Complete Last-Minute Formula Handbook for NEET Aspirants
Formula • Concepts • Memory Tricks • Quick Revision

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For
✔ NEET Aspirants
✔ Class XI Students
✔ Class XII Students
✔ Physics Competitive Examinations

Edition
First Edition – 2026

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Tag Line
"Learn Physics Conceptually, Revise Smartly, Succeed Confidently."

Preface

Dear Students,

Physics is not a subject of memorization; it is a subject of concepts and logical thinking. However, every successful NEET aspirant understands the importance of quick formula revision during the final stages of preparation.

This booklet has been specially prepared to help students revise the most important Physics formulae in a concise, systematic, and examination-oriented manner. Every formula included here has been selected according to the latest **NCERT syllabus**, **CBSE curriculum**, and **NEET examination pattern**.

Instead of searching through multiple books during revision, students can use this handbook as a ready reference for important equations, physical constants, and commonly used relations.

This booklet is designed to help you:

- Revise important formulae quickly.
- Strengthen conceptual understanding.
- Improve numerical problem-solving speed.
- Avoid common mistakes during examinations.
- Perform effective last-minute revision before NEET and Board examinations.

Although this booklet is concise, students are strongly advised to study the detailed concepts from NCERT textbooks and solve sufficient numerical problems regularly. Formulae become meaningful only when they are applied correctly.

I sincerely hope that this handbook becomes your trusted companion during your preparation journey.

I wish every student great success in achieving their academic goals.

Happy Learning!

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How to Use This Book

This booklet has been specially designed for quick revision before NEET, CBSE Board examinations, and other competitive examinations.
There are total 9 Parts in this eBook for Class 11 and 12 Physics Formulae. Each Part is at separate new page.
To obtain maximum benefit from this handbook, follow these simple guidelines:

1. Revise Daily

Spend 15–20 minutes every day revising one chapter's formulae.

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2. Understand Before Memorising

Never memorise a formula without understanding its physical meaning and application.

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3. Revise Chapter-wise

Complete one chapter at a time.
Example:

- Mechanics
- Thermodynamics
- Electrostatics
- Current Electricity
- Magnetism
- Optics
- Modern Physics

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4. Practice Numerical

Every formula should be applied to numerical problems.
Formula + Practice = Success.

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5. Keep This Book During Revision

Use this booklet only for revision—not for first-time learning.

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6. Last Week Strategy

During the final week before NEET:

- Revise one chapter every day.
- Solve Previous Year Questions.
- Revise important constants.
- Avoid learning new topics.

Important SI Units

Physical Quantity	SI Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric Current	ampere	A
Temperature	kelvin	K

Amount of Substance	mole	mol
Luminous Intensity	candela	cd

Important Physical Constants

Constant	Symbol	Value
Speed of Light	c	3×10^8 m/s
Gravitational Constant	G	6.67×10^{-11} N m²/kg²
Acceleration due to Gravity	g	9.8 m/s²
Electronic Charge	e	1.6×10^{-19} C
Permittivity of Free Space	ε_0	8.854×10^{-12} F/m
Permeability of Free Space	μ_0	$4\pi \times 10^{-7}$ H/m
Planck Constant	h	6.626×10^{-34} J s
Boltzmann Constant	k	1.38×10^{-23} J/K
Avogadro Constant	N_a	6.022×10^{23} mol^{-1}
Gas Constant	R	8.314 J/mol K

Quick Revision Rule

Formula → SI Unit → Application → Numerical

Always remember this sequence while revising Physics.

NEET Success Tip

"Do not try to remember every derivation during the last revision. Revise formulae, concepts, graphs, units, and previous year numerical problems."

Class 11 Physics
Part-1
MECHANICS: FORMULA REVISION
(Motion • Newton's Laws • Work, Energy & Power • Momentum)

1. Motion in One Dimension

Average Speed

$$\boxed{Average\ Speed = \frac{Total\ Distance}{Total\ Time}}$$

SI Unit: m s^{-1}

NEET Tip: Average speed is always based on **distance**, not displacement.

Average Velocity

$$\boxed{Average\ Velocity = \frac{Total\ Displacement}{Total\ Time}}$$

SI Unit: m s^{-1}

Instantaneous Velocity

$$\boxed{v = \frac{dx}{dt}}$$

SI Unit: m s^{-1}

Instantaneous Acceleration

$$\boxed{a = \frac{dv}{dt}}$$

SI Unit: m s^{-2}

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2. Equations of Uniformly Accelerated Motion

First Equation

$$\boxed{v = u + at}$$

Use When: **Time is known.**

Second Equation

$$s = ut + \left(\frac{1}{2}\right)at^2$$

Third Equation

$$v^2 = u^2 + 2as$$

Fourth Equation

$$s = \left(\frac{u+v}{2}\right)t$$

NEET Memory Tip

Remember the order:
Velocity → Displacement → Velocity²

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3. Projectile Motion

Time of Flight

$$T = \frac{2u\sin\theta}{g} = \frac{2u_y}{g}$$

Maximum Height

$$H = \frac{u^2 sin^2\theta}{2g} = \frac{{u_y}^2}{2g}$$

Horizontal Range

$$R = \frac{u^2\sin 2\theta}{g} = \frac{2u_x u_y}{g}$$

Greatest Range

Occurs at $\theta = 45^0$

NEET Tip

Questions on complementary angles are very common.

$$\theta + \varphi = 90^0$$

Range remains same.

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4. Circular Motion

Angular Velocity

$$\omega = \frac{2\pi}{T} = \frac{d\theta}{dt}$$

Linear Velocity

$$v = r\omega$$

Centripetal Acceleration

$$a = \frac{v^2}{r} = r\omega^2$$

Centripetal Force

$$F = \frac{mv^2}{r}$$

NEET Tip

Direction is always **towards the centre**.

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5. Newton's Laws of Motion

Newton's Second Law

$$F = ma$$

Weight

$$w = mg$$

Momentum

$$P = mv$$

Impulse

$$I = F\Delta t = \Delta P$$

SI Units

Quantity	SI Unit
Force	Newton (N)
Momentum	kg m s^{-1}
Impulse	N s

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6. Friction

Limiting Friction

$$F = \mu R \text{ and } R = mg$$

Angle of Friction

$$\mu = \tan\theta$$

Angle of Repose

$$\mu = \tan\varphi$$

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7. Work

Constant Force

$$W = Fs\cos\theta = \vec{F}.\vec{s}$$

SI Unit: Joule (J)

Special Cases

θ = 0°

$$W = Fs$$

θ = 90°

$$W = 0$$

θ = 180°

$$W = -Fs$$

---

8. Power

Average Power

$$P_{av} = \frac{Total\ Work}{Total\ Time} = \frac{\int_{t_1}^{t_2} pdt}{\int_{t_1}^{t_2} dt}$$

Instantaneous Power

$$P = \frac{dW}{dt} = Fv\cos\theta = \vec{F}\cdot\vec{v}$$

SI Unit: Watt (W)

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9. Kinetic Energy

$$KE = \frac{1}{2}mv^2$$

10. Potential Energy

$$PE = mgh$$

11. Work-Energy Theorem

$$W = \Delta KE$$

12. Mechanical Energy

$$E = KE + PE$$

Most Important NEET Formula Box

- $v = u + at$
- $s = ut + \frac{1}{2}at^2$
- $v^2 = u^2 + 2as$
- $R = \frac{u^2 \sin 2\theta}{g}$
- $F = ma$
- $P = mv$
- $W = Fs\cos\theta$
- $KE = (1/2)mv^2$
- $PE = mgh$
- $P = W/t$

Quick Revision Checklist

✔ Motion Equations
✔ Projectile Motion
✔ Circular Motion
✔ Newton's Laws
✔ Work
✔ Energy
✔ Momentum
✔ Power

Class 11 Physics
Part – 2: MECHANICS
Rotational Motion • Gravitation • Oscillations (SHM)

1. Centre of Mass (COM)
Position of Centre of Mass

$$x_{cm} = \frac{m_1 x_1 + m_2 x_2 + \cdots}{m_1 + m_2 + \cdots}$$

Vector Form

$$\vec{r}_{cm} = \frac{\sum m_i \vec{r}_i}{\sum m_i}$$

SI Unit: metre (m)
NEET Tip: If masses are equal, the centre of mass lies at the geometric centre.

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2. Torque (Moment of Force)

$$\tau = rF \sin\theta$$

Vector Form

$$\vec{\tau} = \vec{r} \times \vec{F}$$

SI Unit: N·m

Special Cases

- $\theta = 90°$

$\tau = rF$
(Maximum Torque)

- $\theta = 0°$

$\tau = 0$

---

3. Moment of Inertia
General Formula

$$I = \sum mr^2$$

Important Standard Values
Thin Ring

$$I = MR^2$$

Solid Disc

$$I = \frac{1}{2}MR^2$$

Solid Sphere

$$I = \frac{2}{5}MR^2$$

Hollow Sphere

$$I = \frac{2}{3}MR^2$$

Rod (about centre)

$$I = \frac{1}{12}ML^2$$

Rod (about end)

$$I = \frac{1}{3}ML^2$$

NEET Tip

Questions based on standard moments of inertia are asked almost every year.

4. Angular Momentum

$$L = I\omega$$

Vector Form

$$\vec{L} = \vec{r} \times \vec{p}$$

Conservation Law

$$I_1\omega_1 = I_2\omega_2$$

5. Rolling Motion

$$v = r\omega$$

6. Universal Law of Gravitation

$$F = \frac{GMm}{r^2}$$

Gravitational Field

$$g = \frac{GM}{r^2}$$

Gravitational Potential

$$V = -\frac{GM}{r}$$

Potential Energy

$$U = -\frac{GMm}{r}$$

7. Escape Velocity

$$v_e = \sqrt{2gR}$$

8. Orbital Velocity

$$v_o = \sqrt{\frac{GM}{R}}$$

or

$$v_o = \sqrt{gR}$$

9. Satellite Time Period

$$T = 2\pi\sqrt{\frac{R^3}{GM}}$$

NEET Tip

Escape Velocity

$$v_e = \sqrt{2}\, v_o$$

10. Simple Harmonic Motion (SHM)

Displacement

$$x = A\sin\omega t$$

Velocity

$$v = \omega\sqrt{A^2 - x^2}$$

Maximum Velocity

$$v_{max} = A\omega$$

Acceleration

$$a = -\omega^2 x$$

Magnitude of Maximum Acceleration

$$a_{max} = \omega^2 A$$

11. Time Period

Spring

$$T = 2\pi\sqrt{\frac{m}{k}}$$

Simple Pendulum

$$T = 2\pi\sqrt{\frac{L}{g}}$$

12. Frequency

$$f = \frac{1}{T}$$

13. Angular Frequency

$$\omega = 2\pi f$$

Most Important NEET Formula Box

- $\tau = rF\sin\theta$
- $I = mR^2$
- $L = I\omega$
- $F = \frac{GMm}{r^2}$
- $g = \frac{GM}{r^2}$

- $v_e = \sqrt{2gR}$
- $v_o = \sqrt{gR}$
- $T = 2\pi\sqrt{\frac{L}{g}}$
- $T = 2\pi\sqrt{\frac{m}{k}}$
- $a = -\omega^2 x$

Quick Revision Checklist

- Centre of Mass
- Torque
- Moment of Inertia
- Angular Momentum
- Gravitation
- Satellite Motion
- Escape Velocity
- SHM

Class 11 Physics
Part – 3: THERMAL PHYSICS
Heat • Thermodynamics • Kinetic Theory of Gases

1. Temperature Conversion

Celsius to Kelvin

$$K = {}^{\circ}C + 273$$

Fahrenheit to Celsius

$$\frac{C}{5} = \frac{F - 32}{9}$$

NEET Tip

Always convert temperature into **Kelvin** before solving numerical problems.

2. Linear Expansion

$$\Delta L = \alpha L \Delta T$$

Where, α = Coefficient of Linear Expansion

3. Area Expansion

$$\Delta A = 2\alpha A \Delta T$$

4. Volume Expansion

$$\Delta V = \gamma V \Delta T$$

Where

$$\gamma = 3\alpha$$

5. Heat Capacity

$$Q = mc\Delta T$$

Where, Q = Heat supplied , m = Mass, c = Specific Heat Capacity

SI Unit: J kg^{-1} K^{-1}

6. Latent Heat

$$Q = mL$$

Types

- Fusion
- Vaporisation

7. Newton's Law of Cooling

$$\frac{dT}{dt} \propto (T - T_s)$$

Where, Ts = Surrounding Temperature

8. Ideal Gas Equation

$$PV = nRT$$

Universal Gas Constant

$$R = 8.314 J\ mol^{-1}K^{-1}$$

9. Boyle's Law

(Constant Temperature)

$$PV = \text{Constant}$$

10. Charles' Law

(Constant Pressure)

$$\frac{V}{T} = \text{Constant}$$

11. Gay-Lussac's Law

(Constant Volume)

$$\frac{P}{T} = \text{Constant}$$

12. Combined Gas Law

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

13. Internal Energy

For Ideal Gas

$$U = \frac{f}{2}nRT$$

Where, f = Degrees of Freedom

14. First Law of Thermodynamics

$$\Delta Q = \Delta U + \Delta W$$

15. Work Done by Gas

$$W = P\Delta V$$

(Constant Pressure)

16. Isothermal Process

$$\Delta U = 0$$

Therefore,

$$Q = W$$

17. Adiabatic Process

$$Q = 0$$

Poisson Equation

$$PV^{\gamma} = \text{Constant}$$

18. Carnot Engine Efficiency

$$\eta = 1 - \frac{T_2}{T_1}$$

Where, T_1 = Source Temperature, T_2 = Sink Temperature

19. Root Mean Square Speed

$$v_{rms} = \sqrt{\frac{3RT}{M}}$$

20. Average Kinetic Energy

$$KE = \frac{3}{2}kT$$

Boltzmann Constant

$$k = 1.38 \times 10^{-23} J/K$$

21. Degrees of Freedom

Monoatomic

$$\boxed{f = 3}$$

Diatomic

$$\boxed{f = 5}$$

Polyatomic

$$\boxed{f = 6}$$

Most Important NEET Formula Box

- $Q = mc\Delta T$
- $Q = mL$
- $PV = nRT$
- $PV = \text{Constant}$
- $\frac{V}{T} = \text{Constant}$
- $\Delta Q = \Delta U + \Delta W$
- $PV^{\gamma} = \text{Constant}$
- $\eta = 1 - \frac{T_2}{T_1}$
- $v_{rms} = \sqrt{\frac{3RT}{M}}$
- $KE = \frac{3}{2}kT$

Quick Revision Checklist

- Temperature Conversion
- Thermal Expansion
- Calorimetry
- Gas Laws
- Thermodynamics
- Carnot Engine
- Kinetic Theory

NEET Success Tip

Always remember:

Kelvin Temperature + Ideal Gas Equation + First Law of Thermodynamics + Carnot Efficiency

These four topics are generally asked in NEET Exam every year in some other format.

Class 12 Physics
Part – 4: ELECTROSTATICS
Electric Charges • Electric Field • Potential • Capacitors

1. Coulomb's Law

Electrostatic Force

$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$$

or

$$F = k\frac{q_1 q_2}{r^2}$$

Where

- $k = 9\times10^9 Nm^2/C^2$

SI Unit: Newton (N)

NEET Tip

- Like charges repel.
- Unlike charges attract.

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2. Electric Field Intensity

$$E = \frac{F}{q}$$

Due to Point Charge

$$E = \frac{kQ}{r^2}$$

SI Unit: N/C or V/m

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3. Electric Field due to Electric Dipole

Axial Position (Direction same to dipole moment)

$$E = \frac{1}{4\pi\varepsilon_0}\frac{2p}{r^3}$$

Equatorial Position

$$E = \frac{1}{4\pi\varepsilon_0}\frac{p}{r^3}$$

(Direction opposite to dipole moment)

4. Electric Dipole Moment

$$p = qd$$

Where

- d = dipole length
- Direction of dipole moment from negative charge to positive charge

SI Unit: Cm

5. Torque on Dipole

$$\tau = pE\sin\theta$$

Potential Energy

$$U = -pE\cos\theta$$

6. Electric Flux

$$\phi = EA\cos\theta$$

Where

θ is the angle between electric field and normal to the surface (area vector)

- It is a scalar quantity.
- It may be negative, zero or positive.
- If normal to the surface makes an angle φ with the electric field, then $\theta = \varphi$
- If the electric field makes an angle φ with plane of the surface then $\theta = 90^0 - \varphi$
- If an electric field is normal to the plane of the surface, then $\theta = 0^0$ and electric flux is maximum.
- If an electric field is parallel to the plane of the surface, $\theta = 90^0$ and flux is zero.
- If $0^0 \leq \theta < 90^0$: Flux is positive
- If $90^0 < \theta \leq 180$: Flux is negative
- If $\theta = 90^0$: Flux is zero

SI Unit: N·m²/C

7. Gauss's Law

$$\phi = \frac{q}{\varepsilon_0}$$

Also,

$$\varphi = \oint \vec{E} \cdot d\vec{S} = \frac{q_{in}}{\epsilon_0}$$

Applications

✔ Infinite Line Charge
✔ Infinite Plane Sheet
✔ Conducting Sphere
✔ Hollow Sphere

8. Electric Potential

Due to Point Charge

$$V = \frac{kQ}{r}$$

SI Unit: Volt (V)

9. Work Done, Potential Difference and Potential Energy

By Conservative force,

$$W_{i\to f} = Q(V_i - V_f) = U_i - U_f = -\Delta U$$

By External agent or against Conservative force,

$$W_{i\to f} = Q(V_f - V_i) = Q\Delta V = U_f - U_i = \Delta U$$

Where,

i: initial point
f : final point

Note:

Use the expression of work done by external agent or against the conservative force if it is mentioned only to find the work done.

10. Relation Between Electric Field and Potential

$$E = -\frac{dV}{dr}$$

11. Potential Energy

Two Point Charges

$$U = \frac{kq_1q_2}{r}$$

More than two point charges

$$\boldsymbol{U = \frac{1}{4\pi\epsilon_0}\sum_{\substack{i=1\\ i<j}}^{n}\frac{q_j q_i}{r_{ji}}}$$

Where,

J is the highest numbered charge in the system.

Two point charges when brought from infinity and placed in external electric field,

$$\boldsymbol{W = U = q_1 V_{1_{(\vec{r}_1)}} + q_2 V_{2_{\vec{r}_2}} + \frac{1}{4\pi\epsilon_0}\left(\frac{q_2 q_1}{r_{21}}\right)}$$

12. Capacitance

$$C = \frac{Q}{V}$$

SI Unit: Farad (F)

13. Parallel Plate Capacitor (with air only)

$$C = \frac{\varepsilon_0 A}{d}$$

With Dielectric completely inserted

$$C = \frac{K\varepsilon_0 A}{d}$$

With Dielectric (partially inserted with thickness t, plate separation d, plate area A)

$$\boldsymbol{C = \frac{\epsilon_0 A}{(d-t)+\frac{t}{K}}}$$

Note:

- K = 1 for air
- K = ∞ for a conductor
- $C = C_0 K$; C_0 = capacitance in air (without dielectric)

14. Energy Stored in Capacitor

$$U = \frac{1}{2}QV$$

Also,

$$U = \frac{1}{2}CV^2 = \frac{q^2}{2C}$$

15. Capacitors in Series

$$\boxed{\frac{1}{C}=\frac{1}{C_1}+\frac{1}{C_2}+\cdots}$$

16. Capacitors in Parallel

$$\boxed{C=C_1+C_2+\cdots}$$

17. Electrostatic Energy Density

$$\boxed{u=\frac{1}{2}\varepsilon_0 E^2}$$

Most Important NEET Formula Box

- $F=k\frac{q_1q_2}{r^2}$
- $E=\frac{kQ}{r^2}$
- $V=\frac{kQ}{r}$
- $C=\frac{Q}{V}$
- $C=\frac{\varepsilon_0 A}{d}$
- $U=\frac{1}{2}CV^2$
- $U=\frac{1}{2}QV$
- $U=\frac{Q^2}{2C}$
- $\tau=pE\sin\theta$
- $U=-pE\cos\theta$
- $\phi=\frac{q}{\varepsilon_0}$

Quick Revision Checklist

- ☐ Coulomb's Law
- ☐ Electric Field
- ☐ Dipole
- ☐ Electric Flux
- ☐ Gauss's Law
- ☐ Electric Potential
- ☐ Capacitance
- ☐ Combination of Capacitors
- ☐ Electrostatic Energy

NEET Success Tip

Revise these five Formulae every day:

- Coulomb's Law
- Electric Field
- Electric Potential
- Capacitance
- Energy Stored in Capacitor

`Questions are asked directly or indirectly in NEET Paper almost every Year.`

Class 12 Physics
Part – 5: CURRENT ELECTRICITY
Current • Resistance • Drift Velocity • Wheatstone Bridge • Potentiometer

1. Electric Current

Definition

Rate of flow of electric charge

Formula

$$\boxed{I = \frac{Q}{t}}$$

For current and charge varies with time,

$$\boxed{I = \frac{dq}{dt}}$$

Or

$$q = \int_{t_1}^{t_2} I dt$$

SI Unit: Ampere (A)

2. Current Density

$$\boxed{J = \frac{I}{A}}$$

Also,

$$\boxed{I = \vec{J} \cdot \vec{A} = JA\cos\theta}$$

- Current density is a vector quantity.
- Electric current is a scalar quantity.

Where, A = Cross-sectional Area

SI Unit: A/m²

3. Drift Velocity

$$\boxed{v_d = \frac{eE\tau}{m} = \frac{eV\tau}{ml}}$$

$$\boxed{I = neAv_d}$$

Hence,

$$\boxed{v_d = \frac{I}{neA}}$$

Where

- n = Number density
- e = Electronic charge
- A = Area

NEET Tip

Drift velocity is very small (typically of the order of mm/s).

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4. Ohm's Law

$$V = IR$$

Resistance

$$R = \frac{V}{I}$$

SI Unit: Ohm (Ω)

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5. Resistance of a Conductor

$$R = \rho \frac{L}{A}$$

Where

- ρ = Resistivity
- L = Length
- A = Area

---

6. Conductivity

$$\sigma = \frac{1}{\rho}$$

---

7. Temperature Dependence

$$R = R_0(1 + \alpha \Delta T)$$

Also,

$$R_2 = R_1(1 + \alpha \Delta t)$$

Where, $\alpha =$ temperature coefficient of resistance (in per K or /^{0}C

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8. Series Combination

$$R = R_1 + R_2 + R_3 + \cdots$$

9. Parallel Combination

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots$$

Special Case

Two equal resistors: Series: 2 R, Parallel: R/2

10. Electrical Power

$$P = VI$$

Alternative Formulae

$$P = I^2 R$$

Also

$$P = \frac{V^2}{R}$$

SI Unit: Watt (W)

11. Electrical Energy

$$W = Pt$$

Commercial Unit

$$1 kWh = 3.6 \times 10^6 J$$

12. Kirchhoff's Laws

Junction Rule

$$\sum I = 0$$

Loop Rule

$$\sum V = 0$$

13. Wheatstone Bridge

Balanced Condition

$$\frac{P}{Q} = \frac{R}{S}$$

NEET Tip

Balanced Bridge: Current through galvanometer = **Zero**

14. Meter Bridge

$$\frac{R}{X} = \frac{l}{100 - l}$$

Where, l = Balancing Length

15. Potentiometer

Potential Gradient

$$k = \frac{V}{L}$$

Unknown EMF

$$E = kl$$

Comparison of EMFs

$$\frac{E_1}{E_2} = \frac{l_1}{l_2}$$

Internal Resistance

$$r = \left(\frac{l_1 - l_2}{l_2} \right) R$$

16. Cell Combination

Series

$$E_{eq} = nE$$

Parallel

$$E_{eq} = E$$

Cell Voltage

(discharging of a cell in closed circuit)

$$V = E - Ir$$

Also,

$$V = \frac{E}{1 + \frac{r}{R}}$$

(charging of a cell in closed circuit)

$$V = E + Ir$$

Most Important NEET Formula Box

- $I = \frac{Q}{t}$
- $V = IR$
- $R = \rho \frac{L}{A}$
- $P = VI$
- $P = I^2 R$
- $P = \frac{V^2}{R}$
- $W = Pt$
- $I = neAv_d$
- $\frac{P}{Q} = \frac{R}{S}$
- $\frac{R}{X} = \frac{l}{100 - l}$
- $\frac{E_1}{E_2} = \frac{l_1}{l_2}$

Quick Revision Checklist

- Ohm's Law
- Resistance
- Resistivity
- Drift Velocity
- Current Density
- Power
- Kirchhoff's Laws
- Wheatstone Bridge
- Meter Bridge
- Potentiometer

NEET Success Tip

Questions are asked every year about Potentiometer, Meter Bridge and Wheatstone Bridge. Remember Balanced condition alongwith their formulae.

Class 12 Physics
Part – 6: MOVING CHARGES & MAGNETISM
Magnetic Field • Biot–Savart Law • Ampere's Law • Force • Galvanometer

1. Magnetic Force on a Moving Charge

$$F = qvB\sin\theta$$

SI Unit: Newton (N)

Special Cases

θ = 90°

$$F = qvB$$

(Maximum Force)

θ = 0°

$$F = 0$$

---

2. Radius of Circular Path

$$r = \frac{mv}{qB}$$

---

3. Time Period

$$T = \frac{2\pi m}{qB}$$

---

4. Cyclotron Frequency

$$f = \frac{qB}{2\pi m}$$

NEET Tip

Time Period is **independent of velocity**.

---

5. Force on Current Carrying Conductor

$$F = BIL\sin\theta$$

In vector form,

$$\vec{F} = I\vec{l} \times \vec{B}$$

SI Unit: Newton (N)

6. Torque on Current Loop

$$\tau = NBIA\sin\theta$$

where

- N = Number of turns

7. Magnetic Dipole Moment

$$M = NIA$$

8. Biot–Savart Law

$$dB = \frac{\mu_0}{4\pi}\frac{Idl\sin\theta}{r^2}$$

In vector form,

$$d\vec{B} = \frac{\mu_0}{4\pi}\left(\frac{Id\vec{l}\times\vec{r}}{r^3}\right) = \frac{\mu_0}{4\pi}\left(\frac{Id\vec{l}\times\hat{r}}{r^2}\right)$$

9. Magnetic Field due to Long Straight Wire

$$B = \frac{\mu_0 I}{2\pi r}$$

Due to a fixed wire,

$$B = \frac{\mu_0 I(\sin\alpha + \sin\beta)}{4\pi r}$$

Due to a long wire (inside the wire,

$$B = \frac{\mu_0 Ir}{2\pi R^2}$$

Where, R = radius of circular cross-section of the wire and r = distance of a point from the centre of the circular section.

10. Circular Coil

Centre

$$B = \frac{\mu_0 I}{2R}$$

N Turns

$$B = \frac{\mu_0 NI}{2R}$$

At axial position at distance x from the centre of the circle if circle is in y-z plane

$$B = \frac{\mu_0 I R^2}{2(R^2 + x^2)^{\frac{3}{2}}}$$

Due to circular arc makes angle θ at the centre

$$B = \frac{\mu_0 I}{2r}\left(\frac{\theta}{360^0}\right)$$

Where, r = radius of the circle

11. Solenoid

$$B = \mu_0 nI$$

Where, n = Number of turns per unit length

---

12. Toroid

$$B = \frac{\mu_0 NI}{2\pi r}$$

---

13. Ampere's Circuital Law

$$\oint B\,dl = \mu_0 I$$

---

14. Lorentz Force

$$F = q(E + v \times B)$$

---

15. Moving Coil Galvanometer

Torque

$$\tau = NBIA$$

(Here, $\theta = 90^0$ *and* $\sin 90^0 = 1$ as the plane of the coil is parallel to the magnetic field)

Restoring Torque

$$\tau = C\theta$$

Current Sensitivity

$$S_i = \frac{\theta}{I} = \frac{NBA}{C}$$

Voltage Sensitivity

$$S_v = \frac{\theta}{V}$$

16. Conversion of Galvanometer into Ammeter

$$S = \frac{G I_g}{I - I_g}$$

Where, S = Shunt Resistance

17. Conversion of Galvanometer into Voltmeter

$$R = \frac{V}{I_G} - G$$

18. Magnetic Materials

Relative Permeability

$$\mu_r = \frac{\mu}{\mu_0}$$

Magnetic Susceptibility

$$\chi_m = \mu_r - 1$$

Types

✔ Diamagnetic
✔ Paramagnetic
✔ Ferromagnetic

Most Important NEET Formula Box

- $F = qvB\sin\theta$
- $F = BIL\sin\theta$
- $r = \frac{mv}{qB}$
- $T = \frac{2\pi m}{qB}$
- $M = NIA$
- $B = \frac{\mu_0 I}{2\pi r}$
- $B = \frac{\mu_0 NI}{2R}$
- $B = \mu_0 nI$
- $\oint Bdl = \mu_0 I$
- $S_i = \frac{NBA}{C}$

Quick Revision Checklist

- ☐ Lorentz Force
- ☐ Biot–Savart Law
- ☐ Ampere's Law
- ☐ Solenoid
- ☐ Toroid
- ☐ Cyclotron
- ☐ Galvanometer
- ☐ Ammeter
- ☐ Voltmeter

NEET Success Tip

Direction-based Questions (Right-Hand Thumb Rule, Fleming's Left-Hand Rule, Fleming's Right-Hand Rule): Revise formulae of **Solenoid and Toroid** in Magnetic field.

Class 12 Physics
Part – 7: ELECTROMAGNETIC INDUCTION & ALTERNATING CURRENT
Faraday's Law • Inductance • AC Circuits • Transformer

1. Magnetic Flux

$$\Phi = BA\cos\theta$$

SI Unit: Weber (Wb)

Special Cases

θ = 0°

$$\varphi = BA$$

(Maximum Flux)

θ = 90°

$$\varphi = 0$$

---

2. Faraday's First Law

Whenever the magnetic flux linked with a circuit changes, an emf is induced.

---

3. Faraday's Second Law

$$E = -N\frac{d\Phi}{dt}$$

Where, N = Number of turns

NEET Tip

Negative sign indicates **Lenz's Law**.

---

4. Lenz's Law

The direction of induced current always opposes the cause producing it.

---

5. Motional EMF

$$E = Blv$$

where

- B = Magnetic Field

- l = Length
- v = Velocity

6. Self Inductance

$$E = -L\frac{dI}{dt}$$

SI Unit: Henry (H)

7. Inductance of Solenoid

$$L = \frac{\mu_0 N^2 A}{l}$$

8. Energy Stored in Inductor

$$U = \frac{1}{2}LI^2$$

9. Mutual Inductance

$$e_2 = -M\frac{dI_1}{dt}\ Or\ e_1 = -M\frac{dI_2}{dt}$$

10. Alternating Current

Instantaneous Current

$$i = i_0 \sin \omega t$$

Instantaneous Voltage

$$V = V_0 \sin \omega t$$

11. Angular Frequency

$$\omega = 2\pi f$$

12. Time Period

$$T = \frac{1}{f}$$

13. RMS Value

Current

$$I_{rms} = \frac{I_0}{\sqrt{2}}$$

Voltage

$$V_{rms} = \frac{V_0}{\sqrt{2}}$$

14. Average Value

$$I_{avg} = \frac{2I_0}{\pi}$$

(Half Cycle)

15. Capacitive Reactance

$$X_C = \frac{1}{\omega C}$$

16. Inductive Reactance

$$X_L = \omega L$$

17. LCR Series Circuit

Impedance

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

Power Factor

$$PF = \cos\varphi = \frac{R}{Z} = \frac{Actual Power}{Apparent\ Power}$$

Where, φ = phase difference between voltage and current taken from current

- Power Factor leading means current leads the voltage
- Power Factor positive means current lags the voltage

Phase Difference

$$\tan\varphi = \frac{X_L - X_C}{R}$$

If

$$V = V_0 \sin(\omega t \pm \theta_1)$$

And

$$i = I_0 \sin(\omega t \pm \theta_2)$$

Phase difference (φ)

$$\varphi = Voltage\ phase - Current\ Phase$$

Here,

$$\varphi = \{(\omega t \pm \theta_1) - (\omega t \pm \theta_2)\} = \pm(\theta_1 - \theta_2)$$

Leading/lagging

- If phase difference is positive, current lags the voltage and the circuit is Inductive.
- If phase difference is negative, current leads the voltage and the circuit is capacitive
- If phase difference is zero, current and voltage are in same phase and circuit purely resistive.
- If current lags the voltage by 90^0, the circuit is purely inductive.
- If current leads the voltage by 90^0, the circuit is purely capacitive.

---

18. AC Power

$$P = VI\cos\phi$$

---

19. Resonance Condition

$$X_L = X_C$$

Resonant Frequency

$$f = \frac{1}{2\pi\sqrt{LC}}$$

In Resonance

- Impedance is minimum
- Power factor is unity
- Average Power is maximum
- Supply frequency = resonance frequency
- Voltage & Current are in phase

In LCR Series Circuit,

- If $\omega > \omega_0$, the circuit is inductive.
- If $\omega < \omega_0$, the circuit is capacitive
- If $\omega = \omega_0$, the circuit is purely resistive and in Resonance.

---

20. Transformer

(If transformer is Ideal, 100 % Efficiency)

Voltage Ratio

$$\frac{V_s}{V_p} = \frac{N_s}{N_p}$$

Current Ratio

$$\frac{I_s}{I_p} = \frac{N_p}{N_s}$$

If transformer is not ideal, then

$$\frac{V_s}{V_p} = \frac{N_s}{N_p} = \frac{\eta I_p}{I_s}$$

Efficiency

$$\eta = \frac{P_{out}}{P_{in}} \times 100$$

Most Important NEET Formula Box

- $\Phi = BA\cos\theta$
- $E = -N\frac{d\Phi}{dt}$
- $E = Blv$
- $E = -L\frac{dI}{dt}$
- $U = \frac{1}{2}LI^2$
- $I_{rms} = \frac{I_0}{\sqrt{2}}$
- $V_{rms} = \frac{V_0}{\sqrt{2}}$
- $X_L = \omega L$
- $X_C = \frac{1}{\omega C}$
- $Z = \sqrt{R^2 + (X_L - X_C)^2}$
- $P = VI\cos\phi$
- $f = \frac{1}{2\pi\sqrt{LC}}$
- $\frac{V_s}{V_p} = \frac{N_s}{N_p}$

Quick Revision Checklist

- ☐ Magnetic Flux
- ☐ Faraday's Law
- ☐ Lenz's Law
- ☐ Motional EMF
- ☐ Self Inductance
- ☐ Mutual Inductance
- ☐ RMS & Average Values
- ☐ AC Circuits
- ☐ Resonance
- ☐ Transformer

NEET Success Tip

RMS Value, Resonance, Transformer Ratio and Motional EMF related questions are asked time and again in NEET question paper. Practice its formulae on regular basis.

Class 12 Physics
Part – 8: RAY OPTICS & WAVE OPTICS
Reflection • Refraction • Lenses • Optical Instruments • Interference

1. Laws of Reflection

Angle of Reflection

$$\boxed{i = r}$$

Where

- i = Angle of Incidence
- r = Angle of Reflection

---

2. Mirror Formula

$$\boxed{\frac{1}{f} = \frac{1}{v} + \frac{1}{u}}$$

Where

- f = Focal Length measured between pole of the mirror and the focus of it
- u = Object Distance from pole of object
- v = Image Distance from pole to image

Radius of Curvature,

$$\boxed{R - 2f}$$

---

3. Magnification (Mirror)

$$\boxed{m = -\frac{v}{u}}$$

Also,

$$\boxed{m = \frac{h_I}{h_O} = -\frac{v}{u}}$$

NEET Tip

Always use the **New Cartesian Sign Convention**.

---

4. Refraction

Snell's Law

$$\boxed{n_1 \sin i = n_2 \sin r}$$

---

5. Refractive Index (n or μ)

$$n = \frac{c}{v}$$

Where

- c = Speed of Light
- v = Speed in Medium

Relative Refractive Index

$$n_{12} = \frac{1}{n_{21}}$$

Where,

$$n_{12} = \frac{n_1}{n_2} \; and \; n_{21} = \frac{n_2}{n_1}$$

- n_{12} = Refractive Index of Medium-1 with respect to Refractive Index of Medium-2
- n_{21} = Refractive Index of Medium-2 with respect to Refractive Index of Medium-1

Note: Refractive Index depends upon

- Colour of light, $(\mu_R < \mu_V)$
- Temperature (Inversely Proportional)

Real Depth and apparent Depth Relation

$$Apparent\ Depth = \frac{Real\ depth}{\mu}$$

---

6. Lens Formula

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

---

7. Magnification (Lens)

$$m = \frac{v}{u}$$

---

8. Lens Maker's Formula

$$\frac{1}{f} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

Also,

$$\frac{1}{f} = \left(\frac{n_2}{n_1} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_1}\right)$$

Here,

- $n_1 = Refractive\ Index\ of\ air\ or\ other\ medium$ (for air, $n_1 = 1$)
- n_2 = Refractive Index of Glass material

9. Power of Lens

$$P = \frac{1}{f}$$

(f in metre)

SI Unit: Dioptre (D)

10. Combination of Lenses

$$P = P_1 + P_2 + P_3$$

If Two Lenses are in Contact, Combined focal length

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

11. Prism Formula

Angle of Deviation

$$\delta = i + e - A$$

Minimum Deviation

$$\delta_m = 2i - A = 2e - A$$

Refractive Index at Minimum Deviation

$$n = \frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

12. Optical Instruments (Magnifying Power:M and Tube Length-L)

Simple Microscope (when image is formed at least distance of distinct vision: D)

$$M = 1 + \frac{D}{f}$$

(When image is formed at infinity)

$$\boldsymbol{M = \frac{D}{f_e}}$$

Compound Microscope

$$M = \frac{L}{v} \cdot \frac{D}{f}$$

When final image is formed at least distance of distinct vision: D

$$M_D = -\frac{v_0}{u_0}\left(1 + \frac{D}{f_e}\right)$$

Tube Length

$$L_D = v_0 + |u_e|$$

When final image is formed at infinity

$$M_\infty = -\frac{v_0}{u_0}\left(\frac{D}{f_e}\right)$$

Tube Length is:

$$L_\infty = v_0 + f_e$$

Astronomical Telescope

Normal Adjustment (at infinity)

$$M = \frac{f_o}{f_e}$$

When final image is formed at infinity

$$M_\infty = -\frac{f_0}{f_e}$$

Tube Length

$$L_\infty = f_0 + f_e$$

When final image is formed at least distance of distinct vision: D

$$M_D = -\frac{f_0}{f_e}\left(1 + \frac{f_e}{D}\right)$$

Tube Length

$$L_D = f_0 + |u_e|$$

---

13. Young's Double Slit Experiment

Fringe Width

$$\beta = \frac{\lambda D}{d}$$

Note: If YDSE is immersed in a Liquid of refractive index μ, then $\beta_{liquid} = \frac{\beta_{air}}{\mu}$

Where

- λ=Wavelength
- D = Distance of Screen from slits

- d = Slit Separation

Path Difference

Constructive Interference

$$\boxed{\Delta = n\lambda}$$

Or

$$\boxed{\Delta x = n\lambda = d\sin\theta}$$

Destructive Interference

$$\boxed{\Delta = \frac{(2n-1)\lambda}{2}}$$

Or

$$\boxed{\Delta x = \frac{(2n-1)\lambda}{2} = d\sin\theta}$$

Position of nth bright fringe from Central maxima

$$\boxed{y_n = \frac{nD\lambda}{d}}$$

Where

$n = 0, \pm1, \pm2, \pm3, - - -$

Position of nth bright fringe from Central maxima

$$\boxed{y_n = \frac{(2n-1)D\lambda}{2d}}$$

Where

$n == \pm1, \pm2, \pm3, - - -$

Phase Difference and path Difference

$$\boxed{Phase\ Difference(\varphi) = \frac{2\pi}{\lambda} \times path\ difference(\Delta x)}$$

Resultant Intensity on Screen

$$\boxed{I_r = I_0 cos^2\left(\frac{\varphi}{2}\right)}$$

Where

$I_0 = 4I\ (both\ slits\ have\ same\ intensity)$

Relation between Intensity and Slit Width

$$\boxed{I \propto w}$$

Intensity and Amplitude Relation

$$\boxed{I \propto A^2}$$

$$\boxed{I_r = I_1 + I_2 + 2\sqrt{I_1 I_2}\cos\varphi}$$

Where

$\varphi = 2n\pi\ for\ constructive\ interference\ and\ (2n-1)\pi$ for destructive interference

- For constructive interference, $\cos\varphi = 1$

- For destructive interference, $\cos\varphi = -1$

15. Diffraction

Single Slit
Minimum

$$\boxed{a\sin\theta = n\lambda}$$

16. Polarisation

Brewster's Law

$$\boxed{\mu = \tan\theta_B}$$

Most Important NEET Formula Box

- $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$
- $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$
- $m = -\frac{v}{u}$
- $m = \frac{v}{u}$
- $P = \frac{1}{f}$
- $P = P_1 + P_2$
- $n = \frac{c}{v}$
- $n_1 \sin i = n_2 \sin r$
- $\beta = \frac{\lambda D}{d}$
- $\mu = \tan\theta_B$

Quick Revision Checklist

- Reflection
- Refraction
- Mirrors
- Lenses
- Lens Combination
- Prism
- Optical Instruments
- YDSE
- Diffraction
- Polarisation

NEET Success Tip

Mirror Formula, Lens Formula, Lens Power and YDSE की Fringe Width realted questions are largely in NEET paper. Practice its formulae regularly.

Class 12 Physics
Part – 9: MODERN PHYSICS & SEMICONDUCTOR ELECTRONICS
Photoelectric Effect • Atoms • Nuclei • Semiconductor • Logic Gates

1. Photoelectric Equation (Einstein)

$$h\nu = W_0 + \frac{1}{2}mv^2$$

Where

- W0 = Work Function

Threshold Frequency

$$W_0 = h\nu_0$$

Stopping Potential

$$eV_0 = KE_{max}$$

---

2. Photon Energy

$$E = h\nu$$

Using Wavelength

$$E = \frac{hc}{\lambda}$$

---

3. de Broglie Wavelength

$$\lambda = \frac{h}{p}$$

Or

$$\lambda = \frac{h}{mv}$$

---

4. Bohr Radius

$$r_n = n^2 r_1$$

---

5. Radius of Hydrogen Atom

$$r_1 = 0.53\,\mathring{A}$$

6. Energy of nth Orbit

$$E_n = \frac{-13.6}{n^2} eV$$

7. Angular Momentum

$$L = \frac{nh}{2\pi}$$

8. Radioactive Decay

$$N = N_0 e^{-\lambda t}$$

Activity

$$A = \lambda N$$

Half-Life

$$T_{1/2} = \frac{0.693}{\lambda}$$

Mean Life

$$\tau = \frac{1}{\lambda}$$

9. Mass-Energy Relation

$$E = mc^2$$

10. Nuclear Binding Energy

$$BE = \Delta m c^2$$

11. Semiconductor

Conductivity

$$\sigma = ne\mu$$

Current

$$I = \frac{V}{R}$$

12. Diode Equation

Forward Bias
Current increases rapidly.
Reverse Bias
Current almost zero.

13. Rectifier

Half Wave
One diode

Full Wave
Two/Four diodes

14. Logic Gates

AND

$$Y = A \cdot B$$

OR

$$Y = A + B$$

NOT

$$Y = \bar{A}$$

NAND
Universal Gate

NOR
Universal Gate

XOR
Output = 1 only when inputs are different.

Most Important NEET Formula Box

- $E = h\nu$
- $E = \frac{hc}{\lambda}$
- $\lambda = \frac{h}{m\nu}$

- $E_n = \frac{-13.6}{n^2}$
- $r_n = n^2 r_1$
- $N = N_0 e^{-\lambda t}$
- $T_{1/2} = \frac{0.693}{\lambda}$
- $E = mc^2$
- $BE = \Delta mc^2$
- $eV_0 = KE_{max}$

Last Minute Revision Tips for NEET

One Week Before Examination

✔ Revise Formulae Daily
✔ Solve Previous Year Questions
✔ Revise NCERT Diagrams
✔ Practice Numerical Problems
✔ Sleep Properly

One Day Before Examination

- Do **not** start any new chapter.
- Revise only Formulae and Important Concepts.
- Stay relaxed and confident.

Golden Rule

Concept + Formula + Numerical Practice = NEET Success

Quick Formula Revision Checklist

- Mechanics
- Thermal Physics
- Electrostatics
- Current Electricity
- Magnetism
- EMI & AC
- Optics
- Modern Physics

Acknowledgement

This handbook has been prepared to help Physics students revise the complete syllabus in a concise and examination-oriented manner. Every effort has been made to ensure accuracy and usefulness.

I sincerely hope that this booklet helps students strengthen their concepts, improve problem-solving speed, and perform confidently in NEET and other competitive examinations.

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