Practise MCQs: https://www.rankupp.in/neet-physics/dual-nature-of-radiation-and-matter

Semiconductor Electronics · Class 12 · NEET weightage 3–5%

$n_e \cdot n_h = n_i^2$	Mass action law
$\sigma = e(n_e \mu_e + n_h \mu_h)$	Conductivity of a semiconductor
Barrier potential: Si ≈ 0.7 V, Ge ≈ 0.3 V	Typical p-n junction values
$f_{out} = f_{in}$ (half-wave), $2f_{in}$ (full-wave)	Rectifier output ripple frequency
AND: $Y = A \cdot B$, OR: $Y = A + B$, NOT: $Y = \bar{A}$	Basic logic gates
NAND: Y = NOT(A·B), NOR: Y = NOT(A + B)	Universal gates
Depletion layer: narrower in forward bias, wider in reverse	p-n junction under bias

Tip: NAND and NOR are universal gates — any other gate can be built from them alone. Truth-table questions are almost free marks.

Practise MCQs: https://www.rankupp.in/neet-physics/semiconductor-electronics