CHAPTER

21

Moving Charges and Magnetism

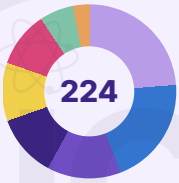
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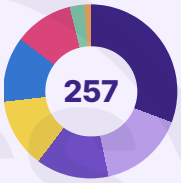
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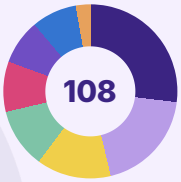
EXAM WEIGHTAGE



MHT CET
2019–2026



JEE Main
2002–2026



NEET
1988–2026

	CET	JEE	NEET
Moving Charge in a Magnetic Field	26 (12%)	79 (31%)	29 (27%)
Biot-Savart Law & Circular Coils	53 (24%)	41 (16%)	21 (19%)
Current Loop as a Magnetic Dipole	46 (21%)	31 (12%)	9 (8%)
Magnetic Field of Straight Wires	31 (14%)	35 (14%)	9 (8%)
Force on Current-Carrying Conductors	24 (11%)	33 (13%)	15 (14%)
Ampere's Law, Cylinders, Solenoid & Toroid	23 (10%)	28 (11%)	10 (9%)
Moving Coil Galvanometer, Ammeter & Voltmeter	14 (6%)	7 (3%)	12 (11%)
Other: Induction & Displacement Current	7 (3%)	3 (1%)	3 (3%)

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01 CONCEPT Biot-Savart Law & Field at the Centre of a Coil

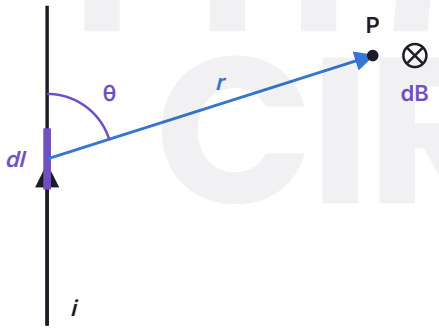
IN ONE LINE

Every small piece of a current-carrying wire makes a magnetic field around it. **Biot-Savart law** gives that field.

21.1.1 Current makes a magnetic field

- A compass needle near a current-carrying wire deflects (Oersted).
- A moving charge produces both an electric and a magnetic field.
- A charge at rest produces only an electric field.
- Reversing the current reverses the magnetic field.

21.1.2 Field of a current element



Element dl, point P at position r

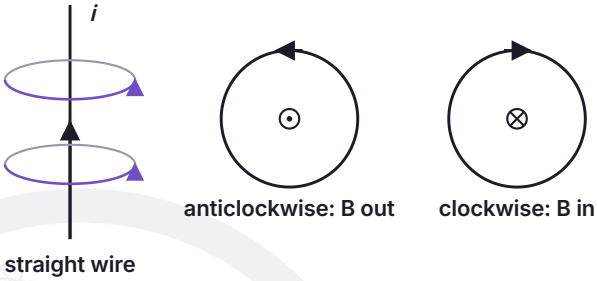
$$dB = \frac{\mu_0}{4\pi} \cdot \frac{i\, dl \sin\theta}{r^2}$$

$$dB = \frac{\mu_0}{4\pi} \cdot \frac{i\,(dl \times r)}{r^3}$$

- $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}, so $\frac{\mu_0}{4\pi} = 10^{-7}$ in SI.
- **i dl** is the current element, a vector along the current.
- d**B** is perpendicular to both d**l** and **r**.
- θ = 0° or 180° (point on the line of the element): dB = 0.
- θ = 90°: dB is maximum.
- dB ∝ i, dB ∝ dl, dB ∝ sin θ and dB follows the inverse-square law.

Quantity	Value
SI unit of B	tesla (T) = Wb m^{-2}
CGS unit	1 T = 10^4 gauss
Nature	B is a vector

21.1.3 Which way does B point?



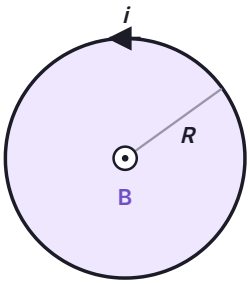
Right-hand thumb rule for a wire and for a coil

- **Right-hand thumb rule**: thumb along the current, curled fingers give B.
- **Maxwell's cork screw rule**: the screw advances along the current, its rotation gives B.
- **Coil**: anticlockwise current gives B out of the page, clockwise gives B into it.
- Symbols: ⊙ out of the page, ⊗ into the page.

21.1.4 Circular coil of n turns

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

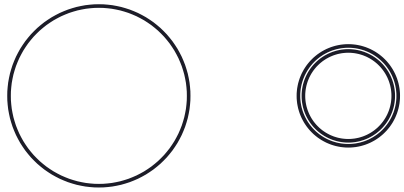
- Every element is at the same distance R.
- Every element is at θ = 90° to r.
- All the elements add up in one direction.
- B ∝ n, B ∝ i and B ∝ 1 over R.



Field at the centre

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21.1.5 Same wire, new number of turns



n = 1, radius R n = 2, radius R÷2

Same length of wire: n times the turns, 1 over n of the radius

- Length is fixed: $L = n \times 2\pi r$, so $r = \frac{R}{n}$.
- New field at the centre:

$$B_n = n^2 B_1$$

- From n_1 turns to n_2 turns: $\frac{B_2}{B_1} = \left(\frac{n_2}{n_1}\right)^2$.
- Same wire, same p.d.: resistance $\propto$ r, so $i \propto \frac{V}{r}$ and $B \propto \frac{V}{r^2}$.

21.1.6 A moving charge is a current

$$i = qf = \frac{q\omega}{2\pi}$$

$$B = \frac{\mu_0 qf}{2R} = \frac{\mu_0 q\omega}{4\pi R}$$

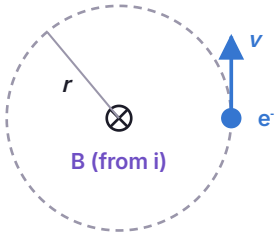
- A charged ring turning about its axis behaves as a coil of current i.
- A point charge on a circular path behaves in the same way.

21.1.7 Field at the nucleus

$$i = \frac{ev}{2\pi r}$$

$$B = \frac{\mu_0}{4\pi} \cdot \frac{ev}{r^2}$$

- Bohr model: $v \propto \frac{1}{n}$ and $r \propto n^2$.
- So $B \propto n^{-5}$.



Electron in a circular orbit

- General moving charge: $B = \frac{\mu_0}{4\pi} \cdot \frac{qv \sin\theta}{r^2}$.

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Solved Examples 01 Biot-Savart Law & Field at the Centre of a Coil

SOLVED 1 MHT CET 2025 · 20 Apr · Shift 2

An element $\Delta\vec{l} = \Delta x\,\hat{i}$ is placed at the origin and carries a current of 10 A. The magnitude of the magnetic field on the Y axis at a distance of 0.5 m, if Δx = 1 cm, is ($\frac{\mu_0}{4\pi} = 10^{-7}$ SI unit)

(a) 2×10^{-7} T (b) 10^{-8} T
(c) 4×10^{-8} T (d) 2×10^{-8} T

STEP 1 Biot-Savart: $dB = \frac{\mu_0}{4\pi} \cdot \frac{i\,dl \sin\theta}{r^2}$, with $\theta = 90°$
STEP 2 $dB = 10^{-7} \times \frac{10 \times 0.01}{(0.5)^2}$
STEP 3 $dB = \mathbf{4 \times 10^{-8}\ T}$

Answer: **(c)**

SOLVED 2 MHT CET 2025 · 22 Apr · Shift 1

A circular coil of wire consisting of n turns, each of radius 8 cm, carries a current of 0.4 A. The magnitude of the magnetic field at the centre of the coil is 3.14×10^{-4} T. The value of n is [$\mu_0 = 12.56 \times 10^{-7}$ SI unit]

(a) 1 (b) 10
(c) 100 (d) 1000

STEP 1 $B = \frac{\mu_0 ni}{2R} \Rightarrow n = \frac{2RB}{\mu_0 i}$
STEP 2 $n = \frac{2 \times 0.08 \times 3.14 \times 10^{-4}}{12.56 \times 10^{-7} \times 0.4}$
STEP 3 $n = \mathbf{100}$

Answer: **(c)**

SOLVED 3 MHT CET 2023 · 10 May · Shift 2

The magnetic field at the centre of a circular coil of radius R carrying current 2 A is B_1. The magnetic field at the centre of another coil of radius 3R carrying current 4 A is B_2. The ratio $B_1 : B_2$ is

(a) 1 : 2 (b) 2 : 1
(c) 2 : 3 (d) 3 : 2

STEP 1 $B \propto \frac{i}{R}$
STEP 2 $\frac{B_1}{B_2} = \frac{2}{R} \times \frac{3R}{4}$
STEP 3 $B_1 : B_2 = \mathbf{3 : 2}$

Answer: **(d)**

SOLVED 4 MHT CET 2026 · 15 May · Shift 1

Two circular coils A and B are made from the same wire but the radius of coil A is twice that of coil B. If the magnetic field at their centres is the same, then the ratio of potential difference applied across them is

(a) 3 : 1 (b) 4 : 1
(c) 6 : 1 (d) 2 : 1

STEP 1 Same wire: resistance $\propto$ length $\propto$ r, so $i \propto \frac{V}{r}$
STEP 2 $B \propto \frac{i}{r} \propto \frac{V}{r^2}$
STEP 3 Same B $\Rightarrow V \propto r^2 \Rightarrow V_A : V_B = \mathbf{4 : 1}$

Answer: **(b)**

SOLVED 5 MHT CET 2026 · 17 Apr · Shift 1

The magnetic field at the centre of a circular coil carrying current I, for a single turn of a given length of wire, is B. The same wire is bent into a circular coil having two turns. When the same current passes through it, the value of the magnetic field becomes

(a) 4B (b) 2B
(c) $\frac{B}{2}$ (d) $\frac{B}{4}$

STEP 1 Same wire, n turns: radius becomes $\frac{R}{n}$
STEP 2 $B' = \frac{\mu_0 n i}{2(\frac{R}{n})} = n^2 B$
STEP 3 For n = 2, $B' = \mathbf{4B}$

Answer: **(a)**

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Solved Examples 01 Biot-Savart Law & Field at the Centre of a Coil (contd.)

SOLVED 6 MHT CET 2025 · 21 Apr · Shift 2

A coil having 9 turns carrying current produces magnetic field B_1 at the centre. Now that coil is rewound into 3 turns carrying the same current. Then the magnetic field at the centre B_2 is

(a) $\frac{B_1}{9}$ (b) $9B_1$

(c) $3B_1$ (d) $\frac{B_1}{3}$

STEP 1 Same length of wire: $B \propto n^2$

STEP 2 $\frac{B_2}{B_1} = (\frac{3}{9})^2$

STEP 3 $B_2 = \frac{B_1}{9}$

Answer: **(a)**

SOLVED 7 MHT CET 2024 · 4 May · Shift 2

A particle carrying a charge equal to 100 times the charge on an electron is rotating one rotation per second in a circular path of radius 0.8 m. The value of magnetic field produced at the centre will be (μ_0 = permeability of vacuum)

(a) $\frac{10^{-7}}{\mu_0}$ (b) $10^{-17}\,\mu_0$

(c) $10^{-6}\,\mu_0$ (d) $10^{-7}\,\mu_0$

STEP 1 $i = qf = 100 \times 1.6 \times 10^{-19} \times 1 = 1.6 \times 10^{-17}$ A

STEP 2 $B = \frac{\mu_0 i}{2r} = \frac{\mu_0 \times 1.6 \times 10^{-17}}{1.6}$

STEP 3 $B = \mathbf{10^{-17}\,\mu_0}$

Answer: **(b)**

SOLVED 8 MHT CET 2026 · 15 Apr · Shift 2

A thin ring of radius R metre has charge q coulomb uniformly spread on it. The ring rotates about its axis with a constant frequency of f revolution per second. The value of magnetic induction at the centre of the ring in Wb m^{-2} is (μ_0 = permeability of free space)

(a) $\frac{\mu_0 q}{2fR}$ (b) $\frac{\mu_0 q}{2\pi R}$

(c) $\frac{\mu_0 qf}{2R}$ (d) $\frac{\mu_0 q\pi}{2fR}$

STEP 1 Equivalent current $i = qf$

STEP 2 $B = \frac{\mu_0 i}{2R}$

STEP 3 $B = \mathbf{\frac{\mu_0 qf}{2R}}$

Answer: **(c)**

SOLVED 9 MHT CET 2021 · 20 Sep · Shift 1

An electron (e) moves in a circular orbit of radius r with uniform speed V. It produces a magnetic field B at the centre of the circle. The magnetic field B is (μ_0 = permeability of free space)

(a) $\frac{\mu_0 e}{4\pi}(\frac{V}{r^2})$

(b) $\frac{\mu_0 e}{4\pi} Vr^2$

(c) $\frac{\mu_0 e}{4\pi}(\frac{V}{r})$

(d) $\frac{\mu_0 e}{4\pi} Vr$

STEP 1 $i = \frac{e}{T} = \frac{eV}{2\pi r}$

STEP 2 $B = \frac{\mu_0 i}{2r} = \frac{\mu_0}{2r} \cdot \frac{eV}{2\pi r}$

STEP 3 $B = \mathbf{\frac{\mu_0 e}{4\pi}(\frac{V}{r^2})}$

Answer: **(a)**

SOLVED 10 MHT CET 2025 · 21 Apr · Shift 2

An electron moves in a Bohr orbit. The magnetic field at the centre is proportional to

(a) n^{-2} (b) n^{-3}

(c) n^{-4} (d) n^{-5}

STEP 1 $B \propto \frac{v}{r^2}$

STEP 2 Bohr model: $v \propto \frac{1}{n}$, $r \propto n^2$

STEP 3 $B \propto n^{-1} \times n^{-4} = \mathbf{n^{-5}}$

Answer: **(d)**

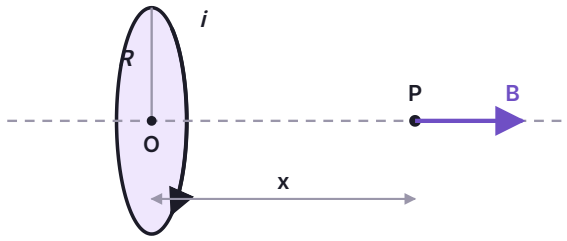
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02 CONCEPT Field on the Axis of a Coil

IN ONE LINE

On the axis, the field of a coil points along the axis and **falls off with distance** from the centre.

21.2.1 Point at distance x from the centre



Coil of radius R, point P on its axis

$$B_a = \frac{\mu_0 n i R^2}{2(R^2 + x^2)^{3/2}}$$

- Direction is along the axis: use the right-hand thumb rule on the coil.
- At x = 0 it becomes the field at the centre.
- The components perpendicular to the axis cancel in pairs.

21.2.2 The shortcut for most questions

$$\frac{B_c}{B_a} = \left(1 + \frac{x^2}{R^2}\right)^{3/2}$$

x	$\frac{B_c}{B_a}$
R	$2\sqrt{2}$
$\sqrt{3}$ R	8
$2\sqrt{2}$ R	27

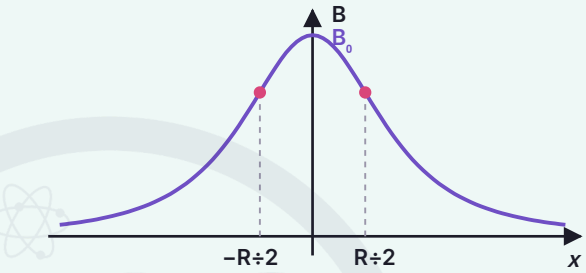
21.2.3 x much larger than R

$$B_a = \frac{\mu_0 n i R^2}{2x^3} = \frac{\mu_0}{4\pi} \cdot \frac{2M}{x^3}$$

- M = niA is the magnetic moment of the coil (Concept 10).
- Far from the coil, $B \propto \frac{1}{x^3}$.
- The coil behaves as a magnetic dipole.

JEE · NEET Corner

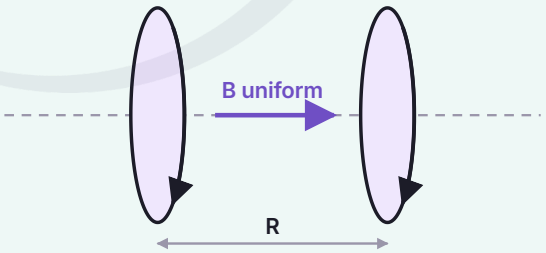
B against x: inflection points



B is largest at the centre and falls on both sides

- The curve changes its bending at $x = \pm \frac{R}{2}$.
- Between these points the field changes almost linearly with x.
- The two points are a distance R apart.

Helmholtz coils



Two equal coils, same current, separation R

- Two identical coaxial coils carry equal currents in the same sense.
- They are kept a distance R apart.
- Field in the middle region is nearly uniform.

$$B = \frac{8\mu_0 N i}{5\sqrt{5}\, R} = 0.716\, \frac{\mu_0 N i}{R}$$

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PHYSICS CIRCLE

MOVING CHARGES
AND MAGNETISM

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

248	32	8
questions	concepts	topics

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01	Biot-Savart Law & Circular Coils	Q 1–44	44 Qs
02	Magnetic Field of Straight Wires	Q 45–65	21 Qs
03	Ampere's Law, Cylinders, Solenoid & Toroid	Q 66–112	47 Qs
04	Moving Charge in a Magnetic Field	Q 113–170	58 Qs
05	Force on Current-Carrying Conductors	Q 171–200	30 Qs
06	Current Loop as a Magnetic Dipole	Q 201–225	25 Qs
07	Moving Coil Galvanometer, Ammeter & Voltmeter	Q 226–239	14 Qs
08	Other: Induction & Displacement Current	Q 240–248	9 Qs
	Answer key		

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TOPIC 01

Biot-Savart Law & Circular Coils

44 PYQs · Easy 44 · Medium 0 · Difficult 0 | MHT CET 22 · NEET 12 · JEE 10

Concepts covered: Biot-Savart law, units & direction rules (7) · Field at the centre of a coil & rewinding (10) · Rotating charge & orbiting electron (3) · Field on the axis of a coil & Helmholtz coils (8) · Arcs, semicircles & division of current (8) · Concentric & perpendicular coils (8)

LEVEL 1 · EASY 44 questions

◆ Biot-Savart law, units & direction rules 7 Qs

1. The shape of the magnetic field lines due to an infinite long, straight current carrying conductor is

NEET 2022 · PHASE 2

(a) a plane (b) a straight line
(c) circular (d) elliptical

2. Given below are two statements:

Statement I: Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current carrying conductor only.

Statement II: Biot-Savart's law is analogous to Coulomb's inverse square law of charge q, with the former being related to the field produced by a scalar source, Idl while the latter being produced by a vector source, q.

In light of above statements choose the most appropriate answer from the options given below.

NEET 2022 · PHASE 1

(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct and Statement II is incorrect
(d) Statement I is incorrect and Statement II is correct

3. Tesla is the unit of

AIPMT 1997

(a) electric field (b) magnetic field
(c) electric flux (d) magnetic flux

4. The magnetic field $d\vec{B}$ due to a small current element $d\vec{l}$ at a distance $\vec{r}$ and element carrying current i is

AIPMT 1996

(a) $d\vec{B}=\frac{\mu_0}{4\pi}i^2\left(\frac{d\vec{l}\times\vec{r}}{r}\right)$ (b) $d\vec{B}=\frac{\mu_0}{4\pi}i\left(\frac{d\vec{l}\times\vec{r}}{r^3}\right)$
(c) $d\vec{B}=\frac{\mu_0}{4\pi}i\left(\frac{d\vec{l}\times\vec{r}}{r}\right)$ (d) $d\vec{B}=\frac{\mu_0}{4\pi}i^2\left(\frac{d\vec{l}\times\vec{r}}{r^2}\right)$

5. Tesla is the unit of

AIPMT 1988

(a) electric field (b) magnetic field
(c) electric flux (d) magnetic flux

6. Given below are two statements:

Statement (I): When currents vary with time, Newton's third law is valid only if momentum carried by the electromagnetic field is taken into account

Statement (II): Ampere's circuital law does not depend on Biot-Savart's law.

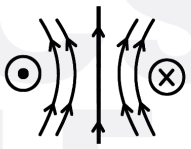
In the light of the above statements, choose the correct answer from the options given below:

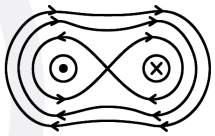
JEE MAIN 2024 · 9 APR · SHIFT 1

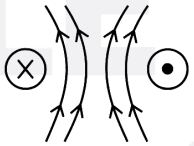
(a) Both Statement I and Statement II are false
(b) Statement I is false but Statement II is true
(c) Both Statement I and Statement II are true
(d) Statement I is true but Statement II is false

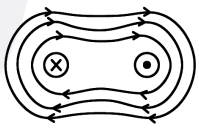
7. Choose the correct sketch of the magnetic field lines of a circular current loop shown by the dot and the cross ⊗.

JEE MAIN 2013 · 22 APR · SHIFT 1

(a) 

(b) 

(c) 

(d) 

◆ Field at the centre of a coil & rewinding 10 Qs

8. A circular coil of wire consisting of ' n ' tums each of radius 8 cm carries a current of 0.4 A. The magnitude of the magnetic field at the centre of coil is 3.14×10^{-4} T . The value of ' n ' is [Take $\mu_0=12.56\times10^{-7}$ SI unit]

MHT CET 2025 · 22 APR · SHIFT 1

(a) 1 (b) 10 (c) 100 (d) 1000

9. The magnetic field at the centre of a circular coil of radius 'R', carrying current $2A$ is 'B_1'. The magnetic field at the centre of another coil of radius '$3R$' carrying current $4A$ is 'B_2'. The ratio $B_1:B_2$ is

MHT CET 2023 · 10 MAY · SHIFT 2

(a) 1 : 2 (b) 2 : 1 (c) 2 : 3 (d) 3 : 2

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10. A circular coil of wire consisting of 100 turns each of radius 9 cm carries a current of 0.4 A. The magnitude of the magnetic field at the centre of coil is $[\mu_0 = 12.56 \times 10^{-7}$SI Unit]

MHT CET 2019 · 2 MAY · SHIFT 2

(a) 2.4×10^{-11} T (b) 2.79×10^{-5} T
(c) 2.79×10^{-4} T (d) 2.79×10^{-3} T

11. A tightly wound 100 turns coil of radius 10 cm carries a current of 7 A. The magnitude of the magnetic field at the centre of the coil is (Take permeability of free space as $4\pi \times 10^{-7}$SI units):

NEET 2024

(a) 44 mT (b) 4.4 T (c) 4.4 mT (d) 44 T

12. A closely packed coil having 1000 turns has an average radius of 62.8 cm. If current carried by the wire of the coil is 1 A, the value of magnetic field produced at the centre of the coil will be (permeability of free space $= 4\pi \times 10^{-7}$ H/m) nearly

NEET 2022 · PHASE 2

(a) 10^{-3} T (b) 10^{-1} T (c) 10^{-2} T (d) 102 T

13. The magnetic field of given length of wire for single turn coil at its centre is B then its value for two turns coil for the same wire is

AIPMT 2002

(a) B/4 (b) B/2 (c) 4B (d) 2B

14. Magnetic field due to 0.1 A current flowing through a circular coil of radius 0.1 m and 1000 turns at the centre of the coil is

AIPMT 1999

(a) 0.2 T (b) 2×10^{-4} T
(c) 6.28×10^{-4} T (d) 9.8×10^{-4} T

15. B_X and B_Y are the magnetic fields at the centre of two coils X and Y respectively each carrying equal current. If coil X has 200 turns and 20 cm radius and coil Y has 400 turns and 20 cm radius, the ratio of B_X and B_Y is:

JEE MAIN 2022 · 26 JUL · SHIFT 1

(a) 1: 1 (b) 1: 2 (c) 2: 1 (d) 4: 1

16. If in a circular coil A of radius R, current I is flowing and in another coil B of radius $2R$ a current $2I$ is flowing, then the ratio of the magnetic fields B_A and B_B, produced by them will be

AIEEE 2002

(a) 1 (b) 2 (c) $1/2$ (d) 4

17. A closely wound circular coil of radius 5 cm produces a magnetic field of 37.68×10^{-4} T at its center. The current through the coil is _____A.
[Given, number of turns in the coil is 100 and $\pi = 3.14$]

JEE MAIN 2022 · 29 JUL · SHIFT 1 *(Numerical)*

◆ Rotating charge & orbiting electron 3 Qs

18. A particle carrying a charge equal to 100 times the charge on an electron is rotating one rotation per second in a circular path of radius 0.8 m. The value of magnetic field produced at the centre will be ($\mu_0 =$ permeability of vacuum)

MHT CET 2024 · 4 MAY · SHIFT 2

(a) $\frac{10^{-7}}{\mu_0}$ (b) $10^{-17}\mu_0$ (c) $10^{-6}\mu_0$ (d) $10^{-7}\mu_0$

19. An electron (e) moves in circular orbit of radius 'r' with uniform speed 'V'. It produces magnetic field 'B' at the centre of circle. The magnetic field B is ($\mu_0 =$ permeability of free space)

MHT CET 2021 · 20 SEP · SHIFT 1

(a) $\frac{\mu_0 e}{4\pi}\left(\frac{V}{r^2}\right)$ (b) $\frac{\mu_0 e}{4\pi}Vr^2$ (c) $\frac{\mu_0 e}{4\pi}\left(\frac{V}{r}\right)$ (d) $\frac{\mu_0 e}{4\pi}Vr$

20. An electron moving in a circular orbit of radius r makes n rotations per second. The magnetic field produced at the centre has magnitude

AIPMT 2015 · CANCELLED PAPER

(a) $\frac{\mu_0 n^2 e}{r}$ (b) $\frac{\mu_0 ne}{2r}$
(c) $\frac{\mu_0 ne}{2\pi r}$ (d) Zero

◆ Field on the axis of a coil & Helmholtz coils 8 Qs

21. A circular coil having n turns, each of radius 'r' carries a current I. The magnetic field at a distance $x = \sqrt{8}\,r$ from its centre along the axis of the coil is ($\mu_0 =$ permeability of free space)

MHT CET 2026 · 20 MAY · SHIFT 1

(a) $\frac{\mu_0 nI}{51r}$ (b) $\frac{\mu_0 nI}{52r}$ (c) $\frac{\mu_0 nI}{53r}$ (d) $\frac{\mu_0 nI}{54r}$

22. The magnitude of magnetic induction at a point on the axis at a large distance r from a centre of a circular coil of n turns and area A carrying current i is ($\mu_0 =$ permeability of free space)

MHT CET 2026 · 14 MAY · SHIFT 1

(a) $\frac{\mu_0 nA}{4\pi ir^3}$ (b) $\frac{2\mu_0 niA}{4\pi r^3}$ (c) $\frac{2\mu_0 ni}{4\pi Ar^3}$ (d) $\frac{\mu_0 niA}{4\pi r^3}$

23. A circular loop of radius R is carrying current I. The ratio of magnetic field at the center of circular loop and at a distance R from the center of the loop on its axis is

MHT CET 2026 · 16 APR · SHIFT 2

(a) $1:\sqrt{2}$ (b) $1:3\sqrt{2}$ (c) $\sqrt{8}:1$ (d) $3\sqrt{2}:1$

24. A circular coil carrying current ' I ' has a radius ' r ' and ' n ' turns. The magnetic field along the axis of a coil at a distance ' $2\sqrt{2}r$ ', from its centre is ($\mu_0 =$ permeability of free space, n is very small)

MHT CET 2025 · 25 APR · SHIFT 2

(a) $\frac{\mu_0 nI}{9r}$ (b) $\frac{\mu_0 nI}{18r}$ (c) $\frac{\mu_0 nI}{54r}$ (d) $\frac{\mu_0 nI}{27r}$

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25. The magnitude of the magnetic induction at a point on the axis at a large distance (r) from the centre of a circular coil of ' n ' turns and area ' A ' carrying current (I) is given by

MHT CET 2019 · 2 MAY · SHIFT 1

(a) $B_{\text{axis}} = \frac{\mu_0}{4\pi} \cdot \frac{nA}{1r^3}$ (b) $B_{\text{axis}} = \frac{\mu_0}{4\pi} \cdot \frac{2nlA}{r^3}$
(c) $B_{\text{axis}} = \frac{\mu_0}{4\pi} \cdot \frac{2nl}{Ar^3}$ (d) $B_{\text{axis}} = \frac{\mu_0}{4\pi} \cdot \frac{nlA}{r^3}$

26. The magnetic field on the axis of a circular loop of radius 100 cm carrying current $I = \sqrt{2}\,A$, at point 1 m away from the centre of the loop is given by:

NEET 2022 · PHASE 2

(a) 6.28×10^{-4} T (b) 3.14×10^{-7} T
(c) 6.28×10^{-7} T (d) 3.14×10^{-4} T

27. The magnetic field at the centre of a current carrying circular loop of radius R is 16μ T. The magnetic field at a distance $x = \sqrt{3}R$ on its axis from the centre is ____ μT.

JEE MAIN 2026 · 28 JAN · SHIFT 1

(a) 8 (b) 2 (c) 4 (d) $2\sqrt{2}$

28. A circular loop of radius r is carrying current I A. The ratio of magnetic field at the center of circular loop and at a distance r from the center of the loop on its axis is:

JEE MAIN 2023 · 24 JAN · SHIFT 1

(a) $3\sqrt{2}$: 2 (b) 1: $3\sqrt{2}$ (c) $2\sqrt{2}$: 1 (d) 1: $\sqrt{2}$

◆ Arcs, semicircles & division of current 8 Qs

29. An arc of a circle of radius R subtends an angle $\pi/2$ at the centre. It carries a current I. The magnetic field at the centre will be (μ_0 = permeability of free space)

MHT CET 2026 · 13 MAY · SHIFT 1

(a) $\frac{\mu_0 I}{2R}$ (b) $\frac{\mu_0 I}{8R}$ (c) $\frac{\mu_0 I}{4R}$ (d) $\frac{2\mu_0 I}{5R}$

30. A circular arc of wire of radius of curvature r subtends an angle of $\frac{\pi}{5}$ radian at its centre. If current i is flowing in it then the magnetic induction at its centre is (μ_0 = permeability of free space)

MHT CET 2026 · 20 APR · SHIFT 2

(a) $\frac{\mu_0 i}{4r}$ (b) $\frac{\mu_0 i}{8r}$ (c) $\frac{\mu_0 i}{16r}$ (d) $\frac{\mu_0 i}{20r}$

31. An arc of a circle of radius ' R ' subtends an angle $\frac{\pi}{2}$ at the centre. It carries a current I. The magnetic field at the centre will be (μ_0 = permeability of free space)

MHT CET 2024 · 16 MAY · SHIFT 2

(a) $\frac{\mu_0 I}{2R}$ (b) $\frac{\mu_0 I}{8R}$ (c) $\frac{\mu_0 I}{4R}$ (d) $\frac{2\mu_0 I}{5R}$

32. A current 'I' flows in anticlockwise direction in a circular arc of a wire having $\left(\frac{3}{4}\right)^{\text{th}}$ of circumference of a circle of radius R. The magnetic field ' B ' at the centre of circle is (μ_0 = permeability of free space)

MHT CET 2024 · 16 MAY · SHIFT 2

(a) $\frac{\mu_0 I}{3R}$ in upward direction
(b) $\frac{\mu_0 I}{2R}$ in downward direction
(c) $\frac{3\mu_0 I}{8R}$ in downward direction
(d) $\frac{3\mu_0 I}{8R}$ in upward direction

33. A circular arc of radius r carrying current ' I ' subtends an angle $\frac{\pi}{8}$ at its centre. The radius of a metal wire is uniform. The magnetic induction at the centre of circular arc is (μ_0 = permeability of free space)

MHT CET 2024 · 10 MAY · SHIFT 1

(a) $\frac{\mu_0 I}{8r}$ (b) $\frac{\mu_0 I}{32r}$ (c) $\frac{\mu_0 I}{64r}$ (d) $\frac{\mu_0 I}{16r}$

34. A circular arc of radius 'r' carrying current 'I' subtends an angle $\frac{\pi}{16}$ at its centre. The radius of a metal wire is uniform. The magnetic induction at the centre of circular arc is [μ_0 = permeability of free space]

MHT CET 2023 · 11 MAY · SHIFT 2

(a) $\frac{\mu_0 I}{32r}$ (b) $\frac{\mu_0 I}{16r}$ (c) $\frac{\mu_0 I}{64r}$ (d) $\frac{\mu_0 I}{8r}$

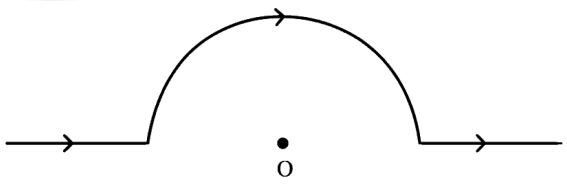
35. When a battery is connected to the two ends of a diagonal of a square conductor frame of side 'a', the magnitude of magnetic field at the centre will be (μ_0 = permeability of free space)

MHT CET 2021 · 22 SEP · SHIFT 1

(a) $\frac{\mu_0}{\sqrt{2}\pi a}$ (b) $\frac{\sqrt{2}\mu_0}{\pi a}$ (c) $\frac{\mu_0}{\pi a}$ (d) zero

36. A straight wire carrying a current of 14 A is bent into a semi-circular arc of radius 2.2 cm as shown in the figure. The magnetic field produced by the current at the centre (O) of the arc. is _____ $\times 10^{-4}$ T

JEE MAIN 2023 · 10 APR · SHIFT 2 *(Numerical)*



◆ Concentric & perpendicular coils 8 Qs

37. Two coils P and Q each of radius R carry currents I and $\sqrt{8}$I respectively in same direction. Those coils are lying in perpendicular planes such that they have a common centre. The magnitude of the magnetic field at the common centre of the two coils is (μ_0 = permeability of free space)

MHT CET 2024 · 16 MAY · SHIFT 1

(a) $\frac{\mu_0 I}{2R}$ (b) $\frac{3\mu_0 I}{2R}$ (c) $\frac{5\mu_0 I}{2R}$ (d) $\frac{7\mu_0 I}{2R}$

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38. Two concentric circular coils A and B having radii 20 cm and 10 cm respectively lie in the same plane. The current in coil A is 0.5 A in anticlockwise direction. The current in coil B, so that net magnetic field at the common centre is zero, is

MHT CET 2024 · 15 MAY · SHIFT 2

(a) 0.5 A in anticlockwise direction.
(b) 0.25 A in anticlockwise direction.
(c) 0.25 A in clockwise direction.
(d) 0.125 A in clockwise direction.

39. Two identical current carrying coils with same centre are placed with their planes perpendicular to each other. If current $I = \sqrt{2}$ A and radius of the coil is $R = 1$ m, then magnetic field at centre is equal to (μ_0 = permeability of free space)

MHT CET 2024 · 2 MAY · SHIFT 1

(a) μ_0 (b) $\frac{\mu_0}{2}$ (c) $2\mu_0$ (d) $\sqrt{2}\mu_0$

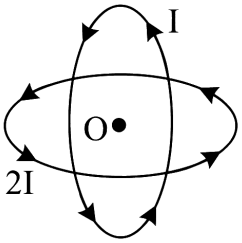
40. Two concentric circular coils A and B have radii 20 cm and 10 cm respectively lie in the same plane. The current in coil A is 0.5 A in anticlockwise direction. The current in coil B so that net field at the common centre is zero, is

MHT CET 2023 · 13 MAY · SHIFT 1

(a) 0.5 A in anticlockwise direction
(b) 0.25 A in anticlockwise direction.
(c) 0.25 A in clockwise direction.
(d) 0. 125 A in clockwise direction.

41. Two similar coils each of radius R are lying concentrically with their planes at right angles to each other. The current flowing in them are I and 2I. The resultant magnetic field of induction at the centre will be (μ_0 = Permeability of vacuum)

MHT CET 2023 · 12 MAY · SHIFT 1



(a) $\frac{\mu_0 I}{2R}$ (b) $\frac{\mu_0 I}{R}$ (c) $\frac{3\mu_0 I}{2R}$ (d) $\frac{\sqrt{5}\mu_0 I}{2R}$

42. Two similar coils of radius R are lying concentrically with their planes at right angles to each other. The currents flowing in them are I and $2I$, respectively. The resultant magnetic field induction at the centre will be

AIPMT 2012 · PRELIMS

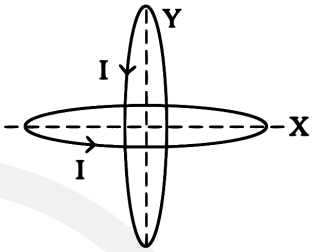
(a) $\frac{\sqrt{5}\mu_0 I}{2R}$ (b) $\frac{\sqrt{5}\mu_0 I}{R}$ (c) $\frac{\mu_0 I}{2R}$ (d) $\frac{\mu_0 I}{R}$

43. Two concentric coils each of radius equal to $2\ \pi\ cm$ are placed at right angles to each other. 3 ampere and 4 ampere are the currents flowing in each coil respectively. The magnetic induction in Weber / m^2 at the center of the coils will be
$(\mu = 4\pi \times 10^{-7} Wb/A.m)$

AIEEE 2005

(a) 10^{-5} (b) 12×10^{-5}
(c) 7×10^{-5} (d) 5×10^{-5}

44. Two identical circular wires of radius 20 cm and carrying current $\sqrt{2}$ A are placed in perpendicular planes as shown in figure. The net magnetic field at the centre of the circular wires is _____ $\times 10^{-8}$ T.



(Take $\pi = 3.14$)

JEE MAIN 2023 · 6 APR · SHIFT 1 *(Numerical)*

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TOPIC 02

Magnetic Field of Straight Wires

21 PYQs · Easy 21 · Medium 0 · Difficult 0 | MHT CET 12 · NEET 5 · JEE 4

Concepts covered: Long straight wire (10) · Two wires: resultant field (10) · Finite wire & polygon loops (1)

LEVEL 1 · EASY 21 questions

◆ Long straight wire 10 Qs

45. A straight long wire is carrying current I. The ratio of magnetic field due to this wire at perpendicular distance 2 cm and 5 cm respectively from the wire is
MHT CET 2026 · 18 APR · SHIFT 2
(a) 2 : 5 (b) 3 : 5 (c) 7 : 3 (d) 5 : 2

46. The magnetic field at a distance 'r' from a long straight wire carrying current I is 0.4 tesla. The magnetic field at a distance 2r will be
MHT CET 2026 · 17 APR · SHIFT 2
(a) 0 · 1 tesla (b) 0 · 2 tesla
(c) 0 · 8 tesla (d) 1 · 6 tesla

47. The magnetic field at perpendicular distance 'r' from a long wire carrying current 'I' is 'B'. The magnetic field at perpendicular distance '$2r$' from the same wire is
MHT CET 2026 · 17 APR · SHIFT 1
(a) $\frac{B}{4}$ (b) $\frac{B}{2}$ (c) $2B$ (d) $4B$

48. The strength of magnetic field at a perpendicular distance ' x ' near a long straight conductor carrying current ' I ' is ' B '. The magnetic field at a distance $\frac{x}{3}$ from straight conductor will be
MHT CET 2024 · 15 MAY · SHIFT 1
(a) $\frac{B}{3}$ (b) 3 B (c) $\frac{B^2}{9}$ (d) $9\,B^2$

49. The magnetic field at a point P situated at perpendicular distance 'R' from a long straight wire carrying a current of 12 A is $3 \times 10^{-5}\ \mathrm{Wb/m^2}$. The value of 'R' in mm is $[\mu_0 = 4\pi \times 10^{-7}\ \mathrm{Wb/Am}]$
MHT CET 2023 · 9 MAY · SHIFT 2
(a) 0.08 (b) 0.8 (c) 8 (d) 80

50. A straight wire of diameter 0.4 mm carrying a current of 2 A is replaced by another wire of 0.8 mm diameter carrying the same current. The magnetic field at distance (R) from both the wires is 'B_1' and 'B_2' respectively. The relation between B_1 and B_2 is
MHT CET 2021 · 23 SEP · SHIFT 2
(a) $B_1 = \frac{B_2}{2}$ (b) $B_1 = B_2$
(c) $B_1 = 2\,B_2$ (d) $B_1 = \frac{B_2}{3}$

51. A straight wire of diameter 0.5 mm carrying a current of 1 A is replaced by another wire of diameter 1 mm carrying the same current. The strength of magnetic field far away is
AIPMT 1999
(a) twice the earlier value
(b) one-half of the earlier value
(c) one quarter of the earlier value
(d) same as earlier value

52. A straight wire of diameter 0.5 mm carrying a current of 1 A is replaced by the another wire of 1 mm diameter carrying the same current. The strength of the magnetic field far away is
AIPMT 1997
(a) one-quarter of the earlier value
(b) one-half of the earlier value
(c) twice the earlier value
(d) same as the earlier value

53. The magnetic field at a distance r from a long wire carrying current i is 0.4 tesla. The magnetic field at a distance $2r$ is
AIPMT 1992
(a) 0.2 tesla (b) 0.8 tesla
(c) 0.1 tesla (d) 1.6 tesla

54. The magnetic induction at a point P which is at the distance of 4 cm from a long current carrying wire is 10^{-3} T. The field of induction at a distance 12 cm from the current will be
AIPMT 1990
(a) 3.33×10^{-4} T (b) 1.11×10^{-4} T
(c) 33×10^{-3} T (d) 9×10^{-3} T

◆ Two wires: resultant field 10 Qs

55. Two parallel wires of equal lengths are separated by a distance of 3 m from each other. The currents flowing through first and second wire is 3 A and 4.5 A respectively in opposite directions. The resultant magnetic field at mid point of both the wires is (μ_0 = permeability of free space)
MHT CET 2026 · 12 MAY · SHIFT 2
(a) $\frac{5\mu_0}{2\pi}$ (b) $\frac{3\mu_0}{4\pi}$ (c) $\frac{2\mu_0}{}$ (d) $\frac{5\mu_0}{6\pi}\ \pi$

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56. Two long straight parallel wires are separated by a distance of 20 cm. Each wire carries current 5 mA in the same direction. The magnetic field at a point P midway between them is $\{\mu_0 =$ permeability of free space$\}$

MHT CET 2026 · 12 MAY · SHIFT 1

(a) $0.05\mu_0$ Wb/m^2 (b) $(0.05/8)\mu_0$ Wb/m^2
(c) $(0.05/4)\mu_0$ Wb/m^2 (d) zero.

57. Two parallel wires of equal lengths are separated by a distance of 3 m from each other. The currents flowing through first and second wire is 3 A and 4.5 A respectively in opposite directions. The resultant magnetic field at mid point of both the wires is (μ_0 =permeability of free space)

MHT CET 2026 · 11 APR · SHIFT 2

(a) $\frac{\mu_0}{2\pi}$ (b) $\frac{5\mu_0}{2\pi}$ (c) $\frac{7\mu_0}{2\pi}$ (d) $\frac{9\mu_0}{2\pi}$

58. Two long straight parallel wires are separated by a distance '2d'. Each wire carries a current 'I' in the same direction. The magnetic field at a point 'P' midway between them is

MHT CET 2024 · 11 MAY · SHIFT 1

(a) $\frac{2\mu_0 I}{r}$ (b) zero (c) $\frac{\mu_0 I}{4r}$ (d) $\frac{\mu_0 I}{2r}$

59. Two parallel wires of equal lengths are separated by a distance of 3 m from each other. The currents flowing through 1st and 2nd wire is 3 A and 4.5 A respectively in opposite directions. The resultant magnetic field at mid point between the wires ($\mu_0 =$ permeability of free space)

MHT CET 2023 · 11 MAY · SHIFT 1

(a) $\frac{\mu_0}{2\pi}$ (b) $\frac{3\mu_0}{2\pi}$ (c) $\frac{7\mu_0}{2\pi}$ (d) $\frac{5\mu_0}{2\pi}$

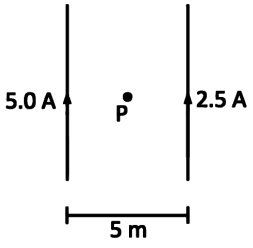
60. Two parallel conducting wires of equal length are placed distance 'd' apart, carry currents 'I_1' and 'I_2' respectively in opposite directions. The resultant magnetic field at the midpoint of the distance between both the wires is

MHT CET 2022 · 11 AUG · SHIFT 2

(a) $\frac{\mu_0(I_1-I_2)}{\pi d}$ (b) $\frac{\mu_0(I_1+I_2)}{2\pi d}$ (c) $\frac{\mu_0(I_1-I_2)}{2\pi d}$ (d) $\frac{\mu_0(I_1+I_2)}{\pi d}$

61. The magnetic field at centre, P will be

AIPMT 2000



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

62. A current of 30 A each flows in opposite directions in two conducting wires, placed parallel to each other at a distance of 8 cm. The magnetic field at the mid point between the two wires is ____ μT . $\left(\frac{\mu_0}{4\pi} = 10^{-7}\ \text{N/A}^2\right)$

JEE MAIN 2026 · 6 APR · SHIFT 2

(a) 30 (b) 300 (c) 150 (d) 0.0

63. Two long current carrying conductors are placed parallel to each other at a distance of 8 cm between them. The magnitude of magnetic field produced at mid-point between the two conductors due to current flowing in them is 300 μT. The equal current flowing in the two conductors is:

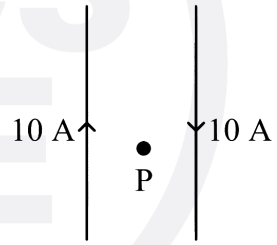
JEE MAIN 2022 · 29 JUN · SHIFT 2

(a) 30A in the same direction.
(b) 30A in the opposite direction.
(c) 60A in the opposite direction.
(d) 300A in the opposite direction.

64. Two long, straight wires carry equal currents in opposite directions as shown in figure. The separation between the wires is 5.0 cm. The magnitude of the magnetic field at a point P midway between the wires is _____ μT

(Given: $\mu_0 = 4\pi \times 10^{-7}\text{TmA}^{-1}$)

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



◆ Finite wire & polygon loops 1 Q

65. A current i is flowing in a straight conductor of length L. The magnetic induction at a point on its axis at a distance $\frac{L}{4}$ from its centre will be:

JEE MAIN 2013 · 22 APR · SHIFT 1

(a) Zero (b) $\frac{\mu_0 i}{2\pi L}$
(c) $\frac{\mu_0 i}{\sqrt{2}L}$ (d) $\frac{4\mu_0 i}{\sqrt{5}\pi L}$

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TOPIC 03

Ampere's Law, Cylinders, Solenoid & Toroid

47 PYQs · Easy 47 · Medium 0 · Difficult 0 | MHT CET 20 · NEET 10 · JEE 17

Concepts covered: Ampere's circuital law (4) · Field of solid & hollow cylinders (17) · Solenoid (23) · Toroid (3)

LEVEL 1 · EASY 47 questions

◆ Ampere's circuital law 4 Qs

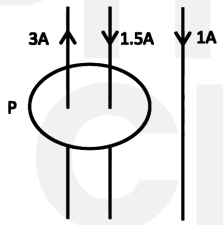
66. Six very long insulated copper wires are bound together to form a cable. The currents carried by the wires are $i_1 = 10\text{A}$, $i_2 = -13\text{A}$, $i_3 = 10\text{A}$, $i_4 = 7\text{A}$, $i_5 = -12\text{A}$ and $i_6 = 18$ A. The magnetic induction at a perpendicular distance of 10 cm from the cable is $(\mu_0 = 4\pi \times 10^{-7}$ SI units)

MHT CET 2026 · 13 MAY · SHIFT 1

(a) 40 μT (b) 375 μT (c) 30 μT (d) 35 μT

67. Two wires with current 3A and 1.5A are enclosed in a circular loop P. Third parallel wire with current 1A is situated outside the loop as shown. All the wires are perpendicular to the plane of the circular loop. The value of $\oint \vec{B} \cdot \vec{dl}$ around the loop is (μ_0 = permeability of free space)

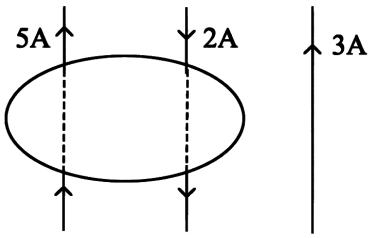
MHT CET 2026 · 18 APR · SHIFT 2



(a) 5.5 μ_0 (b) 2.5 μ_0 (c) 1.5 μ_0 (d) 0.5 μ_0

68. Two wires carrying currents 5 A and 2 A are enclosed in a circular loop as shown in the figure. Another wire carrying a current of 3 A is situated outside the loop. The value of $\oint \vec{B}\vec{dl}$ around the loop is (μ_0 = permeability of free space, $\vec{dl}$ is the length of the element on the Amperion loop)

MHT CET 2021 · 20 SEP · SHIFT 2



(a) $4\mu_0$ (b) $2\mu_0$ (c) $3\mu_0$ (d) μ_0

69. Six very long insulated copper wires are bound together to form a cable. The currents carried by the wires are $I_1 = +10$ A, $I_2 = -13$ A, $I_3 = +10$ A, $I_4 = +7$ A, $I_5 = -12$ A and $I_6 = +18$ A. The magnetic induction at a perpendicular distance of 10 cm from the cable is $(\mu_0 = 4\pi \times 10^{-7}$ Wb/A – m)

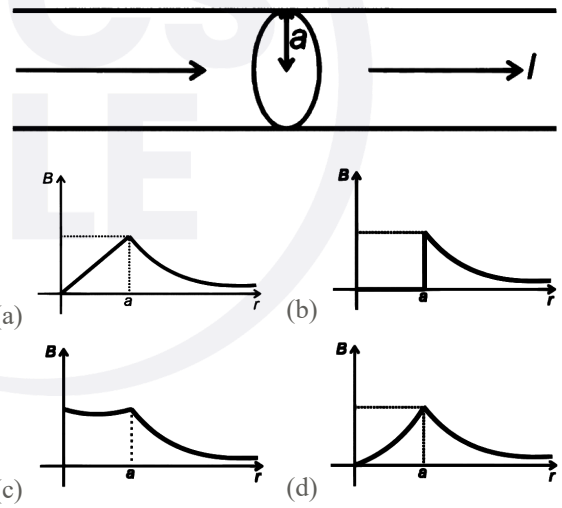
MHT CET 2019 · 3 MAY · SHIFT 1

(a) 40μ T (b) 37.5μ T (c) 30μ T (d) 35μ T

◆ Field of solid & hollow cylinders 17 Qs

70. The figure given below shows a long straight solid wire of circular cross-section of radius ' a ' carrying steady current I. The current I is uniformly distributed across its cross-section. The plot which correctly represents the variation of magnetic field (B) with distance (r) from the axis of the conductor in the region is:

NEET 2026



71. From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is

NEET 2022 · PHASE 1

(a) Uniform and remains constant for both the regions.

(b) A linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region.

(c) A linearly increasing function of distance r upto the boundary of the wire and then decreasing one with $\frac{1}{r}$ dependence for the outside region.

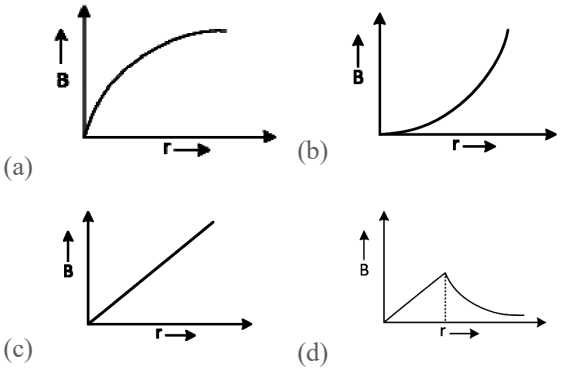
(d) A linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing

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one of the outside region.

72. A thick current carrying cable of radius 'R' carries current 'I' uniformly distributed across its cross section. The variation of magnetic field B(r) due to the cable with the distance 'r' from the axis of the cable is represented by:

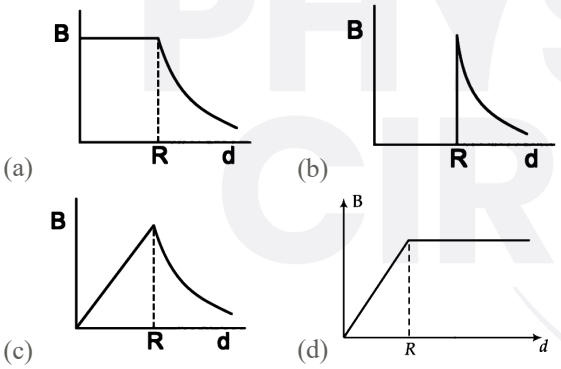
NEET 2021



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

73. A cylindrical conductor of radius R is carrying a constant current. The plot of the magnitude of the magnetic field B with the distance d from the centre of the conductor, is correctly represented by the figure:

NEET 2019



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

74. A long straight wire of radius a carries a steady current I. The current is uniformly distributed over its cross-section. The ratio of the magnetic fields B and B', at radial distance $\frac{a}{2}$ and $2a$ respectively, from the axis of the wire is

NEET 2016 · PHASE 1

(a) 1 (b) 4 (c) $\frac{1}{4}$ (d) $\frac{1}{2}$

75. If a long hollow copper pipe carries a current, then magnetic field is produced

AIPMT 1999

(a) inside the pipe only
(b) outside the pipe only
(c) both inside and outside the pipe
(d) no where

76. A long cylindrical conductor with large cross section carries an electric current distributed uniformly over its cross-section. Magnetic field due to this current is:

A. maximum at either ends of the conductor and minimum at the midpoint
B. maximum at the axis of the conductor
C. minimum at the surface of the conductor
D. minimum at the axis of the conductor
E. same at all points in the cross-section of the conductor

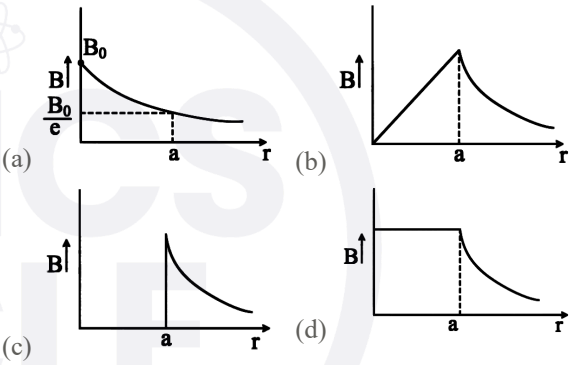
Choose the correct answer from the options given below:

JEE MAIN 2026 · 28 JAN · SHIFT 2

(a) B, C Only (b) E Only (c) A, D Only (d) D Only

77. A long straight wire of a circular cross-section with radius ' a ' carries a steady current I. The current I is uniformly distributed across this cross-section. The plot of magnitude of magnetic field B with distance r from the centre of the wire is given by

JEE MAIN 2025 · 24 JAN · SHIFT 2



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

78. A long straight wire of radius a carries a steady current I. The current is uniformly distributed across its cross section. The ratio of the magnetic field at $\frac{a}{2}$ and $2a$ from axis of the wire is:

JEE MAIN 2024 · 8 APR · SHIFT 2

(a) 4 : 1 (b) 3 : 4 (c) 1 : 1 (d) 1 : 4

79. In a co-axial straight cable, the central conductor and the outer conductor carry equal currents in opposite directions. The magnetic field is zero:

JEE MAIN 2024 · 5 APR · SHIFT 1

(a) inside the outer conductor
(b) outside the cable
(c) in between the two conductors
(d) inside the inner conductor

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80. A long straight wire of circular cross-section (radius a) is carrying steady current I. The current I is uniformly distributed across this cross-section. The magnetic field is

JEE MAIN 2023 · 6 APR · SHIFT 1

(a) uniform in the region $r < a$ and inversely proportional to distance r from the axis, in the region $r > a$

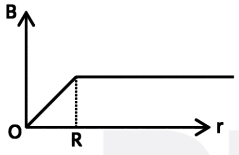
(b) zero in the region $r < a$ and inversely proportional to r in the region $r > a$

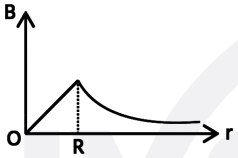
(c) directly proportional to r in the region $r < a$ and inversely proportional to r in the region $r > a$

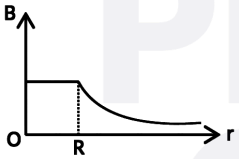
(d) inversely proportional to r in the region $r < a$ and uniform throughout in the region $r > a$

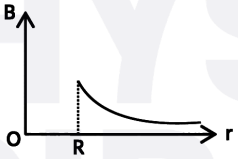
81. An infinitely long hollow conducting cylinder with radius R carries a uniform current along its surface. Choose the correct representation of magnetic field (B) as a function of radial distance (r) from the axis of cylinder.

JEE MAIN 2022 · 28 JUN · SHIFT 1

(a) 

(b) 

(c) 

(d) 

82. A long straight wire with a circular cross-section having radius R, is carrying a steady current I. The current I is uniformly distributed across this cross-section. Then the variation of magnetic field due to current I with distance r (r < R) from its centre will be:

JEE MAIN 2022 · 25 JUN · SHIFT 1

(a) B $\propto$ r2 (b) B $\propto$ r (c) B $\propto \frac{1}{r^2}$ (d) B $\propto \frac{1}{r}$

83. A long, straight wire of radius a carries a current distributed uniformly over its cross-section. The ratio of the magnetic fields due to the wire at distance $\frac{a}{3}$ and $2a$, respectively from the axis of the wire is:

JEE MAIN 2020 · 9 JAN · SHIFT 1

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

84. A long straight wire of radius a carries a steady current i. The current is uniformly distributed across its cross section. The ratio of the magnetic field at $a/2$ and $2a$ is

AIEEE 2007

(a) $1/2$ (b) $1/4$ (c) 4 (d) 1

85. A current I flows along the length of an infinitely long, straight, thin walled pipe. Then

AIEEE 2007

(a) the magnetic field at all points inside the pipe is the same, but not zero

(b) the magnetic field is zero only on the axis of the pipe

(c) the magnetic field is different at different points inside the pipe

(d) the magnetic field at any point inside the pipe is zero

86. A current i ampere flows along an infinitely long straight thin walled tube, then the magnetic induction at any point inside the tube is

AIEEE 2004

(a) $\frac{\mu_0}{4\pi}, \frac{2i}{r}$ tesla (b) zero

(c) infinite (d) $\frac{2i}{r}$ tesla

◆ Solenoid 23 Qs

87. The magnitude of the magnetic field inside a long solenoid is increased by

MHT CET 2026 · 15 MAY · SHIFT 2

(a) decreasing its radius

(b) decreasing the current through it

(c) increasing the area of cross-section

(d) introducing a medium of higher permeability

88. The magnitude of the magnetic field inside a long solenoid is increased by

MHT CET 2026 · 13 MAY · SHIFT 2

(a) decreasing its radius

(b) decreasing the current through it

(c) increasing its area of cross-section

(d) introducing a medium of higher permeability

89. Choose the WRONG Statement from the following statements.

(A) A toroid is a solenoid bent in the form of a closed ring.

(B) The magnetic field lines of solenoid are straight lines parallel to the axis inside the solenoid. (C) The magnetic field lines of toroid are circular having common centre.

(D) Inside a solenoid, magnetic field may be made strong by passing small current and using laminated coil of soft iron.

MHT CET 2026 · 12 MAY · SHIFT 2

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

90. A solenoid of 1000 turns is wound uniformly on a glass tube 4 m long and 0.3 m in diameter. The magnetic intensity at the centre of the solenoid when a current of 4 A flows through it is

MHT CET 2026 · 20 APR · SHIFT 2

(a) $2 \times 10^{+3}$ A/m (b) $16 \times 10^{+3}$ A/m

(c) $4 \times 10^{+3}$ A/m (d) 10^{+3} A/m

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91. A long solenoid carrying a current produces a magnetic field 'B' along its axis. If the current is tripled and the number of turns per cm is halved then new value of magnetic field will be

MHT CET 2026 · 20 APR · SHIFT 1

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

92. The magnetic induction produced inside an ideal solenoid, depends on which of the following quantities?

(a) number of turns per unit length.

(b) radius of the wire.

(c) current flowing throught it.

(d) permeability of the medium.

MHT CET 2026 · 19 APR · SHIFT 2

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

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

93. The magnetic field intensity (H) at the centre of a long solenoid having 'n' turns per unit length and carrying a current I, when no material is kept in it is (μ_0 = permeability of free space)

MHT CET 2026 · 16 APR · SHIFT 2

(a) n/I (b) nI (c) $\mu_0 I$ (d) μ_0/nI

94. The magnetic field intensity H at the centre of a long solenoid having n turns per unit length and carrying a current I, when no material is kept in it is (μ_0 = permeability of free space)

MHT CET 2025 · 25 APR · SHIFT 1

(a) μ_0nI (b) $\frac{\text{n}}{\text{I}}$ (c) nI (d) $\frac{\mu_0}{\text{nI}}$

95. A long solenoid carrying a current produces magnetic field B along its axis. If the number of turns per cm are tripled and the current is made $\left(\frac{1}{4}\right)^{\text{th}}$ then the new value of magnetic field will be

MHT CET 2024 · 9 MAY · SHIFT 2

(a) $\frac{B}{3}$ (b) $\frac{\text{B}}{4}$ (c) $\frac{3B}{4}$ (d) $\frac{2\,\text{B}}{3}$

96. The magnetic induction due to an ideal solenoid is independent of

MHT CET 2024 · 9 MAY · SHIFT 1

(a) total number of turns of the wire.

(b) length of the solenoid.

(c) radius of the wire.

(d) current carried by the wire.

97. The magnetic field intensity inside current carrying solenoid is $\text{H} = 2.4 \times 10^3\ \text{A/m}$. If length and number of turns of a solenoid is 15 cm and 60 turns respectively. The current flowing in the solenoid is

MHT CET 2024 · 9 MAY · SHIFT 1

(a) 4 A (b) 6 A (c) 0.6 A (d) 60 A

98. A long solenoid carrying current I_1 produces magnetic field B_1 along its axis. If the current is reduced to 20% and number of turns per cm are increased five times then new magnetic field B_2 is equal to

MHT CET 2021 · 23 SEP · SHIFT 2

(a) B_1 (b) $\frac{B_1}{5}$ (c) 5B_1 (d) 0.25B_1

99. A long solenoid carrying a current produces a magnetic field B along its axis. If the number of turns per cm is doubled and the current is made $\left(\frac{1}{3}\right)^{\text{rd}}$ then the new value of the magnetic field will be

MHT CET 2021 · 21 SEP · SHIFT 1

(a) $\frac{B}{3}$ (b) 3B (c) 2 B (d) $\frac{2\,\text{B}}{3}$

100. The magnetic field intensity 'H' at the centre of a long solenoid having 'n' turns per unit length and carrying a current 'I', when no material is kept in it, is

MHT CET 2021 · 20 SEP · SHIFT 1

(a) $\frac{1}{\text{n}}$ (b) $\frac{\text{n}}{1}$ (c) nI (d) n^2I

101. A long solenoid of radius 1 mm has 100 turns per mm. If 1 A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is

NEET 2022 · PHASE 1

(a) 6.28×10^{-2} T (b) 12.56×10^{-2} T

(c) 12.56×10^{-4} T (d) 6.28×10^{-4} T

102. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is:
$\left(\mu_0 = 4\pi \times 10^{-7} TmA^{-1}\right)$

NEET 2020 · PHASE 1

(a) $3.14 \times 10^{-4} T$ (b) $6.28 \times 10^{-5} T$

(c) $3.14 \times 10^{-5} T$ (d) $6.28 \times 10^{-4} T$

103. A long solenoid carrying a current produces a magnetic field B along its axis. If the current is doubled and the number of turns per cm is halved, the new value of the magnetic field is

AIPMT 2003

(a) B/2 (b) B (c) 2B (d) 4B

104. A long solenoid is formed by winding 70 turns cm^{-1}. If 2.0 A current flows, then the magnetic field produced inside the solenoid is _____ ($\mu_0 = 4\pi \times 10^{-7}$ TmA $^{-1}$)

JEE MAIN 2023 · 24 JAN · SHIFT 2

(a) 88×10^{-4} T (b) 1232×10^{-4} T

(c) 176×10^{-4} T (d) 352×10^{-4} T

105. A long solenoid carrying a current produces a magnetic field B along its axis. If the current is doubled and the number of turns per cm is halved, the new value of magnetic field will be equal to

JEE MAIN 2022 · 25 JUN · SHIFT 2

(a) B (b) 2B (c) 4B (d) $\frac{B}{2}$

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106. A solenoid of 1000 turns per metre has a core with relative permeability 500. Insulated windings of the solenoid carry an electric current of 5A. The magnetic flux density produced by the solenoid is: (permeability of free space = $4\pi \times 10^{-7}$ H/m)

JEE MAIN 2021 · 17 MAR · SHIFT 1

(a) πT (b) $2 \times 10^{-3}\pi$ T

(c) $10^{-4}\pi$ T (d) $-\frac{\pi}{5}$ T

107. A long solenoid has 200 turns per cm and carries a current i. The magnetic field at its center is 6.28×10^{-2} $Weber/m^2$. Another long solenoid has 100 turns per cm and it carries a current $\frac{i}{3}$. The value of the magnetic field at its center is

AIEEE 2006

(a) 1.05×10^{-2} $Weber/m^2$

(b) 1.05×10^{-5} $Weber/m^2$

(c) 1.05×10^{-3} $Weber/m^2$

(d) 1.05×10^{-4} $Weber/m^2$

108. The magnetic field inside a 200 turns solenoid of radius 10 cm is 2.9×10^{-4} Tesla. If the solenoid carries a current of 0.29 A, then the length of the solenoid is _____ πcm.

JEE MAIN 2025 · 29 JAN · SHIFT 2 *(Numerical)*

109. A solenoid of length 0.5 m has a radius of 1 cm and is made up of 'm' number of turns. It carries a current of 5 A. If the magnitude of the magnetic field inside the solenoid is 6.28×10^{-3} T then the value of m is _____.

JEE MAIN 2024 · 5 APR · SHIFT 2 *(Numerical)*

◆ Toroid 3 Qs

110. The magnetic induction along the axis of a toroidal solenoid is independent of

MHT CET 2024 · 16 MAY · SHIFT 1

(a) number of turns per unit length.

(b) current passing through it.

(c) radius of the toroidal solenoid.

(d) permeability

111. A current of 5 A flows through a toroid having a core of mean radius 20 cm. If 4000 turns of the conducting wire are wound on the core, then the magnetic field inside the core of the toroid is [permeability of free space = $4\pi \times 10^{-7}$ SI units]

MHT CET 2024 · 3 MAY · SHIFT 1

(a) 8×10^{-2} Wb/m^2 (b) 6×10^{-2} Wb/m^2

(c) 5×10^{-2} Wb/m^2 (d) 2×10^{-2} Wb/m^2

112. Two toroids 1 and 2 have total no. of turns 200 and 100 respectively with average radii 40 cm and 20 cm respectively. If they carry same current i, the ratio of the magnetic fields along the two loops is,

NEET 2019

(a) 1 : 2 (b) 1 : 1 (c) 4 : 1 (d) 2 : 1

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TOPIC 04

Moving Charge in a Magnetic Field

58 PYQs · Easy 58 · Medium 0 · Difficult 0 | MHT CET 14 · NEET 17 · JEE 27

Concepts covered: Magnetic force on a moving charge (25) · Circular path: radius & time period (18) · Helical path & pitch (1) · Lorentz force & velocity selector (11) · Cyclotron (3)

LEVEL 1 · EASY 58 questions

◆ Magnetic force on a moving charge 25 Qs

113. When an electron is kept in a strong magnetic field, then
MHT CET 2026 · 15 MAY · SHIFT 1
(a) electron moves in opposite direction of applied magnetic field.
(b) electron moves in the direction of applied magnetic field.
(c) electron moves in the direction of perpendicular direction of magnetic field.
(d) electron remains stationary at the same position.

114. Lorentz magnetic force is acting on a particle of charge q moving with velocity $\vec{V}$ in magnetic field $\vec{B}$. The work done by this force on the charged particle is
MHT CET 2026 · 15 APR · SHIFT 1
(a) zero (b) $\vec{V} \times \vec{B}$
(c) $\vec{V} \times \vec{V}$ (d) $q(\vec{V} \times \vec{B})$

115. Lorentz magnetic force is acting on a particle of charge q moving with velocity $\vec{V}$ in a magnetic field $\vec{B}$. The work done by this force on the charged particle is
MHT CET 2025 · 26 APR · SHIFT 2
(a) zero (b) one (c) infinity (d) $qB \sin\theta$

116. A charged particle is moving along a magnetic field line. What is the magnetic force acting on the particle? $\left(\sin 0^\circ = 0, \sin \frac{\pi}{2} = 1\right)$
MHT CET 2024 · 3 MAY · SHIFT 2
(a) Opposite to its velocity.
(b) Perpendicular to its velocity.
(c) Zero.
(d) Along its velocity.

117. An electron is projected along the axis of circular conductor carrying current I. Electron will experience
MHT CET 2023 · 11 MAY · SHIFT 1
(a) no force.
(b) a force along the axis.
(c) a force at angle 30° with the axis.
(d) a force perpendicular to axis.

118. An electron is projected along the axis of circular conductor carrying current 'I' The electron will experience
MHT CET 2021 · 23 SEP · SHIFT 1
(a) a force perpendicular to axis
(b) a force along the axis
(c) a force at angle 30° with the axis
(d) no force

119. The magnetic force acting on a charged particle of charge $-2\ \mu$C in a magnetic field of 2 T acting in y direction, when the particle velocity is $\left(2\hat{i} + 3\hat{j}\right) \times 10^6\ ms^{-1}$, is
AIPMT 2009
(a) 4 N in z direction (b) 8 N in y direction
(c) 8 N in z direction (d) 8 N in $-$ z direction

120. A particle of mass m, charge Q and kinetic energy T enters a transverse uniform magnetic field of induction $\overrightarrow{B}$. After 3 seconds the kinetic energy of the particle will be
AIPMT 2008
(a) T (b) 4 T (c) 3 T (d) 2 T

121. When a charged particle moving with velocity $\overrightarrow{v}$ is subjected to a magnetic field of induction $\overrightarrow{B}$, the force on it is non-zero. This implies that
AIPMT 2006
(a) angle between is either zero or 180°
(b) angle between is necessarily 90°
(c) angle between can have any value other than 90°
(d) angle between can have any value other than zero and 180°.

122. A charged particle moves through a magnetic field in a direction perpendicular to it. Then the
AIPMT 2003
(a) speed of the particle remains unchanged
(b) direction of the particle remains unchanged
(c) acceleration remains unchanged
(d) velocity remains unchanged

123. Due to earth's magnetic field, the charged cosmic rays particles
AIPMT 1997
(a) can never reach the pole
(b) can never reach the equator
(c) require greater kinetic energy to reach the equator than pole
(d) require less kinetic energy to reach the equator

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than pole.

124. A charge moving with velocity v in X-direction is subjected to a field of magnetic induction in negative X-direction. As a result, the charge will
AIPMT 1993
(a) remain unaffected
(b) start moving in a circular path Y-Z plane
(c) retard along X-axis
(d) moving along a helical path around X-axis

125. A current carrying solenoid is placed vertically and a particle of mass m with charge Q is released from rest. The particle moves along the axis of solenoid. If g is acceleration due to gravity then the acceleration (a) of the charged particle will satisfy:
JEE MAIN 2026 · 21 JAN · SHIFT 1
(a) $a > g$ (b) $a = 0$
(c) $0 < a < g$ (d) $a = g$

126. Given below are two statements. One is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): An electron in a certain region of uniform magnetic field is moving with constant velocity in a straight line path.
Reason (R): The magnetic field in that region is along the direction of velocity of the electron. In the light of the above statements, choose the correct answer from the options given below:
JEE MAIN 2025 · 24 JAN · SHIFT 2
(a) (A) is true but (R) is false
(b) Both (A) and (R) are true and (R) is the correct explanation of (A)
(c) Both $(\mathbf{A})$ and $(\mathbf{R})$ are true but $(\mathbf{R})$ is NOT the correct explanation of (A)
(d) (A) is false but (R) is true

127. The electrostatic force $\left(\vec{F}_1\right)$ and magnetic force $\left(\vec{F}_2\right)$ acting on a charge q moving with velocity v can be written:
JEE MAIN 2024 · 5 APR · SHIFT 2
(a) $\vec{F}_1 = q\vec{B}, \vec{F}_2 = q(\vec{B} \times \vec{v})$
(b) $\vec{F}_1 = q\vec{V} \cdot \vec{E}, \vec{F}_2 = q(\vec{B} \cdot \vec{V})$
(c) $\vec{F}_1 = q\vec{E}, \vec{F}_2 = q(\vec{V} \times \vec{B})$
(d) $\vec{F}_1 = q\vec{E}, \vec{F}_2 = q(\vec{B} \times \vec{V})$

128. An electron is projected with uniform velocity along the axis inside a current carrying long solenoid. Then:
JEE MAIN 2024 · 4 APR · SHIFT 1
(a) the electron will experience a force at 45° to the axis and execute a helical path.
(b) the electron will be accelerated along the axis.
(c) the electron path will be circular about the axis.
(d) the electron will continue to move with uniform velocity along the axis of the solenoid.

129. An electron is moving along the positive x-axis. If the uniform magnetic field is applied parallel to the negative z-axis, then
A. The electron will experience magnetic force along positive y-axis
B. The electron will experience magnetic force along negative y-axis
C. The electron will not experience any force in magnetic field
D. The electron will continue to move along the positive x-axis
E. The electron will move along circular path in magnetic field
Choose the correct answer from the options given below:
JEE MAIN 2023 · 13 APR · SHIFT 2
(a) A and E only (b) B and D only
(c) B and E only (d) C and D only

130. An electron is allowed to move with constant velocity along the axis of current carrying straight solenoid.
A. The electron will experience magnetic force along the axis of the solenoid.
B. The electron will not experience magnetic force.
C. The electron will continue to move along the axis of the solenoid.
D. The electron will be accelerated along the axis of the solenoid.
E. The electron will follow parabolic path-inside the solenoid.
Choose the correct answer from the options given below:
JEE MAIN 2023 · 11 APR · SHIFT 2
(a) B, C and D only (b) B and C only
(c) A and D only (d) B and E only

131. Given below are two statements:
Statement I: The electric force changes the speed of the charged particle and hence changes its kinetic energy; whereas the magnetic force does not change the kinetic energy of the charged particle.
Statement II: The electric force accelerates the positively charged particle perpendicular to the direction of electric field. The magnetic force accelerates the moving charged particle along the direction of magnetic field.
In the light of the above statements, choose the most appropriate answer from the options given below:
JEE MAIN 2022 · 29 JUN · SHIFT 2
(a) Both Statement I and Statement II are correct.
(b) Both Statement I and Statement II are incorrect.
(c) Statement I is correct but Statement II is incorrect.
(d) Statement I is incorrect but Statement II is correct.

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132. Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): In an uniform magnetic field, speed and energy remains the same for a moving charged particle.
Reason (R): Moving charged particle experiences magnetic force perpendicular to its direction of motion.
JEE MAIN 2022 · 24 JUN · SHIFT 1
(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.

133. A charge Q is moving $\vec{dl}$ distance in the magnetic field $\vec{B}$. Find the value of work done by $\vec{B}$.
JEE MAIN 2021 · 16 MAR · SHIFT 2
(a) Zero (b) -1 (c) Infinite (d) 1

134. A charged particle moves through a magnetic field perpendicular to its direction. Then
AIEEE 2007
(a) Kinetic energy changes but the momentum is constant
(b) the momentum changes but the kinetic energy is constant
(c) both momentum and kinetic energy of the particle are not constant
(d) both momentum and kinetic energy of the particle are constant

135. A particle of mass M and charge Q moving with velocity $\vec{v}$ describes a circular path of radius R when subjected to a uniform transverse magnetic field of induction B. The net work done by the field when the particle completes one full circle is
AIEEE 2003
(a) $\left(\frac{Mv^2}{R}\right)2\pi R$ (b) zero
(c) $B\,Q\,2\pi R$ (d) $B\,Qv\,2\pi R$

136. The charged particle moving in a uniform magnetic field of $(3\hat{i}+2\hat{j})$T has an acceleration $\left(4\hat{i}-\frac{x}{2}\hat{j}\right)$m/s^2. The value of x is
JEE MAIN 2026 · 5 APR · SHIFT 1 *(Numerical)*

137. A charge of 4.0μC is moving with a velocity of 4.0×10^6 ms^{-1} along the positive y axis under a magnetic field $\vec{B}$ of strength $(2\hat{k})$T. The force acting on the charge is $x\hat{i}N$. The value of x is _____.
JEE MAIN 2024 · 29 JAN · SHIFT 2 *(Numerical)*

◆ Circular path: radius & time period 18 Qs

138. A charged particle of mass m and charge q travels on a circular path, (of radius 5 unit) is perpendicular to a magnetic field B. The time taken by a particle to complete 10 revolutions is
MHT CET 2026 · 12 MAY · SHIFT 1
(a) $10\pi m/qB$ (b) $20\pi m/qB$
(c) $\pi m/qB$ (d) $5\pi m/qB$

139. A charge moves in a circular path perpendicular to a magnetic field. The time period of revolution is independent of
MHT CET 2026 · 15 APR · SHIFT 2
(a) mass of the particle
(b) velocity of the particle
(c) magnetic field
(d) charge

140. An electron and a proton having the same momenta enter perpendicularly into a magnetic field. What are their trajectories in the field?
MHT CET 2022 · 11 AUG · SHIFT 2
(a) Path of the electron is more curved than that of proton
(b) They will travel undeflected
(c) Path of the proton is more curved than that of the electron
(d) Both the electron and the proton will move along the same curved path but they will move in opposite directions

141. Ionized hydrogen atoms and α-particles with same momenta enters perpendicular to a constant magnetic field, B. The ratio of their radii of their paths rH: r_α will be:
NEET 2019
(a) 1: 2 (b) 4: 1 (c) 1: 4 (d) 2: 1

142. An electron is moving in a circular path under the influence of a transverse magnetic field of 3.57 $\times$ 10-2 T. If the value of e/m is 1.76 $\times$ 1011 C kg^{-}1, the frequency of revolution of the electron is
NEET 2016 · PHASE 2
(a) 1 GHz (b) 100 MHz (c) 62.8 MHz (d) 6.28 MHz

143. Under the influence of a uniform magnetic field, a charged particle moves with constant speed v in a circle of radius R. The time period of rotation of the particle
AIPMT 2009
(a) depends on R and not on v
(b) is independent of both v and R
(c) depends on both v and R
(d) depends on v and not on R

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144. Under the influence of a uniform magnetic field, a charged particle moves with constant speed v in a circle of radius R. The time period of rotation of the particle
AIPMT 2007
(a) depends on R and not on v
(b) is independent of both v and R
(c) depends on both v and R
(d) depends on v and not on R

145. A positively charged particle moving due East enters a region of uniform magnetic field directed vertically upwards. This particle will
AIPMT 1997
(a) move in a circular path with a decreased speed
(b) move in a circular path with a uniform speed
(c) get deflected in vertically upward direction
(d) move in circular path with an increased speed

146. A $10\,\text{eV}$ electron is circulating in a plane at right angles to a uniform field at magnetic induction $10^{-4}\,\text{Wb/m}^2$ (= 1.0 gauss), the orbital radius of electron is
AIPMT 1996
(a) 11 cm (b) 18 cm (c) 12 cm (d) 16 cm

147. A uniform magnetic field acts right angles to the direction of motion of electrons. As a result, the electron moves in a circular path of radius 2 cm. If the speed of electrons is doubled, then the radius of the circular path will be
AIPMT 1991
(a) 2.0 cm (b) 0.5 cm (c) 4.0 cm (d) 1.0 cm

148. A charge particle moves along circular path in a uniform magnetic field in a cyclotron. The kinetic energy of the charge particle increases to 4 times its initial value. What will be the ratio of new radius to the original radius of circular path of the charge particle:
JEE MAIN 2022 · 29 JUN · SHIFT 1
(a) 1: 1 (b) 1: 2 (c) 2: 1 (d) 1: 4

149. A proton and an alpha particle of the same velocity enter in a uniform magnetic field which is acting perpendicular to their direction of motion. The ratio of the radii of the circular paths described by the alpha particle and proton is:
JEE MAIN 2022 · 26 JUN · SHIFT 1
(a) 1: 4 (b) 4: 1 (c) 2: 1 (d) 1: 2

150. Two ions having same mass have charges in the ratio 1: 2. They are projected normally in a uniform magnetic field with their speeds in the ratio 2: 3. The ratio of the radii of their circular trajectories is:
JEE MAIN 2021 · 25 JUL · SHIFT 2
(a) 1: 4 (b) 4: 3 (c) 3: 1 (d) 2: 3

151. A charged particle of mass m and charge q travels on a circular path of radius r that is perpendicular to a magnetic field B. The time taken by the particle to complete one revolution is
AIEEE 2005
(a) $\frac{2\pi q^2 B}{m}$ (b) $\frac{2\pi mq}{B}$ (c) $\frac{2\pi m}{qB}$ (d) $\frac{2\pi qB}{m}$

152. If an electron and a proton having same momentum enter perpendicular to a magnetic field, then
AIEEE 2002
(a) curved path of electron and proton will be same (ignoring the sense of revolution)
(b) they will move undeflected
(c) curved path of electron is more curved than that of the proton
(d) path of proton is more curved.

153. The time period of a charged particle undergoing a circular motion in a uniform magnetic field is independent of its
AIEEE 2002
(a) speed (b) mass
(c) charge (d) magnetic induction

154. A particle of charge 1.6μC and mass 16μ g is present in a strong magnetic field of 6.28 T. The particle is then fired perpendicular to magnetic field. The time required for the particle to return to original location for the first time is _____ s. $(\pi = 3.14)$
JEE MAIN 2025 · 4 APR · SHIFT 2 *(Numerical)*

155. A deuteron and a proton moving with equal kinetic energy enter into a uniform magnetic field at right angle to the field. If rd and rp are the radii of their circular paths respectively, then the ratio $\frac{r_d}{r_p}$ will be $\sqrt{x}$: 1 where x is _____.
JEE MAIN 2022 · 27 JUN · SHIFT 2 *(Numerical)*

◆ Helical path & pitch 1 Q

156. A charge particle moving in magnetic field B, has the components of velocity along B as well as perpendicular to B. The path of the charge particle will be
JEE MAIN 2023 · 8 APR · SHIFT 1
(a) helical path with the axis along magnetic field B
(b) straight along the direction of magnetic field B
(c) circular path
(d) helical path with the axis perpendicular to the direction of magnetic field B

◆ Lorentz force & velocity selector 11 Qs

157. A charge moves with velocity 'V' through electric field (E) as well as magnetic field (B). then the force acting on it is
MHT CET 2021 · 21 SEP · SHIFT 1
(a) $q(\vec{B} \times \vec{V})$ (b) $\text{q}(\overrightarrow{\text{V}} \times \overrightarrow{\text{B}})$
(c) $q\overrightarrow{\text{E}} + q(\vec{V} \times \vec{B})$ (d) $q(\vec{E} \times \vec{V})$

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158. A charge q moves with velocity v through electric field E as well as magnetic field (B). Then, the force acting on it is

MHT CET 2020 · 16 OCT · SHIFT 1

(a) $q(E \times v)$ (b) $q(B \times v)$
(c) $qE + q(v \times B)$ (d) $q(v \times B)$

159. A uniform electric field and a uniform magnetic field are acting along the same direction in a certain region. If an electron is projected in the region such that its velocity is pointed along the direction of fields, then the electron:

NEET 2023

(a) will turn towards right of direction of motion
(b) will turn towards left of direction of motion
(c) speed will decrease
(d) speed will increase

160. A uniform electric field and a uniform magnetic field are acting along the same direction in a certain region. If an electron is projected in the region such that its velocity is pointed along the direction of fields, then the electron

AIPMT 2011 · PRELIMS

(a) will turn towards right of direction of motion
(b) speed will decrease
(c) speed will increase
(d) will turn towards left of direction of motion

161. A charge q moves in a region where electric field and magnetic field both exist, then force on it is

AIPMT 2002

(a) $q\left(\vec{v} \times \vec{B}\right)$ (b) $q\vec{E} + q\left(\vec{v} \times \vec{B}\right)$
(c) $q\vec{E} + \vec{q}\left(\vec{B} \times \vec{v}\right)$ (d) $q\vec{B} + \vec{q}\left(\vec{E} \times \vec{v}\right)$

162. A beam of electrons is moving with constant velocity in a region having electric and magnetic fields of strength $20\ \mathrm{V\,m^{-1}}$ and $0.5\ \mathrm{T}$ at right angles to the direction of motion of the electrons. What is the velocity of the electrons?

AIPMT 1996

(a) $8\ \mathrm{m\,s^{-1}}$ (b) $5.5\ \mathrm{m\,s^{-1}}$
(c) $20\ \mathrm{m\,s^{-1}}$ (d) $40\ \mathrm{m\,s^{-1}}$

163. A particle of charge 16×10^{-16} C moving with velocity $10\ \mathrm{ms^{-1}}$ along x-axis enters a region where magnetic field of induction $\vec{B}$ is along the y-axis and an electric field of magnitude $10^4\ \mathrm{Vm^{-1}}$ is along the negative z-axis. If the charged particle continues moving along x-axis, the magnitude of $\vec{B}$ is:

JEE MAIN 2013 · 23 APR · SHIFT 1

(a) $16 \times 10^3\ \mathrm{Wb\ m^{-2}}$ (b) $2 \times 10^3\ \mathrm{Wb\ m^{-2}}$
(c) $1 \times 10^3\ \mathrm{Wb\ m^{-2}}$ (d) $4 \times 10^3\ \mathrm{Wb\ m^{-2}}$

164. A charged particle with charge q enters a region of constant, uniform and mutually orthogonal fields $\vec{E}$ and $\vec{B}$ with a velocity $\vec{v}$ perpendicular to both $\vec{E}$ and $\vec{B}$, and comes out without any change in magnitude or direction of $\vec{v}$. Then

AIEEE 2007

(a) $\vec{v} = \vec{B} \times \vec{E}/E^2$ (b) $\vec{v} = \vec{E} \times \vec{B}/B^2$
(c) $\vec{v} = \vec{B} \times \vec{E}/B^2$ (d) $\vec{v} = \vec{E} \times \vec{B}/E^2$

165. In a region, steady and uniform electric and magnetic fields are present. These two fields are parallel to each other. A charged particle is released from rest in this region. The path of the particle will be a

AIEEE 2006

(a) helix (b) straight line
(c) ellipse (d) circle

166. A uniform electric field and a uniform magnetic field are acting along the same direction in a certain region. If an electron is projected along the direction of the fields with a certain velocity then

AIEEE 2005

(a) its velocity will increase
(b) Its velocity will decrease
(c) it will turn towards left of a direction of motion
(d) it will turn towards right of direction of motion

167. A particle of charge -16×10^{-18} coulomb moving with velocity $10ms^{-1}$ along the x-axis enters a region where a magnetic field of induction B is along the y-axis, and an electric field of magnitude $10^4 V/m$ is along the negative z-axis. If the charged particle continues moving along the x-axis, the magnitude of B is

AIEEE 2003

(a) $10^3 Wb/m^2$ (b) $10^5 Wb/m^2$
(c) $10^{16} Wb/m^2$ (d) $10^{-3} Wb/m^2$

◆ Cyclotron 3 Qs

168. In the cyclotron, as radius of the circular path of the charged particle increases, (ω = angular velocity, V = linear velocity)

MHT CET 2026 · 17 APR · SHIFT 2

(a) V increases, ω decreases.
(b) V increases, ω remains constant.
(c) only ω increases, V remains constant.
(d) both ω and V increase.

169. Cyclotron is used to

MHT CET 2024 · 2 MAY · SHIFT 2

(a) accelerate neutrons.
(b) accelerate positively charged particles only.
(c) accelerate negatively charged particles only.
(d) accelerate positively and negatively charged particles.

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170. Maximum kinetic energy gained by the charged particle in the cyclotron is independent of

MHT CET 2019 · 3 MAY · SHIFT 1

(a) radius of the dees
(b) charge
(c) mass
(d) frequency of revolution

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TOPIC 05

Force on Current-Carrying Conductors

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

Concepts covered: Force on a straight conductor (5) · Closed loops & bent wires in a uniform field (4) · Balancing a conductor: hanging wire & incline (2) · Force between parallel wires (18) · Loop near a long wire (1)

LEVEL 1 · EASY 30 questions

◆ Force on a straight conductor 5 Qs

171. A wire carrying current 'I' along x axis has length 'L' and it is kept in a magnetic field $B(\hat{i}+2\hat{j}-2\hat{k})$ T. The magnitude of magnetic force acting on the wire is

MHT CET 2026 · 16 APR · SHIFT 1

(a) $\sqrt{8}$ ILB (b) 2 ILB (c) 4 ILB (d) $\sqrt{2}$ ILB

172. A wire of length L carries current I along x - axis. A magnetic field $\vec{B} = B_0(\hat{i}-\hat{j}-\hat{k})$T acts on the wire. The magnitude of magnetic force acting on the wire is

MHT CET 2025 · 22 APR · SHIFT 2

(a) $\frac{ILB_0}{2}$ (b) ILB_0 (c) $2ILB_0$ (d) $\sqrt{2}ILB_0$

173. A wire carrying a current I along the positive x-axis has length L. It is kept in a magnetic field $\vec{B} = (2\hat{i}+3\hat{j}-\hat{k})$T. The magnitude of the magnetic force acting on the wire is:

NEET 2023

(a) $\sqrt{5}$ IL (b) 5 IL (c) $\sqrt{3}$ IL (d) 3 IL

174. A straight wire of length 0.5 metre and carrying a current of 1.2 ampere is placed in uniform magnetic field of induction 2 tesla. The magnetic field is perpendicular to the length of the wire. The force on the wire is

AIPMT 1992

(a) 2.4 N (b) 1.2 N (c) 3.0 N (d) 2.0 N

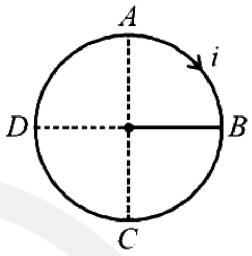
175. A 4.0 cm long straight wire carrying a current of 8 A is placed perpendicular to a uniform magnetic field of strength 0.15 T. The magnetic force on the wire is _____mN.

JEE MAIN 2025 · 3 APR · SHIFT 1 *(Numerical)*

◆ Closed loops & bent wires in a uniform field 4 Qs

176. A circular coil ABCD carrying a current 'i' is placed in a uniform magnetic field. If the magnetic force on the segment AB is $\vec{F}$, the force on the remaining segment BCDA is

NEET 2013



(a) $-\vec{F}$ (b) $3\vec{F}$ (c) $-3\vec{F}$ (d) $\vec{F}$

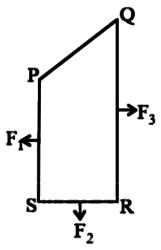
177. A square current carrying loop is suspended in a uniform magnetic field acting in the plane of the loop. If the force on one arm of the loop is $\vec{F}$, the net force on the remaining three arms of the loop is

AIPMT 2010 · PRELIMS

(a) $3\vec{F}$ (b) $-\vec{F}$ (c) $-3\vec{F}$ (d) $\vec{F}$

178. A closed loop PQRS carrying a current is placed in a uniform magnetic field. If the magnetic forces on segments PS, SR and RQ are F1, F2 and F3 respectively and are in the plane of the paper and along the directions shown, the force on the segment QP is

AIPMT 2008



(a) $\sqrt{(F_3-F_1)^2-F_2^2}$ (b) $F_3-F_1+F_2$

(c) $F_3-F_1-F_2$ (d) $\sqrt{(F_3-F_1)^2+F_2^2}$

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179. A loop of flexible wire of irregular shape carrying current is placed in an external magnetic field. Identify the effect of the field on the wire.

JEE MAIN 2021 · 18 MAR · SHIFT 1

(a) Loop assumes circular shape with its plane normal to the field.
(b) Loop assumes circular shape with its plane parallel to the field.
(c) Wire gets stretched to become straight.
(d) Shape of the loop remains unchanged.

◆ Balancing a conductor: hanging wire & incline 2 Qs

180. A long straight wire of length 2 m and mass 250 g is suspended horizontally in a uniform horizontal magnetic field of 0.7 T. The amount of current flowing through the wire will be $\left(g = 9.8\ ms^{-2}\right)$:

NEET 2023

(a) 2.45 A (b) 2.25 A (c) 2.75 A (d) 1.75 A

181. A straight wire AB of mass 40 g and length 50 cm is suspended by a pair of flexible leads in uniform magnetic field of magnitude 0.40 T as shown in the figure. The magnitude of the current required in the wire to remove the tension in the supporting leads is _____ A.
(Take $g = 10\ ms^{-2}$).

JEE MAIN 2023 · 13 APR · SHIFT 2 *(Numerical)*



◆ Force between parallel wires 18 Qs

182. The currents through two thin long parallel wires, A and B carrying I and $\frac{I}{3}$ respectively, in the same direction. The distance between two wires is 'd'. The magnitude of force per unit length exerted by wire A on wire B is

MHT CET 2026 · 19 MAY · SHIFT 2

(a) $\frac{\mu_0 I^2}{6\pi d}$ (b) $\frac{\mu_0 I^2}{3\pi d}$ (c) $\frac{\mu_0 I}{3\pi d}$ (d) $\frac{\mu_0 I}{6\pi d}$

183. Two thin long parallel wires, W_1 and W_2 separated by distance 'a', carry currents i and $3i$ respectively in the same direction. The magnitude of the force per unit length exerted by wire W_1 on wire W_2 is

MHT CET 2026 · 19 APR · SHIFT 1

(a) $\frac{\mu_0 i^2}{2\pi a}$ (b) $\frac{\mu_0 i^2}{\pi a}$ (c) $\frac{3\mu_0 i^2}{2\pi a}$ (d) $\frac{2\mu_0 i^2}{3\pi a}$

184. Two long straight wires are arranged parallel to each other and are kept 20 cm apart in vacuum. They carry currents of 2 A and 4 A respectively in the same direction. What will be the magnetic force on a length of 10 cm of either wire?
($\mu_0 = 4\pi \times 10^{-7}$ SI units)

MHT CET 2026 · 13 APR · SHIFT 2

(a) 10^{-7} N (b) 2×10^{-7} N
(c) 4×10^{-7} N (d) 8×10^{-7} N

185. Two long straight wires A and B carrying equal current 'I' were kept parallel to each other at distance 'd' apart. Magnitude of magnetic force experienced by length L of wire A is 'F'. If the distance between the wires is made half and currents are doubled, force F_2 on length L of wire A will be

MHT CET 2025 · 19 APR · SHIFT 1

(a) 2F (b) F (c) 8F (d) 4F

186. Two parallel wires separated by distance 'b' are carrying equal current 'I' in the same direction. The force per unit length of the wire is

MHT CET 2024 · 15 MAY · SHIFT 1

(a) $\frac{\mu_0}{4\pi}\left(\frac{I}{b^2}\right)$ (b) $\frac{\mu_0}{4\pi}\left(\frac{I^2}{b^2}\right)$ (c) $\frac{\mu_0}{4\pi}\left(\frac{I^2}{b}\right)$ (d) $\frac{\mu_0}{4\pi}\left(\frac{2I^2}{b}\right)$

187. Two wires 2 mm apart supply current to a 100 V, 1 kW heater. The force per metre between the wires is ($\mu_0 = 4\pi \times 10^{-7}$ SI unit)

MHT CET 2023 · 10 MAY · SHIFT 2

(a) 2×10^{-2} N (b) 4×10^{-3} N
(c) 2×10^{2} N (d) 10^{-2} N

188. 10 A current is flowing in two straight parallel wires in the same direction. Force of attraction between them is 1×10^{-3} N. If the current is doubled in both the wires the force will be

MHT CET 2023 · 9 MAY · SHIFT 2

(a) 1×10^{-3} N (b) 2×10^{-3} N
(c) 4×10^{-3} N (d) 0.25×10^{-3} N

189. Two parallel conductors carrying unequal currents in the same direction .....

MHT CET 2019 · 2 MAY · SHIFT 1

(a) neither attract nor repel each other
(b) repel each other
(c) attract each other
(d) will have rotational motion.

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190. Two very long, straight, parallel conductors A and B carry current of 5 A and 10 A respectively and are at a distance of 10 cm from each other. The direction of current in two conductors is same. The force acting per unit length between two conductors is: ($\mu_0 = 4\pi \times 10^{-7}$ SI unit)

NEET 2022 · PHASE 2

(a) 1×10^{-4} Nm^{-1} and is repulsive
(b) 2×10^{-4} Nm^{-1} and is attractive
(c) 2×10^{-4} Nm^{-1} and is repulsive
(d) 1×10^{-4} Nm^{-1} and is attractive

191. Two long parallel wires are at a distance of 1 m. Both of them carry one ampere of current. The force of attraction per unit length between the two wires is

AIPMT 1998

(a) 2×10^{-7} N/m (b) 2×10^{-8} N/m
(c) 5×10^{-8} N/m (d) 10^{-7} N/m

192. Two parallel wires in free space are 10 cm apart and each carries a current of 10 A in the same direction. The force exerted by one wire on the other, per metre length is

AIPMT 1997

(a) 2×10^{-4} N, repulsive
(b) 2×10^{-7} N, repulsive
(c) 2×10^{-4} N, attractive
(d) 2×10^{-7} N, attractive

193. Two long straight wires P and Q carrying equal current 10A each were kept parallel to each other at 5 cm distance. Magnitude of magnetic force experienced by 10 cm length of wire P is F_1. If distance between wires is halved and currents on them are doubled, force F_2 on 10 cm length of wire P will be:

JEE MAIN 2023 · 24 JAN · SHIFT 1

(a) $\frac{F_1}{8}$ (b) 10 F_1 (c) $\frac{F_1}{10}$ (d) 8 F_1

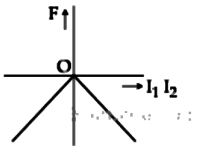
194. Two parallel, long wires are kept 0.20 m apart in vacuum, each carrying current of x A in the same direction. If the force of attraction per meter of each wire is 2×10^{-6} N, then the value of x is approximately:

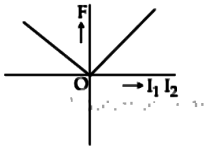
JEE MAIN 2022 · 28 JUN · SHIFT 2

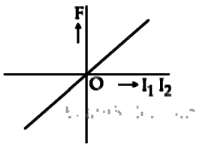
(a) 1 (b) 2.4 (c) 1.4 (d) 2

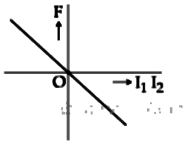
195. Two long straight parallel wires, carrying (adjustable) currents I1 and I2, are kept at a distance d apart. If the force 'F' between the two wires is taken as 'positive' when the wires repel each other and 'negative' when the wires attract each other, the graph showing the dependence of 'F', on the product I1I2, would be:

JEE MAIN 2015 · 11 APR · SHIFT 1

(a) 

(b) 

(c) 

(d) 

196. Two thin, long, parallel wires, separated by a distance $'d'$ carry a current of $'i'$ A in the same direction. They will

AIEEE 2005

(a) repel each other with a force of $\mu_0 i^2/(2\pi d)$
(b) attract each other with a force of $\mu_0 i^2/(2\pi d)$
(c) repel each other with a force of $\mu_0 i^2/(2\pi d^2)$
(d) attract each other with a force of $\mu_0 i^2/(2\pi d^2)$

197. Two long conductors, separated by a distance d carry current I_1 and I_2 in the same direction. They exert a force F on each other. Now the current in one of them is increased to two times and its direction is reversed. The distance is also increased to $3d$. The new value of the force between them is

AIEEE 2004

(a) $-\frac{2F}{3}$ (b) $\frac{F}{3}$ (c) $-2F$ (d) $-\frac{F}{3}$

198. If a current is passed through a spring then the spring will

AIEEE 2002

(a) expand (b) compress
(c) remain same (d) none of these

199. Two 10 cm long, straight wires, each carrying a current of 5A are kept parallel to each other. If each wire experienced a force of 10^{-5} N, then separation between the wires is _____ cm.

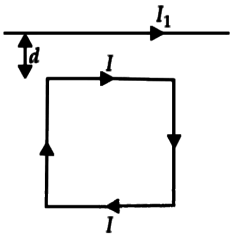
JEE MAIN 2022 · 26 JUN · SHIFT 2 *(Numerical)*

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◆ Loop near a long wire 1 Q

200. A square loop, carrying a steady current I, is placed in a horizontal plane near a long straight conductor carrying a steady current I_1 at a distance d from the conductor as shown in figure. The loop will experience

AIPMT 2011 · MAINS



(a) a net attractive force towards the conductor
(b) a net repulsive force away from the conductor
(c) a net torque acting upward perpendicular to the horizontal plane
(d) a net torque acting downward normal to horizontal plane

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TOPIC 06

Current Loop as a Magnetic Dipole

25 PYQs · Easy 25 · Medium 0 · Difficult 0 | MHT CET 16 · NEET 6 · JEE 3

Concepts covered: Magnetic moment of a current loop (6) · Orbiting electron: moment & gyromagnetic ratio (10) · Torque on a coil (8) · Potential energy, work & equilibrium (1)

LEVEL 1 · EASY 25 questions

◆ Magnetic moment of a current loop 6 Qs

201. The magnetic moments associated with two closely wound circular coils a and b of radius r and $2r$ respectively are equal if (where N_a, I_a and N_b, I_b are number of turns and current in A and B respectively)
MHT CET 2026 · 13 APR · SHIFT 2
(a) $2N_aI_a = N_bI_b$ (b) $N_a = 2N_b$
(c) $N_aI_a = 4N_bI_b$ (d) $4N_aI_a = N_bI_b$

202. The magnetic moment of a current (I) carrying circular coil of radius 'r' and number of turns 'n' depends on
MHT CET 2023 · 12 MAY · SHIFT 1
(a) n only (b) I only
(c) r only (d) n, I and r

203. A 2 amp current is flowing through two different small circular copper coils having radii ratio $1:2$. The ratio of their respective magnetic moments will be
NEET 2025
(a) $2:1$ (b) $4:1$ (c) $1:4$ (d) $1:2$

204. A wire of length L metre carrying a current of I ampere is bent in the form of a circle. Its magnetic moment is
NEET 2020 · PHASE 2
(a) $IL^2/4\pi$ A m^2 (b) $IL^2/4$ A m^2
(c) $I\pi L^2/4$ A m^2 (d) $2IL^2/\pi$ A m^2

205. If number of turns, area and current through a coil is given by n, A and i respectively then its magnetic moment will be
AIPMT 2001
(a) niA (b) n^2iA (c) niA^2 (d) $\frac{ni}{\sqrt{A}}$

206. The magnetic moments associated with two closely wound circular coils A and B of radius $r_A = 10$ cm and $r_B = 20$ cm respectively are equal if: (Where N_A, I_A and N_B, I_B are number of turns and current of A and B respectively)
JEE MAIN 2023 · 30 JAN · SHIFT 1
(a) $4\,N_AI_A = N_BI_B$ (b) $2\,N_AI_A = N_BI_B$
(c) $N_A = 2\,N_B$ (d) $N_AI_A = 4\,N_BI_B$

◆ Orbiting electron: moment & gyromagnetic ratio 10 Qs

207. A particle of charge 'q' and mass 'm' moves in a circular orbit of radius 'r' with angular speed 'ω'. The ratio of the magnitude of its magnetic moment to that of its angular momentum depends upon
MHT CET 2026 · 18 APR · SHIFT 2
(a) q and m (b) ω and m
(c) ω and q (d) ω, q and m

208. In hydrogen atom, an electron of charge 'e' revolves in an orbit of radius ' r ' with speed ' v '. The magnetic moment associated with electron is
MHT CET 2025 · 23 APR · SHIFT 2
(a) $\frac{evr}{3}$ (b) $\frac{evr}{2}$ (c) evr (d) $\sqrt{2}$evr

209. Let the current ' I ' be associated with an electron of charge ' e ' moving in a circular orbit of radius ' r ' with speed ' v ' around the positively charged nucleus. The ratio $\frac{r}{v}$ is
MHT CET 2025 · 23 APR · SHIFT 1
(a) $\frac{eI}{2\pi}$ (b) $\frac{2\pi}{eI}$ (c) $\frac{e}{2\pi I}$ (d) $\frac{2eI}{\pi}$

210. The ratio of angular momentum L of an electron to the magnetic dipole moment $\vec{m}_{orb}$ is (' m ' is mass of electron, ' e ' is charge on electron)
MHT CET 2025 · 19 APR · SHIFT 1
(a) $\frac{e}{m}$ (b) $\frac{2m}{e}$ (c) $\frac{e}{2m}$ (d) $\frac{m}{e}$

211. A particle of charge 'q' and mass 'm' moves in a circular orbit of radius 'r' with angular speed 'ω'. The ratio of the magnitude of its magnetic moment to that of its angular momentum depends on
MHT CET 2021 · 24 SEP · SHIFT 2
(a) ω and q (b) ω and m
(c) q and m (d) ω, q and m

212. An electron in a circular orbit of radius 0.05 nm performs 10^{16} revolutions/second. What is the magnetic moment due to the rotation of electron? ($e = 1.6 \times 10^{-19}$C)
MHT CET 2021 · 23 SEP · SHIFT 2
(a) 3.21×10^{-23} (b) 2.16×10^{-23}
(c) 3.21×10^{-22} (d) 1.26×10^{-23}

213. Magnetic moment of revolving electron of charge (e) and mass (m) in terms of angular momentum (L) of electron is:
MHT CET 2021 · 21 SEP · SHIFT 2
(a) $\frac{eL}{8m}$ (b) $\frac{eL}{4m}$ (c) $\frac{eL}{2m}$ (d) $\frac{eL}{m}$

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214. The relation between magnetic moment 'M' of revolving electron and principle quantum number 'n' is
MHT CET 2021 · 20 SEP · SHIFT 2
(a) $M \propto \frac{1}{n}$ (b) $M \propto n$ (c) $M \propto n^2$ (d) $M \propto n^3$

215. If the charge to mass ratio of an electron is 'A' C/kg, then the gyromagnetic ratio of an orbital electron in C/kg is
MHT CET 2021 · 20 SEP · SHIFT 1
(a) $\frac{A}{4}$ (b) A (c) 2A (d) $\frac{A}{2}$

216. In a hydrogen atom, an electron of charge e revolves in a orbit of radius r with speed v. Then, magnetic moment associated with electron is
MHT CET 2019 · 3 MAY · SHIFT 1
(a) $\frac{evr}{2}$ (b) 2 evr (c) evr (d) $\frac{evr}{3}$

◆ Torque on a coil 8 Qs

217. A rectangular coil of n turns has area $\vec{A}$ and it is placed in uniform magnetic field $\vec{B}$. If the current passing through the coil is 'I' then the torque acting on the coil is
MHT CET 2026 · 20 MAY · SHIFT 1
(a) $\frac{I}{n}(\vec{A} \times \vec{B})$ (b) $nI(\vec{A} \cdot \vec{B})$
(c) $nI(\vec{A} \times \vec{B})$ (d) $\frac{n}{I}(\vec{A} \cdot \vec{B})$

218. Torque acting on a coil carrying current 'I' situated parallel to magnetic field of induction 'B' having of turns 'n' and area 'A' is
MHT CET 2026 · 16 APR · SHIFT 1
(a) $nI(\vec{A} \cdot \vec{B})$ (b) $nI(\vec{A} \times \vec{B})$
(c) IBA/n (d) nBA/I

219. A current carrying loop is placed in a uniform magnetic field. The torque acting on the loop does not depend upon
MHT CET 2021 · 24 SEP · SHIFT 1
(a) area of loop
(b) number of turns in the loop
(c) shape of the loop
(d) strength of the magnetic field

220. Torque acting on a rectangular coil carrying current ' i ' situated parallel to magnetic field of induction ' B ', having number of turns ' n ' and area ' A ' is
MHT CET 2019 · 2 MAY · SHIFT 2
(a) $ni(\hat{A} \cdot \hat{B})$ (b) $\frac{nBA}{i}$
(c) $ni(\mathbf{A} \times \mathbf{B})$ (d) $\frac{iBA}{n}$

221. A circular loop of area $0.01\ \mathrm{m}^2$ carrying a current of $10\ \mathrm{A}$, is held perpendicular to a magnetic field of intensity $0.1\ \mathrm{T}$. The torque acting on the loop is
AIPMT 1994
(a) $0.001\ \mathrm{N\ m}$ (b) $0.8\ \mathrm{N\ m}$
(c) zero (d) $0.01\ \mathrm{N\ m}$

222. A coil carrying electric current is placed in uniform magnetic field
AIPMT 1993
(a) torque is formed
(b) e.m.f is induced
(c) both (a) and (b) are correct
(d) none of these

223. A current carrying coil is subjected to a uniform magnetic field. The coil will orient so that its plane becomes
AIPMT 1988
(a) inclined at 45° to the magnetic field
(b) inclined at any arbitrary angle to the magnetic field
(c) parallel to the magnetic field
(d) perpendicular to magnetic field

224. A galvanometer coil has 500 turns and each turn has an average area of 3 × 10–4 m2. If a torque of 1.5 Nm is required to keep this coil parallel to a magnetic field when a current of 0.5 A is flowing through it, the strength of the field (in T) is _____.
JEE MAIN 2020 · 3 SEP · SHIFT 2 *(Numerical)*

◆ Potential energy, work & equilibrium 1 Q

225. A magnetic dipole in a constant magnetic field has:
JEE MAIN 2017 · 8 APR · SHIFT 1
(a) maximum potential energy when the torque is maximum.
(b) zero potential energy when the torque is minimum.
(c) zero potential energy when the torque is maximum.
(d) minimum potential energy when the torque is maximum.

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TOPIC 07

Moving Coil Galvanometer, Ammeter & Voltmeter

14 PYQs · Easy 14 · Medium 0 · Difficult 0 | MHT CET 6 · NEET 7 · JEE 1

Concepts covered: Moving coil galvanometer & sensitivity (3) · Ammeter: shunt (7) · Voltmeter: series resistance (4)

LEVEL 1 · EASY 14 questions

◆ Moving coil galvanometer & sensitivity 3 Qs

226. If the number of turns in the coil of a moving coil galvanometer decreases, the resistance of the galvanometer,

MHT CET 2026 · 13 APR · SHIFT 1

(a) decreases
(b) increases
(c) remains the same
(d) may increase or decrease

227. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V. The resistance of the galvanometer is

NEET 2018

(a) 40 Ω (b) 25 Ω (c) 250 Ω (d) 500 Ω

228. The current sensitivity of a galvanometer can be increased by:
(A) decreasing the number of turns
(B) increasing the magnetic field
(C) decreasing the area of the coil
(D) decreasing the torsional constant of the spring
Choose the most appropriate answer from the options given below:

JEE MAIN 2022 · 28 JUL · SHIFT 1

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

◆ Ammeter: shunt 7 Qs

229. An ammeter has resistance R and range I. What resistance should be connected in parallel with it to increase its range by nI?

MHT CET 2026 · 13 MAY · SHIFT 2

(a) $\frac{R}{(n-1)}$ (b) $\frac{R}{(n+1)}$ (c) $\frac{R}{n}$ (d) Rn

230. The value of shunt resistance that allows 5 % of the main current through the galvanometer of 100 Ω is nearly

MHT CET 2026 · 12 MAY · SHIFT 1

(a) 4 Ω. (b) 5 Ω. (c) 7 Ω. (d) 8 Ω.

231. The current passing through the galvanometer is 4 % of the total current in the curcuit. If the resistance of the galvanometer is 'G', the shunt resistance 'S' connected across the galvanometer is

MHT CET 2026 · 17 APR · SHIFT 2

(a) $25\,G$ (b) $24\,G$ (c) $\frac{G}{24}$ (d) $\frac{G}{25}$

232. If a galvanometer is shunted by $\left(\frac{1}{n-1}\right)^{th}$ of the value of its resistance, then the fraction of the total current passing through the galvanometer is

MHT CET 2026 · 15 APR · SHIFT 1

(a) $\frac{1}{(n-1)}$ (b) $\frac{1}{n}$ (c) $\frac{n}{(n-1)}$ (d) $\frac{1}{1-n}$

233. In an ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be

AIPMT 2014

(a) $\frac{1}{499}G$ (b) $\frac{499}{500}G$ (c) $\frac{1}{500}G$ (d) $\frac{500}{499}G$

234. A galvanometer havings a coil resistance of 60 Ω shows full scale deflection when a current of 1.0 amp passes through it. It can be converted into an ammeter to read currents upto 5.0 amp by

AIPMT 2009

(a) putting in series a resistance of 15 Ω
(b) putting in series a resistance of 240 Ω
(c) putting in parallel a resistance of 15 Ω
(d) putting in parallel a resistance of 240 Ω

235. To convert a galvanometer into a ammeter, one needs to connect a

AIPMT 1992

(a) low resistance in parallel
(b) high resistance in parallel
(c) low resistance in series
(d) high resistance in series

◆ Voltmeter: series resistance 4 Qs

236. A galvanometer has resistance G and range Vg. How much resistance is required to read voltage up to V volt?

MHT CET 2026 · 16 APR · SHIFT 2

(a) GV_g (b) $G\left(\frac{V-V_g}{V}\right)$
(c) $G\left(\frac{V}{V_g}-1\right)$ (d) $G\left(\frac{V+V_g}{V}\right)$

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237. A galvanometer has a coil of resistance 100 ohm and gives a full scale deflection for 30 mA current. If it is to work as a voltmeter of 30 volt range, the resistance required to be added will be

AIPMT 2010 · PRELIMS

(a) 900 Ω (b) 1800 Ω (c) 500 Ω (d) 1000 Ω

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238. To convert a galvanometer into a voltmeter one should connect a

AIPMT 2004

(a) high resistance in series with galvanometer
(b) low resistance in series with galvanometer
(c) high resistance in parallel wilh galvanometer
(d) low resistance in parallel with galvanometer.

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239. To convert a galvanometer into a voltmeter one should connect a

AIPMT 2002

(a) high resistance in series with galvanometer
(b) low resistance in series with galvanometer
(c) high resistance in parallel with galvanometer
(d) low resistance in parallel with galvanometer.

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TOPIC 08

Other: Induction & Displacement Current

9 PYQs · Easy 9 · Medium 0 · Difficult 0 | MHT CET 6 · NEET 2 · JEE 1

Concepts covered: Electromagnetic induction (4) · Displacement current & magnetic materials (5)

LEVEL 1 · EASY 9 questions

◆ Electromagnetic induction 4 Qs

240. A square of side ' L ' metre lies in $x-y$ plane in a region where the magnetic field is $\overline{\mathrm{B}}$ and $\vec{B}=B_0(2\hat{i}+3\hat{j}+4\hat{k})$, where B_0 is constant. The magnitude of flux passing through the square (in weber) is

MHT CET 2025 · 25 APR · SHIFT 1

(a) $\sqrt{29}\,\mathrm{B_0\,L^2}$ (b) $4\,\mathrm{B_0\,L^2}$
(c) $2\,\mathrm{B_0\,L^2}$ (d) $3\,\mathrm{B_0\,L^2}$

241. A boat is moving due east in a region where the earth's magnetic field is $3.6\times10^{-5}\,\mathrm{N/Am}$ due north and horizontal. The boat carries a vertical conducting rod 2 m long. If the speed of the boat is $2.00\,\mathrm{m/s}$, the magnitude of the induced e.m.f. in the rod is

MHT CET 2024 · 11 MAY · SHIFT 1

(a) 1.4 mV (b) 0.72 mV (c) 0.54 mV (d) 0.144 mV

242. The magnetic potential energy stored in certain inductor is $64\times10^{-3}\,\mathrm{J}$, when the current in the inductor is 80 mA. This inductor is of inductance

MHT CET 2024 · 9 MAY · SHIFT 2

(a) 0.20 H (b) 2.0 H (c) 20 H (d) 200 H

243. A metal conductor of length 1 m rotates vertically about one of its ends at an angular velocity of $5\,\mathrm{rad/s}$. If horizontal component of earth's magnetic field is $0.2\times10^{-4}\,\mathrm{T}$, then the e.m.f. developed between the two ends of the conductor is

MHT CET 2021 · 20 SEP · SHIFT 2

(a) 5 μV (b) 50 mV (c) 5 mV (d) 50 μV

◆ Displacement current & magnetic materials 5 Qs

244. A cylindrical magnetic rod has length 5 cm and diameter 1 cm . It has uniform magnetization $5.3\times10^{3}\,\mathrm{A/m^3}$. Its net magnetic dipole moment is nearly

MHT CET 2023 · 11 MAY · SHIFT 1

(a) $1\times10^{-2}\,\mathrm{J/T}$ (b) $0.5\times10^{-2}\,\mathrm{J/T}$
(c) $2.5\times10^{-2}\,\mathrm{J/T}$ (d) $2\times10^{-2}\,\mathrm{J/T}$

245. The magnetic dipole moment of a short magnetic dipole at a distant point along the equator of magnet has a magnitude of ' X ' in SI units. If the distance between the point and the magnet is halved then the magnitude of dipole moment will be

MHT CET 2019 · 2 MAY · SHIFT 2

(a) $2x$ (b) $\frac{1}{2}x$ (c) X (d) $\frac{1}{8}x$

246. A parallel plate capacitor made of circular plates is being charged such that the surface charge density on its plates is increasing at a constant rate with time. The magnetic field arising due to displacement current is:

NEET 2025

(a) Non-zero everywhere with maximum at the imaginary cylindrical surface connecting peripheries of the plates
(b) Zero between the plates and non-zero outside
(c) Zero at all places
(d) Constant between the plates and zero outside the plates

247. A parallel plate capacitor is charged by connecting it to a battery through a resistor. If I is the current in the circuit, then in the gap between the plates:

NEET 2024

(a) There is no current
(b) Displacement current of magnitude equal to I flows in the same direction as I
(c) Displacement current of magnitude equal to I flows in a direction opposite to that of I
(d) Displacement current of magnitude greater than I flows but can be in any direction

248. The source of time varying magnetic field may be

(A) a permanent magnet
(B) an electric field changing linearly with time
(C) direct current
(D) a decelerating charge particle
(E) an antenna fed with a digital signal

Choose the correct answer from the options given below:

JEE MAIN 2023 · 13 APR · SHIFT 1

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

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ANSWER KEY

Shaded by level: **Easy**

01 Biot-Savart Law & Circular Coils

1. (c)	2. (c)	3. (b)	4. (b)	5. (b)	6. (d)	7. (a)	8. (c)	9. (d)	10. (c)
11. (c)	12. (a)	13. (c)	14. (c)	15. (b)	16. (a)	17. 3	18. (b)	19. (a)	20. (b)
21. (d)	22. (b)	23. (c)	24. (c)	25. (b)	26. (b)	27. (b)	28. (c)	29. (b)	30. (d)
31. (b)	32. (d)	33. (b)	34. (c)	35. (d)	36. 2	37. (b)	38. (c)	39. (a)	40. (c)
41. (d)	42. (a)	43. (d)	44. 628						

02 Magnetic Field of Straight Wires

45. (d)	46. (b)	47. (b)	48. (b)	49. (d)	50. (b)	51. (d)	52. (d)	53. (a)	54. (a)
55. (a)	56. (d)	57. (b)	58. (b)	59. (d)	60. (d)	61. (c)	62. (b)	63. (b)	64. 160
65. (a)									

03 Ampere's Law, Cylinders, Solenoid & Toroid

66. (a)	67. (c)	68. (c)	69. (a)	70. (a)	71. (c)	72. (d)	73. (c)	74. (a)	75. (b)
76. (d)	77. (b)	78. (c)	79. (b)	80. (c)	81. (d)	82. (b)	83. (d)	84. (d)	85. (d)
86. (b)	87. (d)	88. (d)	89. (a)	90. (d)	91. (c)	92. (d)	93. (b)	94. (c)	95. (c)
96. (c)	97. (b)	98. (a)	99. (d)	100. (c)	101. (b)	102. (d)	103. (b)	104. (c)	105. (a)
106. (a)	107. (a)	108. 8	109. 500	110. (c)	111. (d)	112. (b)			

04 Moving Charge in a Magnetic Field

113. (d)	114. (a)	115. (a)	116. (c)	117. (a)	118. (d)	119. (d)	120. (a)	121. (d)	122. (a)
123. (c)	124. (a)	125. (d)	126. (b)	127. (c)	128. (d)	129. (c)	130. (b)	131. (c)	132. (a)
133. (a)	134. (b)	135. (b)	136. 12	137. 32	138. (b)	139. (b)	140. (d)	141. (d)	142. (a)
143. (b)	144. (b)	145. (b)	146. (a)	147. (c)	148. (c)	149. (c)	150. (b)	151. (c)	152. (a)
153. (a)	154. 0	155. 2	156. (a)	157. (c)	158. (c)	159. (c)	160. (b)	161. (b)	162. (d)
163. (c)	164. (b)	165. (b)	166. (b)	167. (a)	168. (b)	169. (b)	170. (d)		

05 Force on Current-Carrying Conductors

171. (a)	172. (d)	173. (b)	174. (b)	175. 48	176. (a)	177. (b)	178. (d)	179. (a)	180. (d)
181. 2	182. (a)	183. (c)	184. (d)	185. (c)	186. (d)	187. (d)	188. (c)	189. (c)	190. (d)
191. (a)	192. (c)	193. (d)	194. (c)	195. (d)	196. (b)	197. (a)	198. (b)	199. 5	200. (a)

06 Current Loop as a Magnetic Dipole

201. (c)	202. (d)	203. (c)	204. (a)	205. (a)	206. (d)	207. (a)	208. (b)	209. (c)	210. (b)
211. (c)	212. (d)	213. (c)	214. (b)	215. (d)	216. (a)	217. (c)	218. (b)	219. (c)	220. (c)
221. (c)	222. (a)	223. (d)	224. 20	225. (c)					

07 Moving Coil Galvanometer, Ammeter & Voltmeter

226. (a)	227. (c)	228. (d)	229. (c)	230. (b)	231. (c)	232. (b)	233. (c)	234. (c)	235. (a)
236. (c)	237. (a)	238. (a)	239. (a)						

08 Other: Induction & Displacement Current

240. (b)	241. (d)	242. (c)	243. (d)	244. (d)	245. (c)	246. (a)	247. (b)	248. (a)	

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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