CHAPTER

12

Electromagnetic Induction

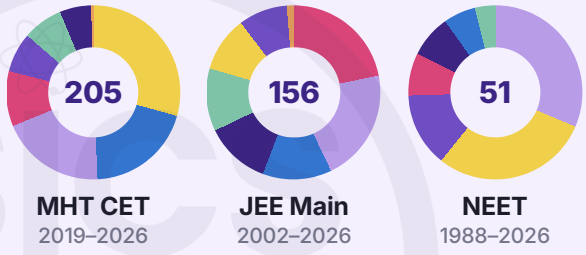
MHT CET · JEE · NEET Physics

PHYSICS CIRCLE

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EXAM WEIGHTAGE



MHT CET 2019–2026 · **JEE Main** 2002–2026 · **NEET** 1988–2026

	CET	JEE	NEET
Self-Inductance & Energy	60 29%	16 10%	15 29%
Magnetic Flux & Faraday's Law	40 20%	33 21%	16 31%
Mutual Inductance	41 20%	20 13%	3 6%
Motional EMF	21 10%	34 22%	4 8%
Lenz's Law, Eddy Currents & Induced Electric Field	15 7%	14 9%	7 14%
Rotating Conductors & AC Generator	12 6%	19 12%	4 8%
Combination of Inductors, LR & LC Circuits	15 7%	18 12%	2 4%
Other / Mixed	1 0%	2 1%	0 0%

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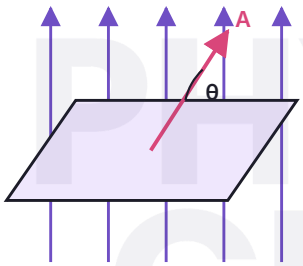
01 CONCEPT Magnetic Flux & Faraday's Law

IN ONE LINE
A change in the magnetic flux through a circuit produces an emf. The faster the flux changes, the larger the emf.

12.1.1 Magnetic flux

- Number of field lines passing normally through an area.
- Scalar quantity.
- θ is the angle between B and the area vector (the normal).

$$\varphi = B \cdot A = BA\cos\theta$$



Area vector A is along the normal

- θ = 0° (plane ⊥ field): φ = BA, the maximum.
- θ = 90° (plane ∥ field): φ = 0.
- Net flux through any closed surface is **zero**.
- If $B = B_x\hat{i} + B_y\hat{j} + B_z\hat{k}$ and the area lies in the XY plane, only B_z counts.

12.1.2 Unit and dimension

- SI unit: weber (Wb) = T m² = V s = H A.
- CGS unit: maxwell. 1 Wb = 10^8 maxwell.
- Dimension: $[ML^2T^{-2}A^{-1}]$.

12.1.3 Faraday's laws

- **First law**: an emf is induced whenever the flux through a circuit changes. It lasts only as long as the change lasts.
- **Second law**: the emf equals the rate of change of flux linkage.

$$e = -N\frac{d\varphi}{dt}$$

- The negative sign shows opposition (Lenz's law).
- φ is the flux per turn; Nφ is the flux linkage.

$$\text{average emf: } e = -N\frac{\varphi_2 - \varphi_1}{\Delta t}$$

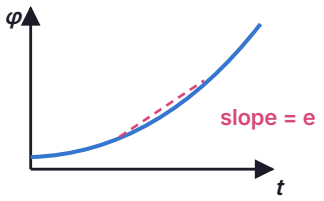
12.1.4 φ = BA cos θ: change any of the three

What changes	Induced emf
B	$e = NA\cos\theta\,\frac{\Delta B}{\Delta t}$
A	$e = NB\cos\theta\,\frac{\Delta A}{\Delta t}$
θ (turned)	$e = \frac{NBA(\cos\theta_1 - \cos\theta_2)}{\Delta t}$

- Turned from ⊥ field through 90°: Δφ = NBA.
- Turned from ⊥ field through 180°: Δφ = 2NBA.
- Removed from the field: Δφ = NBA.

12.1.5 φ as a function of time

- Differentiate, then put in t.
- Example: $\varphi = at^2 + bt + c$ gives $|e| = 2at + b$.
- "In the 5th second": from t = 4 to t = 5, use φ(5) − φ(4).
- In a φ–t graph, the slope gives e.



e = slope of the φ–t graph

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JEE · NEET Corner

Expanding or shrinking loop

$$e = B\frac{dA}{dt} = B(2\pi r)\frac{dr}{dt}$$

- The field stays the same; the area changes.
- Elastic loop whose radius shrinks at rate $\frac{dr}{dt}$: use r at that instant.
- Circle reshaped into a square of the same wire: area changes, so an emf appears.

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Solved Examples 01 Magnetic Flux & Faraday's Law

SOLVED 1 MHT CET 2026 · 20 Apr · Shift 2

A circular disc of radius 20 cm is placed in uniform magnetic field of induction $\frac{7}{22}$ Wb/m² in such a way that its axis makes an angle of 60° with B. The magnetic flux linked with the disc is (cos 60° = 0.5)

(a) 0.01 Wb (b) 0.02 Wb
(c) 0.06 Wb (d) 0.08 Wb

STEP 1 Axis is the area vector, so θ = 60°
STEP 2 $\varphi = BA\cos\theta = \frac{7}{22} \times \frac{22}{7} \times (0.2)^2 \times 0.5$
STEP 3 φ = **0.02 Wb**

Answer: **(b)**

SOLVED 2 MHT CET 2026 · 14 May · Shift 2

A square of side L metre lies in the XY plane in a region, where the magnetic field is $B = B_0(2\hat{i} + 3\hat{j} + 4\hat{k})$, where B_0 is constant. The magnitude of flux passing through the square is

(a) $2B_0L^2$ Wb (b) $3B_0L^2$ Wb
(c) $4B_0L^2$ Wb (d) $\sqrt{29}\,B_0L^2$ Wb

STEP 1 Area vector of a square in the XY plane: $A = L^2\hat{k}$
STEP 2 $\varphi = B \cdot A$: only the $\hat{k}$ part of B counts
STEP 3 φ = **$4B_0L^2$ Wb**

Answer: **(c)**

SOLVED 3 NEET 2022 · Phase 1

A square loop of side 1 m and resistance 1 Ω is placed in a magnetic field of 0.5 T. If the plane of loop is perpendicular to the direction of magnetic field, the magnetic flux through the loop is

(a) 2 weber (b) 0.5 weber
(c) 1 weber (d) Zero weber

STEP 1 Plane ⊥ field ⇒ θ = 0°
STEP 2 $\varphi = BA = 0.5 \times 1^2$
STEP 3 φ = **0.5 weber**

Answer: **(b)**

SOLVED 4 MHT CET 2026 · 20 May · Shift 1

A coil having effective area 'A' is held with its plane normal to a magnetic field of induction 'B'. The magnetic induction is quickly reduced to 25% of its initial value in 2 second. Then e.m.f. induced across the coil will be

(a) $\frac{AB}{2}$ (b) $\frac{AB}{4}$
(c) $\frac{3AB}{4}$ (d) $\frac{3AB}{8}$

STEP 1 $\Delta B = B - 0.25B = 0.75B$
STEP 2 $e = \frac{A\,\Delta B}{\Delta t} = \frac{A \times 0.75B}{2}$
STEP 3 $e = \mathbf{\frac{3AB}{8}}$

Answer: **(d)**

SOLVED 5 MHT CET 2026 · 20 Apr · Shift 1

A coil of effective area 3 m² is placed at right angles to a magnetic field of induction 0.05 Wb/m². If the field is decreased to 20% of its original value in 10 second, the e.m.f. induced in the coil will be

(a) 15 mV (b) 12 mV
(c) 10 mV (d) 5 mV

STEP 1 $\Delta B = 0.8 \times 0.05 = 0.04$ T
STEP 2 $e = \frac{A\,\Delta B}{\Delta t} = \frac{3 \times 0.04}{10}$
STEP 3 $e = 0.012$ V = **12 mV**

Answer: **(b)**

SOLVED 6 MHT CET 2025 · 26 Apr · Shift 1

A magnetic field 4×10^{-2} T acts at right angles to a coil of area 100 cm² with 50 turns. The average e.m.f. induced in the coil is 0.1 V, when it is removed from the field in time 't'. The value of 't' is

(a) 0.02 second (b) 0.05 second
(c) 0.2 second (d) 2 second

STEP 1 $e = \frac{NBA}{t}$
STEP 2 $t = \frac{50 \times 4 \times 10^{-2} \times 10^{-2}}{0.1}$
STEP 3 t = **0.2 second**

Answer: **(c)**

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Solved Examples 01 Magnetic Flux & Faraday's Law (contd.)

SOLVED 7 MHT CET 2025 · 19 Apr · Shift 2

The magnetic flux through a coil is 4×10^{-4} Wb at time t = 0. It reduces to 30% of its original value in time t second. If e.m.f. induced in the coil is 0.56 mV then the value of t is

(a) 0.5 s (b) 0.4 s
(c) 0.8 s (d) 0.7 s

STEP 1 $\Delta\varphi = 0.7 \times 4 \times 10^{-4} = 2.8 \times 10^{-4}$ Wb
STEP 2 $t = \frac{\Delta\varphi}{e} = \frac{2.8 \times 10^{-4}}{0.56 \times 10^{-3}}$
STEP 3 t = **0.5 s**

Answer: **(a)**

SOLVED 8 MHT CET 2026 · 12 May · Shift 2

The coil of area 0.1 m^2 has 1000 turns. It is placed in a magnetic field of strength 5×10^{-4} T. The average e.m.f. induced in the coil, if rotated through 180° in 0.1 s is (cos 0° = 1, cos 180° = −1)

(a) 0 V (b) 2.5 V
(c) 1 V (d) 5 V

STEP 1 Turning through 180° reverses the flux: $\Delta\varphi = 2NBA$
STEP 2 $e = \frac{2 \times 1000 \times 5 \times 10^{-4} \times 0.1}{0.1}$
STEP 3 e = **1 V**

Answer: **(c)**

SOLVED 9 MHT CET 2021 · 24 Sep · Shift 1

A coil has an area 0.06 m^2 and it has 600 turns. After placing the coil in a magnetic field of strength 5×10^{-5} Wb m^{-2}, it is rotated through 90° in 0.2 second. The magnitude of average e.m.f. induced in the coil is

(a) 12×10^{-3} V (b) 3 mV
(c) 3 V (d) 9×10^{-3} V

STEP 1 Through 90°: flux goes from NBA to 0
STEP 2 $e = \frac{NBA}{t} = \frac{600 \times 5 \times 10^{-5} \times 0.06}{0.2}$
STEP 3 e = **9×10^{-3} V**

Answer: **(d)**

SOLVED 10 MHT CET 2026 · 13 May · Shift 2

A varying magnetic flux linking a coil is $\Phi = xt^2$. If at time t = 3 s, the e.m.f. induced is 9 V then the magnitude of x is (in Wb/s^2)

(a) 1.5 (b) 0.66
(c) 0.33 (d) 0.75

STEP 1 $|e| = \frac{d\Phi}{dt} = 2xt$
STEP 2 $9 = 2x(3)$
STEP 3 x = **1.5**

Answer: **(a)**

SOLVED 11 MHT CET 2026 · 19 Apr · Shift 1

Magnetic flux linked with the coil in weber is given by the equation $\Phi = 5t^2 + 6t + 11$. The e.m.f. induced in the coil in the 5^{th} second will be

(a) 10 V (b) 51 V
(c) 102 V (d) 166 V

STEP 1 "In the 5th second" means from t = 4 s to t = 5 s
STEP 2 $\Phi(5) - \Phi(4) = 5(25 - 16) + 6(1) = 51$ Wb
STEP 3 $e = \frac{51}{1}$ = **51 V**

Answer: **(b)**

SOLVED 12 MHT CET 2021 · 23 Sep · Shift 1

The magnitude of flux linked with coil varies with time as $\varphi = 3t^2 + 4t + 7$. The magnitude of induced e.m.f. at t = 2 s is

(a) 3 V (b) 16 V
(c) 10 V (d) 7 V

STEP 1 $|e| = \frac{d\varphi}{dt} = 6t + 4$
STEP 2 At t = 2 s: 6(2) + 4
STEP 3 |e| = **16 V**

Answer: **(b)**

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CONCEPT

02 Induced Current, Charge & Heat

IN ONE LINE

Once the circuit is closed, the emf drives a current. The total charge depends only on the change of flux, not on how fast it happens.

12.2.1 Induced current

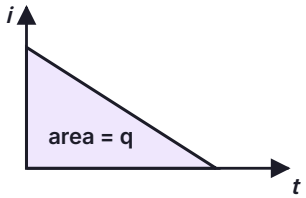
$$i = \frac{e}{R} = -\frac{N}{R}\frac{d\varphi}{dt}$$

- R is the **total** resistance of the closed circuit.
- Coil R with a galvanometer G in series: $R_{total} = R + G$.
- Example: coil R and galvanometer 6R give $i = \frac{N(\varphi_2 - \varphi_1)}{7Rt}$.
- No closed path (a cut ring): emf yes, current no.

12.2.2 Induced charge

$$q = \frac{N\Delta\varphi}{R}$$

- q does not depend on the time taken.
- A slower or faster change gives the same q.
- Removed from the field: $q = \frac{NBA}{R}$.
- Turned through 180°: $q = \frac{2NBA}{R}$.
- In an i–t graph, the area gives q; then $\Delta\varphi = qR$.
- Faster magnet ⇒ e and i larger.
- Same start and end ⇒ q the same.
- So for two speeds: $e_2 > e_1$, $i_2 > i_1$, $q_2 = q_1$.



Area under i–t = q

12.2.3 Power and heat

$$P = i^2R = \frac{e^2}{R} = \frac{N^2}{R}\left(\frac{d\varphi}{dt}\right)^2$$

Quantity	Depends on time?	Depends on R?
e	yes	no
i	yes	yes
q	no	yes
P	yes	yes

JEE · NEET Corner

Coil of wire: power in terms of N and wire radius

$$P = \frac{e^2}{R} \propto N a^2$$

- $e \propto N$ and $R \propto \frac{N}{a^2}$, where a is the radius of the wire.
- Halving N and doubling a makes P twice as large.

Total heat when B falls with time

$$H = \int \frac{e^2}{R}\,dt$$

- Use e(t) from the given φ(t), then integrate from start to the time flux becomes zero.

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ELECTROMAGNETIC INDUCTION

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

208	25	8
questions	concepts	topics

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01	Magnetic Flux & Faraday's Law	Q 1–51	51 Qs
02	Lenz's Law, Eddy Currents & Induced Electric Field	Q 52–71	20 Qs
03	Motional EMF	Q 72–82	11 Qs
04	Rotating Conductors & AC Generator	Q 83–101	19 Qs
05	Self-Inductance & Energy	Q 102–157	56 Qs
06	Mutual Inductance	Q 158–204	47 Qs
07	Combination of Inductors, LR & LC Circuits	Q 205–207	3 Qs
08	Other / Mixed	Q 208–208	1 Qs
	Answer key		

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TOPIC 01

Magnetic Flux & Faraday's Law

51 PYQs · Easy 51 · Medium 0 · Difficult 0 | MHT CET 30 · NEET 10 · JEE 11

Concepts covered: Magnetic flux (5) · Faraday's law and average emf (15) · Flux as a function of time (5) · Induced current (16) · Induced charge (10)

LEVEL 1 · EASY 51 questions

◆ Magnetic flux 5 Qs

1. A circular disc of radius 20 cm is placed in uniform magnetic field of induction $\frac{7}{22}$ Wb/m^2 in such a way that its axis makes an angle of 60° with $\vec{B}$. The magnetic flux linked with the disc is $(\cos 60^\circ = 0.5)$

MHT CET 2026 · 20 APR · SHIFT 2

(a) 0.01 Wb (b) 0.02 Wb (c) 0.06 Wb (d) 0.08 Wb

2. The net magnetic flux through any closed surface is:

NEET 2023

(a) Positive (b) Infinity (c) Negative (d) Zero

3. A square loop of side 1 m and resistance 1 Ω is placed in a magnetic field of 0.5 T. If the plane of loop is perpendicular to the direction of magnetic field, the magnetic flux through the loop is

NEET 2022 · PHASE 1

(a) 2 weber (b) 0.5 weber
(c) 1 weber (d) Zero weber

4. A circular disc of radius 0.2 meter is placed in a uniform magnetic field of induction $\frac{1}{\pi}\left(\frac{Wb}{m^2}\right)$ in such a way that its axis makes an angle of 60° with $\vec{B}$. The magnetic flux linked with the disc is

AIPMT 2008

(a) 0.08 Wb (b) 0.01 Wb (c) 0.02 Wb (d) 0.06 Wb

5. A coil is placed in magnetic field such that plane of coil is perpendicular to the direction of magnetic field. The magnetic flux through a coil can be changed:

A. By changing the magnitude of the magnetic field within the coil.

B. By changing the area of coil within the magnetic field.

C. By changing the angle between the direction of magnetic field and the plane of the coil. D. By reversing the magnetic field direction abruptly without changing its magnitude. Choose the most appropriate answer from the options given below:

JEE MAIN 2023 · 1 FEB · SHIFT 2

(a) A, B and D only (b) A, B and C only
(c) A and B only (d) A and C only

◆ Faraday's law and average emf 15 Qs

6. A coil having effective area 'A' is held with its plane normal to a magnetic field of induction 'B'. The magnetic induction is quickly reduced to 25% of its initial value in 2 second. Then e.m.f. induced across the coil will be

MHT CET 2026 · 20 MAY · SHIFT 1

(a) $\frac{AB}{2}$ (b) $\frac{AB}{4}$ (c) $\frac{3AB}{4}$ (d) $\frac{3AB}{8}$

7. Whenever a magnet is moved either towards or away from a conducting coil, magnetic flux linked with the coil changes. This change is dependent on

(a) the strength of the magnetic field.
(b) the area of cross-section of the coil.
(c) the resistance of the coil.
(d) the number of turns in the coil.

MHT CET 2026 · 19 MAY · SHIFT 1

(a) (a), (b), (c) (b) (a), (c), (d)
(c) (a), (b), (d) (d) (b), (c), (d)

8. A coil of effective area 3 m^2 is placed at right angles to a magnetic field of induction 0.05 Wb/m^2. If the field is decreased to 20% of its original value in 10 second, the e.m.f. induced in the coil will be

MHT CET 2026 · 20 APR · SHIFT 1

(a) 15 mV (b) 12 mV (c) 10 mV (d) 5 mV

9. A conducting loop of radius $10/[\pi]^{1/2}$ cm is placed perpendicular to a uniform magnetic field 0.5 T. The magnetic field is decreased to zero in 0.5 s at a steady rate. The induced emf in the circular loop at 0.25 s is

MHT CET 2026 · 13 APR · SHIFT 2

(a) 1 mV (b) 10 mV (c) 100 mV (d) 5 mV

10. A coil of effective area 3 m^2 is placed at right angles to a magnetic field of induction 0.05 Wb/m^2 If the field is decreased to 20% of its original value in 10 second, the e.m.f. induced in the coil will be

MHT CET 2025 · 5 MAY · SHIFT 2

(a) 10 mV (b) 12 mV (c) 15 mV (d) 20 mV

11. A magnetic field 4×10^{-2} T acts at right angles to a coil of area 100 cm^2 with 50 turns. The average e.m.f. induced in the coil is 0.1 V, when it is removed from the field in time 't'. The value of 't' is

MHT CET 2025 · 26 APR · SHIFT 1

(a) 0.02 second (b) 0.05 second
(c) 0.2 second (d) 2 second

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12. A magnetic field of 2×10^{-2} T acts at right angles to a coil of area $100\,\text{cm}^2$ with 50 turns, The average e.m.f. induced in the coil is 0.1 V, when it is removed from the field in time t. The value of 't' is (in second)

MHT CET 2024 · 4 MAY · SHIFT 2

(a) 0.1 s (b) 0.01 s (c) 1 s (d) 20 s

13. A coil having effective area A, is held with its plane normal to magnetic field of induction B. The magnetic induction is quickly reduced by 25% of its initial value in 2 second. Then the e.m.f. induced across the coil will be

MHT CET 2023 · 14 MAY · SHIFT 2

(a) $\frac{AB}{8}$ (b) $\frac{AB}{2}$ (c) $\frac{3AB}{4}$ (d) $\frac{3AB}{8}$

14. A magnetic field of 2×10^{-2} T acts at right angles to a coil of area $100\,\text{cm}^2$ with 50 turns. The average e.m.f. induced in the coil is 0.1 V, when it is removed from the field in time 't'. The value of 't' is

MHT CET 2023 · 14 MAY · SHIFT 1

(a) 2×10^{-3} s (b) 0.5 s
(c) 0.1 s (d) 1 s

15. A coil having effective area 'A' is held with its plane normal to a magnitude field of induction 'B'. The magnetic induction is quickly reduced to 25% of its initial value in 1 second. The e.m.f. induced in the coil (in volt) will be

MHT CET 2023 · 11 MAY · SHIFT 2

(a) $\frac{BA}{4}$ (b) $\frac{BA}{2}$ (c) $\frac{3BA}{8}$ (d) $\frac{3BA}{4}$

16. A magnetic field of 2×10^{-2} T acts at right angles to a coil of area $100\,\text{cm}^2$, with 50 turns. The average e.m.f. induced in the coil is 0.1 V, when it is removed from the field in t sec. The value of t is

AIPMT 1991

(a) 10 s (b) 0.1 s (c) 0.01 s (d) 1 s

17. The induced emf can be produced in a coil by

A. moving the coil with uniform speed inside uniform magnetic field

B. moving the coil with non uniform speed inside uniform magnetic field

C. rotating the coil inside the uniform magnetic field

D. changing the area of the coil inside the uniform magnetic field

Choose the correct answer from the options given below:

JEE MAIN 2023 · 6 APR · SHIFT 1

(a) A and C only (b) C and D only
(c) B and D only (d) B and C only

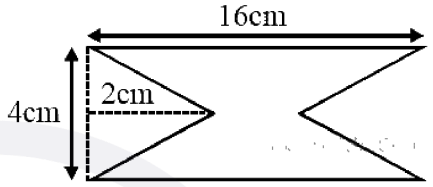
18. A conducting circular loop of radius $\frac{10}{\sqrt{\pi}}$ cm is placed perpendicular to a uniform magnetic field of 0.5 T. The magnetic field is decreased to zero in 0.5 s at a steady rate. The induced emf in the circular loop at 0.25 s is:

JEE MAIN 2023 · 24 JAN · SHIFT 1

(a) emf = 10 mV (b) emf = 5 mV
(c) emf = 100 mV (d) emf = 1 mV

19. At time t = 0 magnetic field of 1000 Gauss is passing perpendicularly through the area defined by the closed loop shown in the figure. If the magnetic field reduces linearly to 500 Gauss, in the next 5s, then induced EMF in the loop is:

JEE MAIN 2020 · 8 JAN · SHIFT 1



(a) 48 μV (b) 28 μV (c) 56 μV (d) 36 μV

20. A coil of circular cross-section having 1000 turns and 4 cm2 face area is placed with its axis parallel to a magnetic field which decreases by 10^{-2} Wb m^{-2} in 0.01 s. The e.m.f. induced in the coil is:

JEE MAIN 2014 · 11 APR · SHIFT 1

(a) 400 mV (b) 200 mV (c) 4 mV (d) 0.4 mV

◆ Flux as a function of time 5 Qs

21. Magnetic flux linked with the coil in weber is given by the equation $\Phi = 5t^2 + 6t + 11$. The e.m.f. induced in the coil in the 5^{th} second will be

MHT CET 2026 · 19 APR · SHIFT 1

(a) 10 V (b) 51 V (c) 102 V (d) 166 V

22. The magnitude of flux linked with coil varies with time as $\phi = 3t^2 + 4t + 7$. The magnitude of induced e.m.f. at $t = 2$ s is

MHT CET 2021 · 23 SEP · SHIFT 1

(a) 3 V (b) 16 V (c) 10 V (d) 7 V

23. The magnetic flux linked to a circular coil of radius R is

$\phi = 2t^3 + 4t^2 + 2t + 5$ Wb

The magnitude of induced emf in the coil at t = 5 s is

NEET 2022 · PHASE 2

(a) 192 V (b) 108 V (c) 197 V (d) 150 V

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24. The magnetic flux linked with a coil (in Wb) is given by the equation
$\phi = 5t^2 + 3t + 16$
The magnitude of induced emf in the coil at the fourth second will be
NEET 2020 · PHASE 2
(a) 10 V (b) 33 V (c) 43 V (d) 108 V

25. The flux linked with a coil at any instant $'t'$ is given by
$\phi = 10t^2 - 50t + 250$
The induced emf at $t = 3s$ is
AIEEE 2006
(a) $-190\ V$ (b) $-10\ V$ (c) $10\ V$ (d) $190\ V$

◆ Induced current 16 Qs

26. A coil of 'n' turns and resistance $R\,\Omega$ is connected in series with a resistance $R/4$. The combination is moved for time 't' second through flux Φ_1 to Φ_2. The induced current in the circuit is
MHT CET 2026 · 15 APR · SHIFT 1
(a) $\frac{4n(\Phi_1 - \Phi_2)}{5RT}$ (b) $\frac{5n^2(\Phi_1 - \Phi_2)}{4RT}$
(c) $\frac{2n(\Phi_1 - \Phi_2)}{3RT}$ (d) $\frac{3n(\Phi_1 - \Phi_2)}{4RT}$

27. A coil having 'n' turns and resistance 'R' is connected with a galvanometer of resistance '2R'. This combination is moved in time 't' from flux ϕ_1 to ϕ_2 Wb. The induced current in the circuit is
MHT CET 2026 · 11 APR · SHIFT 2
(a) $\frac{n(\phi_1 - \phi_2)}{Rt}$ (b) $\frac{n(\phi_2 - \phi_1)}{Rt}$
(c) $\frac{n(\phi_2 - \phi_1)}{3Rt}$ (d) $\frac{n(\phi_2 - \phi_1)}{2Rt}$

28. A coil having $'N'$ turns and resistance $'R'\,\Omega$ is connected to a galvanometer of resistance ' 6 R $'\Omega$. The magnetic flux linked with this coil changes from ϕ_1 weber to ϕ_2 weber in time ' t ' second. The induced current in the circuit is
MHT CET 2025 · 5 MAY · SHIFT 2
(a) $\frac{N(\phi_2 - \phi_1)}{t}$ (b) $\frac{N(\phi_2 - \phi_1)}{7Rt}$ (c) $\frac{N(\phi_2 - \phi_1)}{Rt}$ (d) $\frac{N(\phi_2 - \phi_1)}{6Rt}$

29. A coil of $'n'$ turns and resistance $R\Omega$ is connected in series with a resistance $\frac{R}{2}$. The combination is moved for time $'t'$ second through magnetic flux ϕ_1 to ϕ_2. The induced current in the circuit is
MHT CET 2025 · 25 APR · SHIFT 2
(a) $\frac{n(\phi_1 - \phi_2)}{3Rt}$ (b) $\frac{2n(\phi_1 - \phi_2)}{3Rt}$ (c) $\frac{2n(\phi_1 - \phi_2)}{Rt}$ (d) $\frac{n(\phi_1 - \phi_2)}{Rt}$

30. A coil of n turns and resistance $R\Omega$ is connected in series with resistance $R/4$. The combination is moved for time t second through magnetic flux ϕ to ϕ_2. The induced current in the circuit is
MHT CET 2025 · 23 APR · SHIFT 2
(a) $\frac{2n(\phi_1 - \phi_2)}{5Rt}$ (b) $\frac{4n(\phi_1 - \phi_2)}{5Rt}$ (c) $\frac{3n(\phi_1 - \phi_2)}{4Rt}$ (d) $\frac{5n(\phi_1 - \phi_2)}{3Rt}$

31. A coil of resistance 400Ω is placed in a magnetic field. If the magnetic flux $'\phi'$ (Wb) linked with the coil varies with time $'t'$ (s) is $\phi = 50t^2 + 4$, the current in the coil at $t = 2$ s will be
MHT CET 2025 · 22 APR · SHIFT 1
(a) 1 A (b) 2 A (c) 0.5 A (d) 0.1 A

32. A coil of resistance 250Ω is placed in a magnetic field. If the magnetic flux (ϕ) linked with the coil varies with time t(s) as $\phi = 50t^2 + 7$. The current in the coil at $t = 4$ s is
MHT CET 2024 · 16 MAY · SHIFT 1
(a) 1.3 A (b) 1.4 A (c) 1.5 A (d) 1.6 A

33. At what rate a single conductor should cut the magnetic flux so that current of 1.5 mA flows through it when a resistance of 5Ω is connected across its ends?
MHT CET 2021 · 23 SEP · SHIFT 1
(a) $6 \times 10^{-3}\ \frac{\text{wb}}{\text{s}}$ (b) $8 \times 10^{-3}\ \frac{\text{wb}}{\text{s}}$
(c) $4 \times 10^{-4}\ \frac{\text{wb}}{\text{s}}$ (d) $7.5 \times 10^{-3}\ \frac{\text{wb}}{\text{s}}$

34. the magnetic flux (in weber) in a closed circuit of resistance 20Ω varies with time t second according to equation $\phi = 5t^2 - 6t + 9$. The magnitude of induced current at $t = 0.2$ second is
MHT CET 2021 · 22 SEP · SHIFT 2
(a) 0.8 A (b) 1 A (c) 0.2 A (d) 0.4 A

35. A coil of n turns and resistance $R\Omega$ is connected in series with a resistance $\frac{R}{2}$. The combination is moved for time t second through magnetic flux ϕ_1 to ϕ_2. The induced current in the circuit is
MHT CET 2020 · 16 OCT · SHIFT 1
(a) $\frac{n(\phi_1 - \phi_2)}{3Rt}$ (b) $\frac{2n(\phi_1 - \phi_2)}{3Rt}$ (c) $\frac{2n(\phi_1 - \phi_2)}{Rt}$ (d) $\frac{n(\phi_1 - \phi_2)}{Rt}$

36. A coil of resistance 400 Ω is placed in a magnetic field. If the magnetic flux ϕ (Wb) linked with the coil varies with time t (sec) as $\phi = 50t^2 + 4$.
The current in the coil at t = 2 sec is
AIPMT 2012 · PRELIMS
(a) 0.5 A (b) 0.1 A (c) 2 A (d) 1 A

37. A rectangular coil of 20 turns and area of cross-section 25 sq. cm has a resistance of 100 Ω. If a magnetic field which is perpendicular to the plane of coil changes at a rate of 1000 tesla per second, the current in the coil is
AIPMT 1992
(a) 1 A (b) 50 A (c) 0.5 A (d) 5 A

38. The magnetic flux through a coil perpendicular to its plane is varying according to the relation $\phi = (5t^3 + 4t^2 + 2t - 5)$ Weber. If the resistance of the coil is 5 ohm, then the induced current through the coil at t = 2 s will be,
JEE MAIN 2022 · 26 JUN · SHIFT 1
(a) 15.6 A (b) 16.6 A (c) 17.6 A (d) 18.6 A

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39. A coil having n turns and resistance $R\Omega$ is connected with a galvanometer of resistance $4R\Omega$. This combination is moved in time t seconds from a magnetic field W_1 weber to W_2 weber. The induced current in the circuit is

AIEEE 2004

(a) $\frac{(W_2-W_1)}{Rnt}$ (b) $-\frac{n(W_2-W_1)}{5\ Rt}$
(c) $-\frac{(W_2-W_1)}{5\ Rnt}$ (d) $-\frac{n(W_2-W_1)}{Rt}$

40. The magnetic flux ϕ (in weber) linked with a closed circuit of resistance 8Ω varies with time (in seconds) as $\phi = 5t^2 - 36t + 1$. The induced current in the circuit at $t = 2$ s is _____ A.

JEE MAIN 2024 · 31 JAN · SHIFT 2 *(Numerical)*

41. Magnetic flux (in weber) in a closed circuit of resistance 20 Ω varies with time t(s) at $\phi = 8t2 - 9t + 5$. The magnitude of the induced current at t = 0.25 s will be _____ mA.

JEE MAIN 2022 · 25 JUL · SHIFT 2 *(Numerical)*

◆ Induced charge 10 Qs

42. The magnetic flux through a coil of resistance 'R' changes by an amount $\Delta\phi$ in the time Δt. The total quantity of induced current and charge is respectively

MHT CET 2026 · 19 MAY · SHIFT 1

(a) $\frac{\Delta\phi}{\Delta t}$ and $\frac{\Delta\phi}{R}$
(b) $\frac{-r}{\Delta t} \times R^{\Delta\phi}$ and $\frac{\Delta\phi}{\Delta t}$
(c) $\frac{\Delta\phi}{R\Delta t}$ and $\frac{\Delta\phi}{R}$
(d) $\frac{R\Delta t}{\Delta\phi}$ and $R\Delta\phi$

43. An induced current of 2A flows through a coil. The resistance of the coil is 10 Ω. What is the change in magnetic flux associated with a coil in 1 ms?

MHT CET 2026 · 12 MAY · SHIFT 2

(a) $2 \times 10^{-3}\ wb$ (b) $2 \times 10^{-2}\ wb$
(c) $22 \times 10^{-2}\ wb$ (d) $22 \times 10^{-4}\ wb$

44. The total charge induced in a conducting loop when it is moved in a uniform magnetic field depends on

MHT CET 2025 · 22 APR · SHIFT 1

(a) initial magnetic flux only.
(b) final magnetic flux only.
(c) the total change in magnetic flux.
(d) the rate of change of magnetic flux.

45. The magnetic flux through a coil of resistance ' R ' changes by an amount ' $\Delta\phi$ ' in time ' Δt '. The amount of induced current and induced charge in the coil are respectively

MHT CET 2024 · 9 MAY · SHIFT 1

(a) $\left(\frac{\Delta\phi}{\Delta t}\right)R$ and $\frac{R}{\Delta\phi}$ (b) $\frac{\Delta\phi}{\mathrm{R}}$ and $\mathrm{R}\left(\frac{\Delta t}{\Delta\phi}\right)$
(c) $\frac{\Delta\phi}{\mathrm{R}} + \mathrm{R}$ and $\frac{\Delta\phi}{\Delta t}$ (d) $\left(\frac{\Delta\phi}{\Delta t}\right) \times \frac{1}{\mathrm{R}}$ and $\frac{\Delta\phi}{\mathrm{R}}$

46. The magnetic flux through a circuit of resistance 'R' changes by an amount $\Delta\phi$ in the time Δt. The total quantity of electric charge 'Q' which passes during this time through any point of the circuit is

MHT CET 2023 · 11 MAY · SHIFT 2

(a) $-\frac{\Delta\phi}{\Delta t} + R$ (b) $\frac{\Delta\phi}{\mathrm{R}}$
(c) $\frac{\Delta\phi}{\Delta t}$ (d) $\frac{\Delta\phi}{\Delta t} \times R$

47. The magnetic flux through a coil of resistance 'R' changes by an amount '$\Delta\phi$' in time 'Δt'. The total quantity of induced electric charge 'Q' is

MHT CET 2022 · 11 AUG · SHIFT 2

(a) $-\frac{\Delta\phi}{\Delta \mathrm{t}} + \mathrm{R}$ (b) $\frac{\Delta\phi}{\Delta \mathrm{t}} \times \mathrm{R}$
(c) $\frac{\Delta\phi}{\mathrm{R}}$ (d) $\frac{\Delta\phi}{\Delta t}$

48. A conducting loop of resistance 'R' is moved to magnetic field, the total induced charge depends upon

MHT CET 2021 · 23 SEP · SHIFT 2

(a) initial magnetic flux and R.
(b) final magnetic flux and R.
(c) the total change in magnetic flux and R.
(d) the rate of change of magnetic flux and R.

49. The magnetic flux through a circuit of resistance R changes by an amount $\Delta\phi$ in a time Δt. Then the total quantity of electric charge Q that passes any point in the circuit during the time Δt is represented by

AIPMT 2004

(a) $Q = \frac{1}{R} \cdot \frac{\Delta\phi}{\Delta t}$ (b) $Q = \frac{\Delta\phi}{R}$
(c) $Q = \frac{\Delta\phi}{\Delta t}$ (d) $Q = R.\ \frac{\Delta\phi}{\Delta t}$

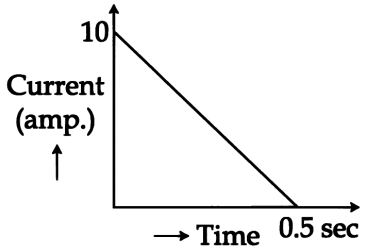
50. The total charge, induced in a conducting loop when it is moved in magnetic field depend on

AIPMT 1992

(a) the rate of change of magnetic flux
(b) initial magnetic flux only
(c) the total change in magnetic flux
(d) final magnetic flux only

51. In a coil of resistance 100 Ω, a current is induced by changing the magnetic flux through it as shown in the figure. The magnitude of change in flux through the coil is:

JEE MAIN 2017



(a) 275 Wb (b) 200 Wb (c) 225 Wb (d) 250 Wb

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TOPIC 02

Lenz's Law, Eddy Currents & Induced Electric Field

20 PYQs · Easy 20 · Medium 0 · Difficult 0 | MHT CET 11 · NEET 4 · JEE 5

Concepts covered: Lenz's law and direction of current (5) · Magnet falling through a ring or pipe (9) · Eddy currents (4) · Induced electric field (2)

LEVEL 1 · EASY 20 questions

◆ Lenz's law and direction of current 5 Qs

52. Two similar circular loops carry equal currents in the same direction. On moving coils further apart, the electric current will

MHT CET 2026 · 15 MAY · SHIFT 1

(a) increase in both
(b) decrease in both
(c) remain unchanged
(d) increase in one coil and decrease in second coil

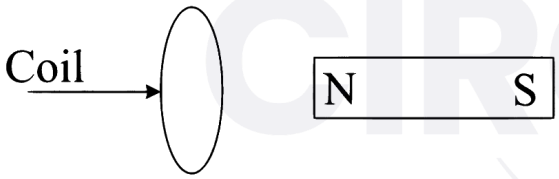
53. Out of the following which law obeys the law of conservation of energy?

MHT CET 2025 · 19 APR · SHIFT 2

(a) Kirchhoff's 1st law in electricity.
(b) Lenz's law in induction.
(c) Ampere's circuital law.
(d) Gauss's law in electrostatics.

54. The coil and magnet are moved in the same direction with same speed (V). The induced e.m.f. is

MHT CET 2024 · 2 MAY · SHIFT 2



(a) zero.
(b) proportional to V.
(c) proportional to V^{-1}.
(d) finite but does not depend on V.

55. Two conducting wire loops are concentric and lie in the same plane. The current in the outer loop is clockwise and increasing with time. The induced current in the inner loop is

MHT CET 2021 · 20 SEP · SHIFT 1

(a) clockwise
(b) anticlockwise
(c) in a direction which depends on the ratio of the loop radii.
(d) zero

56. Faraday's laws are consequence of conservation of

AIPMT 1991

(a) energy
(b) energy and magnetic field
(c) charge
(d) magnetic field

◆ Magnet falling through a ring or pipe 9 Qs

57. A bar magnet falls from a height through a metal pipe. Its acceleration will be (g = acceleration due to gravity)

MHT CET 2026 · 20 MAY · SHIFT 1

(a) less than g
(b) greater than g
(c) equal to g
(d) zero

58. A bar magnet falls from a height 'h' through a metal pipe, its acceleration after coming out of pipe is

MHT CET 2026 · 15 APR · SHIFT 1

(a) less than 9.8 m/s^2
(b) greater than 9.8 m/s^2
(c) equal to 9.8 m/s^2
(d) equal to 'h' m/s^2

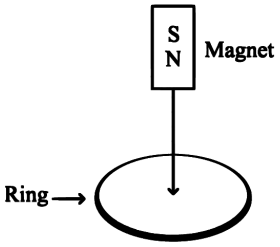
59. Spherical insulating ball and a spherical metallic ball of same size and mass are dropped from the same height. Choose the correct statement out of the following {Assume negligible air friction}

MHT CET 2026 · 13 APR · SHIFT 2

(a) Time taken by them to reach the earth's surface will be independent of the properties of their materials.
(b) Insulating ball will reach the earth's surface earlier than the metal ball.
(c) Both will reach the earth's surface simultaneously.
(d) Metal ball will reach the earth's surface earlier than the insulating ball.

60. A copper ring having a cut such as not to form a complete loop is held horizontally and a bar magnet is dropped through the ring with its length along the axis of the ring as shown in figure. The acceleration of the falling magnet is (g = acceleration due to gravity)

MHT CET 2025 · 25 APR · SHIFT 2



(a) g
(b) less than g
(c) more than g
(d) zero

61. A copper ring is held horizontally and a bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet while it is passing through the ring is

MHT CET 2025 · 22 APR · SHIFT 1

(a) more than acceleration due to gravity.
(b) less than acceleration due to gravity.
(c) depends on the diameter of ring and length of

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magnet.
(d) depends on pole strength of magnet.

62. A hollow metal pipe is held vertically and bar magnet is dropped through it with its length along the axis of the pipe. The acceleration of the falling magnet is (g = acceleration due to gravity)
MHT CET 2023 · 10 MAY · SHIFT 2
(a) equal to g. (b) less than g.
(c) more than g. (d) zero.

63. A metal ring is held horizontally and bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet is
AIPMT 1996
(a) more than g (b) equal to g
(c) less than g (d) either (1) or (3)

64. A bar magnet is released from rest along the axis of a very long vertical copper tube. After some time the magnet will
JEE MAIN 2023 · 10 APR · SHIFT 2
(a) move down with almost constant speed
(b) move down with an acceleration equal to g
(c) move down with an acceleration greater than g
(d) oscillate inside the tube

65. Spherical insulating ball and a spherical metallic ball of same size and mass are dropped from the same height. Choose the correct statement out of the following
{Assume negligible air friction}
JEE MAIN 2023 · 31 JAN · SHIFT 1
(a) Metal ball will reach the earth's surface earlier than the insulating ball
(b) Both will reach the earth's surface simultaneously.
(c) Insulating ball will reach the earth's surface earlier than the metal ball
(d) Time taken by them to reach the earth's surface will be independent of the properties of their materials

◆ Eddy currents 4 Qs

66. Eddy currents are produced when
MHT CET 2021 · 23 SEP · SHIFT 1
(a) a thick metal plate is kept in a steady magnetic field
(b) a circular coil is placed in a steady magnetic field
(c) a steady current is passed through a coil
(d) a thick metal plate is kept in a varying magnetic field

67. In which of the following devices, the eddy current effect is not used?
NEET 2019
(a) magnetic braking in train
(b) electromagnet
(c) electric heater
(d) induction furnace

68. Eddy currents are produced when
AIPMT 1988
(a) a metal is kept in varying magnetic field
(b) a metal is kept in steady magnetic field
(c) a circular coil is placed in a magnetic field
(d) through a circular coil, current is passed

69. Certain galvanometers have a fixed core made of non magnetic metallic material. The function of this metallic material is
JEE MAIN 2023 · 8 APR · SHIFT 1
(a) to bring the coil to rest quickly
(b) to produce large deflecting torque on the coil
(c) to oscillate the coil in magnetic field for longer period of time
(d) to make the magnetic field radial

◆ Induced electric field 2 Qs

70. Match List I with List II

	List I		List II
(A)	Gauss's law of magnetostatics	(I)	$\oint \vec{E} \cdot \vec{da} = \frac{1}{\varepsilon_0} \int \rho dV$
(B)	Faraday's law of electromagnetic induction	(II)	$\oint \vec{B} \cdot \vec{da} = 0$
(C)	Ampere's law	(III)	$\int \vec{E} \cdot \vec{dl} = \frac{-d}{dt} \int \vec{B} \cdot \vec{da}$
(D)	Gauss's law of electrostatics	(IV)	$\oint \vec{B} \cdot \vec{dl} = \mu_0 I$

Choose the correct answer from the options given below:
JEE MAIN 2024 · 30 JAN · SHIFT 2
(a) A-III, B-IV, C-I, D-II
(b) A-IV, B-II, C-III, D-I
(c) A-II, B-III, C-IV, D-I
(d) A-I, B-III, C-IV, D-II

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71. Match List I with List II

	List - I		List - II
(A)	$\oint \vec{B} \cdot \overrightarrow{dl} = \mu_o i_c + \mu_o \varepsilon_o \frac{d\phi_E}{dt}$	(I)	Gauss' law for electricity
(B)	$\oint \vec{E} \cdot \overrightarrow{dl} = \frac{d\phi_B}{dt}$	(II)	Gauss' law for magnetism
(C)	$\oint \vec{E} \cdot dA = \frac{Q}{\varepsilon_o}$	(III)	Faraday law
(D)	$\oint \vec{B} \cdot dA = 0$	(IV)	Ampere - Maxwell law

Choose the correct answer from the options given below:

JEE MAIN 2024 · 29 JAN · SHIFT 1

(a) A-IV, B-III, C-I, D-II
(b) A-I, B-II, C-III, D-IV
(c) A-IV, B-I, C-III, D-II
(d) A-II, B-III, C-I, D-IV

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TOPIC 03

Motional EMF

11 PYQs · Easy 11 · Medium 0 · Difficult 0 | MHT CET 6 · NEET 1 · JEE 4

Concepts covered: Straight conductor and moving loops (6) · Earth's field, aeroplane and falling wire (3) · Force, power and work on a moving rod (2)

LEVEL 1 · EASY 11 questions

◆ Straight conductor and moving loops 6 Qs

72. A straight line conductor of length 0.4 m is moved with a speed of 7.0 ms^{-1} perpendicular to magnetic field of intensity 0.8 Wb m^{-2}. The induced e.m.f. across the conductor is

MHT CET 2026 · 17 APR · SHIFT 2

(a) $2 \cdot 24$ V (b) $2 \cdot 80$ V (c) $3 \cdot 20$ V (d) $5 \cdot 60$ V

73. A conductor 10 cm long is moves with a speed 1 m/s perpendicular to a field of strength 1000 A/m. The emf induced in the conductor is (Given: $\mu_0 = 4\pi \times 10^{-7}$ Wb/Am)

MHT CET 2023 · 13 MAY · SHIFT 2

(a) π mV (b) 2π mV (c) $40\pi\mu$ V (d) $4\pi\mu$ V

74. A straight conductor of length 0.6 M is moved with a speed of 10 ms^{-1} perpendicular to magnetic field of induction 1.2 weber m^{-2}. The induced e.m.f. across the conductor is

MHT CET 2021 · 20 SEP · SHIFT 1

(a) 6 V (b) 7.2 V (c) 0.72 V (d) 12 V

75. A straight line conductor of length 0.4 m is moved with a speed of 7 m/s perpendicular to a magnetic field of intensity 0.9 Wb/m^2. The induced e.m.f. across the conductor is

AIPMT 1995

(a) 5.04 V (b) 25.2 V (c) 1.26 V (d) 2.52 V

76. An emf of 0.08 V is induced in a metal rod of length 10 cm held normal to a uniform magnetic field of 0.4 T, when moves with a velocity of:

JEE MAIN 2023 · 8 APR · SHIFT 2

(a) 20 ms^{-1} (b) 2 ms^{-1}
(c) 3.2 ms^{-1} (d) 0.5 ms^{-1}

77. A wire of length 1m moving with velocity 8 m/s at right angles to a magnetic field of 2T. The magnitude of induced emf, between the ends of wire will be _____.

JEE MAIN 2023 · 25 JAN · SHIFT 2

(a) 20 V (b) 8 V (c) 16 V (d) 12 V

◆ Earth's field, aeroplane and falling wire 3 Qs

78. An air craft of wing span 40 m flies horizontally in earth's magnetic field 5×10^{-5} T at a speed of 500 m/s. The e.m.f. generated between the tips of the wings of the air craft is

MHT CET 2023 · 12 MAY · SHIFT 2

(a) 0.5 V (b) 1 V (c) 1.2 V (d) 1.5 V

79. A boat is moving due east in a region where the earth's magnetic field is $5.0 \times 10^{-5}\ NA^{-1}\ m^{-1}$ due north and horizontal. The boat carries a vertical aerial 2 m long. If the speed of the boat is 1.50 ms^{-1}, the magnitude of the induced emf in the wire of aerial is:

AIEEE 2011

(a) 0.75 mV (b) 0.50 mV
(c) 0.15 mV (d) 1 mV

80. A horizontal straight wire 5 m long extending from east to west is falling freely at right angle to horizontal component of earths magnetic field 0.60×10^{-4} Wbm $^{-2}$. The instantaneous value of emf induced in the wire when its velocity is 10 ms^{-1} is _____ $\times 10^{-3}$ V.

JEE MAIN 2024 · 29 JAN · SHIFT 2 *(Numerical)*

◆ Force, power and work on a moving rod 2 Qs

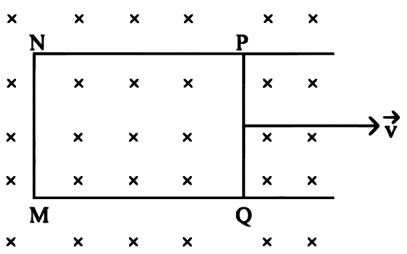
81. If current 'I' is flowing in the closed circuit with collective resistance 'R', the rate of production of heat energy in the loop as we pull it along with a constant speed 'V' is (L = length of conductor, B = magnetic field)

MHT CET 2023 · 9 MAY · SHIFT 2

(a) $\frac{BLV}{R}$ (b) $\frac{B^2L^2V^2}{R^2}$ (c) $\frac{BLV}{R^2}$ (d) $\frac{B^2L^2V^2}{R}$

82. A rectangular loop PQMN with movable arm PQ of length 12 cm and resistance 2Ω is placed in a uniform magnetic field of 0.1 T acting perpendicular to the plane of the loop as shown in figure. The resistances of the arms MN, NP and MQ are negligible. The current induced in the loop when arm PQ is moved with velocity 20 ms^{-1} is

MHT CET 2021 · 24 SEP · SHIFT 2



(a) 0.12 A (b) 0.06 A (c) 0.24 A (d) 0.18 A

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TOPIC 04

Rotating Conductors & AC Generator

19 PYQs · Easy 19 · Medium 0 · Difficult 0 | MHT CET 7 · NEET 3 · JEE 9

Concepts covered: Rotating rod (7) · Wheel and disc (4) · Rotating coil and ac generator (8)

LEVEL 1 · EASY 19 questions

◆ Rotating rod 7 Qs

83. A conductor of length 1 m rotates vertically about one of its ends at angular velocity 5 rad/s. If the horizontal component of earth's magnetic field is 0.2×10^{-4} T, then the e.m.f. developed between the ends of the conductor is

MHT CET 2026 · 14 MAY · SHIFT 1

(a) 5 μV (b) 5 mV (c) 50 μV (d) 50 mV

84. A metal rod of length ' l ' rotates about one of its ends in a plane perpendicular to a magnetic field of induction ' B '. If the e.m.f. induced between the ends of the rod is ' e ', then the number of revolutions made by the rod per second is

MHT CET 2024 · 9 MAY · SHIFT 1

(a) $\frac{e}{B\pi^2 l}$ (b) $\frac{e}{B\pi l^2}$ (c) $\frac{B^2}{e\pi l}$ (d) $\frac{\pi l^2}{eB}$

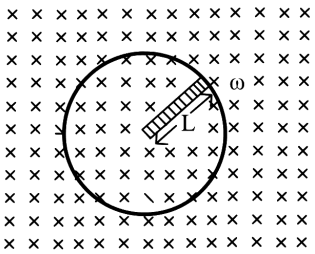
85. A rod of length ' l ' is rotated with angular velocity ' ω ' about its one end, perpendicular to a magnetic field of induction ' B '. The e.m.f. induced in the rod is

MHT CET 2024 · 3 MAY · SHIFT 2

(a) $Bl^2\omega$ (b) $0.5\,Bl^2\omega$ (c) B/ω (d) $0.5\,B/\omega$

86. A metallic rod of length 'L' is rotated with an angular speed of 'ω' normal to a uniform magnetic field 'B' about an axis passing through one end of rod as shown in figure. The induced emf will be:

JEE MAIN 2023 · 24 JAN · SHIFT 2



(a) $\frac{1}{2}B^2L^2\omega$ (b) $\frac{1}{2}BL^2\omega$ (c) $\frac{1}{4}BL^2\omega$ (d) $\frac{1}{4}B^2L\omega$

87. A metallic conductor of length 1 m rotates in a vertical plane parallel to east-west direction about one of its end with angular velocity 5 rad $s^{-}1$. If the horizontal component of earth's magnetic field is 0.2×10^{-4} T, then emf induced between the two ends of the conductor is:

JEE MAIN 2022 · 26 JUN · SHIFT 2

(a) 5 μV (b) 50 μV (c) 5 mV (d) 50 mv

88. A metal conductor of length $1\,m$ rotates vertically about one of its ends at angular velocity 5 radians per second. If the horizontal component of earth's magnetic field is $0.2 \times 10^{-4}T$, then the $e.m.f.$ developed between the two ends of the conductor is

AIEEE 2004

(a) $5mV$ (b) $50\mu V$ (c) $5\mu V$ (d) $50mV$

89. A 20 cm long metallic rod is rotated with 210 rpm about an axis normal to the rod passing through its one end. The other end of the rod is in contact with a circular metallic ring. A constant and uniform magnetic field 0.2 T parallel to the axis exists everywhere. The emf developed between the centre and the ring is _____ mV.

Take $\pi = \frac{22}{7}$

JEE MAIN 2023 · 15 APR · SHIFT 1 *(Numerical)*

◆ Wheel and disc 4 Qs

90. A metal disc of radius R rotates with an angular velocity ω about an axis perpendicular to its plane passing through its centre in a magnetic field of induction B acting perpendicular to the plane of the disc. The induced e.m.f. between the rim and axis of the disc is

MHT CET 2024 · 15 MAY · SHIFT 2

(a) $B\pi R^2$ (b) $\frac{2B\pi^2R^2}{\omega}$ (c) $B\pi R^2\omega$ (d) $\frac{BR^2\omega}{2}$

91. A metal disc of radius R rotates with an angular velocity ω about an axis perpendicular to its plane passing through its centre in a magnetic field of induction B acting perpendicular to the plane of the disc. The magnitude of induced emf between the rim and axis of the disc is

MHT CET 2023 · 13 MAY · SHIFT 2

(a) πBR^2 (b) $\frac{2\pi^2BR^2}{\omega}$ (c) $\pi BR^2\omega$ (d) $\frac{BR^2\omega}{2}$

92. A cycle wheel of radius 0.5 m is rotated with constant angular velocity of 10 rad/s in a region of magnetic field of 0.1 T which is perpendicular to the plane of the wheel. The EMF generated between its centre and the rim is,

NEET 2019

(a) Zero (b) 0.25 V (c) 0. 125 V (d) 0.5 V

93. A uniform magnetic field of 0.4 T acts perpendicular to a circular copper disc 20 cm in radius. The disc is having a uniform angular velocity of 10 π rad s-1 about an axis through its centre and perpendicular to the disc. What is the potential difference developed between the axis of the disc and the rim? ($\pi = 3.14$)

JEE MAIN 2025 · 28 JAN · SHIFT 2

(a) 0.5024 V (b) 0.0628 V (c) 0.2512 V (d) 0.1256 V

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◆ Rotating coil and ac generator 8 Qs

94. What is the phase difference between the flux linked with a coil rotating in a uniform magnetic field and the induced e.m.f. produced in it?

MHT CET 2025 · 21 APR · SHIFT 2

(a) π (b) $-\frac{\pi}{6}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

95. In an a. c. generator, when the plane of the coil is perpendicular to the magnetic field

MHT CET 2024 · 3 MAY · SHIFT 1

(a) magnetic flux is zero and induced e.m.f. is maximum.
(b) magnetic flux is maximum and induced e.m.f. is zero.
(c) both magnetic flux and induced e.m.f. are maximum.
(d) both magnetic flux and induced e.m.f. are zero.

96. An emf is generated by an ac generator having 100 turn coil, of loop area $1\ m^2$. The coil rotates at a speed of one revolution per second and placed in a uniform magnetic field of $0.05\ T$ perpendicular to the axis of rotation of the coil. The maximum value of emf is :-

NEET 2023

(a) 3.14 V (b) 31.4 V (c) 62.8 V (d) 6.28 V

97. A wire loop is rotated in a magnetic field. The frequency of change of direction of the induced e.m.f. is

NEET 2013

(a) four times per revolution
(b) six times per revolution
(c) once per revolution
(d) twice per revolution

98. A coil of area A and N turns is rotating with angular velocity ω in a uniform magnetic field $\vec{B}$ about an axis perpendicular to $\vec{B}$. Magnetic flux φ and induced emf ε across it, at an instant when $\vec{B}$ is parallel to the plane of coil, are:

JEE MAIN 2025 · 29 JAN · SHIFT 1

(a) $\varphi = AB, \varepsilon = NAB\omega$ (b) $\varphi = AB, \varepsilon = 0$
(c) $\varphi = 0, \varepsilon = 0$ (d) $\varphi = 0, \varepsilon = NAB\omega$

99. A coil of cross-sectional area A having n turns is placed in a uniform magnetic field B. When it is rotated with an angular velocity ω, the maxium e.m.f. induced in the coil will be:

JEE MAIN 2018 · 16 APR · SHIFT 1

(a) $3\ nBA\omega$ (b) $\frac{3}{2}\ nBA\omega$
(c) $nBA\omega$ (d) $\frac{1}{2}\ nBA\omega$

100. A circular coil of 1000 turns each with area 1m2 is rotated about its vertical diameter at the rate of one revolution per second in a uniform horizontal magnetic field of 0.07T. The maximum voltage generation will be _____ V.

JEE MAIN 2022 · 24 JUN · SHIFT 2 *(Numerical)*

101. A circular coil of radius 8.0 cm and 20 turns is rotated about its vertical diameter with an angular speed of 50 rad s^{-1} in a uniform horizontal magnetic field of 3.0×10^{-2} T. The maximum emf induced the coil will be ..... $\times 10^{-2}$ volt (rounded off to the nearest integer)

JEE MAIN 2021 · 26 AUG · SHIFT 2 *(Numerical)*

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TOPIC 05

Self-Inductance & Energy

56 PYQs · Easy 56 · Medium 0 · Difficult 0 | MHT CET 40 · NEET 11 · JEE 5

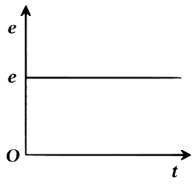
Concepts covered: L from flux and emf (27) · L of a solenoid and its dependence (17) · Energy stored in an inductor (12)

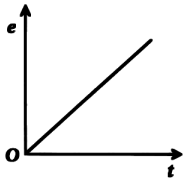
LEVEL 1 · EASY 56 questions

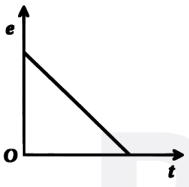
◆ L from flux and emf 27 Qs

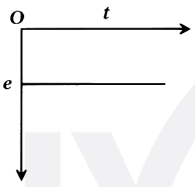
102. The current flowing through an inductor of self-inductance L is continuously increasing at constant rate. The variation of induced e.m.f. (e) versus time t is shown graphically by

MHT CET 2026 · 20 MAY · SHIFT 1

(a) 

(b) 

(c) 

(d) 

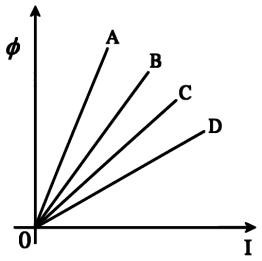
103. Two coils A and B have 180 and 360 turns respectively. The current of 1A flows through both the coils. Due to current of 1A in coil A, flux per turn of 0.8×10^{-3} Wb is linked with coil A. Due to current of 1A in coil B, flux per turn of 1×10^{-3} Wb is linked with coil B. The self inductance of coil A is L_A and the self inductance of coil B is L_B. The ratio L_A to L_B is

MHT CET 2026 · 18 APR · SHIFT 2

(a) $\frac{1}{5}$ (b) $\frac{2}{5}$ (c) $\frac{3}{2}$ (d) $\frac{5}{2}$

104. A graph of magnetic flux (Φ) versus current (I) is shown for four inductors A, B, C, D. The smallest value of self inductance is for inductor.

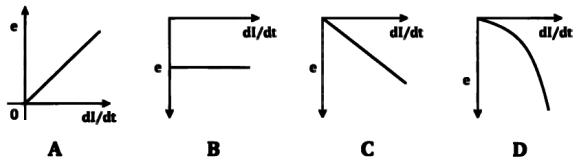
MHT CET 2026 · 16 APR · SHIFT 2



(a) A (b) B (c) C (d) D

105. The current flowing through the inductor of self inductance 'L' is continuously increasing at constant rate. The variation of induced e.m.f. (e) versus $\frac{dI}{dt}$ is shown graphically by figure

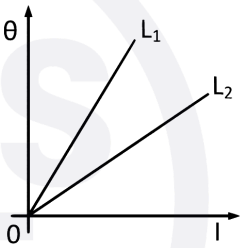
MHT CET 2026 · 13 APR · SHIFT 1



(a) A (b) B (c) C (d) D

106. The plot of magnetic flux ' ϕ ' linked with the coil versus current ' I ' is as shown in figure for two inductors L_1 and L_2. The self inductance of

MHT CET 2025 · 26 APR · SHIFT 2



(a) L_1 is equal to that of L_2.
(b) L_1 is less than that of L_2.
(c) L_1 is greater than that of L_2.
(d) L_1 is half that of L_2.

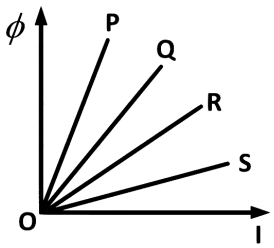
107. When a current in the conducting coil is changed from 5 A in one direction to 5 A in opposite direction in 0.5 second, an average induced e.m.f in the coil is 2 V. The selfinductance of the coil is

MHT CET 2025 · 23 APR · SHIFT 1

(a) 25 mH (b) 50 mH (c) 75 mH (d) 100 mH

108. A graph of magnetic flux (ϕ) versus current (I) is shown for four inductors P, Q, R, S. The largest value of self-inductance is for inductor

MHT CET 2025 · 22 APR · SHIFT 2

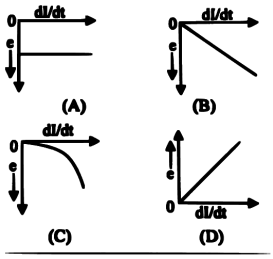


(a) R (b) P (c) Q (d) S

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109. The current flowing through an inductor of selfinductance L is continuously increasing at constant rate. The variation of induced e.m.f. (e) verses dI/dt is shown graphically by figure

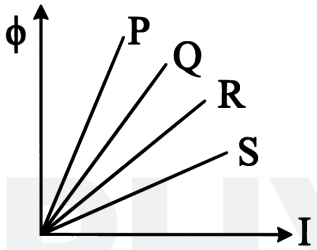
MHT CET 2025 · 20 APR · SHIFT 1



(a) B (b) A (c) D (d) C

110. A graph of magnetic flux (ϕ) versus current (I) is shown for 4 different inductors P, Q, R, S. Minimum value of inductance is for inductor

MHT CET 2024 · 16 MAY · SHIFT 1



(a) P (b) Q (c) R (d) S

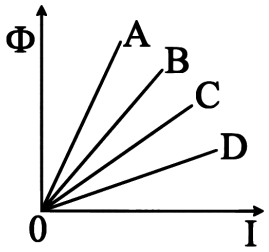
111. A current of 0.5 A is passed through winding of a long solenoid having 400 turns. The magnetic flux linked with each turn is 3×10^{-3} Wb. The self inductance of the solenoid is

MHT CET 2024 · 4 MAY · SHIFT 2

(a) 2.4 H (b) 2.0 H (c) 1.2 H (d) 0.6 H

112. A graph of magnetic flux (ϕ) versus current (I) is shown for four inductors A, B, C, D. Smaller value of self inductance is for inductor

MHT CET 2024 · 4 MAY · SHIFT 1



(a) D (b) C (c) B (d) A

113. A long solenoid has 1500 turns. When a current of 3.5 A flows through it, the magnetic flux linked with each turn of solenoid is 2.8×10^{-3} weber. The self-inductance of solenoid is

MHT CET 2023 · 14 MAY · SHIFT 2

(a) 1.2 H (b) 2.4 H (c) 3.6 H (d) 6 H

114. SI units of self inductance is

MHT CET 2023 · 12 MAY · SHIFT 2

(a) $\frac{V-A}{S}$ (b) $\frac{V}{A-S}$ (c) $\frac{V-S}{A}$ (d) $\frac{A}{V-S}$

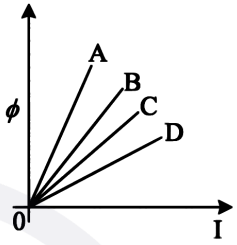
115. When a current of 1 A is passed through a coil of 100 turns, the flux associated with it is 2.5×10^{-5} Wb/ turn. The self inductance of the coil in millihenry is

MHT CET 2023 · 11 MAY · SHIFT 1

(a) 40 (b) 25 (c) 4 (d) 2.5

116. A graph of magnetic flux (ϕ) versus current (I) is plotted for four inductors A, B, C, D. Larger value of self inductance is for inductor

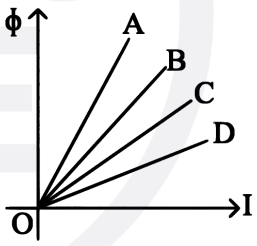
MHT CET 2023 · 10 MAY · SHIFT 1



(a) A (b) B (c) C (d) D

117. A graph of magnetic flux (ϕ) versus current (I) is drawn for four inductors A, B, C, D. Larger value of self inductance is for inductor.

MHT CET 2022 · 11 AUG · SHIFT 2



(a) D (b) B (c) C (d) A

118. A current 'I' produces a magnetic flux 'ϕ' per turn in a coil of 'n' turns. Self inductance of the coil is 'L'. The relation between them is

MHT CET 2021 · 24 SEP · SHIFT 2

(a) $nLI = \phi$ (b) $\frac{nL}{I} = \phi$ (c) $\frac{LI}{n^2} = \phi$ (d) $\frac{LI}{n} = \phi$

119. A long solenoid has 1000 turns. When a current of 4 A flows through it, the magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb. The self-inductance of the solenoid is

NEET 2016 · PHASE 1

(a) 2 H (b) 1 H (c) 4 H (d) 3 H

120. A current of 2.5 A flows through a coil of inductance 5 H. The magnetic flux linked with the coil is

NEET 2013

(a) 0.5 Wb (b) 12.5 Wb (c) zero (d) 2 Wb

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121. A long solenoid has 500 turns. When a current of 2 ampere is passed through it, the resulting magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb. The self-inductance of the solenoid is
AIPMT 2008
(a) 1.0 henry (b) 4.0 henry
(c) 2.5 henry (d) 2.0 henry

122. What is the self-inductance of a coil which produces 5 V when the current changes from 3 ampere to 2 ampere in one millisecond?
AIPMT 1993
(a) 5000 henry (b) 5 milli-henry
(c) 50 henry (d) 5 henry

123. The current in self inductance $L = 40$ mH is to be increased uniformly from 1 amp to 11 amp in 4 milliseconds. The e.m.f. induced in inductor during process is
AIPMT 1990
(a) 100 volt (b) 0.4 volt (c) 4.0 volt (d) 440 volt

124. Regarding self-inductance:
A. The self-inductance of the coil depends on its geometry.
B. Self-inductance does not depend on the permeability of the medium.
C. Self-induced e.m.f. opposes any change in the current in a circuit.
D. Self-inductance is electromagnetic analogue of mass in mechanics.
E. Work needs to be done against self-induced e.m.f. in establishing the current. Choose the correct answer from the options given below:
JEE MAIN 2025 · 23 JAN · SHIFT 1
(a) A, B, C, E only (b) A, B, C, D only
(c) A, C, D, E only (d) B, C, D, E only

125. In a coil, the current changes from -2 A to $+2$ A in 0.2 s and induces an emf of 0.1 V. The self inductance of the coil is:
JEE MAIN 2024 · 6 APR · SHIFT 2
(a) 4 mH (b) 2.5 mH (c) 1 mH (d) 5 mH

126. When current in a coil changes from 5 A to 2 A in 0.1 s, an average voltage of 50 V is produced. The self - inductance of the coil is:
JEE MAIN 2015 · 10 APR · SHIFT 1
(a) 0.67 H (b) 1.67 H (c) 3 H (d) 6 H

127. When the current changes from $+2A$ to $-2A$ in 0.05 second, an $e.m.f.$ of 8 V is inducted in a coil. The coefficient of self- induction of the coil is
AIEEE 2003
(a) $0.2H$ (b) $0.4H$ (c) $0.8\ H$ (d) $0.1\ H$

128. A 10 Ω, 20 mH coil carrying constant current is connected to a battery of 20 V through a switch. Now after switch is opened current becomes zero in 100 μs. The average e.m.f. induced in the coil is _____ V.
JEE MAIN 2022 · 26 JUN · SHIFT 1 *(Numerical)*

◆ L of a solenoid and its dependence 17 Qs

129. The inductance of a coil is proportional to
MHT CET 2026 · 15 MAY · SHIFT 2
(a) its length
(b) the number of turns
(c) the resistance of coil
(d) the square of the number of turns

130. What is the self inductance of a solenoid of length 10π cm, area of cross-section 10^{-3} m^2 and total number of turns 10^3? ($\mu_0 = 4\pi \times 10^{-7}$ SI unit)
MHT CET 2026 · 14 MAY · SHIFT 1
(a) 4 mH (b) 4 H (c) 40 H (d) 0.4 H

131. A coil of wire of radius r has 600 turns and a self-inductance of 108 mH. The self inductance of a coil with same radius and 500 turns is
MHT CET 2026 · 13 MAY · SHIFT 2
(a) 80 mH (b) 75 mH (c) 108 mH (d) 90 mH

132. The self inductance of an air-core inductor (solenoid) is 0.03 mH. By introducing an iron core into inductor the self-inductance increases to 30 mH. The relative permeability of the core used is
MHT CET 2026 · 20 APR · SHIFT 1
(a) 10^{-3} (b) 10^{-2} (c) 10^2 (d) 10^3

133. A coil of wire of radius ' r ' has 600 turns and a self-inductance of 108 mH. The self-inductance of a coil with same radius and 500 turns is
MHT CET 2025 · 25 APR · SHIFT 2
(a) 80 mH (b) 75 mH (c) 108 mH (d) 90 mH

134. When the number of turns in a coil are made 3 times without any change in the length of the coil, its self inductance becomes
MHT CET 2024 · 15 MAY · SHIFT 1
(a) (9) times (b) two times
(c) three times (d) four times

135. If number of turns per unit length in a solenoid is tripled, the self inductance of solenoid will
MHT CET 2024 · 11 MAY · SHIFT 2
(a) remain constant (b) be halved
(c) become 9 times (d) become $\frac{1}{9}$ times

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136. When the number of turns in a coil is doubled without any change in the length of the coil, its self-inductance
MHT CET 2024 · 11 MAY · SHIFT 1
(a) becomes 4 times. (b) becomes 2 times.
(c) gets halved. (d) remains unchanged.

137. The self induction (L) produced by solenoid of length 'l' having 'N' number of turns and cross sectional area 'A' is given by the formula (ϕ = magnetic flux, μ_0 = permeability of vacuum)
MHT CET 2023 · 14 MAY · SHIFT 2
(a) $\mathrm{L} = \mathrm{N}\phi$ (b) $\mathrm{L} = \mu_0 \mathrm{NAl}$
(c) $\mathrm{L} = \frac{\mu_0 \mathrm{N}^2 \mathrm{A}}{l}$ (d) $\mathrm{L} = \frac{\mu_0 \mathrm{NA}}{l}$

138. The self inductance 'L' of a solenoid of length 'l' and area of cross-section 'A', with a fixed number of turns 'N' increases as
MHT CET 2023 · 11 MAY · SHIFT 2
(a) both l and A increase
(b) l decreases and A increases
(c) l increases and A decreases
(d) both l and A decrease

139. Self inductance of solenoid is
MHT CET 2023 · 9 MAY · SHIFT 1
(a) directly proportional to current flowing through the coil.
(b) directly proportional to the length.
(c) directly proportional to its area of cross-section.
(d) inversely proportional to the area of cross-section.

140. Self inductance of a solenoid cannot be increased by
MHT CET 2022 · 11 AUG · SHIFT 2
(a) decreasing its length
(b) increasing its area of cross-section
(c) increasing the current through it
(d) increasing the number of turns in it

141. The self inductance of solenoid of length 31.4 cm, area of cross section $10^{-3}\ \mathrm{m}^2$ having total number of turns 500 will be nearly [$\mu_0 = 4\pi \times 10^{-7}$ SI unit]
MHT CET 2021 · 23 SEP · SHIFT 2
(a) $3 \times 10^{-6}\mathrm{H}$ (b) $2 \times 10^{-6}\mathrm{H}$
(c) $0.5 \times 10^{-6}\mathrm{H}$ (d) $4 \times 10^{-6}\mathrm{H}$

142. A circular coil of radius 'R' has 'N' turns of a wire. The coefficient of self induction of the coil will be (μ_0 = permeability of free space)
MHT CET 2021 · 22 SEP · SHIFT 1
(a) $\frac{\mu_0 N\pi R^2}{2}$ (b) $\frac{\mu_0 N\pi R}{4}$ (c) $\frac{\mu_0 N^2\pi R}{2}$ (d) $\frac{\mu_0 N\pi R}{2}$

143. Consider a long solenoid of length l and radius r. If n is the number of turns per unit length and μ_0 is the permeability of free space, the inductance of the solenoid is:
RE-NEET 2026
(a) $2\mu_0\pi n^2 r^2 l$ (b) $\mu_0\pi n^2 r^2 l$
(c) $\mu_0 n^2 r^2 l$ (d) $(\mu_0/2\pi) n^2 r^2 l$

144. If N is the number of turns in a coil, the value of self inductance varies as
AIPMT 1993
(a) N^0 (b) N (c) N^2 (d) N^{-2}

145. If the number of turns per unit length of a coil of solenoid is doubled, the self-inductance of the solenoid will
AIPMT 1991
(a) remain unchanged (b) be halved
(c) be doubled (d) become four times

◆ Energy stored in an inductor 12 Qs

146. The magnetic energy stored in an inductor of inductance 4 H carrying a current of 1.5 A is
MHT CET 2026 · 19 APR · SHIFT 2
(a) 4.5 mJ (b) 3 μJ (c) 45 μJ (d) 4500 mJ

147. If current of 4 A produces magnetic flux of 3×10^{-3} Wb through a coil of 400 turns, the energy stored in the coil will be
MHT CET 2026 · 18 APR · SHIFT 2
(a) 1.2 J (b) 2.4 J (c) 24 J (d) 240 J

148. The magnetic potential energy stored in a certain inductor is 49 mJ when the current in the inductor is 70 mA. The inductance of the inductor is
MHT CET 2026 · 18 APR · SHIFT 1
(a) 0.20 H (b) 2.0 H (c) 20 H (d) 200 H

149. The self-inductance of a circuit is numerically equal to
MHT CET 2025 · 19 APR · SHIFT 1
(a) the work done in establishing the magnetic flux associated with circuit.
(b) twice the work done in establishing the magnetic flux associated with unit current in the circuit.
(c) thrice the work done in establishing the magnetic flux associated with unit current in the circuit.
(d) the work done in establishing the magnetic flux associated with unit current in the circuit.

150. If current of 4 A produces magnetic flux of 3×10^{-3} Wb through a coil of 400 turns, the energy stored in the coil will be
MHT CET 2024 · 10 MAY · SHIFT 2
(a) 1.2 J (b) 2.4 J (c) 24 J (d) 240 J

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151. The current in LR circuit if reduced to half What will be the energy stored in it?

MHT CET 2024 · 10 MAY · SHIFT 1

(a) 4 times (b) 2 times
(c) half times (d) $\left(\frac{1}{4}\right)^{\text{th}}$ times

152. The magnetic energy stored in an inductor of inductance 5μH carrying a current of 2 A is

MHT CET 2024 · 2 MAY · SHIFT 1

(a) 10 mJ (b) 5 mJ (c) 10μ J (d) 5μ J

153. . If the current of 'I' A gives rise to a magnetic flux 'ϕ' through a coil having 'N' turns then mangetic energy stored in the medium surrounding the coil is

MHT CET 2021 · 24 SEP · SHIFT 1

(a) $\frac{\mathrm{N}\phi\mathrm{I}}{4}$ (b) $\frac{\mathrm{N}\phi\mathrm{I}}{2}$ (c) $\frac{\mathrm{NI}}{2\phi}$ (d) $\frac{\mathrm{N}\phi}{2\mathrm{I}}$

154. The magnetic potential energy stored in a certain inductor is 25 mJ, when the current in the inductor is 50 mA. This inductor is of inductance

MHT CET 2021 · 21 SEP · SHIFT 1

(a) 2.00 H (b) 0.20 H (c) 200 H (d) 20 H

155. A 100 millihenry coil carries a current of 1 A. Energy stored in its magnetic field is

AIPMT 1991

(a) 0.5 J (b) 1 A (c) 0.05 J (d) 0.1 J

156. An inductor may store energy in

AIPMT 1990

(a) its electric field
(b) its coils
(c) its magnetic field
(d) both in electric and magnetic fields

157. Energy in a current carrying coil is stored in the form of

AIPMT 1989

(a) electric field only (b) magnetic field only
(c) dielectric strength (d) both (a) and (b)

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TOPIC 06

Mutual Inductance

47 PYQs · Easy 47 · Medium 0 · Difficult 0 | MHT CET 40 · NEET 3 · JEE 4

Concepts covered: M from flux and emf (23) · Coefficient of coupling (6) · Concentric loops and coaxial solenoids (15) · Transformer (3)

LEVEL 1 · EASY 47 questions

◆ M from flux and emf 23 Qs

158. Two coils P and Q are separated by some distance. When a current of $3A$ flows through coil P, a magnetic flux of 10^{-3} Wb passes through Q. No current is passed through Q. When no current passes through P and a current of $2A$ passes through Q, the flux through P is $x \times 10^{-3}$ Wb. The value of x is
MHT CET 2026 · 15 MAY · SHIFT 2
(a) 6.67 (b) 0.667 (c) 3.67 (d) 0.367

159. A current $i = 10\sin(100\pi t)$ A is passed in first coil, which induces a maximum e.m.f. 5π V in second coil. The mutual inductance between the coils is
MHT CET 2026 · 14 MAY · SHIFT 1
(a) 10 mH (b) 15 mH (c) 25 mH (d) 5 mH

160. Consider two coils in which a current in one coil carrying 6 A causes the change in the flux in the second coil 12×10^{-4} weber/turn. The second coil has 2000 turns. The mutual inductance between the coils is
MHT CET 2026 · 19 APR · SHIFT 1
(a) 0.2 H (b) 0.3 H (c) 0.4 H (d) 2.4 H

161. Two coils have a mutual inductance of 0.005 H. The current changes in the first coil according to equation $I = I_0 \sin \omega t$, where $I_0 = 10$ A and $\omega = 60\pi$ rad s^{-1}. The maximum values of e.m.f. in the second coil in volt will be
MHT CET 2026 · 18 APR · SHIFT 1
(a) 2π (b) 3π (c) 4π (d) 6π

162. The coefficient of mutual induction is 3H and induced e.m.f. across secondary is 4 kV. Current in primary is reduced from 7 A to 2A. The time required for the change of current is
MHT CET 2026 · 15 APR · SHIFT 1
(a) 3.75×10^{-3} s (b) 2.5×10^{-3} s
(c) 4.5×10^{-3} s (d) 3.5×10^{-3} s

163. Two coils P and Q have mutual inductance 'M' H. If the current in the coil P is $I = I_0 \sin \omega t$, then the maximum value of e.m.f. induced in coil Q is
MHT CET 2026 · 13 APR · SHIFT 1
(a) $\frac{\omega}{MI_0}$ (b) $\frac{M\omega}{I_0}$ (c) $M\omega I_0$ (d) $\frac{MI_0}{\omega}$

164. Alternating current of peak value $\left(\frac{2}{\pi}\right)$ A flows through the primary coil of a transformer. The coefficient of mutual inductance between primary and secondary coils is 1 H. The peak em.f. induced in secondary coil is (Frequency of a. c. is 50 Hz)
MHT CET 2026 · 11 APR · SHIFT 2
(a) 25 V (b) 50 V (c) 100 V (d) 200 V

165. Two coils P and Q are kept near each other. When no current flows through coil P and current increases in coil Q at the rate 10 A/s, the emf in coil P is 12 mV. When coil Q carries no current and current of 1.5 A flows through coil P, the magnetic flux linked with the coil Q in mWb is
MHT CET 2025 · 26 APR · SHIFT 2
(a) 0.9 (b) 1.2 (c) 1.5 (d) 1.8

166. When magnetic flux changes from 6.5×10^{-2} Wb to 11×10^{-2} Wb and the change in current is 0.03 A, the coefficient of mutual inductance will be
MHT CET 2025 · 26 APR · SHIFT 1
(a) 1.0 H (b) 1.2 H (c) 1.5 H (d) 1.8 H

167. Two coils P and Q are kept near each other. When no current flows through coil P and current increases in coil Q at the rate of 10 A/S, the e.m.f. in coil P is 15 mV. When coil Q carries no current and current of 1.8 A flows through coil P, the magnetic flux linked with coil Q is
MHT CET 2025 · 21 APR · SHIFT 1
(a) 1.8 mWb (b) 2.7 mWb (c) 1.5 mWb (d) 1 mWb

168. The coefficient of mutual induction is 2 H and induced e.m.f. across secondary is 2 kV. Current in the primary is reduced from 6 A to 3 A. The time required for the change of current is
MHT CET 2025 · 20 APR · SHIFT 1
(a) 4×10^{-3} s (b) 6×10^{-3} s
(c) 2×10^{-3} s (d) 3×10^{-3} s

169. The coefficient of mutual induction is 2 H and induced e.m.f. across secondary is 2 kV. Current in the primary is reduced from 6 A to 3 A. The time required for the change of current is
MHT CET 2024 · 11 MAY · SHIFT 1
(a) 3×10^{-3} s (b) 3×10^{-2} s
(c) 6×10^{-3} s (d) 6×10^{-2} s

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170. Two coils have a mutual inductance 0.003 H. The current changes in the first coil according to equation $I = I_0 \sin \omega t$, where $I_0 = 8$ A and $\omega = 100\pi \text{rads}^{-1}$. The maximum value of e.m.f. in the second coil is

MHT CET 2024 · 10 MAY · SHIFT 1

(a) 2π V (b) 2.4π V (c) 5π V (d) 7.2π V

171. Two coils have a mutual inductance 5×10^{-3}H. The current changes in the first coil according to the equation $I_1 = I_0 \sin \omega t$ where $I_0 = 10$ A and $\omega = 100\pi \text{rad/s}$. What is the value of the maximum e.m.f. in the coil?

MHT CET 2024 · 9 MAY · SHIFT 1

(a) 2π V (b) 3π V (c) 4π V (d) 5π V

172. Two coils are kept near each other. When no current passes through first coil and current in the 2^{nd} coil increases at the rate 10 A/s, the e.m.f. in the 1^{st} coil is 20 mV. When no current passes through 2^{nd} coil and 3.6 A current passes through 1^{st} coil the flux linkage in coil 2 is

MHT CET 2024 · 3 MAY · SHIFT 2

(a) 1.2×10^{-3} Wb (b) 1.8×10^{-3} Wb
(c) 3.6×10^{-3} Wb (d) 7.2×10^{-3} Wb

173. Two coils have a mutual inductance of 0.004 H. The current changes in the first coil according to equation $I = I_0 \sin \omega t$, where $I_0 = 10$ A and $\omega = 50\,\pi$ rad s^{-1}. The maximum value of e.m.f. in the second coil in volt is

MHT CET 2023 · 12 MAY · SHIFT 1

(a) 5π (b) 4π (c) 2.5π (d) 2π

174. Two coils A and B have mutual inductance 0.008 H. The current changes in the coil A, according to the equation $I = I_m \sin \omega t$, where $I_m = 5$ A and $\omega = 200\pi$ rad s^{-1}. The maximum value of the e.m.f. induced in the coil B in volt is

MHT CET 2023 · 9 MAY · SHIFT 2

(a) 4π (b) 8π (c) 10π (d) 16π

175. A current $I = 10\sin(100\pi t)$ ampere, is passed in a coil which induces a maximum emf 5π volt in neighbouring coil. The mutual inductance of two coils is

MHT CET 2021 · 24 SEP · SHIFT 2

(a) 5 mH (b) 10 mH (c) 15 mH (d) 25 mH

176. Two coils have a mutual inductance of 0.01 H. The current in the first coil changes according to equation, $I = 5\sin 200\pi t$. The maximum value of emf induced in the second coil is

MHT CET 2019 · 2 MAY · SHIFT 1

(a) $10\pi V$ (b) 0.1π V (c) πV (d) 0.01π V

177. Two coils have a mutual inductance of 0.005 H. The current changes in the first coil according to equation $I = I_0 \sin \omega t$, where $I_0 = 10$ A and $\omega = 100\pi$ rad/s. The maximum value of emf in the second coil is

AIPMT 1998

(a) 2π (b) 5π (c) π (d) 4π

178. Two coils 'P' and 'Q' are separated by some distance. When a current of 3 A flows through coil 'P', a magnetic flux of 10–3 Wb passes through 'Q'. No current is passed through 'Q'. When no current passes through 'P' and a current of 2 A passes through 'Q', the flux through 'P' is :-

JEE MAIN 2019 · 9 APR · SHIFT 2

(a) 3.67 × 10–4 Wb (b) 3.67 × 10–3 Wb
(c) 6.67 × 10–4 Wb (d) 6.67 × 10–3 Wb

179. Two coils are placed close to each other. The mutual inductance of the pair of coils depends upon

AIEEE 2003

(a) the rates at which currents are changing in the two coils
(b) relative position and orientation of the two coils
(c) the currents in the two coils
(d) the materials of the wires of the coils

180. Two coils have mutual inductance 0.002 H . The current changes in the first coil according to the relation $i = i_0 \sin \omega t$, where $i_0 = 5$ A and $\omega = 50\pi$ rad/s. The maximum value of emf in the second coil is $\frac{\pi}{\alpha}$ V. The value of α is _____.

JEE MAIN 2024 · 27 JAN · SHIFT 1 *(Numerical)*

◆ Coefficient of coupling 6 Qs

181. Two coils of self inductance, 2 mH and 8 mH are placed so closed together that the effective flux in one coil is completely linked with the other. The mutual inductance between these coils is,

MHT CET 2026 · 19 MAY · SHIFT 2

(a) 16 mH (b) 10 mH (c) 6 mH (d) 4 mH

182. Two coils having self-inductance $L_1 = 75$ mH and $L_2 = 48$ mH are coupled with each other. If the mutual inductance of the coils is 37.2 mH, then coefficient of coupling will be

MHT CET 2026 · 17 APR · SHIFT 2

(a) 0.58 (b) 0.60 (c) 0.62 (d) 0.64

183. The mutual inductance of two coils is 45 mH. The self-inductance of the coils are $L_1 = 75$mH and $L_2 = 48$mH. The coefficient of coupling between the two coils is

MHT CET 2024 · 16 MAY · SHIFT 1

(a) 0.3 (b) 0.4 (c) 0.75 (d) 1.0

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184. Two coils of self-inductance 25 mH and 9 mH are placed close together such that the effective flux in one coil is completely linked with the other The mutual inductance between these coils is

MHT CET 2024 · 9 MAY · SHIFT 2

(a) 34 mH (b) 16 mH (c) 15 mH (d) 6 mH

185. The mutual inductance (M) of the two coils is 3 H. The self inductances of the coils are 4 H and 9 H respectively. The coefficient of coupling between the coils is

MHT CET 2023 · 9 MAY · SHIFT 2

(a) 0.3 (b) 0.4 (c) 0.5 (d) 0.6

186. Two coils of self inductance 2 mH and 8 mH are placed so close together that the effective flux in one coil is completely linked with the other. The mutual inductance between these coils is

AIPMT 2006

(a) 16 mH (b) 10 mH (c) 6 mH (d) 4 mH

◆ Concentric loops and coaxial solenoids 15 Qs

187. Two conducting circular loops of radii r_1 and r_2 are placed in the same plane with their centres coinciding. If $r_1 >> r_2$, then the mutual inductance M between them is proportional to [I_1 = current flowing through coil 1 and I_2 = current flowing through coil 2]

MHT CET 2026 · 19 MAY · SHIFT 2

(a) $\frac{r_1}{r_2}$ (b) $\sqrt{\frac{r_1^2}{r_2}}$ (c) $\frac{r_2^2}{r_1}$ (d) $\frac{r_2}{r_1}$

188. Two conducting circular loops of radii r and $2r$ are placed in the same plane with their centres coinciding. The mutual inductance M between them is {same current is passing through both the coils} (μ_0 = permeability of free space)

MHT CET 2026 · 12 MAY · SHIFT 1

(a) $\pi\mu_0 r$ (b) $\frac{\mu_0\pi r}{4}$ (c) $\frac{\mu_0\pi r}{2}$ (d) $\frac{\mu_0\pi r}{8}$

189. Two planar concentric rings of metal wire having radii 'r_1' and 'r_2' (with $r_1 > r_2$) are placed in air. The current 'I' is flowing through the coil of larger radius. The mutual inductance between the coils is given by (μ_0 = permeability of free space)

MHT CET 2026 · 17 APR · SHIFT 2

(a) $\frac{\mu_0\pi r_1^2}{2r_2}$ (b) $\frac{\mu_0\pi r_2^2}{2r_1}$

(c) $\frac{\mu_0\pi(r_1+r_2)^2}{2r_1}$ (d) $\frac{\mu_0\pi(r_1-r_2)^2}{2r_2}$

190. A circular coil of radius 'r' is placed on another circular coil whose radius is 'R' and the current flowing through it is changing and their centers coincide. ($R \gg r$). If both the coils are coplanar, then the mutual inductance between them is proportional to

MHT CET 2026 · 16 APR · SHIFT 2

(a) $\frac{r}{R}$ (b) $\frac{R}{r}$ (c) $\frac{R^2}{r}$ (d) $\frac{r^2}{R}$

191. Two concentric circular coils having radii r_1 and r_2 ($r_2 << r_1$) are placed co-axially with centres coinciding. The mutual inductance of the arrangement is (Both coils have single turn, μ_0 = permeability of free space)

MHT CET 2026 · 15 APR · SHIFT 2

(a) $\frac{\mu_0\pi r_2}{2r_1}$ (b) $\frac{\mu_0\pi r_1^2}{2r_2}$ (c) $\frac{\mu_0\pi r_1}{2r_2}$ (d) $\frac{\mu_0 r_2^2\pi}{2r_1}$

192. Two planar concentric rings of metal wire having radii r_1 and r_2 ($r_1 > r_2$) are placed in air. The current I is flowing through the coil of larger radius. The mutual inductance between the coils is given by (μ_0 = permeability of free space)

MHT CET 2025 · 20 APR · SHIFT 1

(a) $\frac{\mu_0\pi r_1^2}{2r_2}$ (b) $\frac{\mu_0\pi r_2^2}{2r_1}$

(c) $\frac{\mu_0\pi(r_1+r_2)^2}{2r_1}$ (d) $\frac{\mu_0\pi(r_1-r_2)^2}{2r_2}$

193. Two conducting circular loops of radii R_1 and R_2 are placed in the same plane with their centres coinciding. If $R_1 > R_2$, the mutual inductance M between them will be directly proportional to

MHT CET 2025 · 19 APR · SHIFT 1

(a) $\frac{R_1}{R_2}$ (b) $\frac{R_2}{R_1}$ (c) $\frac{R_1^2}{R_2}$ (d) $\frac{R_2^2}{R_1}$

194. Two concentric circular coils having radii 'r_1' and 'r_2' ($r_2 \ll r_1$) are placed co-axially with centres coinciding. The mutual inductance of the arrangement is (μ_0 = permeability of free space) (Both coils have single turn)

MHT CET 2024 · 10 MAY · SHIFT 2

(a) $\frac{\mu_0\pi r_2}{2r_1}$ (b) $\frac{\mu_0\pi}{2r_1r_2}$ (c) $\frac{\mu_0\pi r_1}{2r_2}$ (d) $\frac{\mu_0\pi r_2^2}{2r_1}$

195. The planar concentric rings of metal wire having radii r_1 and r_2 (with $r_1 > r_2$) are placed in air. The current I is flowing through the coil of larger radius. The mutual inductance between the coils is given by (μ_0 = permeability of free space)

MHT CET 2024 · 4 MAY · SHIFT 2

(a) $\frac{\mu_0\pi(r_1+r_2)^2}{2r_2}$ (b) $\frac{\mu_0\pi(r_1-r_2)^2}{2r_1}$

(c) $\frac{\mu_0\pi r_1^2}{2r_2}$ (d) $\frac{\mu_0\pi r_2^2}{2r_1}$

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196. A coil of radius 'r' is placed on another coil (whose radius is R and current flowing through it is changing) so that their centres coincide ($R \gg r$). If both the coils are coplanar then the mutual inductance between them is (μ_0 = permeability of free space)

MHT CET 2023 · 11 MAY · SHIFT 1

(a) $\frac{\mu_0 \pi R^2}{2r}$ (b) $\frac{\mu_0 \pi r^2}{2R}$ (c) $\frac{\mu_0 \pi r^2}{R}$ (d) $\mu_0 \pi R^2$

197. Two concentric circular coils having radii r_1 and r_2 ($r_2 << r_1$) are placed co-axially with centres coinciding. The mutual induction of the arrangement is (Both coils have single turn, μ_0 = permeability of free space)

MHT CET 2023 · 10 MAY · SHIFT 2

(a) $\frac{\mu_0 \pi r_2^2}{2r_1}$ (b) $\frac{\mu_0 \pi r_2}{2r_1}$ (c) $\frac{\mu_0 \pi r_2^2}{r_1^2}$ (d) $\frac{\mu_0 \pi r_2}{r_1}$

198. Two conducting circular loops of radii 'R_1' and 'R_2' are placed in the same plane with their centres coinciding. If $R_1 > R_2$, the mutual inductance M between them will be directly proportional to

MHT CET 2023 · 10 MAY · SHIFT 1

(a) $\frac{R_1}{R_2}$ (b) $\frac{R_2}{R_1}$ (c) $\frac{R_1^2}{R_2}$ (d) $\frac{R_2^2}{R_1}$

199. A coil of radius 'r' is placed on another coil (whose radius is 'R' and current through it is changing) so that their centres coincide. ($R > r$). If both coplanar, then the mutual inductance between them is proportional to

MHT CET 2021 · 21 SEP · SHIFT 1

(a) $\frac{R}{r^2}$ (b) $\frac{r}{R}$ (c) $\frac{R}{r}$ (d) $\frac{r^2}{R}$

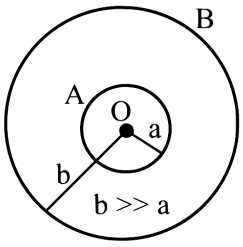
200. Two conducting circular loops of radii R1 and R2 are placed in the same plane with their centres coinciding. If R1 >> R2, the mutual inductance M between them will be directly proportional to:

NEET 2021

(a) $\frac{R_2^2}{R_1}$ (b) $\frac{R_1}{R_2}$ (c) $\frac{R_2}{R_1}$ (d) $\frac{R_1^2}{R_2}$

201. Two conducting circular loops A and B are placed in the same plane with their centres coinciding as shown in figure. The mutual inductance between them is:

JEE MAIN 2024 · 5 APR · SHIFT 1



(a) $\frac{\mu_o}{2\pi} \cdot \frac{b^2}{a}$ (b) $\frac{\mu_o \pi a^2}{2b}$ (c) $\frac{\mu_0 \pi b^2}{2a}$ (d) $\frac{\mu_0}{2\pi} \cdot \frac{a^2}{b}$

◆ Transformer 3 Qs

202. The number of turns in the primary of a transformer are 1000 and in secondary 3000. If 80 V a.c. is applied to the primary, the potential difference per turn of the secondary coil is

MHT CET 2024 · 11 MAY · SHIFT 2

(a) 0.02 V (b) 0.04 V (c) 0.08 V (d) 0.16 V

203. The alternating e.m.f. induced in the secondary coil of a transformer is mainly due to

MHT CET 2023 · 14 MAY · SHIFT 1

(a) varying electric field
(b) varying magnetic field
(c) the iron core
(d) heat produced in the coil

204. A transformer has 20 turns in the primary and 100 turns in the secondary coil. An ac voltage of $V_{in} = 600 \sin 314t$ is applied to primary terminal of transformer. Then maximum value of secondary output voltage obtained in volt is

MHT CET 2023 · 13 MAY · SHIFT 1

(a) 600 (b) 300 (c) 3000 (d) 6000

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TOPIC 07

Combination of Inductors, LR & LC Circuits

3 PYQs · Easy 3 · Medium 0 · Difficult 0 | MHT CET 1 · NEET 0 · JEE 2

Concepts covered: Series and parallel inductors (2) · LR growth and decay (1)

LEVEL 1 · EASY 3 questions

◆ Series and parallel inductors 2 Qs

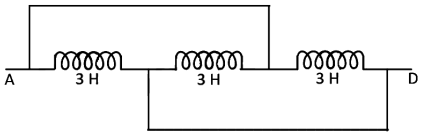
205. By combining three inductances, 2 H, 4 H and 6 H, the minimum value of effective inductance that can be obtained is (in H)

MHT CET 2026 · 12 MAY · SHIFT 1

(a) $12/11$ (b) $11/12$ (c) $5/12$ (d) $12/5$

206. The inductance between A and D is

AIEEE 2002



(a) $3.66\ H$ (b) $9\ H$ (c) $0.66\ H$ (d) $1\ H$

◆ LR growth and decay 1 Q

207. A coil of inductance $300\ mH$ and resistance $2\ \Omega$ is connected to a source of voltage $2\ V$. The current reaches half of its steady state value in

AIEEE 2005

(a) $0.1\ s$ (b) $0.05\ s$ (c) $0.3\ s$ (d) $0.15\ s$

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TOPIC 08

Other / Mixed

1 PYQs · Easy 1 · Medium 0 · Difficult 0 | MHT CET 1 · NEET 0 · JEE 0

Concepts covered: Questions outside this chapter (1)

LEVEL 1 · EASY 1 questions

208. An electron (mass m) is accelerated through a potential difference of 'V' and then it enters in a magnetic field of induction 'B' normal to the lines. The radius of the circular path is (e = electronic charge)

MHT CET 2023 · 9 MAY · SHIFT 1

(a) $\sqrt{\frac{2\mathrm{eV}}{\mathrm{m}}}$ (b) $\sqrt{\frac{2\mathrm{Vm}}{\mathrm{eB}^2}}$ (c) $\sqrt{\frac{2Vm}{eB}}$ (d) $\sqrt{\frac{2Vm}{\mathrm{e}^2\,\mathrm{B}}}$

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ANSWER KEY

Shaded by level: **Easy**

01 Magnetic Flux & Faraday's Law

1. (b)	2. (d)	3. (b)	4. (c)	5. (b)	6. (d)	7. (c)	8. (b)	9. (b)	10. (b)
11. (c)	12. (a)	13. (a)	14. (c)	15. (d)	16. (b)	17. (b)	18. (a)	19. (c)	20. (a)
21. (b)	22. (b)	23. (a)	24. (c)	25. (b)	26. (a)	27. (c)	28. (b)	29. (b)	30. (b)
31. (c)	32. (d)	33. (d)	34. (c)	35. (b)	36. (a)	37. (c)	38. (a)	39. (b)	40. 2
41. 250	42. (c)	43. (b)	44. (c)	45. (d)	46. (b)	47. (c)	48. (c)	49. (b)	50. (c)
51. (d)									

02 Lenz's Law, Eddy Currents & Induced Electric Field

52. (a)	53. (b)	54. (a)	55. (b)	56. (a)	57. (a)	58. (c)	59. (c)	60. (a)	61. (b)
62. (b)	63. (c)	64. (a)	65. (c)	66. (d)	67. (c)	68. (a)	69. (a)	70. (c)	71. (a)

03 Motional EMF

72. (a)	73. (c)	74. (b)	75. (d)	76. (b)	77. (c)	78. (b)	79. (c)	80. 3	81. (d)
82. (a)									

04 Rotating Conductors & AC Generator

83. (c)	84. (b)	85. (b)	86. (b)	87. (b)	88. (b)	89. 88	90. (d)	91. (d)	92. (c)
93. (c)	94. (d)	95. (b)	96. (b)	97. (d)	98. (d)	99. (c)	100. 440	101. 60	

05 Self-Inductance & Energy

102. (d)	103. (b)	104. (d)	105. (c)	106. (c)	107. (d)	108. (b)	109. (b)	110. (d)	111. (a)
112. (a)	113. (a)	114. (c)	115. (d)	116. (a)	117. (d)	118. (d)	119. (b)	120. (b)	121. (a)
122. (b)	123. (a)	124. (c)	125. (d)	126. (b)	127. (d)	128. 400	129. (d)	130. (a)	131. (b)
132. (d)	133. (b)	134. (a)	135. (c)	136. (a)	137. (c)	138. (b)	139. (c)	140. (c)	141. (b)
142. (c)	143. (b)	144. (c)	145. (d)	146. (d)	147. (b)	148. (c)	149. (b)	150. (b)	151. (d)
152. (c)	153. (b)	154. (d)	155. (c)	156. (c)	157. (b)				

06 Mutual Inductance

158. (b)	159. (d)	160. (c)	161. (b)	162. (a)	163. (c)	164. (d)	165. (d)	166. (c)	167. (b)
168. (d)	169. (a)	170. (b)	171. (d)	172. (d)	173. (d)	174. (b)	175. (a)	176. (a)	177. (b)
178. (c)	179. (b)	180. 2	181. (d)	182. (c)	183. (c)	184. (c)	185. (c)	186. (d)	187. (c)
188. (b)	189. (b)	190. (d)	191. (d)	192. (b)	193. (d)	194. (d)	195. (d)	196. (b)	197. (a)
198. (d)	199. (d)	200. (a)	201. (b)	202. (c)	203. (b)	204. (c)			

07 Combination of Inductors, LR & LC Circuits

205. (a)	206. (d)	207. (a)							

08 Other / Mixed

208. (b)									

Note: *"Bonus" = no option is correct as the question is printed (dropped in the official key). Numerical questions show the numerical answer.*

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