

PHYSICS · JEE MAIN

Electromagnetic Induction

Chapter-wise previous year questions, with answer key

58

PYQS

2020–2025

PAPERS

4

TOPICS

Faraday's Laws

Motional EMF

Self and Mutual Inductance

Eddy Currents

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

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Faraday's Laws · 19 PYQs

Q1 JEE Main 2024 · 1 Feb · Shift 2

A coil of 200 turns and area 0.20m^2 is rotated at half a revolution per second and is placed in uniform magnetic field of 0.01T perpendicular to axis of rotation of the coil. The maximum voltage generated in the coil is $\frac{2\pi}{\beta}$ volt. The value of β is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/KIyHI36RG0](https://www.prepwiser.in/questions/KIyHI36RG0)

Q2 JEE Main 2024 · 31 Jan · Shift 2

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 $t = 2\text{s}$ is _____ A.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/usYPv48VmK](https://www.prepwiser.in/questions/usYPv48VmK)

Q3 JEE Main 2024 · 31 Jan · Shift 1

A coil is placed perpendicular to a magnetic field of 5000T . When the field is changed to 3000T in 2s , an induced emf of 22V is produced in the coil. If the diameter of the coil is 0.02m , then the number of turns in the coil is:

- | | |
|--------|---------|
| (A) 35 | (B) 70 |
| (C) 7 | (D) 140 |

[Step-by-step solution ► prepwiser.in/questions/XPF9BFL2Ia](https://www.prepwiser.in/questions/XPF9BFL2Ia)

Q4 JEE Main 2024 · 27 Jan · Shift 1

A rectangular loop of length 2.5m and width 2m is placed at 60° to a magnetic field of 4T . The loop is removed from the field in 10sec . The average emf induced in the loop during this time is

- | | |
|------------------|------------------|
| (A) -2V | (B) $+2\text{V}$ |
| (C) $+1\text{V}$ | (D) -1V |

[Step-by-step solution ► prepwiser.in/questions/yc4cEjUm7](https://www.prepwiser.in/questions/yc4cEjUm7)

Q5 JEE Main 2023 · 13 Apr · Shift 2

An insulated copper wire of 100 turns is wrapped around a wooden cylindrical core of the cross-sectional area 24cm^2 . The two ends of the wire are connected to a resistor. The total resistance in the circuit is 12Ω . If an externally applied uniform magnetic field in the core along its axis changes from 1.5T in one direction to 1.5T in the opposite direction, the charge flowing through a point in the circuit during the change of magnetic field will be _____ mC.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/QC9TaXx0Ih](https://www.prepwiser.in/questions/QC9TaXx0Ih)

Q6 JEE Main 2023 · 6 Apr · Shift 1

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:

- (A) A and C only
- (B) C and D only
- (C) B and D only
- (D) B and C only

[Step-by-step solution](#) ► [prepwiser.in/questions/o2-Ivnqyxt](https://www.prepwiser.in/questions/o2-Ivnqyxt)

Q7 JEE Main 2023 · 1 Feb · Shift 2

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 :

- (A) A, B and D only
- (B) A, B and C only
- (C) A and B only
- (D) A and C only

[Step-by-step solution](#) ► [prepwiser.in/questions/Wsyd_EAzlK](https://www.prepwiser.in/questions/Wsyd_EAzlK)

Q8 JEE Main 2023 · 30 Jan · Shift 2

In an ac generator, a rectangular coil of 100 turns each having area $14 \times 10^{-2} \text{m}^2$ is rotated at 360rev/min about an axis perpendicular to a uniform magnetic field of magnitude 3.0T . The maximum value of the emf produced will be _____ V.

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

Numerical answer — enter the value.

[Step-by-step solution](#) ► [prepwiser.in/questions/6HNVHzZ10X](https://www.prepwiser.in/questions/6HNVHzZ10X)

Q9 JEE Main 2023 · 24 Jan · Shift 1

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 :

- (A) emf = 10 mV
- (B) emf = 5 mV
- (C) emf = 100 mV
- (D) emf = 1 mV

[Step-by-step solution](#) ► [prepwiser.in/questions/6Aa20mdFbe](https://www.prepwiser.in/questions/6Aa20mdFbe)

Q10 JEE Main 2022 · 27 Jul · Shift 2

A conducting circular loop is placed in $X - Y$ plane in presence of magnetic field

$$\vec{B} = (3t^3 \hat{j} + 3t^2 \hat{k})$$

in SI unit. If the radius of the loop is 1m, the induced emf in the loop, at time, $t = 2\text{s}$ is $n\pi$ V. The value of n is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/r1zyc701Ua](https://www.prepwiser.in/questions/r1zyc701Ua)

Q11 JEE Main 2022 · 26 Jul · Shift 2

In a coil of resistance 8Ω , the magnetic flux due to an external magnetic field varies with time as $\phi = \frac{2}{3}(9 - t^2)$. The value of total heat produced in the coil, till the flux becomes zero, will be _____ J.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/OSW14OP8YQ](https://www.prepwiser.in/questions/OSW14OP8YQ)

Q12 JEE Main 2022 · 25 Jul · Shift 2

Magnetic flux (in weber) in a closed circuit of resistance 20Ω varies with time $t(\text{s})$ at $\phi = 8t^2 - 9t + 5$. The magnitude of the induced current at $t = 0.25\text{ s}$ will be _____ mA.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/x9m2WE3eyy](https://www.prepwiser.in/questions/x9m2WE3eyy)

Q13 JEE Main 2022 · 28 Jun · Shift 2

A coil is placed in a time varying magnetic field. If the number of turns in the coil were to be halved and the radius of wire doubled, the electrical power dissipated due to the current induced in the coil would be :

(Assume the coil to be short circuited.)

(A) Halved

(B) Quadrupled

(C) The same

(D) Doubled

[Step-by-step solution ► prepwiser.in/questions/INJPxZo6wR](https://www.prepwiser.in/questions/INJPxZo6wR)

Q14 JEE Main 2022 · 26 Jun · Shift 1

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 $t = 2\text{ s}$ will be,

(A) 15.6 A

(B) 16.6 A

(C) 17.6 A

(D) 18.6 A

[Step-by-step solution ► prepwiser.in/questions/_6RyZQ_WzN](https://www.prepwiser.in/questions/_6RyZQ_WzN)

Q15 JEE Main 2022 · 24 Jun · Shift 2

A circular coil of 1000 turns each with area 1m^2 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.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/JkfOQRw9Rt](https://www.prepwiser.in/questions/JkfOQRw9Rt)

Q16 JEE Main 2021 · 25 Jul · Shift 1

A circular conducting coil of radius 1 m is being heated by the change of magnetic field $\vec{B}$ passing perpendicular to the plane in which the coil is laid. The resistance of the coil is $2\ \mu\Omega$. The magnetic field is slowly switched off such that its magnitude changes in time as $B = \left(4 - \frac{t}{100}\right) \times 10^{-3} \text{ T}$.

The energy dissipated by the coil before the magnetic field is switched off completely is $E = \text{_____ mJ}$.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/Py99s5fa4m](https://www.prepwiser.in/questions/Py99s5fa4m)

Q17 JEE Main 2020 · 3 Sep · Shift 2

A uniform magnetic field B exists in a direction perpendicular to the plane of a square loop made of a metal wire. The wire has a diameter of 4 mm and a total length of 30 cm. The magnetic field changes with time at a steady rate $\frac{dB}{dt} = 0.032 \text{ Ts}^{-1}$. The induced current in the loop is close to (Resistivity of the metal wire is $1.23 \times 10^{-8} \Omega\text{m}$)

- (A) 0.53 A (B) 0.43 A
(C) 0.34 A (D) 0.61 A

[Step-by-step solution ► prepwiser.in/questions/IIVMirFGMb](https://www.prepwiser.in/questions/IIVMirFGMb)

Q18 JEE Main 2020 · 7 Jan · Shift 1

A loop ABCDEFA of straight edges has six corner points $A(0, 0, 0)$, $B(5, 0, 0)$, $C(5, 5, 0)$, $D(0, 5, 0)$, $E(0, 5, 5)$ and $F(0, 0, 5)$. The magnetic field in this region is $\vec{B} = (3\hat{i} + 4\hat{k}) \text{ T}$. The quantity of flux through the loop ABCDEFA (in Wb) is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/es33NwHe8c](https://www.prepwiser.in/questions/es33NwHe8c)

Q19 JEE Main 2020 · 7 Jan · Shift 1

A long solenoid of radius R carries a time (t) - dependent current $I(t) = I_0 t(1 - t)$. A ring of radius $2R$ is placed coaxially near its middle. During the time interval $0 \leq t \leq 1$, the induced current (I_R) and the induced EMF (V_R) in the ring change as :

- (A) Direction of I_R remains unchanged and V_R is zero at $t = 0.25$
(B) Direction of I_R remains unchanged and V_R is maximum at $t = 0.5$
(C) At $t = 0.25$ direction of I_R reverses and V_R is maximum
(D) At $t = 0.5$ direction of I_R reverses and V_R is zero

[Step-by-step solution ► prepwiser.in/questions/7V4Z2Ari0D](https://www.prepwiser.in/questions/7V4Z2Ari0D)

Q20 JEE Main 2025 · 28 Jan · Shift 2

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 $10\pi \text{ rad s}^{-1}$ 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? ($\pi = 3.14$)

(A) 0.5024 V

(B) 0.0628 V

(C) 0.2512 V

(D) 0.1256 V

Step-by-step solution ► [prepwisar.in/questions/HWGBA7Nmmt](https://www.prepwisar.in/questions/HWGBA7Nmmt)

Q21 JEE Main 2024 · 4 Apr · Shift 2

A rod of length 60cm rotates with a uniform angular velocity 20rads^{-1} about its perpendicular bisector, in a uniform magnetic field 0.5T . The direction of magnetic field is parallel to the axis of rotation. The potential difference between the two ends of the rod is _____ V.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisar.in/questions/8nVQpc9oa_](https://www.prepwisar.in/questions/8nVQpc9oa_)

Q22 JEE Main 2024 · 30 Jan · Shift 1

A ceiling fan having 3 blades of length 80cm each is rotating with an angular velocity of 1200 rpm. The magnetic field of earth in that region is 0.5G and angle of dip is 30° . The emf induced across the blades is $N\pi \times 10^{-5}\text{V}$. The value of N is _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisar.in/questions/IK_cKt7EYV](https://www.prepwisar.in/questions/IK_cKt7EYV)

Q23 JEE Main 2024 · 29 Jan · Shift 2

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

Numerical answer — enter the value.

Step-by-step solution ► [prepwisar.in/questions/xTVRfeAnZz](https://www.prepwisar.in/questions/xTVRfeAnZz)

Q24 JEE Main 2023 · 15 Apr · Shift 1

A 20cm long metallic rod is rotated with 210rpm 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 0.2T parallel to the axis exists everywhere. The emf developed between the centre and the ring is _____ mV.

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

Numerical answer — enter the value.

Step-by-step solution ► [prepwisar.in/questions/YCWgO0kYVi](https://www.prepwisar.in/questions/YCWgO0kYVi)

Q25 JEE Main 2023 · 12 Apr · Shift 1

A conducting circular loop is placed in a uniform magnetic field of 0.4 T with its plane perpendicular to the field. Somehow, the radius of the loop starts expanding at a constant rate of 1 mm/s . The magnitude of induced emf in the loop at an instant when the radius of the loop is 2 cm will be _____ μV .

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/oeBhI0dGQg](https://www.prepwisser.in/questions/oeBhI0dGQg)

Q26 JEE Main 2023 · 8 Apr · Shift 2

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:

(A) 20 ms^{-1}

(B) 2 ms^{-1}

(C) 3.2 ms^{-1}

(D) 0.5 ms^{-1}

[Step-by-step solution ► prepwisser.in/questions/3PEh0p2xnv](https://www.prepwisser.in/questions/3PEh0p2xnv)

Q27 JEE Main 2023 · 1 Feb · Shift 2

A square shaped coil of area 70 cm^2 having 600 turns rotates in a magnetic field of 0.4 wb m^{-2} , about an axis which is parallel to one of the side of the coil and perpendicular to the direction of field. If the coil completes 500 revolution in a minute, the instantaneous emf when the plane of the coil is inclined at 60° with the field, will be _____ V. (Take $\pi = \frac{22}{7}$)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/CICCF9bq4n](https://www.prepwisser.in/questions/CICCF9bq4n)

Q28 JEE Main 2023 · 29 Jan · Shift 2

A square loop of area 25 cm^2 has a resistance of $10\ \Omega$. The loop is placed in uniform magnetic field of magnitude 40.0 T . The plane of loop is perpendicular to the magnetic field. The work done in pulling the loop out of the magnetic field slowly and uniformly in 1.0 sec , will be

(A) $1.0 \times 10^{-3}\text{ J}$

(B) $5 \times 10^{-3}\text{ J}$

(C) $2.5 \times 10^{-3}\text{ J}$

(D) $1.0 \times 10^{-4}\text{ J}$

[Step-by-step solution ► prepwisser.in/questions/daiUpInI0V](https://www.prepwisser.in/questions/daiUpInI0V)

Q29 JEE Main 2023 · 29 Jan · Shift 1

A certain elastic conducting material is stretched into a circular loop. It is placed with its plane perpendicular to a uniform magnetic field $B = 0.8\text{ T}$. When released the radius of the loop starts shrinking at a constant rate of 2 cm s^{-1} . The induced emf in the loop at an instant when the radius of the loop is 10 cm will be _____ mV.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/OTh9RUZQjF](https://www.prepwisser.in/questions/OTh9RUZQjF)

Q30 JEE Main 2022 · 27 Jun · Shift 2

A metallic rod of length 20 cm is placed in North-South direction and is moved at a constant speed of 20 m/s towards East. The horizontal component of the Earth's magnetic field at that place is $4 \times 10^{-3}\text{ T}$ and the angle of dip is 45° . The emf induced in the rod is _____ mV.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/N1p7qWcpJ_](https://www.prepwisser.in/questions/N1p7qWcpJ_)

Q31 JEE Main 2022 · 26 Jun · Shift 2

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 $0.2 \times 10^{-4} \text{ T}$, then emf induced between the two ends of the conductor is :

- (A) $5 \mu\text{V}$ (B) $50 \mu\text{V}$
(C) 5 mV (D) 50 mV

Step-by-step solution ► [prepwisser.in/questions/r-iXlBhVWT](https://www.prepwisser.in/questions/r-iXlBhVWT)

Q32 JEE Main 2021 · 26 Aug · Shift 2

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 $3.0 \times 10^{-2} \text{ T}$. The maximum emf induced the coil will be $\times 10^{-2}$ volt (rounded off to the nearest integer)

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/vCVYyIRevZ](https://www.prepwisser.in/questions/vCVYyIRevZ)

Q33 JEE Main 2021 · 26 Feb · Shift 2

An aeroplane, with its wings spread 10 m, is flying at a speed of 180 km/h in a horizontal direction. The total intensity of earth's field at that part is $2.5 \times 10^{-4} \text{ Wb/m}^2$ and the angle of dip is 60° . The emf induced between the tips of the plane wings will be _____.

- (A) 88.37 mV (B) 62.50 mV
(C) 54.125 mV (D) 108.25 mV

Step-by-step solution ► [prepwisser.in/questions/12gXEEExOhK](https://www.prepwisser.in/questions/12gXEEExOhK)

Q34 JEE Main 2020 · 2 Sep · Shift 1

A circular coil of radius 10 cm is placed in a uniform magnetic field of $3.0 \times 10^{-5} \text{ T}$ with its plane perpendicular to the field initially. It is rotated at constant angular speed about an axis along the diameter of coil and perpendicular to magnetic field so that it undergoes half of rotation in 0.2 s. The maximum value of EMF induced (in μV) in the coil will be close to the integer _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/dKAPbEsiTQ](https://www.prepwisser.in/questions/dKAPbEsiTQ)

Q35 JEE Main 2020 · 7 Jan · Shift 2

A planar loop of wire rotates in a uniform magnetic field. Initially at $t = 0$, the plane of the loop is perpendicular to the magnetic field. If it rotates with a period of 10 s about an axis in its plane then the magnitude of induced emf will be maximum and minimum, respectively at :

- (A) 2.5 s and 7.5 s (B) 5.0 s and 10.0 s
(C) 5.0 s and 7.5 s (D) 2.5 s and 5.0 s

Step-by-step solution ► [prepwisser.in/questions/ke3e1taIqp](https://www.prepwisser.in/questions/ke3e1taIqp)

Self and Mutual Inductance · 20 PYQs

Q36 JEE Main 2025 · 2 Apr · Shift 2

A solenoid having area A and length ' l ' is filled with a material having relative permeability 2. The magnetic energy stored in the solenoid is :

- (A) $\frac{B^2 Al}{4\mu_0}$
- (B) $\frac{B^2 Al}{2\mu_0}$
- (C) $\frac{B^2 Al}{\mu_0}$
- (D) $B^2 Al$

[Step-by-step solution ► prepwiser.in/questions/_XGu-DEieD](https://www.prepwiser.in/questions/_XGu-DEieD)

Q37 JEE Main 2025 · 29 Jan · Shift 1

Consider I_1 and I_2 are the currents flowing simultaneously in two nearby coils 1 & 2, respectively. If L_1 = self inductance of coil 1, M_{12} = mutual inductance of coil 1 with respect to coil 2, then the value of induced emf in coil 1 will be :

- (A) $e_1 = -L_1 \frac{dI_2}{dt} - M_{12} \frac{dI_1}{dt}$
- (B) $e_1 = -L_1 \frac{dI_1}{dt} + M_{12} \frac{dI_2}{dt}$
- (C) $e_1 = -L_1 \frac{dI_1}{dt} - M_{12} \frac{dI_1}{dt}$
- (D) $e_1 = -L_1 \frac{dI_1}{dt} - M_{12} \frac{dI_2}{dt}$

[Step-by-step solution ► prepwiser.in/questions/tWguyO-IOc](https://www.prepwiser.in/questions/tWguyO-IOc)

Q38 JEE Main 2025 · 23 Jan · Shift 1

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:

- (A) A, B, C, E only
- (B) A, B, C, D only
- (C) A, C, D, E only
- (D) B, C, D, E only

[Step-by-step solution ► prepwiser.in/questions/G7uO3Tpa8T](https://www.prepwiser.in/questions/G7uO3Tpa8T)

Q39 JEE Main 2024 · 6 Apr · Shift 2

In a coil, the current changes from $-2A$ to $+2A$ in $0.2s$ and induces an emf of $0.1V$. The self inductance of the coil is :

- (A) 4 mH
- (B) 2.5 mH
- (C) 1 mH
- (D) 5 mH

[Step-by-step solution ► prepwiser.in/questions/0EKDfsvC1q](https://www.prepwiser.in/questions/0EKDfsvC1q)

Q40 JEE Main 2024 · 5 Apr · Shift 2

The current in an inductor is given by $I = (3t + 8)$ where t is in second. The magnitude of induced emf produced in the inductor is 12mV . The self-inductance of the inductor _____ mH .

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/On_sw9Sk4E](https://www.prepwisser.in/questions/On_sw9Sk4E)

Q41 JEE Main 2024 · 27 Jan · Shift 1

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/ZqePKzyNGJ](https://www.prepwisser.in/questions/ZqePKzyNGJ)

Q42 JEE Main 2023 · 15 Apr · Shift 1

12V battery connected to a coil of resistance 6Ω through a switch, drives a constant current in the circuit. The switch is opened in 1ms . The emf induced across the coil is 20V . The inductance of the coil is :

(A) 5mH

(B) 8mH

(C) 10mH

(D) 12mH

[Step-by-step solution ► prepwisser.in/questions/awPIAGHcJ1](https://www.prepwisser.in/questions/awPIAGHcJ1)

Q43 JEE Main 2023 · 11 Apr · Shift 2

A coil has an inductance of 2H and resistance of 4Ω . A 10V is applied across the coil. The energy stored in the magnetic field after the current has built up to its equilibrium value will be _____ $\times 10^{-2}\text{J}$.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/vLMxPkCHVo](https://www.prepwisser.in/questions/vLMxPkCHVo)

Q44 JEE Main 2023 · 10 Apr · Shift 2

A square loop of side 2.0cm is placed inside a long solenoid that has 50 turns per centimetre and carries a sinusoidally varying current of amplitude 2.5A and angular frequency 700rad/s^{-1} . The central axes of the loop and solenoid coincide. The amplitude of the emf induced in the loop is $x \times 10^{-4}\text{V}$. The value of x is _____.

(Take, $\pi = \frac{22}{7}$)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/M_jOYXVfd1](https://www.prepwisser.in/questions/M_jOYXVfd1)

Q45 JEE Main 2023 · 6 Apr · Shift 2

Two concentric circular coils with radii 1cm and 1000cm , and number of turns 10 and 200 respectively are placed coaxially with centers coinciding. The mutual inductance of this arrangement will be _____ $\times 10^{-8}\text{H}$. (Take, $\pi^2 = 10$)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/nlCRQu9r03](https://www.prepwisser.in/questions/nlCRQu9r03)

Q46 JEE Main 2022 · 29 Jul · Shift 1

A coil of inductance 1 H and resistance $100\ \Omega$ is connected to a battery of 6 V. Determine approximately :

- (a) The time elapsed before the current acquires half of its steady - state value.
 (b) The energy stored in the magnetic field associated with the coil at an instant 15 ms after the circuit is switched on. (Given $\ln 2 = 0.693$, $e^{-3/2} = 0.25$)

(A) $t = 10\text{ ms}$; $U = 2\text{ mJ}$

(B) $t = 10\text{ ms}$; $U = 1\text{ mJ}$

(C) $t = 7\text{ ms}$; $U = 1\text{ mJ}$

(D) $t = 7\text{ ms}$; $U = 2\text{ mJ}$

[Step-by-step solution](#) ► [prepwisar.in/questions/S5Lx7DEIfL](https://www.prepwisar.in/questions/S5Lx7DEIfL)

Q47 JEE Main 2022 · 25 Jun · Shift 1

The current in a coil of self inductance 2.0 H is increasing according to $I = 2 \sin(t^2)$ A. The amount of energy spent during the period when current changes from 0 to 2 A is _____ J.

Numerical answer — enter the value.

[Step-by-step solution](#) ► [prepwisar.in/questions/oPb-J5X4eK](https://www.prepwisar.in/questions/oPb-J5X4eK)

Q48 JEE Main 2021 · 26 Aug · Shift 1

An inductor coil stores 64 J of magnetic field energy and dissipates energy at the rate of 640 W when a current of 8A is passed through it. If this coil is joined across an ideal battery, find the time constant of the circuit in seconds :

(A) 0.4

(B) 0.8

(C) 0.125

(D) 0.2

[Step-by-step solution](#) ► [prepwisar.in/questions/ZRe2p7GIR7](https://www.prepwisar.in/questions/ZRe2p7GIR7)

Q49 JEE Main 2021 · 25 Jul · Shift 1

An inductor of 10 mH is connected to a 20V battery through a resistor of $10\text{ k}\Omega$ and a switch. After a long time, when maximum current is set up in the circuit, the current is switched off. The current in the circuit after $1\ \mu\text{s}$ is $\frac{x}{100}$ mA. Then x is equal to _____. (Take $e^{-1} = 0.37$)

Numerical answer — enter the value.

[Step-by-step solution](#) ► [prepwisar.in/questions/j1on0x2FGC](https://www.prepwisar.in/questions/j1on0x2FGC)

Q50 JEE Main 2021 · 18 Mar · Shift 2

The time taken for the magnetic energy to reach 25% of its maximum value, when a solenoid of resistance R, inductance L is connected to a battery, is :

(A) infinite

(B) $\frac{L}{R} \ln 10$

(C) $\frac{L}{R} \ln 2$

(D) $\frac{L}{R} \ln 5$

[Step-by-step solution](#) ► [prepwisar.in/questions/miPSZkkg9K](https://www.prepwisar.in/questions/miPSZkkg9K)

Q51 JEE Main 2021 · 25 Feb · Shift 1

A coil of inductance 2 H having negligible resistance is connected to a source of supply whose voltage is given by $V = 3t$ volt. (where t is in second). If the voltage is applied when $t = 0$, then the energy stored in the coil after 4 s is _____ J.

Numerical answer — enter the value.

[Step-by-step solution](#) ► [prepwisar.in/questions/L8UuvOrmPC](https://www.prepwisar.in/questions/L8UuvOrmPC)

Q52 JEE Main 2020 · 5 Sep · Shift 1

Two concentric circular coils, C_1 and C_2 are placed in the XY plane. C_1 has 500 turns, and a radius of 1 cm. C_2 has 200 turns and radius of 20 cm. C_2 carries a time dependent current

$I(t) = (5t^2 - 2t + 3)$ A where t is in s. The emf induced in C_1 (in mV), at the instant $t = 1$ s is $\frac{4}{x}$. The value of x is ____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/GOJ2GrElRS](https://www.prepwiser.in/questions/GOJ2GrElRS)

Q53 JEE Main 2020 · 4 Sep · Shift 2

A series L-R circuit is connected to a battery of emf V . If the circuit is switched on at $t = 0$, then the time at which the energy stored in the inductor reaches $\left(\frac{1}{n}\right)$ times of its maximum value, is :

- (A) $\frac{L}{R} \ln \left(\frac{\sqrt{n}}{\sqrt{n}+1} \right)$
- (B) $\frac{L}{R} \ln \left(\frac{\sqrt{n}}{\sqrt{n}-1} \right)$
- (C) $\frac{L}{R} \ln \left(\frac{\sqrt{n}+1}{\sqrt{n}-1} \right)$
- (D) $\frac{L}{R} \ln \left(\frac{\sqrt{n}-1}{\sqrt{n}} \right)$

[Step-by-step solution ► prepwiser.in/questions/8OqT-TQRrx](https://www.prepwiser.in/questions/8OqT-TQRrx)

Q54 JEE Main 2020 · 9 Jan · Shift 1

In a fluorescent lamp choke (a small transformer) 100 V of reverse voltage is produced when the choke current changes uniformly from 0.25 A to 0 in a duration of 0.025 ms. The self-inductance of the choke (in mH) is estimated to be _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/0TSvug4mx8](https://www.prepwiser.in/questions/0TSvug4mx8)

Q55 JEE Main 2020 · 7 Jan · Shift 2

An emf of 20 V is applied at time $t = 0$ to a circuit containing in series 10 mH inductor and 5Ω resistor. The ratio of the currents at time $t = \infty$ and at $t = 40$ s is close to : (Take $e^2 = 7.389$)

- | | |
|----------|----------|
| (A) 1.06 | (B) 0.84 |
| (C) 1.15 | (D) 1.46 |

[Step-by-step solution ► prepwiser.in/questions/cKzul3qgvC](https://www.prepwiser.in/questions/cKzul3qgvC)

Q56 JEE Main 2023 · 11 Apr · Shift 2

Given below are two statements: one is labelled as Assertion **A** and the other is labelled as Reason **R**
Assertion A: A bar magnet dropped through a metallic cylindrical pipe takes more time to come down compared to a non-magnetic bar with same geometry and mass.

Reason R: For the magnetic bar, Eddy currents are produced in the metallic pipe which oppose the motion of the magnetic bar.

In the light of the above statements, choose the correct answer from the options given below

- (A) A is true but R is false
- (B) A is false but R is true
- (C) Both A and R are true but R is NOT the correct explanation of A
- (D) Both A and R are true and R is the correct explanation of A

[Step-by-step solution ► prepwiser.in/questions/UOCxsPc4QW](https://www.prepwiser.in/questions/UOCxsPc4QW)

Q57 JEE Main 2023 · 10 Apr · Shift 2

A bar magnet is released from rest along the axis of a very long vertical copper tube. After some time the magnet will

- (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

[Step-by-step solution ► prepwiser.in/questions/uUgoM3AmXP](https://www.prepwiser.in/questions/uUgoM3AmXP)

Q58 JEE Main 2022 · 25 Jul · Shift 2

When you walk through a metal detector carrying a metal object in your pocket, it raises an alarm. This phenomenon works on :

- | | |
|-------------------------------------|---|
| (A) Electromagnetic induction | (B) Resonance in ac circuits |
| (C) Mutual induction in ac circuits | (D) Interference of electromagnetic waves |

[Step-by-step solution ► prepwiser.in/questions/dmY7Nq1huN](https://www.prepwiser.in/questions/dmY7Nq1huN)

Answer key — Electromagnetic Induction

Numbers match the question numbers above. For full working, open the solution link under each question.

1	5	2	2	3	B	4	C	5	60	6	B	7	B	8	1584
9	A	10	12	11	2	12	250	13	D	14	A	15	440	16	80
17	D	18	175	19	D	20	C	21	0	22	32	23	3	24	88
25	50	26	B	27	44	28	A	29	10	30	16	31	B	32	60
33	D	34	15	35	D	36	A	37	D	38	C	39	D	40	4
41	2	42	C	43	625	44	44	45	4	46	C	47	4	48	D
49	74	50	C	51	144	52	5	53	B	54	10	55	A	56	D
57	A	58	B												

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