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PHYSICS · JEE MAIN

Magnetic Effects of Current

Previous Year Questions with answers

261 questions · **165** papers · **2002–2026** · newest paper first

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What is in this PDF: every Magnetic Effects of Current question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

Step-by-step solutions for every question are free in the EdLoop JEE app (Google Play) and on app.edloop.in. More chapters: pyq.edloop.in/free-pdfs/

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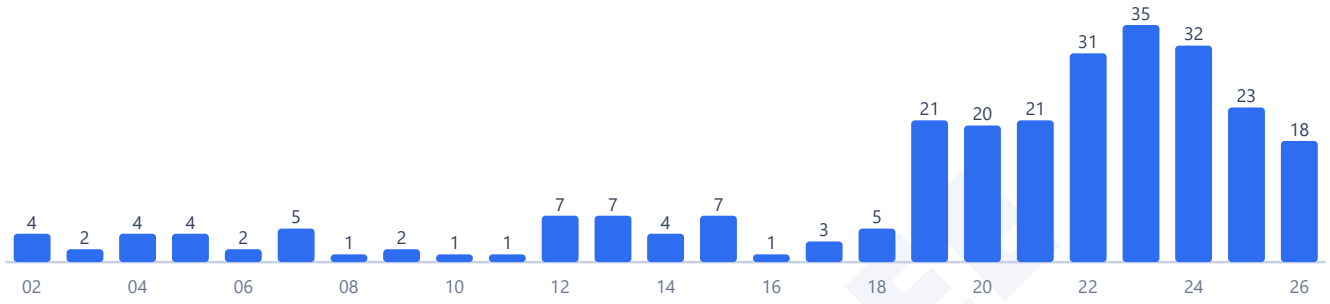
Chapter at a glance

4.4%	261	133 of 162	213 / 48
of Physics questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Steady: 1.3 questions per paper in 2024–2026 against 1.2 in 2019–2023.

Questions per year



Counts are the questions we hold: 261 in 165 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2002–2026)

Force on Charges & Currents	**116**
Magnetic Field due to Current	**101**
Current Loops & Galvanometer	**44**

How often it comes up

Magnetic effects of current bridges electrostatics and electrodynamics under Unit 13: Magnetic Effects of Current and Magnetism in the Class 12 NTA syllabus, holding rank 7 among the 29 physics chapters. Throughout the computer-based testing era from 2019 to 2026, 201 questions were drawn from this chapter across 162 papers, translating to an average of 1.2 questions per sitting. The topic appeared in 133 of those 162 exam sessions, and questions have been featured every year without omission. Looking at the three-year block from 2024 to 2026, candidates faced 73 questions across 58 papers, maintaining a rate of 1.3 questions per test and a 4.7 percent share. The chapter's subject share has stayed about the same when compared to the 2002 to 2018 window, which logged a 4.5 percent share from 60 questions across 38 papers. During the 2026 exams, 18 questions were presented across 19 papers, featured in 15 individual shifts. A total of 48 problems between 2019 and 2026 were formatted as numerical answer questions, requiring exact vector computations and numerical evaluations.

Most-asked topics

The syllabus organizes questions into three prominent areas:

- **Force on Charges & Currents**: 116 questions since 2002, with 83 delivered between 2019 and 2026, asked up to 2026. This topic tests the Lorentz magnetic force on free charges, helical and circular trajectories, magnetic forces on straight and curved current-carrying wires, and mutual forces between parallel conductors.
- **Magnetic Field due to Current**: 101 lifetime questions, including 80 from 2019 to 2026, tested in 2026. Problems center on the Biot-Savart law, circular loops, circular arcs, coaxial ring fields, Ampere's circuital law, solenoids, toroids, and field distributions inside thick cylindrical wires.
- **Current Loops & Galvanometer**: 44 total questions, with 38 concentrated between 2019 and 2026, tested through 2026. Concepts examine the magnetic dipole moment of planar loops and spiral coils, torque on loops in uniform fields, potential energy of orientations, and moving coil galvanometer mechanics.

What the questions look like

JEE Main problems in this chapter emphasize vector cross products, spatial geometry, and right-hand rules:

- **Superposition of loop and straight wire fields**: A planar circuit formed by a straight wire running tangential to a full circular loop. Students apply the right-hand grip rule to find whether individual field vectors reinforce or oppose each other at the center.
- **Force on multi-conductor parallel arrays**: Three or four parallel long wires carry specified currents in coplanar arrangements. Questions ask for the net magnetic force per unit length exerted on one specific wire.
- **Centroid and axial fields of regular polygons**: Evaluating magnetic field intensity at the centroid of an equilateral triangle, square, or regular polygon carrying a steady current.
- **Helical and circular particle motion**: Charged particles injected with specified velocity vectors into uniform magnetic fields or crossed electric and magnetic fields, calculating cyclotron radius, pitch, or net velocity.

How to practise it

Master right-hand rules for both magnetic field direction and magnetic force direction. Biot-Savart calculations require cross products of current elements with displacement vectors, while Lorentz forces require the cross product of velocity with magnetic field. A simple sign error in vector direction immediately leads to wrong choices.

Memorize standard magnetic field results: straight finite wire segments, circular arcs subtending an angle at the center, axial fields of circular loops, and interior solenoid fields. When finding field values for polygonal loops, calculate the field of a single side segment and multiply by symmetry.

For moving charges, become comfortable relating kinetic energy, momentum, and magnetic field through the cyclotron radius formula. When charged particles enter at an angle to the field, separate motion into parallel drift along the field lines and circular orbit in the transverse plane.

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Q1 JEE Main 2026 · 8 Apr · Shift 2 MCQ

A current carrying circular loop of radius 2 cm with unit normal $\hat{n} = \frac{\hat{k} + \hat{i}}{\sqrt{2}}$ is placed in a magnetic field, $\vec{B} = B_o\left(3\hat{i} + 2\hat{k}\right)$. If $B_o = 4 \times 10^{-3}$ T and current $I = 100\sqrt{2}$ A, the torque experienced by the loop is _____ Wb.A. ($\pi = 3.14$)

(A) $16 \times 10^{-5}\,\hat{k}$
(B) $5024 \times 10^{-7}\,\hat{k}$
(C) $5024 \times 10^{-7}\,\hat{i}$
(D) $5024 \times 10^{-7}\,\hat{j}$

Answer: (D) $5024 \times 10^{-7}\,\hat{j}$ · Official NTA final key

Q2 JEE Main 2026 · 8 Apr · Shift 2 Numerical

A 5 mg particle carrying a charge of $5\pi \times 10^{-6}$ C is moving with velocity of $\left(3\hat{i} + 2\hat{k}\right) \times 10^{-2}$ m/s in a region having magnetic field $\vec{B} = 0.1\,\hat{k}$ Wb/m^2. It moves a distance of α meter along $\hat{k}$ when it completes 5 revolutions. The value of α is _____.

Numerical value type: the answer is a number.

Answer: 2. · Official NTA final key

Q3 JEE Main 2026 · 6 Apr · Shift 1 MCQ

A small cube of side 1 mm is placed at the centre of a circular loop of radius 10 cm carrying a current of 2 A. The magnetic energy stored inside the cube is $\alpha \times 10^{-14}$ J. The value of α is _____.
($\mu_o = 4\pi \times 10^{-7}$ Tm/A, $\pi = 3.14$)

(A) 6.28
(B) 6.28×10^{-6}
(C) 628
(D) 6.28×10^{-4}

Answer: (A) 6.28 · Official NTA final key

Q4 JEE Main 2026 · 6 Apr · Shift 2 MCQ

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.
($\frac{\mu_o}{4\pi} = 10^{-7}$ N/A^2)

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(A) 30
(B) 300
(C) 150
(D) 0.0

Answer: (B) 300 · Official NTA final key

Q5 JEE Main 2026 · 5 Apr · Shift 1 Numerical

The charged particle moving in a uniform magnetic field of $\left(3\hat{i}+2\hat{j}\right)$T has an acceleration $\left(4\hat{i}-\frac{x}{2}\hat{j}\right)$ m/s^2. The value of x is

Numerical value type: the answer is a number.

Answer: 12. · Official NTA final key

Q6 JEE Main 2026 · 5 Apr · Shift 2 MCQ

A particle of charge q and mass m is projected from origin with an initial velocity $\vec{v}=\left(\frac{v_o}{\sqrt{2}}\hat{x}+\frac{v_o}{\sqrt{2}}\hat{y}\right)$. There exists a uniform magnetic field $\vec{B}=B_0\,\hat{z}$ and a space varying electric field $\vec{E}=E_o\,e^{-\lambda x}\hat{x}$ within the region $0\le x\le L$. After travelling a distance such that x-coordinate has changed from $x=0$ to $x=L$, the change in the kinetic energy is _____.

(A) $\frac{qE_0}{\lambda}\left[1-e^{-\lambda L}\right]$
(B) $\left(\frac{v_o\,q\,B_o}{2\lambda}\right)\left[2-e^{-2\lambda L}\right]$
(C) $\frac{qE_0}{\lambda}\left[1+e^{-\lambda L}\right]$
(D) $q\left(\frac{E_0+v_oB_o}{\lambda}\right)\left[1-e^{-\lambda L/2}\right]$

Answer: (A) $\frac{qE_0}{\lambda}\left[1-e^{-\lambda L}\right]$ · Official NTA final key

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Q7 JEE Main 2026 · 4 Apr · Shift 1 MCQ

An insulated wire is wound so that it forms a flat coil with $N=200$ turns. The radius of the innermost turn is $r_1=3$ cm, and of the outermost turn $r_2=6$ cm. If 20 mA current flows in it then the magnetic moment will be $\alpha\times10^{-2}$ A.m^2. The value of α is _____.

(A) 4.4
(B) 2.64
(C) 3.25
(D) 1.2

Answer: (B) 2.64 · Official NTA final key

Q8 JEE Main 2026 · 4 Apr · Shift 2 Numerical

A circular coil of radius 2 cm and 125 turns carries a current of 1 A. The coil is placed in a uniform magnetic field of magnitude 0.4 T. The axis of the coil makes an angle of 30° with the direction of the

magnetic field. The torque acting on the coil is $\alpha \times 10^{-4}$ N.m. The value of α is _____.
$(\pi = 3.14)$

Numerical value type: the answer is a number.

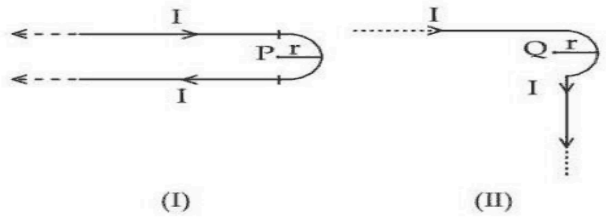
Answer: 314. · Official NTA final key

Q9 JEE Main 2026 · 2 Apr · Shift 1 MCQ

Two identical long current carrying wires are bent into the shapes shown in the following figures. If the magnitude of magnetic fields at the centres P and Q of a semicircular arc are B_1 and B_2 respectively, then the ratio $\frac{B_1}{B_2}$ is _____.

(see the figure above)

Two identical long current carrying wires are bent into the shapes shown in the following figures. If the magnitude of magnetic fields at the centres P and Q of a semicircular arc are B_1 and B_2 respectively, then the ratio $\frac{B_1}{B_2}$ is _____.



(I) (II)

Options :

691121138. $\frac{2+\pi}{1+\pi}$

691121139. $\frac{1+\pi}{1-\pi}$

691121140. $\frac{2+\pi}{1-\pi}$

691121141. $\frac{1+\pi}{2-\pi}$

(A) $\frac{2+\pi}{1+\pi}$
(B) $\frac{1+\pi}{1-\pi}$
(C) $\frac{2+\pi}{1-\pi}$
(D) $\frac{1+\pi}{2-\pi}$

Answer: (A) $\frac{2+\pi}{1+\pi}$ · Official NTA final key

Q10 JEE Main 2026 · 2 Apr · Shift 1 Numerical

1 μC charge moving with velocity $\vec{v} = \left(\hat{i} - 2\hat{j} + 3\hat{k}\right)$ m/s in the region of magnetic field $\vec{B} = \left(2\hat{i} + 3\hat{j} - 5\hat{k}\right)$ T. The magnitude of force acting on it is $\sqrt{\alpha} \times 10^{-6}$ N. The value of α is _____.

Numerical value type: the answer is a number.

Answer: 171. · Official NTA final key

Q11 JEE Main 2026 · 2 Apr · Shift 2 MCQ

A particle having charge 10^{-9} C moving in x-y plane in fields of $0.4\,\hat{j}$ N/C and $4 \times 10^{-3}\,\hat{k}$ T experiences a force of $\left(4\hat{i} + 2\hat{j}\right) \times 10^{-10}$ N. The velocity of the particle at that instant is _____ m/s.

(A) $50\hat{i} + 100\hat{j}$
(B) $100\hat{i} + 50\hat{j}$
(C) $-50\hat{i} + 100\hat{j}$
(D) $50\hat{i} - 100\hat{j}$

Answer: (A) $50\hat{i} + 100\hat{j}$ · Official NTA final key

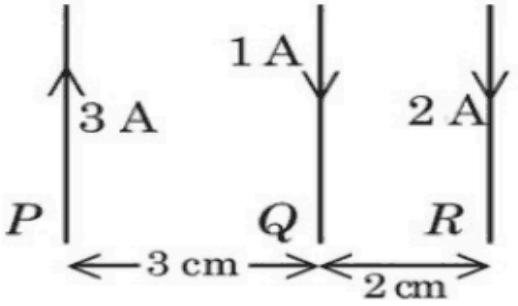
Q12 JEE Main 2026 · 28 Jan · Shift 1 MCQ

Three long straight wires carrying current are arranged mutually parallel as shown in the figure. The force experienced by 15 cm length of wire Q is _____.

(see the figure above)

($\mu_0 = 4\pi \times 10^{-7}$ T.m/A)

Q.34 Three long straight wires carrying current are arranged mutually parallel as shown in the figure. The force experienced by 15 cm length of wire Q is_____.



($\mu_0 = 4\pi \times 10^{-7}$ T.m/A)

Options
1. 6×10^{-7} N towards P
2. 6×10^{-6} N towards P
3. 6×10^{-7} N towards R
4. 6×10^{-6} N towards R

(A) 6×10^{-7} N towards P
(B) 6×10^{-6} N towards P
(C) 6×10^{-7} N towards R
(D) 6×10^{-6} N towards R

Answer: (D) 6×10^{-6} N towards R · Official NTA final key

Q13 JEE Main 2026 · 28 Jan · Shift 1 MCQ

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

(A) 4
(B) 8
(C) $2\sqrt{2}$
(D) 2

Answer: (D) 2 · Official NTA final key

Q14 JEE Main 2026 · 28 Jan · Shift 2 MCQ

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 :

(A) D Only
(B) B, C Only
(C) A, D Only
(D) E Only

Answer: (A) D Only · Official NTA final key

Q15 JEE Main 2026 · 24 Jan · Shift 2 MCQ

Two identical circular loops P and Q each of radius r are lying in parallel planes such that they have common axis. The current through P and Q are I and $4I$ respectively in clockwise direction as seen from O. The net magnetic field at O is:

(see the figure above)

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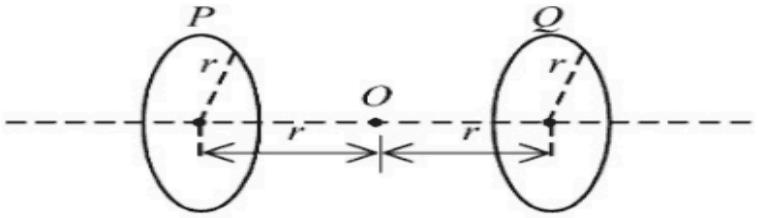
Q.33



Two identical circular loops P and Q each of radius r are lying in parallel planes such that they have common axis. The current through P and Q are I and $4I$ respectively in clockwise direction as seen from O. The net magnetic field at O is:

Options

1. $\frac{\mu_o I}{4\sqrt{2}r}$ towards Q
2. $\frac{\mu_o I}{4\sqrt{2}r}$ towards P
3. $\frac{3\mu_o I}{4\sqrt{2}r}$ towards P
4. $\frac{3\mu_o I}{4\sqrt{2}r}$ towards Q

(A) $\frac{\mu_0 I}{4\sqrt{2}r}$ towards Q

(B) $\frac{\mu_0 I}{4\sqrt{2}r}$ towards P

(C) $\frac{3\mu_0 I}{4\sqrt{2}r}$ towards P

(D) $\frac{3\mu_0 I}{4\sqrt{2}r}$ towards Q

Answer: (D) $\frac{3\mu_0 I}{4\sqrt{2}r}$ towards Q · Official NTA final key

Q16 JEE Main 2026 · 23 Jan · Shift 2 MCQ

The current passing through a conducting loop in the form of equilateral triangle of side $4\sqrt{3}$ cm is 2 A. The magnetic field at its centroid is $\alpha \times 10^{-5}$ T. The value of α is _____.

(Given : $\mu_0 = 4\pi \times 10^{-7}$ SI units)

(A) $3\sqrt{3}$

(B) $2\sqrt{3}$

(C) $\sqrt{3}$

(D) $\frac{\sqrt{3}}{2}$

Answer: (A) $3\sqrt{3}$ · Official NTA final key

Q17 JEE Main 2026 · 21 Jan · Shift 1 MCQ

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 :

(A) $0 < a < g$

(B) $a > g$

(C) $a = 0$

(D) $a = g$

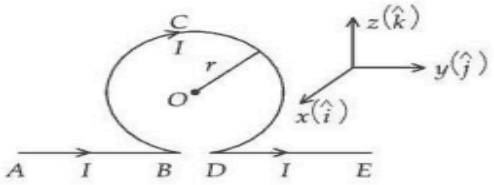
Answer: (D) $a = g$ · Official NTA final key

Q18 JEE Main 2026 · 21 Jan · Shift 2 MCQ

An infinitely long straight wire carrying current I is bent in a planer shape as shown in the diagram. The radius of the circular part is r. The magnetic field at the centre O of the circular loop is :

(see the figure above)

Q.32 An infinitely long straight wire carrying current I is bent in a planer shape as shown in the diagram. The radius of the circular part is r. The magnetic field at the centre O of the circular loop is :



Options

1. $\frac{\mu_0}{2\pi}\frac{I}{r}(\pi - 1)\hat{i}$
2. $\frac{\mu_0}{2\pi}\frac{I}{r}(\pi + 1)\hat{i}$
3. $-\frac{\mu_0}{2\pi}\frac{I}{r}(\pi - 1)\hat{i}$
4. $-\frac{\mu_0}{2\pi}\frac{I}{r}(\pi + 1)\hat{i}$

(A) $\frac{\mu_0}{2\pi}\frac{I}{r}(\pi - 1)\hat{i}$

(B) $\frac{\mu_0}{2\pi}\frac{I}{r}(\pi + 1)\hat{i}$

(C) $-\frac{\mu_0}{2\pi}\frac{I}{r}(\pi - 1)\hat{i}$

(D) $-\frac{\mu_0}{2\pi}\frac{I}{r}(\pi + 1)\hat{i}$

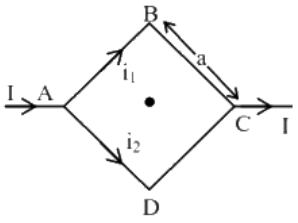
Answer: (C) $-\frac{\mu_0}{2\pi}\frac{I}{r}(\pi - 1)\hat{i}$ · Official NTA final key

Q19 JEE Main 2025 · 8 Apr · Shift 2 MCQ

Figure shows a current carrying square loop ABCD of edge length is 'a' lying in a plane. If the resistance of the ABC part is r and that of ADC part is 2r, then the magnitude of the resultant magnetic field at centre of the square loop is

(see the figure above)

8. Figure shows a current carrying square loop ABCD of edge length is 'a' lying in a plane. If the resistance of the ABC part is r and that of ADC part is 2r, then the magnitude of the resultant magnetic field at centre of the square loop is



(1) $\frac{\sqrt{2}\mu_0 I}{3\pi a}$ (2) $\frac{\mu_0 I}{2\pi a}$ (3) $\frac{2\mu_0 I}{3\pi a}$ (4) $\frac{3\pi\mu_0 I}{\sqrt{2}a}$

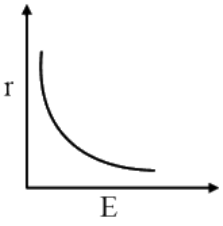
(A) $\frac{\sqrt{2}\mu_0 I}{3\pi a}$
(B) $\frac{\mu_0 I}{2\pi a}$
(C) $\frac{2\mu_0 I}{3\pi a}$
(D) $\frac{3\pi\mu_0 I}{\sqrt{2}a}$

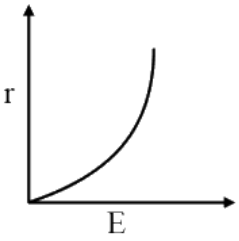
Answer: (A) $\frac{\sqrt{2}\mu_0 I}{3\pi a}$ · Key from source paper

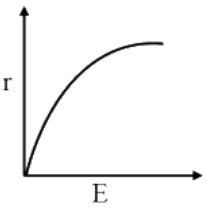
Q20 JEE Main 2025 · 7 Apr · Shift 1 MCQ

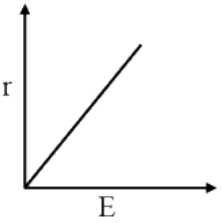
A particle of charge q, mass m and kinetic energy E enters in magnetic field perpendicular to its velocity and undergoes a circular arc of radius (r). Which of the following curves represents the variation of r with E ?

8. A particle of charge q, mass m and kinetic energy E enters in magnetic field perpendicular to its velocity and undergoes a circular arc of radius (r). Which of the following curves represents the variation of r with E ?

(1) 

(2) 

(3) 

(4) 

(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (C) · Key from source paper

Q21 JEE Main 2025 · 7 Apr · Shift 1 MCQ

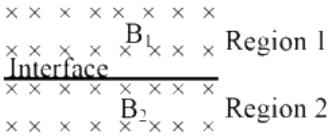
Uniform magnetic fields of different strengths (B_1 and B_2), both normal to the plane of the paper exist as shown in the figure. A charged particle of mass m and charge q, at the interface at an instant,

moves into the region 2 with velocity v and returns to the interface. It continues to move into region 1 and finally reaches the interface. What is the displacement of the particle during this movement along the interface ?

(see the figure above)

(Consider the velocity of the particle to be normal to the magnetic field and $B_2 > B_1$)

11. Uniform magnetic fields of different strengths (B_1 and B_2), both normal to the plane of the paper exist as shown in the figure. A charged particle of mass m and charge q, at the interface at an instant, moves into the region 2 with velocity v and returns to the interface. It continues to move into region 1 and finally reaches the interface. What is the displacement of the particle during this movement along the interface ?



(Consider the velocity of the particle to be normal to the magnetic field and $B_2 > B_1$)

(1) $\frac{mv}{qB_1}\left(1-\frac{B_2}{B_1}\right)$ (2) $\frac{mv}{qB_1}\left(1-\frac{B_1}{B_2}\right)$ (3) $\frac{mv}{qB_1}\left(1-\frac{B_2}{B_1}\right)\times 2$ (4) $\frac{mv}{qB_1}\left(1-\frac{B_1}{B_2}\right)\times 2$

(A) $\frac{mv}{qB_1}\left(1-\frac{B_2}{B_1}\right)$
(B) $\frac{mv}{qB_1}\left(1-\frac{B_1}{B_2}\right)$
(C) $\frac{mv}{qB_1}\left(1-\frac{B_2}{B_1}\right)\times 2$
(D) $\frac{mv}{qB_1}\left(1-\frac{B_1}{B_2}\right)\times 2$

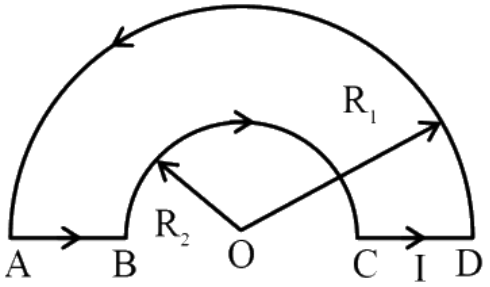
Answer: (D) $\frac{mv}{qB_1}\left(1-\frac{B_1}{B_2}\right)\times 2$ · Key from source paper

Q22 JEE Main 2025 · 3 Apr · Shift 1 Numerical

A loop ABCDA , carrying current $I = 12A$, is placed in a plane, consists of two semi-circular segments of radius $R_1 = 6\pi m$ and $R_2 = 4\pi m$. The magnitude of the resultant magnetic field at center O is $k \times 10^{-7}T$. The value of k is _____ (Given $\mu_0 = 4\pi \times 10^{-7}TmA^{-1}$)

(see the figure above)

23. A loop ABCDA , carrying current $I = 12\,A$, is placed in a plane, consists of two semi-circular segments of radius $R_1 = 6\pi\,m$ and $R_2 = 4\pi\,m$. The magnitude of the resultant magnetic field at center O is $k \times 10^{-7}\,T$. The value of k is _____ (Given $\mu_0 = 4\pi \times 10^{-7} TmA^{-1}$)



Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q23 JEE Main 2025 · 3 Apr · Shift 1 Numerical

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 .

Numerical value type: the answer is a number.

Answer: 48. · Key from source paper

Q24 JEE Main 2025 · 3 Apr · Shift 2 MCQ

A magnetic dipole experiences a torque of $80\sqrt{3}Nm$ when placed in uniform magnetic field in such a way that dipole moment makes angle of 60° with magnetic field. The potential energy of the dipole is :

(A) -60 J
(B) $-40\sqrt{3}J$
(C) 80 J
(D) -80 J

Answer: (D) -80 J · Key from source paper

Q25 JEE Main 2025 · 3 Apr · Shift 2 MCQ

Given below are two statements: one is labelled as Assertion **A** and the other is labelled as Reason **R**

Assertion A : If Oxygen ion (O^{-2}) and Hydrogen ion (H^+) enter normal to the magnetic field with equal momentum, then the path of O^{-2} ion has a smaller curvature than that of H^+.

Reason R : A proton with same linear momentum as an electron will form a path of smaller radius of curvature on entering a uniform magnetic field perpendicularly.

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

(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 false but **R** is true

(D) **A** is true but **R** is false

Answer: (D) A is true but R is false · Key from source paper

Q26 JEE Main 2025 · 2 Apr · Shift 1 MCQ

Let B_1 be the magnitude of magnetic field at center of a circular coil of radius R carrying current I. Let B_2 be the magnitude of magnetic field at an axial distance ' x ' from the center. For $x : R = 3 : 4$, $\frac{B_2}{B_1}$ is :

(A) 25 : 16

(B) 16 : 25

(C) 4 : 5

(D) 64 : 125

Answer: (D) 64 : 125 · Key from source paper

Q27 JEE Main 2025 · 2 Apr · Shift 1 MCQ

A monochromatic light is incident on a metallic plate having work function ϕ. An electron, emitted normally to the plate from a point A with maximum kinetic energy, enters a constant magnetic field, perpendicular to the initial velocity of electron. The electron passes through a curve and hits back the plate at a point B. The distance between A and B is :

(Given : The magnitude of charge of an electron is e and mass is m, h is Planck's constant and c is velocity of light. Take the magnetic field exists throughout the path of electron)

(A) $\sqrt{m(hc/\lambda - \phi)}/eB$

(B) $\sqrt{8m\left(\frac{hc}{\lambda} - \phi\right)}/eB$

(C) $2\sqrt{m(hc/\lambda - \phi)}/eB$

(D) $\sqrt{2m\left(\frac{hc}{\lambda} - \phi\right)}/eB$

Answer: (B) $\sqrt{8m\left(\frac{hc}{\lambda} - \phi\right)}/eB$ · Key from source paper

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Q28 JEE Main 2025 · 2 Apr · Shift 2 MCQ

In a moving coil galvanometer, two moving coils M_1 and M_2 have the following particulars :

$R_1 = 5\Omega, N_1 = 15, A_1 = 3.6 \times 10^{-3} m^2, B_1 = 0.25T$

$R_2 = 7\Omega, N_2 = 21, A_2 = 1.8 \times 10^{-3} m^2, B_2 = 0.50T$

Assuming that torsional constant of the springs are same for both coils, what will be the ratio of voltage sensitivity of M_1 and M_2 ?

(A) 1 : 2
(B) 1 : 3
(C) 1 : 1
(D) 1 : 4

Answer: (C) 1 : 1 · Key from source paper

Q29 JEE Main 2025 · 2 Apr · Shift 2 MCQ

An electron with mass 'm' with an initial velocity $(t = 0)\vec{v} = v_0\hat{i}$ $(v_0 > 0)$ enters a magnetic field $\vec{B} = B_0\hat{j}$. If the initial de-Broglie wavelength at t = 0 is λ_0 then its value after time ' t ' would be :

(A) λ_0
(B) $\frac{\lambda_0}{\sqrt{1+\frac{e^2B_0^2t^2}{m^2}}}$
(C) $\frac{\lambda_0}{\sqrt{1-\frac{e^2B_0^2t^2}{m^2}}}$
(D) $\lambda_0\sqrt{1+\frac{e^2B_0^2t^2}{m^2}}$

Answer: (A) λ_0 · Key from source paper

Q30 JEE Main 2025 · 29 Jan · Shift 1 MCQ

Consider a long straight wire of a circular cross-section (radius a) carrying a steady current I. The current is uniformly distributed across this cross-section. The distances from the centre of the wire's cross-section at which the magnetic field [inside the wire, outside the wire] is half of the maximum possible magnetic field, any where due to the wire, will be

(A) [a/4, 3a/2]
(B) [a/4, 2a]
(C) [a/2, 2a]
(D) [a/2, 3a]

Answer: (C) [a/2, 2a] · Key from source paper

Q31 JEE Main 2025 · 29 Jan · Shift 2 Numerical

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.

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q32 JEE Main 2025 · 28 Jan · Shift 1 MCQ

Consider a long thin conducting wire carrying a uniform current I. A particle having mass " M " and charge " q " is released at a distance " a " from the wire with a speed v_0 along the direction of current

in the wire. The particle gets attracted to the wire due to magnetic force. The particle turns round when it is at distance x from the wire. The value of x is [μ_0 is vacuum permeability]

(A) $ae^{-\frac{4\pi mv_0}{q\mu_0 I}}$

(B) $a\left[1-\frac{mv_o}{2q\mu_0 I}\right]$

(C) $a\left[1-\frac{mv}{q\mu_0 I}\right]$

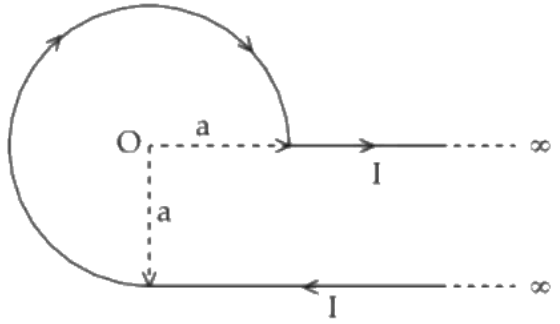
(D) $\frac{a}{2}$

Answer: (A) $ae^{-\frac{4\pi mv_0}{q\mu_0 I}}$ · Key from source paper

Q33 JEE Main 2025 · 28 Jan · Shift 2 MCQ

see figure

Q32.



An infinite wire has a circular bend of radius a, and carrying a current I as shown in figure. The magnitude of magnetic field at the origin O of the arc is given by :

(1) $\frac{\mu_0}{4\pi}\frac{I}{a}\left[\frac{\pi}{2}+1\right]$

(2) $\frac{\mu_0}{4\pi}\frac{I}{a}\left[\frac{3\pi}{2}+2\right]$

(3) $\frac{\mu_0}{2\pi}\frac{I}{a}\left[\frac{\pi}{2}+2\right]$

(4) $\frac{\mu_0}{4\pi}\frac{I}{a}\left[\frac{3\pi}{2}+1\right]$

(A) $\frac{\mu_0}{4\pi}\frac{I}{a}\left[\frac{\pi}{2}+1\right]$

(B) $\frac{\mu_0}{4\pi}\frac{I}{a}\left[\frac{3\pi}{2}+2\right]$

(C) $\frac{\mu_0}{2\pi}\frac{I}{a}\left[\frac{\pi}{2}+2\right]$

(D) $\frac{\mu_0}{4\pi}\frac{I}{a}\left[\frac{3\pi}{2}+1\right]$

Answer: (D) $\frac{\mu_0}{4\pi}\frac{I}{a}\left[\frac{3\pi}{2}+1\right]$ · Key from source paper

Q34 JEE Main 2025 · 24 Jan · Shift 1 Numerical

A current of 5A exists in a square loop of side $\frac{1}{\sqrt{2}}$ m. Then the magnitude of the magnetic field B at the centre of the square loop will be $p \times 10^{-6}$ T. where, value of p is _____ . [Take $\mu_0 = 4\pi \times 10^{-7}\mathrm{TmA}^{-1}$].

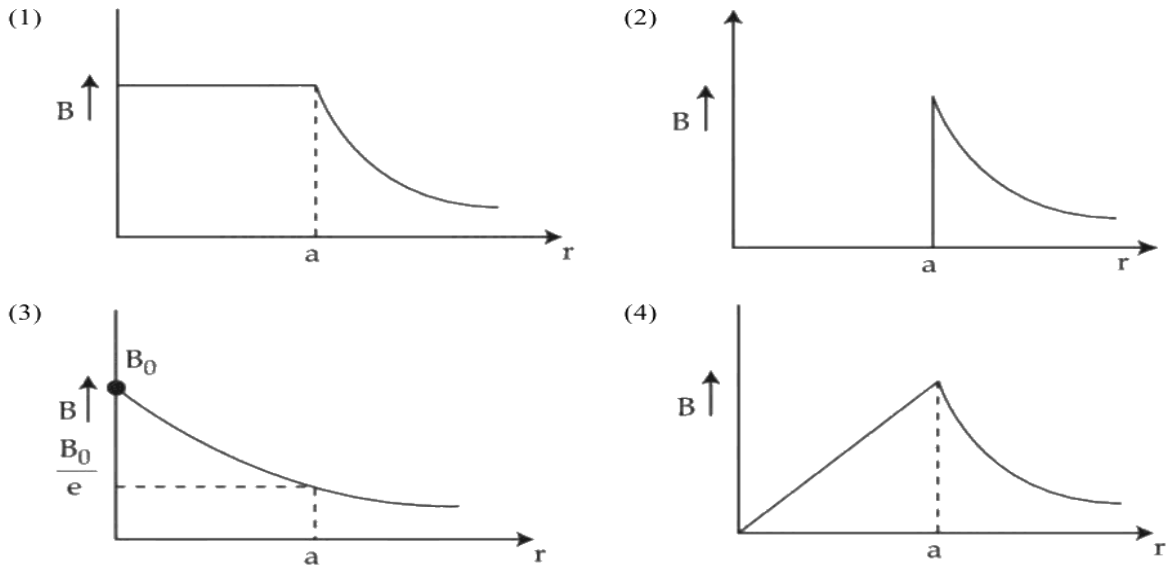
Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q35 JEE Main 2025 · 24 Jan · Shift 2 MCQ

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

Q31. 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



(A) *see figure*

(B) *see figure*

(C) *see figure*

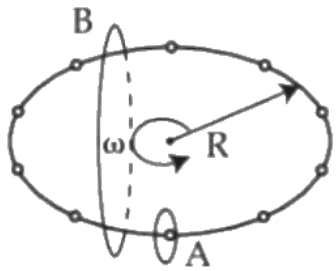
(D) *see figure*

Answer: (D) · Key from source paper

Q36 JEE Main 2025 · 24 Jan · Shift 2 MCQ

see figure

Q35.



N equally spaced charges each of value q , are placed on a circle of radius R . The circle rotates about its axis with an angular velocity ω as shown in the figure. A bigger Amperian loop B encloses the whole circle where as a smaller Amperian loop A encloses a small segment. The difference between enclosed currents, $I_A - I_B$, for the given Amperian loops is

(1) $\frac{2\pi}{N}q\omega$
(2) $\frac{N^2}{2\pi}q\omega$
(3) $\frac{N}{\pi}q\omega$
(4) $\frac{N}{2\pi}q\omega$

(A) $\frac{2\pi}{N}q\omega$
(B) $\frac{N^2}{2\pi}q\omega$
(C) $\frac{N}{\pi}q\omega$
(D) $\frac{N}{2\pi}q\omega$

Answer: (D) $\frac{N}{2\pi}q\omega$ · Key from source paper

Q37 JEE Main 2025 · 24 Jan · Shift 2 MCQ

Given below are two statements. One is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A) : A 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 :

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

Answer: (C) Both (A) and (R) are true and (R) is the correct explanation of (A) · Key from source paper

Q38 JEE Main 2025 · 24 Jan · Shift 2 Numerical

A tightly wound long solenoid carries a current of 1.5 A . An electron is executing uniform circular motion inside the solenoid with a time period of 75 ns . The number of turns per metre in the solenoid is _____ -. [Take mass of electron $m_e = 9 \times 10^{-31}$ kg, charge of electron $|q_e| = 1.6 \times 10^{-19}$C, $\mu_0 = 4\pi \times 10^{-7}\frac{N}{A^2}$, 1 ns = 10^{-9} s]

Numerical value type: the answer is a number.

Answer: 250. · Key from source paper

Q39 JEE Main 2025 · 23 Jan · Shift 1 MCQ

Consider a moving coil galvanomenter (MCG): A. The torsional constant in moving coil galvanometer has dimentions $\left[\mathrm{ML}^2\ \mathrm{T}^{-2}\right]$ B. Increasing the current sensitivity may not necessarily increase the voltage sensitivity. C. If we increase number of turns (N) to its double (2 N), then the voltage sensitivity doubles. D. MCG can be converted into an ammeter by introducing a shunt resistance of large value in parallel with galvanometer. E. Current sensitivity of MCG depends inversely on number of turns of coil. Choose the correct answer from the options given below:

(A) A, D Only
(B) A, B, E Only
(C) B, D, E Only
(D) A, B Only

Answer: (D) A, B Only · Key from source paper

Q40 JEE Main 2025 · 22 Jan · Shift 2 Numerical

A proton is moving undeflected in a region of crossed electric and magnetic fields at a constant speed of $2 \times 10^5\ \mathrm{ms}^{-1}$. When the electric field is switched off, the proton moves along a circular path of radius 2 cm . The magnitude of electric field is $x \times 10^4$ N/C. The value of x is _____ Take the mass of the proton $= 1.6 \times 10^{-27}$ kg.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

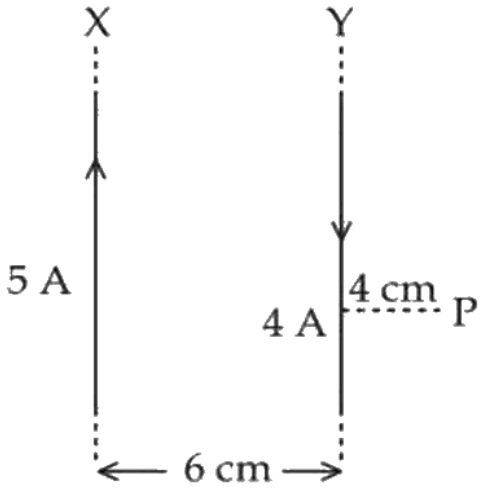
Q41 JEE Main 2025 · 22 Jan · Shift 2 Numerical

Two long parallel wires X and Y, separated by a distance of 6 cm , carry currents of 5A and 4A, respectively, in opposite directions as shown in the figure. Magnitude of the resultant magnetic field at point P at a distance of 4 cm from wire Y is $x \times 10^{-5}$ T. The value of x is _____ . Take permeability of free space as

(see the figure above)

$\mu_0 = 4\pi \times 10^{-7}$ SI units.

Q50. Two long parallel wires X and Y, separated by a distance of 6 cm , carry currents of 5A and 4A, respectively, in opposite directions as shown in the figure. Magnitude of the resultant magnetic field at point P at a distance of 4 cm from wire Y is $x \times 10^{-5}$ T. The value of x is_____ . Take permeability of free space as $\mu_0 = 4\pi \times 10^{-7}$SI units.



Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q42 JEE Main 2024 · 9 Apr · Shift 1 MCQ

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 :

(A) Both Statement I and Statement II are true
(B) Statement I is true but Statement II is false
(C) Both Statement I and Statement II are false
(D) Statement I is false but Statement II is true

Answer: (B) Statement I is true but Statement II is false · Key from source paper

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Q43 JEE Main 2024 · 9 Apr · Shift 1 Numerical

A square loop of edge length 2 m carrying current of 2 A is placed with its edges parallel to the x y axis. A magnetic field is passing through the $x - y$ plane and expressed as $\vec{B} = \mathrm{B}_0(1 + 4x)\hat{k}$, where B_0 = 5 T. The net magnetic force experienced by the loop is _____ N.

Numerical value type: the answer is a number.

Answer: 160. · Key from source paper

Q44 JEE Main 2024 · 9 Apr · Shift 2 MCQ

A proton and a deutron ($q = +e$, $m = 2.0$u) having same kinetic energies enter a region of uniform magnetic field $\vec{B}$, moving perpendicular to $\vec{B}$. The ratio of the radius r_d of deutron path to the radius r_p of the proton path is:

(A) $\sqrt{2} : 1$
(B) $1 : 1$
(C) $1 : \sqrt{2}$
(D) $1 : 2$

Answer: (A) $\sqrt{2} : 1$ · Key from source paper

Q45 JEE Main 2024 · 8 Apr · Shift 1 Numerical

An electron with kinetic energy 5eV enters a region of uniform magnetic field of 3 μT perpendicular to its direction. An electric field E is applied perpendicular to the direction of velocity and magnetic field. The value of E, so that electron moves along the same path, is _____ NC^{-1}. (Given, mass of electron = 9×10^{-31} kg , electric charge = 1.6×10^{-19}C)

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q46 JEE Main 2024 · 8 Apr · Shift 2 MCQ

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 :

(A) 1 : 4
(B) 1 : 1
(C) 3 : 4
(D) 4 : 1

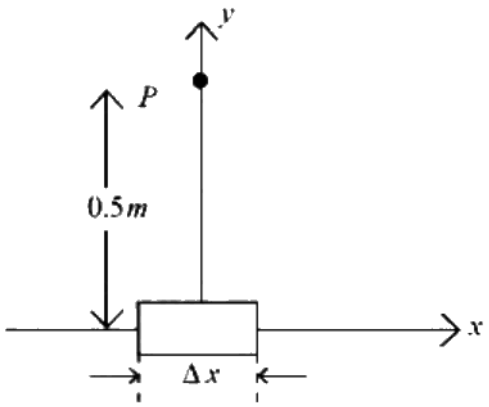
Answer: (B) 1 : 1 · Key from source paper

Q47 JEE Main 2024 · 6 Apr · Shift 1 MCQ

An element $\Delta l = \Delta x \hat{i}$ is placed at the origin and carries a large current $I = 10$ A. The magnetic field on the y-axis at a distance of 0.5 m from the elements Δx of 1 cm length is:

(see the figure above)

Q13. An element $\Delta l = \Delta x i$ is placed at the origin and carries a large current $I = 10$ A. The magnetic field on the y-axis at a distance of 0.5 m from the elements Δx of 1 cm length is:



(1) 4×10^{-8} T
(2) 10×10^{-8} T
(3) 8×10^{-8} T
(4) 12×10^{-8} T

(A) 4×10^{-8} T
(B) 10×10^{-8} T
(C) 8×10^{-8} T
(D) 12×10^{-8} T

Answer: (A) 4×10^{-8} T · Key from source paper

Q48 JEE Main 2024 · 6 Apr · Shift 1 Numerical

A circular coil having 200 turns, 2.5×10^{-4} m^2 area and carrying 100μA current is placed in a uniform magnetic field of 1T. Initially the magnetic dipole moment ($\vec{M}$) was directed along $\vec{B}$. Amount of work, required to rotate the coil through 90° from its initial orientation such that $\vec{M}$ becomes perpendicular to $\vec{B}$, is _____ μJ.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q49 JEE Main 2024 · 6 Apr · Shift 2 MCQ

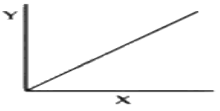
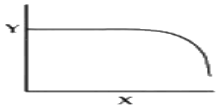
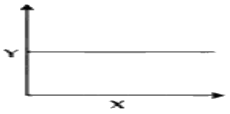
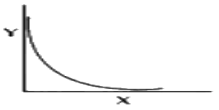
Match List-I with List-II :

List-I (Y vs X)		List-II (Shape of Graph)
(A) Y = magnetic susceptibility; X = magnetising field	(I)	*(see the figure above)*
(B) Y = magnetic field; X = distance from centre of a current carrying wire for $x < a$ (where a = radius of wire)	(II)	*(see the figure above)*
(C) Y = magnetic field; X = distance from centre of a current carrying wire for $x > a$ (where a = radius of wire)	(III)	*(see the figure above)*

(D) Y = magnetic field inside solenoid; X = distance from centre (IV) *(see the figure above)*

Choose the correct answer from the options given below :

Q12. Match List-I with List-II :

List-I (Y vs X)		List-II (Shape of Graph)
(A) Y = magnetic susceptibility; X = magnetising field	(I)	
(B) Y = magnetic field; X = distance from centre of a current carrying wire for $x < a$ (where a = radius of wire)	(II)	
(C) Y = magnetic field; X = distance from centre of a current carrying wire for $x > a$ (where a = radius of wire)	(III)	
(D) Y = magnetic field inside solenoid; X = distance from centre	(IV)	

Choose the correct answer from the options given below :

(1) (A)-(IV), (B)-(I), (C)-(III), (D)-(II)
(2) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)
(3) (A)-(III), (B)-(IV), (C)- (I), (D)-(II)
(4) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

(A) (A)-(IV), (B)-(I), (C)-(III), (D)-(II)
(B) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)
(C) (A)-(III), (B)-(IV), (C)- (I), (D)-(II)
(D) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

Answer: (D) (A)-(III), (B)-(I), (C)-(IV), (D)-(II) · Key from source paper

Q50 JEE Main 2024 · 6 Apr · Shift 2 Numerical

A coil having 100 turns, area of 5×10^{-3} m^2, carrying current of 1 mA is placed in uniform magnetic field of 0.20 T such a way that plane of coil is perpendicular to the magnetic field. The work done in turning the coil through 90° is _____ μJ.

Numerical value type: the answer is a number.

Answer: 100. · Key from source paper

Q51 JEE Main 2024 · 5 Apr · Shift 1 MCQ

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

(A) outside the cable
(B) inside the outer conductor
(C) inside the inner conductor
(D) in between the two conductors

Answer: (A) outside the cable · Key from source paper

Q52 JEE Main 2024 · 5 Apr · Shift 1 Numerical

A 2 A current carrying straight metal wire of resistance 1Ω, resistivity $2 \times 10^{-6}\Omega$m, area of cross-section 10 mm^2 and mass 500 g is suspended horizontally in mid air by applying a uniform magnetic field $\vec{B}$. The magnitude of B is _____ $\times 10^{-1}$ T (given, g = 10 m/s^2).

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q53 JEE Main 2024 · 5 Apr · Shift 2 MCQ

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 :

(A) $\vec{F}_1 = q\vec{E}, \vec{F}_2 = q(\vec{V} \times \vec{B})$
(B) $\vec{F}_1 = q\vec{B}, \vec{F}_2 = q(\vec{B} \times \vec{V})$
(C) $\vec{F}_1 = q\vec{E}, \vec{F}_2 = q(\vec{B} \times \vec{V})$
(D) $\vec{F}_1 = q\vec{V} \cdot \vec{E}, \vec{F}_2 = q(\vec{B} \cdot \vec{V})$

Answer: (A) $\vec{F}_1 = q\vec{E}, \vec{F}_2 = q(\vec{V} \times \vec{B})$ · Key from source paper

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Q54 JEE Main 2024 · 5 Apr · Shift 2 Numerical

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 _____ .

Numerical value type: the answer is a number.

Answer: 500. · Key from source paper

Q55 JEE Main 2024 · 4 Apr · Shift 1 MCQ

An electron is projected with uniform velocity along the axis inside a current carrying long solenoid. Then :

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(A) the electron will continue to move with uniform velocity along the axis of the solenoid.
(B) the electron will be accelerated along the axis.
(C) the electron path will be circular about the axis.
(D) the electron will experience a force at 45° to the axis and execute a helical path.

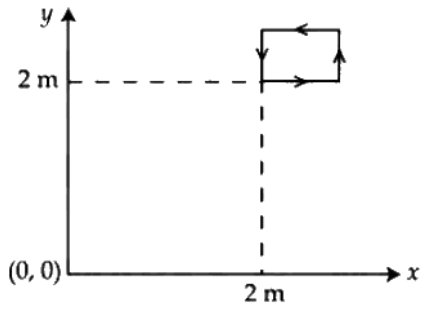
Answer: (A) the electron will continue to move with uniform velocity along the axis of the solenoid. · Key from source paper

Q56 JEE Main 2024 · 4 Apr · Shift 1 Numerical

The magnetic field existing in a region is given by $B = 0.2(1 + 2x)k$ T. A square loop of edge 50 cm carrying 0.5 A current is placed in $x - y$ plane with its edges parallel to the $x - y$ axes, as shown in figure. The magnitude of the net magnetic force experienced by the loop is _____ mN.

(see the figure above)

Q27. The magnetic field existing in a region is given by $B = 0.2(1 + 2x)k$ T. A square loop of edge 50 cm carrying 0.5 A current is placed in $x - y$ plane with its edges parallel to the $x - y$ axes, as shown in figure. The magnitude of the net magnetic force experienced by the loop is_____ mN.



Numerical value type: the answer is a number.

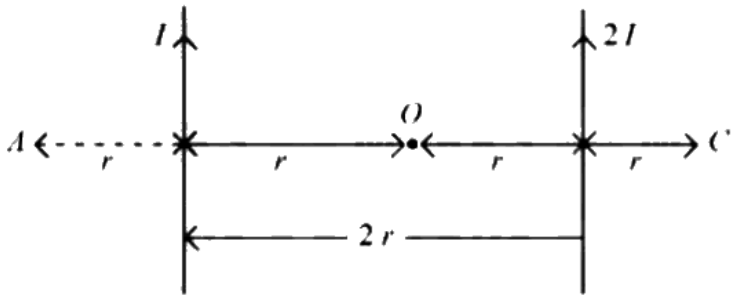
Answer: 50. · Key from source paper

Q57 JEE Main 2024 · 4 Apr · Shift 2 Numerical

Two parallel long current carrying wire separated by a distance $2r$ are shown in the figure. The ratio of magnetic field at A to the magnetic field produced at C is $\frac{x}{7}$. The value of x is _____

(see the figure above)

Q27. Two parallel long current carrying wire separated by a distance $2r$ are shown in the figure. The ratio of magnetic field at A to the magnetic field produced at C is $\frac{x}{7}$. The value of x is _____



Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q58 JEE Main 2024 · 1 Feb · Shift 1 Numerical

A regular polygon of 6 sides is formed by bending a wire of length 4π meter. If an electric current of $4\pi\sqrt{3}$ A is flowing through the sides of the polygon, the magnetic field at the centre of the polygon would be $x \times 10^{-7}$ T. The value of x is _____.

Numerical value type: the answer is a number.

Answer: 72. · Key from source paper

Q59 JEE Main 2024 · 1 Feb · Shift 2 Numerical

A moving coil galvanometer has 100 turns and each turn has an area of 2.0 cm^2. The magnetic field produced by the magnet is 0.01 T and the deflection in the coil is 0.05 radian when a current of 10 mA is passed through it. The torsional constant of the suspension wire is $x \times 10^{-5}$ N-m / rad. The value of x is _____.

Numerical value type: the answer is a number.

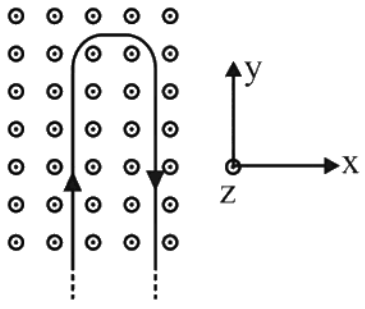
Answer: 4. · Key from source paper

Q60 JEE Main 2024 · 31 Jan · Shift 1 MCQ

A rigid wire consists of a semicircular portion of radius R and two straight sections. The wire is partially immerged in a perpendicular magnetic field $B = B_0\,\hat{j}$ as shown in figure. The magnetic force on the wire if it has a current i is :

(see the figure above)

Q14. A rigid wire consists of a semicircular portion of radius R and two straight sections. The wire is partially immerged in a perpendicular magnetic field $B = B_0\ \hat{j}$ as shown in figure. The magnetic force on the wire if it has a current i is :



(1) $-iBR\ \hat{j}$
(2) $2iBR\ \hat{j}$
(3) $iBR\ \hat{j}$
(4) $-2iBR\ \hat{j}$

(A) $-iBR\,\hat{j}$
(B) $2iBR\,\hat{j}$
(C) $iBR\,\hat{j}$
(D) $-2iBR\,\hat{j}$

Answer: (D) $-2iBR\,\hat{j}$ · Key from source paper

Q61 JEE Main 2024 · 31 Jan · Shift 1 Numerical

An electron moves through a uniform magnetic field $\vec{B} = B_0\hat{i} + 2B_0\hat{j}$ T. At a particular instant of time, the velocity of electron is $\vec{u} = 3\hat{i} + 5\hat{j}$ m s^{-1}. If the magnetic force acting on electron is $\vec{F} = 5e\hat{k}$ N, where e is the charge of electron, then the value of B_0 is _____ T.

Numerical value type: the answer is a number.

Answer: -5. · Checked by our team

Q62 JEE Main 2024 · 31 Jan · Shift 2 MCQ

A uniform magnetic field of 2×10^{-3} T acts along positive Y-direction. A rectangular loop of sides 20 cm and 10 cm with current of 5 A is in Y-Z plane. The current is in anticlockwise sense with reference to negative X axis. Magnitude and direction of the torque is :

(A) 2×10^{-4} N m along positive Z –direction
(B) 2×10^{-4} N m along negative Z-direction
(C) 2×10^{-4} N m along positive X-direction
(D) 2×10^{-4} N m along positive Y-direction

Answer: (B) 2×10^{-4} **N m along negative Z-direction** · Key from source paper

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Q63 JEE Main 2024 · 31 Jan · Shift 2 Numerical

Two circular coils P and Q of 100 turns each have same radius of π cm. The currents in P and Q are 1 A and 2 A respectively. P and Q are placed with their planes mutually perpendicular with their centers coincide. The resultant magnetic field induction at the center of the coils is $\sqrt{x}$ mT, where $x =$ _____. [Use $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}]

Numerical value type: the answer is a number.

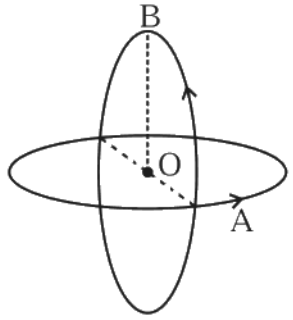
Answer: 20. · Key from source paper

Q64 JEE Main 2024 · 30 Jan · Shift 1 MCQ

Two insulated circular loop A and B radius a carrying a current of I in the anti clockwise direction as shown in figure. The magnitude of the magnetic induction at the centre will be:

(see the figure above)

Q13. Two insulated circular loop A and B radius a carrying a current of I in the anti clockwise direction as shown in figure. The magnitude of the magnetic induction at the centre will be:



(1) $\frac{\sqrt{2}\mu_0 I}{a}$
(2) $\frac{\mu_0 I}{2a}$
(3) $\frac{\mu_0 I}{\sqrt{2}a}$
(4) $\frac{2\mu_0 I}{a}$

(A) $\frac{\sqrt{2}\mu_0 I}{a}$
(B) $\frac{\mu_0 I}{2a}$
(C) $\frac{\mu_0 I}{\sqrt{2}a}$
(D) $\frac{2\mu_0 I}{a}$

Answer: (C) $\frac{\mu_0 I}{\sqrt{2}a}$ · Key from source paper

Q65 JEE Main 2024 · 30 Jan · Shift 1 Numerical

The horizontal component of earth's magnetic field at a place is 3.5×10^{-5} T. A very long straight conductor carrying current of $\sqrt{2}$ A in the direction from South east to North West is placed. The force per unit length experienced by the conductor is _____ $\times 10^{-6}$ $\mathrm{N\,m^{-1}}$.

Numerical value type: the answer is a number.

Answer: 35. · Key from source paper

Q66 JEE Main 2024 · 30 Jan · Shift 2 MCQ

An electron revolving in n^{th} Bohr orbit has magnetic moment μ_n. If $\mu_n \propto n^x$, the value of x is:

(A) 2
(B) 1
(C) 3
(D) 0

Answer: (B) 1 · Key from source paper

Q67 JEE Main 2024 · 30 Jan · Shift 2 Numerical

The current of 5 A flows in a square loop of sides 1 m is placed in air. The magnetic field at the centre of the loop is $X\sqrt{2} \times 10^{-7}$ T. The value of X is _____.

Numerical value type: the answer is a number.

Answer: 40. · Key from source paper

Q68 JEE Main 2024 · 29 Jan · Shift 2 MCQ

Two particles X and Y having equal charges are being accelerated through the same potential difference. Thereafter, they enter normally in a region of uniform magnetic field and describes circular paths of radii R_1 and R_2 respectively. The mass ratio of X and Y is :

(A) $\left(\frac{R_2}{R_1}\right)^2$

(B) $\left(\frac{R_1}{R_2}\right)^2$

(C) $\left(\frac{R_1}{R_2}\right)$

(D) $\left(\frac{R_2}{R_1}\right)$

Answer: (B) $\left(\frac{R_1}{R_2}\right)^2$ · Key from source paper

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Q69 JEE Main 2024 · 29 Jan · Shift 2 Numerical

A charge of 4.0 μC is moving with a velocity of 4.0×10^6 m s^{-1} along the positive y-axis under a magnetic field B of strength $\left(2\hat{k}\right)$ T. The force acting on the charge is $x\hat{i}$ N. The value of x is _____.

Numerical value type: the answer is a number.

Answer: 32. · Key from source paper

Q70 JEE Main 2024 · 27 Jan · Shift 1 MCQ

A proton moving with a constant velocity passes through a region of space without any change in its velocity. If $\vec{E}$ and $\vec{B}$ represent the electric and magnetic fields respectively, then the region of space may have :

(A) $E = 0$, $B = 0$; (B) $E = 0$, $B \neq 0$; (C) $E \neq 0$, $B = 0$; (D) $E \neq 0$, $B \neq 0$

Choose the most appropriate answer from the options given below :

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

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

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

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

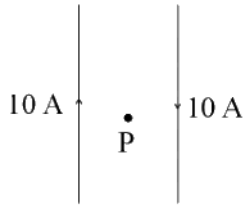
Answer: (C) (A), (B) and (D) only · Key from source paper

Q71 JEE Main 2024 · 27 Jan · Shift 1 Numerical

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: $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(see the figure above)

Q27. 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: $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})



Numerical value type: the answer is a number.

Answer: 160. · Key from source paper

Q72 JEE Main 2024 · 27 Jan · Shift 2 MCQ

A current of 200 μA deflects the coil of a moving coil galvanometer through 60°. The current to cause deflection through $\frac{\pi}{10}$ radian is

(A) 30 μA
(B) 120 μA
(C) 60 μA
(D) 180 μA

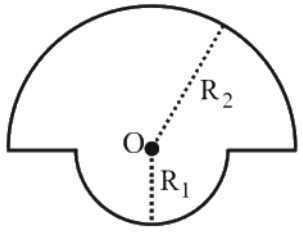
Answer: (C) 60 μA · Key from source paper

Q73 JEE Main 2024 · 27 Jan · Shift 2 Numerical

The magnetic field at the centre of a wire loop formed by two semicircular wires of radii $R_1 = 2\pi$ m and $R_2 = 4\pi$ m carrying current $I = 4$ A as per figure given below is $\alpha \times 10^{-7}$ T. The value of α is _____. (Centre O is common for all segments)

(see the figure above)

Q27. The magnetic field at the centre of a wire loop formed by two semicircular wires of radii $R_1 = 2\pi$ m and $R_2 = 4\pi$ m carrying current $I = 4$ A as per figure given below is $\alpha \times 10^{-7}$ T. The value of α is _____. (Centre O is common for all segments)



Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q74 JEE Main 2023 · 15 Apr · Shift 1 Numerical

An electron in a hydrogen atom revolves around its nucleus with a speed of 6.76×10^6 m s^{-1} in an orbit of radius 0.52 Å. The magnetic field produced at the nucleus of the hydrogen atom is _____ T.

Numerical value type: the answer is a number.

Answer: 40. · Key from source paper

Q75 JEE Main 2023 · 13 Apr · Shift 2 MCQ

An electron is moving along the positive x-axis. If 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 option given below:

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

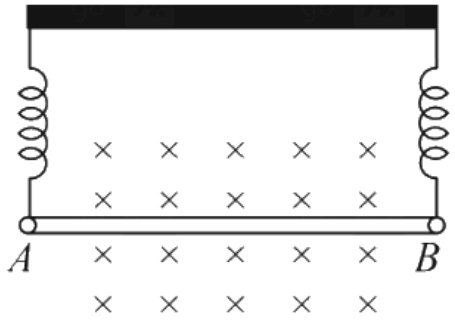
Answer: (C) B and E only · Key from source paper

Q76 JEE Main 2023 · 13 Apr · Shift 2 Numerical

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 to remove the tension in the supporting leads is _____ A. (Take g = 10 m s^{-2}).

(see the figure above)

Q27. 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 $g = 10$ m s^{-2}.



Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q77 JEE Main 2023 · 11 Apr · Shift 1 MCQ

The current sensitivity of moving coil galvanometer is increased by 25%. This increase is achieved only changing in the number of turns of coils and area of cross section of the wire while keeping the resistance of galvanometer coil constant. The percentage change in the voltage sensitivity will be:

(A) +25%
(B) -50%
(C) -25%
(D) Zero

Answer: (A) +25% · Key from source paper

Q78 JEE Main 2023 · 11 Apr · Shift 2 MCQ

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 option given below:

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

Answer: (C) B and C only · Key from source paper

Q79 JEE Main 2023 · 10 Apr · Shift 1 MCQ

Given below are two statements:
Statement I: If the number of turns in the coil of a moving coil galvanometer is doubled then the current sensitivity becomes double.
Statement II: Increasing current sensitivity of a moving coil galvanometer by only increasing the number of turns in the coil will also increase its voltage sensitivity in the same ratio
In the light of the above statements, choose the correct answer from the options given below:

(A) Statement I is true but Statement II is false
(B) Statement I is false but Statement II is true
(C) Both Statement I and Statement II are false
(D) Both Statement I and Statement II are true

Answer: (A) Statement I is true but Statement II is false · Key from source paper

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Q80 JEE Main 2023 · 10 Apr · Shift 1 Numerical

The current required to be passed through a solenoid of 15 cm length and 60 turns in order to demagnetise a bar magnet of magnetic intensity $2.4 \times 10^3\ \mathrm{A\,m^{-1}}$ is _____ A.

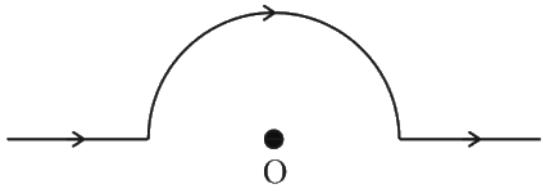
Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q81 JEE Main 2023 · 10 Apr · Shift 2 Numerical

A straight wire carrying a current of 14 A is bent into a semicircular 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
(see the figure above)

Q27. A straight wire carrying a current of 14 A is bent into a semicircular 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 ____ × 10^{-4} T



Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q82 JEE Main 2023 · 8 Apr · Shift 1 MCQ

Certain galvanometers have a fixed core made of non magnetic metallic material. The function of this metallic material is

(A) to oscillate the coil in magnetic field for longer period of time
(B) to bring the coil to rest quickly
(C) to produce large deflecting torque on the coil
(D) to make the magnetic field radial

Answer: (B) to bring the coil to rest quickly · Key from source paper

Q83 JEE Main 2023 · 8 Apr · Shift 1 MCQ

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

(A) helical path with the axis perpendicular to the direction of magnetic field B
(B) helical path with the axis along magnetic field B
(C) circular path
(D) straight along the direction of magnetic field B

Answer: (B) helical path with the axis along magnetic field B · Key from source paper

Q84 JEE Main 2023 · 8 Apr · Shift 1 Numerical

The magnetic intensity at the centre of a long current carrying solenoid is found to be $1.6 \times 10^3\ \mathrm{A\,m^{-1}}$. If the number of turns is 8 per cm, then the current flowing through the solenoid is _____ A.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q85 JEE Main 2023 · 8 Apr · Shift 2 Numerical

The ratio of magnetic field at the centre of a current carrying coil of radius r to the magnetic field at distance r from the centre of coil on its axis is $\sqrt{x}:1$. The value of x is _____ .

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q86 JEE Main 2023 · 6 Apr · Shift 1 MCQ

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

(A) inversely proportional to r in the region $r < a$ and uniform throughout in the region $r > a$
(B) directly proportional to r in the region $r < a$ and inversely proportional to r in the region $r > a$
(C) Zero in the region $r < a$ and inversely proportional to r in the region $r > a$
(D) uniform in the region $r < a$ and inversely proportional to distance r from the axis, in the region $r > a$

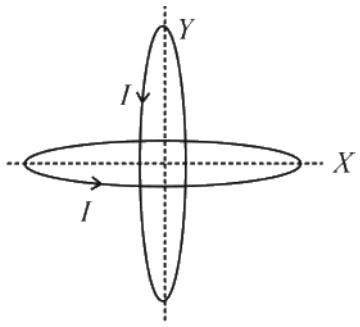
Answer: (B) directly proportional to r in the region $r < a$ and inversely proportional to r in the region $r > a$ · Key from source paper

Q87 JEE Main 2023 · 6 Apr · Shift 1 Numerical

Two identical circular wires of radius $20\ \mathrm{cm}$ and carrying current $\sqrt{2}\ \mathrm{A}$ are placed in perpendicular planes as shown in figure. The net magnetic field at the centre of the circular wires is _____ $\times 10^{-8}\ \mathrm{T}$. (Take $\pi = 3.14$)

(see the figure above)

Q27. 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 $\pi = 3.14$)

Numerical value type: the answer is a number.

Answer: 628. · Key from source paper

Q88 JEE Main 2023 · 6 Apr · Shift 2 Numerical

A proton with a kinetic energy of 2.0 eV moves into a region of uniform magnetic field of magnitude $\frac{\pi}{2} \times 10^{-3}$ T. The angle between the direction of magnetic field and velocity of proton is 60°. The pitch of the helical path taken by the proton is _____ cm. (Take, mass of proton $= 1.6 \times 10^{-27}$ kg and charge on proton $= 1.6 \times 10^{-19}$ C).

Numerical value type: the answer is a number.

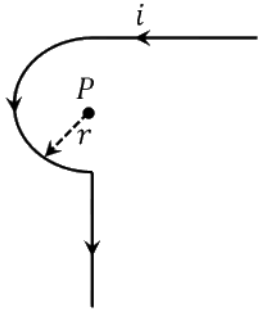
Answer: 40. · Key from source paper

Q89 JEE Main 2023 · 1 Feb · Shift 1 MCQ

Find the magnetic field at the point P in figure. The curved portion is a semicircle connected to two long straight wires.

(see the figure above)

Q13. Find the magnetic field at the point P in figure. The curved portion is a semicircle connected to two long straight wires.



(1) $\frac{\mu_0 i}{2r} 1 + \frac{2}{\pi}$

(2) $\frac{\mu_0 i}{2r} 1 + \frac{1}{\pi}$

(3) $\frac{\mu_0 i}{2r} \frac{1}{2} + \frac{1}{2\pi}$

(4) $\frac{\mu_0 i}{2r} \frac{1}{2} + \frac{1}{\pi}$

(A) $\frac{\mu_0 i}{2r}1+\frac{2}{\pi}$
(B) $\frac{\mu_0 i}{2r}1+\frac{1}{\pi}$
(C) $\frac{\mu_0 i}{2r}\frac{1}{2}+\frac{1}{2\pi}$
(D) $\frac{\mu_0 i}{2r}\frac{1}{2}+\frac{1}{\pi}$

Answer: (C) $\frac{\mu_0 i}{2r}\frac{1}{2}+\frac{1}{2\pi}$ · Key from source paper

Q90 JEE Main 2023 · 1 Feb · Shift 1 Numerical

A charge particle of 2 μC accelerated by a potential difference of 100 V enters a region of uniform magnetic field of magnitude 4 mT at right angle to the direction of field. The charge particle completes semicircle of radius 3 cm inside magnetic field. The mass of the charge particle is _____ $\times 10^{-18}$ kg.

Numerical value type: the answer is a number.

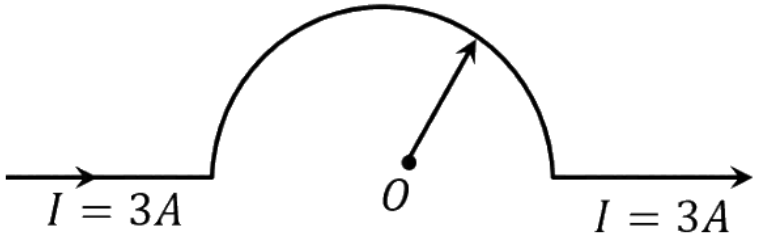
Answer: 144. · Key from source paper

Q91 JEE Main 2023 · 1 Feb · Shift 2 MCQ

As shown in the figure, a long straight conductor with semicircular arc of radius $\frac{\pi}{10}$ m is carrying current I = 3A. The magnitude of the magnetic field. at the center O of the arc is: (The permeability of the vacuum = $4\pi \times 10^{-7}$ NA^{-2})

(see the figure above)

Q21. As shown in the figure, a long straight conductor with semicircular arc of radius $\frac{\pi}{10}$ m is carrying current $I = 3A$. The magnitude of the magnetic field. at the center O of the arc is: (The permeability of the vacuum $= 4\pi \times 10^{-7}\,\mathrm{NA}^{-2}$)



(1) 6 μT
(2) 1 μT
(3) 4 μT
(4) 3 μT

(A) 6 μT
(B) 1 μT
(C) 4 μT
(D) 3 μT

Answer: (D) 3 μT · Key from source paper

Q92 JEE Main 2023 · 31 Jan · Shift 2 MCQ

The number of turns of the coil of a moving coil galvanometer is increased in order to increase current sensitivity by 50%. The percentage change in voltage sensitivity of the galvanometer will be :

(A) 100%
(B) 50%
(C) 75%
(D) 0%

Answer: (D) 0% · Key from source paper

Q93 JEE Main 2023 · 31 Jan · Shift 2 MCQ

A long conducting wire having a current I flowing through it, is bent into a circular coil of N turns. Then it is bent into a circular coil of n turns. The magnetic field is calculated at the centre of coils in both the cases. The ratio of the magnetic field in first case to that of second case is:

(A) $N : n$
(B) $n^2 : N^2$
(C) $N^2 : n^2$
(D) $n : N$

Answer: (C) $N^2 : n^2$ · Key from source paper

Q94 JEE Main 2023 · 30 Jan · Shift 1 MCQ

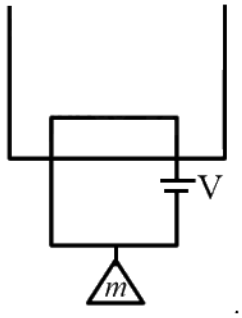
A massless square loop, of wire of resistance 10 Ω, supporting a mass of 1 g, hangs vertically with one of its sides in a uniform magnetic field of 10^3 G, directed outwards in the shaded region. A dc voltage V is applied to the loop. For what value of V, the magnetic force will exactly balance the weight of the supporting mass of 1 g?
(If sides of the loop = 10 cm, g = 10 m s^{-2})

(see the figure above)

EdLoop JEE

Q13. A massless square loop, of wire of resistance 10 Ω, supporting a mass of 1 g, hangs vertically with one of its sides in a uniform magnetic field of 10^3 G, directed outwards in the shaded region. A dc voltage V is applied to the loop. For what value of V, the magnetic force will exactly balance the weight of the supporting mass of 1 g?

(If sides of the loop = 10 cm, $g = 10$ m s^{-2})



(1) $\frac{1}{10}$V
(2) 100 V
(3) 1 V
(4) 10 V

(A) $\frac{1}{10}$ V
(B) 100 V
(C) 1 V
(D) 10 V

Answer: (D) 10 V · Key from source paper

Q95 JEE Main 2023 · 30 Jan · Shift 1 MCQ

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 turn and current of A and B respectively)

(A) $2N_AI_A = N_BI_B$
(B) $N_A = 2N_B$
(C) $N_AI_A = 4N_BI_B$
(D) $4N_AI_A = N_BI_B$

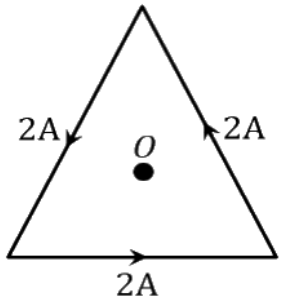
Answer: (C) $N_AI_A = 4N_BI_B$ · Key from source paper

Q96 JEE Main 2023 · 30 Jan · Shift 2 MCQ

As shown in the figure, a current of 2 A flowing in an equilateral triangle of side $4\sqrt{3}$ cm. The magnetic field at the centroid O of the triangle is :
(Neglect the effect of earth's magnetic field)

(see the figure above)

Q19. As shown in the figure, a current of 2 A flowing in an equilateral triangle of side $4\sqrt{3}$ cm . The magnetic field at the centroid O of the triangle is :



(Neglect the effect of earth's magnetic field)

(1) $4\sqrt{3} \times 10^{-4}$ T
(2) $4\sqrt{3} \times 10^{-5}$ T
(3) $\sqrt{3} \times 10^{-4}$ T
(4) $3\sqrt{3} \times 10^{-5}$ T

(A) $4\sqrt{3} \times 10^{-4}$ T
(B) $4\sqrt{3} \times 10^{-5}$ T
(C) $\sqrt{3} \times 10^{-4}$ T
(D) $3\sqrt{3} \times 10^{-5}$ T

Answer: (D) $3\sqrt{3} \times 10^{-5}$ T · Key from source paper

Q97 JEE Main 2023 · 30 Jan · Shift 2 MCQ

A current carrying rectangular loop $PQRS$ is made of uniform wire. The length PR = QS = 5 cm and PQ = RS = 100 cm. If ammeter current reading changes from I to $2I$, the ratio of magnetic forces per unit length on the wire PQ due to wire RS in the two cases respectively $\left(f_{PQ}^{I} : f_{PQ}^{2I}\right)$ is:

(see the figure above)

Q20. A current carrying rectangular loop $PQRS$ is made of uniform wire. The length $PR = QS = 5$ cm and $PQ = RS = 100$ cm. If ammeter current reading changes from I to $2I$, the ratio of magnetic forces per unit length on the wire PQ due to wire RS in the two cases respectively $\left(f_{PQ}^{I} : f_{PQ}^{2I}\right)$ is:



(1) 1 : 2
(2) 1 : 4
(3) 1 : 5
(4) 1 : 3

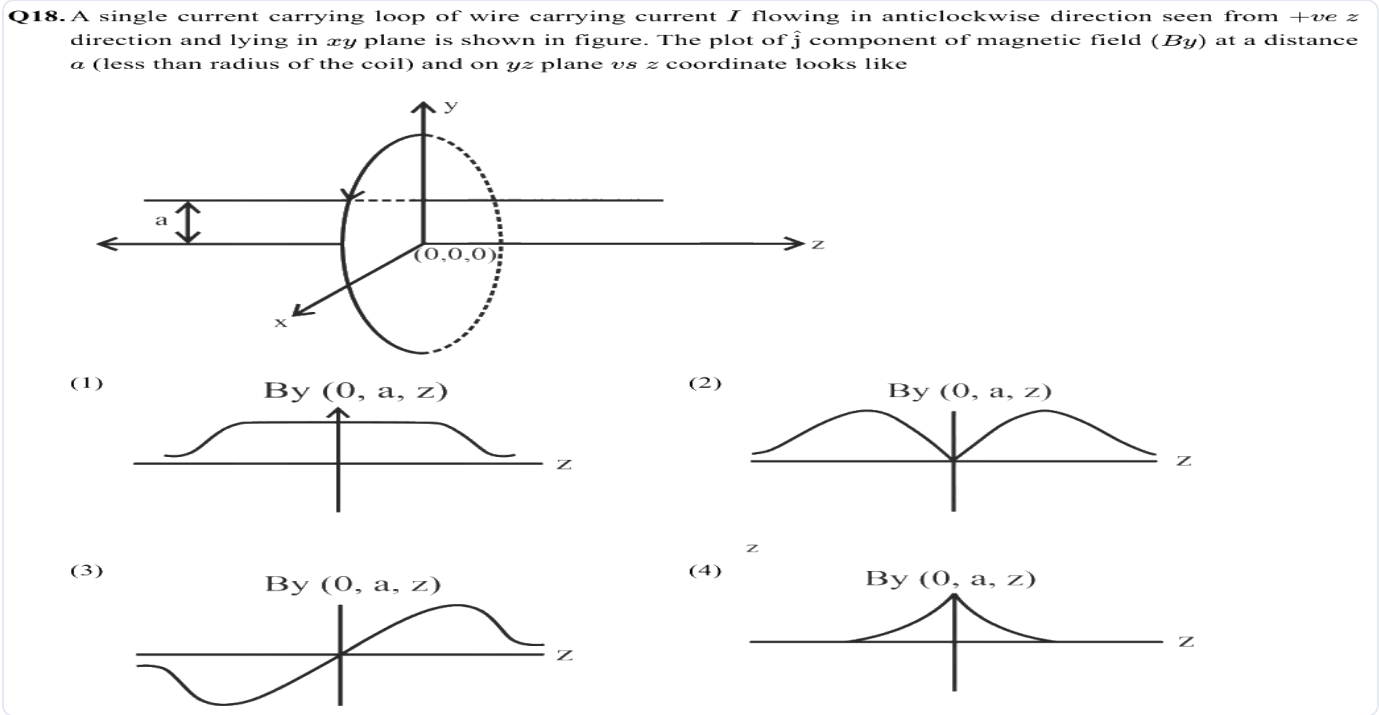
(A) 1 : 2
(B) 1 : 4
(C) 1 : 5
(D) 1 : 3

Answer: (B) 1 : 4 · Key from source paper

Q98 JEE Main 2023 · 29 Jan · Shift 1 MCQ

A single current carrying loop of wire carrying current I flowing in anticlockwise direction seen from $+ve$ z direction and lying in xy plane is shown in figure. The plot of $\hat{j}$ component of magnetic field (By) at a distance a (less than radius of the coil) and on yz plane vs z coordinate looks like

(see the figure above)



(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (C) · Key from source paper

Q99 JEE Main 2023 · 29 Jan · Shift 1 MCQ

The magnitude of magnetic induction at mid-point O due to current arrangement as shown in figure will be

(A) $\frac{\mu_0 I}{2\pi a}$
(B) 0
(C) $\frac{\mu_0 I}{4\pi a}$
(D) $\frac{\mu_0 I}{\pi a}$

Answer: (D) $\frac{\mu_0 I}{\pi a}$ · Key from source paper

Q100 JEE Main 2023 · 29 Jan · Shift 2 MCQ

The electric current in a circular coil of four turns produces a magnetic induction 32 T at its centre. The coil is unwound and is rewound into a circular coil of single turn, the magnetic induction at the centre of the coil by the same current will be :

(A) 8 T
(B) 4 T
(C) 2 T
(D) 16 T

Answer: (C) 2 T · Key from source paper

Q101 JEE Main 2023 · 25 Jan · Shift 1 MCQ

Match List I with List II

List - I (Current configuration)
A *(see the figure above)*
B *(see the figure above)*
C *(see the figure above)*
D *(see the figure above)*

List - II (Magnetic field at point O)
I. $B_0 = \frac{\mu_0 I}{4\pi r}[\pi + 2]$
II. $B_0 = \frac{\mu_0}{4}\frac{I}{r}$
III. $B_0 = \frac{\mu_0 I}{2\pi r}[\pi - 1]$
IV. $B_0 = \frac{\mu_0 I}{4\pi r}[\pi + 1]$

Choose the correct answer from the option given below:

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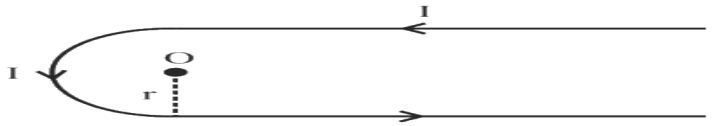
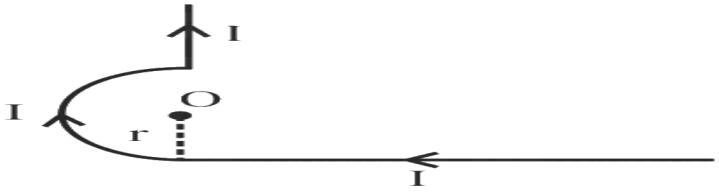
Q19. Match List I with List II

List – I
(Current configuration)

A 

B 

C 

D 

List – II
(Magnetic field at point O)

I. $B_0 = \frac{\mu_0 I}{4\pi r}[\pi + 2]$

II. $B_0 = \frac{\mu_0}{4}\frac{I}{r}$

III. $B_0 = \frac{\mu_0 I}{2\pi r}[\pi - 1]$

IV. $B_0 = \frac{\mu_0 I}{4\pi r}[\pi + 1]$

Choose the correct answer from the option given below:
(1) A-III, B-IV, C-I, D-II
(2) A-I, B-III, C-IV, D-II
(3) A-III, B-I, C-IV, D-II
(4) A-II, B-I, C-IV, D-III

(A) A-III, B-IV, C-I, D-II
(B) A-I, B-III, C-IV, D-II
(C) A-III, B-I, C-IV, D-II
(D) A-II, B-I, C-IV, D-III

Answer: (C) A-III, B-I, C-IV, D-II · Key from source paper

Q102 JEE Main 2023 · 25 Jan · Shift 1 MCQ

A solenoid of 1200 turns is wound uniformly in a single layer on a glass tube 2 m long and 0.2 m in diameter. The magnetic intensity at the center of the solenoid when a current of 2 A flows through it is:

(A) $2.4 \times 10^3\ \mathrm{A\,m^{-1}}$
(B) $1.2 \times 10^3\ \mathrm{A\,m^{-1}}$
(C) $1\ \mathrm{A\,m^{-1}}$
(D) $2.4 \times 10^{-3}\ \mathrm{A\,m^{-1}}$

Answer: (B) $1.2 \times 10^3\ \mathrm{A\,m^{-1}}$ · Key from source paper

Q103 JEE Main 2023 · 25 Jan · Shift 2 MCQ

For a moving coil galvanometer, the deflection in the coil is 0.05 rad when a current of 10 mA is passed through it. If the torsional constant of suspension wire is $4.0 \times 10^{-5}\ \mathrm{N\,m\,rad^{-1}}$, the magnetic field is 0.01 T and the number of turns in the coil is 200, the area of each turn (in $\mathrm{cm^2}$) is :

(A) 2.0
(B) 1.0
(C) 1.5
(D) 0.5

Answer: (B) 1.0 · Key from source paper

Q104 JEE Main 2023 · 25 Jan · Shift 2 Numerical

Two long parallel wires carrying currents 8 A and 15 A in opposite directions are placed at a distance of 7 cm from each other. A point P is at equidistant from both the wires such that the lines joining the point P to the wires are perpendicular to each other. The magnitude of magnetic field at P is _____ $\times 10^{-6}$ T. (Given: $\sqrt{2} = 1.4$)

Numerical value type: the answer is a number.

Answer: 68. · Key from source paper

Q105 JEE Main 2023 · 24 Jan · Shift 1 MCQ

Two long straight wires P and Q carrying equal current 10 A 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:

(A) $8F_1$
(B) $10\ F_1$
(C) $\frac{F_1}{8}$
(D) $\frac{F_1}{10}$

Answer: (A) $8F_1$ · Key from source paper

Q106 JEE Main 2023 · 24 Jan · Shift 1 MCQ

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

(A) $1 : 3\sqrt{2}$
(B) $3\sqrt{2} : 2$
(C) $2\sqrt{2} : 1$
(D) $1 : \sqrt{2}$

Answer: (C) $2\sqrt{2} : 1$ · Key from source paper

Q107 JEE Main 2023 · 24 Jan · Shift 2 MCQ

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 _____.

($\mu_0 = 4\pi \times 10^{-7}\ \mathrm{T\,m\,A^{-1}}$)

(A) 1232×10^{-4} T

(B) 176×10^{-4} T

(C) 352×10^{-4} T

(D) 88×10^{-4} T

Answer: (B) 176×10^{-4} T · Key from source paper

Q108 JEE Main 2023 · 24 Jan · Shift 2 Numerical

A single turn current loop in the shape of a right angle triangle with sides 5 cm, 12 cm, 13 cm is carrying a current of 2 A. The loop is in a uniform magnetic field of magnitude 0.75 T whose direction is parallel to the current in the 13 cm side of the loop. The magnitude of the magnetic force on the 5 cm side will be $\frac{x}{130}$ N. The value of x is _____.

Numerical value type: the answer is a number.

Answer: 9. · Key from source paper

Q109 JEE Main 2022 · 29 Jul · Shift 1 Numerical

A closely wounded 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 $\pi = 3.14$]

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q110 JEE Main 2022 · 29 Jul · Shift 1 Numerical

A wire of length 314 cm carrying current of 14 A is bent to form a circle. The magnetic moment of the coil is _____ $\mathrm{A-m^2}$. [Given $\pi = 3.14$]

Numerical value type: the answer is a number.

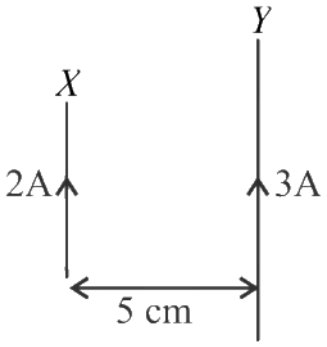
Answer: 11. · Key from source paper

Q111 JEE Main 2022 · 29 Jul · Shift 2 MCQ

A wire X of length 50 cm carrying a current of 2 A is placed parallel to a long wire Y of length 5 m. The wire Y carries a current of 3 A. The distance between two wires is 5 cm and currents flow in the same direction. The force acting on the wire Y is :

(see the figure above)

Q15. A wire X of length 50 cm carrying a current of 2 A is placed parallel to a long wire Y of length 5 m. The wire Y carries a current of 3 A. The distance between two wires is 5 cm and currents flow in the same direction. The force acting on the wire Y is :



(1) 1.2×10^{-5} N directed towards wire X.
(2) 1.2×10^{-4} N directed away from wire X.
(3) 1.2×10^{-4} N directed towards wire X.
(4) 2.4×10^{-5} N directed towards wire X.

(A) 1.2×10^{-5} N directed towards wire X.
(B) 1.2×10^{-4} N directed away from wire X.
(C) 1.2×10^{-4} N directed towards wire X.
(D) 2.4×10^{-5} N directed towards wire X.

Answer: (A) 1.2×10^{-5} N directed towards wire X. · Key from source paper

Q112 JEE Main 2022 · 28 Jul · Shift 1 MCQ

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 :

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

Answer: (D) (B) and (D) only · Key from source paper

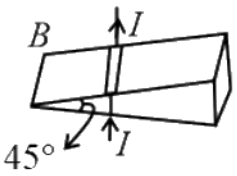
Q113 JEE Main 2022 · 28 Jul · Shift 1 MCQ

As shown in the figure, a metallic rod of linear density $0.45\ \text{kg m}^{-1}$ is lying horizontally on a smooth incline plane which makes an angle of 45° with the horizontal. The minimum current flowing in the rod required to keep it stationary, when $0.15\ \text{T}$ magnetic field is acting on it in the vertical upward direction, will be
(Use $g = 10\ \text{m s}^{-2}$)

(see the figure above)

Q13. As shown in the figure, a metallic rod of linear density 0.45 kg m^{-1} is lying horizontally on a smooth incline plane which makes an angle of 45° with the horizontal. The minimum current flowing in the rod required to keep it stationary, when 0.15 T magnetic field is acting on it in the vertical upward direction, will be

(Use $g = 10$ m s^{-2})



(1) 30 A
(2) 15 A
(3) 10 A
(4) 3 A

(A) 30 A
(B) 15 A
(C) 10 A
(D) 3 A

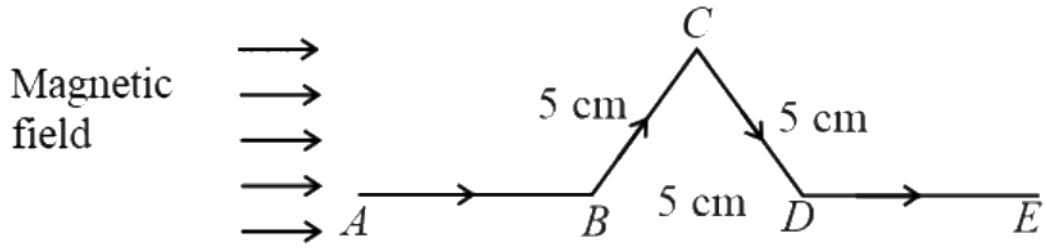
Answer: (A) 30 A · Key from source paper

Q114 JEE Main 2022 · 28 Jul · Shift 2 MCQ

A triangular shaped wire carrying 10 A current is placed in a uniform magnetic field of 0.5 T, as shown in figure. The magnetic force on segment CD is (Given $BC = CD = BD = 5$ cm).

(see the figure above)

Q12. A triangular shaped wire carrying 10 A current is placed in a uniform magnetic field of 0.5 T, as shown in figure. The magnetic force on segment CD is (Given $BC = CD = BD = 5$ cm).



(1) 0.126 N
(2) 0.312 N
(3) 0.216 N
(4) 0.245 N

(A) 0.126 N
(B) 0.312 N
(C) 0.216 N
(D) 0.245 N

Answer: (C) 0.216 N · Key from source paper

Q115 JEE Main 2022 · 28 Jul · Shift 2 MCQ

The magnetic field at the center of current carrying circular loop is B_1. The magnetic field at a distance of $\sqrt{3}$ times radius of the given circular loop from the center on its axis is B_2. The value of $\frac{B_1}{B_2}$ will be

(A) $9:4$
(B) $12:\sqrt{5}$
(C) $8:1$
(D) $5:\sqrt{3}$

Answer: (C) $8:1$ · Key from source paper

Q116 JEE Main 2022 · 27 Jul · Shift 2 MCQ

A cyclotron is used to accelerate protons. If the operating magnetic field is 1.0 T and the radius of the cyclotron 'dees' is 60 cm, the kinetic energy of the accelerated protons in MeV will be :
[use $m_{\mathrm{p}} = 1.6 \times 10^{-27}$ kg, $e = 1.6 \times 10^{-19}$ C]

(A) 12
(B) 18
(C) 16
(D) 32

Answer: (B) 18 · Key from source paper

Q117 JEE Main 2022 · 26 Jul · Shift 1 MCQ

A charge particle is moving in a uniform magnetic field $(2\hat{i} + 3\hat{j})$ T. If it has an acceleration of $(\alpha\hat{i} - 4\hat{j})\ \mathrm{m\ s^{-2}}$, then the value of α will be

(A) 3
(B) 6
(C) 12
(D) 2

Answer: (B) 6 · Key from source paper

Q118 JEE Main 2022 · 26 Jul · Shift 1 MCQ

B_X and B_Y are the magnetic field at the centre of two coils 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

(A) $1:1$
(B) $1:2$
(C) $2:1$
(D) $4:1$

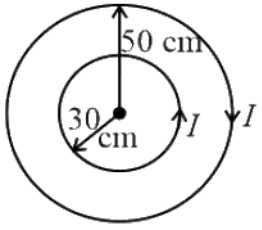
Answer: (B) $1:2$ · Key from source paper

Q119 JEE Main 2022 · 26 Jul · Shift 2 MCQ

Two concentric circular loops of radii $r_1 = 30$ cm and $r_2 = 50$ cm are placed in $X - Y$ plane as shown in the figure. A current $I = 7$ A is flowing through them in the direction as shown in figure. The net magnetic moment of this system of two circular loops is approximately

(see the figure above)

Q13. Two concentric circular loops of radii $r_1 = 30$ cm and $r_2 = 50$ cm are placed in X - Y plane as shown in the figure. A current $I = 7$ A is flowing through them in the direction as shown in figure. The net magnetic moment of this system of two circular loops is approximately



(1) $\frac{7}{2}\hat{k}$ A m^2
(2) $-\frac{7}{2}\hat{k}$ A m^2
(3) $7\hat{k}$ A m^2
(4) $-7\hat{k}$ A m^2

(A) $\frac{7}{2}\hat{k}$ A m^2
(B) $-\frac{7}{2}\hat{k}$ A m^2
(C) $7\hat{k}$ A m^2
(D) $-7\hat{k}$ A m^2

Answer: (B) $-\frac{7}{2}\hat{k}$ A m^2 · Key from source paper

Q120 JEE Main 2022 · 26 Jul · Shift 2 MCQ

A velocity selector consists of electric field $\vec{E} = E\,\hat{k}$ and magnetic field $\vec{B} = B\,\hat{j}$ with $B = 12$ mT. The value E required for an electron of energy 728eV moving along the positive x-axis to pass undeflected is
(Given, mass of electron $= 9.1 \times 10^{-31}$ kg)

(A) 192 kV m^{-1}
(B) 192 mV m^{-1}
(C) 9600 kV m^{-1}
(D) 16 kV m^{-1}

Answer: (A) 192 kV m^{-1} · Key from source paper

Q121 JEE Main 2022 · 25 Jul · Shift 1 MCQ

Two charged particles, having same kinetic energy, are allowed to pass through a uniform magnetic field perpendicular to the direction of motion. If the ratio of radii of their circular paths is $6:5$ and their respective masses ratio is $9:4$. Then, the ratio of their charges will be

(A) $8:5$
(B) $5:4$
(C) $5:3$
(D) $8:7$

Answer: (B) $5:4$ · Key from source paper

Q122 JEE Main 2022 · 25 Jul · Shift 1 MCQ

The magnetic moment of an electron e revolving in an orbit around nucleus with an orbital angular momentum is given by

(A) $\vec{\mu}_L = \frac{eL}{2m}$
(B) $\vec{\mu}_L = -\frac{eL}{2m}$
(C) $\vec{\mu}_L = -\frac{e\vec{L}}{m}$
(D) $\vec{\mu}_L = \frac{2e\vec{L}}{m}$

Answer: (B) $\vec{\mu}_L = -\frac{eL}{2m}$ · Key from source paper

Q123 JEE Main 2022 · 25 Jul · Shift 2 MCQ

An electron with energy 0.1 keV moves at right angle to the earth's magnetic field of $1 \times 10^{-4}\ \mathrm{Wbm^{-2}}$. The frequency of revolution of the electron will be
(Take mass of electron $= 9.0 \times 10^{-31}$ kg)

(A) 1.6×10^{5} Hz
(B) 5.6×10^{5} Hz
(C) 2.8×10^{6} Hz
(D) 1.8×10^{6} Hz

Answer: (C) 2.8×10^{6} Hz · Key from source paper

Q124 JEE Main 2022 · 25 Jul · Shift 2 MCQ

The electric current in a circular coil of 2 turns produces a magnetic induction B_1 at its centre. The coil is unwound and is rewound into a circular coil of 5 turns and the same current produces a magnetic induction B_2 at its centre.
The ratio of $\frac{B_2}{B_1}$ is:

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(A) $\frac{5}{2}$
(B) $\frac{25}{4}$
(C) $\frac{5}{4}$
(D) $\frac{25}{2}$

Answer: (B) $\frac{25}{4}$ · Key from source paper

Q125 JEE Main 2022 · 29 Jun · Shift 1 MCQ

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?

(A) $1:1$
(B) $1:2$
(C) $2:1$
(D) $1:4$

Answer: (C) $2:1$ · Key from source paper

Q126 JEE Main 2022 · 29 Jun · Shift 2 MCQ

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

(A) $30\ \mathrm{A}$ in the same direction.
(B) $60\ \mathrm{A}$ in the opposite direction.
(C) $30\ \mathrm{A}$ in the opposite direction.
(D) $300\ \mathrm{A}$ in the opposite direction.

Answer: (C) $30\ \mathrm{A}$ **in the opposite direction.** · Key from source paper

Q127 JEE Main 2022 · 29 Jun · Shift 2 MCQ

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 :

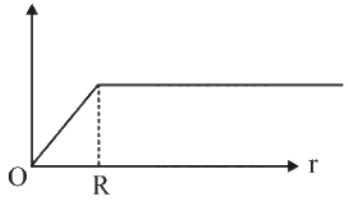
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

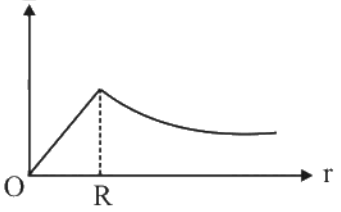
Answer: (C) Statement I is correct but Statement II is incorrect. · Key from source paper

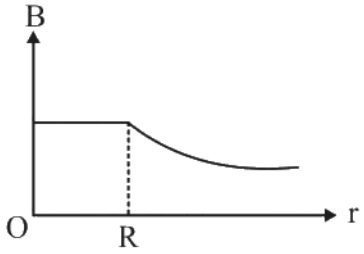
Q128 JEE Main 2022 · 28 Jun · Shift 1 MCQ

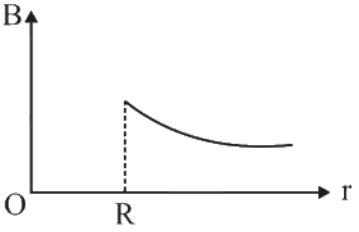
An infinitely long hollow conducting cylinder with radius R carries a uniform current along its surface. Choose the correct representation of magnetic field (B) as a function of radial distance (r) from the axis of cylinder.

Q12. 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.

(1)


(2)


(3)


(4)


(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (D) · Key from source paper

Q129 JEE Main 2022 · 28 Jun · Shift 1 Numerical

A singly ionized magnesium atom $(A = 24)$ ion is accelerated to kinetic energy $5\ \mathrm{keV}$, and is projected perpendicularly into a magnetic field B of the magnitude $0.5\ \mathrm{T}$. The radius of path formed will be _____ cm.

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q130 JEE Main 2022 · 28 Jun · Shift 2 MCQ

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

(A) 1
(B) 2.4
(C) 1.4
(D) 2

Answer: (C) 1.4 · Key from source paper

Q131 JEE Main 2022 · 27 Jun · Shift 2 MCQ

Two long parallel conductors S_1 and S_2 are separated by a distance $10\ \text{cm}$ and carrying currents of $4\ \text{A}$ and $2\ \text{A}$ respectively. The conductors are placed along x-axis in $X-Y$ plane. There is a point P located between the conductors (as shown in figure).

A charge particle of 3π coulomb is passing through the point P with velocity $\vec{v} = \left(2\hat{i} + 3\hat{j}\right)\ \text{m s}^{-1}$; where $\hat{i}$ & $\hat{j}$ represents unit vector along x & y axis respectively.

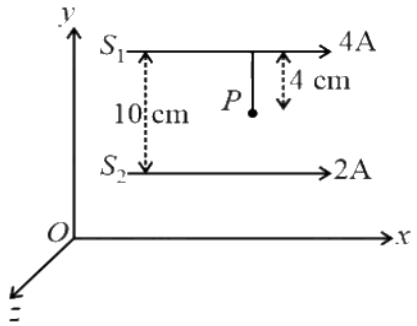
The force acting on the charge particle is $4\pi \times 10^{-5}\left(-x\hat{i} + 2\hat{j}\right)$ N. The value of x is

(see the figure above)

Q15. Two long parallel conductors S_1 and S_2 are separated by a distance $10\ \text{cm}$ and carrying currents of $4\ \text{A}$ and $2\ \text{A}$ respectively. The conductors are placed along x-axis in $X-Y$ plane. There is a point P located between the conductors (as shown in figure).

A charge particle of 3π coulomb is passing through the point P with velocity $\vec{v} = \left(2\hat{i} + 3\hat{j}\right)\ \text{m s}^{-1}$; where $\hat{i}$ & $\hat{j}$ represents unit vector along x & $y$axis respectively.

The force acting on the charge particle is $4\pi \times 10^{-5}\left(-x\hat{i} + 2\hat{j}\right)$ N. The value of x is



(1) 2
(2) 1
(3) 3
(4) -3

(A) 2
(B) 1
(C) 3
(D) -3

Answer: (C) 3 · Key from source paper

Q132 JEE Main 2022 · 27 Jun · Shift 2 Numerical

A deuteron and a proton moving with equal kinetic energy enter into to a uniform magnetic field at right angle to the field. If r_d and r_p are the radii of their circular paths respectively, then the ratio $\frac{r_d}{r_p}$ will be $\sqrt{x}:1$ where x is _____ .

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q133 JEE Main 2022 · 26 Jun · Shift 1 MCQ

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

(A) $4:1$
(B) $2:1$
(C) $1:2$
(D) $1:4$

Answer: (B) $2:1$ · Key from source paper

Q134 JEE Main 2022 · 26 Jun · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q135 JEE Main 2022 · 25 Jun · Shift 1 MCQ

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 $r < R$ from its centre will be

(A) $B \propto r$
(B) $B \propto \frac{1}{r}$
(C) $B \propto r^2$
(D) $B \propto \frac{1}{r^2}$

Answer: (A) $B \propto r$ · Key from source paper

Q136 JEE Main 2022 · 25 Jun · Shift 2 MCQ

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

(A) $2B$
(B) $4B$
(C) $\frac{B}{2}$
(D) B

Answer: (D) B · Key from source paper

Q137 JEE Main 2022 · 24 Jun · Shift 1 MCQ

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.

(A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(B) Both Assertion and Reason are true but Reason is NOT the correct explanation of Assertion.
(C) Assertion is true but Reason is false.
(D) Assertion is false but Reason is true.

Answer: (A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion. · Key from source paper

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Q138 JEE Main 2022 · 24 Jun · Shift 1 MCQ

The magnetic field at the centre of a circular coil of radius r, due to current I flowing through it, is B. The magnetic field at a point along the axis at a distance $\frac{r}{2}$ from the centre is :

(A) $\frac{B}{2}$
(B) $2B$
(C) $\left(\frac{2}{\sqrt{5}}\right)^3 \mathrm{B}$
(D) $\left(\frac{2}{\sqrt{3}}\right)^3 \mathrm{B}$

Answer: (C) $\left(\frac{2}{\sqrt{5}}\right)^3 \mathrm{B}$ · Key from source paper

Q139 JEE Main 2022 · 24 Jun · Shift 2 MCQ

A proton, a deuteron and an α-particle with same kinetic energy enter into a uniform magnetic field at right angle to magnetic field. The ratio of the radii of their respective circular paths is :

(A) $1 : \sqrt{2} : \sqrt{2}$
(B) $1 : \sqrt{2} : 1$
(C) $\sqrt{2} : 1 : 1$
(D) None of these

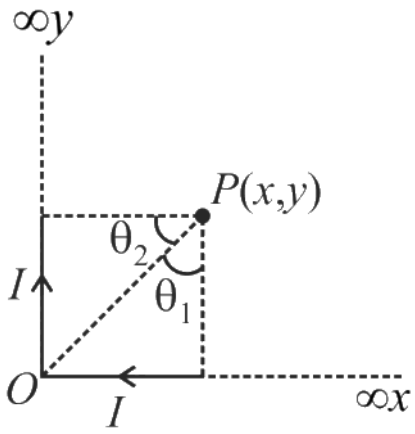
Answer: (B) $1 : \sqrt{2} : 1$ · Key from source paper

Q140 JEE Main 2021 · 1 Sep · Shift 2 MCQ

There are two infinitely long straight current-carrying conductors and they are held at right angles to each other so that their common ends meet at the origin as shown in the figure given below. The ratio of current in both conductors is $1 : 1$. The magnetic field at point P is _____.

(see the figure above)

Q17. There are two infinitely long straight current-carrying conductors and they are held at right angles to each other so that their common ends meet at the origin as shown in the figure given below. The ratio of current in both conductors is 1: 1. The magnetic field at point P is_____.



(1) $\frac{\mu_0 I}{4\pi xy}\sqrt{x^2+y^2}\,\text{-}\,(x+y)$
(2) $\frac{\mu_0 I xy}{4\pi}\sqrt{x^2+y^2}\,\text{-}\,(x+y)$
(3) $\frac{\mu_0 I}{4\pi xy}\sqrt{x^2+y^2}+(x+y)$
(4) $\frac{\mu_0 I xy}{4\pi}\sqrt{x^2+y^2}+(x+y)$

(A) $\frac{\mu_0 I}{4\pi xy}\sqrt{x^2+y^2}-(x+y)$
(B) $\frac{\mu_0 Ixy}{4\pi}\sqrt{x^2+y^2}-(x+y)$
(C) $\frac{\mu_0 I}{4\pi xy}\sqrt{x^2+y^2}+(x+y)$
(D) $\frac{\mu_0 Ixy}{4\pi}\sqrt{x^2+y^2}+(x+y)$

Answer: (C) $\frac{\mu_0 I}{4\pi xy}\sqrt{x^2+y^2}+(x+y)$ · Key from source paper

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Q141 JEE Main 2021 · 31 Aug · Shift 1 MCQ

A coil having N turns is wound tightly in the form of a spiral with inner and outer radii a and b respectively. Find the magnetic field at centre, when a current I passes through coil :

(A) $\frac{\mu_0 I}{8}\left[\frac{a+b}{a-b}\right]$
(B) $\frac{\mu_0 I}{4(a-b)}\left[\frac{1}{a}-\frac{1}{b}\right]$
(C) $\frac{\mu_0 I}{8}\left(\frac{a-b}{a+b}\right)$
(D) $\frac{\mu_0 IN}{2(b-a)}\log_e\left(\frac{b}{a}\right)$

Answer: (D) $\frac{\mu_0 IN}{2(b-a)}\log_e\left(\frac{b}{a}\right)$ · Key from source paper

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Q142 JEE Main 2021 · 31 Aug · Shift 2 MCQ

A current of 1.5 A is flowing through a triangle, of side 9 cm each. The magnetic field at the centroid of the triangle is :
(Assume that the current is flowing in the clockwise direction.)

(A) $2\sqrt{3}\times 10^{-5}$ T, inside the plane of triangle
(B) $2\sqrt{3}\times 10^{-7}$ T, outside the plane of triangle
(C) 3×10^{-7} T, outside the plane of triangle
(D) 3×10^{-5} T, inside the plane of triangle

Answer: (D) 3×10^{-5} **T, inside the plane of triangle** · Key from source paper

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Q143 JEE Main 2021 · 27 Aug · Shift 1 MCQ

Two ions of masses 4 amu and 16 amu have charges $+2$ e and $+3$ e respectively. These ions pass through the region of the constant perpendicular magnetic field. The kinetic energy of both ions is the same. Then:

(A) lighter ion will be deflected less than heavier ion
(B) lighter ion will be deflected more than heavier ion
(C) both ions will be deflected equally
(D) no ion will be deflected

Answer: (B) lighter ion will be deflected more than heavier ion · Key from source paper

Q144 JEE Main 2021 · 27 Aug · Shift 1 Numerical

A uniform conducting wire of length $24a$, and resistance R is wound up as a current carrying coil in the shape of an equilateral triangle of side a and then in the form of a square of side a. The coil is connected to a voltage source V_0. The ratio of magnetic moment of the coils in case of equilateral triangle to that for square is $1 : \sqrt{y}$ where y is _____.

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q145 JEE Main 2021 · 27 Aug · Shift 2 MCQ

For full scale deflection of total 50 divisions, $50\ \mathrm{mV}$ voltage is required in galvanometer. The resistance of galvanometer if its current sensitivity is $2\ \mathrm{div}\ /\ \mathrm{mA}$ will be:

(A) $1\ \Omega$
(B) $2\ \Omega$
(C) $5\ \Omega$
(D) $4\ \Omega$

Answer: (B) $2\ \Omega$ · Key from source paper

Q146 JEE Main 2021 · 27 Aug · Shift 2 MCQ

A coaxial cable consists of an inner wire of radius a surrounded by an outer shell of inner and outer radii b and c respectively. The inner wire carries an electric current i_0 which is distributed uniformly across cross-sectional area. The outer shell carries an equal current in opposite direction and distributed uniformly. What will be the ratio of the magnetic field at a distance x from the axis when $(i)\ \mathrm{x} < \mathrm{a}$ and $(ii)\ \mathrm{a} < \mathrm{x} < \mathrm{b}$?

(A) $\frac{a^2}{x^2}$
(B) $\frac{b^2-a^2}{x^2}$
(C) $\frac{x^2}{b^2-a^2}$
(D) $\frac{x^2}{a^2}$

Answer: (D) $\frac{x^2}{a^2}$ · Key from source paper

Q147 JEE Main 2021 · 26 Aug · Shift 1 MCQ

The fractional change in the magnetic field intensity at a distance r from centre on the axis of current carrying coil of radius a to the magnetic field intensity at the centre of the same coil is: (Take $\mathrm{r} < \mathrm{a}$)

(A) $\frac{2}{3}\frac{a^2}{r^2}$
(B) $\frac{3}{2}\frac{a^2}{r^2}$
(C) $\frac{3}{2}\frac{r^2}{a^2}$
(D) $\frac{2}{3}\frac{r^2}{a^2}$

Answer: (C) $\frac{3}{2}\frac{r^2}{a^2}$ · Key from source paper

Q148 JEE Main 2021 · 26 Aug · Shift 2 Numerical

If the maximum value of accelerating potential provided by a radio frequency oscillator is $12\,\mathrm{kV}$. The number of revolution made by a proton in a cyclotron to achieve one sixth of the speed of light is: [$\mathrm{m_p} = 1.67 \times 10^{-27}$ kg, $\mathrm{e} = 1.6 \times 10^{-19}$ C, Speed of light$= 3 \times 10^8\ \mathrm{m\ s^{-1}}$]

Numerical value type: the answer is a number.

Answer: 543. · Key from source paper

Q149 JEE Main 2021 · 26 Aug · Shift 2 Numerical

A coil in the shape of an equilateral triangle of side $10\ \mathrm{cm}$ lies in a vertical plane between the pole pieces of permanent magnet producing a horizontal magnetic field $20\,\mathrm{mT}$. The torque acting on the coil when a current of $0.2\ \mathrm{A}$ is passed through it and its plane becomes parallel to the magnetic field will be $\sqrt{x} \times 10^{-5}\ \mathrm{Nm}$. The value of x is

Numerical value type: the answer is a number.

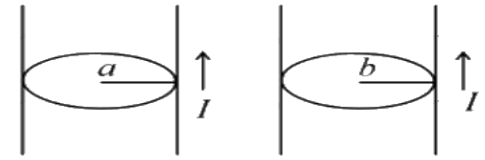
Answer: 3. · Key from source paper

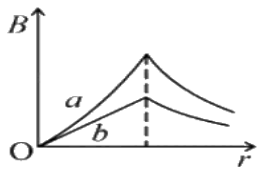
Q150 JEE Main 2021 · 27 Jul · Shift 2 MCQ

Figure A and B shown two long straight wires of circular cross-section (a and b with $a < b$), carrying current I which is uniformly distributed across the cross-section. The magnitude of magnetic field B varies with radius r and can be represented as:
(see the figure above)

EdLoop JEE

Q15. Figure A and B shown two long straight wires of circular cross-section (a and b with $a < b$), carrying current I which is uniformly distributed across the cross-section. The magnitude of magnetic field B varies with radius r and can be represented as:



(1)


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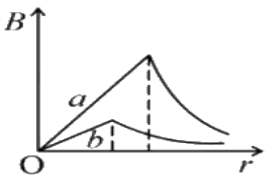
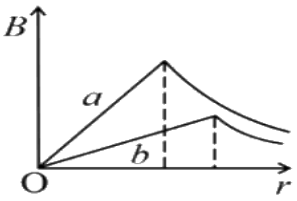
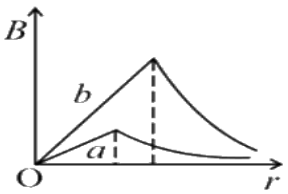


(3)


(4)


(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (C) · Key from source paper

Q151 JEE Main 2021 · 25 Jul · Shift 2 MCQ

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,

(A) $1:4$
(B) $4:3$
(C) $3:1$
(D) $2:3$

Answer: (B) $4:3$ · Key from source paper

Q152 JEE Main 2021 · 20 Jul · Shift 1 MCQ

A deuteron and an alpha particle having equal kinetic energy enter perpendicular into a magnetic field. Let r_d and r_α be their respective radii of circular path. The value of $\frac{r_d}{r_\alpha}$ is equal to:

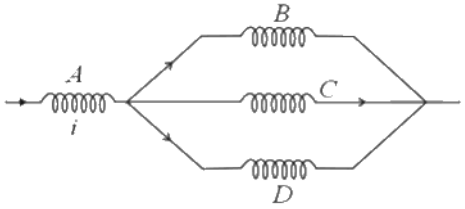
(A) $\frac{1}{\sqrt{2}}$
(B) $\sqrt{2}$
(C) 1
(D) 2

Answer: (B) $\sqrt{2}$ · Key from source paper

Q153 JEE Main 2021 · 18 Mar · Shift 1 MCQ

Four identical long solenoids A, B, C and D are connected to each other as shown in the figure. If the magnetic field at the center of A is 3 T the field at the center of C would be : (Assume that the magnetic field is confined with in the volume of respective solenoid).
(see the figure above)

Q9. Four identical long solenoids A, B, C and D are connected to each other as shown in the figure. If the magnetic field at the center of A is 3 T the field at the center of C would be : (Assume that the magnetic field is confined with in the volume of respective solenoid).



(1) 12 T
(2) 6 T
(3) 9 T
(4) 1 T

(A) 12 T
(B) 6 T
(C) 9 T
(D) 1 T

Answer: (D) 1 T · Key from source paper

Q154 JEE Main 2021 · 18 Mar · Shift 1 MCQ

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.

(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.

Answer: (A) Loop assumes circular shape with its plane normal to the field. · Key from source paper

Q155 JEE Main 2021 · 18 Mar · Shift 2 MCQ

A proton and an α-particle, having kinetic energies $\mathrm{K_p}$ and K_α, respectively, enter into a magnetic field at right angles. The ratio of the radii of the trajectory of proton to that of α -particle is $2:1$. The ratio of $\mathrm{K_p}:\mathrm{K}_\alpha$ is:

(A) $1:8$
(B) $8:1$
(C) $1:4$
(D) $4:1$

Answer: (D) $4:1$ · Key from source paper

Q156 JEE Main 2021 · 17 Mar · Shift 1 MCQ

A solenoid of 1000 turns per metre has a core with relative permeability 500. Insulated windings of the solenoid carry an electric current of 5 A. The magnetic flux density produced by the solenoid is: (Permeability of free space$= 4\pi \times 10^{-7}\mathrm{Hm}^{-1}$)

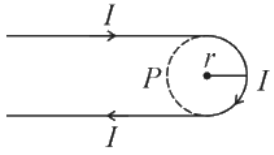
(A) $(\pi)\mathrm{T}$
(B) $\left(2 \times 10^{-3}\pi\right)\mathrm{T}$
(C) $\left(\frac{\pi}{5}\right)\mathrm{T}$
(D) $\left(10^{-4}\pi\right)\mathrm{T}$

Answer: (A) $(\pi)\mathrm{T}$ · Key from source paper

Q157 JEE Main 2021 · 17 Mar · Shift 2 MCQ

A hairpin like shape as shown in figure is made by bending a long current carrying wire. What is the magnitude of a magnetic field at point P which lies on the centre of the semicircle ?
(see the figure above)

Q14. A hairpin like shape as shown in figure is made by bending a long current carrying wire. What is the magnitude of a magnetic field at point P which lies on the centre of the semicircle ?



(1) $\frac{\mu_0 I}{4\pi r}\left(2-\pi\right)$
(2) $\frac{\mu_0 I}{4\pi r}\left(2+\pi\right)$
(3) $\frac{\mu_0 I}{2\pi r}\left(2+\pi\right)$
(4) $\frac{\mu_0 I}{2\pi r}\left(2-\pi\right)$

(A) $\frac{\mu_0 I}{4\pi r}(2-\pi)$
(B) $\frac{\mu_0 I}{4\pi r}(2+\pi)$
(C) $\frac{\mu_0 I}{2\pi r}(2+\pi)$
(D) $\frac{\mu_0 I}{2\pi r}(2-\pi)$

Answer: (B) $\frac{\mu_0 I}{4\pi r}(2+\pi)$ · Key from source paper

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Q158 JEE Main 2021 · 16 Mar · Shift 2 MCQ

A charge Q is moving $d\vec{l}$ distance in the magnetic field $\vec{B}$. Find the value of work done by $\vec{B}$.

(A) 1
(B) Infinite
(C) Zero
(D) -1

Answer: (C) Zero · Key from source paper

Q159 JEE Main 2021 · 25 Feb · Shift 1 MCQ

A proton, a deuteron and an α particle are moving with same momentum in a uniform magnetic field. The ratio of magnetic forces acting on them _____ and their speed is _____ in the ratio.

(A) $2:1:1$ and $4:2:1$
(B) $1:2:4$ and $2:1:1$
(C) $4:2:1$ and $2:1:1$
(D) $1:2:4$ and $1:1:2$

Answer: (A) $2:1:1$ and $4:2:1$ · Key from source paper

Q160 JEE Main 2021 · 25 Feb · Shift 1 MCQ

Magnetic fields at two points on the axis of a circular coil at a distance of $0.05\ \text{m}$ and $0.2\ \text{m}$ from the centre are in the ratio $8:1$. The radius of coil is _____ .

(A) $0.15\ \text{m}$
(B) $0.2\ \text{m}$
(C) $0.1\ \text{m}$
(D) $1.0\ \text{m}$

Answer: (C) $0.1\ \text{m}$ · Key from source paper

Q161 JEE Main 2020 · 6 Sep · Shift 1 MCQ

A particle of charge q and mass m is moving with a velocity $-v\hat{i}\,(v \neq 0)$ towards a large screen placed in the $Y-Z$ plane at distance d. If there is magnetic field $\vec{B} = B_0\hat{k}$, the minimum value of v for which the particle will not hit the screen is :

(A) $\frac{qdB_0}{3m}$
(B) $\frac{2qdB_0}{m}$
(C) $\frac{qdB_0}{m}$
(D) $\frac{qdB_0}{2m}$

Answer: (C) $\frac{qdB_0}{m}$ · Key from source paper

Q162 JEE Main 2020 · 6 Sep · Shift 1 MCQ

An electron is moving along $+x$ direction with a velocity of $6 \times 10^6\ \mathrm{ms}^{-1}$. It enters a region of uniform electric field of $300\ V/cm$ pointing along $+y$ direction. The magnitude and direction of the magnetic field set up in this region such that the electron keeps moving along the x direction will be:

(A) $3 \times 10^{-4}\mathrm{T}$, along $+z$ direction
(B) $5 \times 10^{-3}\mathrm{T}$, along $-z$ direction
(C) $5 \times 10^{-3}\mathrm{T}$, along $+z$ direction
(D) $3 \times 10^{-4}\mathrm{T}$, along $-z$direction

Answer: (C) $5 \times 10^{-3}\mathrm{T}$, along $+z$ direction · Key from source paper

Q163 JEE Main 2020 · 6 Sep · Shift 2 MCQ

A charged particle going around in a circle can be considered to be a current loop. A particle of a mass m carrying charge q is moving in a plane with speed v under the influence of magnetic field $\vec{B}$. The magnetic moment of this moving particle is :

(A) $\frac{mv^2\vec{B}}{2B^2}$
(B) $-\frac{mv^2\vec{B}}{2\pi B^2}$
(C) $-\frac{mv^2\vec{B}}{B^2}$
(D) $-\frac{mv^2\vec{B}}{2B^2}$

Answer: (D) $-\frac{mv^2\vec{B}}{2B^2}$ · Key from source paper

Q164 JEE Main 2020 · 6 Sep · Shift 2 MCQ

A square loop of side 2a and carrying current I is kept in xz plane with its centre at origin. A long wire carrying the same current I is placed parallel to z-axis and passing through point (0, b, 0), (b >> a). The magnitude of torque on the loop about z-axis will be :

(A) $\frac{2\mu_0 I^2 a^2}{\pi b}$
(B) $\frac{2\mu_0 I^2 a^2 b}{\pi(a^2+b^2)}$
(C) $\frac{\mu_0 I^2 a^2 b}{2\pi(a^2+b^2)}$
(D) $\frac{\mu_0 I^2 a^2}{2\pi b}$

Options (2) or (1) were accepted. More than one answer was accepted. · Key from source paper

Q165 JEE Main 2020 · 5 Sep · Shift 1 MCQ

A square loop of side $2a$, and carrying current I is kept in XZ plane with its centre at origin. A long wire carrying the same current I is placed parallel to the z-axis and passing through the point $(0, b, 0), (b >> a)$. The magnitude of the torque on the loop about z-axis is given by.

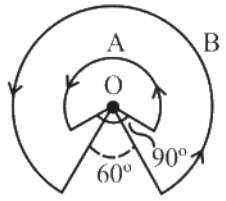
(A) $\frac{\mu_0 I^2 a^2}{2\pi b}$
(B) $\frac{\mu_0 I^2 a^3}{2\pi b^2}$
(C) $\frac{2\mu_0 I^2 a^2}{\pi b}$
(D) $\frac{2\mu_0 I^2 a^3}{\pi b^2}$

Answer: (C) $\frac{2\mu_0 I^2 a^2}{\pi b}$ · Key from source paper

Q166 JEE Main 2020 · 4 Sep · Shift 1 MCQ

A wire A, bent in the shape of an arc of a circle, carrying a current of 2 A and having radius 2 cm and another wire B, also bent in the shape of an arc of a circle, carrying a current of 3 A and having radius of 4 cm, are placed as shown in the figure. The ratio of the magnetic fields due to the wires A and B at the common centre O is:
(see the figure above)

Q14. A wire A, bent in the shape of an arc of a circle, carrying a current of 2 A and having radius 2 cm and another wire B, also bent in the shape of an arc of a circle, carrying a current of 3 A and having radius of 4 cm, are placed as shown in the figure. The ratio of the magnetic fields due to the wires A and B at the common centre O is:



(1) 4 : 6
(2) 6 : 4
(3) 2 : 5
(4) 6 : 5

(A) 4 : 6
(B) 6 : 4
(C) 2 : 5
(D) 6 : 5

Answer: (D) 6 : 5 · Key from source paper

Q167 JEE Main 2020 · 4 Sep · Shift 2 MCQ

A circular coil has moment of inertia $0.8\ \text{kg m}^2$ around any diameter and is carrying current to produce a magnetic moment of $20\ \text{Am}^2$. The coil is kept initially in a vertical position and it can rotate freely around a horizontal diameter. When a uniform magnetic field of $4\ \text{T}$ is applied along the

vertical, it starts rotating around its horizontal diameter. The angular speed the coil acquires after rotating by 60° will be :

(A) $10\ \text{rad s}^{-1}$
(B) $10\pi\ \text{rad s}^{-1}$
(C) $20\pi\ \text{rad s}^{-1}$
(D) $20\ \text{rad s}^{-1}$

Answer: (A) $10\ \text{rad s}^{-1}$ · Key from source paper

Q168 JEE Main 2020 · 3 Sep · Shift 1 MCQ

Magnitude of magnetic field (in SI units) at the centre of a hexagonal shape coil of side $10\ \text{cm}$, 50 turns and carrying current$I$ (Ampere) in units of $\frac{\mu_0 I}{\pi}$ is :

(A) $250\sqrt{3}$
(B) $50\sqrt{3}$
(C) $500\sqrt{3}$
(D) $5\sqrt{3}$

Answer: (C) $500\sqrt{3}$ · Key from source paper

Q169 JEE Main 2020 · 3 Sep · Shift 1 MCQ

A charged particle carrying charge $1\ \mu C$ is moving with velocity $(2\hat{i}+3\hat{j}+4\hat{k})\ \text{m s}^{-1}$. If an external magnetic field of $(5\hat{i}+3\hat{j}-6\hat{k})\times 10^{-3}T$ exists in the region where the particle is moving then the force on the particle is $\vec{F}\times 10^{-9}\ \text{N}$. the vector $\vec{F}$ is :

(A) $-0.30\hat{i}+0.32\hat{j}-0.09\hat{k}$
(B) $-30\hat{i}+32\hat{j}-9\hat{k}$
(C) $-300\hat{i}+320\hat{j}-90\hat{k}$
(D) $-3.0\hat{i}+32\hat{j}-0.9\hat{k}$

Answer: (B) $-30\hat{i}+32\hat{j}-9\hat{k}$ · Key from source paper

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Q170 JEE Main 2020 · 3 Sep · Shift 2 Numerical

A galvanometer coil has 500 turns and each turn has an average area of $3\times 10^{-4}\text{m}^2$. If a torque of $1.5\ \text{Nm}$ is required to keep this coil parallel to a magnetic field when a current of 0.5A is flowing through it, the strength of the field (in T) is _____ .

Numerical value type: the answer is a number.

Answer: 20. · Key from source paper

Q171 JEE Main 2020 · 2 Sep · Shift 1 MCQ

A beam of protons with speed $4\times 10^5\ \text{m s}^{-1}$ enters a uniform magnetic field of $0.3\ \text{T}$ at an angle 60° to the magnetic field, the pitch of the resulting helical path of protons is close to : (Mass of the

proton $= 1.67 \times 10^{-27}$ kg, charge of the proton$= 1.69 \times 10^{-19}$C)

(A) 2 cm

(B) 5 cm

(C) 12 cm

(D) 4 cm

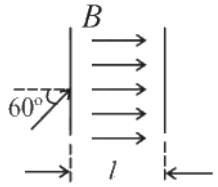
Answer: (D) 4 cm · Key from source paper

Q172 JEE Main 2020 · 2 Sep · Shift 2 MCQ

The figure shows a region of length 'ℓ' with a uniform magnetic field of 0.3 T in it and a proton entering the region with velocity 4×10^5 m s^{-1} making an angle 60° with the field. If the proton completes 10 revolution by the time it cross the region shown, 'ℓ' is close to (mass of proton $= 1.67 \times 10^{-27}$ kg, charge of the proton $= 1.6 \times 10^{-19}$ C)

(see the figure above)

Q12. The figure shows a region of length 'ℓ' with a uniform magnetic field of 0.3 T in it and a proton entering the region with velocity 4×10^5 m s^{-1} making an angle 60° with the field. If the proton completes 10 revolution by the time it cross the region shown, 'ℓ' is close to (mass of proton $= 1.67 \times 10^{-27}$ kg, charge of the proton $= 1.6 \times 10^{-19}$ C)



(1) 0.11 m

(2) 0.88 m

(3) 0.44 m

(4) 0.22 m

(A) 0.11 m

(B) 0.88 m

(C) 0.44 m

(D) 0.22 m

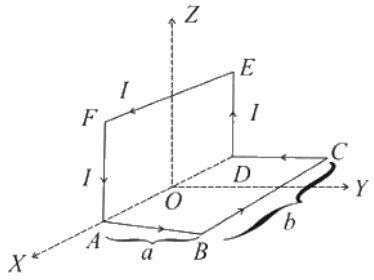
Answer: (C) 0.44 m · Key from source paper

Q173 JEE Main 2020 · 2 Sep · Shift 2 MCQ

A wire carrying current I is bent in the shapeABCDEFA as shown, where rectangle ABCDA and ADEFA are perpendicular to each other. If the sides of the rectangles are of lengths a and b, then the magnitude and direction of magnetic moment of the loop ABCDEFA is :

(see the figure above)

Q13. A wire carrying current I is bent in the shapeABCDEFA as shown, where rectangle ABCDA and ADEFA are perpendicular to each other. If the sides of the rectangles are of lengths a and b, then the magnitude and direction of magnetic moment of the loop ABCDEFA is :



(1) $\sqrt{2}abI$ along $\left(\frac{\hat{j}}{\sqrt{2}}+\frac{\hat{k}}{\sqrt{2}}\right)$

(2) abI along $\left(\frac{\hat{j}}{\sqrt{2}}+\frac{\hat{k}}{\sqrt{2}}\right)$

(3) $\sqrt{2}abI$ along $\left(\frac{\hat{j}}{\sqrt{5}}+\frac{2\hat{k}}{\sqrt{5}}\right)$

(4) abI along $\left(\frac{\hat{j}}{\sqrt{5}}+\frac{\hat{k}}{\sqrt{5}}\right)$

(A) $\sqrt{2}abI$ along $\left(\frac{\hat{j}}{\sqrt{2}}+\frac{\hat{k}}{\sqrt{2}}\right)$

(B) abI along $\left(\frac{\hat{j}}{\sqrt{2}}+\frac{\hat{k}}{\sqrt{2}}\right)$

(C) $\sqrt{2}abI$ along $\left(\frac{\hat{j}}{\sqrt{5}}+\frac{2\hat{k}}{\sqrt{5}}\right)$

(D) abI along $\left(\frac{\hat{j}}{\sqrt{5}}+\frac{\hat{k}}{\sqrt{5}}\right)$

Answer: (A) $\sqrt{2}abI$ along $\left(\frac{\hat{j}}{\sqrt{2}}+\frac{\hat{k}}{\sqrt{2}}\right)$ · Key from source paper

Q174 JEE Main 2020 · 9 Jan · Shift 1 MCQ

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:

(A) $\frac{2}{3}$

(B) 2

(C) $\frac{1}{2}$

(D) $\frac{3}{2}$

Answer: (A) $\frac{2}{3}$ · Key from source paper

Q175 JEE Main 2020 · 9 Jan · Shift 1 MCQ

A charged particle of mass ' m ' and charge ' q ' moving under the influence of uniform electric field $\overrightarrow{\mathrm{E}}\hat{i}$ and a uniform magnetic field $\overrightarrow{\mathrm{B}}\hat{k}$ follows a trajectory from point P to Q as shown in figure. The velocities at P and Q are respectively, $\overrightarrow{v}\hat{i}$ and $-2\overrightarrow{v}\hat{j}$. Then which of the following statements (A, B, C, D) are the correct?

(Trajectory shown is schematic and not to scale)

(see the figure above)

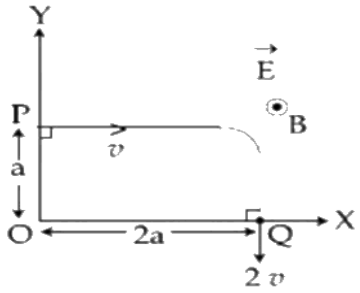
(A) $\mathrm{E}=\frac{3}{2}\left(\frac{mv^2}{qa}\right)$

(B) Rate of work done by the electric field at P is $\frac{3}{2}\left(\frac{mv^3}{a}\right)$

(C) Rate of work done by both the fields at Q is zero

(D) The difference between the magnitude of angular momentum of the particle at P and Q is $2mav$.

Q15. A charged particle of mass ' m ' and charge ' q ' moving under the influence of uniform electric field $\vec{E}\hat{i}$ and a uniform magnetic field $\vec{B}\hat{k}$ follows a trajectory from point P to Q as shown in figure. The velocities at P and Q are respectively, $\vec{v}i$ and $-2\vec{v}j$. Then which of the following statements (A, B, C, D) are the correct?
(Trajectory shown is schematic and not to scale)



(A) $E = \frac{3}{2}\left(\frac{mv^2}{qa}\right)$

(B) Rate of work done by the electric field at P is $\frac{3}{2}\left(\frac{mv^3}{a}\right)$

(C) Rate of work done by both the fields at Q is zero

(D) The difference between the magnitude of angular momentum of the particle at P and Q is 2mav .

(1) $(A), (C), (D)$ (2) $(B), (C), (D)$

(3) $(A), (B), (C)$ (4) $(A), (B), (C), (D)$

(A) $(A), (C), (D)$

(B) $(B), (C), (D)$

(C) $(A), (B), (C)$

(D) $(A), (B), (C), (D)$

Answer: (C) $(A), (B), (C)$ · Key from source paper

Q176 JEE Main 2020 · 9 Jan · Shift 2 MCQ

A small circular loop of conducting wire has radius a and carries current I. It is placed in a uniform magnetic field B perpendicular to its plane such that when rotated slightly about its diameter and released, it starts performing simple harmonic motion of time period T. The mass of the loop is m then:

(A) $T = \sqrt{\frac{2m}{iB}}$

(B) $T = \sqrt{\frac{\pi m}{2iB}}$

(C) $T = \sqrt{\frac{2\pi m}{iB}}$

(D) $T = \sqrt{\frac{\pi m}{iB}}$

Answer: (C) $T = \sqrt{\frac{2\pi m}{iB}}$ · Key from source paper

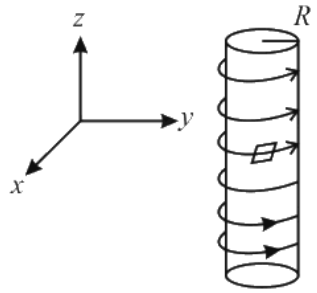
Q177 JEE Main 2020 · 9 Jan · Shift 2 MCQ

An electron gun is placed inside a long solenoid of radius R on its axis. The solenoid has n turns/length and carries a current I. The electron gun shoots an electron along the radius of the solenoid with speed v. If the electron does not hit the surface of the solenoid, maximum possible

value of v is (all symbols have their standard meaning):

(see the figure above)

Q13. An electron gun is placed inside a long solenoid of radius R on its axis. The solenoid has n turns/length and carries a current I. The electron gun shoots an electron along the radius of the solenoid with speed v. If the electron does not hit the surface of the solenoid, maximum possible value of v is (all symbols have their standard meaning):



(1) $\frac{e\mu_0 nIR}{m}$
(2) $\frac{e\mu_0 nIR}{2m}$
(3) $\frac{e\mu_0 nIR}{4m}$
(4) $\frac{2e\mu_0 nIR}{m}$

A $\frac{e\mu_0 nIR}{m}$
B $\frac{e\mu_0 nIR}{2m}$
C $\frac{e\mu_0 nIR}{4m}$
D $\frac{2e\mu_0 nIR}{m}$

Answer: (B) $\frac{e\mu_0 nIR}{2m}$ · Checked by our team

Q178 JEE Main 2020 · 8 Jan · Shift 1 MCQ

Proton with kinetic energy of $1\ \mathrm{MeV}$ moves from south to north. It gets an acceleration of $10^{12}\ \mathrm{m/s^2}$ by an applied magnetic field (west to east). The value of magnetic field: (Rest mass of proton is $1.6 \times 10^{-27}\mathrm{kg}$)

A $0.71\mathrm{mT}$
B $7.1\mathrm{mT}$
C $0.071\mathrm{mT}$
D $71\mathrm{mT}$

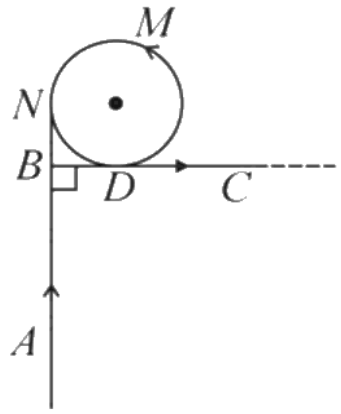
Answer: (A) $0.71\mathrm{mT}$ · Key from source paper

Q179 JEE Main 2020 · 8 Jan · Shift 2 MCQ

A very long wire ABDMNDC is shown in figure carrying current I. AB and BC parts are straight, long and at right angle. At D wire forms a circular turn DMND of radius R. AB, BC parts are tangential to circular turn at N and D. Magnetic filed at the center of circle is:

(see the figure above)

Q14. A very long wire ABDMNDC is shown in figure carrying current I. AB and BC parts are straight, long and at right angle. At D wire forms a circular turn DMND of radius R. AB, BC parts are tangential to circular turn at N and D. Magnetic filed at the center of circle is:



(1) $\frac{\mu_0 I}{2\pi R}\left(\pi+\frac{1}{\sqrt{2}}\right)$
(2) $\frac{\mu_0 I}{2\pi R}\left(\pi-\frac{1}{\sqrt{2}}\right)$
(3) $\frac{\mu_0 I}{2\pi R}(\pi+1)$
(4) $\frac{\mu_0 I}{2R}$

(A) $\frac{\mu_0 I}{2\pi R}\left(\pi+\frac{1}{\sqrt{2}}\right)$
(B) $\frac{\mu_0 I}{2\pi R}\left(\pi-\frac{1}{\sqrt{2}}\right)$
(C) $\frac{\mu_0 I}{2\pi R}(\pi+1)$
(D) $\frac{\mu_0 I}{2R}$

Answer: (A) $\frac{\mu_0 I}{2\pi R}\left(\pi+\frac{1}{\sqrt{2}}\right)$ · Key from source paper

Q180 JEE Main 2020 · 7 Jan · Shift 2 MCQ

A particle of mass m and charge q has an initial velocity $\vec{v}=v_0\hat{j}$. If an electric field $\vec{E}=E_0\hat{i}$ and magnetic field $\vec{B}=B_0\hat{i}$ act on the particle, its speed will double after a time

(A) $\frac{2mv_0}{qE_0}$
(B) $\frac{3mv_0}{qE_0}$
(C) $\frac{\sqrt{3}mv_0}{qE_0}$
(D) $\frac{\sqrt{2}mv_0}{qE_0}$

Answer: (C) $\frac{\sqrt{3}mv_0}{qE_0}$ · Key from source paper

Q181 JEE Main 2019 · 12 Apr · Shift 1 MCQ

A thin ring of 10 cm radius carries a uniformly distributed charge. The ring rotates at a constant angular speed of $40\pi\ \mathrm{rads}^{-1}$ about its axis, perpendicular to its plane. Is the magnetic field its centre is $3.8\times10^{-9}\mathrm{T}$, then the charge carried by the ring is close to $\mu_0=4\pi\times10^{-7}\ \mathrm{N}\ /\ \mathrm{A}^2$.

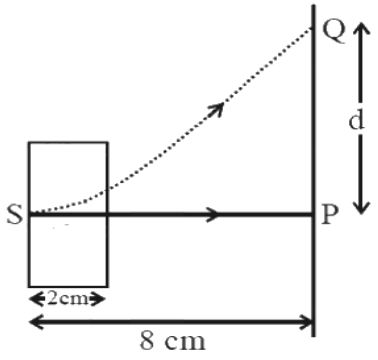
(A) 4×10^{-5} C
(B) 3×10^{-5} C
(C) 2×10^{-6} C
(D) 7×10^{-6} C

Answer: (B) 3×10^{-5} C · Key from source paper

Q182 JEE Main 2019 · 12 Apr · Shift 2 MCQ

An electron, moving along the $x-$ axis with an initial energy of 100 eV, enters a region of magnetic field $\vec{B} = \left(1.5 \times 10^{-3}\ \mathrm{T}\right)\hat{k}$ at S (see figure). The field extends between $x = 0$ and $x = 2$ cm. The electron is detected at the point Q on a screen placed 8 cm away from the point S. The distance d between P and Q (on the screen) is:
(electron's charge 1.6×10^{-19} C , mass of electron $= 9.1 \times 10^{-31}$ kg)
(see the figure above)

Q19. An electron, moving along the $x-$ axis with an initial energy of 100 eV, enters a region of magnetic field $\vec{B} = \left(1.5 \times 10^{-3}\ \mathrm{T}\right)\hat{k}$ at S (see figure). The field extends between $x = 0$ and $x = 2$ cm. The electron is detected at the point Q on a screen placed 8 cm away from the point S. The distance d between P and Q (on the screen) is:
(electron's charge 1.6×10^{-19} C , mass of electron $= 9.1 \times 10^{-31}$ kg)



(1) 1.22 cm
(2) 12.87 cm
(3) 11.65 cm
(4) 2.25 cm

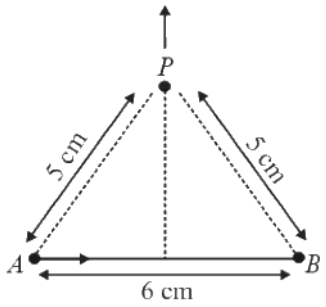
(A) 1.22 cm
(B) 12.87 cm
(C) 11.65 cm
(D) 2.25 cm

Answer: (B) 12.87 cm · Key from source paper

Q183 JEE Main 2019 · 12 Apr · Shift 2 MCQ

Find the magnetic field at point P due to a straight line segment AB of length 6 cm carrying a current of 5 A. (See figure) $\left(\mu_0 = 4\pi \times 10^{-7}\ \mathrm{NA}^{-2}\right)$
(see the figure above)

Q20. Find the magnetic field at point P due to a straight line segment AB of length 6 cm carrying a current of 5 A. (See figure) $(\mu_0 = 4\pi \times 10^{-7}\ \text{NA}^{-2})$



(1) 1.5×10^{-5} T
(2) 2.0×10^{-5} T
(3) 3.0×10^{-5} T
(4) 2.5×10^{-5} T

(A) 1.5×10^{-5} T
(B) 2.0×10^{-5} T
(C) 3.0×10^{-5} T
(D) 2.5×10^{-5} T

Answer: (A) 1.5×10^{-5} T · Key from source paper

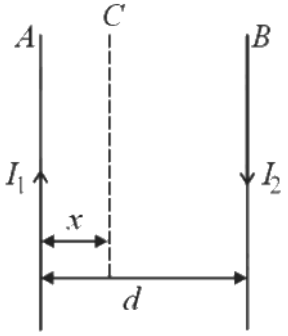
Q184

JEE Main 2019 · 10 Apr · Shift 1 | MCQ

Two wires A & B are carrying currents I_1 and I_2 as shown in the figure. The separation between them is d . A third wire C carrying a current I is to be kept parallel to them at a distance x from A such that the net force acting on it is zero. The possible values of x are:

(see the figure above)

Q19. Two wires A & B are carrying currents I_1 and I_2 as shown in the figure. The separation between them is d . A third wire C carrying a current I is to be kept parallel to them at a distance x from A such that the net force acting on it is zero. The possible values of x are:



(1) $x = \pm\frac{I_1 d}{(I_1 - I_2)}$
(2) $x = \left(\frac{I_1}{I_1+I_2}\right)d$ and $x = \frac{I_2}{(I_1-I_2)}d$
(3) $x = \left(\frac{I_2}{I_1+I_2}\right)d$ and $x = \left(\frac{I_2}{I_1-I_2}\right)d$
(4) $x = \left(\frac{I_1}{I_1-I_2}\right)d$ and $x = \frac{I_2}{(I_1+I_2)}d$

(A) $x = \pm \frac{I_1 d}{(I_1 - I_2)}$
(B) $x = \left(\frac{I_1}{I_1 + I_2}\right) d$ and $x = \frac{I_2}{(I_1 - I_2)} d$
(C) $x = \left(\frac{I_2}{I_1 + I_2}\right) d$ and $x = \left(\frac{I_2}{I_1 - I_2}\right) d$
(D) $x = \left(\frac{I_1}{I_1 - I_2}\right) d$ and $x = \frac{I_2}{(I_1 + I_2)} d$

Answer: (A) $x = \pm \frac{I_1 d}{(I_1 - I_2)}$ · Key from source paper

Q185 JEE Main 2019 · 10 Apr · Shift 1 MCQ

A proton, an electron, and a Helium nucleus, have the same energy. They are in circular orbits in a plane due to magnetic field perpendicular to the plane. Let r_p, r_e and r_{He} be their respective radii, then,

(A) $r_e > r_p = r_{He}$
(B) $r_e < r_p = r_{He}$
(C) $r_e < r_p < r_{He}$
(D) $r_e > r_p > r_{He}$

Answer: (B) $r_e < r_p = r_{He}$ · Key from source paper

Q186 JEE Main 2019 · 10 Apr · Shift 2 MCQ

A square loop is carrying a steady current I and the magnitude of its magnetic dipole moment is m . If this square loop is changed to a circular loop and it carries the same current, the magnitude of the magnetic dipole moment of circular loop will be:

(A) $\frac{4m}{\pi}$
(B) $\frac{3m}{\pi}$
(C) $\frac{2m}{\pi}$
(D) $\frac{m}{\pi}$

Answer: (A) $\frac{4m}{\pi}$ · Key from source paper

Q187 JEE Main 2019 · 10 Apr · Shift 2 MCQ

The magnitude of the magnetic field at the centre of an equilateral triangular loop of side $1\ \mathrm{m}$ which is carrying a current of $10\ \mathrm{A}$ is:
[Take $\mu_0 = 4\pi \times 10^{-7}\ \mathrm{N\,A^{-2}}$]

(A) $3\ \mu\mathrm{T}$
(B) $1\ \mu\mathrm{T}$
(C) $18\ \mu\mathrm{T}$
(D) $9\ \mu\mathrm{T}$

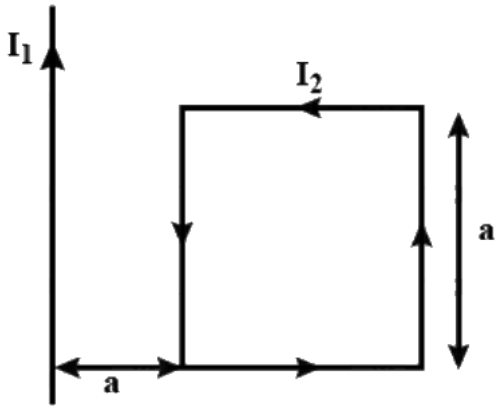
Answer: (C) $18\ \mu\mathrm{T}$ · Key from source paper

Q188 JEE Main 2019 · 9 Apr · Shift 1 MCQ

A rigid square loop of side 'a' and carrying current I_2 is lying on a horizontal surface near a long current I_1 carrying wire in the same plane as shown in figure. The net force on the loop due to the wire will be:

(see the figure above)

Q21. A rigid square loop of side 'a' and carrying current I_2 is lying on a horizontal surface near a long current I_1 carrying wire in the same plane as shown in figure. The net force on the loop due to the wire will be:



(1) Attractive and equal to $\frac{\mu_0 I_1 I_2}{3\pi}$
(2) Repulsive and equal to $\frac{\mu_0 I_1 I_2}{4\pi}$
(3) Repulsive and equal to $\frac{\mu_0 I_1 I_2}{2\pi}$
(4) Zero

(A) Attractive and equal to $\frac{\mu_0 I_1 I_2}{3\pi}$
(B) Repulsive and equal to $\frac{\mu_0 I_1 I_2}{4\pi}$
(C) Repulsive and equal to $\frac{\mu_0 I_1 I_2}{2\pi}$
(D) Zero

Answer: (B) Repulsive and equal to $\frac{\mu_0 I_1 I_2}{4\pi}$ · Key from source paper

Q189 JEE Main 2019 · 9 Apr · Shift 1 MCQ

A rectangular coil (Dimension 5 cm $\times$ 2.5 cm) with 100 turns, carrying a current of 3 A in the clock-wise direction, is kept centered at the origin and in the X $-$ Z plane. A magnetic field of 1 T is applied along X $-$ axis . If the coil is tilted through 45° about Z $-$ axis , then the torque on the coil is:

(A) 0.42 N m
(B) 0.55 N m
(C) 0.38 N m
(D) 0.27 N m

Answer: (D) 0.27 N m · Key from source paper

Q190 JEE Main 2019 · 9 Apr · Shift 2 MCQ

A moving coil galvanometer has a coil with 175 turns and area 1 cm^2. It uses a torsion band of torsion constant 10^{-6} N m/rad The coil is placed in a magnetic field B parallel to its plane. The coil deflects by 1° for a current of 1 mA The value of B (in tesla) is approximately:

(A) 10^{-2}
(B) 10^{-4}
(C) 10^{-3}
(D) 10^{-1}

Answer: (C) 10^{-3} · Key from source paper

Q191 JEE Main 2019 · 8 Apr · Shift 1 MCQ

A circular coil having N turns and radius r carries a current I. It is held in the XZ plane in a magnetic field $B\hat{i}$. The torque on the coil due to the magnetic field is:

(A) $B\pi r^2 IN$
(B) $\dfrac{Br^2 I}{\pi N}$
(C) $\dfrac{B\pi r^2 I}{N}$
(D) Zero

Answer: (A) $B\pi r^2 IN$ · Key from source paper

Q192 JEE Main 2019 · 8 Apr · Shift 2 MCQ

Two very long, straight, and insulated wires are kept at 90° angle from each other in xy - plane as shown in figure.

(see the figure above)

These wires carry currents of equal magnitude I , whose direction are shown in the figure. The net magnetic field at point P will be:

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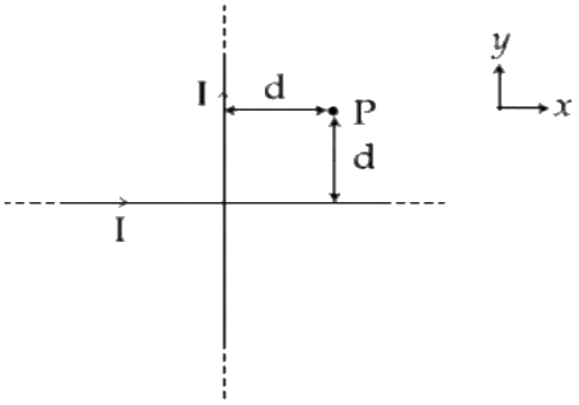
Q21. Two very long, straight, and insulated wires are kept at 90° angle from each other in xy - plane as shown in figure.



These wires carry currents of equal magnitude I , whose direction are shown in the figure. The net magnetic field at point P will be:

(1) $-\frac{\mu_0 I}{2\pi d}\hat{x}+\hat{y}$
(2) $\frac{+\mu_0 I}{\pi d}\hat{z}$
(3) $\frac{\mu_0 I}{2\pi d}\hat{x}+\hat{y}$
(4) Zero

(A) $-\frac{\mu_0 I}{2\pi d}\hat{x}+\hat{y}$
(B) $\frac{+\mu_0 I}{\pi d}\hat{z}$
(C) $\frac{\mu_0 I}{2\pi d}\hat{x}+\hat{y}$
(D) Zero

Answer: (D) Zero · Key from source paper

Q193 JEE Main 2019 · 12 Jan · Shift 1 MCQ

A proton and an α- particle (with their masses in the ratio of 1 : 4 and charges in the ratio of 1 : 2) are accelerated from rest through a potential difference V. If a uniform magnetic field (B) is set up perpendicular to their velocities, the ratio of the radii $r_p : r_\alpha$ of the circular paths described by them will be:

(A) 1 : 3
(B) $1 : \sqrt{2}$
(C) 1 : 2
(D) $1 : \sqrt{3}$

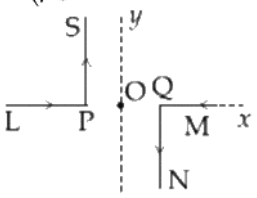
Answer: (B) $1 : \sqrt{2}$ · Key from source paper

Q194 JEE Main 2019 · 12 Jan · Shift 1 MCQ

As shown in the figure, two infinitely long, identical wires are bent by 90° and placed in such a way that the segments LP and QM are along the x - axis, while segments PS and QN are parallel to the y - axis. If $OP = OQ = 4cm$, and the magnitude of the magnetic field at O is $10^{-4}\ T$, and the two wires carry equal currents (see figure), the magnitude of the current in each wire and the direction of the magnetic field at O will be ($\mu_0 = 4\pi \times 10^{-7} NA^{-2}$) :

(see the figure above)

Q20. As shown in the figure, two infinitely long, identical wires are bent by 90° and placed in such a way that the segments LP and QM are along the x - axis, while segments PS and QN are parallel to the y - axis. If $OP = OQ = 4cm$, and the magnitude of the magnetic field at O is $10^{-4}\ T$, and the two wires carry equal currents (see figure), the magnitude of the current in each wire and the direction of the magnetic field at O will be $\left(\mu_0 = 4\pi \times 10^{-7} NA^{-2}\right)$:



(1) 20 A, perpendicular into the page
(2) 20 A, perpendicular out of the page
(3) 40 A, perpendicualr into the page
(4) 40 A, perpendicular out of the page

(A) 20 A, perpendicular into the page
(B) 20 A, perpendicular out of the page
(C) 40 A, perpendicualr into the page
(D) 40 A, perpendicular out of the page

Answer: (A) 20 A, perpendicular into the page · Key from source paper

Q195 JEE Main 2019 · 11 Jan · Shift 1 MCQ

In an experiment, electrons are accelerated, from rest, by applying a voltage of 500 V. Calculate the radius of the path if a magnetic field 100mT is then applied. [Charge of the electron = 1.6×10^{-19}C Mass of the electron = 9.1×10^{-31} kg]

(A) 7.5×10^{-3} m
(B) 7.5×10^{-2} m
(C) 7.5 m
(D) 7.5×10^{-4} m

Answer: (D) 7.5×10^{-4} m · Key from source paper

Q196 JEE Main 2019 · 11 Jan · Shift 2 MCQ

The region between $y = 0$ and $y =$ d contains a magnetic field $\vec{B} = B\hat{z}$. A particle of mass m and charge q enters the region with a velocity $\vec{v} = v\hat{i}$. if d = $\frac{mv}{2qB}$, the acceleration of the charged particle at the point of its emergence at the other side is :

(A) $\frac{qv\,B}{m}\left(\frac{1}{2}\hat{i} - \frac{\sqrt{3}}{2}\hat{j}\right)$
(B) $\frac{qv\,B}{m}\left(\frac{\sqrt{3}}{2}\hat{i} + \frac{1}{2}\hat{j}\right)$
(C) $\frac{qv\,B}{m}\left(\frac{-\hat{j}+\hat{i}}{\sqrt{2}}\right)$
(D) None of the above

Answer: (D) None of the above · Key from source paper

Q197 JEE Main 2019 · 10 Jan · Shift 1 MCQ

An insulating thin rod of length l has a linear charge density $\rho(x) = \rho_0 \frac{x}{l}$ on it. The rod is rotated about an axis passing through the origin $(x = 0)$ and perpendicular to the rod. If the rod makes n rotations per second, then the time averaged magnetic moment of the rod is:

(A) $\frac{\pi}{4} n\ \rho_0 l^3$

(B) $n\ \rho_0 l^3$

(C) $\pi\ n\ \rho_0\ l^3$

(D) $\frac{\pi}{3} n\ \rho_0 l^3$

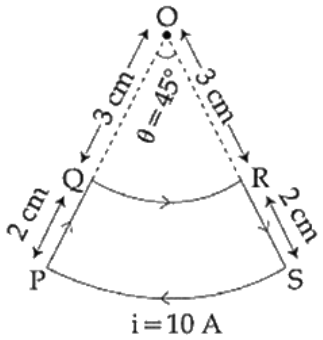
Answer: (A) $\frac{\pi}{4} n\ \rho_0 l^3$ · Key from source paper

Q198 JEE Main 2019 · 9 Jan · Shift 1 MCQ

A current loop, having two circular arcs joined by two radial lines is shown in the figure. It carries a current of $10\ A$. The magnetic field at point O will be close to:

(see the figure above)

Q22. A current loop, having two circular arcs joined by two radial lines is shown in the figure. It carries a current of $10\ A$. The magnetic field at point O will be close to:



(1) $1.5 \times 10^{-7}\ T$

(2) $1.0 \times 10^{-7}\ T$

(3) $1.5 \times 10^{-5}\ T$

(4) $1.0 \times 10^{-5}\ T$

(A) $1.5 \times 10^{-7}\ T$

(B) $1.0 \times 10^{-7}\ T$

(C) $1.5 \times 10^{-5}\ T$

(D) $1.0 \times 10^{-5}\ T$

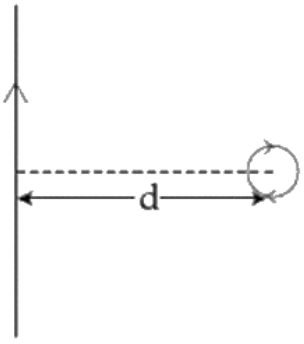
Answer: (D) $1.0 \times 10^{-5}\ T$ · Key from source paper

Q199 JEE Main 2019 · 9 Jan · Shift 1 MCQ

An infinitely long current carrying wire and a small current carrying loop are in the plane of the paper as shown. The radius of the loop is a and distance of its centre from the wire is $d\ d \gg a$. If the loop applies a force F on the wire then:

(see the figure above)

Q23. An infinitely long current carrying wire and a small current carrying loop are in the plane of the paper as shown. The radius of the loop is a and distance of its centre from the wire is d $d \gg a$. If the loop applies a force F on the wire then:



(1) $F \propto \frac{a^2}{d}$
(2) $F = 0$
(3) $F \propto \frac{a^2}{d^3}$
(4) $F \propto \frac{a}{d}$

(A) $F \propto \left(\frac{a}{d}\right)^2$
(B) $F = 0$
(C) $F \propto \frac{a^2}{d^3}$
(D) $F \propto \frac{a}{d}$

Answer: (A) $F \propto \left(\frac{a}{d}\right)^2$ · Key from source paper

Q200 JEE Main 2019 · 9 Jan · Shift 2 MCQ

A particle having the same charge as of electron moves in a circular path of radius $0.5\ \text{cm}$ under the influence of a magnetic field of $0.5\ T$. If an electric field of $100\ V/m$ makes it to move in a straight path, then the mass of the particle is (Given charge of electron $= 1.6 \times 10^{-19} C$)

(A) $9.1 \times 10^{-31}\ kg$
(B) $1.6 \times 10^{-27}\ kg$
(C) $2.0 \times 10^{-24}\ kg$
(D) $1.6 \times 10^{-19}\ kg$

Answer: (C) $2.0 \times 10^{-24}\ kg$ · Key from source paper

Q201 JEE Main 2019 · 9 Jan · Shift 2 MCQ

One of the two identical conducting wires of length L is bent in the form of a circular loop and the other one into a circular coil of N identical turns. If the same current is passed in both, the ratio of the magnetic field at the centre of the loop (B_L) to that at the centre of the coil (B_C), i.e. $\frac{B_L}{B_C}$ will be

EdLoop JEE

(A) $\frac{1}{N^2}$
(B) $\frac{1}{N}$
(C) N
(D) N^2

Answer: (A) $\frac{1}{N^2}$ · Key from source paper

Q202 JEE Main 2018 · 16 Apr · Online MCQ

A charge q is spread uniformly over an insulated loop of radius r. If it is rotated with an angular velocity ω with respect to normal axis then magnetic moment of the loop is:

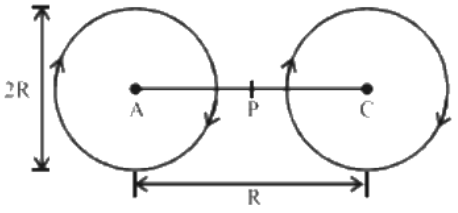
(A) $\frac{3}{2}\,q\omega r^2$
(B) $\frac{1}{2}\,q\omega r^2$
(C) $q\omega r^2$
(D) $\frac{4}{3}\,q\omega r^2$

Answer: (B) $\frac{1}{2}\,q\omega r^2$ · Key from source paper

Q203 JEE Main 2018 · 15 Apr · Shift 1 MCQ

A Helmholtz coil has pair of loops, each with N turns and radius R. They are placed coaxially at distance R and the same current I flows through the loops in the same direction. The magnitude of magnetic field at P, midway between the centres A and C, is given by (Refer to figure):
(see the figure above)

Q19. A Helmholtz coil has pair of loops, each with N turns and radius R. They are placed coaxially at distance R and the same current I flows through the loops in the same direction. The magnitude of magnetic field at P, midway between the centres A and C, is given by (Refer to figure):



(1) $\frac{4N\mu_0 I}{5^{3/2}R}$
(2) $\frac{8N\mu_0 I}{5^{3/2}R}$
(3) $\frac{4N\mu_0 I}{5^{1/2}R}$
(4) $\frac{8N\mu_0 I}{5^{1/2}R}$

(A) $\frac{4N\mu_0 I}{5^{3/2}R}$
(B) $\frac{8N\mu_0 I}{5^{3/2}R}$
(C) $\frac{4N\mu_0 I}{5^{1/2}R}$
(D) $\frac{8N\mu_0 I}{5^{1/2}R}$

Answer: (B) $\frac{8N\mu_0 I}{5^{3/2}R}$ · Key from source paper

Q204 JEE Main 2018 · 15 Apr · Shift 2 MCQ

A current of $1\ \mathrm{A}$ is flowing on the sides of an equilateral triangle of side $4.5 \times 10^{-2}\ \mathrm{m}$. The magnetic field at the centre of the triangle will be:

(A) $4 \times 10^{-5}\ \mathrm{Wb/m^2}$
(B) Zero
(C) $2 \times 10^{-5}\ \mathrm{Wb/m^2}$
(D) $8 \times 10^{-5}\ \mathrm{Wb/m^2}$

Answer: (A) $4 \times 10^{-5}\ \mathrm{Wb/m^2}$ · Key from source paper

Q205 JEE Main 2018 · 8 Apr · Offline MCQ

The dipole moment of a circular loop carrying a current I, is m and the magnetic field at the centre of the loop is B_1 . When the dipole moment is doubled by keeping the current constant, the magnetic field at the centre of the loop is B_2 . The ratio $\frac{B_1}{B_2}$ is:

(A) $\frac{1}{\sqrt{2}}$
(B) 2
(C) $\sqrt{3}$
(D) $\sqrt{2}$

Answer: (D) $\sqrt{2}$ · Key from source paper

Q206 JEE Main 2018 · 8 Apr · Offline MCQ

An electron, a proton and an alpha particle having the same kinetic energy are moving in circular orbits of radii r_e, r_p, r_α respectively in a uniform magnetic field B. The relation between r_e, r_p, r_α is:

(A) $r_e < r_\alpha < r_p$
(B) $r_e > r_P = r_\alpha$
(C) $r_e < r_p = r_\alpha$
(D) $r_e < r_p < r_\alpha$

Answer: (C) $r_e < r_p = r_\alpha$ · Key from source paper

Q207 JEE Main 2017 · 9 Apr · Online MCQ

A negative test charge is moving near a long straight wire carrying a current. The force acting on the test charge is parallel to the direction of the current. The motion of the charge is:

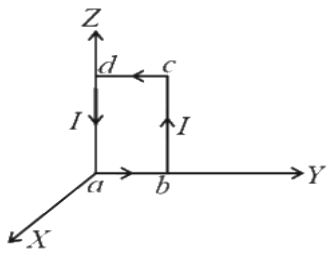
(A) Away from the wire
(B) Towards the wire
(C) Parallel to the wire along the current
(D) Parallel to the wire opposite to the current

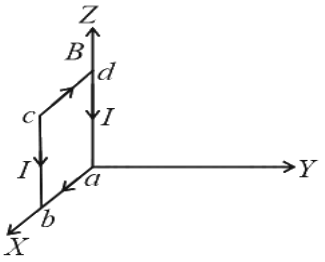
Answer: (B) Towards the wire · Key from source paper

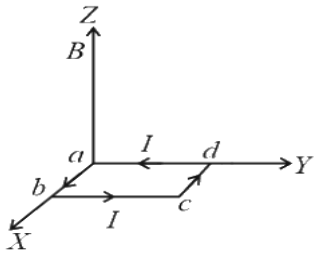
Q208 JEE Main 2017 · 9 Apr · Online MCQ

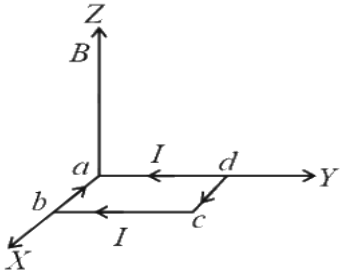
A uniform magnetic field B of 0.3 T is along the positive Z-direction. A rectangular loop $(abcd)$ of sides $10\ \text{cm} \times 5\ \text{cm}$ carries a current I of 12 A. Out of the following different orientations which one corresponds to stable equilibrium?

Q21. A uniform magnetic field B of 0.3 T is along the positive Z -direction. A rectangular loop $(abcd)$ of sides 10 cm $\times 5$ cm carries a current I of 12 A. Out of the following different orientations which one corresponds to stable equilibrium?

(1)


(2)


(3)


(4)


(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (C) · Key from source paper

Q209 JEE Main 2017 · 8 Apr · Online MCQ

In a certain region static electric and magnetic fields exist. The magnetic field is given by $\vec{B} = B_0\left(\hat{i} + 2\hat{j} - 4\hat{k}\right)$. If a test charge moving with a velocity $\vec{v} = v_0\left(3\hat{i} - \hat{j} + 2\hat{k}\right)$ experiences no force in that region, then the electric field in the region, in SI units, is:

(A) $\vec{E} = -v_0 B_0 \left(\hat{i} + \hat{j} + 7\hat{k}\right)$

(B) $\vec{E} = -v_0 B_0 \left(3\hat{i} - 2\hat{j} - 4\hat{k}\right)$

(C) $\vec{E} = v_0 B_0 \left(14\hat{j} + 7\hat{k}\right)$

(D) $\vec{E} = -v_0 B_0 \left(14\hat{j} + 7\hat{k}\right)$

Answer: (D) $\vec{E} = -v_0 B_0 \left(14\hat{j} + 7\hat{k}\right)$ · Key from source paper

Q210 JEE Main 2016 · 3 Apr · Offline MCQ

Two identical wires A and B, each of length l, carry the same current I . Wire A is bent into a circle of radius R and wire B is bent to form a square of side a. If B_A and B_B are the values of magnetic field at the centres of the circle and square respectively, then the ratio $\frac{B_A}{B_B}$ is

(A) $\frac{\pi^2}{16}$

(B) $\frac{\pi^2}{8\sqrt{2}}$

(C) $\frac{\pi^2}{8}$

(D) $\frac{\pi^2}{16\sqrt{2}}$

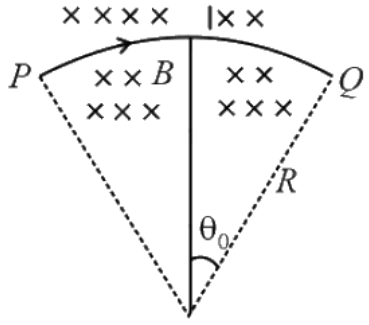
Answer: (B) $\frac{\pi^2}{8\sqrt{2}}$ · Key from source paper

Q211 JEE Main 2015 · 11 Apr · Online MCQ

A wire carrying current I is tied between points P and Q and is in the shape of a circular arc of radius R due to a uniform magnetic field B (perpendicular to the plane of the paper, as shown in the figure) in the vicinity of the wire. If the wire subtends an angle $2\theta_0$ at the center of the circle (of which it forms an arch) then the tension in the wire is:

(see the figure above)

Q20. A wire carrying current I is tied between points P and Q and is in the shape of a circular arc of radius R due to a uniform magnetic field B (perpendicular to the plane of the paper, as shown in the figure) in the vicinity of the wire. If the wire subtends an angle $2\theta_o$ at the center of the circle (of which it forms an arch) then the tension in the wire is:



(1) IBR

(2) $\frac{IBR}{sin\theta_0}$

(3) $\frac{IBR}{2sin\theta_0}$

(4) $\frac{IBR\theta_0}{sin\theta_0}$

(A) IBR

(B) $\frac{IBR}{\sin\theta_0}$

(C) $\frac{IBR}{2\sin\theta_0}$

(D) $\frac{IBR\theta_0}{\sin\theta_0}$

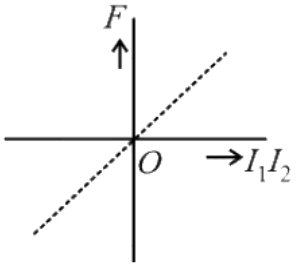
Answer: (A) IBR · Key from source paper

Q212 JEE Main 2015 · 11 Apr · Online MCQ

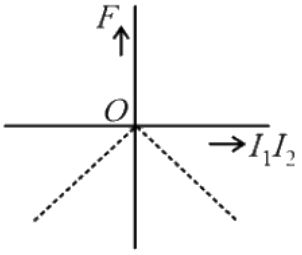
Two long straight parallel wires, carrying (adjustable) currents I_1 and I_2, are kept at a distance d apart. If the force F between the two wires is taken as 'positive' when the wires repel each other and 'negative' when the wires attract each other, the graph showing the dependence of F, on the product I_1I_2, would be:

Q21. Two long straight parallel wires, carrying (adjustable) currents I_1 and I_2 , 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 I_1I_2 , would be:

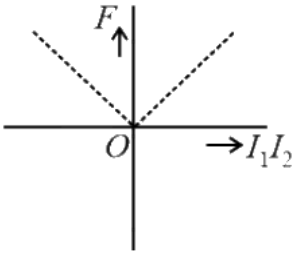
(1)



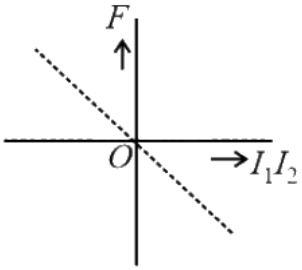
(2)



(3)



(4)



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (D) · Key from source paper

Q213 JEE Main 2015 · 10 Apr · Online MCQ

A 25 cm long solenoid has the radius 2 cm and 500 turns. It carries a current of 15 A. If it is equivalent to a magnet of the same size and magnetization $\vec{M}$ $\left(\frac{\text{Magnetic moment}}{\text{volume}}\right)$,then $\left|\vec{M}\right|$ is:

(A) $3\pi\ \mathrm{A\,m^{-1}}$

(B) $30000\ \mathrm{A\,m^{-1}}$

(C) $30000\pi\ \mathrm{A\,m^{-1}}$

(D) $300\ \mathrm{A\,m^{-1}}$

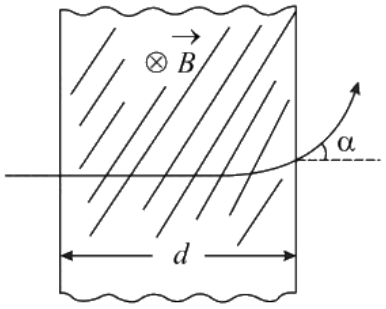
Answer: (B) $30000\ \mathrm{A\,m^{-1}}$ · Key from source paper

Q214 JEE Main 2015 · 10 Apr · Online MCQ

A proton (mass m) accelerated by a potential difference V flies through a uniform transverse magnetic field B. The field occupies a region of space by width d. If α be the angle of deviation of proton from the initial direction of motion (see figure), the value of $\sin\alpha$ will be:

(see the figure above)

Q21. A proton (mass m) accelerated by a potential difference V flies through a uniform transverse magnetic field B. The field occupies a region of space by width d. If α be the angle of deviation of proton from the initial direction of motion (see figure), the value of $\sin\alpha$ will be:



(1) $\frac{B}{2}\sqrt{\frac{qd}{mV}}$

(2) $Bd\sqrt{\frac{q}{2mV}}$

(3) $\frac{B}{d}\sqrt{\frac{q}{2mV}}$

(4) $qV\sqrt{\frac{Bd}{2m}}$

(A) $\frac{B}{2}\sqrt{\frac{qd}{mV}}$

(B) $Bd\sqrt{\frac{q}{2mV}}$

(C) $\frac{B}{d}\sqrt{\frac{q}{2mV}}$

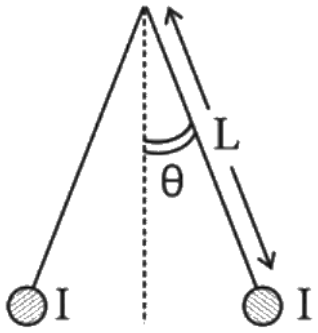
(D) $qV\sqrt{\frac{Bd}{2m}}$

Answer: (B) $Bd\sqrt{\frac{q}{2mV}}$ · Key from source paper

Q215 JEE Main 2015 · 4 Apr · Offline MCQ

see figure

Q14.



Two long currents carrying thin wires, both with current I, are held by insulating threads of length L and are in equilibrium as shown in the figure, with threads making an angle ' θ ' with the vertical. If wires have a mass λ per unit length then the value of I is:

(g = gravitational acceleration)

(1) $\sqrt{\frac{\pi\lambda gL}{\mu_0}\tan\theta}$

(2) $\sin\theta\sqrt{\frac{\pi\lambda gL}{\mu_0\cos\theta}}$

(3) $2\sin\theta\sqrt{\frac{\pi\lambda gL}{\mu_0\cos\theta}}$

(4) $2\sqrt{\frac{\pi gL}{\mu_0}\tan\theta}$

(A) $\sqrt{\frac{\pi\lambda gL}{\mu_0}\tan\theta}$

(B) $\sin\theta\sqrt{\frac{\pi\lambda gL}{\mu_0\cos\theta}}$

(C) $2\sin\theta\sqrt{\frac{\pi\lambda gL}{\mu_0\cos\theta}}$

(D) $2\sqrt{\frac{\pi gL}{\mu_0}\tan\theta}$

Answer: (C) $2\sin\theta\sqrt{\frac{\pi\lambda gL}{\mu_0\cos\theta}}$ · Key from source paper

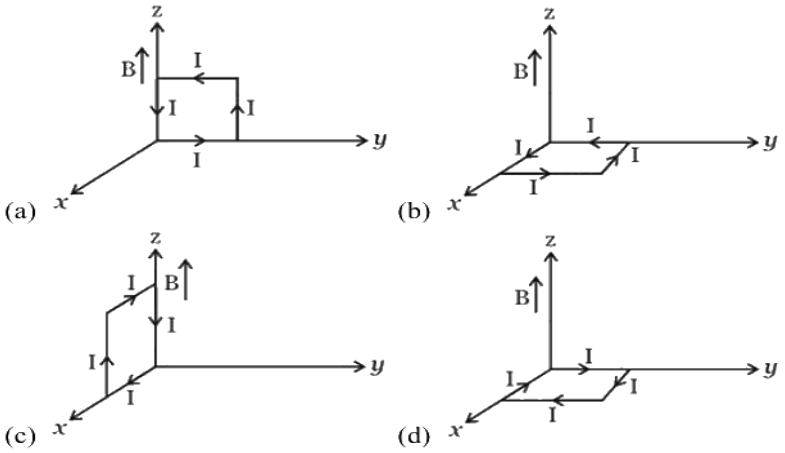
Q216 JEE Main 2015 · 4 Apr · Offline MCQ

A rectangular loop of sides $10\ \text{cm}$ and $5\ \text{cm}$, carrying a current I of $12\ \text{A}$, is placed in different orientations as shown in the figure below.

(see the figure above)

If there is a uniform magnetic field of $0.3\ \text{T}$ in the positive z direction, in which orientations the loop would be in (i) stable equilibrium and (ii) unstable equilibrium?

Q20. A rectangular loop of sides 10 cm and 5 cm, carrying a current I of 12 A, is placed in different orientations as shown in the figure below.



If there is a uniform magnetic field of 0.3 T in the positive z direction, in which orientations the loop would be in (i) stable equilibrium and (ii) unstable equilibrium?

(1) (b) and (c), respectively.
(2) (a) and (b), respectively.
(3) (a) and (c), respectively.
(4) (b) and (d), respectively.

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

Answer: (D) (b) and (d), respectively. · Key from source paper

Q217 JEE Main 2015 · 4 Apr · Offline MCQ

Two coaxial solenoids of different radii carry current I in the same direction. Let $\vec{F}_1$ be the magnetic force on the inner solenoid due to the outer one and $\vec{F}_2$ be the magnetic force on the outer solenoid due to the inner one. Then:

(A) $\vec{F}_1$ is radially outwards and $\vec{F}_2 = 0$
(B) $\vec{F}_1 = \vec{F}_2 = 0$
(C) $\vec{F}_1$ is radially inwards and $\vec{F}_2$ is radially outwards
(D) $\vec{F}_1$ is radially inwards and $\vec{F}_2 = 0$

Answer: (B) $\vec{F}_1 = \vec{F}_2 = 0$ · Key from source paper

Q218 JEE Main 2014 · 12 Apr · Online MCQ

A positive charge ' q ' of mass ' m ' is moving along the $+x$ axis. We wish to apply a uniform magnetic field B for time Δt so that the charge reverses its direction crossing the y axis at a distance d. Then:

(A) $B = \frac{mv}{qd}$ and $\Delta t = \frac{\pi d}{v}$

(B) $B = \frac{mv}{2qd}$ and $\Delta t = \frac{\pi d}{2v}$

(C) $B = \frac{2mv}{qd}$ and $\Delta t = \frac{\pi d}{2v}$

(D) $B = \frac{2mv}{qd}$ and $\Delta t = \frac{\pi d}{v}$

Answer: (C) $B = \frac{2mv}{qd}$ and $\Delta t = \frac{\pi d}{2v}$ · Key from source paper

Q219 JEE Main 2014 · 12 Apr · Online MCQ

Consider two thin identical conducting wires covered with very thin insulating material. One of the wires is bent into a loop and produces magnetic field B_1, at its centre when a current I passes through it. The second wire is bent into a coil with three identical loops adjacent to each other and produces magnetic field B_2 at the centre of the loops when current I/3 passes through it. The ratio $B_1 : B_2$ is:

(A) $1 : 1$

(B) $1 : 3$

(C) $1 : 9$

(D) $9 : 1$

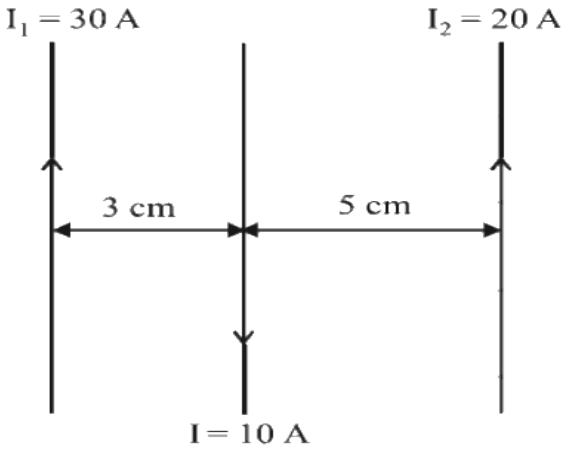
Answer: (B) $1 : 3$ · Key from source paper

Q220 JEE Main 2014 · 11 Apr · Online MCQ

Three straight parallel current carrying conductors are shown in the figure. The force experienced by the middle conductor of length $25\ cm$ is:

(see the figure above)

Q21. Three straight parallel current carrying conductors are shown in the figure. The force experienced by the



middle conductor of length 25 cm is:

(1) 3×10^{-4} N toward right

(2) 6×10^{-4} N toward right

(3) 9×10^{-4} N toward right

(4) Zero

(A) 3×10^{-4} N toward right
(B) 6×10^{-4} N toward right
(C) 9×10^{-4} N toward right
(D) Zero

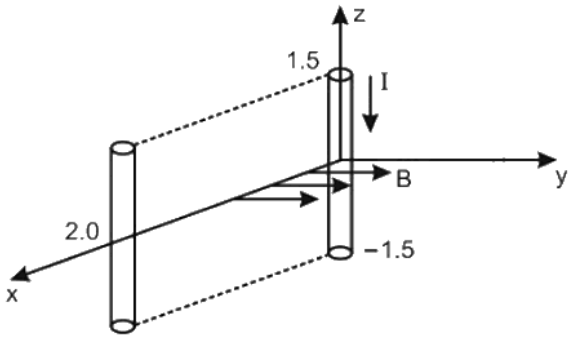
Answer: (A) 3×10^{-4} N **toward right** · Key from source paper

Q221 JEE Main 2014 · 6 Apr · Offline MCQ

A conductor lies along the z-axis at $-1.5 \leq z < 1.5$ m and carries a fixed current of 10.0 A in $-\hat{a}_z$ direction (see figure). For a field $\vec{B} = 3.0 \times 10^{-4}\, e^{-0.2x}\, \hat{a}_y$ T, find the power required to move the conductor at constant speed to x = 2.0 m, y = 0 m in 5×10^{-3} s. Assume parallel motion along the x-axis.

(see the figure above)

Q20. A conductor lies along the z-axis at $-1.5 \leq z < 1.5$ m and carries a fixed current of 10.0 A in $-\hat{a}_z$ direction (see figure). For a field $\vec{B} = 3.0 \times 10^{-4}\, e^{-0.2x}\, \hat{a}_y$ T, find the power required to move the conductor at constant speed to x = 2.0 m, y = 0 m in 5×10^{-3} s. Assume parallel motion along the x-axis.



(1) 1.57 W
(2) 2.97 W
(3) 14.85 W
(4) 29.7 W

(A) 1.57 W
(B) 2.97 W
(C) 14.85 W
(D) 29.7 W

Answer: (B) 2.97 W · Key from source paper

Q222 JEE Main 2013 · 25 Apr · Online MCQ

One of the two small circular coils, (none of them having any self - inductance) is suspended with a V-shaped copper wire, with plane horizontal. The other coil is placed just below the first one with plane horizontal. Both the coils are connected in series with a dc supply. The coils are found to attract each other with a force. Which one of the following statements is incorrect?

(A) Both the coils carry currents in the same direction.

(B) Coils will attract each other, even if the supply is an ac source.

(C) Force is proportional to d^{-1}

(D) Force is proportional to d^{-2}

Answer: (D) Force is proportional to d^{-2} · Key from source paper

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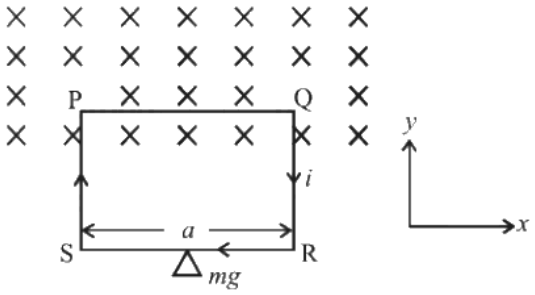
Q223 JEE Main 2013 · 23 Apr · Online MCQ

A rectangular loop of wire, supporting a mass m, hangs with one end in a uniform magnetic field B pointing out of the plane of the paper. A clockwise current is set up such that $i > mg/Ba$, where a is the width of the loop. Then :

(see the figure above)

Q19. A rectangular loop of wire, supporting a mass m, hangs with one end in a uniform magnetic field B pointing out of the plane of the paper. A clockwise current is set up such that $i > mg/Ba$, where a is the width of the loop. Then :



(1) The weight rises due to a vertical force caused by the magnetic field and work is done on the system.

(2) The weight do not rise due to vertical for caused by the magnetic field and work is done on the system.

(3) The weight rises due to a vertical force caused by the magnetic field but no work is done on the system.

(4) The weight rises due to a vertical force caused by the magnetic field and work is extracted from the magnetic field.

(A) The weight rises due to a vertical force caused by the magnetic field and work is done on the system.

(B) The weight do not rise due to vertical for caused by the magnetic field and work is done on the system.

(C) The weight rises due to a vertical force caused by the magnetic field but no work is done on the system.

(D) The weight rises due to a vertical force caused by the magnetic field and work is extracted from the magnetic field.

Answer: (C) The weight rises due to a vertical force caused by the magnetic field but no work is done on the system. · Key from source paper

Q224 JEE Main 2013 · 23 Apr · Online MCQ

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 :

(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) $4 \times 10^3\ \mathrm{Wb\,m}^{-2}$

Answer: (C) $1 \times 10^3\ \mathrm{Wb\,m}^{-2}$ · Key from source paper

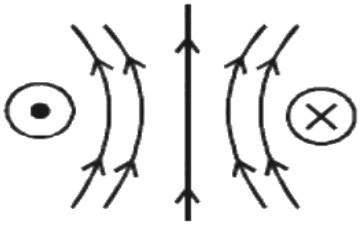
Q225 JEE Main 2013 · 22 Apr · Online MCQ

Choose the correct sketch of the magnetic field lines of a circular current loop shown by the dot and the cross $\otimes$.

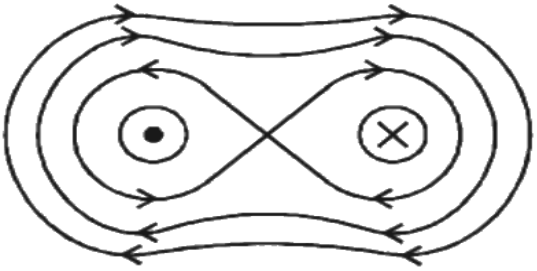
(see the figure above)

Q19. Choose the correct sketch of the magnetic field lines of a circular current loop shown by the dot and the cross $\otimes$.

(1)



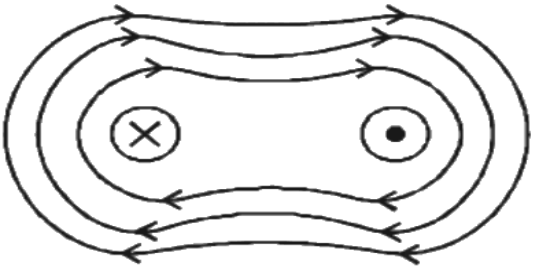
(2)



(3)



(4)



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (A) · Key from source paper

Q226 JEE Main 2013 · 22 Apr · Online MCQ

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 :

(A) Zero
(B) $\frac{\mu_0 i}{2\pi L}$
(C) $\frac{\mu_0 i}{\sqrt{2}L}$
(D) $\frac{4\mu_0 i}{\sqrt{5}\pi L}$

Answer: (A) Zero · Key from source paper

Q227

JEE Main 2013 · 9 Apr · Online · MCQ

An electric current is flowing through a circular coil of radius R. The ratio of the magnetic field at the centre of the coil and that at a distance $2\sqrt{2}R$ from the centre of the coil and on its axis is :

(A) $2\sqrt{2}$
(B) 27
(C) 36
(D) 8

Answer: (B) 27 · Key from source paper

Q228

JEE Main 2013 · 9 Apr · Online · MCQ

In the Bohr model an electron moves in a circular orbit around the proton. Considering the orbiting electron to be a circular current loop, the magnetic moment of the hydrogen atom, when the electron is in n^{th} excited state, is :

(A) $\left(\frac{e}{2m}\frac{n^2h}{2\pi}\right)$
(B) $\left(\frac{e}{m}\right)\frac{nh}{2\pi}$
(C) $\left(\frac{e}{2m}\right)\frac{nh}{2\pi}$
(D) $\left(\frac{e}{m}\right)\frac{n^2h}{2\pi}$

Answer: (C) $\left(\frac{e}{2m}\right)\frac{nh}{2\pi}$ · Key from source paper

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Q229

AIEEE 2012 · 26 May · Online · MCQ

Currents of a 10 ampere and 2 ampere are passed through two parallel thin wires A and B respectively in opposite directions. Wire A is infinitely long and the length of the wire B is 2 m. The force acting on the conductor B, which is situated at 10 cm distance from A will be

(A) 8×10^{-5} N
(B) 5×10^{-5} N
(C) $8\pi \times 10^{-7}$ N
(D) $4\pi \times 10^{-7}$ N

Answer: (A) 8×10^{-5} N · Key from source paper

Q230 AIEEE 2012 · 19 May · Online MCQ

A proton and a deuteron are both accelerated through the same potential difference and enter in a magnetic field perpendicular to the direction of the field. If the deuteron follows a path of radius R, assuming the neutron and proton masses are nearly equal, the radius of the proton's path will be

(A) $\sqrt{2}R$
(B) $\frac{R}{\sqrt{2}}$
(C) $\frac{R}{2}$
(D) R

Answer: (B) $\frac{R}{\sqrt{2}}$ · Key from source paper

Q231 AIEEE 2012 · 12 May · Online MCQ

The magnetic force acting on charged particle of charge $2\,\mu\text{C}$ in magnetic field of $2T$ acting in $y-$ direction, when the particle velocity is $(2\hat{i}+3\hat{j})\times 10^6\ \text{ms}^{-1}$ is

(A) 8 N in z-direction
(B) 8 N in y-direction
(C) 4 N in y-direction
(D) 4 N in z-direction

Answer: (A) 8 N in z-direction · Key from source paper

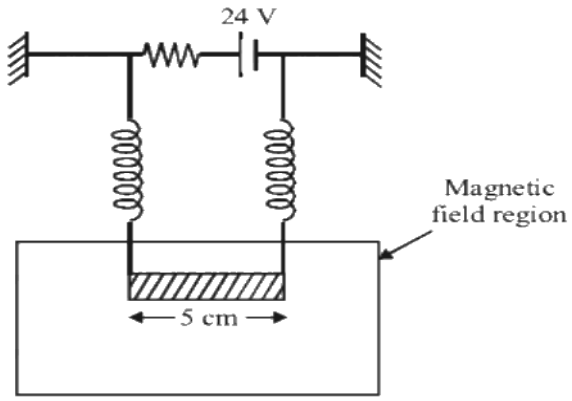
Q232 AIEEE 2012 · 12 May · Online MCQ

The circuit in figure consists of wires at the top and bottom and identical springs as the left and right sides. The wire at the bottom has a mass of 10 g and is 5 cm long. The wire is hanging as shown in the figure. The springs stretch 0.5 cm under the weight of the wire and the circuit has a total resistance of $12\,\Omega$. When the lower wire is subjected to a static magnetic field, the springs, stretch an additional 0.3 cm. The magnetic field is

(see the figure above)

EdLoop JEE

Q20. The circuit in figure consists of wires at the top and bottom and identical springs as the left and right sides. The wire at the bottom has a mass of 10 g and is 5 cm long. The wire is hanging as shown in the figure. The springs stretch 0.5 cm under the weight of the wire and the circuit has a total resistance of 12Ω. When the lower wire is subjected to a static magnetic field, the springs, stretch an additional 0.3 cm. The magnetic field is



(1) 0.6 T and directed out of page
(2) 1.2 T and directed into the plane of page
(3) 0.6 T and directed into the plane of page
(4) 1.2 T and directed out of page

(A) 0.6 T and directed out of page
(B) 1.2 T and directed into the plane of page
(C) 0.6 T and directed into the plane of page
(D) 1.2 T and directed out of page

Answer: (A) 0.6 T and directed out of page · Key from source paper

Q233 AIEEE 2012 · 7 May · Online MCQ

The velocity of certain ions that pass undeflected through crossed electric field $E = 7.7\text{kV/m}$ and magnetic field $B = 0.14$ T is

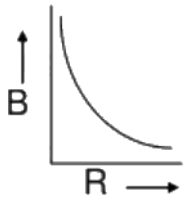
(A) 18 km/s
(B) 77 km/s
(C) 55 km/s
(D) 1078 km/s

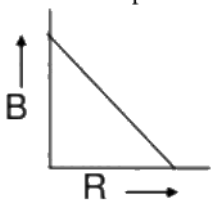
Answer: (C) 55 km/s · Key from source paper

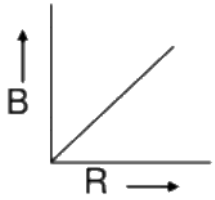
Q234 AIEEE 2012 · Offline MCQ

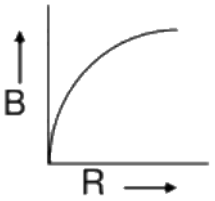
A charge Q is uniformly distributed over the surface of non conducting disc of radius R. The disc rotates about an axis perpendicular to its plane and passing through its centre with an angular velocity ω. As a result of this rotation a magnetic field of induction B is obtained at the centre of the disc. If we keep both the amount of charge placed on the disc and its angular velocity to be constant and vary the radius of the disc then the variation of the magnetic induction at the centre of the disc will be represented by the figure

Q18. A charge Q is uniformly distributed over the surface of non conducting disc of radius R. The disc rotates about an axis perpendicular to its plane and passing through its centre with an angular velocity ω. As a result of this rotation a magnetic field of induction B is obtained at the centre of the disc. If we keep both the amount of charge placed on the disc and its angular velocity to be constant and vary the radius of the disc then the variation of the magnetic induction at the centre of the disc will be represented by the figure

(1) 

(2) 

(3) 

(4) 

(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (A) · Key from source paper

Q235 AIEEE 2012 · Offline MCQ

Proton, Deuteron and alpha particle of the same kinetic energy are moving in circular trajectories in a constant magnetic field. The radii of proton, deuteron and alpha particle are respectively r_p, r_d and r_α. Which one of the following relations is correct?

(A) $r_\alpha = r_p = r_d$
(B) $r_\alpha = r_p < r_d$
(C) $r_\alpha > r_d > r_p$
(D) $r_\alpha = r_d > r_p$

Answer: (B) $r_\alpha = r_p < r_d$ · Key from source paper

Q236 AIEEE 2011 MCQ

A current I flows in an infinitely long wire with cross section in the form of a semicircular ring of radius R. The magnitude of the magnetic induction along its axis is

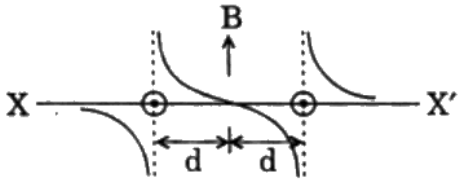
(A) $\frac{\mu_0 I}{2\pi^2 R}$
(B) $\frac{\mu_0 I}{2\pi R}$
(C) $\frac{\mu_0 I}{4\pi^2 R}$
(D) $\frac{\mu_0 I}{\pi^2 R}$

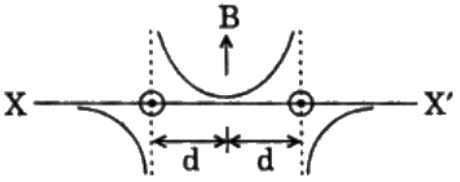
Answer: (D) $\frac{\mu_0 I}{\pi^2 R}$ · Key from source paper

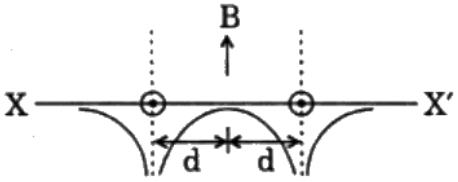
Q237 AIEEE 2010 MCQ

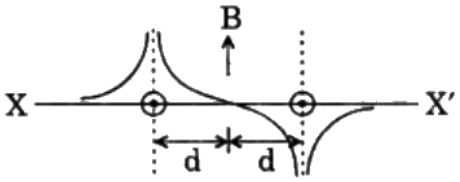
Two long parallel wires are at a distance 2 d apart. They carry steady equal current flowing out of the plane of the paper as shown. The variation of the magnetic field along the line XX ' is given by

Q18. Two long parallel wires are at a distance 2 d apart. They carry steady equal current flowing out of the plane of the paper as shown. The variation of the magnetic field along the line XX ' is given by

(1) 

(2) 

(3) 

(4) 

(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (A) · Key from source paper

Q238 AIEEE 2009 MCQ

A current loop $ABCD$ is held fixed on the plane of the paper. The arcs BC (radius $= b$) and DA (radius $= a$) of the loop are joined by two straight wires AB and CD. A steady current I is flowing in the loop. Angle made by AB and CD at the origin O is 30°. Another straight thin wire with steady current I_1 flowing out of the plane of the paper is kept at the origin.
The magnitude of the magnetic field (B) due to loop $ABCD$ at the origin (O) is

(A) zero
(B) $\frac{\mu_0 I(b-a)}{24ab}$
(C) $\frac{\mu_0 I}{4\pi}\left[\frac{b-a}{ab}\right]$
(D) $\frac{\mu_0 I}{4\pi}\left[2(b-a)+\frac{\pi}{3}(a+b)\right]$

Answer: (B) $\frac{\mu_0 I(b-a)}{24ab}$ · Key from source paper

Q239 AIEEE 2009 MCQ

A current loop $ABCD$ is held fixed on the plane of the paper. The arcs BC (radius $= b$) and DA (radius $= a$) of the loop are joined by two straight wires AB and CD. A steady current I is flowing in the loop. Angle made by AB and CD at the origin O is 30°. Another straight thin wire with steady current I_1 flowing out of the plane of the paper is kept at the origin.
Due to the presence of the current I_1 at the origin

(A) The forces on AB and DC are zero
(B) The forces on AD and BC are zero
(C) The magnitude of the net force on the loop is given by $\frac{\mu_0 I I_1}{4\pi}\left[2(b-a)+\frac{\pi}{3}(a+b)\right]$
(D) The magnitude of the net force on the loop is given by $\frac{\mu_0 I I_1}{24ab}(b-a)$

Answer: (B) The forces on AD and BC are zero · Key from source paper

Q240 AIEEE 2008 MCQ

A horizontal overhead power line is at a height of 4 m from the ground and carries a current of 100 A from east to west. The magnetic field directly below it on the ground is ($\mu_0 = 4\pi \times 10^{-7}\ \mathrm{T\ m\ A^{-1}}$)

(A) 2.5×10^{-7} T southward
(B) 5×10^{-6} T northward
(C) 5×10^{-6} T southward
(D) 2.5×10^{-7} northward

Answer: (C) 5×10^{-6} T southward · Key from source paper

Q241 AIEEE 2007 MCQ

A long straight wire of radius ' a ' caries a steady current i. The current is uniformly distributed across its cross section. The ratio of the magnetic field at $\frac{a}{2}$ and $2a$ is

(A) $\frac{1}{4}$
(B) 4
(C) 1
(D) $\frac{1}{2}$

Answer: (C) 1 · Key from source paper

Q242 AIEEE 2007 MCQ

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

(A) the magnetic field is zero only on the axis of the pipe
(B) the magnetic field is different at different points inside the pipe
(C) the magnetic field at any point inside the pipe is zero
(D) the magnetic field at all points inside the pipe is the same, but not zero

Answer: (C) the magnetic field at any point inside the pipe is zero · Key from source paper

Q243 AIEEE 2007 MCQ

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

(A) $\vec{v} = \vec{E} \times \vec{B}/B^2$
(B) $\vec{v} = \vec{B} \times \vec{E}/B^2$
(C) $\vec{v} = \vec{E} \times \vec{B}/E^2$
(D) $\vec{v} = \vec{B} \times \vec{E}/E^2$

Answer: (A) $\vec{v} = \vec{E} \times \vec{B}/B^2$ · Key from source paper

Q244 AIEEE 2007 MCQ

A charged particle moves through a magnetic field perpendicular to its direction. Then

(A) the momentum changes but the kinetic energy is constant
(B) both momentum and kinetic energy of the particle are not constant
(C) both, momentum and kinetic energy of the particle are constant
(D) kinetic energy changes but the momentum is constant

Answer: (A) the momentum changes but the kinetic energy is constant · Key from source paper

Q245 AIEEE 2007 MCQ

Two identical conducting wires AOB and COD are placed at right angles to each other. The wire AOB carries an electric current I_1 and COD carries a current I_2. The magnetic field on a point lying at a distance ' d ' from O, in a direction perpendicular to the plane of the wires AOB and COD, will be given by

(A) $\frac{\mu_0}{2\pi}\left(\frac{I_1+I_2}{d}\right)^{1/2}$
(B) $\frac{\mu_0}{2\pi d}\left(I_1^2+I_2^2\right)^{1/2}$
(C) $\frac{\mu_0}{2\pi d}\left(I_1+I_2\right)$
(D) $\frac{\mu_0}{2\pi d}\left(I_1^2+I_2^2\right)$

Answer: (B) $\frac{\mu_0}{2\pi d}\left(I_1^2+I_2^2\right)^{1/2}$ · Checked by our team

Q246 AIEEE 2006 MCQ

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

(A) circle
(B) helix
(C) straight line
(D) ellipse

Answer: (C) straight line · Key from source paper

Q247 AIEEE 2006 MCQ

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

the magnetic field at its centre is

(A) 1.05×10^{-4} Weber/m
(B) 1.05×10^{-2} Weber $/\mathrm{m}^2$
(C) 1.05×10^{-5}Weber/m^2
(D) 1.05×10^{-3}Weber/m^2

Answer: (B) 1.05×10^{-2} **Weber** $/\mathrm{m}^2$ · Key from source paper

Q248 AIEEE 2005 MCQ

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

(A) attract each other with a force of $\mu_0 i^2/(2\pi \mathrm{d})$
(B) repel each other with a force of $\mu_0 i^2/(2\pi \mathrm{d})$
(C) attract each other with a force of $\mu_0 \mathrm{i}^2\ (2\pi \mathrm{d}^2)$
(D) repel each other with a force of $\mu_0 \mathrm{i}^2\ /(2\pi \mathrm{d}^2)$

Answer: (A) attract each other with a force of $\mu_0 i^2/(2\pi \mathrm{d})$ · Key from source paper

Q249 AIEEE 2005 MCQ

Two concentric coils each of radius equal to 2π 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 $/\mathrm{m}^2$ at the centre of the coils will be ($\mu_0 = 4\pi \times 10^{-7}$ Wb/A-m)

(A) 12×10^{-5}
(B) 10^{-5}
(C) 5×10^{-5}
(D) 7×10^{-5}

Answer: (C) 5×10^{-5} · Key from source paper

Q250 AIEEE 2005 MCQ

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

(A) its velocity will decrease.
(B) its velocity will increase.
(C) it will turn towards right of direction of motion.
(D) it will turn towards left of direction of motion

Answer: (A) its velocity will decrease. · Key from source paper

Q251 AIEEE 2005 MCQ

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

(A) $\frac{2\pi \mathrm{mq}}{\mathrm{B}}$
(B) $\frac{2\pi q^2 B}{m}$
(C) $\frac{2\pi qB}{m}$
(D) $\frac{2\pi m}{qB}$

Answer: (D) $\frac{2\pi m}{qB}$ · Key from source paper

Q252 AIEEE 2004 MCQ

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

(A) infinite
(B) zero
(C) $\frac{\mu_0}{4\pi}\frac{2i}{r}$ tesla
(D) $2n^2$ B

Answer: (B) zero · Key from source paper

Q253 AIEEE 2004 MCQ

A long wire carries a steady current. It is bent into a circle of one turn and the magnetic field at the centre of the coil is B. It is then bent into a circular loop of n turns. The magnetic field at the centre of the coil will be

(A) nB
(B) n^2 B
(C) 2nB
(D) $2n^2B$

Answer: (B) n^2 B · Key from source paper

Q254 AIEEE 2004 MCQ

The magnetic field due to a current carrying circular loop of radius 3 cm at a point on the axis at a distance of 4 cm from the centre is 54μT. What will be its value at the centre of the Loop?

EdLoop JEE

(A) 250μT
(B) 150μT
(C) 125μT
(D) 75μT

Answer: (A) 250μT · Key from source paper

Q255 AIEEE 2004 MCQ

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 increased to two times and its direction reversed. The distance is also increased to 3 d. The new value of the force between them is

(A) -2 F
(B) F/3
(C) $-2F/3$
(D) $-F/3$

Answer: (C) $-2F/3$ · Key from source paper

Q256 AIEEE 2003 MCQ

A particle of mass M and charge Q moving with velocity $\vec{v}$ describe a circular path of radius R when subjected to a uniform transverse magnetic field of induction B. The work done by the field when the particle completes one full circle is

(A) $\left(\frac{\mathrm{Mv}^2}{\mathrm{R}}\right) 2\pi\mathrm{R}$
(B) Zero
(C) $BQ2\pi R$
(D) BQ v $2\pi R$

Answer: (B) Zero · Key from source paper

Q257 AIEEE 2003 MCQ

A particle of charge -16×10^{-18} coulomb moving with velocity $10\ \mathrm{ms}^{-1}$ 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

(A) 10^3 Wb/m^2
(B) 10^5 Wb/m^2
(C) 10^{16} Wb/m^2
(D) 10^{-3} Wb/m^2

Answer: (A) 10^3 Wb/m^2 · Key from source paper

Q258 AIEEE 2002 MCQ

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

(A) expand
(B) compress
(C) insulator
(D) none of these

Answer: (B) compress · Key from source paper

Q259 AIEEE 2002 MCQ

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

(A) 1
(B) 2
(C) 1/2
(D) 4

Answer: (A) 1 · Key from source paper

Q260 AIEEE 2002 MCQ

If an electron and a proton having same momenta enter perpendicular to a magnetic field, then

(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

Answer: (A) curved path of electron and proton will be same (ignoring the sense of revolution) · Key from source paper

Q261 AIEEE 2002 MCQ

The time period of a charged particle undergoing a circular motion in a uniform magnetic field is independent of its

(A) speed
(B) mass
(C) charge
(D) magnetic induction

Answer: (A) speed · Key from source paper