doubtnut
India's Number 1 Education App

PHYSICS

FOR IIT JEE ASPIRANTS OF CLASS 12 FOR PHYSICS

MOVING CHARGES AND MAGNETISM

W.E.

1. Eight wires cut the page perpendicular to the points shown. Each wire carries current i_0. Odd currents are out of the page and even current into the page. Find the line integral $\oint \vec{B}.\ \vec{dl}$ along the loop.

Watch Video Solution

2. Find the magnetic induction due to a straight condutor of length $16cm$ carrying current of $5A$ at a distance of $6cm$ from the midpoint of conductor.

Watch Video Solution

3. If a straight conductor of length $40cm$ bent in the form of a square and the current $2A$ is allowed to pass through square, then find the magnetic induction at the centre of the square loop.

Watch Video Solution

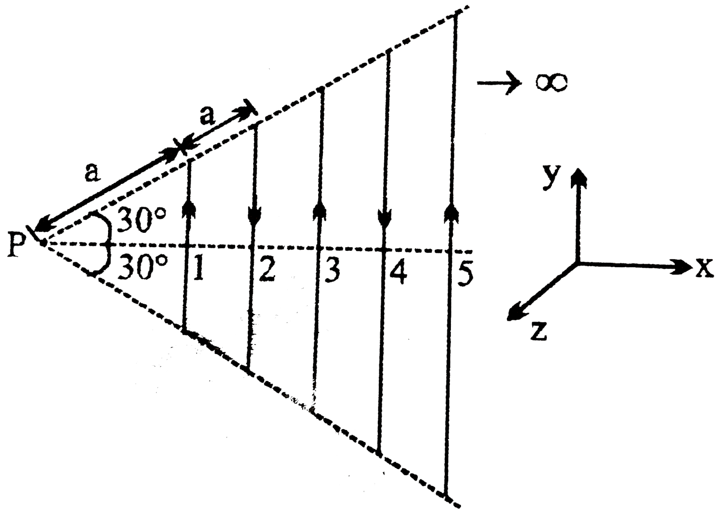
4. If a thin uniform wire of length $1m$ is bent into an equilateral triangle and crries a current of $\sqrt{2}A$ in anticlockwise direction, find the net magnetic induction at the centroid

Watch Video Solution

5. A large straight current carrying conductor is bent in the form of L shape. Find $\vec{B}$ at P.

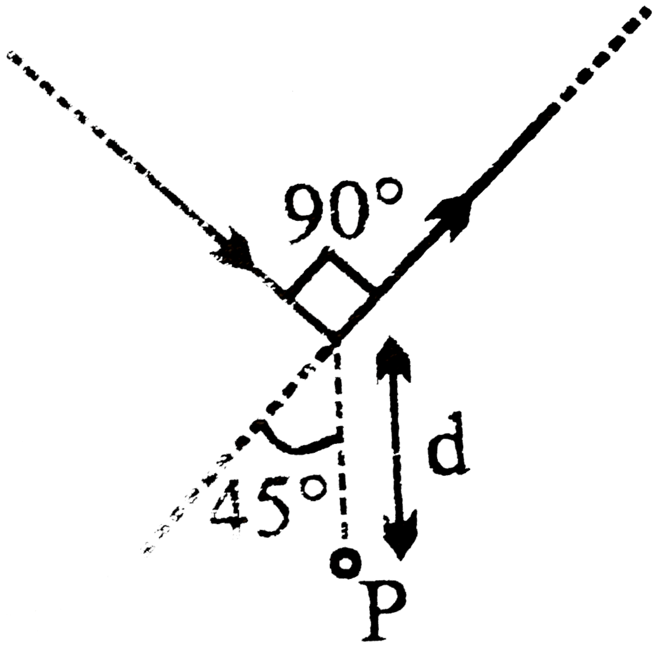
View Text Solution

6. Infinite number of straight wires each carrying current I are equally placed as shown in the figure Adjacent wires have current in opposite direction Net magnetic field at point P is



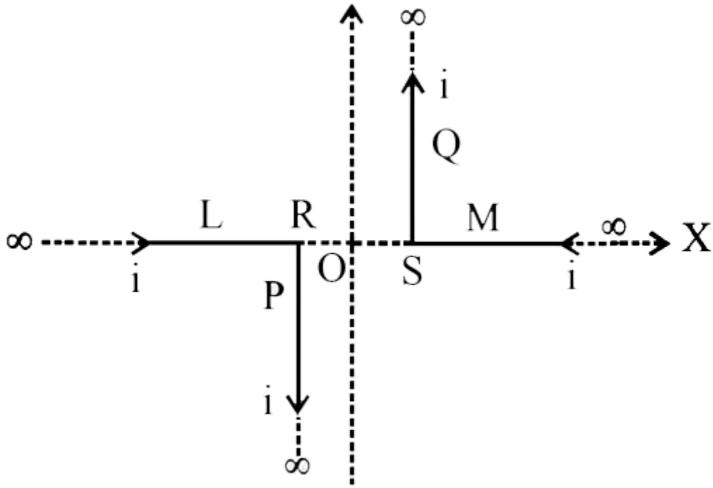
Watch Video Solution

7. Find the magnetic field at P due to the arrangement shown



Watch Video Solution

8. A pair of stationary and infintely long bent wires are placed in the XY planes as shown in fig. The wires carry currents of $I = 10 amperes$ each as shown . The segments P and Q are parallel to the Y - $a\xi s$ such that $OS = OR = 0.02m$. Find the magnitude and direction of the magnetic induction at the origin O.

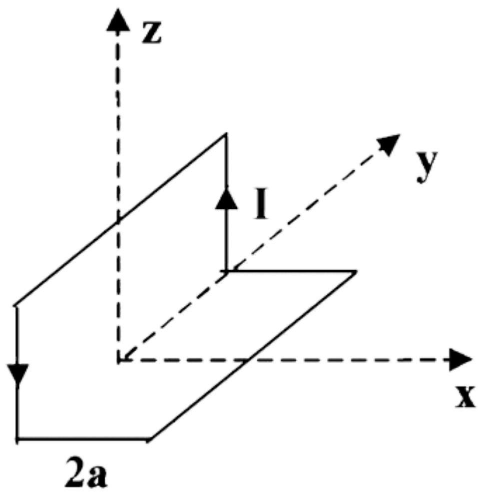


Watch Video Solution

9. An equilateral triangle of side length l is formed from a piece of wire of uniform resistance. The current I is as shown in figure. Find the magnitude of the magnetic field at its centre O.

Watch Video Solution

10. A non - popular loop of conducting wire carrying a current I is placed as shown in the figure . Each of the straighrt sections of the loop is of the length $2a$. The magnetic field due to this loop at the point $P(a, 0, a)$ points in the direction

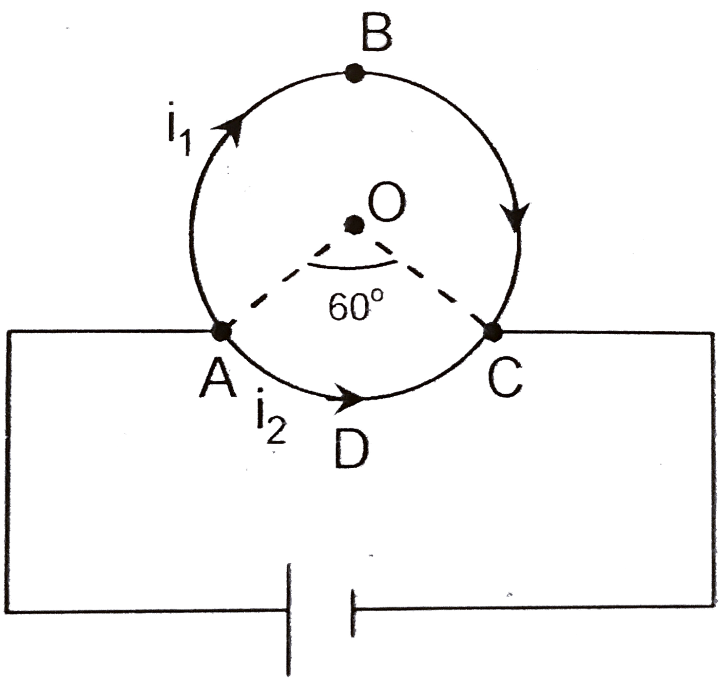


Watch Video Solution

11. $A2A$ current is flowing through a circular coil of radius $10cm$ containing 100 turns. Find the magnetic flux density at the centre of the coil.

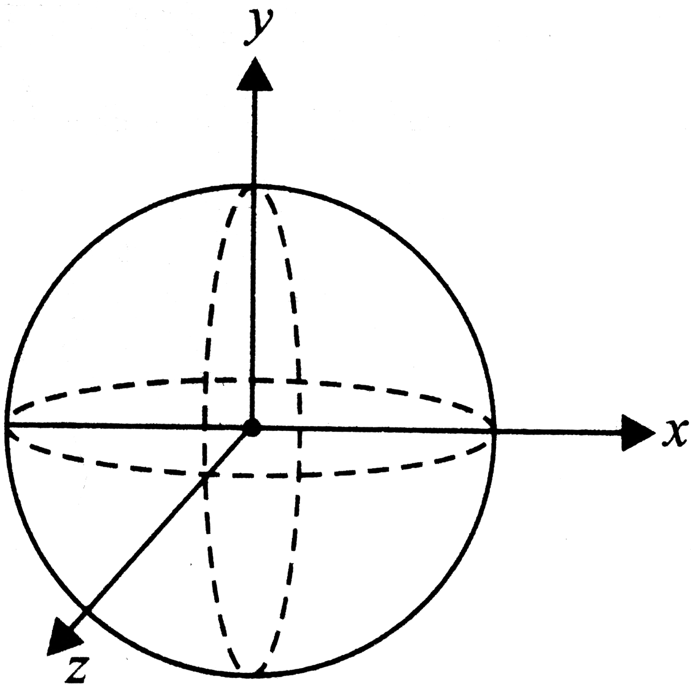
Watch Video Solution

12. A cell is connected between the point A and C of a circular conductor ABCD of centre O, $\angle AOC = 60^{\circ}$. If B_1 and B_2 are the magnitude of magnetic fields at O due to the currents in ABC and ADC respectively, the ratio of B_1/B_2 is.



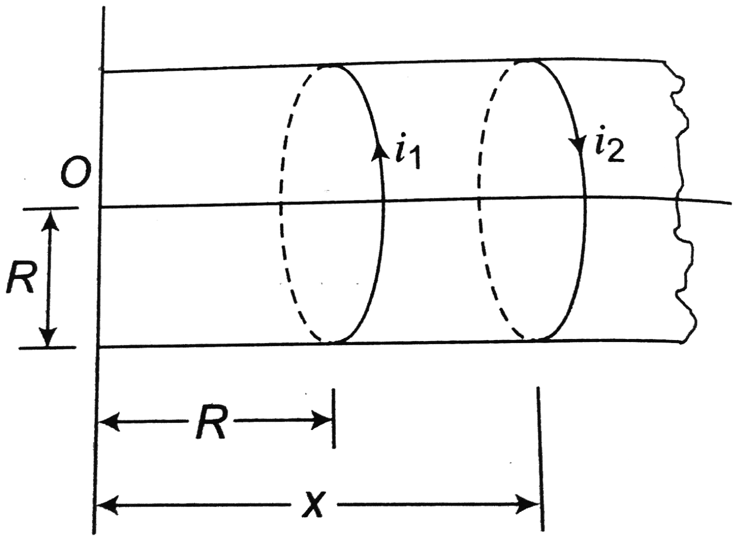
Watch Video Solution

13. Three rings, each having equal radius R, are placed mutually perpendicular to each other and each having its centre at the origin of coordinate system. If current I is flowing through each ring, then the magnitude of the magnetic field at the common centre is



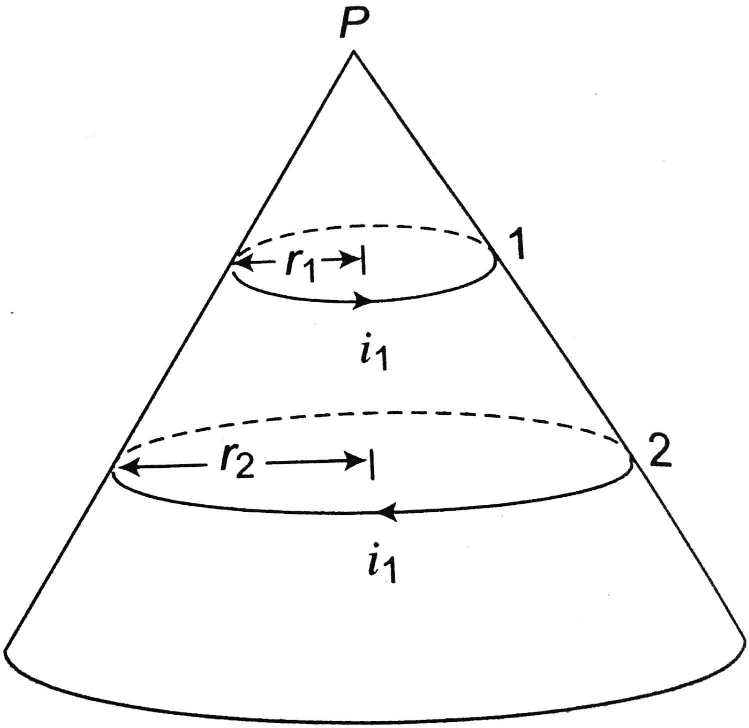
Watch Video Solution

14. Two wires are wrapped over wooden cylinder to form two co-axial loops carrying currents i_1 and i_2. If $i_2 = 8i_1$ the value of x for $B = 0$ at the origin O is:



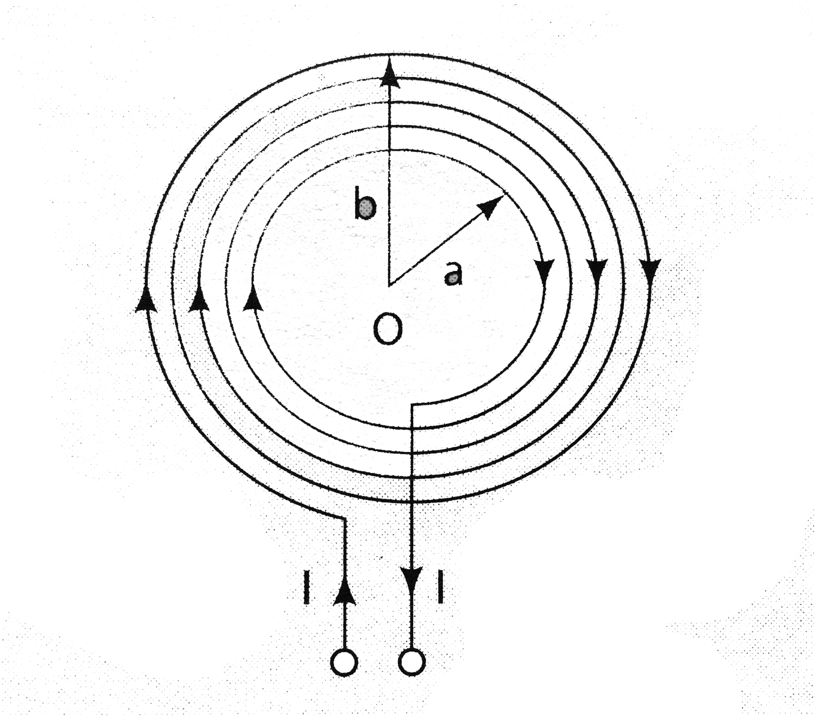
Watch Video Solution

15. Two wires wrapped over a conical frame from the coils 1 and 2. If they produce no net magnetic field at the apex P, the value of



Watch Video Solution

16. A thin insulated wire forms a plane spiral of $N = 100$ turns carrying a current $i = 8mA$. The inner and outer radii are equal to $a = 5cm$ and $b = 10cm$. Find the magnetic induction at the centre of the spiral



Watch Video Solution

17. A plastic disc of radius $'R'$ has a charge $'q'$ uniformly distributed over its surface. If the dis is rotated with a frequency $'f'$ about its axis, then the magnetic induction at the centre of the disc is given by

Watch Video Solution

18. A charge of $1C$ is placed at one end of a non conducting rod of length $0.6m$. The rod is rotated in a vertical plane about a horizontal axis passing through the other end of the rod with angular frequency $10^4 \pi rad/s$. Find the magnetic field at a point on the axis of rotation at a distance of $0.8m$ from the centre of the path.

Watch Video Solution

19. Two circular coils made of same material having radii $20cm \& 30cm$ have turns $100 \& 50$ respectively. If they are connected a) in series b) in parallel c) separately across a source of ef find the ratio of magnetic inductions at the centre of circles in each case

Watch Video Solution

20. Two circular coils are made from a uniform wire the ratio of radii of circular coils are $2:3\&$ no. of turns is $3:4$. If they are connected in parallel across a battery.

A: Find ratio of magnetic inductions at their centres

B: Find the ratio magnetic moments of 2 coils.

Watch Video Solution

21. Figure shows a square current carrying loop $ABCD$ of side $2m$ and current $i = \frac{1}{2}A$. The magnetic moment $\vec{M}$ of the loop is

Watch Video Solution

22. If two charged particles each of charge q mass m are connected to the ends of a rigid massless rod and is rotated about an axid passing through the centre and $\perp$ to length. Then find the ratio of magnetic moment to angular momentum.

Watch Video Solution

23. Find the magnetic dipole moment of the spiral of total number of turns N, carrying current i having inner and outer radii a and b respectively.

Watch Video Solution

24. Consider a non conducting plate of radius a and mass m which has a charge q distributed uniformly over it, The plate is rotated about its own axis with a angular speed ω. Show that the magnetic moment M and the angular momentum L of the plate are related as $\frac{M}{L} = \frac{q}{2m}$.

Watch Video Solution

25. A magnetic needle is arranged at the centre of a current carrying coil having 50 turns with radius of coil $20cm$ arranged along magnetic meridian. When a current of $0.5mA$ is allowed to pass through the coil the deflection is observed to be 30°. Find the horizontal component of earth's magnetic field

Watch Video Solution

26. A solenoid of length $8cm$ has 100 turns in it. If radius of coil is $3cm$ and if it is carrying a current of $2A$, find the magnetic induction at a point $4cm$ from the end on the axis of the solenoid.

Watch Video Solution

27. A solenoid $60cm$ long and of radius $4 \cdot 0cm$ has 3 layers of windings of 300 turns each. A $2 \cdot 0cm$ long wire of mass $2 \cdot 5g$ lies inside the solenoid (near its centre) normal to the axis : both the wire and the axis of the solenoid are in the horizontal plane. The wire is connected through two leads parallel to the axis of solenoid to an external battery which supplies a current of $6 \cdot 0A$ in the wire. What value of current (with appropriate sense of circulation) in the windings of the solenoid can support the weight of the wire? $g = 9 \cdot 8ms^{-2}$.

Watch Video Solution

28. A toroid of non ferromagnetic has core of inner radius $25cm$ and outer radius $26cm$. It has 3500 turns & carries a current of $11A$, then find the magnetic field at a point

(i) In the internal cavity of toroid

(ii) At the midpoint of the windings

(iii) At a point which is at a distance of $30cm$ from the centred of toroid.

Watch Video Solution

29. A solenoid of $2m$ long $\&3cm$ diameter has 5 layers of winding of 500 turns per metre length in each layer & carries a current of $5A$. Find intensity of magnetic field at the centre of the solenoid.

Watch Video Solution

30. A magnetic field of $\left(4.0 \times 10^{-3}\hat{k}\right)T$ exerts a force $\left(4.0\hat{i} + 3.0\hat{j}\right) \times 10^{-10}N$ on a particle having a charge $10^{-9}C$ and moving in te $x - y$ plane. Find the velocity of the particle.

Watch Video Solution

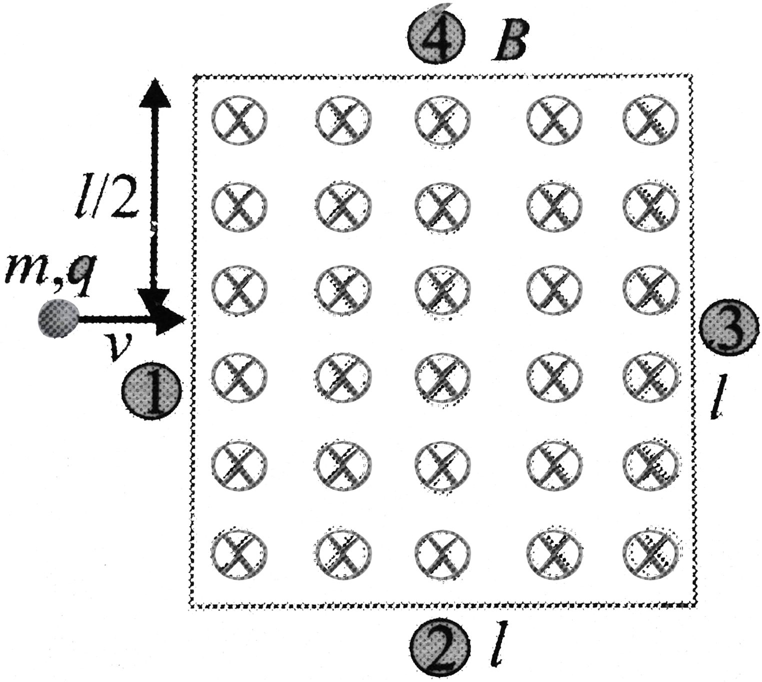
31. If a particle of charge $1\mu C$ is projected into a magnetic fiels $\vec{B} = \left(2\hat{i} + y\hat{j} - z\hat{k}\right)T$ with a velocity $\vec{V}\left(4\hat{i} + 2\hat{j} - 6\hat{k}\right)ms^{-1}$, then it passes undeviated. If it is now projected with a velocity $\vec{V} = \hat{i} + \hat{j}$, then find the force experienced by it

Watch Video Solution

32. An α - particle is accelerated by a potential difference of 10^4V. Find the change in its direction of motion, if it enters normally in a region of thickness 0.1 m having transverse magnetic induction of 0.1 tesla. (Given: mass of α - particle 6.4×10^{-27}kg).

Watch Video Solution

33. The magnetic field is confirmed in a square region. A positive charged particle of charge q and mass m the limiting velocities of the particles so that it may come out of face (1), (2), (3), and (4).



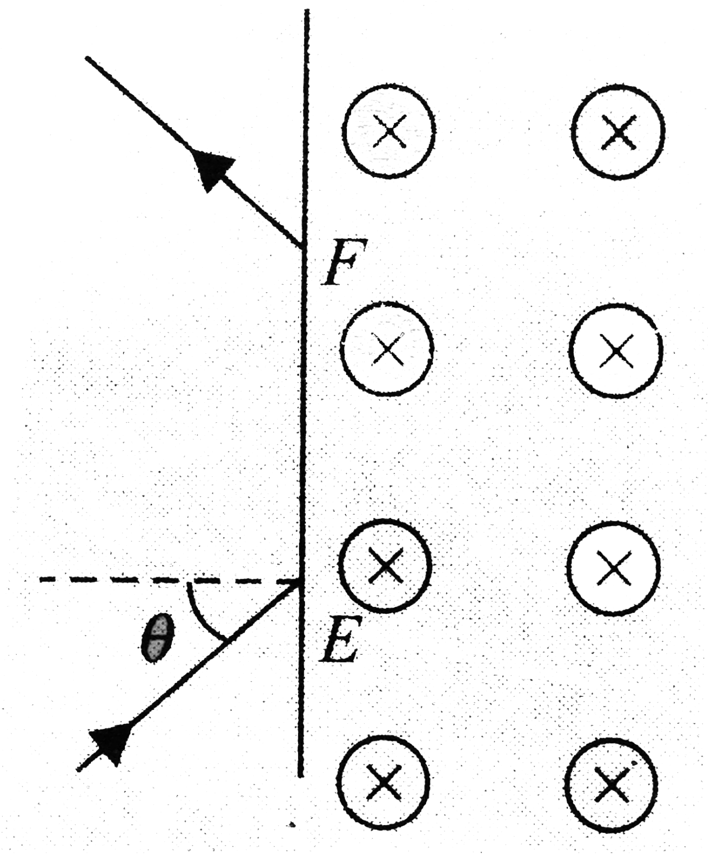
Watch Video Solution

34. A particle of mass m and charge +q enters a region of magnetic field with a velocity v, as shown in Fig. 1.93.

a. Find the angle subtended by the circular arc described by it in the magnetic field.

b. How long does the particle stay inside the magnetic field?

c. If the particle enters at E, what is the intercept EF?

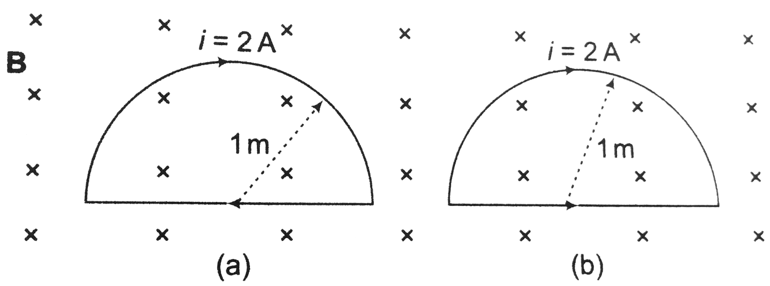


Watch Video Solution

35. Find the force experienced by the wire carrying a current $2A$ if the ends P and Q of the wire have coordinates $(1, 2 - 3)m$ and $(-2, -5, 1)m$ respectively when it is placed in a magnetic field $\vec{B} = \left(\hat{i} + \hat{j} + \hat{k}\right)T$

Watch Video Solution

36. In the figure shown a semicircular wire loop is placed in a uniform magnetic field $B = 1.0T$. The plane of the loop is perpendicular to the magnetic field. Current $i = 2A$ flows in the loop in the directions shown. Find the magnitude of the magnetic force in both the cases a and b. The radius of the loop is 1.0 m

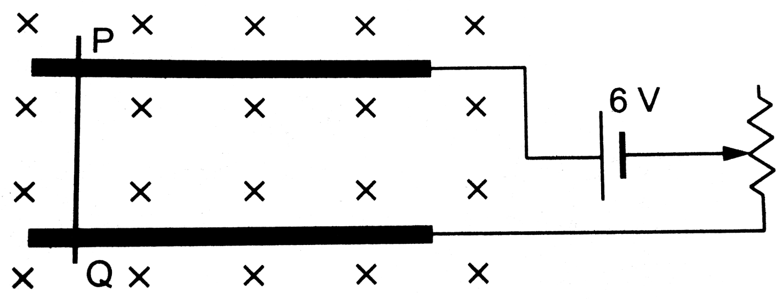


Watch Video Solution

37. A rough inclined plane inclined at angle of 37° with horizontal has a metallic wire of length $20cm$ with its length $\perp$ to length of inclines plane $(\mu = 0.1)$ When a current of its passingthrough the wire and a magnetic field is applied normal to the plane upwards, the wire starts moving up with uniform velocity for $B = 0.5T$. The find the magnitude of current i, (mass of the wire $= 50g$)

Watch Video Solution

38. A matel wire PQ of mass 10g lies at rest on two horizontal metal rails separated by 4.90 cm . A vertically downward magnetic field of magnitude 0.800 T exists in the space. The resistance of the circuit is slowly decreased and it is found that when the resistance goes below20.0Ω, the wire PQ starts sliding on the rails. Find the coefficient of friction.



Watch Video Solution

39. A current carrying conductor of mass m, length 1 carrying a current i hangs by two identical springs each of stiffness k. For an outward magnetic field B find the deformation of the springs. Put $m = 50gm. \ g = 10m/s^2, l = 1/2m, i = 1A$ and $B = 1T$ and $k = 50N/m$

Watch Video Solution

40. A square loop of side a hangs from an insulating hanger of spring balance. The magnetic field of strength B occurs only at the lower edge. It carries a current I . Find the change in the reading of the spring balance if the direction of current is reversed.

Watch Video Solution

41. A rod CD of length b carrying a current I_2 is placed in a magentic field due to a thin long wire AB carrying current I_1 as shown in figure. Then find the net force experience by the wire

Watch Video Solution

42. A long straight conductor carrying a current of $2A$ is in parallel to another conductor of length $5cm$. And carrying a current $3A$. They are separated by a distance of $10cm$. Calculate $(a)B$ due to first conductor at second conductor (b) the force on the short conductor.

Watch Video Solution

43. Two long straight parallel current carrying conductors each of length l and current i are placed at a distance r_0. Show that the total work done by an external agent in slowly reducing their distance of separation to $\frac{r_0}{2}$ is $\frac{\mu_0}{2\pi}i^2\ln(2)$

Watch Video Solution

44. Two parallel horizontal conductors are suspended by two light vertical threads each 75 cm long. Each conductor has a mass of $40gm$, and when there is no current they are 0.5 cm apart. Equal current in the two wires result in a separation of 1.5 cm. Find the values and directions of currents. Take $g = 9.8ms^{-2}$.

Watch Video Solution

45. A conductor AB of length $10cm$ at a distance of $10cm$ from an infinitely long parallel conductor carrying a current $10A$. What work must be done to move AB to a distance of $20cm$ if it carries $5A$?

Watch Video Solution

46. Three long straight wires are connected parallel to each other across a battery of negligible internal resistance. The ratio of their resistances are $3:4:5$. What is the ratio of distances of middle wire from the others if the net forces experienced by it is zero.

Watch Video Solution

47. A circular loop of area $1cm^2$ carrying a current of $10A$ is placed in a magnetic field of $2T\hat{i}$. The loop is in xy plane with current in clockwise direction . Fing the torque on the loop

Watch Video Solution

48. A metallic wire is folded to form a square loop a side $'a'$. It carries a current $'I'$ and is kept perpendicular to a uniform magnetic field. If the shape of the loop is changed from square to a circle without changing the length of thw wire and current, the amount of work done in doing so is

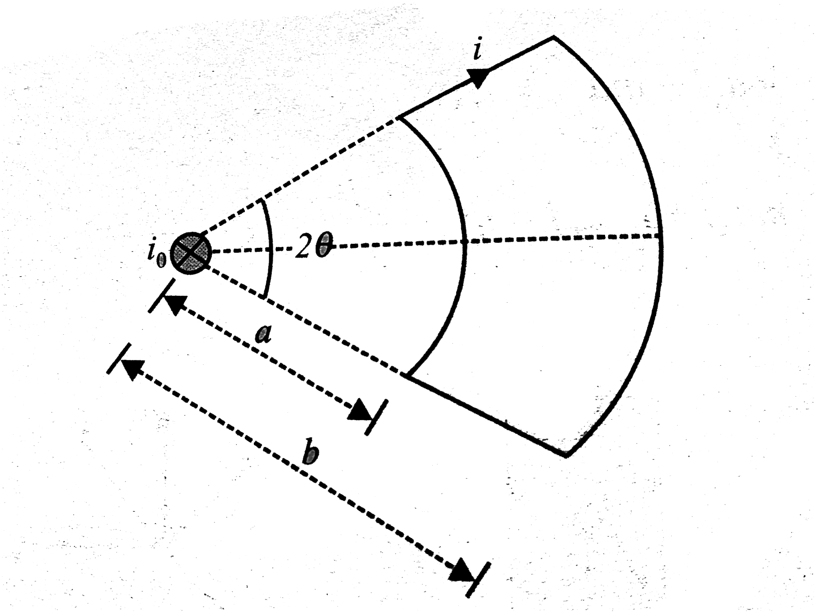
Watch Video Solution

49. A flat insulating disc of radius $'a'$ carries an excess charge on its surface is of surface charge density $\sigma C/m^2$. Consider disc to rotate around the perpendicular to its plane with angular speed $\omega rad/s$/ If magnetic field $\vec{B}$ is directed perpendicular to the roation axis, then find the torque acting on the disc.

Watch Video Solution

50. A loop, carring a current i, lying in the plane of the paper, is in the field of a long straight wire with current i_0 (inward) as shown in Fig. Find the

torque acting on the loop.



Watch Video Solution

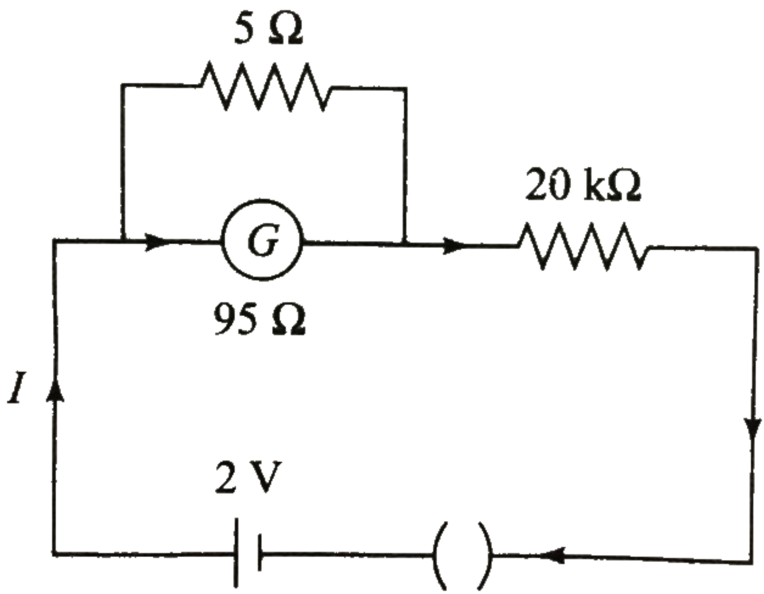
51. The area of the coil in a moving coil galvanometer is $15cm^2$ and has 20 turns. The magnetic induction is $0.2T$ and the couple per unit twist of the suspended wire is $10^{-6}Nm$ per degree. If the deflection is 45°, the current passing through it is

Watch Video Solution

52. A coil of area $100cm^2$ having 500 turns carries a current of $1mA$. It is suspended in a uniform magnetic field of induction $10^{-3}wb/m^2$. Its plane makes an angle fo $60°$ with the lines of induction. The torque acting on the coil is

Watch Video Solution

53. A galvanometer of resistance 95Ω, shunted resistance of 5Ω, gives a deflection of 50 divisions when joined in series with a resistance of $20k\Omega$ and a $2V$ accumulator. What is the current sensitivity of the galvanomter (in div/μA)?



Watch Video Solution

54. A galvanometer of resistance 20Ω is shunted by a 2Ω resistor. What part of the main current flows through the galvanometer ?

Watch Video Solution

55. A galvanometer has resistance $500 ohm$. It is shunted so that its senstivity decreases by 100 times. Find the shunt resistance.

Watch Video Solution

56. The resistance of galvanometer is 999Ω. A shunt of 1Ω is connected to it.If the main current current is $10^{-2}A$, what is the current flowing through the galvanometer .

Watch Video Solution

57. A galvanometer has a resistance of 98Ω. If 2% of the main current is to be passed through the meter, what should be the value of the shunt ?

Watch Video Solution

58. A maximum current point $0.5mA$ can be passed through a galvanometer of resistance 20Ω . The resistance to be connected in series to convert it in the voltmeter of range $0 - 5V$ is

Watch Video Solution

59. A galvanometer has a resistance of 100Ω. A current of 10^{-3} A pass through the galvanometer How can it be converted into (A) ammeter of range $10A$ and (b) voltmeter of range $10v$

Watch Video Solution

60. A galvanometer having 30 divisions has a current sensitivity of $20\mu A/division$. It has a resistance of 25Ω. How will you convert it into an ammeter upto 1 ampere? How will you convert this ammeter into a voltmeter up to 1 volt?

Watch Video Solution

61. What is the value of the shunt that passes 10% of the main current through a galvenomenter of 99Ω?

Watch Video Solution

C.U.Q-KEY

1. The work done in maving a unit n - pole round a conductor carrying current in a circle of radius $10cm$ is w. The work done in moving it in a circle of radius $20cm$ is

A. w

B. $2w$

C. $w/2$

D. $4w$

Answer: 1

Watch Video Solution

2. 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. $\frac{\mu_0}{4\pi}.\frac{2I}{r}$

D. $\frac{2I}{r}$

Answer: 2

Watch Video Solution

3. A long thin hollow metallic cylinder of radius $'R'$ has a current i ampere. The magnetic induction $'B'$ -away from the axis at a distance r from the axis varies as shown in

A.

B.

C.

D.

Answer: 4

Watch Video Solution

4. A current carrying wire produces in the neighbourhood

A. Electric and magnetic fields

B. Electric field only

C. Magnetic field only

D. No field

Answer: 3

Watch Video Solution

5. A vertical straight conductor carries a current vertically upwards. A point P lies to the east of it at a small distance and another point Q lies to the west at the same distance. The magnetic field at P is

A. Greater than at Q

B. Same as at Q

C. Less than at Q

D. Greater or less than at Q depending upon the magnetic field of the current.

Answer: 1

Watch Video Solution

6. A current carrying power line carries current from west to east. The direction of magnetic field $1m$ above is

A. north to south

B. south to north

C. east to west

D. west to east

Answer: 1

Watch Video Solution

7. What is the form of magnetic field lines due to a straight current-carrying conductor?

A. Straight lines

B. Elliptical

C. Circular

D. Parabolic

Answer: 3

Watch Video Solution

8. A current $'I'$ flows along an infinitely long straight conductor. If r is the perpendicular distance of a point, very far from the ends of the conductor then the magnetic induction B is given by

A. $B = \frac{\mu_0}{4\pi} \frac{2i}{r}$

B. $B = \frac{\mu_0}{4\pi} \frac{i}{r}$

C. $B = \frac{\mu_0}{4\pi} \frac{\pi i}{r}$

D. $B = \frac{\mu_0}{4\pi} \frac{2\pi i}{r}$

Answer: 1

Watch Video Solution

9. A current $'I'$ flows along an infinitely long straight conductor. If $'r'$ is the perpendicular distance of a point from the lower end of the conductor, then the magnetic induction B is given by

A. $B = \frac{\mu_0}{4\pi} \frac{2i}{r}$

B. $B = \frac{\mu_0}{4\pi} \frac{i}{r}$

C. $B = \frac{\mu_0}{4\pi} \frac{\pi i}{r}$

D. $B = \frac{\mu_0}{4\pi} \frac{2\pi i}{r}$

Answer: 2

Watch Video Solution

10. A long straight wire of circular cross- section carries a current along its length. On the axis inside the wire, it follows that

A. strength of electric and magnetic fields are zero

B. strength of electric field is zero but magnetic field is non - zero

C. strength of electric and magnetic field non - zero

D. strength of electric field is non - zero but magnetic field is zero.

Answer: 1

Watch Video Solution

11. Magnetic field at a point on the line of current carrying conductor is

A. maximum

B. infinity

C. zero

D. finite value

Answer: 3

Watch Video Solution

12. If a long hollow copper pipe carriers a direct current, the magnetic field associated with the current will be:

A. inside the pipe only

B. Outside the pipe only

C. Neither inside nor outside the pipe.

D. Both inside and outside the pipe.

Answer: 2

Watch Video Solution

13. The magnetic field $\overline{dB}$ due to a small current element $\overline{dl}$ at a distance $\vec{r}$ and carrying current $'I'$ is

A. $\overline{dB} = \frac{\mu_0}{4\pi} i \left(\frac{\overline{dl} \times \bar{r}}{r} \right)$

B. $\overline{dB} = \frac{\mu_0}{4\pi} i^2 \left(\frac{\overline{dl} \times \bar{r}}{r^2} \right)$

C. $\overline{dB} = \frac{\mu_0}{4\pi} i^2 \left(\frac{\overline{dl} \times \bar{r}}{r} \right)$

D. $\overline{dB} = \frac{\mu_0}{4\pi} i \left(\frac{\overline{dl} \times \bar{r}}{r^3} \right)$

Answer: 4

Watch Video Solution

14. For a given distance from a current element, the magnetic induction is maximum at an angle measured with respect to axis of the current carrying conductor.

A. $3\pi/4$

B. $\pi/4$

C. $\pi/2$

D. 2π

Answer: 3

Watch Video Solution

15. If we double the radius of a current carrying coil keeping the current unchanged, the magnetic field at its centre

A. becomes four times

B. doubled

C. remains unchanged

D. halved

Answer: 4

Watch Video Solution

16. A current carrying coil is placed with its plane in the magnetic meridian of the earth. When seen from the east side a clockwise current is set up in the coil. The magnetic field at its centre with be directed towards

A. north

B. south

C. west

D. east

Answer: 3

Watch Video Solution

17. A unit N - pole is placed on the axis of a circular coil carrying current in anti - clockwise direction. It experiences a force

A. towards the coil

B. perpendicular to the coil

C. inclined to axis

D. parallel to the coil.

Answer: 3

Watch Video Solution

18. If we double the radius of the coil keeping the current through it unchanged, the magnetic field on its axis at very very far away points

A. becomes four times

B. is doubled

C. remains unchanged

D. halved

Answer: 1

Watch Video Solution

19. Two concentric circular loops of radiir_1 and r_2 carry clockwise and anticlockwise currents i_1 and i_2. If the centre is a null point, i_1/i_2 must be equal to

A. r_2/r_1

B. r_2^2/r_1^2

C. r_1^2/r_2^2

D. r_1/r_2

Answer: 4

Watch Video Solution

20. A length of wire carries a steady current. It is first bent to form a circular coil of one turn. The same length is now bent more sharply to give a loop of two turns of smaller radius. The magentic field at the centre caused by the same current now will be

A. a quarter of its first value

B. same as that of the first value

C. four times the first value

D. double of its first value

Answer: 3

Watch Video Solution

21. A charge $'e'$ moves round a circle of radius $'r'$ with a uniform speed $'v'$. The magnitude of the magnetic induction at the centre of the circle is

A. $\mu_0 ev / 4\pi r$

B. $\mu_0 ev / 4\pi r^2$

C. $\mu_0 ev / 4\pi r^3$

D. $\mu_0 er / 4\pi v$

Answer: 2

Watch Video Solution

22. An electron of charge e moves in a circular orbit of radius r round a nucleus the magnetic field due to orbit motion off the electron at the site of the nucleus is B. The angular velocity ω of the electron is

A. $\omega = \frac{\mu_0 eB}{4\pi r}$

B. $\omega = \frac{\mu_0 eB}{\pi r}$

C. $\omega = \frac{4\pi rB}{\mu_0 e}$

D. $\omega = \frac{2\pi rB}{\mu_0 e}$

Answer: 3

Watch Video Solution

23. A particle of charge q and mass m moves in a circular orbit of radius r with angular speed ω. The ratio of the magnitude of its magnetic moment to that of its angular momentum depends on

A. $\omega : q$

B. $q : m$

C. $q : 2m$

D. $\omega : m$

Answer: 3

Watch Video Solution

24. A loosly wound helix made of stiff wire is mounted vertically with the lower end just touching a dish of mercury when a current from the battery is started in the coil through the mercury

A. the wire oscillates

B. the wire continues makes contact

C. the wire breaks contact just when the current is passed

D. the mercury will expand by heating due to passage of current

Answer: 1

Watch Video Solution

25. Two very thin metallic wires placed along X and Y axes carry equal currents as shown AB and CD are lines at 45° with the axes having origin at O the magnetic field will be zero on the line

A. AB

B. CD

C. straight segment OB only of line AB

D. straight segment OC only of line CD

Answer: 1

Watch Video Solution

26. A positively charged particle enters at the middle as shown in Figure. With speed $10^5 m/s$ will bend

A. towards $1A$ wire

B. upwards the plane of wwires

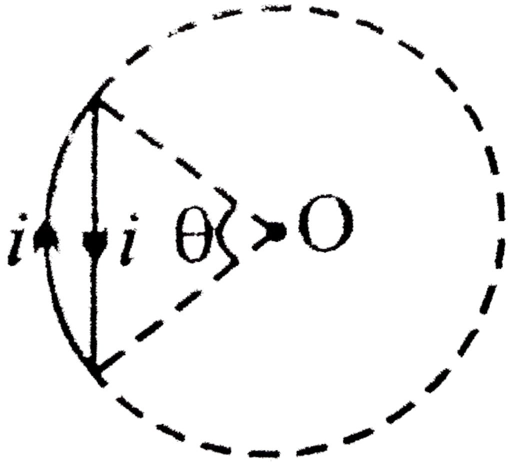
C. towards $3A$ wire

D. down wards the plane of wires

Answer: 3

Watch Video Solution

27. Net magnetic field at the centre of the circle O due to a current carrying loop as shown in figure is $\left(\theta < 180^\circ\right)$



A. zero

B. perpendicular to paper inwards

C. perpendicular to paper outwards

D. perpendicular to the paper inwards if $\theta \leq 90^\circ$ and perpendicular to paper outwards if $90^\circ \leq \theta \leq 180^\circ$

Answer: 3

Watch Video Solution

28. Match the following and find the correct pairs.

List -I

a) Fleming's left hand rule

b) Right hand thumb rule

c) Biot - Savart law

d) Fleming's right hand rule

List -II

e) Direction of induced current

f) Magnitude and direction of magnetic induction

g) Direction of force due to magnetic induction

h) Direction of magnetic lines due to current

A. a - g, b - e, c - f, d - h

B. a - g, b - h, c - f, d - e

C. a - f, b - h, c - g, d - e

D. a - h, b - g, c - e, d - f`

Answer: 2

Watch Video Solution

29. The reduction factor of a tangent galvanometer may be defined as the current passing through it to produce a deflection of

A. 90°

B. 45°

C. 30°

D. 60°

Answer: 2

Watch Video Solution

30. A tangent galvanometer is taken from equator to the north pole. During this the sensitivity of the tangent galvanometer

A. decreases because its reduction factor decreases

B. increases because its reduction factor decreases

C. decreases becase its reduction factor increases

D. increases because its reduction factor increases

Answer: 2

Watch Video Solution

31. In a tangent galvanometer, the circular coils is unwound and rewound to have twice the previous radius. As a result of this the reduction factor (K) of the tangent galvanometer if

A. unaffected

B. doubled

C. quadrupled

D. halved

Answer: 3

Watch Video Solution

32. The sensitivity of a tangent galvanometer increases if

A. number of turns decreases

B. number of turns increases

C. field increases

D. number of turns remains same.

Answer: 2

Watch Video Solution

33. The plane of the coild of tangent galvanometer is parallel to the magnetic meridian

A. to avoid the influence of earth's magnetic field.

B. to increase the magnetic field due to the current in the coil.

C. to make earth's magnetic field perpendicular to that due to the current in the coil.

D. for some other reason.

Answer: 3

Watch Video Solution

34. The galvanometer constant of a tangent galvanometer depends upon

A. earth's magnetic field

B. current in the coil

C. magnetic field of the coil

D. deflection of the magnetic needle

Answer: 1

Watch Video Solution

35. The sensitivity of tangent galvanometer will be maximum if deflection in it is tending to........... and reading is accurate for $\theta = \ldots\ldots\ldots\ldots\ldots\ldots$.

A. $0^\circ, 45^\circ$

B. $30^\circ, 0^\circ$

C. $45^\circ, 0^\circ$

D. $60^\circ, 45^\circ$

Answer: 1

Watch Video Solution

36. A tangen galvanometer of reduction factor $1A$ is placed with plane of its coil perpendicular to the magnetic meridian when a current of $1A$ is passed through it. The deflection produced is

A. 45°

B. Zero

C. 30°

D. 60°

Answer: 2

Watch Video Solution

37. An electric charge in uniformmotion produces

A. an electric field only

B. a magnetic field only

C. both electric and magnetic field

D. no such field at all

Answer: 3

Watch Video Solution

38. What is the force acting on charge (q) moving in a direction perpendicular to a magnetic field (B) with velocity v?

A. $= \frac{q}{\vec{V} \times \vec{B}}$

B. $\frac{\vec{V} \times \vec{B}}{q}$

C. $q\left(\vec{V} \times \vec{B}\right)$

D. $\left(\vec{V}. \vec{B}\right)q$

Answer: 3

Watch Video Solution

39. A magnetic field exerts no force on

A. a stream of electrons

B. a stream of protons

C. unmagnetised piece of iron

D. stationary charge

Answer: 4

Watch Video Solution

40. If the direction of the initial velocity of a charged particle is neither along nor perpendicular to that of the magnetic field, then the orbit will be

A. a straight line

B. an ellipse

C. a circle

D. a helix

Answer: 4

Watch Video Solution

41. A charge moving with veloity V in X direction is subjected to a field of magnetic induction in the negative X direction . As a result the charge will

A. remain unaffected

B. start moving in a circular path in y - z plane

C. retard along X - axis

D. move along a helical path around X - axis

Answer: 1

Watch Video Solution

42. The mano energetic beams of electrons moving along $+y$ direction enter a region of uniform electric and magnetic fields. If the beam goes straight through these simultaneously then field B and E are directed respectively along.

A. -y axis and -z axis

B. $+z$ axis and -x axis

C. $+x$ axis and -x axis

D. -x axis and -y` axis

Answer: 2

Watch Video Solution

43. An α - particle moves from E to W in a magnetic field perpendicular to the plane of the paper and into the paper. The particle is defelcted towards

A. East

B. West

C. South

D. North

Answer: 3

Watch Video Solution

44. A positively charged particle falls vertically downwards. The horizontal component of earth's magnetic field will deflect it towards

A. West

B. East

C. South

D. North

Answer: 2

Watch Video Solution

45. An electron and a proton enter a magnetic field with equal velocities. The particle that experiences more force is

A. electron

B. proton

C. both experience same force

D. it cannot be predicted.

Answer: 3

Watch Video Solution

46. An electron and a proton enter a magnetic field at right angles to the field with the same kinetic energy

A. trajectory of electron is less curved

B. trajectroy of proton is less curved

C. both are equally curved

D. both move along straight line paths

Answer: 2

Watch Video Solution

47. A charged particle moving in a magnetic field experiences a resultant force

A. in the direction opposite to that of the field.

B. in the direction opposite to that of its velocity

C. in the direction perpendicular to both field & its velocity

D. in the direction parallel to the field

Answer: 3

Watch Video Solution

48. An electron of mass $'m'$ is accelerated through a potential difference of V and then it enters a magnetic field of induction B. Normal to the lines of force. Then the radius of the circular path is

A. $\sqrt{\frac{2eV}{m}}$

B. $\sqrt{\frac{2Vm}{eB^2}}$

C. $\sqrt{\frac{2Vm}{eB}}$

D. $\sqrt{\frac{2Vm}{e^2B}}$

Answer: 2

Watch Video Solution

49. Among the following, one characteristic is independecnt of the angle between $\vec{V}$ and $\vec{B}$

A. Momentum

B. Radius of helical path

C. Angular speed

D. Both 1 and 2.

Answer: 3

Watch Video Solution

50. A charged particle enters into a uniform magnetic field the parameter that remains constant is

A. velocity

B. momentum

C. kinetic energy

D. angular velocity

Answer: 3

Watch Video Solution

51. A free charged particle moves through a magnetic field. The particle may undergo a change in

A. speed

B. energy

C. direction of motion

D. magnitude of the velocity

Answer: 3

Watch Video Solution

52. An electron is projected parallel to electric and uniform magnetic fields acting simultaneously in the same direction. The electron.

A. gains kinetic energy

B. loses kinetic energy

C. moves along circular path

D. moves along a parabolic path

Answer: 2

Watch Video Solution

53. A charged particle is moving with velocity' V' in a magnetic field of induction B. The force on the paricle will be maximum when

A. V and B are in the same direction

B. V and B are in Opposite direction

C. V and B are perpendicular

D. V and B are at an angle of 45°

Answer: 3

Watch Video Solution

54. If electron velocity is $2i + 4j$ and it is subjected to magnetic field of $4k$, then its

A. speed will change

B. path will change

C. velocity is Constant

D. momentum is Constant

Answer: 2

Watch Video Solution

55. A proton (or charged particle) moving with velocity v is acted upon by electric field E and magnetic field B. The proton will move indeflected if

A. E is perpendicular to B and E parallel to V

B. E is parallel to V and perpendicular to B

C. E and B both are perpendicular to V

D. E, V and B are mutually perpendicular and $V = E/B$

Answer: 4

Watch Video Solution

56. A protn and an alpha particle enter into a uniform magnetic field with the same velocity. The period of rotation of the alpha particle will be

A. four times that of proton

B. two times that of proton

C. three times that of proton

D. same as that of proton

Answer: B

Watch Video Solution

57. A uniform electric field and a uniform magneitc field exist in a region in the same direction An electron is projected with velocity pointed in the same direction the electron will

A. turn to its right

B. turn to its left

C. keep moving in the same direction but its speed will increase

D. keep moving in the same direction but its speed will decrease

Answer: 4

Watch Video Solution

58. Imagine that you are seated in a room and there is a uniform magnetic field pointing vertically down wards in it at the centre of the room an electron is projected horizontally from left to right with a certain speed. Discuss the speed and the path of the electron in this field.

A. electron moves in anticlockwise path

B. electron moves in clockwise path

C. electron moves left wards

D. electron moves right wards

Answer: 2

Watch Video Solution

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

A. $\vec{v} = \left(\vec{E} \times \vec{B}\right)/B^2$

B. $\vec{v} = \left(\vec{B} \times \vec{E}\right)/B^2$

C. $\vec{v} = \left(\vec{E} \times \vec{B}\right)/E^2$

D. $\vec{v} = \left(\vec{B} \times \vec{E}\right)/E^2$

Answer: 1

Watch Video Solution

60. An electron of charge$e$, revolves round in an orbit of radius r with a uniform angular velocity ω. The magnetic dipole moment of the electron in the orbit is

A. $e\omega r/2$

B. $e\omega r^2/2$

C. $e\omega^2 r/2$

D. $e\omega^2 r^2/2$

Answer: B

Watch Video Solution

61. A proton and a deuteron are projected with same speeds normal to a uniform magnetic field. Which of the following statements is / are true

a) The ratio of their respective time periods is $1:2$

b) The ratio of their respective angular momenta about the centres of their circular path is $1:4$

c) The ratio of their respective radii of their circular is $1:2$

A. only a

B. only$c$

C. only a, b

D. All are true

Answer: 4

Watch Video Solution

62. If a charged particle is projected perpendicular to a uniform magnetic field, then a) it revolves in circular path

b) its $K.E.$ remains constant

c) its momentum remains constant

d) its path is psiral

A. onlya, b are correct

B. only $a, c,$ are correct

C. onlyb, d are correct

D. only a, d are correct

Answer: 1

Watch Video Solution

63. When a positively charged particle enters a uniform magnetic field with uniform velocity, its trajectory can be

a) a straight line b) a circle c) a helix

A. a only

B. a or b

C. a or c

D. any one of $a, b,$ and c

Answer: 4

Watch Video Solution

64. A circular coil of wire carries a current . PQ is a part of very long wire carrying a current and passing close to the circular coil. If the direction of currents are those shown in figure, then the direction of the force acting on PQ is

A. parallel to PQ, towards p

B. parallel to PQ, towards Q

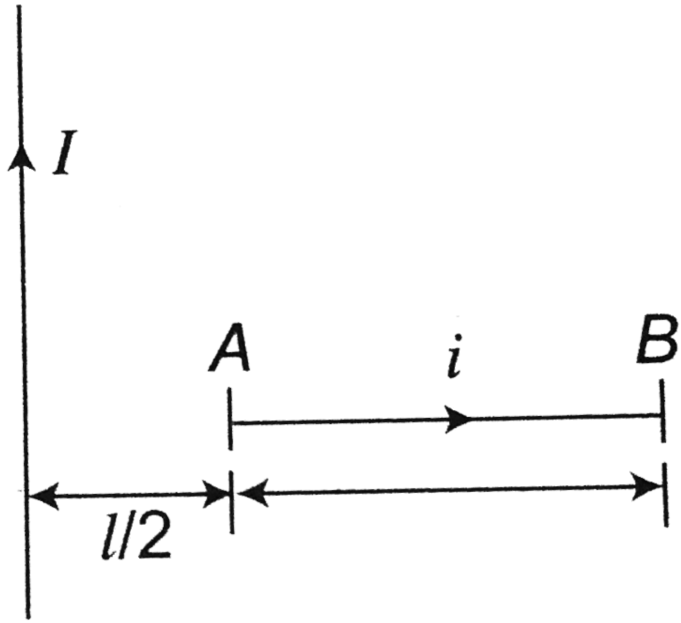
C. at right angles to PQ , to the right

D. at right angles to PQ , to the left

Answer: 4

Watch Video Solution

65. A conductor AB of length l carrying current i is placed perpendicular to a long straight conductor carrying a current I as shown. Force on AB will be



A. along x to y

B. along y to x

C. to the right

D. to the left

Answer: 1

Watch Video Solution

66. A conducting circular loop of radius r carries a constant current i. It is placed in a uniform magnetic field B such that B is perpendicular to the plane of loop. What is the magnetic force acting on the loop?

A. BIR

B. $2\pi(BIR)$

C. zero

D. $\pi(BIR)$

Answer: 3

Watch Video Solution

67. Two coplanar circular coils of equal radius carrying currents i_1, i_2 in opposite directions are at a large distance $'d'$. The distance from the first coil where the resultant magnetic induction is zero is

A. $\dfrac{d}{1+\frac{i_2}{i_1}}$

B. $\dfrac{d}{1+\sqrt{\frac{i_2}{i_1}}}$

C. $\dfrac{d}{1+\left(\frac{i_2}{i_1}\right)^{\frac{1}{3}}}$

D. $\dfrac{d}{1+\left(\frac{i_2}{i_1}\right)^{2}}$

Answer: C

Watch Video Solution

68. A rectangular loop carryinig current I is located near an infinite long straight conductor carrying current I as shown in the figure. The loop,

A. remain stationary

B. is attracted towards the wire

C. is repelled away from the wire

D. will rotate about an axis parallel to the wire

Answer: 2

Watch Video Solution

69. If two steams of proton move parallel to each other in the same direction, then they

A. attract each other

B. repel each other

C. neither attract nor repel

D. rotate

Answer: 2

Watch Video Solution

70. Two streams of electrons are moving parallel to each other in the same direction. They

A. attract each other

B. repel each other

C. cancel the electric field of each other

D. cancel the magnetic field of each other

Answer: 2

Watch Video Solution

71. A light body is hanging at the lower end of a vertical spring . On passing current in the spring, the body

A. rises up

B. goes down

C. no change

D. oscillates up & down

Answer: 1

Watch Video Solution

72. A current carrying wire is placed along east and west in a magnetic field directed north wards. If the current in the wire is directed east wards, the direction of force on the wire is

A. due west

B. due south

C. vertically upwards

D. vertically downwards

Answer: 3

Watch Video Solution

73. Two parallel wires carrying equal currents i_1 and i_2 with $i_1 > i_2$. When the current are in the same direction, the $10 mT$. If the direction of i_2 is reversed, the field becomes $30 mT$. The ratio i_1 / i_2 is

A. 1

B. 2

C. 3

D. 4

Answer: 3

Watch Video Solution

74. Two straight long conductors AOB and COD are perpendicular to each other and carry currents I_1 and I_2. The magnitude of the magnetic induction at a point P at a distance d from the point o in a direction perpendicular to the plane $ABCD$ is :

A. $\left(\mu_0/2\pi a\right)\left(i_1 + i_2\right)$

B. $\left(\mu_0/2\pi a\right)\left(i_1 - i_2\right)$

C. $\left(\mu_0/2\pi a\right)\left(i_1^2 - i_2^2\right)^{1/2}$

D. $\left(\mu_0/2\pi a\right)\left[i_1 i_2/\left(i_1 + i_2\right)\right]$

Answer: 3

Watch Video Solution

75. A wire carrying current I and other carrying $2I$ in the sam direction produce a magnetic field B at the midpoint. What will be the field when $2I$ wire is swiched off?

A. $B/2$

B. B

C. $2B$

D. $3B$

Answer: 2

Watch Video Solution

76. Two long straight horizontal parallel wires one above the other are separated by a distance $'2a'$. If the wires carry equal currents in opposite directions, the magnitude of the magnitude induction in the plane of the wires at a distance $'a'$ above the upper wire is

A. $\frac{\mu_0}{2\pi a}$

B. $\frac{\mu_0}{2\pi a} + \frac{\mu_0 i}{4\pi a}$

C. $\frac{\mu_0 i}{2\pi a}$ - $\frac{\mu_i}{4\pi a}$

D. $\frac{\mu_0 i}{3\pi a}$

Answer: 4

Watch Video Solution

77. Choose the correct statement. There will be no force experienced if

A. two parallel wires carry currents in the same direction

B. two parallel wires carry currents in the opposite direction

C. a positive charge is projected between the pole pieces of bar magnet

D. a positive charge is projected along the axis of a solenoid carrying current

Answer: 4

Watch Video Solution

78. If the angular momentum of an electron revolving in a circular orbit is L, then its magnetic moment is

A. eLm

B. eL/m

C. $eL/2m$

D. zero

Answer: 3

Watch Video Solution

79. The magnetic dipole moment of current loop is independent of

A. current in the loop

B. number of turns

C. area of the loop

D. magnetic field in which it is situated

Answer: 4

Watch Video Solution

80. Tangent law is applicable to a dipole placed in two magnetic field $\vec{B}$ and $\overrightarrow{Bo}$ when

A. $\vec{B} = \vec{B}_o$

B. $\vec{B}$ and $\vec{B}_o$ are perpendicular to each other

C. $\vec{B}$ makes any angle with $\vec{B}_0$

D. $\vec{B}$ is directed opposite to $\vec{B}_o$

Answer: 2

Watch Video Solution

81. A magnetic dipole placed in two perpendicular magnetic fields $\vec{B}$ and $\vec{B}_o$ is in equilibrium making an angle θ with $\vec{B}$ then.

A. $B = B_o$

B. $B\cos\theta = B_o\sin\theta$

C. $B\sin\theta = B_o\cos\theta$

D. $B = B_o\tan\theta$

Answer: 3

Watch Video Solution

82. A current loop placed in a magnetic field behaves like a

A. magnetic dipole

B. magnetic substance

C. magnetic pole

D. non magnetic substance

Answer: 1

Watch Video Solution

83. Singly ionized heliium (x), ionized deuteron(y), alpha(z) particles are projected into a uniform magnetic field 3×10^{-4} tesla with velocities $10^5 ms^{-1}, 0.4 \times 10^4 ms^{-1}$ and $2 \times 10^3 ms^{-2}$ respectively. The correct relation between the ration of the angular momentum to the magnetic moment of the particles is

A. $x > y = z$

B. $x < y < z$

C. $y < x < z$

D. $z > x > y$

Answer: 1

Watch Video Solution

84. A small coil of N turns has area A and a current I flows through it. The magnetic dipole moment of this coil will be

A. iNA

B. i^2NA

C. iN^2A

D. iN/A

Answer: 1

Watch Video Solution

85. A straight horizontal conductor of length L meter and mass mkg carries a current $'I'$ ampere. The minimum magnetic induction which must exist in the region to balance its weight

A. mg/iL

B. iL/mg

C. mgL/i

D. mL/ig

Answer: 1

Watch Video Solution

86. A current carrying loop in a uniform magnetic field will experience

A. force only

B. torque only

C. both torque and force

D. neither torque nor force

Answer: 2

Watch Video Solution

87. The torque acting on a magnetic dipole of moment P_m when placed in a magnetic field is

A. $P_m B$

B. $\overrightarrow{P}_m \times \vec{B}$

C. $\overrightarrow{P}_m . \vec{B}$

D. P_m / B

Answer: 2

Watch Video Solution

88. A coil of area A, turns N and carrying current i is placed with its face parallelt to the lines of magnetic induction B. The work done in rotating the coil through an angle of 180° is

A. $Inav$

B. $2INAB$

C. $INAB/2$

D. zero

Answer: 2

Watch Video Solution

89. A conducting circular loop of radiius r carries a constant current i. It is placed in a uniform magnetic field $\vec{B}_0$ such that $\vec{B}_0$ is perpendicular to the plane of the loop . The magnetic force acting on the loop is

A. irB_o

B. $2\pi riB_o$

C. zero

D. πriB_o

Answer: 1

Watch Video Solution

90. A current carrying loop is free to turn in a uniform magnetic field.The loop will then come into equilibrium when its plane is inclined at

A. 0° to the direction of the field

B. 45° to the direction of the field.

C. 90° to the direction of the field.

D. 60° to the direction of the field.

Answer: 3

Watch Video Solution

91. When a current carrying coil is placed in a uniform magnetic field of induction B, then a torque τ acts on it. If I is the current, n is the number of turns and A is the face area of the coil and the normal to the coil makes an angle θ with B, Then

A. $\tau = BInA$

B. $\tau = BInA\sin\theta$

C. $\tau = BInA\cos\theta$

D. $\tau = BInA\tan\theta$

Answer: 2

Watch Video Solution

92. A moving coil type of galvanometer is based upon the principle that

A. a coil carrying current experiences a torque in magnetic field.

B. a coil carrying current produces a magnetic field.

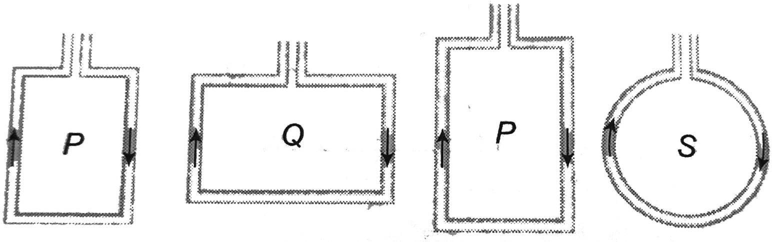
C. a coil carrying current experiences impulse in a magnetic field.

D. a coil carrying current experience a force in magnetic field.

Answer: 1

Watch Video Solution

93. Four wires each of length 2.0 meters area bent into four loops P, Q, R and S and then suspended into uniform magnetic field. Same current is passed in each loop. Which statement is correct?



A. couple on loop P will be highest

B. couple on loop Q will be highest

C. couple on loop R will be highest

D. couple on loop S will be highest

Answer: 4

Watch Video Solution

94. Two circular coils carrying currents are of nearly same radius have common centre and released from rest with their planes perpendicular .

Assuming that they can freely rotate about their diameter, select the wrong alternative.

A. Each will exert a torque on the other

B. Through out their rotation, angular momentum of the system is conserved

C. Angular momentum of system initially increases and then decreases

D. Potential energy of system first decreases

Answer: 3

Watch Video Solution

95. A current carrying circular coil, suspended freely in a uniform external magnetic field orients to a position of stable equilibrium. In this state :

A. the plane of the coil is normal to the external magnetic field

B. the plane of the coil is parallel to the external magnetic field

C. flux through the coil is minimum

D. torque on the coil is maximum

Answer: 1

Watch Video Solution

96. A conducting wire of length l is turned in the form of a circular coil and a current I is passed through it. For the torque, due to magnetic field produced at its centre, to be maximum, the number of turns in the coil will be

A. 1

B. 2

C. infinity

D. 0

Answer: 1

Watch Video Solution

Watch Video Solution

97. When a current loop is placed in a uniform magnetic field

$(i)\ \vec{F}_R = 0$ and $\vec{\tau}$,$(ii)\vec{F}_R = 0$ but $\vec{\tau} = 0$

$(iii)\vec{F}_R = 0$ but $\tau = 0$,$(iv)\vec{F}_R = 0$ and $\tau = 0$

A. only $I\&ii$ are true

B. only $ii\&iii$ are true

C. only $iii\&iv$ are true

D. only $I\&iv$ are true

Answer: 2

Watch Video Solution

98. When a current carrying coil is situated in a uniform magnetic field with its magnetic moment antiparallel to the field

$i)$ Torque on it is maximum

$ii)$ Torque on it is minimum

$iii)PE$ of loop is maximum

$iv)PE$ of loop is minimum

A. only i and ii are true

B. only ii and iii are true

C. only iii and iv are true

D. only I, ii and iii are true

Answer: 2

Watch Video Solution

99. In a moving coil galvanometer a radial magnetic field is applied with concave magnetic poles, to have

$A)$ uniform magnetic field

$B)$ the plane of the coil parallel to field

A. A, B true

B. A, Bfalse

C. A true, B false

D. A false B true

Answer: 1

Watch Video Solution

100. A current carrying coil tends to set itself

A. parallel to an external magnetic field.

B. parallel to its own magnetic field

C. perpendicular to the external magnetic field.

D. perpendicular to the geographic meridian

Answer: 3

Watch Video Solution

101. The restoring couple in the moving coil galvanometer is due to

A. current in the coil

B. magnetic field of the magnet.

C. material of the coil.

D. twist produced in the suspension wire.

Answer: 4

Watch Video Solution

102. A wire of length $'L'$ is made in the form of a coil in a moving coil galvanometer . To have maximum sensitive the shape of the coil is

A. circular

B. Elliptical

C. rectangular

D. square

Answer: 1

Watch Video Solution

103. The relation between voltage sensitivity $'\sigma_V'$ and current sensitiviy σ_i of moving coil galvanometer if its resistance is $'G'$ is

A. $\sigma_V = G\sigma_i$

B. $\sigma_V = \sigma_i / G$

C. $\sigma_V \sigma_i = G$

D. $\sigma_V \sigma_i = 1/G$

Answer: 2

Watch Video Solution

104. The resistance of an ideal voltmeter is

A. zero

B. infinity

C. finite, very small

D. finite and large

Answer: 2

Watch Video Solution

105. The sensitivity of a moving coil galvanometer increases with the decrease in

A. number of turns

B. area of coil

C. magnetic field

D. couple per unit twist

Answer: 4

Watch Video Solution

106. If a galvanometer is shunted then among the following which statement is not true

A. effective range increases.

B. equivalent resistance decreases.

C. galvanometer becomes more sensitive

D. galvanometer becomes more protective.

Answer: 3

Watch Video Solution

107. The purpose of soft iron cylinder between the pole pieces of the horse - shoe magnet in a moving coil galvanometer is

A. to increase the magnetic induction in the polar gap

B. to evenly distribute the magnetic lines of force

C. to provide a radial magnetic field

D. to reduce the magnetic flux leakage in the polar gap

Answer: 1

Watch Video Solution

108. The radial magnetic field is used in a suspended coil galvanometer to provide

A. a uniform torque on the coil

B. maximum torque on the coil in all positions

C. a uniform and maximum torque in all positions of the coil

D. a non uniform torque on the coil

Answer: 1

Watch Video Solution

109. Assertion (A): In $M.C.G.$, the deflection $'\theta'$ is directly proportional to the strength of the current

Reason (R): In $M.C.G.$, the torque experience by the loop is $BiAN\cos\theta$

A. Both A and T are correct, R is correct reason of A

B. Both are wrong

C. Both A and R are correct and R is not the correct reason of A

D. A is correct, R is wrong

Answer: 4

Watch Video Solution

110. To measure the resistance of a device using $Ohm's$ law the mode of connection used is

A. ammeter in series, voltmeter in parallel

B. voltmeter in series, ammeter in parallel

C. both ammeter and voltmeter in series

D. both ammeter and voltmeter in parallel

Answer: 1

Watch Video Solution

111. To increase the range of an ammeter, we need to connect a suitable

A. low resistance in parallel

B. low resistance in series

C. high resistance in parallel

D. high resistance in series.

Answer: 1

Watch Video Solution

112. An ammeter has a resistance of $G ohm$ and a range of $'I'$ amere. The value of resistance used in parallel, to convert into an ammeter of range $'ni'$ ampere is

A. nG

B. $(n - 1)G$

C. G/n

D. $G/n - 1$

Answer: 4

View Text Solution

113. Among the following the false statement is

A. ammeter is connected in series and maximum current flows through is

B. voltmeter is connected in parallel and potential is maximum

C. ammeter is connected in series and current through it is negligible

D. voltmeter is connected in parallel and current through it is negligible.

Answer: 3

Watch Video Solution

114. A voltmeter has a resistance G and range V. Calculate the resistance to be used in series with it to extend its range to nV.

A. ng

B. $g(n - 1)$

C. $\frac{g}{n}$

D. $\frac{g}{(n - 1)}$

Answer: 2

Watch Video Solution

115. In an electrical circuit containing a source of emf and a load resistance, the voltmeter is connected by mistake in series with the load across the source and ammeter is connected parallel to the load. Then which meter burns out

A. ammeter

B. voltmeter

C. both ammeter and voltmeter in series

D. neither ammeter nor voltmeter

Answer: 4

Watch Video Solution

116. If a voltmeter, in advertently mistaken for an ammeter, were inserted into the circuit, the current

A. increases

B. remains same

C. decreases because its reduction factor increases

D. becomes zero

Answer: 3

Watch Video Solution

117. An ammeter and a voltmeter of resistance R connected in seires to an electric cell of negligible internal resistance. Their readings are A and V respecitvely. If another resistance R is connected in parallel with the voltmeter

A. Both A and V increases

B. Both A and V decreases

C. A decreases but V increases

D. A increases but V decreases

Answer: 4

Watch Video Solution

118. A moving coil voltmeter is generally used to measure the potential difference across a conductor of resistance $'r'$ carrying a current i. The resistance of voltmeter is R. For more correct measurement of potential difference

A. $R = r$

B. $R > > r$

C. $R < < r$

D. $R = 0$

Answer: 2

Watch Video Solution

119. The resistance of an ideal voltmeter is

A. Zero

B. infinity

C. 1000Ω

D. 10000Ω

Answer: B

Watch Video Solution

120. If G, r_A and r_V denote the internal resistances of a galvanometer, an ammeter and a voltmeter among the following the correct relationship is

A. $G < r_A < r_V$

B. $r_A < r_V < G$

C. $r_A < G < r_V$

D. $r_V < r_A < G$

Answer: 3

Watch Video Solution

121. Among the following the true statement is,

A. ammeter is a high resistance galvanometer and voltmeter is a low resistance galvanometer

B. ammeter is a low resistance galvanometer and voltmeter is a high resistance galvanometer

C. ammeter and voltmeter cannot be distinguished on the basis of their resistance.

D. ammeter and voltmeter have same resistance.

Answer: B

Watch Video Solution

LEVEL-I(C.W)

1. A north pole of strengtπAm, is moved around a circle of radius $10cm$ which lies around a long straight conductor carrying a current of $10A$. The work doen is nearly

A. $4\mu J$

B. $40\mu J$

C. $400\mu J$

D. $0.4\mu J$

Answer: B

Watch Video Solution

2. A closed circuit is in the form of a regular hexagon of side r. If the circuit carries current I, what is the magnetic field induction at the centre of the hexagon?

A. $\dfrac{\sqrt{3}\mu_0 I}{4\pi a}$

B. $\dfrac{\sqrt{3}\mu_0 I}{2\pi a}$

C. $\dfrac{\sqrt{3}\mu_0 I}{3\pi a}$

D. $\dfrac{\sqrt{3}\mu_0 I}{\pi a}$

Answer: 4

Watch Video Solution

3. A current of $1/(4\pi)$ ampere is flowing in a long straight conductor. The line integral of magnetic induction around a closed path enclosing the current carrying conductor is

A. $4\pi \times 10^{-7} Wb/m$

B. $10^{-7} Wb/m$

C. $16\pi^2 \times 10^{-7} Wb/m$

D. zero

Answer: 2

Watch Video Solution

4. A wire in the form of a square of side $'2m'$ carries a current $2A$. Then the magentic induction at the centre of the square wire is (magnetic permeability of free space $= \mu_0$)

A. $\frac{\mu_0}{2\pi}$

B. $\frac{\mu_0\sqrt{2}}{\pi}$

C. $\frac{2\sqrt{2}\mu_0}{\pi}$

D. $\frac{\mu_0}{\sqrt{2\pi}}$

Answer: 3

Watch Video Solution

5. An electric current passes through a long straight wire. At a distance 5 cm from the wire the magnetic field is B. The field at 20 cm from the wire would be

A. $2B$

B. $B/4$

C. $B/2$

D. B

Answer: 2

Watch Video Solution

6. A current of one ampere is passed through a straight wire of length $2 \cdot 0$ metre. Find the magnetic field at a point in air at a distance 3 metre from one end of wire but lying on the axis of the wire.

A. $\mu_0/2\pi$

B. $\mu_0/4\pi$

C. $\mu_0/8\pi$

D. Zero

Answer: 4

Watch Video Solution

7. A straight vertical conductor carries a current. At a point $5cm$ due north of it, the magnetic induction is founded to be $20\mu T$ due east. The magnetic induction at a point $10cm$ east of its will be

A. $5\mu T$ north

B. $10\mu T$ north

C. $5\mu T$ south

D. $10\mu T$ south

Answer: 4

Watch Video Solution

8. A circular coil of radius $25cm$, carries a current of 50 ampere. If it has 35 turns, the flux density at the centre of the coil is $\left(inWb/m^2\right)$

A. $\pi \times 10^{-3}$

B. $1.4\pi \times 10^{-3}$

C. $14\pi \times 10^{-3}$

D. $2\pi \times 10^{-3}$

Answer: 2

Watch Video Solution

9. A circular coil of radius R carries a current i. The magnetic field at its centre is B. The distance from the centre on the axis of the coil where the magnetic field will be $B/8$ is

A. $\sqrt{2}R$

B. $\sqrt{3}R$

C. $2R$

D. $3R$

Answer: 2

Watch Video Solution

10. Two circular coils are made of two identical wires of same length and carry same current. If the number of turns of the two coils are 4 and 2, then the ratio of magnetic induction at the centres will be

A. $2:1$

B. $1:2$

C. $1:1$

D. $4:1$

Answer: 4

Watch Video Solution

11. Two circular coils have diameters $10cm$ and $20cm$ with same number of turns. The ratio of the magnetic field induction produced at the centre of the coils when connected in series is

A. $1:2$

B. $2:1$

C. $4:1$

D. $1:4$

Answer: 2

Watch Video Solution

12. A wire carrying a current of $4A$ is in the form of the circle. It is necessary to have a magnetic field of induction $\pi \times 10^{-5}T$ at the centre. The radius of the circle must be

A. $0.08cm$

B. $0.8cm$

C. $8cm$

D. $80cm$

Answer: 3

Watch Video Solution

13. Two concentric circular coils A and B have radii $25cm$ and $15cm$ and carry currents $10A$ and $15A$ respectively. A has 24 turns and B has 18 turns. The direction of currents are in opposite order. The magnetic induction at the common centre of the coil is

A. $120\mu_0 T$

B. $480\mu_0 T$

C. $420\mu_0 T$

D. μ_0

Answer: 3

Watch Video Solution

14. A wire carrying a current of 140 ampere is bent into the form of a circle of radius $6cm$. The flux density at a distance of $8cm$ on the axis passing through the centre of the coil and perpendicular to its plane is $\left(InWb/m^2\right.$(approximately))

A. $\pi \times 10^{-4}$

B. $2\pi \times 10^{-4}$

C. $\frac{\pi}{2} \times 10^{-4}$

D. $\frac{1}{\pi} \times 10^{-4}$

Answer: 1

Watch Video Solution

15. The magnetic induction at a point at a large distance d on the axial line of circular coil of small radius carrying current is $120\mu T$. At a distance $2d$ the magnetic induction would be

A. $60\mu T$

B. $30\mu T$

C. $15\mu T$

D. $240\mu T$

Answer: C

Watch Video Solution

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

A. $10^{-7}/\mu_0$

B. $10^{-17}\mu_0$

C. $10^{-6}\mu_0$

D. $10^{-15}/\mu_0$

Answer: 2

Watch Video Solution

17. A battery is connected between two points A and B on the circumference of a uniform conducting ring of radius r and resistance R. One of the arcs AB of the ring subtends an angle θ at the centre . The value of the magnetic induction at the centre due to the current in the ring is

A. proportional to $2\left(180^\circ - \theta\right)$

B. Inversely proportional to r

C. zero only if $\theta = 180^\circ$

D. zero for all values of θ

Answer: 4

Watch Video Solution

18. A TG has 500 turns, each of radius $2\pi cm$. If $B_H = 3.6 \times 10^{-5} Wb/m^2$, The deflection due to $7.2mA$ current is

A. 60°

B. 30°

C. 45°

D. Zero

Answer: 3

Watch Video Solution

19. In a propertly adjusted tangent galvanometer, the deflection for $1A$ current is found to 30°. Now the coil is turned through 90° about the vertical axis, the deflection for the same current will be

A. 60°

B. 30°

C. 90°

D. 0°

Answer: 4

Watch Video Solution

20. Two tangent galvanometer are connetected in series across a battery. The deflections in them found to be 30° and 60° respectively. The ratio of their reduction factors is

A. $\sqrt{3}:1$

B. $1:\sqrt{3}$

C. $3:1$

D. $1:3$

Answer: 3

Watch Video Solution

21. In a tangent galvanometer, the magnetic induction produced by the coil of wire situated in the magnetic meridian is found to be equal to the horizontal component of the earth's magnetic field. The deflection produced in it will be

A. 30°

B. 60°

C. 45°

D. 90°

Answer: 3

Watch Video Solution

22. If an electron is revolving in a circular orbit of radius $0.5A^{\circ}$ with a velocity of $2.2 \times 10^6 m/s$. The magnetic dipole moment of the revolving electron is

A. $8.8 \times 10^{-24} Am$

B. $8.8 \times 10^{-23} Am$

C. $8.8 \times 10^{-22} Am$

D. $8.8 \times 10^{21} Am$

Answer: 1

Watch Video Solution

23. Magnetic induction at the centre of a circular loop of area π square meter is 0.1 tesla . The magnetic moment of the loop is $\left(\mu_0\right.$ is permeability of air)

A. $\frac{0.1\pi}{\mu_0}$

B. $\frac{0.2\pi}{\mu_0}$

C. $\frac{0.3\pi}{\mu_0}$

D. $\frac{0.4\pi}{\mu_0}$

Answer: 2

Watch Video Solution

24. The length of a solenoid is $0.1m$ and its diameter is very small . A wire is wound over in two layers. The number of turns in the inner layer is 50 and that on the outer layer is 40. The strength of current flowing in two

layers in the same direction is 3 ampere. The magnetic induction in the middle of the solenoid will be

A. $3.4 \times 10^{-3} T$

B. 3.4×10^{-3}gauss

C. $3.4 \times 10^{3} T$

D. 3.4×10^{3}gauss

Answer: 1

Watch Video Solution

25. The magnetic induction at the centre of a solenoid is B. If the length of the solenoid is reduced to half and the same wire is would in two layers the new magnetic induction is

A. B

B. $2B$

C. $B/2$

D. $4B$

Answer: 2

Watch Video Solution

26. A proton is fired with a speed of $2 \times 10^6 m/s$ at an angle of 60° to the X - axis . If a uniform magnetic field of 0.1 tesla is aplied along the Y - axis, the force acting on the proton is

A. $1.603 \times 10^{-14} N$

B. $1.6 \times 10^{-14} N$

C. $3.203 \times 10^{-14} N$

D. $3.2 \times 10^{-14} N$

Answer: 2

Watch Video Solution

27. A conducting circular loop of radius r carries a constant current i. It is placed in a uniform magnetic field B such that B is perpendicular to the plane of loop. What is the magnetic force acting on the loop?

A. $ir\vec{B}$

B. $2\pi ri\vec{B}$

C. zero

D. $\pi ri\vec{B}$

Answer: 3

Watch Video Solution

28. A proton enters a magnetic field with a velocity of $2.5 \times 10^{7} ms^{-1}$ making an angle 30° with the magnetic field. The force on the proton is $(B = 25T)$

A. $1.25 \times 10^{-11} N$

B. $2.5 \times 10^{-11} N$

C. $5.0 \times 10^{-11} N$

D. $7.5 \times 10^{-11} N$

Answer: 3

Watch Video Solution

29. A doubly ionised He^{+2} atom travels at right angles to a magnetic field of induction $0.4T$ with a velcoity of $10^5 ms^{-1}$ describing a circle of radius r. A proton travelling with same speed in same direction in the same field will describe a circle of radius.

A. $r/4$

B. $r/2$

C. r

D. $2r$

Answer: 2

Watch Video Solution

Watch Video Solution

30. A proton is projected with a velocity $10^7 ms^{-1}$, at right angles to a uniform magnetic field of induction $100mT$. The time (in second) taken by the proton to traverse 90° are is :(Mass of proton $= 1.65 \times 10^{-27} kg$ an charge of proton $= 1.6 \times 10^{-19} C\big)$

A. 0.81×10^{-7}

B. 1.62×10^{-7}

C. 2.43×10^{-7}

D. 3.24×10^{-7}

Answer: 2

Watch Video Solution

31. A proton of energy $2MeV$ is moving perpendicular to uniform magnetic field of $2.5T$. The form on the proton is $\big(Mp = 1.6 \times 10^{-27} Kg$

and $q = e = 1.6 \times 10^{-19} C\Big)$

A. $2.5X10^{-10}$ newton

B. $8X10^{-11}$ newton

C. $2.5X10^{-11}$ newton

D. $8X10^{-12}$ newton

Answer: 4

Watch Video Solution

32. A cyclotron in which protons are accelerated has a flux density of $1.57t$. The variation of frequency of electric field is (in Hz)

A. 4.8×10^{8}

B. 8.4×10^{8}

C. 2.5×10^{7}

D. 4.8×10^{6}

Answer: 3

Watch Video Solution

33. Cyclotron is adjusted to give proton beam, magnetic induction is $0.15 wbsm^{-2}$ and the extreme radius is $1.5m$ The energy of emergent proton ini MeV will be

A. 34.2

B. 3.42

C. 2.43

D. 24.3

Answer: 3

Watch Video Solution

34. A cyclotron has an oscillator frequency $12MHz$ and a dee of radius $50cm$. Calculate the magnetic induction needed to accelerate deuterons of mass $3.3 \times 10^{-27} kg$ and charge $1.6 \times 10^{-19} C$

A. $1.55 wb / m^2$

B. $2.55 wb / m^2$

C. $0.55 wb / m^2$

D. $3.55 wb / m^2$

Answer: 1

Watch Video Solution

35. A straight wire (conductor) length $10cm$ is kept in a uniform magnetic field of induction $0.02T$. The angle between the conductor and the field direction is 30°. A current of $5A$ is passed through the conductor . Th force on the conductor is (in N)

A. 4×10^{-3}

B. 5×10^{-3}

C. 6×10^{-3}

D. 7×10^{-3}

Answer: 2

Watch Video Solution

36. A ciruclar coil of 20 turns and radius $10cm$ is placed in a uniform magnetic field of $0.1T$ normal to the plane of the coil . If the current in the coil is $5.0A$ what is the average force on each electron in the coil due to the magnetic field (The coil is made of copper wire of cross - sectional area $10^{-5}m^2$ and the free electron density in copper is given to be about $10^{29}m^{-3}$).

A. $2.5 \times 10^{-25}N$

B. $7.5 \times 10^{-25}N$

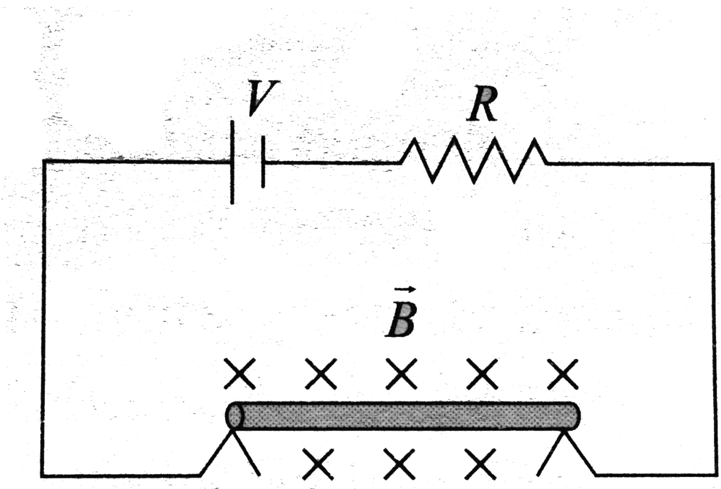
C. $5 \times 10^{-25} N$

D. $10^{-25} N$

Answer: 3

Watch Video Solution

37. A thin, 50 cm long metal bar with mass 750 g rests on, but is not attracted to, two metallic supports in a uniform 0.450T magnetic field, as shown in fig. A battery and a 25Ω resistor in series are connected to the supports.



What is the largest voltage the battery can have without breaking the circuit at the supports?

A. 817

B. 718

C. 827

D. 837

Answer: 1

Watch Video Solution

38. The magnitude of the force between a pair of conductors, each length $110cm$, carrying a current of $10A$ and seperated by a distance of $10cm$ is

A. $5 \times 10^{-5}N$

B. $44 \times 10^{-5}N$

C. $33 \times 10^{-5}N$

D. $22 \times 10^{-5} N$

Answer: 4

Watch Video Solution

39. Two parallel conductors A and B separated by $5cm$ carry electric current of $6A$ and $2A$ in the same direction. The point between A and B where the field is zero at

A. $0.25cm$ from B

B. $1cm$ from B

C. $1.25cm$ from B

D. $3.75cm$ from B

Answer: 3

Watch Video Solution

40. The distance between the wires of electric mains is $12cm$. These wires experience $4mgwt$ per unit length. The value of current flowing in each wire will be if they carry current in same direction

A. $4.85A$

B. zero

C. $4.85 \times 10^{-2}A$

D. $8.5 \times 10^{-4}A$

Answer: 1

Watch Video Solution

41. Two long straight conductors are held parallel to each other $7cm$ apart. The conductors carry currents of $9A$ and $16A$ in opposite directions. The distance of neutral point from the conductor carrying $16A$ current is

A. $9cm$

B. $16cm$

C. $25cm$

D. $63/25cm$

Answer: 2

Watch Video Solution

42. A rectangular coil of wire of 500 turns of area $10 \times 5cm^2$ carries a current of $2A$ in a magnetic field of induction $2 \times 10^{-3}T$. If the plane of the coild is parallel to the field. The torque on the coil is $(in)Nm$.

A. 0.1

B. 0.01

C. 0.001

D. 1

Answer: 2

Watch Video Solution

43. A coil of area $100cm^2$ having 500 turns carries a current of $1mA$. It is suspended in a uniform magnetic field of induction $10^{-3}wb/m^2$. Its plane makes an angle fo 60° with the lines of induction. The torque acting on the coil is

A. $250 \times 10^{-8}Nm$

B. $25 \times 10^{-8}Nm$

C. $2.5 \times 10^{-8}Nm$

D. $0.2 \times 10^{-8}Nm$

Answer: 1

Watch Video Solution

44. A circular coil of 1 turn and area $0.01m^2$ carries a current of $10A$. It is placed in a uniform magnetic field of induction 0.1 tesla such that the plane of the circle is perpendicular to the direction of the field, the torque acting on the coil is

A. $0.1Nm$

B. $0.001Nm$

C. $0.01Nm$

D. Zero

Answer: 4

Watch Video Solution

45. A current of $10^{-5}A$ produced a deflection of 10° in a moving coil galvanometer . A current of $10^{-6}amp$ in the same galvanometer produces a deflection of 1°

A. 0.1°

B. 10°

C. $(1/100)^{\circ}$

D.

Answer: 1

Watch Video Solution

46. The coils made of same material in two moving coil galvanometer have their area in the ratio of $2:3$ and number of turns in the ratio $4:5$. These two coils carry the same current and are situated in the same field. The deflections produced by these two coils willl be in the ratio of

A. $8:15$

B. $15:8$

C. $8:1$

D. $1:4$

Answer: 1

Watch Video Solution

47. A galvanometer has a resistance of 400Ω. The value of shunt so that its sensitivity is to be reduced by $1/50$ times

A. 6.16Ω

B. 7.16Ω

C. 8.16Ω

D. 9.16Ω

Answer: 3

Watch Video Solution

48. A galvanometer of resistance 20Ω is to be shunted so that only 1% of the current passes through it. Shunt connected is $99/20\Omega$

A. $9/20\Omega$

B. $20/99\Omega$

C. $2/99\Omega$

D.

Answer: 3

Watch Video Solution

49. The resistance of a moving coil galvanometer is $5 ohm$. The maximum current it can measure is $0.015A$. To convert it into an ammeter to measure $1.5A$

A. connected $5/99 ohm$ in series

B. connected $99/50 ohm$ in parallel

C. connected $5/99 ohm$ in parallel

D. connected $99/50 ohm$ in series

Answer: 3

Watch Video Solution

50. A galvaometer of coil resistance 100Ω is connected to a shunt of resistance 10Ω. The current throught the galvanometer is i_{10} , the current through the shunt is i_2 and the total current into the combination is i_3, then the ratio $i_1 : i_2 : i_3$ is

A. $1 : 10 : 11$

B. $10 : 1 : 11$

C. $11 : 10 : 1$

D. $10 : 11 : 1$

Answer: 1

Watch Video Solution

51. The resistance of a galvanometer is 100Ω. A shunt of 5Ω is connected to it to convert it into an ammeter. The internal resistance of the ammeter is

A. 5.2Ω

B. 4.8Ω

C. 4.6Ω

D. 4.2Ω

Answer: 2

Watch Video Solution

52. A galvanometer of resistance $100 ohms$ is shunted so that only $1/11$ of the main current flows through the galvanometer. The resistance of the shunt is

A. $1 ohm$

B. $11 ohms$

C. $10 ohms$

D. $9 ohms$

Answer: 3

Watch Video Solution

53. If a shunt is to be applied to a galvanometer of resistance 50Ω so that only 5% of total current passes through the galvanometer. The resistance of shunt should be

A. 1.63Ω

B. 4.2Ω

C. 3.5Ω

D. 2.63Ω

Answer: 4

Watch Video Solution

54. If only 2% of the main current is to be passed through a galvanometer of resistance G, then the resistance of the shunt will be

A. $G/50$

B. $G/49$

C. $50G$

D. $49G$

Answer: 2

Watch Video Solution

55. A maximum current point $0.5mA$ can be passed through a galvanometer of resistance 20Ω . The resistance to be connected in series to convert it in the voltmeter of range 0 - $5V$ is

A. 980Ω

B. 9980Ω

C. 990Ω

D. 9990Ω

Answer: 2

Watch Video Solution

56. The maximum potential that can be measured with a voltmeter of resistance 1000Ω is $6V$. Resistance that must be connected to measure a potential of $30V$ with it is

A. 4000Ω in Series

B. 6000Ω in Series

C. 12000Ω in Series

D. 2000Ω in Series

Answer: 1

Watch Video Solution

57. A voltmeter has an internal resistance of 1000Ω and gives full scale deflection when $2V$ is applied across the terminals. Now a resistance of 4000Ω is connected in series with it. Then it gives full scale deflection with

A. $8V$

B. $10V$

C. $6V$

D. $4V$

Answer: 2

Watch Video Solution

58. To convert a voltmeter measuring $15V$ into a voltmeter measuring $150V$, if the resistance of the voltmeter is 1000Ω, the resistance to be connected is

A. $10,000\Omega$ in Series

B. $9,000\Omega$ in Series

C. $11,000\Omega$ in Series

D.

Answer: 2

Watch Video Solution

Level-II(C.W)

1. A thin straight vertical conductor has $10amp$ current flows vertically upwards. It is present at a place where $B_H = 4 \times 10^{-6}T$. Arrange the net magnetic induction at the following points in ascending order

$a)$ at $0.5m$ on south of conductor

$b)$ at $0.5m$ on west of conductor

$c)$ at $0.5m$ on east of conductor

$d)$ at $0.5m$ on north - east of conductor

A. a, b, c, d

B. a, b, d, c

C. a, c, d, b

D. b, a, d, c

Answer: D

Watch Video Solution

2. A long straight wire carrying current of $30A$ is placed in an external unifrom magnetic field of induction $4 \times 10^{4}T$. The magnetic field is acting parallel to the direction of current. The maggnetic of the resultant magnetic inuduction in tesla at a point $2.0cm$ away form the wire is

A. 10^{-4}

B. 3×10^{-4}

C. 5×10^{-4}

D. 6×10^{-4}

Answer: 3

Watch Video Solution

3. A straight section PQ of a circuit lise along the X-axis from $x = -\frac{a}{2}$ to $x = \frac{a}{2}$ and carriers a steady current i. The magnetic field due to the section PQ at a point $X = +a$ will be

A. protportional to a

B. proportional to I/a

C. proportional to a^2

D. zero

Answer: 4

Watch Video Solution

4. $ABCD$ is a square of side L. A very long straight conductor carrying a current i passes through the vertex A of the square and is perpendicular to its plane. The minimum magnetic induction at a vertex of the square is

A. $\frac{\mu_0}{4\pi}\frac{2\sqrt{2}i}{L}$

B. $\frac{\mu_0}{4\pi}\frac{\sqrt{2}i}{L}$

C. $\frac{\mu_0}{4\pi}\frac{4\sqrt{2}i}{L}$

D. $\frac{\mu_0}{4\pi}\frac{2i}{L}$

Answer: 2

Watch Video Solution

5. The magnetic field at the centre of circular loop in the circuit shown below is

A. $\frac{\mu_0}{4\pi}\frac{2I}{r}(1+\pi)$

B. $\frac{\mu_0}{4\pi}\frac{2I}{r}(\pi - 1)$

C. $\frac{\mu_0}{4\pi}\frac{2I}{r}$

D. $\frac{\mu_0}{4\pi}\frac{I}{r}(\pi + 1)$

Answer: 2

Watch Video Solution

6. A current of $1 \cdot 0A$ flowing in the sides of an equilateral triangle of side $4 \cdot 5 \times 10^{-2} m$. Find the magnetic fied at the centroid of the triangle.

A. $4 \times 10^{-5} T$

B. $40T$

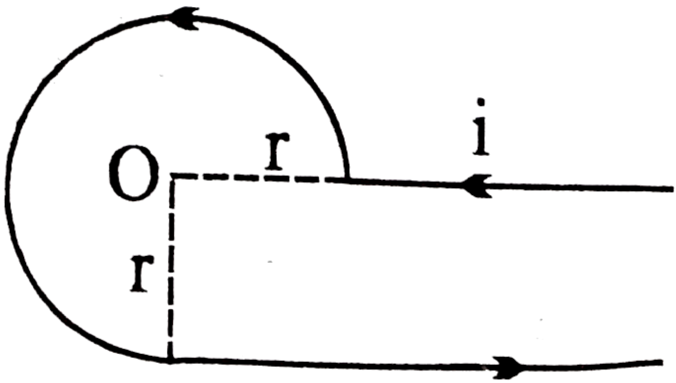
C. $0.4 \times 10^{-3} T$

D. $4 \times 10^{-2} T$

Answer: 1

Watch Video Solution

7. Find the magnetic induction at point O if the current carrying wire is in the shape shown in the figure.



A. $\frac{\mu_0 I}{4\pi r}$

B. $\frac{\mu_0 I}{4r}+\frac{\mu_0 I}{2\pi r}$

C. $\frac{\mu_0 I}{4r}+\frac{\mu_0 I}{4\pi r}$

D. $\frac{\mu_0 I}{4r}-\frac{\mu_0 I}{4\pi r}$

Answer: 3

Watch Video Solution

8. Figure shows a coil of radius $2cm$ concentric with a coil of radius $7cm$ Each coil has 1000 turns with a current of $5A$. In larger coil, then the current needed in the smaller coil to give the total magnetic field at the centre equal to $2mT$ is

A. $1.49A$

B. $1.84A$

C. $2.88A$

D. $3.4A$

Answer: 1

Watch Video Solution

9. Two identical coils carry equal currents have a common centre and their planes are at right angles to each other. The ratio of the magnitude of the resulatant magnetic field at the centre and the field due to one coil is

A. $2:1$

B. $1:2$

C. $\sqrt{2}:14$

D. $1:\sqrt{2}$

Answer: 3

Watch Video Solution

10. A uniform wire of resistance 12Ω is bent in the form of a square. A cell of $emf6V$ having negligible innternal resistance connected across the diagonal of the square. The magnetic induction at its centre (in tesla).

A. 0

B. 10^{-7}

C. 5×10^{-7}

D. $\frac{\mu_0}{4\pi} \times 5 \times 10^{-7}$

Answer: 1

Watch Video Solution

11. A wire of length $10cm$ is bent into an arc of a circle such that it subtends an angle of 1 radian at the centre. If a current of $1A$ is passed through the wire, the magnetic induction at the centre of the circle will be

A. 2×10^{-4} tesla

B. 1×10^{-6} tesla

C. 1×10^{-4} tesla

D. 2×10^{-6} tesla

Answer: 2

Watch Video Solution

12. A circular coil of radius $'r'$ having $'n'$ turns carries a current $'I'$. The magnetic induction at the center of the coil is $'B'$. Now the coil is unwound and rewound with half the original radius. If the magnetic induction at the center of the coil is to be the same, the current that should be passed through the coil is

A. $2i$

B. i

C. $i/2$

D. $i/4$

Answer: 4

Watch Video Solution

13. Two wires A and B are of lengths $40cm$ and $30cm$. A is bent into a circle of radius r and B into an arc of radius r. A current i_1 is passed through A

and i_{20} through B. To have the same magnetic inductions at the centre, the ratio of $i_1 : i_2$ is

A. $3:4$

B. $3:5$

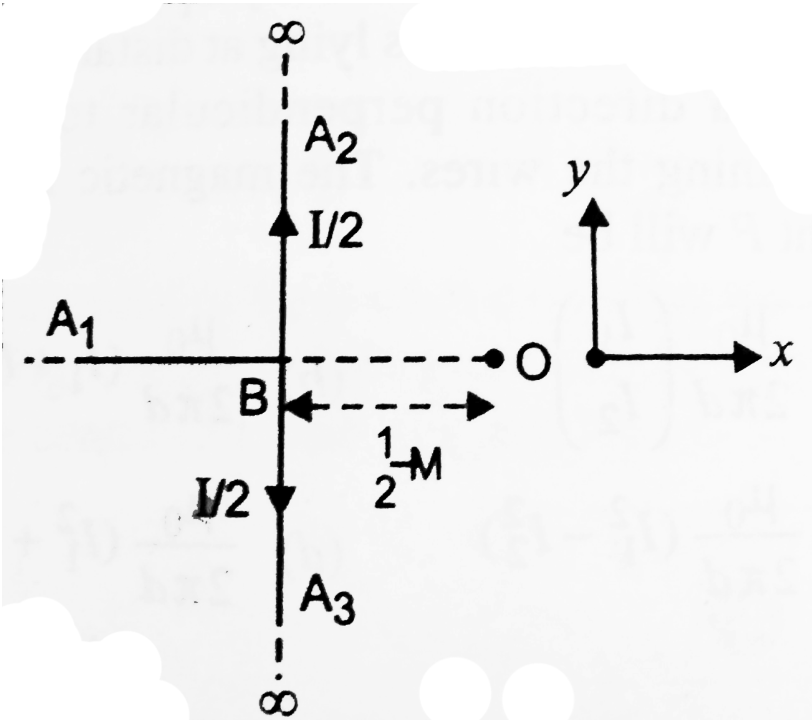
C. $2:3$

D. $4:3$

Answer: 1

Watch Video Solution

14. Electric currents I_1 and I_2 are flowing in two mutually perpendicular conductors as shown in figure. Find the equation of locus of zero magnetic field points.



A. $Y = X$

B. $Y = \frac{I_2 X}{I_1}$

C. $Y = \frac{I_1}{I_2} X$

D. $Y = \frac{X}{I_1 I_2}$

Answer: 3

Watch Video Solution

15. Magnetic field induction at the center of a circular coil of radius $5cm$ and carrying a current $0.9A$ is (in $S.I.$ units in$)\left(\in_0 =\right.$ absolute permitivity of air in $S.I.$ units : velocity of light $= 3 \times 10^8 ms^{-1}\left.\right)$

A. $\dfrac{1}{\in_0 10^{16}}$

B. $\dfrac{10^{16}}{\in_0}$

C. $\dfrac{\in_0}{10^{16}}$

D. $10^{16} \in_0$

Answer: A

Watch Video Solution

16. The magnetic induction at the centre of a current carrying circular coil of radius $10cm$ is $5\sqrt{5}$ times the magnetic induction at a point on its axis. The distance of the point from the centre of the coild in cm is

A. 5

B. 10

C. 20

D. 25

Answer: 3

Watch Video Solution

17. Same current i is flowing in the three infinitely long wires along positive x-,y- and z-directions. The magnetic filed at a point (0,0,-a) would be

A. $\frac{\mu_0 i}{2\pi a}\left(\hat{j} - \hat{i}\right)$

B. $\frac{\mu_0 i}{2\pi a}\left(\hat{i} + \hat{j}\right)$

C. $\frac{\mu_0 i}{2\pi a}\left(\hat{i} - \hat{j}\right)$

D. $\frac{\mu_0 i}{2\pi a}\left(\hat{i} + \hat{j} + \hat{k}\right)$

Answer: 1

Watch Video Solution

18. Two long straight wires are connected by a circular section which has a radius R. All the three segments lie in the same plane and carry a current I. The magnetic induction at the centre O of the circular segments is

A. $\frac{\mu_0 I}{4\pi R}$

B. $\frac{\alpha \mu_0 I}{4\pi R}$

C. $\frac{\alpha \mu_0 I}{R}$

D. $\frac{\alpha \mu_0 I}{2\pi R}$

Answer: 2

Watch Video Solution

19. If B is the magnetic induction, at the centre of a circular coil of radius $'r'$ carrying a current is $1T$, then its value at a distance of $\sqrt{3}r$ on the axis from the centre of the coil is

A. $\frac{1}{8}T$

B. $\frac{1}{16}T$

C. $8T$

D. $\frac{1}{4}T$

Answer: 1

Watch Video Solution

20. A cell of negligible internal resistance is connected to a tangent galvanometer and the deflection produced is 30°. If theree such cells are connected in series and the combination is connected to the same galvanometer, the deflection will be

A. 30°

B. 60°

C. 90°

D. 45°

Answer: B

Watch Video Solution

21. The resistance of the coil of a tangent galvanometer is 60Ω. It is connected to a battery of negligible internal resistance. The deflection is found to be 60°. Now a shunt resistance of 30Ω is connected across the coil of the tangent galvanometer. The deflection produced will be

A. 30°

B. 45°

C. 60°

D. 37°

Answer: 3

Watch Video Solution

22. Magnetic induction at the center of a circular loop carrying a current is $'B'$. If $'A'$ is the area of the coil, the magnetic dipole moment of the loop is

A. $\frac{BA^2}{\mu_0 \pi}$

B. $\frac{BA(\sqrt{A})}{\mu_0}$

C. $\frac{BA(\sqrt{A})}{\mu_0 \pi}$

D. $\frac{BA}{\mu_0}\sqrt{\frac{A}{\pi}}$

Answer: 4

Watch Video Solution

23. A circular current loop of magnetic moment M is in an arbitrary orientation in an external magnetic field $\vec{B}$. The work done to rotate the loop by 30° about an axis perpendicular to its plane is :

A. MB

B. $\sqrt{3}\frac{MB}{2}$

C. $\frac{MB}{2}$

D. zero

Answer: 4

Watch Video Solution

24. A solenoid of length $20cm$ and radius $2cm$ is closely wound with 200 turns. The magnetic field intensity at either end of the solenoid when the current in the winding is $5amp$. Is

A. $2500Amp/m$

B. $2000 Amp/m$

C. $1750 Amp/m$

D. $2940 Amp/m$

Answer: 1

Watch Video Solution

25. A solenoid of length $0 \cdot 5m$ has a radius of $1cm$ and is made up of 500 turns. It carries a current of $5A$. What is the magnitude of the magnetic field inside the solenoid?

A. $3.14 \times 10^{-3} T$

B. $6.28 \times 10^{-3} T$

C. $9.14 \times 10^{-3} T$

D. $1.68 \times 10^{-3} T$

Answer: 2

Watch Video Solution

26. The length of a solenoid is $0.1m$ and its diameter is very small . A wire is wound over in two layers. The number of turns in the inner layer is 50 and that on the outer layer is 40. The strength of current flowing in two layers in the same direction is 3 ampere. The magnetic induction in the middle of the solenoid will be

A. $3.4 \times 10^{-3}T$

B. 3.4×10^{-3} gauss

C. $3.4x10^{-3}T$

D. 3.4×10^{3} gauss

Answer: 1

Watch Video Solution

27. A long solenoid has $200 turns per cm$ and carries a current i. The magnetic field at its centre is $6.28 \times 10^{-2} weber/cm^2$. Another long soloenoid has $100 turns per cm$ and it carries a current $\frac{i}{3}$. The value of the magnetic field at its centre is

A. $1.05 \times 10^{-4} Wb/m^2$

B. $1.05 \times 10^{-2} Wb/m^2$

C. $1.05 \times 10^{-5} Wb/m^2$

D. $1.05 \times 10^{-4} Wb/m^2$

Answer: 2

Watch Video Solution

28. A toroidal solenoid has 3000 turns and a mean radius of $10 cm$. It has a soft iron core of relative magnetic permeability 2000. Find the magnitude of the magnetic field in the core when a current of $1.0 amp.$ is passed through the solenoid.

A. $20T$

B. $12T$

C. $6T$

D. $3T$

Answer: B

Watch Video Solution

29. A particle of mass $1 \times 10^{26} kg$ and charge $1.6 \times 10^{-19} C$ travelling with a velocity $1.28 \times 10^{6} cm^{-1}$ along the positive X - axis enters a region in which a uniform electric field $\vec{E} = -102.4 \times 10^{3} kNC^{-1}$ and magnetic field $B = 8 \times 10^{-2} jWbm^{-2}$, the direction of motion of the particle is :

A. x - axis

B. y - axis

C. z - axis

D. $-x$ - axis

Answer: 1

Watch Video Solution

30. Two particles X and Y having equal charges, after being accelerated through the same potential difference, enter a region of uniform magnetic field and describe circular paths of radii R_1 and R_2, respectively. The ratio of masses of X and Y is

A. $\left(R_1/R_2\right)^{1/2}$

B. $\left(R_2/R_1\right)$

C. $\left(R_1/R_2\right)^2$

D. $\left(R_1/R_2\right)$

Answer: 3

Watch Video Solution

31. A charged particle moving at right angles to a uniform magnetic field and starts moving along a circular arc of radius of curvature $'r'$. In the field it now penetrates a layer of lead and loses $3/4$ of its initial kinetic energy. The radius of curvature of its path now will be

A. $4r$

B. $2r$

C. $r/4$

D. $r/2$

Answer: D

Watch Video Solution

32. Two particles having same charge and KE enter at right angles into the same magnetic field and travel in circular paths of radii $2cm$ and $3cm$ respectively. The ratio of their masses is .

A. $2:3$

B. $3:2$

C. $4:9$

D. $9:4$

Answer: 3

Watch Video Solution

33. Two electrons move parallel to each other with equal speed $'V'$ the ratio of magnetic & electric force between them is

A. V/C

B. C/V

C. V^2/C^2

D. C^2/V^2

Answer: 3

Watch Video Solution

34. A proton, a deuteron and an α particle are accelerated through same potential difference and then they enter a normal uniform magnetic field, the ratio of their kinetic energies will be

A. $2:1:3$

B. $1:1:2$

C. $1:1:1$

D. $1:2:4$

Answer: B

Watch Video Solution

35. A proton of energy $8eV$ is moving in a circular path in a uniform magnetic field. The energy of an alpha particle moving in the same magnetic field and along the same path will be

A. $4eV$

B. $2eV$

C. $8eV$

D. $6eV$

Answer: 3

Watch Video Solution

36. A charged particle of charge $10mC$ enters a uniform magnetic field of induction $\bar{B} = 4\hat{i} + y\hat{j} + z\hat{k}$ tesla with a velocity $\bar{V} = 2\hat{i} + 3\hat{j} - 6\hat{k}$. If the particle continues to move undeviated then the strength of the magnetic field induction in tesla

A. 4

B. 8

C. 14

D. 30

Answer: 3

Watch Video Solution

37. Magnetic induction field is existing along $+Z$ axis in a region $0 \leq x \leq a$(a is positive). A point charge q is projected with a velocity $'v'$ at origin along positive x - axis , choose the correct alternative regarding its deviation.

A. maximum deviation is π rad independent of value of a

B. maximum deviation is $\pi/2$ rad independent of value of a

C. maximum deviation is $\pi/2$ rad if a is greater then its radius of curvature

D. Maximum deviation is $\pi/2$ rad only if a equal to its radius of curvature.

Answer: 3

Watch Video Solution

38. A proton moving with a velocity of $(6i + 8j)x10^5 ms^{-1}$ enters uniform magnetic field of induction $5 \times 10^{-3}\hat{k}$ tesla. The magnitude of the force acting on the proton is (I, j and k are unit vectors along X, Y, Z directions respectively)

A. zero

B. $8 \times 10^{-16} N$

C. $3 \times 10^{-16} N$

D. $4 \times 10^{-16} N$

Answer: 2

Watch Video Solution

39. A proton of energy $2MeV$ is moving perpendicular to uniform magnetic field of $2.5T$. The form on the proton is $\left(Mp = 1.6 \times 10^{-27} Kg\right.$ and $\left.q = e = 1.6 \times 10^{-19} C\right)$

A. $2.5 \times 10^{-16} N$

B. $8 \times 10^{-11} N$

C. $2.5 \times 10^{-11} N$

D. $8 \times 10^{-12} N$

Answer: 4

Watch Video Solution

40. Acceleration experienced by a particle with specific charge $1 \times 10^{7} C/kg$ when fired perpendicular to a magnetic field of induction $100 \mu T$ with a velocity $10^{5} ms^{-1}$ is

A. $10^{8} ms^{-2}$

B. $10^{-6} ms^{-2}$

C. $10^{14} ms^{-2}$

D. $10^{-8} ms^{-2}$

Answer: 1

Watch Video Solution

41. When two electrons enter into a magnetic field with different velocieis, they deflect in different circular paths, in such a way that the radius of one path is double that of the other. $1X10^7 ms^{-1}$ is the velocity of the electron in smaller of radius $2 \times 10^3 m$. The velocity of electron in the other circular path is :

A. $4 \times 10^7 ms^{-1}$

B. $4 \times 10^6 ms^{-1}$

C. $2 \times 10^7 ms^{-1}$

D. $2 \times 10^6 ms^{-1}$

Answer: 3

Watch Video Solution

42. A beam of charged particle, having kinetic energy $10^3 eV$, contains masses $8 \times 10^{-27} kg$ and $1.6 \times 10^{-26} kg$ emerge from the end of an accelerator tube. There is a plate at distance $10^2 m$ from the end of the tube and placed perpendicular to the beam. Calculate the magnitude of the smallest magnetic field which can prevent the beam from striking the plate.

A. $1.414T$

B. $2.414T$

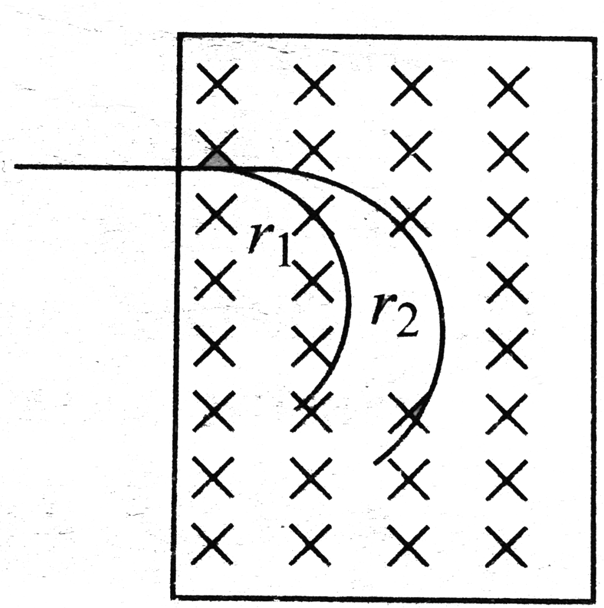
C. $3.414T$

D. $4.414T$

Answer: A

Watch Video Solution

43. A beam of mixture of α particle and protons are accelerted through same potential difference before entering into the magnetic field of strength B. if $r_1 = 5$ cm then r_2 is



A. $5cm$

B. $5\sqrt{2}cm$

C. $10\sqrt{2}cm$

D. $20cm$

Answer: 2

Watch Video Solution

44. A horizontal wire of length $0.5m$ carries a current of $5A$. If the mass of the wire is $10mg$, the minimum magnetic field required to support the weight of the wire is $\left(g = 10m/g^2\right)$

A. $4 \times 10^{-4}T$

B. $25 \times 10^{-4}T$

C. $4 \times 10^{-1}T$

D. $25 \times 10^{-1}T$

Answer: 1

Watch Video Solution

45. Currents of $10A$, $2A$ are passed through two parallel wires A and B respectively in opposite directions. If the wire A is infinitely long and the length of the wire B is 2 metre, the force on the conductor B, which is situated at $10cm$ distance from A will be

A. 8×10^{-5}newton

B. 5×10^{-5} netwon

C. $8\pi \times 10^{-7}$ newton

D. $4\pi \times 10^{-7}$ newton

Answer: 1

Watch Video Solution

46. Two long parallel conductors carry currents i and $2I$ in the same direction. The magnetic induction at a point exactly mid way between them is B. If the current in the first conductor is reversed in direction, the magnetic induction at the same point will be

A. $B/3$

B. $2B$

C. $3B$

D. $B/2$

Answer: 3

Watch Video Solution

47. A horizontal wire carries $200 amp$ current below which another wire of linear density $20 \times 10^{-5} kgm^{-1}$ carrying a current is kept at $2cm$ distance. If the wire kept below hangs in air. The current in this wire is

A. $100A$

B. $9.8A$

C. $98A$

D. $48A$

Answer: C

Watch Video Solution

48. Two long parallel conductors are placed at right angles to a metre scale at the $2cm$ and $6cm$ marks, as shown in the figure

They carry currents of $1A$ and $3A$ respectively. They will produce zero magnetic field at the (ignore the earth's magnetic field)

A. $5cm$ mark

B. $3cm$ mark

C. $1cm$ mark

D. $8cm$ mark

Answer: 2

Watch Video Solution

49. A rectangular loop of wire of size $4cm/10cm$ carries a steady current of $2A$. A straight long wire carrying $5A$ current is kept near the loop (as shown in figu). If the loop and the wire are coplanar, find the net force on the loop

A. $3.2 \times 10^{-5} N$

B. $1.6 \times 10^{-5} N$

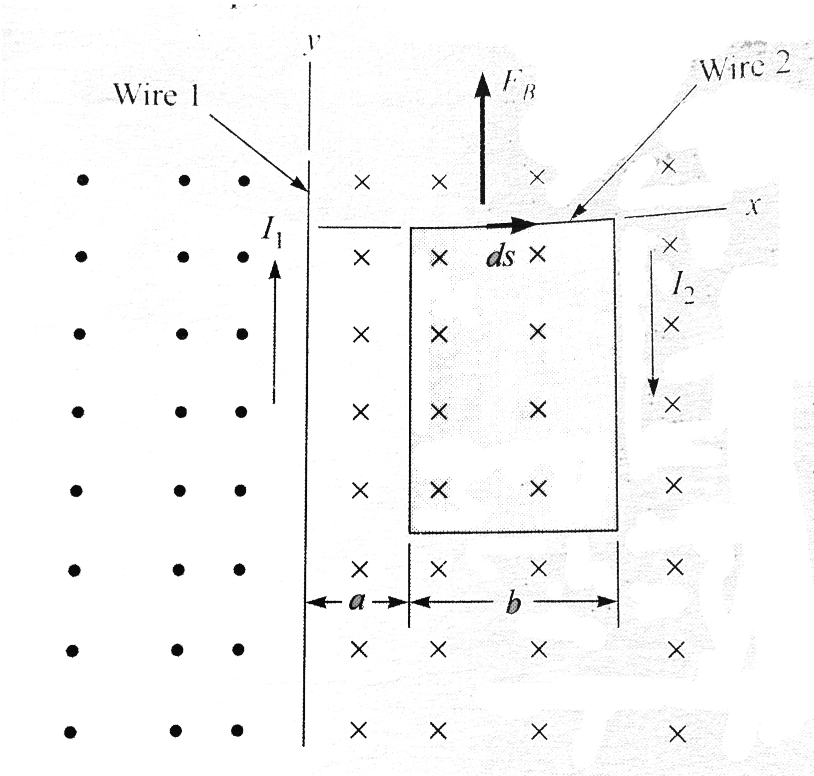
C. $0.4 \times 10^{-5} N$

D. $4 \times 10^{-5} N$

Answer: 2

Watch Video Solution

50. Wire 1 in Fig. is oriented along the y-axis and carries a steady current I_1. A rectangular loop located to right of the wire and in the x-y plane carries a current I_2. Find the magnetic force exerted by wire (1) on the top wire (1) on the top wire of length b in the loop, labeled "wire (2)" in the figure.



A. $\left[\dfrac{\mu_0 I_1 I_2}{2\pi}\ln\left(1+\dfrac{b}{a}\right)\hat{j}\right]$

B. $\left[\dfrac{\mu_0 I_1 I_2}{2\pi}\ln\left(1+\dfrac{b}{a}\right)\left(-\hat{j}\right)\right]$

C. $\left[\dfrac{\mu_0 I_1 I_2}{2\pi}\ln\left(1+\dfrac{b}{a}\right)\left(-\hat{i}\right)\right]$

D. $\left[\dfrac{\mu_0 I_1 I_2}{2\pi}\ln\left(1+\dfrac{b}{a}\right)\left(\hat{i}\right)\right]$

Answer: 1

Watch Video Solution

51. A square loop of side L carries a current I. Another smaller square loop of side $l(l < < L)$ carrying a current i is placed inside the bigger loop such that they are coplanar with their centre coinciding. If the currents in the loops are in the same direction, the magnitude of the torque on the smaller loop is

A. $\dfrac{\mu_0 I i l^2}{\sqrt{2}\pi L}$

B. $\dfrac{\mu_0 I i l^2}{2\pi L}$

C. $\dfrac{\mu_0 I i l^2}{\sqrt{32}\pi L}$

D. Zero

Answer: 4

Watch Video Solution

52. A coil in the shape of an equilateral triangle of side 0.02 m is suspended from a vertex such that it is hanging in a vertical plane between the pole pieces of a permanent magnet producing a horizontal magnetic field of $5 \times 10^{-2}T$. Find the couple acting on the coil when a current of 0.1 A is passed through it and the magnetic field is parallel to its plane.

A. $0.866 \times 10^{-6}N - M$

B. $1.732 \times 10^{-4}N - M$

C. $0.422 \times 10^{-6}N - M$

D. $0.866 \times 10^{-2}N - M$

Answer: 1

Watch Video Solution

53. A moving coil galvanometer A has 200 turns and resistance 100Ω. Another meter B has 100 turns and resistance 40Ω. All the other quantities are same in both the cases. The current sensitivity of

A. B is double as that of A

B. A is 2 times of B

C. A is 5 times of B

D. B is 5 times of A.

Answer: B

Watch Video Solution

54. A rectangular coil of size $3 \times 3cm$ consisting of 100 turns caries $0.1A$. If it produces a deflection 10^0, in a field of induction $0.1T$, the couple per unit twist is

A. $9 \times 10^{-2}N - m/$ Degree

B. $9 \times 10^{-5}N - m/$ Degree

C. $9 \times 10^{-5}N - m/rad$

D. 0.9N-m//`Degree

Answer: 2

Watch Video Solution

55. To increase the current sensitivity of a moving coil galvanometer by 50% its resistance is increased so that the new resistance becomes twice its initial resistance. By what factor does its voltage sensitivity change?

A. decreasesd by 75%

B. Increased by 75%

C. decreased by 25%

D. Increase by 25%

Answer: 3

Watch Video Solution

56. A galvanometer of resistance 25Ω is connected to a battery of 2 volt along with a resistance in series. When the value of this resistance is 3000Ω, a full scale deflection of 30 units is obtained in the galvanometer. In order to reduce this deflection to 20 units, the resistance in series will be

A. $4513 ohm$

B. $5413 ohm$

C. $2000 ohm$

D. $6000 ohm$

Answer: 1

Watch Video Solution

57. A voltmeter has a range O - V with a series resistance R. With a series resistance $2R$, the range is O - V. The correct relation between V and V' is

A. $v^1 = 2v$

B. $v^1 > 2v$

C. $v^1 < 2v$

D. $v^1 > \ > 2v$

Answer: 3

Watch Video Solution

58. A $100V$ voltmeter having an internal resistance of $20k\Omega$ is connected in series with a large resistance R across a $110V$ line. What is the magnitude of resistance R if the voltmeter reads $5V$?

A. $210K\Omega$

B. $315K\Omega$

C. $420K\Omega$

D. $440K\Omega$

Answer: 3

Watch Video Solution

59. A galvanometer ahs resistance G and Current I_g produces full scale deflection. S_1 is the value of the shunt which converts it into an ammeter of range $0 - I$ and S_2 is the value of shunt for the range $0 - 2I$. The ratio of S_1 and S_2 is

A. $\frac{1}{2}\left(\frac{I - I_g}{2I - i_g}\right)$

B. $\frac{2I - I_g}{I - I_g}$

C. $1/2$

D. 2

Answer: 2

Watch Video Solution

60. Tha scale of a galvanometer is divided into 150 equal divisions. The galvanometer be designed to read (i) 6 A per division and (ii) $1V$ per division?

A. $S = 8.3 \times 10^{-5}\Omega, R = 9995\Omega$

B. $S = 8.3 \times 10^{-2}\Omega, r = 995\Omega$

C. $S = 4.3 \times 10^{-5}\Omega, R = 995\Omega$

D. $R = 8.3 \times 10^{-5}\Omega, S = 995\Omega$

Answer: 1

Watch Video Solution

61. In a circuit 5 percent of total current passes through a galvanometer. If resistance of the galvanometer is G then value of the shunt is

A. $19G$

B. $G/19$

C. $20G$

D. $G/20$

Answer: 2

Watch Video Solution

62. A galvanometer has a sensitivity of 60 division/ampere. When a shunt is used its sentivity becomes 10 divisions/ampere. What is the value of shunt used if the resistance of the galvanometer is 20Ω?

A. 4Ω

B. 5Ω

C. 20Ω

D. 2Ω

Answer: B

Watch Video Solution

63. The sensitivity of a galvanometer that measures current is decreased by $1/40$ times by using shunt ressitance of 10Ω. Then, value of resistance of the galvanometer is

A. 400Ω

B. 410Ω

C. 30Ω

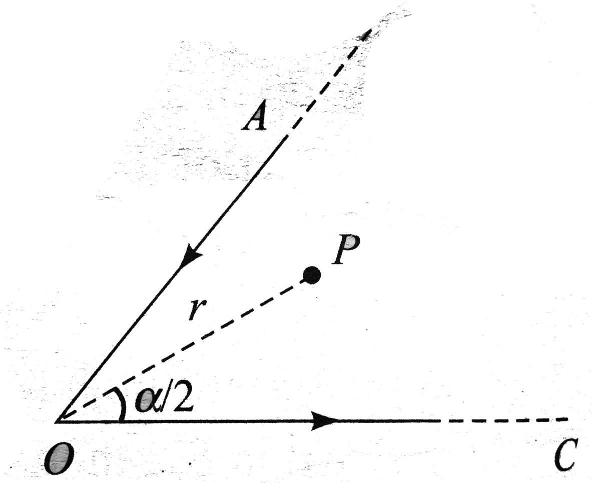
D. 390Ω

Answer: D

Watch Video Solution

LEVEL-III

1. Two wires AO and OC carry equal currents i as shown in Fig. One end of both the wires extends to infinity. Angle AOC is α. The magnitude of magnetic field is point P on the bisector of these two wires at a distance r from point O is



A. $\frac{\mu_0 i}{2\pi r}\cot\left(\frac{\alpha}{2}\right)$

B. $\frac{\mu_0 i}{4\pi r}\cot\left(\frac{\alpha}{2}\right)$

C. $\frac{\mu_0 i}{2\pi r}\frac{\left(1+\frac{\cos(\alpha)}{2}\right)}{\sin}\left(\frac{\alpha}{2}\right))$

D. $\frac{\mu_0 i}{4\pi r}\sin\left(\frac{\alpha}{2}\right)$

Answer: C

Watch Video Solution

2. A current of $1A$ is flowing through a straight conductor of length $16cm$. The magnetic induction (in tesla) at a point $10cm$ from the either end the wire is :

A. $\frac{8}{3} \times 10^{-6}$

B. $\frac{1}{6\sqrt{2}} \times 10^{-5}$

C. $\frac{1}{6\sqrt{3}} \times 10^{-6}$

D. $\frac{\sqrt{3}}{6} \times 10^{-6}$

Answer: 1

Watch Video Solution

3. Each of two long parallel wires carries a constant current i along the same direction . The wires are separated by a distance $2I$. The magnitude of resultant magnetic induction in the symmetric plane of this system located between the wires at a distance R from each wire will be

A. $\frac{\mu_0 i}{\pi R}$

B. zero

C. $\frac{\mu_0 i}{\pi\sqrt{R^2 - l^2}}$

D. $\frac{\mu_0 i}{\pi R}\sqrt{1 - \frac{l^2}{R^2}}$

Answer: 2

Watch Video Solution

4. 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 magnetis field at $(a)/(2)$ and $(2a)$ is

A. $1/4$

B. 4

C. 1

D. $1/2$

Answer: 3

Watch Video Solution

5. A horizontal rod of mass $10g$ and length $10cm$ is placed on a smooth plane inclined at an angle of 60° with the horizontal with the length of the rod parallel to the edge of the inclined plane. A uniform magnetic field induction B is applied vertically downwards. If the current through the rod is $1 \cdot 73 ampere$, the value of B for which the rod remains stationary on the inclined plane is

A. 1.73 Tesla

B. $\frac{1}{1.73}$ Tesla

C. 1 Tesla

D. None of the above

Answer: 3

Watch Video Solution

6. PQ is a uniform rod of length l and mass m carrying current i and is suspended in uniform magnetic field of induction $\vec{B}$ acting inward as shown in figure. The tension in each string is

A. $mg - Bil$

B. $mg + Bil$

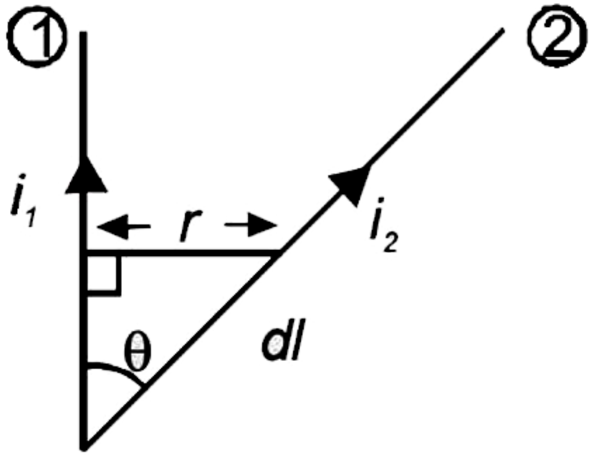
C. $\frac{mg - Bil}{2}$

D. $\frac{mg + Bil}{2}$

Answer: 3

Watch Video Solution

7. Wires 1 and 2 carrying currents i_1 and i_2 respectively are inclined at an angle θ to each other. What is the force on a small element dl of wire 2 at a distance of r from wire 1 (as shown in figure) due to the magnetic field of wire 1`?



A. $\frac{\mu_0}{2\pi r} i_1 i_2 dl \tan\theta$

B. $\frac{\mu_0}{2\pi r} i_1 i_2 dl \sin\theta$

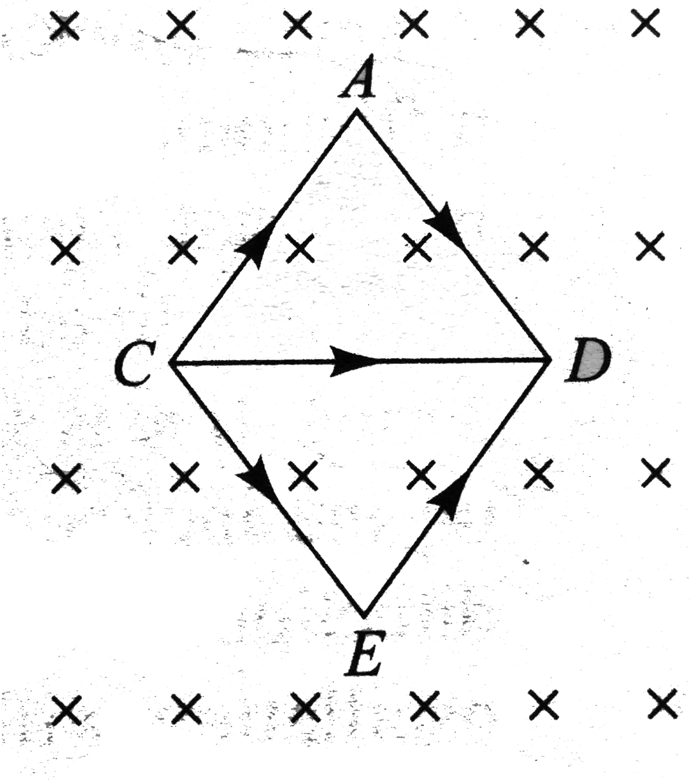
C. $\frac{\mu_0}{2\pi r} i_1 i_2 dl \cos\theta$

D. $\frac{\mu_0}{4\pi r} i_1 i_2 dl \sin\theta$

Answer: 3

Watch Video Solution

8. Let current $i = 2A$ be flowing in each part of a wire frame as shown in Fig. 1.138. The frame is a combination of two equilateral triangles ACD and CDE of side 1 m. It is placed in uniform magnetic field $B = 4T$ acting perpendicular to the plane of frame. The magnitude of magnetic force acting on the frame is



The pithc of the helical path followed by the particle is p. The radius of the helix will be

A. $24N$

B. Zero

C. $16N$

D. $8N$

Answer: 1

Watch Video Solution

9. A wire bent in the form a right angled triangle PQR, carries a current $1A$. It is placed in a region of a uniform magnetic field $B = 0.2T$. If $PR = 1m$, the net force on the wire is

A. $1.73N$

B. $3.46N$

C. $2.73N$

D. Zero

Answer: 4

Watch Video Solution

10. Two long parallel conductors carry currents $i_1 = 3A$ and $i_2 = 3A$ both are directed into the plaane of paper. The magnitude of resultant magnetic field at point $'P'$, is

A. $12\mu T$

B. $5\mu T$

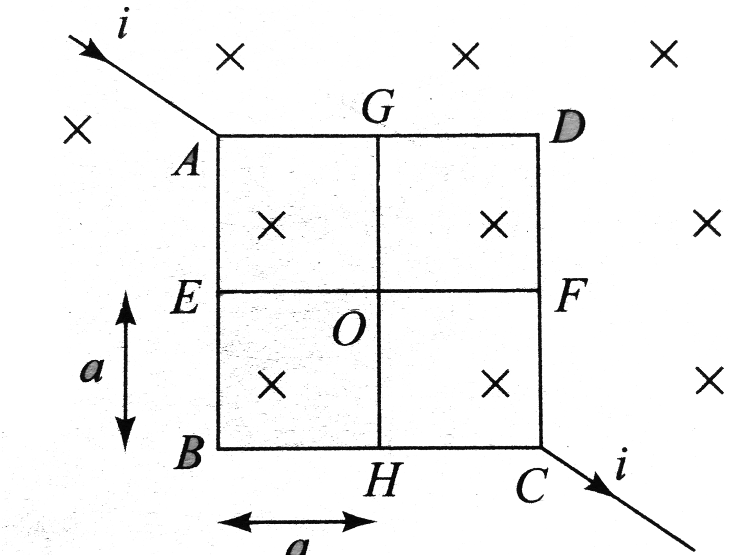
C. $13\mu T$

D. $7\mu T$

Answer: 3

Watch Video Solution

11. In Fig. there is a uniform conducting structure in which each small square has side a. The structure is kept in a uniform magnetic field B. Then the magnetic force on the structure will be



A. $2\sqrt{2}iBa$

B. $\sqrt{2}iBa$

C. $2iBa$

D. iBa

Answer: 1

Watch Video Solution

Watch Video Solution

12. A current - carrying circular loop of radius R is placed in the XY - plane with centre at the origin. Half of the loop with $x > 0$ is now bent so that is now lies in the XY - plane

A. The magnitude of magnetic moment now diminishes

B. The magnetic moment does not change

C. The magnitude of $\vec{B}$ at $(0, 0, z), z > > R$ increeases

D. The magnitude of $\vec{B}$ at $(0, 0, z), z > > R$ is unchanged

Answer: 1

Watch Video Solution

13. A long straight wire along the z- axis carries a current I in the negative z - *direction* . The magnetic vector field $\vec{B}$ at a point having coordinates (x,y) in the $Z = 0$ plane is

A. $\dfrac{\mu_0 I(y\hat{i} - x\hat{j})}{2\pi(x^2 + y^2)}$

B. $\dfrac{\mu_0 I(x\hat{i} + y\hat{j})}{2\pi(x^2 + y^2)}$

C. $\dfrac{\mu_0 I(x\hat{j} - y\hat{i})}{2\pi(x^2 + y^2)}$

D. $\dfrac{\mu_0 I(x\hat{i} - y\hat{j})}{2\pi(x^2 + y^2)}$

Answer: 1

Watch Video Solution

14. The magnetic induction at O due to a current in conductor shaped as shown in figure

A. $\dfrac{\mu_0 i}{4\pi}\left[\dfrac{3\pi}{2a} + \dfrac{\sqrt{2}}{b}\right]$

B. $\frac{\mu_0 i}{4\pi}\left[\frac{3\pi}{4a} - \frac{\sqrt{2}}{b}\right]$

C. $\frac{\mu_0 i}{4\pi}\left[\frac{3\pi}{4a} + \frac{1}{\sqrt{2}b}\right]$

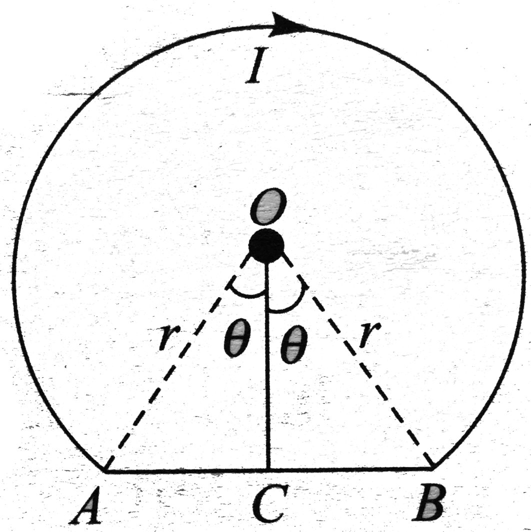
D. $\frac{\mu_0 i}{4\pi}\left[\frac{1}{a} + \frac{1}{b}\right]$

Answer: 1

View Text Solution

15. A wire is bent in the form of a circular arc with a straight portion AB.

Magnetic induction at O when current flowing in the wire, is



A. $\frac{\mu_0 i}{2\pi r}(\tan\phi)$

B. $\frac{\mu_0 i}{2\pi r}(\pi - \phi)$

C. $\frac{\mu_0 i}{2\pi r}(\pi - \phi + \tan\phi)$

D. $\frac{\mu_0 i}{2\pi r}(\pi - \tan\phi)$

Answer: 3

Watch Video Solution

16. A wire of length $'L'$ is bent in to an arc of a circle and found to subtentd and angle of $'\theta'$ radians at the centre.If a current of $'I'$ is passed through it, the magnetic induction at the center of the circle is

A. $\frac{\mu_0 i\theta^2}{2\pi L}$

B. $\frac{\mu_0 i\theta^2}{4\pi L}$

C. $\frac{\mu_0 i\theta}{4\pi L}$

D. $\frac{\mu_0 i\theta}{2\pi L}$

Answer: 2

Watch Video Solution

17. A wiere of length L is shaped into a cricle and then bent in such a way that the two semi - circle are perpendicular. The magnetic moment of the system when current I flows through the system is

A. $\frac{\sqrt{2}iL^2}{8\pi}$

B. $\frac{\sqrt{3}iL^2}{4\pi}$

C. $\frac{iL^2}{4\pi}$

D. $\frac{iL^2}{2\pi}$

Answer: 1

Watch Video Solution

18. A square frame of side l carries a current produces a field B at its centre. The same current is passed through a circular loop having same perimeter as the square. The field at its centre is B', the ratio of B/B' is

A. $\frac{8\sqrt{2}}{\pi^2}$

B. $\frac{8}{\pi^2}$

C. $\frac{\sqrt{2}}{\pi^2}$

D. $\frac{\pi^2}{8\sqrt{2}}$

Answer: 1

Watch Video Solution

19. A circular coil of 100 turns and effective diameter $20cm$ carries a current of $0.5A$. It is to be turned in a magnetic field of $B = 2.0T$ from a position in which the normal to the plane of the coil makes an angle θ

equals to zero to one in which θ equals to 180°. Thw work required in this process is

A. πJ

B. $2\pi J$

C. $4\pi J$

D. $8\pi J$

Answer: 2

Watch Video Solution

20. A long solenoid has $200 turnspercm$ and carries a current i. The magnetic field at its centre is $6.28 \times 10^{-2} weber/cm^2$. Another long soloenoid has $100 turnspercm$ and it carries a current $\frac{i}{3}$. The value of the magnetic field at its centre is

A. $1.05X10^{-3} Wb/m^2$

B. $1.05X10^{-4} Wb/m^2$

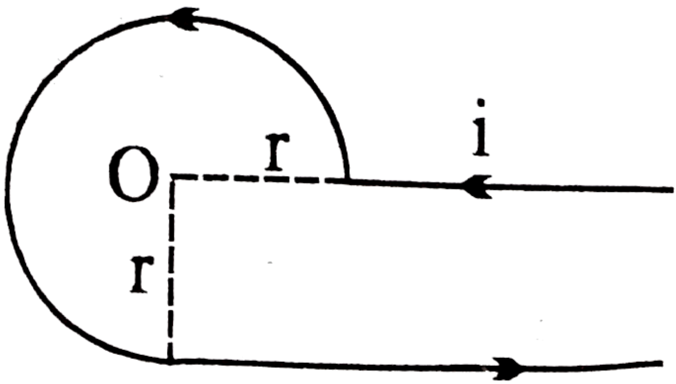
C. $1.05X10^{-2}Wb/m^2$

D. $1.05X10^{-5}Wb/m^2$

Answer: 3

Watch Video Solution

21. Find the magnetic induction at point O if the current carrying wire is in the shape shown in the figure.



A. $\frac{\mu_0 I}{2R}$

B. $\frac{\mu_0 I}{2\pi R}$

C. $\frac{\mu_0 I\left(\pi^2+4\right)^{1/2}}{4\pi R}$

D. $\frac{\mu_0 I\left(\pi^2+4\right)}{4\pi R}$

Answer: 3

Watch Video Solution

22. Two circular coils P and Q are made from similar wire but radius of Q is twice that of P. Relation between the values of potential difference across them so that the magnetic induction at their centers may be the same is

A. $V_q = 2V_p$

B. $V_q = 3V_p$

C. $V_q = 4V_p$

D. $V_q = 1/4V_p$

Answer: 3

Watch Video Solution

23. A charged particle of charge $5mc$ and mass $5gm$ is moving with a constant speed $5m/s$. In a uniform magnetic field on a curve $x^2 + y^2 = 25$. Where x and y are in meter. The value of magnetic filed required will be

A. 1 Tesla

B. $1T$ along z - axis

C. $5KT$ along the x - axis

D. $1KT$ along any line in the x - y plane

Answer: 2

Watch Video Solution

24. Velocity and acceleration vectors of a charged particle moving in a magnetic field at some instant are $\vec{v} = 3\hat{i} + 4\hat{j}$ and $\vec{a} = 2\hat{i} + x\hat{j}$. Selcet the wrong alternative.

A. $x = -1.5$

B. $x = 3$

C. magnetic field is along z - direction

D. Kinetic energy of the particle is constant

Answer: 2

Watch Video Solution

25. A charged particle enters a magnetic field at right angles to the field. The field exists for a length equal to 1.5 times the radius of circular path of particle. The particle will be deviated from its path by

A. 90°

B. $\sin^{-1}(2/3)$

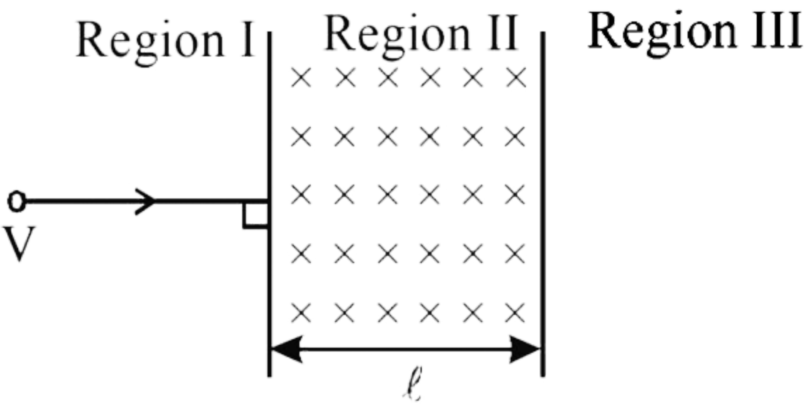
C. 30°

D. 180°

Answer: 4

Watch Video Solution

26. A particle of mass $m$and charge q, moving with velocity v enters Region II normal to the boundary as shown in the figure. Region II has a uniform magnetic field B perpendicular to the plane of the paper . The length of the region II is l. Choose the correct choice(s).



A. The particle enters Region III only if its velocity $V > \frac{qlB}{m}$

B. Path length of the particle in region ii is maximum when velocity $V = \frac{qlB}{m}$

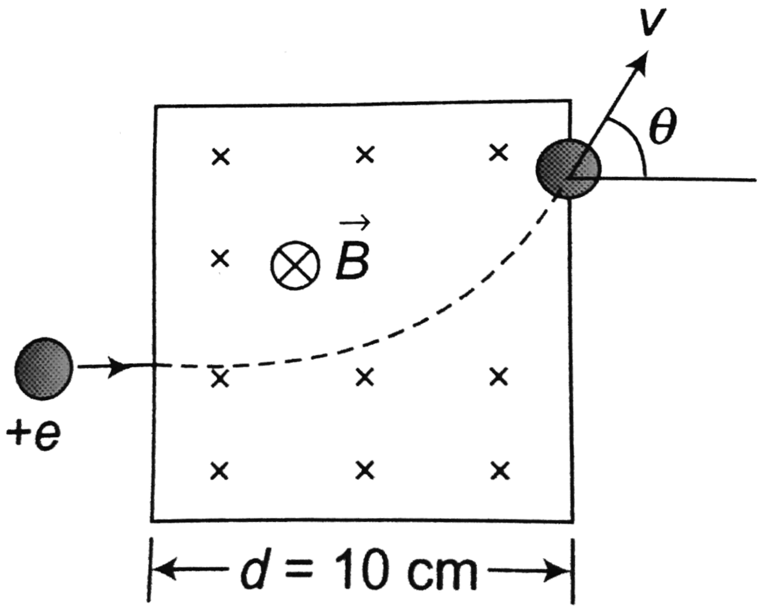
C. Time spent in Region II is same for any veloicty V as long as the particle returens to Region I.

D. All the above are correct.

Answer: 4

Watch Video Solution

27. A proton accelerated by a potential difference $500KV$ moves though a transverse field of $0.51T$ as shown in figure. The angle θ through which the proton deviates from the intial direction of its motion is



A. 15°

B. 30°

C. 45°

D. 60°

Answer: 2

Watch Video Solution

28. Two identical charged particles enter a uniform magnetic field with same speed but at angles 30° and 60° with field Let a,b and c be the ratio of their time periods, radii and pitches of the helical paths than .

A. $abc = 1$

B. $abc > 1$

C. $abc < 1$

D. $ac = b$

Answer: 1

Watch Video Solution

29. An electron whose e/m is $1.76X10^{11}c/kg$ enter a region $2X10^{-3}$ tesla with a velocity of $3X10^{6}m/\sec$ in a direction making an angle of 45° with the field. The pitch of its helical path in the region is

A. $1.5cm$

B. $3.8cm$

C. $5.36cm$

D. $8.4cm$

Answer: 2

Watch Video Solution

30. Two charged particles traverse identical helical paths in a completely opposite sense in a uniform magnetic field $\vec{B} = B_0\hat{K}$

A. They have equal z - components of momenta

B. They must have equal charges

C. They necessarily represent a partical - antipartical parit

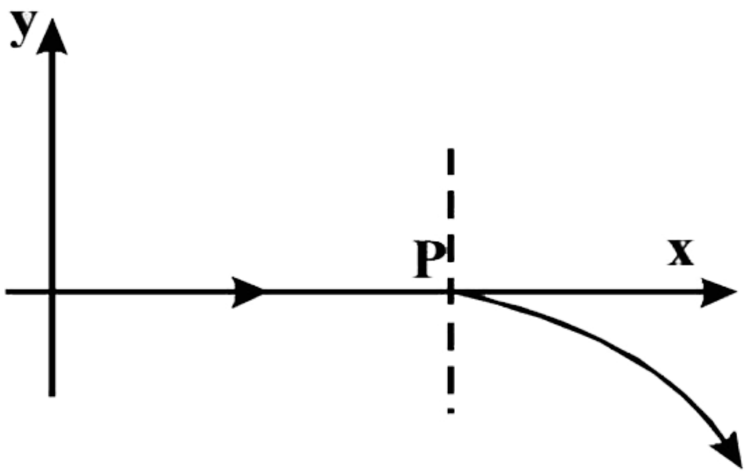
D. The charge to mass ratio satisfy :

$(e/m)_1 + (e/m)_2 = 0$

Answer: 4

Watch Video Solution

31. For a positively charged particle moving in a x - y plane initially along the x - $a\xi s$, there is a sudden change in its path due to the presence of electric and//or magnetic fields beyond p . The curved path is shown in the x - $y$plane and is found to be non - circular. Which one of the following combinations is possible ?



A. $\vec{E} = 0, \vec{B} = b\hat{i} + c\hat{k}$

B. $\vec{E} = ai, \vec{B} = c\hat{k} + a\hat{i}$

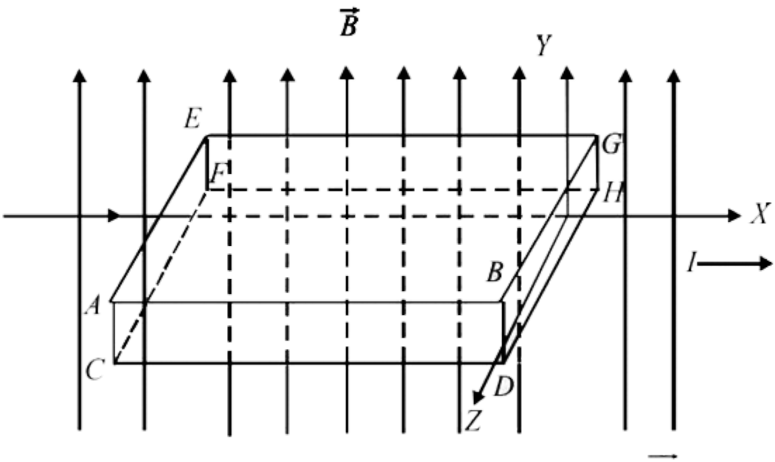
C. $\vec{E} = 0, \vec{B} = c\hat{j} + b\hat{k}$

D. $\vec{E} = ai, \vec{B} = c\hat{k} + b\hat{j}$

Answer: 2

Watch Video Solution

32. A metallic block carrying current I is subjected to a uniform magnetic induction $\vec{B} asshown \in Figure. Themov \in gchar \geq sexperienceaf$ or ce vec(F) given by ..... Which results in the lowering of the potential of the face .... Assume the speed of the carries to be v .



A. $eVB\hat{k}, ABCD$

B. $eV B\hat{k} EFGH$

C. - $eV B\hat{k}, ABCD$

D. - $eV B\hat{k}, EFGH$

Answer: 1

Watch Video Solution

33. Two parallel beams of protons and electrons, carrying equal currents are fixed at a separation d. The protons and electrons move in opposite directions. There is a point P on the straight perpendicular line joining the two beams at a distance x from one beam. The magnetic field at this point is B. If B is plotted against x, it can be represented by the curve.

A.

B.

C.

D.

Answer: C

Watch Video Solution

34. Three very long straight conductors are arranged parallel to each other in a plane and have resistances in the ration $1:2:3$. They are connected in parallel to a battery of negligible internal resistance such that the currents in all three wires are in the same direction. The distance between the first two conductors is x and the distance between the second and third conductors is y. If the middle conductors is in equilibrium, the ratio $x:y$ is

A. $1:3$

B. $3:1$

C. $1:\sqrt{3}$

D. $\sqrt{3}:1$

Answer: 2

Watch Video Solution

Watch Video Solution

35. Two long wires are placed parallel to each other $10cm$ apart as shown in figure. The magnetic field at point P is

A. $5/6 \times 10^{-3}T$ directed perpendicular into the paper

B. $1/3 \times 10^{-3}T$ directed perpendicular out of the paper

C. $5/6 \times 10^{-3}T$ directed perpendicular out of the paper

D. $1/6 \times 10^{-3}T$ directed perpendicular into the paper

Answer: 4

Watch Video Solution

36. Two long parallel wires are at a distance $2d$ apart. They carry steady equal currents flowing out of the plane of the paper , as shown. The variation of the magnetic field B along the line XX is given by

A.

B.

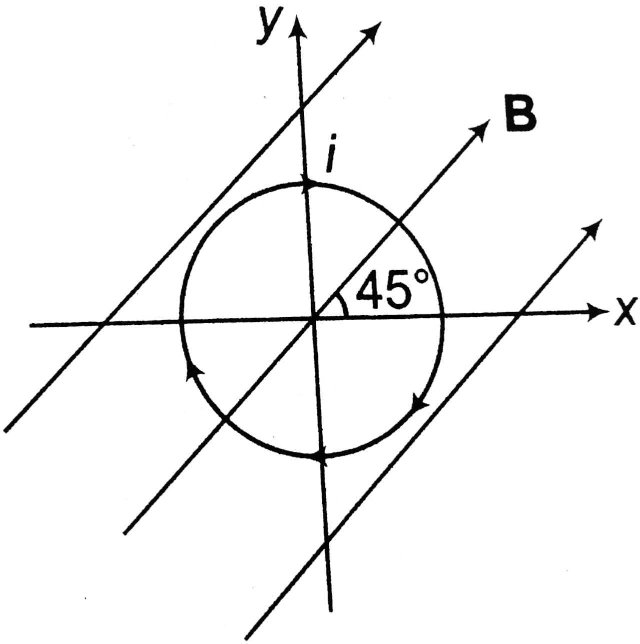
C.

D.

Answer: 2

Watch Video Solution

37. A circular loop of radius $R = 20$ cm is placed in a uniform magnetic field $B = 2T$ in xy-plane as shown in figure. The loop carries a current $i = 1.0A$ in the direction shown in figure. Find the magnitude of torque acting on the loop.



A. $0.25N - m$

B. $\frac{0.25}{\sqrt{2}}N - m$

C. $0.75N - m$

D. $\frac{0.75}{\sqrt{2}}N - m$

Answer: 1

Watch Video Solution

38. A non conducting disc of radius R, charge q is rotating about an axis passing through its centre and perpendicular to its plane with an angular velocity ω charge q is uniformly distributed over its surface. The magnetic moment of the disc is

A. $\frac{1}{4}q\omega R^2$

B. $\frac{1}{2}q\omega R$

C. $q\omega R$

D. $\frac{1}{2}q\omega R^2$

Answer: 1

Watch Video Solution

39. A galvanometer of resistance 5Ω is connected in series with a resistance of 0.2Ω to a battery of negligible internal resistance. The deflection is noted. If the 0.2Ω resistance is replaced by 2Ω resistance, the value of shunt resistance to be connected to the galvanometer to maintain the same deflection is

A. 1Ω

B. 0.55Ω

C. 0.01Ω

D. 10Ω

Answer: 2

Watch Video Solution

40. A thin wire of length L is made of an insulating material. The wire is bent to form a circular loop, and a positive charge q is distributed uniformly around the circumference of the loop. The loop is then set into rotation with angular speed ω around an axis through its centre. If the loop is in the region where there is a uniform magnetic field $\vec{B}$ directed parallel to the plane of the loop, calculate the magnitude of the magnetic torque on the loop.

A. $\frac{q\omega L^2 B}{8\pi^2}$

B. $\frac{q\omega L^2 B}{4\pi^2}$

C. $\frac{q\omega L^2 B}{2\pi^2}$

D. $\frac{q\omega L^2 B}{\pi^2}$

Answer: 1

Watch Video Solution

41. A rigid circular loop of radius r & mass m lies in the xy plane on a flat table and has a current I flowing in it At this particular place the earth's magnetic filed is $B = B_x\hat{i} + B_y\hat{j}$ How large must I be before one edge of the loop will lift from table

Repeat if ,$\vec{B} = \overrightarrow{B_x}\hat{i} + \overrightarrow{B_z}\hat{k}$.

A. $\frac{mg}{\pi r\sqrt{B_x^2 + B_z^2}}$

B. $\frac{mg}{\pi r B_x}$

C. $\frac{mg}{\pi r B_z}$

D. $\frac{mg}{\pi r \sqrt{B_x B_z}}$

Answer: 2

Watch Video Solution

42. A hollow sphere has charge $'q'$ which is uniformly distributed over its surface and rotating about its axis .Find the magnetic moment of the sphere

A. $\frac{qr^2\omega}{2}$

B. $\frac{qr^2\omega}{3}$

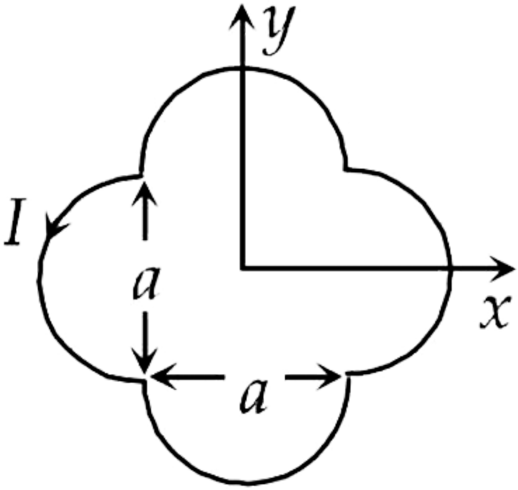
C. $qr^2\omega$

D. $\frac{qr^2\omega}{4}$

Answer: 2

Watch Video Solution

43. A loop carrying current I lies in the x - y plane as shown in the figure . The unit vector $\hat{k}$ is coming out of the plane of the paper . The magnetic moment of the current loop is



A. $a^2 I\hat{k}$

B. $\left(\frac{\pi}{2} + 1\right)a^2 I\hat{k}$

C. - $\left(\frac{\pi}{2} + 1\right)a^2 I\hat{k}$

D. $(2\pi + 1)a^2 I\hat{k}$

Answer: 2

Watch Video Solution

44. Electric field strength $\bar{E} = E_0\hat{i}$ and magnetic induction $\bar{B} = B_0\hat{i}$ exists in a region. A charged particle $'q'$ is released from rest at origin. Work done by both the fields is after certain time is

A. qEx

B. qEy

C. qEz

D. $qE\sqrt{x^2 + y^2}$

Answer: 1

Watch Video Solution

45. A long current carrying wire, carrying current such that it is flowing out from the plane of paper, is placed at O. A steady state current is flowing in the loop $ABCD$. Then

A. the net force is zero

B. as seen from O , the loop will rotate in clock wise direction along axis OO' .

C. BOTH $1\&2$ are correct.

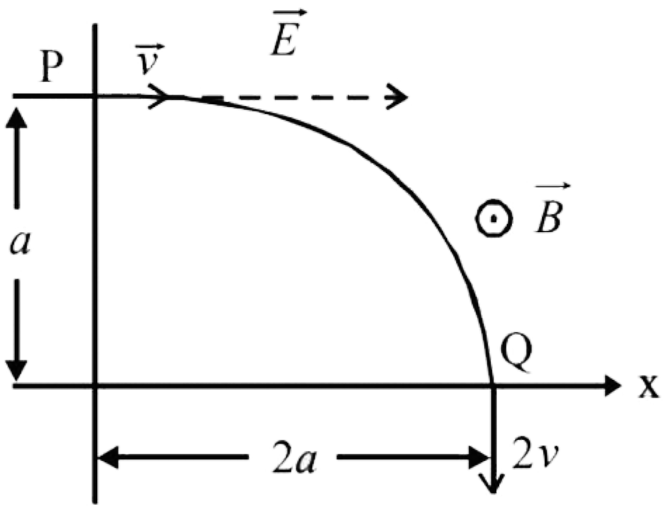
D. as seen from O , the loop will rotate in anticlock wise direction along axis OO' .

Answer: 3

Watch Video Solution

NCERT Based Questions

1. A particle of charge $+q$ and mass m moving under the influence of a uniform electric field $E\hat{i}$ and uniform magnetic field $B\hat{k}$ follows a trajectory from $P \rightarrow Q$ as shown in fig. The velocities at P and Q are $v\hat{i}$ and $-2v\hat{j}$. which of the following statement(s) is/are correct ?



A. $E = \frac{3}{4}\frac{mv^2}{qa}$

B. Rate of work done by electric field at P is $\frac{3}{4}\frac{mv^3}{a}$

C. Rate of work done by electric field at P is zero

D. Rate of word down by both the fields at Q is zero

Answer: 1,2,3

Watch Video Solution

2. Two coaxil solenoids 1 and 2 of the same length are set so that one is inside the other. The number of turns per unit length are n_1 and n_2. The current i_1 and i_2 are flowing in opposite directions. The magnetic field inside the inner coil is zero. This is possible when

A. $i_2 = i_2$ and $n_1 = n_2$

B. $i_2 = i_2$ and $n_1 = n_2$

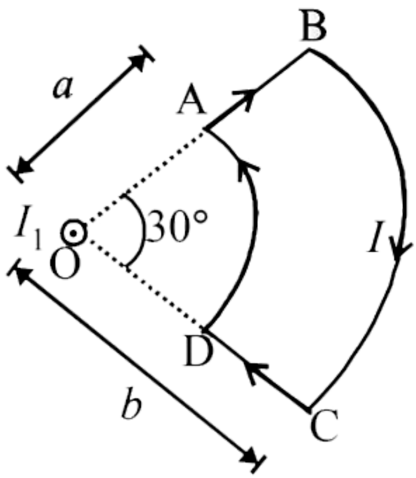
C. $i_2 = i_2$ and $n_1 = n_2$

D. $i_1 n_1 = i_2 n_2$

Answer: 3,4

Watch Video Solution

3. A current loop $ABCD$ is held fixed on the plane of the paper as shown in figure. The arcs $BC(radius = b)$ and $DA(radius = a)$ of the loop are joined by two straight wires AB and CD at the origin O is 30^(@) $. A \neg herstraightth \in wirewithsteadycurrent$I_(1)` flowing out of the plane of the paper is kept at the origin .



The magnitude of the magnetic field (B) due to the loop *ABCD* at the origin (o) is :

A. zero

B. $\dfrac{\mu_0(b - a)i}{24ab}$

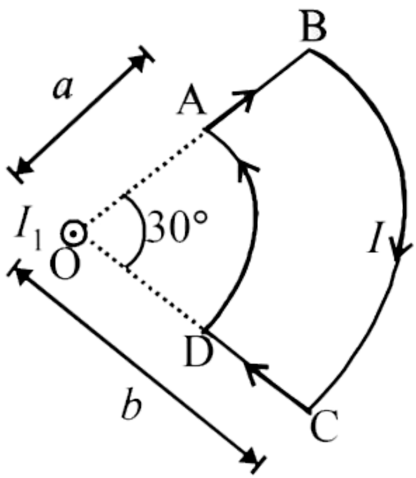
C. $\dfrac{\mu_0 I}{4\pi}\left[\dfrac{b - a}{ab}\right]$

D. $\dfrac{\mu_0 I}{4\pi}\left[2(b - a) + \dfrac{\pi}{3}[a + b)\right]$

Answer: C

Watch Video Solution

4. A current loop $ABCD$ is held fixed on the plane of the paper as shown in figure. The arcs $BC(radius = b)$ and $DA(radius = a)$ of the loop are joined by two straight wires AB and CD at the origin O is 30^(@) $. A \neg herstraightth \in wirewithsteadycurrent$I_(1)` flowing out of the plane of the paper is kept at the origin .



Due to the process of the current I_1 at the origin:

A. The force 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

$$\frac{\mu_0 I I_1}{4\pi}\left[2(b - a) + \frac{\pi}{3}(a + b)\right]$$

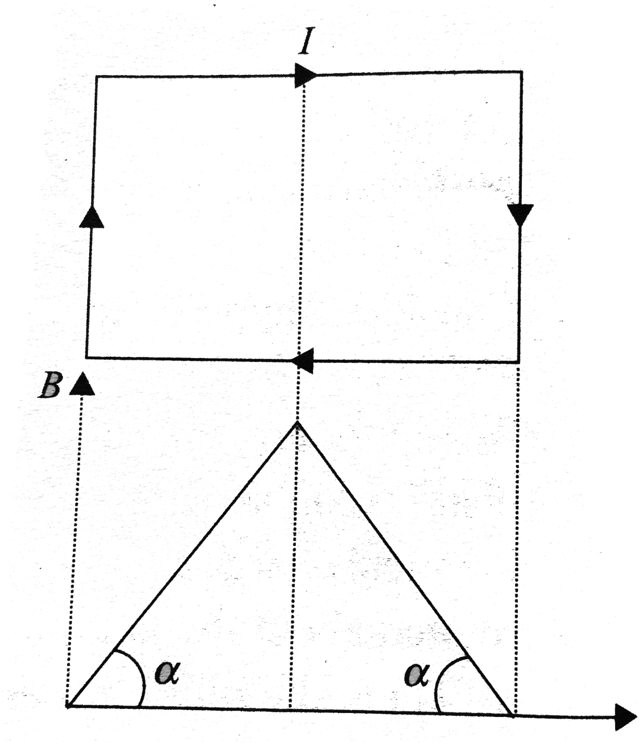
D. The magnitude of the net force on the loop is given by

$$\frac{\mu_0 I I_1}{4\pi}\left[\frac{b - a}{ab}\right]$$

Answer: 3

Watch Video Solution

5. A current carrying loop is placed in the non-uniform magnetic field whose variation in space is shown in fig. Direction of magnetic field is into the plane of paper. The magnetic of paper. The magnetic force experienced by the loop is



A. non - zero

B. zero

C. cannot say anything

D. None of the above

Answer: 1

Watch Video Solution

6. Electric field strength $\bar{E} = E_0\hat{i}$ and $\bar{B} = B_0\hat{i}$ exists in a region. A charge is projected with a velocity $\bar{v} = v_0\hat{j}$ at origin , then

A. It moves along helix with constant pitch

B. It moves along circular path in YZ plane

C. It moves along helix with increasing pitch

D. It moves along helix with decreasing pitch

Answer: 3

Watch Video Solution

7. Two moving coil meters, M_1 and M_2 have following particulars :

$R_1 = 10\Omega, N_1 = 30, A_1$

$= 3.6 \times 10^{-3}m^2, B_1 = 0.25T$

$R_2 = 10\Omega, N_2 = 42, A_2$

$= 1.8 \times 10^{-3}m^2, B_2 = 0.50T$

(The spring constants are identical for two meters). The ration of (i) current sensitivity (ii) voltage sensitivity of M_2 and M_1 is

A. $1.4, 1$

B. $1, 1.4$

C. $1:1$

D. $1:4$

Answer: C

Watch Video Solution

8. A circular coil of 30 turns and radius $8.0cm$ carrying a current of $6.0A$ suspended vertically in a uniform horizontal magnetic field of magnitude $1.0T$. The field lines makes an angle of 60° with the normal of the coild. Calculate the magnitude of the counter torque that must be applies to prevent the coil form turning.

A. $3.13Nm$

B. $1.13Nm$

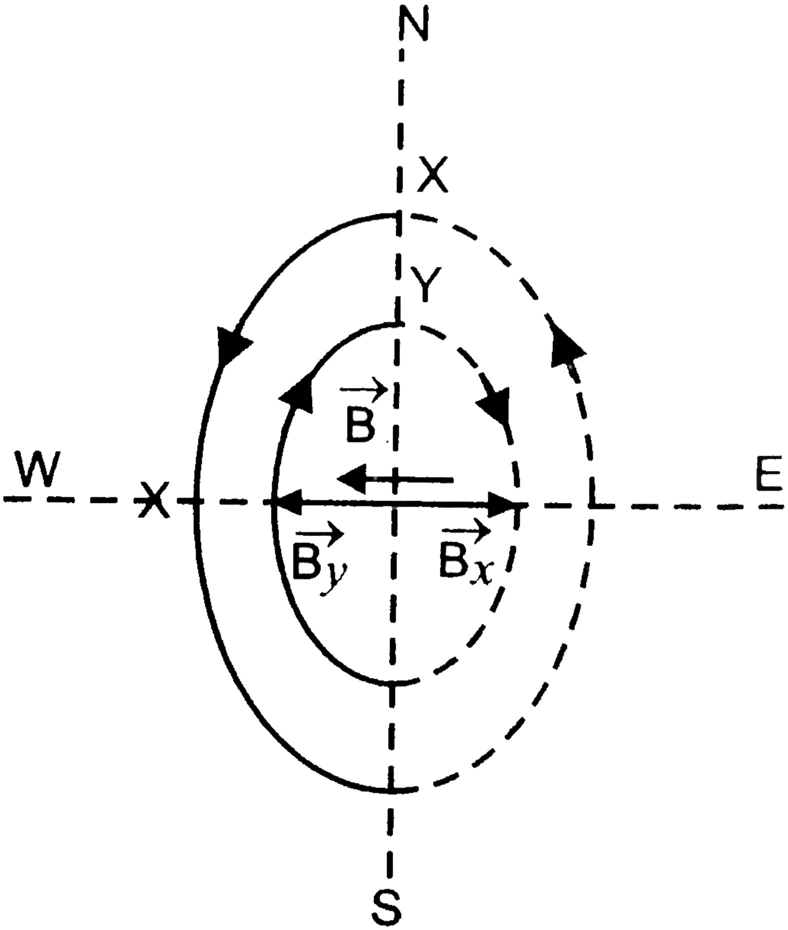
C. $2.13Nm$

D. $4.13Nm$

Answer: A

Watch Video Solution

9. Two concentric coil X and Y of radii $16cm$ and $10cm$ respectively lie in the same vertical plane containing the north-south direction. Coil X has 20 turns and carries a current of 16A, coil Y has 25 turns and carries a current of 18A. The sense of current in X is anti-clockwise and in Y, clockwise, for an observer looking at the coil facing west, Figure. Give the magnitude and direction of the net magnetic field due to the coils at their centre.



A. 1.6×10^{-5} west

B. 1.6×10^{-3} east

C. 1.6×10^{-3} west

D. 1.6×10^{-5} east

Answer: 3

Watch Video Solution

10. A toroid has a core (non ferromagnetic material) of inner radius $25cm$ and outer radius $26cm$ around which 3500 turns of wire are wound. If the current in the wire is $11A$, what is the magnetic field (a) outside the toroid (b) inside the core of the toroid (c) in the empty space surrounded by the toroid?

A. $\left(0, 0, 3 \times 10^{-2}T\right)$

B. $(0, 0, 0)$

C. $\left(0, 3 \times 10^{-2}T, 0\right)$

D. $\left(3 \times 10^{-2}T, 0, 3 \times 10^{-2}T\right)$

Answer: 3

Watch Video Solution

11. A uniform magnetic field of $1 \cdot 5T$ is in cylindrical region of radius $10 \cdot 0cm$ with its direction parallel to the axis along east to west. A wire carrying current of $7 \cdot 0A$ in the north to south direction passes through this region. What is the magnitude and direction of the force on the wire if (a) the wire intersects the axes, (b) the wire is turned from N-S to north east-south west direction, (c) the wire in the N-S direction is lowered from the axis by a distance $6 \cdot 0cm$?

A. $2.1N \downarrow$, $2.1N \downarrow$, $1.68N \downarrow$

B. $1.68N \downarrow$, $2.1N \downarrow$, $2.1N \downarrow$

C. $2.1N \downarrow$, $1.68N \downarrow$, $2.1N \uparrow$

D. $2.1N \uparrow$, $1.68N \downarrow$, $2.1N \uparrow$

Answer: 3

Watch Video Solution

12. A cubical region of space is filled with some uniform electric and magnetic fields. An electron enters the cube across one of its faces with velocity $\vec{v}$ and a positron enters via opposite face with velocity - $\vec{v}$. At this instant,

A. $(a, b, c,)$

B. (b, c, d)

C. (a, d)

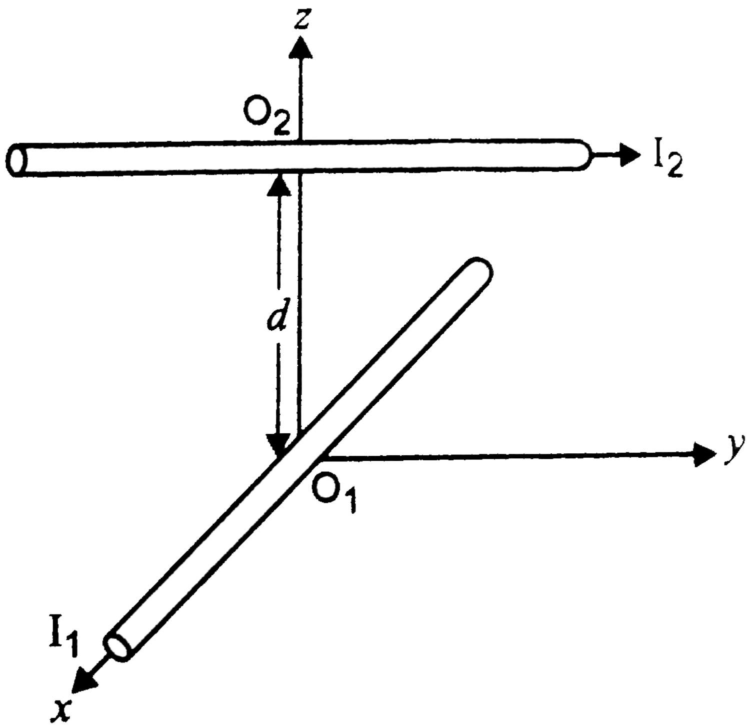
D. (a, c, d)

Answer: 2

Watch Video Solution

13. Two long wires carrying current I_1 and I_2 are arranged as shown in figure. The one carrying current I_1 is along the x-axis. The other carrying current I_2 is along a line parallel to the y-axis given by $x = 0$ and $z = d$.

Find the force exerted at O_2 because of the wire along the x-axis.



A. Bil

B. $2Bil$

C. Zero

D. $\sqrt{2}$ Bil

Answer: 3

Watch Video Solution

14. A current carrying loop consists of 3 identical quarter circles of radius R, lying in the positive quadrants of the x-y, y-z and z-x planes with their centres at the origin, joined together. Find the direction and magnitude to $\vec{B}$ at the origin.

A. $\frac{1}{4}\left(\frac{\mu_0 I}{2R}\right)\left(\hat{i}+\hat{j}+\hat{k}\right)$

B. $2\left(\frac{\mu_0 I}{2R}\right)\left(\hat{i}+\hat{j}+\hat{k}\right)$

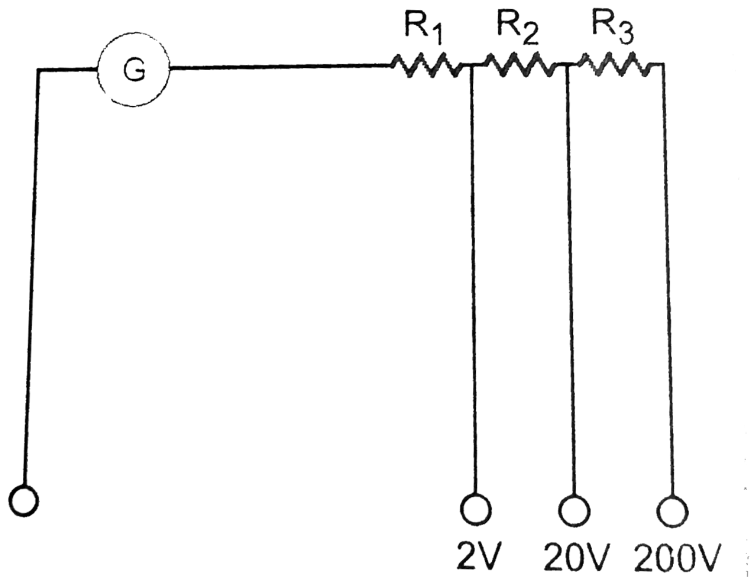
C. $\frac{1}{2}\left(\frac{\mu_0 I}{2R}\right)\left(\hat{i}+\hat{j}+\hat{k}\right)$

D. $3\left(\frac{\mu_0 I}{2R}\right)\left(\hat{i}+\hat{j}+\hat{k}\right)$

Answer: 1

Watch Video Solution

15. A multirange voltmeter can be constructed by using a galvanometer circuit as shown in figure. We want to construct a voltmeter that can measure 2V, 20V and 200V using a galvanometer of resistance 10Ω and that produces maximum deflection for current of $1mA$. Find R_1, R_2 and R_3 that have to be used.



A. $18k\Omega$

B. $180k\Omega$

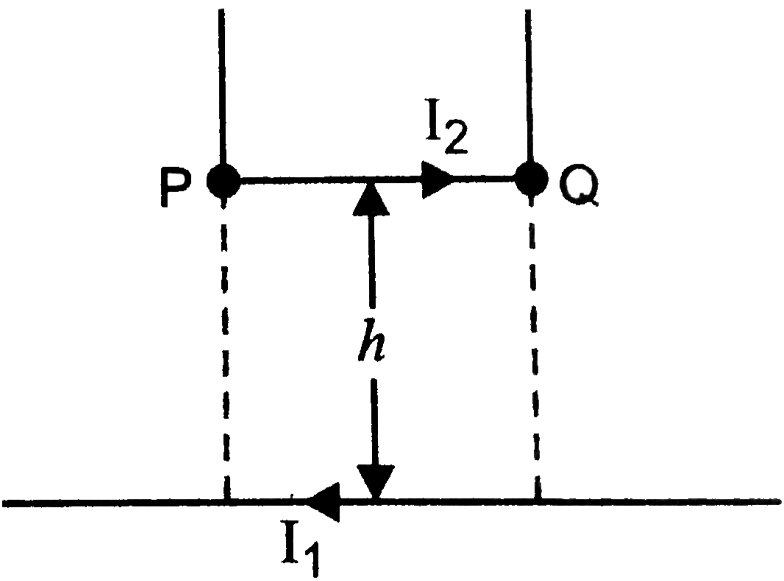
C. $1.8k\Omega$

D. $1800k\Omega$

Answer: 1

Watch Video Solution

16. A long straight wire carrying current of $25A$ rests on a table as shown in figure. Another wire PQ of length 1m, mass $2 \cdot 5g$ carries the same current but in the opposite direction. The wire PQ is free to slide up and down. To what height will PQ rise?



A. $1.5m$

B. $2.5m$

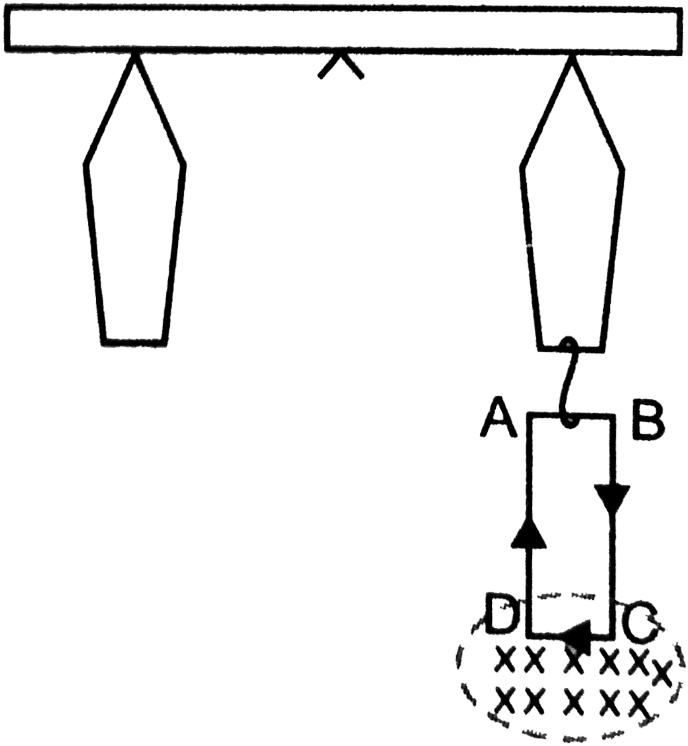
C. $0.51m$

D. $1m$

Answer: 3

Watch Video Solution

17. A 100 turn rectangular coil ABCD (in XY plane) is hung from one arm of a balance (figure). A mass $500g$ is added to the other arm to balance the weight of the coil. A current $4 \cdot 9A$ passes through the coil and a constant magnetic field of $0 \cdot 2T$ acting inward (in xz plane) is switched on such that only arm CD of length $1cm$ lies in the field. How much additional mass 'm' must be added to regain the balance?



A. $1kg$

B. $1gm$

C. $2kg$

D. $2gm$

Answer: 2

Watch Video Solution

18. A rectangular conducting loop consists of two wires on two opposite sides of length l joined together by rods of length d. The wires are each of the same material but with cross-sections differing by a factor of 2. The thicker wire has a resistance R and the rods are of low resistance, which in turn are connected to a constant voltage source V_0. The loop is placed in a uniform magnetic field B at 45° to its plane. Find τ, the torque exerted by the magnetic field on the loop about an axis through the centres of rods.

A. $\frac{V_0AB}{4\sqrt{2}R}$

B. $\frac{V_0AB}{\sqrt{2}R}$

C. $\frac{V_0AB}{2\sqrt{2}R}$

D. $\frac{3V_0AB}{\sqrt{2}R}$

Answer: 1

Watch Video Solution

19. An electron and a position are released from (0, 0, 0) and $(0, 0, 1 \cdot 5R)$ respectively, in a uniform magnetic field $\vec{B} = B_0\hat{i}$, each with an equal momentum of magnitude $p = eBR$. Under what conditions on the direction of momentum will the orbits be non-intersecting circles?

A. $\cos\theta < \frac{3}{8}$

B. $\cos\theta < \frac{1}{8}$

C. $\cos\theta > \frac{1}{8}$

D. $\cos\theta > \frac{3}{8}$

Answer: 1

Watch Video Solution

20. Five long wires A, B, C, D and E, each carrying current I are arranged to form edges of a pentagonal prism as shown in figure. Each carries current out of the plane of paper.

(a) What will be magnetic induction at a point on the axis O? Axis is at a distance R from each wire.

(b) What will be the field if current in one of the wires (say A) is switched off?

(c) What if current in one of the wire (say) A is reversed?

A. $0, \frac{\mu_0 I}{2\pi R}, \frac{\mu_0 I}{\pi R}$

B. $\frac{\mu_0 I}{2\pi R}, 0, \frac{\mu_0 I}{\pi R}$

C. $\frac{\mu_0 I}{2\pi R}, \frac{\mu_0 I}{\pi R}, \frac{\mu_0 I}{\pi R}$

D. $\frac{\mu_0 I}{2\pi R}, \frac{\mu_0 I}{2\pi R}, \frac{\mu_0 I}{\pi R}$

Answer: 1

Watch Video Solution

LEVEL-V (SINGLE ANSWER QUESTION)

1. Two infinitely long, thin, insulated, straight wires lie in the x-y plane along the x- and y- axis respectively. Each wire carries a current I, respectively in the positive x-direction and positive y-direction. The magnetic field will be zero at all points on the straight line:

A. $y = x$

B. $y = -x$

C. $y = x - 1$

D. $y - x + 1$

Answer: a

Watch Video Solution

2. In the given figure the magnitude of magnetic field at O is (all three wires are quarter circular ares)

A. $\frac{\mu_0 I}{4R}\sqrt{3}$

B. $\frac{\mu_0 I}{2R}\sqrt{3}$

C. $\frac{\mu_0 I}{8R}\sqrt{3}$

D. $\frac{\mu_0 I}{6R}\sqrt{3}$

Answer: c

Watch Video Solution

3. Two parallel, long wires carry current i_1 and i_2 with$i_1 > i_2$. When the currents are in the same direction, the magnetic field at a point midway between the wires is $30\mu T$. If the direction of i_1 is reversed , the field becomes $90\mu T$. The ratio i_1/i_2 is

A. 4

B. 3

C. 2

D. 1

Answer: c

Watch Video Solution

4. Magnetic field B along the axis of a long solenoid is given by

A.

B.

C.

D.

Answer: a

Watch Video Solution

5. The magnetic field at the centre O of the circular portion of radius $3cm$ carrying current 4 ampere in the wire is

A. $(8\pi/3)\times10^{-5}T$

B. $(8\pi/3)\times10^{-4}T$

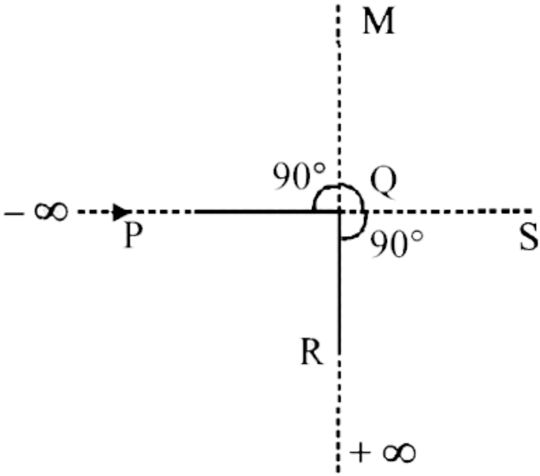
C. $2\pi\times10^{-5}T$

D. $2\pi\times10^{-4}T$

Answer: c

View Text Solution

6. An infinitely long conductor PQR is bent to form a light angle as shown in Figure . A current I flows through PQR . The magnetic field due to this current at the point M is H_1. Now , another infinitely long straight conductor QS is connected at Q so that current is $\frac{I}{2}$ in QR as well as in QS , the current in PQ remaining unchanged . The magnetic field at M is now H_2. The ratio $\frac{H_1}{H_2}$ is given by



A. $1/2$

B. 1

C. $2/3$

D. 2

Answer: c

Watch Video Solution

7. A long current wire is bent in the shapes shown in figure. The circular portion has radius R. The magnetic induction at the center of the circular segment is

A. $-\frac{\mu_0 I}{4\pi R}\left[2\hat{k}p + \pi\hat{i}\right]$, $-\frac{\mu_0 I}{4\pi R}\left[\hat{k} + (\pi + 1)\hat{i}\right]$, $-\frac{\mu_0 I}{4\pi R}\left[\hat{k} + \hat{j} + \frac{3\pi}{2}\hat{i}\right]$

B. $\frac{\mu_0 I}{4\pi R}\left[2\hat{k}p + \pi\hat{i}\right]$, $-\frac{\mu_0 I}{4\pi R}\left[\hat{k} + (\pi + 1)\hat{i}\right]$, $\frac{\mu_0 I}{4\pi R}\left[\hat{k} + \hat{j} + \frac{3\pi}{2}\hat{i}\right]$

C. $-\frac{\mu_0 I}{4\pi R}\left[2\hat{k}p + \pi\hat{i}\right]$, $\frac{\mu_0 I}{4\pi R}\left[\hat{k} + (\pi + 1)\hat{i}\right]$, $\frac{\mu_0 I}{4\pi R}\left[\hat{k} + \hat{j} + \frac{3\pi}{2}\hat{i}\right]$

D. $\frac{\mu_0 I}{4\pi R}\left[2\hat{k}p + \pi\hat{i}\right]$, $\frac{\mu_0 I}{4\pi R}\left[\hat{k} + (\pi + 1)\hat{i}\right]$, $\frac{\mu_0 I}{4\pi R}\left[\hat{k} + \hat{j} + \frac{3\pi}{2}\hat{i}\right]$

Answer: a

View Text Solution

8. An ionized gas contains both positive and negative ions . If it is subjected simultaneously to an electric field along the $+x$ - direction and a magnetic field along the $+y$ - direction and the negative ions towardws $-y$ - direction

A. positive ions defect towards $+y$ directionand negative ions towards $-y$ direction

B. all ions deflect towards $+y$ direction

C. all ions deflect towards $-y$ direction

D. positive ions deflect towards $-y$ direction and negative ions towards $+y$ direction.

Answer: C

Watch Video Solution

9. A charged particle is released from rest in a region of steady and uniform electric and magnetic fields which are parallel to each other . The particle will remove in a

A. Straight lines

B. circle

C. helix

D. cycloid.

Answer: A

Watch Video Solution

10. A charged particle of mass m and charge q enters a magnetic field B with a velocity v at an angle θ with the direction of B. The radius fo the resulting path is

A. $\frac{mv\sin\theta}{qB}$

B. $\frac{mv}{qB\sin\theta}$

C. $\frac{mv}{qB}$

D. $\frac{mv\tan\theta}{qB}$

Answer: A

Watch Video Solution

11. A particle of mass m and charge q is projected into a region having a perpendicular magnetic, field B. Find the angle of deviation of the particle as it comes out of the magnetic field if th„ width of the region is (b)

(a) $\frac{2mv}{Bq}$ (b)(mv)/(Bq)(c)(mv)/(2 Bq)`

A. 30°

B. 60°

C. 45°

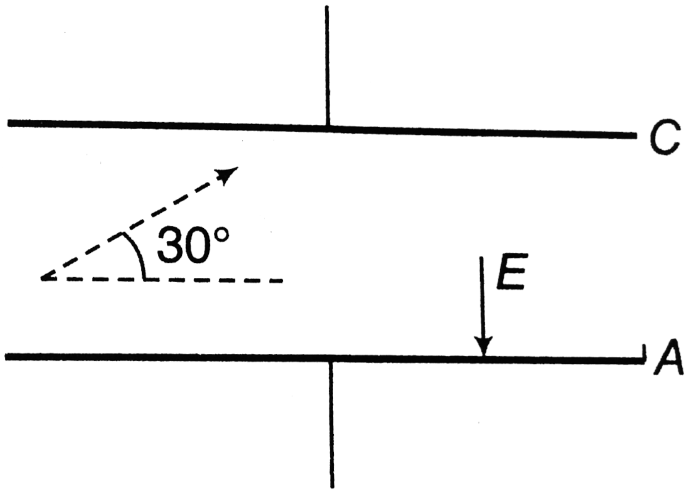
D. 90°

Answer: A

Watch Video Solution

12. A charged particle having charge 10^{-6} C and mass of 10^{-10} kg is fired from the middle of the plate making an angle 30° with plane of the plate.

Length of the plate is $0.17m$ and it is separated by $0.1m$. Electric field $E = 10^{-3}\frac{N}{C}$ is present between the plates. Just outside the plates magnetic field is present. Find the velocity of projection of charged particle and magnitude of the magnetic field perpendicular to the plane of the figure, if it has to graze the plate at C and A parallel to the surface of the plate. (Neglect gravity)



A. $3.4mT$

B. $4.3mT$

C. $2.3mT$

D. $5.3mT$

Answer: A

Watch Video Solution

13. A particle moves in a circle of diamater 1.0 cm under the action of magnetic field of 0.40 T, An electric field of $200Vm^{-1}$ makes the path straight. Find the charges/mass ration of the particle.

A. $2.5 \times 10^3 C/kg$

B. $2 \times 10^3 C/kg$

C. $3.5 \times 10^5 C/kg$

D. $3 \times 10^5 C/kg$

Answer: A

Watch Video Solution

14. A proton , a deutron and α)- particle having the same kinetic energy are moving in circular trajectories in a constant magnetic field . If $r_p, r_d,$ and r_α denote respectively the radii of the trajectories of these particles , then

A. $r_a = r_p < r_d$

B. $r_a > r_d > r_p$

C. $r_a = r_d > \; > r_p$

D. $r_p = r_d = r_a$

Answer: A

Watch Video Solution

15. A proton of mass $1.67 \times 10^{-27} kg$ and charge $1.6 \times 10^{-19} c$ is projected with a speed of $2 \times 10^6 m/s$ at an angle of $60°$ to the x-axis. If a uniform magnetic field of 0.104 Tesla is applied along Y-axis, the path of proton is

A. a circle of radius $\cong 0.1m$ and time perio $\pi \times 10^{-7}s$

B. a circle of radius $\cong 0.2m$ and time period $2\pi \times 10^{-7}s$

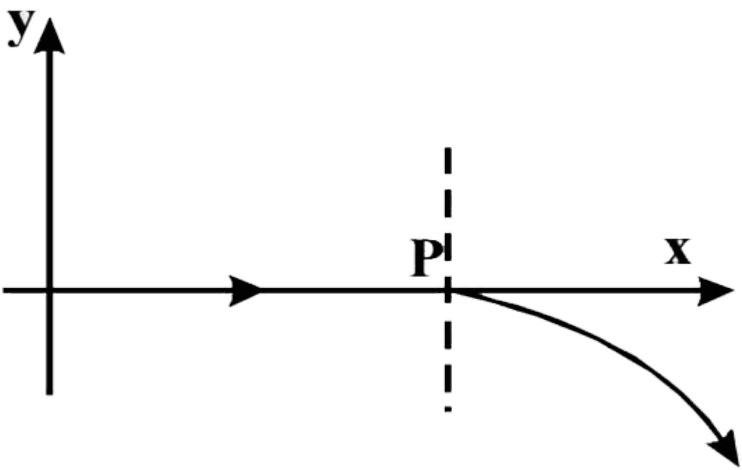
C. a helix of radius $\cong 0.1m$ and time period $2\pi \times 10^{-7}s$

D. a helix of radius $\cong 0.2m$ and time period $4\pi \times 10^{-7}s$

Answer: C

Watch Video Solution

16. For a positively charged particle moving in a $x - y$ plane initially along the $x - a\xi s$, there is a sudden change in its path due to the presence of electric and//or magnetic fields beyond p . The curved path is shown in the $x - y$plane and is found to be non - circular. Which one of the following combinations is possible ?



A. $\vec{E} = 0, \vec{B} = b\hat{i} + c\hat{k}$

B. $\vec{E} = a\hat{i}, \vec{B} = c\hat{k} + a\hat{i}$

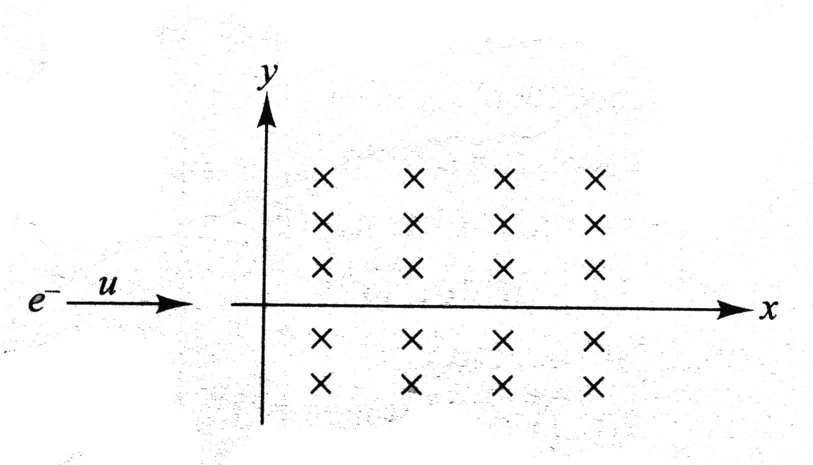
C. $\vec{E} = 0, \vec{B} = c\hat{j} + b\hat{k}$

D. $\vec{E} = a\hat{i}, \vec{B} = c\hat{k} + b\hat{j}$

Answer: B

Watch Video Solution

17. An electron moving with a speed u along the positive x-axis at $y = 0$ enters a region of uniform magnetic field which exists to the right of y-axis. The electron exits from the region after some time with the speed v at coordinate y, then



A. $v > u, y < 0$

B. $v = u, y > 0$

C. $v > u, y > 0$

D. $v = u, y < 0$

Answer: D

Watch Video Solution

18. A uniform magnetic field is directed out of the page. A charged particle , moving in the plane of the page, follows a clockwise spiral of decreasing radius as shown. A reasonable explanation is :

A. the charge is positive and slowing down

B. the charge is negative and slowing down

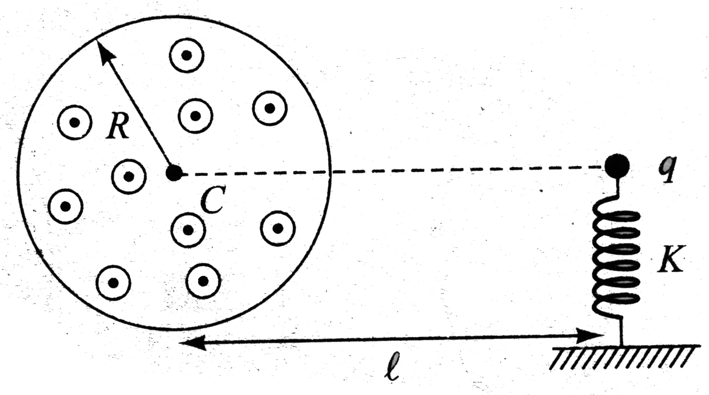
C. the charge is positive and speeding up

D. the charge is negative and speeding up

Answer: A

View Text Solution

19. There is a horizontal cylindrical uniform but time-varying nagnetic field increasing at a constant rate dB/dt as shown in Fig. 3.173. A charged particle having charge q and mass m is kept in euilibrium, at the top of a spring of spring constant K, in such a way that it is on the horizontal line passing through the center of the magnetic field as shown in the figure. The compression in the spring will be



A. $\frac{1}{K}\left[mg - \frac{qR^2}{2l}\frac{dB}{dt}\right]$

B. $\frac{1}{K}\left[mg + \frac{qR^2}{l}\frac{dB}{dt}\right]$

C. $\frac{1}{K}\left[mg + \frac{2qR^2}{l}\frac{dB}{dt}\right]$

D. $\frac{1}{K}\left[mg + \frac{qR^2}{2l}\frac{dB}{dt}\right]$

Answer: D

Watch Video Solution

20. A charged particle of specific charge (charge/mass) α released from origin at time $t = 0$ with velocity $\vec{v} = v_0\left(\hat{i} + \hat{j}\right)$ in uniform magnetic field $\vec{B} = B_0\hat{i}$. Coordinates of the particle at time $t = \pi/\left(B_0\alpha\right)$ are

A. $\left(\frac{\upsilon_0}{2B_0\alpha}, \frac{\sqrt{2}\upsilon_0}{\alpha B_0}, \frac{-\upsilon_0}{B_0\alpha}\right)$

B. $\left(\frac{-\upsilon_0}{2B_0\alpha}, 0, 0\right)$

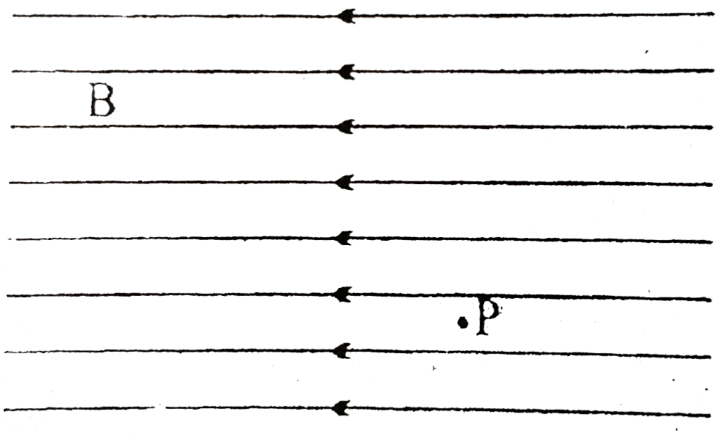
C. $\left(0, \frac{2\upsilon_0}{B_0\alpha}, \frac{\upsilon_0\pi}{2B_0\alpha}\right)$

D. $\left(\frac{\upsilon_0\pi}{B_0\alpha}, 0, \frac{-2\upsilon_0}{B_0\alpha}\right)$

Answer: D

Watch Video Solution

21. Consider the uniform magnetic field shown:



Starting from point P and without leaving the region of magnetic field, is it possible to choose a closed path (that is, a path that returns to P) for which the line integral of the magnetic field is nonzero?

A. Yes, but only anti clockwise

B. Yes, but only clockwise

C. Yes, both anti clockwise and clockwise

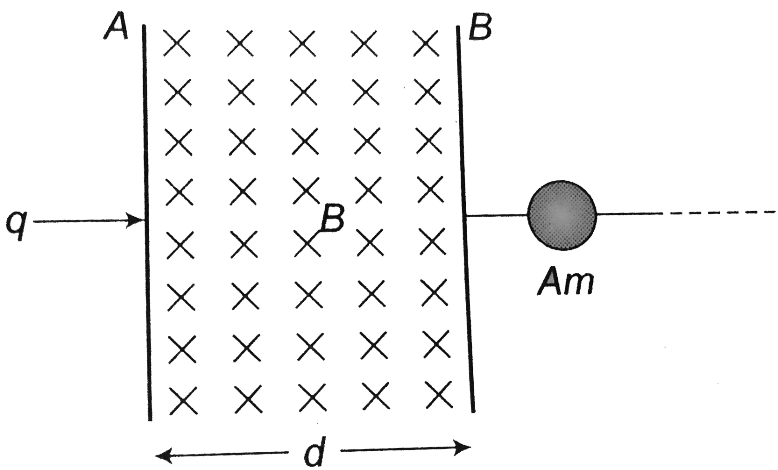
D. No

Answer: D

Watch Video Solution

Watch Video Solution

22. Two charged plates A and B are at the same electrical potential, and parallel and separated by a distance d. A unifrom magnetic induction field B acts perpendicular to plane of paper (and parallel to plates)n between the plates. Particels,each with charge q, mass m and kinetic energy K are shot throgh a hole in A directly towards B, each particle entering the hole perpendicular to A, An ammeter AM connected to an electrical network is connected to B and measures the current collected by the plate B, as the particles hit it. The limited value of the fied B for which the ammeter will stop showing a current is



A. $\dfrac{\sqrt{2mK}}{qd}$

B. $\dfrac{\sqrt{3mK}}{qd}$

C. $\dfrac{\sqrt{mK}}{qd}$

D. $\dfrac{2\sqrt{mK}}{qd}$

Answer: A

Watch Video Solution

23. A particle of charge per unit mass α is released from origin with a velocity $\vec{v} = v_0\hat{i}$ in a magnetic field

$\vec{B} = -B_0\hat{k}$ for $x \leq \dfrac{\sqrt{3}}{2}\dfrac{v_0}{B_0\alpha}$

and $\vec{B} = 0$ for $x > \dfrac{\sqrt{3}}{2}\dfrac{v_0}{B_0\alpha}$

The x-coordinate of the particle at time $t\left(\dfrac{\pi}{3B_0\alpha}\right)$ would be

A. $\dfrac{\sqrt{3}}{2}\dfrac{\upsilon_0}{B_0\alpha} + \dfrac{\sqrt{3}}{2}\upsilon_0\left(t - \dfrac{\pi}{B_0\alpha}\right)$

B. $\frac{\sqrt{3}}{2}\frac{\upsilon_0}{B_0\alpha}+\upsilon_0\left(t-\frac{\pi}{3B_0\alpha}\right)$

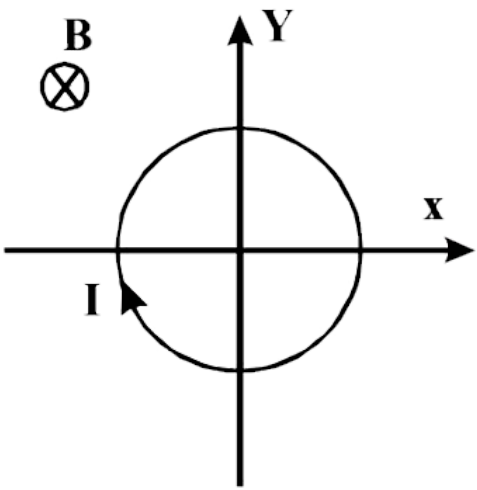
C. $\frac{\sqrt{3}}{2}\frac{\upsilon_0}{B_0\alpha}+\frac{\upsilon_0}{2}\left(t-\frac{\pi}{3B_0\alpha}\right)$

D. $\frac{\sqrt{3}}{2}\frac{\upsilon_0}{B_0\alpha}+\frac{\upsilon_0 t}{2}$

Answer: C

Watch Video Solution

24. A conducting loop carrying a current I is placed in a uniform magnetic field ponting into the plane of the paper as shown. The loop will have a tendency to



A. contract

B. expand

C. move towards positive x - axis

D. move towards negative x - axis

Answer: B

Watch Video Solution

25. Two thin long parallel wires seperated by a distance 'b' are carrying a current ' I' amp each . The magnitude of the force3 per unit length exerted by one wire on the other is

A. $\frac{\mu_0 i^2}{b^2}$

B. $\frac{\mu_0 i^2}{2\pi b}$

C. $\frac{\mu_0 i}{2\pi b}$

D. $\frac{\mu_0 i}{\pi b^2}$

Answer: B

Watch Video Solution

26. A rod of mass m and radius R rest on two parallel rails that are distance l apart and have a length L. The rod carries a current I(in the direction shown) and rolls along the rails without slipping. A uniform magnetic field B is directed perpendicular to the rod and the rails. If it starts from rest, wat is the speed of the rod as it leaves the rails ?

A. $\sqrt{\frac{4BIlL}{3m}}$

B. $\sqrt{\frac{3BIlL}{3m}}$

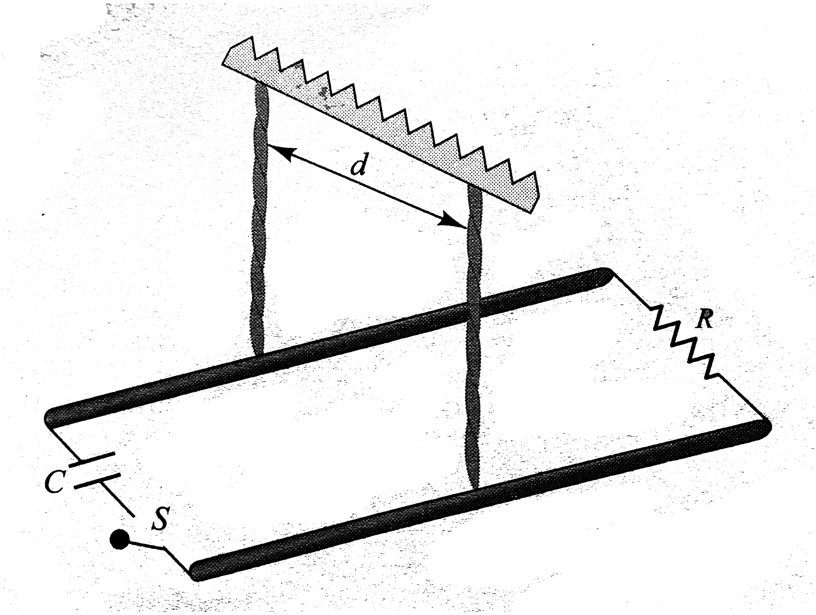
C. $\sqrt{\frac{4BIlL}{2m}}$

D. $\sqrt{\frac{BIlL}{m}}$

Answer: A

Watch Video Solution

27. Two long conducting rods suspended by means of two insulating threads as shown in Fig. are connected at one end to a charged capacitor through a switch S, which initially open. At the other end , they are connected by a loose wire. The capacitor has charge Q and mass per unit length of the rod is λ. The effective resistance of the circuit after closing the switch is R. Find the velocity of each rod when the capacitor is discharged after closing the switch. (Assume that the displacement of rods during the discharging time is negligible.)



A. $\frac{\mu_0 Q^2}{4\pi\lambda dRC}$

B. $\frac{\mu_0 Q}{4\pi\lambda dRC}$

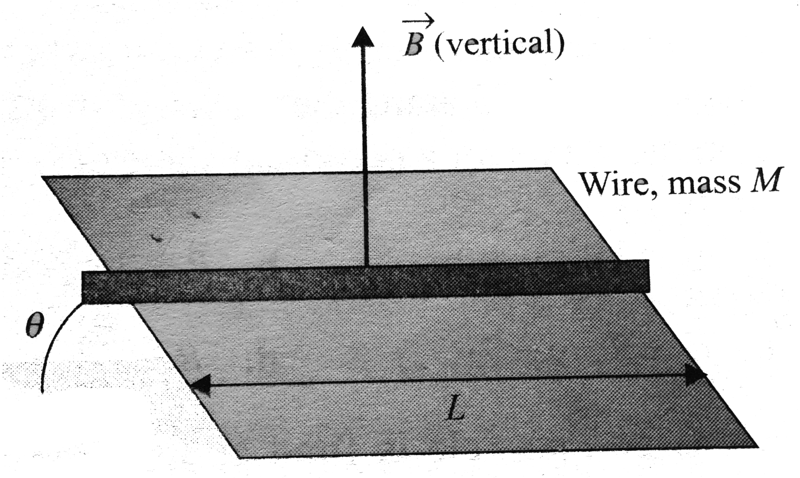
C. $\frac{\mu_0 Q^3}{4\pi\lambda dRC}$

D. $\frac{\mu_0 Q^4}{4\pi\lambda dRC}$

Answer: A

Watch Video Solution

28. A straight peice of conducting wire with mass M and length L is placed on a frictionless incline tilited at an angle θ from the horizontal (as shown in fig) There is a uniform. Vertical magnetic field at all points (produced by an arrangement of magnets not shown in fig. To keep the wire from sliding down the incline, a voltage source is



attached to the ends of the wire. When just the right amount of current flows through the wire, the wire remains at rest. Determine the magnitude and direction of the current in the wire that will cause the wire to remain at rest.

A. $\dfrac{Mg\tan\theta}{2LB}$ to the left

B. $\frac{Mg\tan\theta}{LB}$ to the right

C. $\frac{Mg\tan\theta}{LB}$ to the left

D. $\frac{3Mg\tan\theta}{2LB}$ to the left

Answer: C

Watch Video Solution

29. Figure shows four wires placed in the same uniform magnetic field B and carrying the same current in which case force acting on the wire is minimum

A.

B.

C.

D.

Answer: B

View Text Solution

30. An alpha particle moving with a velocity $\vec{v}_1 = 2\hat{i} m/s$ is a uniform magnetic field experiences a force $\vec{F}_1 = -4e(\hat{j} - \hat{k})N$. When the particle moves with a velocity $\vec{v}_2 = \hat{j} m/s$, then the force experienced by it is $\vec{F}_2 = 2e(\hat{i} - \hat{k})N$. The magnetic induction $\vec{B}$ at that point is :

A. $\hat{i} + \hat{j} - \hat{k}$

B. $-\hat{i} - \hat{j} + \hat{k}$

C. $\hat{i} - \hat{j} - \hat{k}$

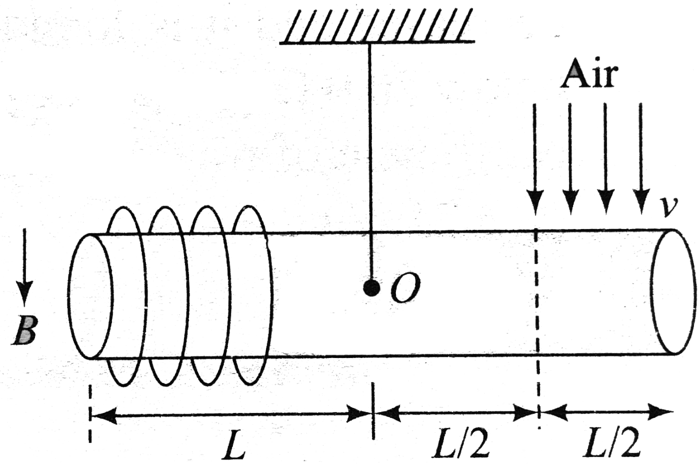
D. $\hat{i} + \hat{j} + \hat{k}$

Answer: D

Watch Video Solution

31. A non-conducting rod having circular cross section of radius R is suspended from a rigid support as shown in fig. A light and small coil of

300turns is wrapped tightly at the left end where uniform magnetic filed B exists in vertically downward direction. Air of density ρ hits the half of the right part of the rod with velocity V as shown in the fig. What should be current in clockwise direction (as seen from O) in the coil so that rod remains horizontal? Give answer in mA. Given $\frac{2}{Lv}\sqrt{\frac{\pi RB}{\rho}} = \frac{1}{\sqrt{5}} A^{-1/2}$.



A. $0.01A$

B. $0.1A$

C. $0.02A$

D. $0.2A$

Answer: A

Watch Video Solution

32. A current carrying wire frame is in the shape of digit eight (8). It is carrying current i_0. If the radius of each loop is R_0, then the net magnetic dipole moment of the figure is :

A. $\left(i_0 \pi R_0^2\right)\sqrt{2}$

B. zero

C. $i_0 \times 2\pi R_0^2$

D. $i_0 \times \left(4\pi R_0\right)$

Answer: B

Watch Video Solution

33. An insulating rod of length l carries a charge q distrubuted uniformly on it. The rod is pivoted at its mid-point and is rotated at a frequency f about a fixed axis perpendicular to the the rod and passing through the pivot . The magnetic moment of the rod system is

A. zero

B. $\pi q f l^2$

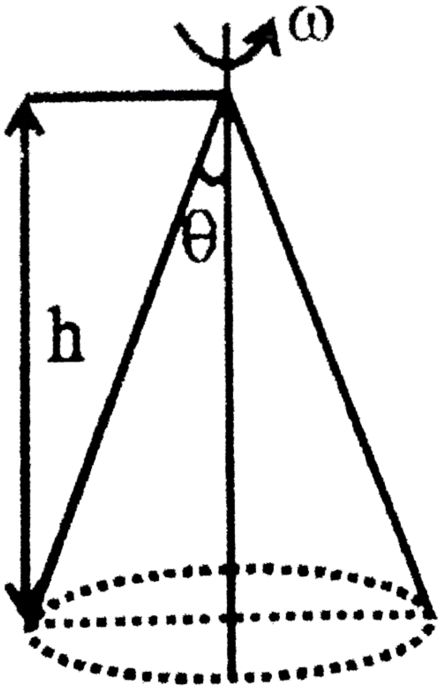
C. $\frac{1}{2}\pi q f l^2$

D. $\frac{1}{3}\pi q f l^2$

Answer: D

Watch Video Solution

34. Q charge is uniformaly distributed over the same surface of a right circular cone of semi -vertical angle theta and height h The cone is uniformly rotated about its axis at angular velocity omega Calculated associated magnetic dipole moment



A. $\frac{Q\omega \tan^2\theta h^2}{4}\hat{n}$

B. $\frac{Q\omega \tan^2\theta h^2}{2}\hat{n}$

C. $\frac{Q\omega \tan^2\theta h^2}{3}\hat{n}$

D. $Q\omega \tan^2\theta h^2\hat{n}$

Answer: A

Watch Video Solution

35. A sphere of radius R, uniformly charged with the surface charge density σ rotates around the axis passing through its centre at an angular velocity. (a) Find the magnetic induction at the centre of the rotating sphere. (b) Also, find its magnetic moment.

A. $\frac{2}{3}\mu_0\omega\sigma R(\hat{k}), \frac{4}{3}\pi\sigma R^4\omega$

B. $\frac{2}{3}\mu_0\omega\sigma R^2(\hat{k}), \frac{4}{3}\pi\sigma R^4\omega$

C. $\frac{2}{3}\mu_0\omega\sigma R^3(\hat{k}), \frac{4}{3}\pi\sigma R^4\omega$

D. $\frac{2}{3}\mu_0\omega\sigma R^4(\hat{k}), \frac{4}{3}\pi\sigma R^4\omega$

Answer: A

Watch Video Solution

36. A conductor carries a constant current I along the closed path abcdefgha involving 8 of the 12 edges of length l. Find the magnetic dipole moment of the closed path.

A. $l^2 I\hat{j}$

B. $l^3 I\hat{j}$

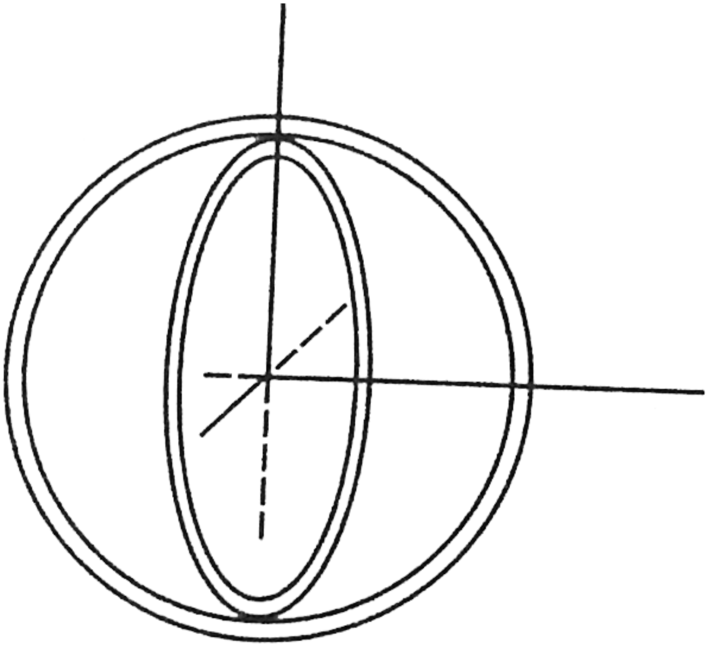
C. $l^4 I\hat{j}$

D. $l^5 I\hat{j}$

Answer: A

Watch Video Solution

37. Two insulated rings, one of a slighlty smaller diameter than the other are suspended along their common diameter as shown. Initially the planes of the rings are mutually perpendicular. When a steady current is set up each of them



A. The two rings rotate into a common plane

B. The inner ring oscillates about its initial position

C. The inner ring stays stationary while the outer one moves into the plane of the inner ring.

D. The outer ring stays stationary while the inner one moves into the plane of the outer ring.

Answer: A

Watch Video Solution

38. A uniformly charged ring of radius R is rotated about its axis with constant linear speed v of each of its particle. The ratio of electric field to magnetic field at a point P on the axis of the ring distant $x = R$ from centre of ring is (c is speed of light)

A. $\frac{c^2}{v}$

B. $\frac{v^2}{c}$

C. $\frac{v}{c}$

D. $\frac{c}{v}$

Answer: A

Watch Video Solution

39. In the given loop length of each side is a. Current flowing through the loop is $I = 1$ amp. Find its manetic dipole moment.

A. $\frac{a^2}{\sqrt{2}}\left(\hat{j}\right) + \frac{a^2\left(1 - \sqrt{2}\right)}{\sqrt{2}}\left(\hat{i}\right) - a^2\left(\hat{k}\right)$

B. $\frac{a^2}{\sqrt{2}}\left(-\hat{i}\right) + \frac{a^2\left(1 - \sqrt{2}\right)}{\sqrt{2}}\left(\hat{j}\right) + a^2\left(-\hat{k}\right)$

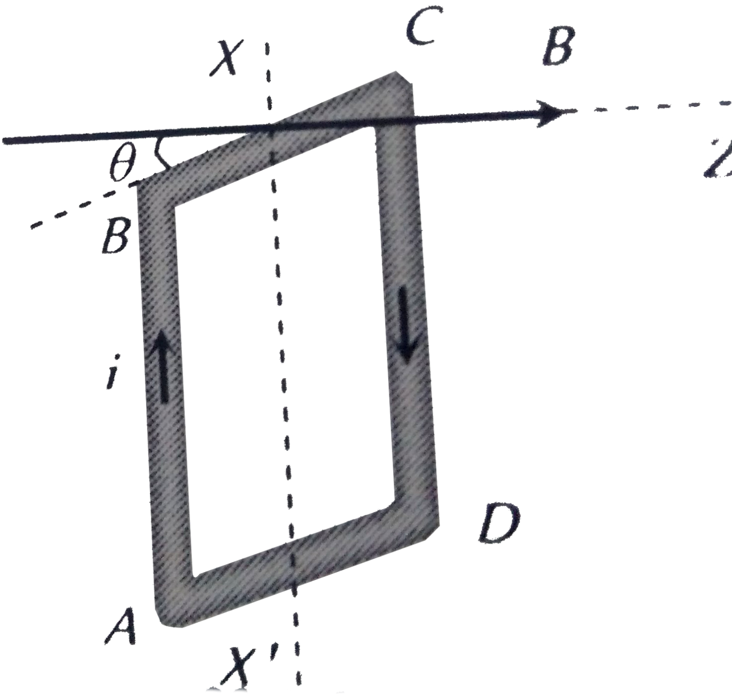
C. $-a^2\left(\hat{i}\right) - \frac{a^2\left(1 - \sqrt{2}\right)}{\sqrt{2}}\left(\hat{j}\right) - \frac{a^2}{\sqrt{2}} - \frac{a^2}{\sqrt{2}}\left(\hat{k}\right)$

D. none of these

Answer: B

Watch Video Solution

40. The square loop $ABCD$, carrying a current i, is placed in uniform magnetic field B, as shown. The loop can rotate about the axis XX'. The plane of the loop makes and angle$\theta\left(\theta < 90^\circ\right)$ with the direction of B. Through what angle will the loop rotate by itself before the torque on it becomes zero



A. θ

B. $90^{\circ} - \theta$

C. $90^{\circ} + \theta$

D. $180^{\circ} - \theta$

Answer: C

Watch Video Solution

41. A flat circular coil, carrying a current, has a magnetic moment μ

A. μ has only magnitude, it does not have direction

B. The direction of μ is along the normal to the plane of the coil

C. The direction of μ depends on the direction of the current flow

D. The direction of μ does not change if the current in the coil is reversed

Answer: B,C

Watch Video Solution

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

A. The magnetic field at all points inside the pipe is the same, but not zero.

B. The magnetic field at any point inside the pipe is zero

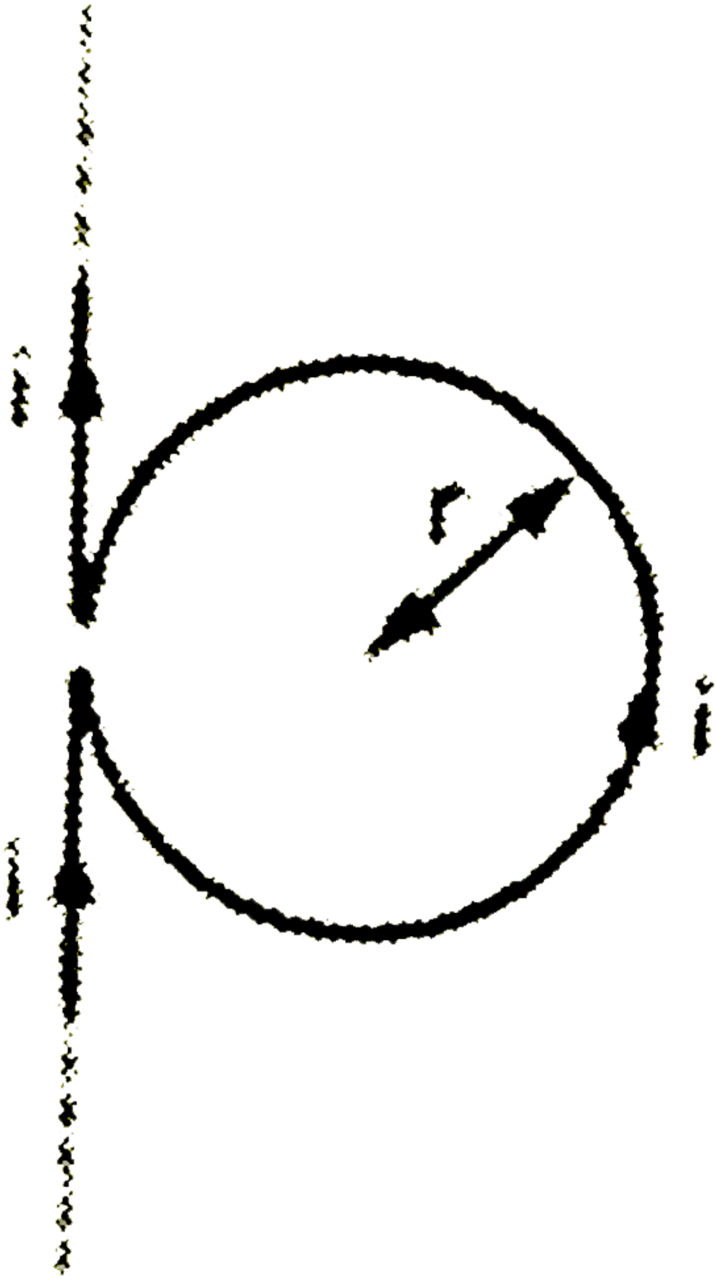
C. The magnetic field is zero only on the axis of the pipe

D. The magnetic field is different points inside the pipe.

Answer: B

Watch Video Solution

43. A long straight conductor carrying a current i is bent to form an almost complete circular loop of radius r on it. The magnetic field at the centre of the loop



A. is directed into the paper

B. is directed out of the paper

C. has magnitude $\frac{\mu_0 i}{2R}\left(1 - \frac{1}{\pi}\right)$

D. has magnitude $\frac{\mu_0 i}{2R}\left(1 + \frac{1}{\pi}\right)$

Answer: A,C

Watch Video Solution

44. The figure shows an infinitely long current wire out of the plane of the paper (shown as a dot ' $\odot$ '). A current carrying loop ABCD is placed as shown in figure. The loop

A. experiences no net force

B. experiences no torque

C. turns clockwise as seen by an observer located at the dot (' $\odot$ ')

D. turns anti - clockwise as seen by an observer located at the dot

(' ⊙ ')

Answer: A,C

View Text Solution

45. A charged particle moves in a uniform magnetic field. The velocity of the particle at some instant makes an acute angle with the magnetic field. The path of the particle will be

A. a circle

B. a helix with uniform pitch

C. a helix with non uniform radius

D. a helix with uniform radius

Answer: B,D

Watch Video Solution

46. A charged particle goes undeflected in a region containing electric and magnetic field. It is possible that

(i) $\vec{E}\,||\,\vec{B}.\ \vec{v}\,||\,\vec{E}$

(ii) $\vec{E}$ is not parallel to $\vec{B}$

(iii) $\vec{v}\ |\ |\ \vec{B}$ but $\vec{E}$ is not parallel to $\vec{B}$

(iv) $\vec{E}\ |\ |\ \vec{B}$ but $\vec{v}$ is not parallel to $\vec{E}$

A. $\vec{E}\,||\,\vec{B},\ \vec{v}\,||\,\vec{E}$

B. $\vec{E}$ is not parallel to $\vec{B}$

C. $\vec{v}\ |\ |\ \vec{B}$ but $\vec{E}$ is not parallel to $\vec{E}$

D. $\vec{E}\ |\ |\ \vec{B}$ but $\vec{v}$ is not parallel to $\vec{E}$.

Answer: A,B,C,D

Watch Video Solution

47. A region has uniform electric and magnetic fields along the positive x-direction. An electron is fired from the origin at an angle $\theta\left(< 90^{\circ} \right)$ with the x-axis. It will

(i) move along a helical path of increasing pitch

(ii) move along a helical path of decreasing pitch initially

(iii) return to the yz plane at some time

(iv) come to rest momentarily at some position

A. move along a helical path of increasing pitch

B. move along a helical path of decreasing pitch initially

C. return to the origin after some time

D. come to rest momentarily at some position

Answer: B,C

Watch Video Solution

48. A semicircular wire of radius r, carrying a current I, is placed in a magnetic field of magnitude B. The force acting on it

A. can never be zero

B. can have the maximum magnitude $2Bir$

C. can have the maximum magntidue $Bi\pi r$

D. can have the maximum magnitude Bir

Answer: B

Watch Video Solution

49. A charged particle of unit mass and unit charge moves with velocity $\vec{v} = \left(8\hat{i} + 6\hat{j}\right)ms^{-1}$ in magnetic field of $\vec{B} = 2\hat{k}T$. Choose the correct alternative (s).

A. The path of the particle may be $x^2 + y^2 - 4x - 21 = 0$

B. The path of the particle may be $x^2 + y^2 = 25$

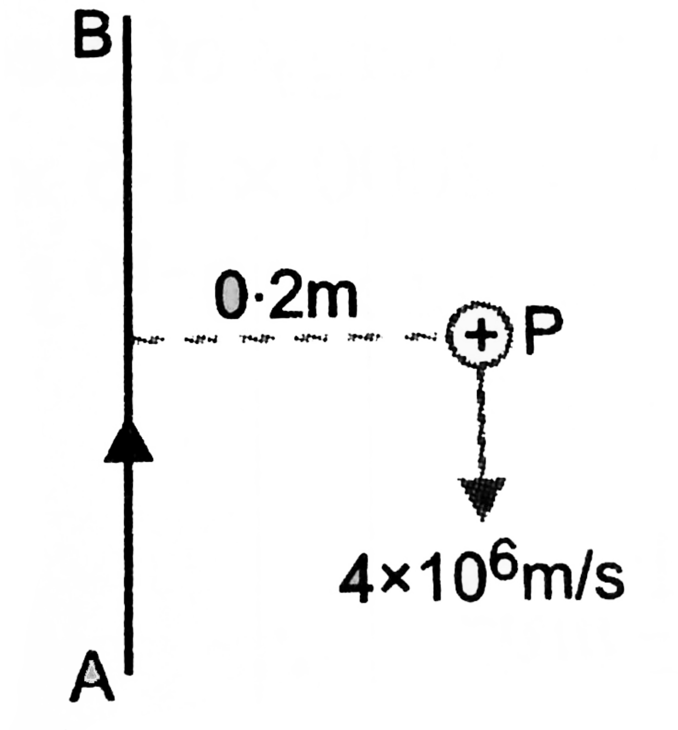
C. The path of the particle may be $y^2 + z^2 = 25$

D. The time period of the particle will be $3.14s$.

Answer: B,D

Watch Video Solution

50. A long straight wire AB carries a current of $4A$. A proton P travels at $4 \times 10^6 ms^{-1}$ parallel to the wire, $0 \cdot 2m$ from it and in a direction opposite to the current as shown in figure. Calculate the force which the magnetic field of current exerts on the proton. Also specify the direction of the force.



A. $2.56 \times 10^{-18} N$ towards left

B. $2.56 \times 10^{-18} N$ towards right

C. $5.12 \times 10^{-18} N$ towards left

D. $5.12 \times 10^{-8} N$ towards right

Answer: B

Watch Video Solution

51. Two circular coil of radii 5cm and 10cm carry equal currents of 2A. The coils have 50 and 100 turns, respectively, and are placed in such a way that their planes as well as their centers coincide. Magnitude of magnetic field at the common centre of coils is

A. $8\pi \times 10^{-4} T$ if current in the coil are in same sense.

B. $4\pi \times 10^{-4} T$ if current in the coil are in opposite sense.

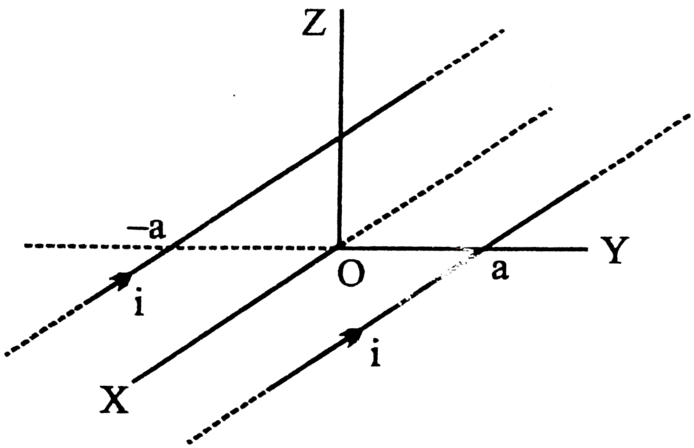
C. Zero if currents in the coils are in opposite sense.

D. $8\pi \times 10^{-4} T$ if current in the coil are in opposite sense.

Answer: A,C

Watch Video Solution

52. Two long thin, parallel conductors carrying equal current in the same direction are fixed parallel to the x-axis one passing through magnetic field due to the two conductors at any point is B Which of the following are correct ?(A) B=0 for all points on the x-axis (B) At all points on the y-axis, excluding the origin, B has only a zcomponent. (C) At all points on the z-axis, excluding the origin, B has only an x-component.



A. $B = 0$, for all points on the x - axis

B. At all points on the y - axis, excluding the origin, B has only a z - component.

C. At all points on the z - axis , excluding the origin, B has only a y - component.

D. B cannot have an x - component

Answer: A,B,C,D

Watch Video Solution

53. A long straight wire carries the current along +ve x-direction. Consider four points in space $A(0, 1, 0), B(0, 1, 1), C(1, 0, 1), \text{ and } D(1, 1, 1)$. Which of the pairs will have the same magnitude of magnetic field?

A. A and B

B. A and C

C. B and C

D. B and D

Answer: B,D

Watch Video Solution

54. Current flows through a straight cylindrical conductor of radius r. The current is distributed uniformly over its cross-section. The magnetic field at a distanace x from the axis of the conductor has magnitude B:

A. $B = 0$ at the axis

B. $B \propto x$ for $0 \leq x \leq r$

C. $B \propto \frac{1}{x}$ for $x > r$

D. B is maximum for $x = r$

Answer: A,B,C,D

Watch Video Solution

55. There are two infinite parallel current carrying wires in vertical plane. Lower wire is fixed and upper wire is having a linear mass density λ. Two wires are carrying currents I_1 and I_2. Now upper wire is placed in a magnetic field produced by lower wire. Magnetic field due to lower wire at the location of upper wire is $\frac{\mu_0 I}{2\pi d}$, where I_1 current lower wire, d separation between wires.

Force on any small portion of upper wire having length dl is $dF = \frac{\mu_0 I_1 I_2 dl}{2\pi d}$, where I_2 current in the upper wire. If directions of current in the wires is appropriate then upper wire can be in equilibrium if its weight is balanced by magnetic force. Now answer the following questions.

Equilibrium separation between the two wires is

A. $\frac{\mu_0 I_1 I_2}{4\pi\lambda g}$

B. $\frac{\mu_0 I_1 I_2}{2\pi\lambda g}$

C. $\frac{\mu_0 I}{\pi\lambda g}$

D. $\frac{\mu_0 I_2 I_2}{6\pi\lambda g}$

Answer: B

Watch Video Solution

56. There are two infinite parallel current carrying wires in vertical plane. Lower wire is fixed and upper wire is having a linear mass density λ. Two wires are carrying currents I_1 and I_2. Now upper wire is placed in a magnetic field produced by lower wire. Magnetic field due to lower wire at the location of upper wire is $\frac{\mu_0 I}{2\pi d}$, where I_1 current lower wire, d

separation between wires.

Force on any small portion of upper wire having length dl is $dF = \frac{\mu_0 I_1 I_2 dl}{2\pi d}$, where I_2 current in the upper wire. If directions of current in the wires is appropriate then upper wire can be in equilibrium if its weight is balanced by magnetic force. Now answer the following questions.

The upper wire can be in equilibrium if

A. Direction of current inboth wires is same

B. Direction of current in both wires is opposite

C. Equilibrium does not depend upon the direction of currents

D. Two wires attract each other.

Answer: B

Watch Video Solution

57. There are two infinite parallel current carrying wires in vertical plane. Lower wire is fixed and upper wire is having a linear mass density λ. Two wires are carrying currents I_1 and I_2. Now upper wire is placed in a magnetic field produced by lower wire. Magnetic field due to lower wire at the location of upper wire is $\frac{\mu_0 I}{2\pi d}$, where I_1 current lower wire, d separation between wires.

Force on any small portion of upper wire having length dl is $dF = \frac{\mu_0 I_1 I_2 dl}{2\pi d}$, where I_2 current in the upper wire. If directions of current in the wires is appropriate then upper wire can be in equilibrium if its weight is balanced by magnetic force. Now answer the following questions.

If upper wire is slightly displaced from its mean position and released it will perform simple harmonic motion. As wire then total mechanical energy of wire

A. Remains constant

B. Decreases

C. We can't say anything about mechanical energy in magnetic field

D. Increases

Answer: A

Watch Video Solution

58. A closed current-carrying loop having a current I is having area A. Magnetic moment of this loop is defined as $\vec{\mu} = I\overrightarrow{A}$ where direction of area vector is towards the observer if current is flowing in anticlockwise direction with respect to the observer. If this loop is placed in a uniform magnetic field $\vec{B}$, then torque acting on the loop is given by $\vec{\tau} = \vec{\mu} \times \vec{B}$. Now answer the following questions:

A uniformly charged insulating ring is rotated in a uniform magnetic field about its own axis, then

A. Ring will experience a magnetic force

B. Ring must be experience a magnetic torque

C. Ring may experience a magnetic torque

D. None of the above

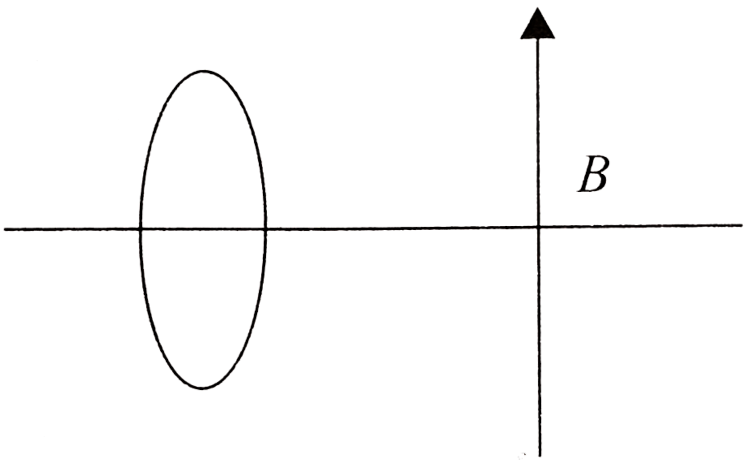
Answer: C

Watch Video Solution

59. A closed current-carrying loop having a current I is having area A. Magnetic moment of this loop is defined as $\vec{\mu} = I\vec{A}$ where direction of area vector is towards the observer if current is flowing in anticlockwise direction with respect to the observer. If this loop is placed in a uniform magnetic field $\vec{B}$, then torque acting on the loop is given by $\vec{\tau} = \vec{\mu} \times \vec{B}$.

Now answer the following questions:

Consider the situation shown in Fig., ring is having a uniformly distributed positive charge. Magnetic field is perpendicular to the axis of ring. Now ring is rotated in anticlockwise direction as seen from left hand side direction of magnetic torque acting on the ring is



A. Parallel to

B. Parallel to axis of ring

C. perpendicular to axis and magnitic field

D. Coming out of plane of paper

Answer: C

Watch Video Solution

60. A closed current-carrying loop having a current I is having area A. Magnetic moment of this loop is defined as $\vec{\mu} = I\vec{A}$ where direction of area vector is towards the observer if current is flowing in anticlockwise direction with respect to the observer. If this loop is placed in a uniform magnetic field $\vec{B}$, then torque acting on the loop is given by $\vec{\tau} = \vec{\mu} \times \vec{B}$. Now answer the following questions:

Let ring in the above question is having a radius R and a charge Q is uniformly distributed over it. Ring is rotated with a constant angular velocity (ω) as mentioned above.

Torque acting on the ring due to magnetic force is

A. $\frac{QR^2\omega B}{2}$

B. $\frac{\pi R^2 qB}{2\omega}$

C. $\frac{q\omega R^2 B}{2\pi}$

D. None of the above

Answer: A

Watch Video Solution

61. A wire frame in the form of a part of circle (sector) of radius 1 and resistance R is free to rotate about on axis passing through O and perpendicular to plane of paper as shown in the figure. The angle of the sector is $\frac{\pi}{4}$ and it is rotating with constant angular velocity ω as shown. Above line PQ uniform magnetic field of magnitude B exists in the direction perpendicular to plane of paper. In region I field is outward while in region II, field is inward.

Based on above information, answer the following questions :

The thermal energy dissipated in wire frame when it moves from region I to region II, is

A. $\dfrac{B^2\omega\pi pl^4}{16R}$

B. $\dfrac{B^2\omega\pi pl^4}{4R}$

C. $\dfrac{3B^2\omega pl^4}{8R}$

D. $\dfrac{3B^2\omega pl^4}{16R}$

Answer: B

View Text Solution

62. A wire frame in the form of a part of circle (sector) of radius 1 and resistance R is free to rotate about on axis passing through O and perpendicular to plane of paper as shown in the figure. The angle of the sector is $\frac{\pi}{4}$ and it is rotating with constant angular velocity ω as shown. Above line PQ uniform magnetic field of magnitude B exists in the direction perpendicular to plane of paper. In region I field is outward while in region II, field is inward.

Based on above information, answer the following questions :

Total thermal energy dissipated in one cycle is

A. $\frac{B^2 \omega p l^4}{16R}$

B. $\frac{B^2 \omega p l^4}{4R}$

C. $\frac{3B^2 \omega p l^4}{8R}$

D. $\frac{3B^2 \omega p l^4}{16R}$

Answer: C

View Text Solution

63. A wire frame in the form of a part of circle (sector) of radius 1 and resistance R is free to rotate about on axis passing through O and perpendicular to plane of paper as shown in the figure. The angle of the sector is $\frac{\pi}{4}$ and it is rotating with constant angular velocity ω as shown. Above line PQ uniform magnetic field of magnitude B exists in the direction perpendicular to plane of paper. In region I field is outward while in region II, field is inward.

Based on above information, answer the following questions :

Average power produced in wire framce is

A. $\frac{3B^2\omega p l^4}{16R}$

B. $\frac{B^2\omega^2 l^4}{16R}$

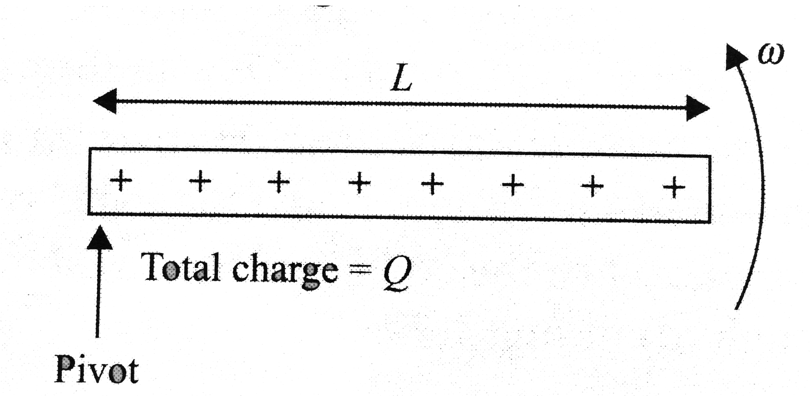
C. $\frac{B^2\omega^2 l^4}{8R}$

D. $\frac{3B^2\omega^2 l^4}{8R}$

Answer: A

View Text Solution

64. A rod has a total charge Q uniformly distributed along its length L. If the rod rotates with angular velocity ω about its end, compute its magnetic moment.



Watch Video Solution

65. An infinitely long wire of uniform cross section carries a current whose current density varies as $j = br^{\alpha}$. Where $b = \frac{10^7}{\pi}$unit,$\alpha = .1$unit and r the distance from axis. The magnetic induction at a distance 0.25 from axis is given by $\frac{n \times 5}{3} x10^{-2}$ tesla. Find n

Watch Video Solution

66. A straight conductor of length $60cm$ and mass $10gm$ is suspended horizontally by a pair of flexible leads in a magnetic field of $0.4T$ as shown in figure. A current at $0.41A$ should be passed through the conductor to just remove the tension in the supporting cable. The total tension in the leads if the direction of current is reversed is found $1.96 \times 10^{-y}N$. Find y ?

Watch Video Solution

67. A thin wire is bent in the form of a semi circular ring of radius $R = 0.9m$ carries a current $I = 1amp$. The magnetic induction at a point P as shown in the fig. is given by $nX10^{-7}$ Tesla. Find the value of n. $\left[\ln\left(\sqrt{2} + 1\right) = 0.9\right]$

Watch Video Solution

68. A particle having a charge $q = 1C$ and mass $m = 0.5kg$ is projected on a rough horizontal plane (x, y) from a point $(15m, 0, 0)$ with a initial velocity $\vec{v} = 20j$. In space a uniform electric field $\vec{E} = 25\left(-\hat{k}\right)$ and magnetic filed $\vec{B} = 10\left(-\hat{k}\right)$. The acceleration due to gravity $g = 10\text{sec}^{-2}$ and co - efficient of friction $\mu = 0.5$. The particle moves on a spiral path and reaches to the origin . The time taken by particle to reach origin is found $y \times 10\text{sec}$. Find y.

Watch Video Solution

69. A long straight wire carries a current $I_0 = 100amp$, a particle having a positive charge $q = 100C$ and mass $m = 10gms$ is kept at a distance $x_0 = 10m$ from the axis of the wire is projected away from it with a speed $v_0 = 10m/\text{sec}$. Find the maximum separation between particle and wire is found to be $y \times 10m$ Find y.

Watch Video Solution

70. A particle of mass m and charge + q is projected from origin with velocity $\vec{V} = V_0\hat{i}$ in a magnetic field $\vec{B} = -\left(B_0 x\right)\hat{k}$. Here V_0 and B_0 are positive constants of proper dimensions. Find the radius of curvature of the path of the particle when it reaches maximum positive x co-ordinate.

Watch Video Solution

71. If the work required to move the conductor shown in figure, one full turn in the positive direction at a rotational frequency N revolutions per minute, if $\vec{B} = B_0\hat{a}_r\left(B_0\right.$ is positive constant and $\hat{a}_r$ is a unit vector in radial direciton), is $y\pi r B_0 il$. Then y is .

Watch Video Solution

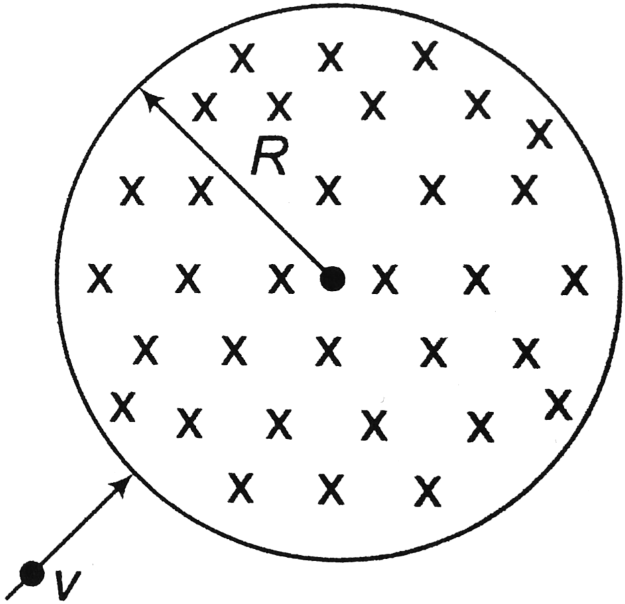
72. A long straight metal rod has a very long hole of radius a drilled parallel to rod as shown in the figure. If the rod carries a current i. Find the magnetic field (a) on the axis of the rod. (b) on the axis of the hole.

Watch Video Solution

73. There exists a uniform and constant magnetic field of strength B in the space betweent he plates of a charged parallel plate capacitor. The charge density on the plate is σ and length of the plate is l. An electron is projected in the space between the plates along the length of the plate. It is foudn that velcoity of the electron does not change. Find the time taken by the electron to come out of the capacitor. The figure describes the situtation. Ignore the gravity.

View Text Solution

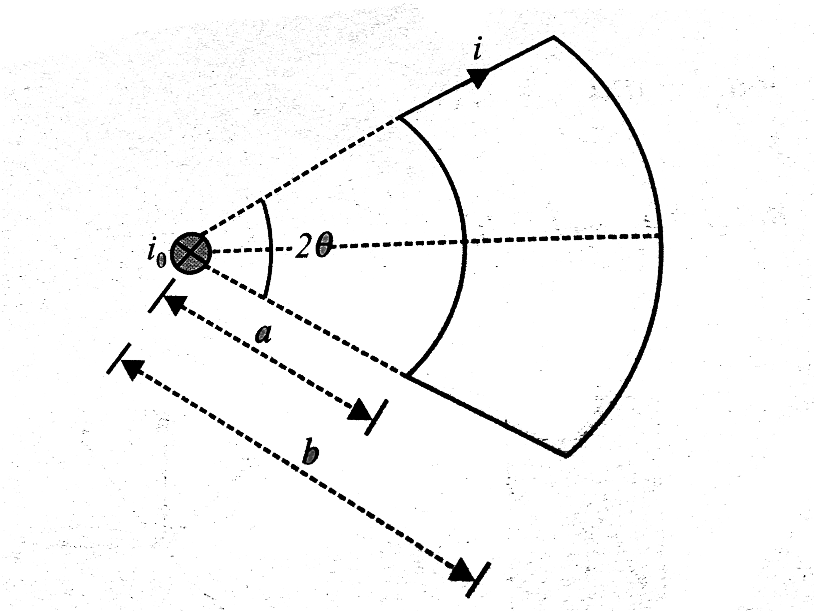
74. A particle of mass m having a charge q enters into a circular region of radius R with velocity v directed towards the centre. The strength of magnetic field is B. Find the deviation in the path of the particle.



Watch Video Solution

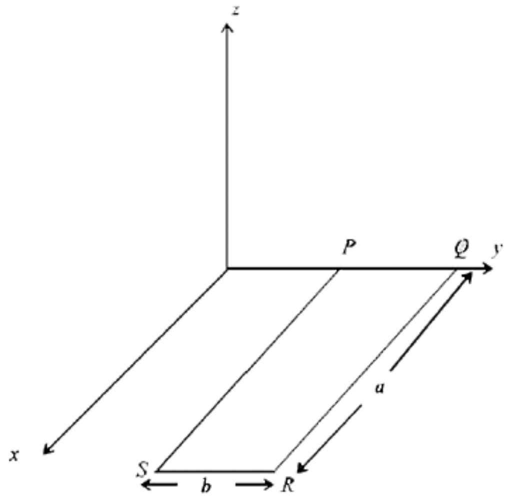
75. A loop, carring a current i, lying in the plane of the paper, is in the field of a long straight wire with current i_0 (inward) as shown in Fig. Find the

torque acting on the loop.



Watch Video Solution

76. A rectangular loop PQRS made from a uniform wire has length a, width b and mass m. It is free to rotate about the arm PQ, which remains hinged along a horizontal line taken as the y-axis (see figure). Take the vertically upward direction as the z-axis. A uniform magnetic field $\vec{B} = (3\hat{i} + 4\hat{k})B_0$ exists in the region. The loop is held in the x-y plane and a current I is passed through it. The loop is now released and is found to stay in the horizontal position in equilibrium



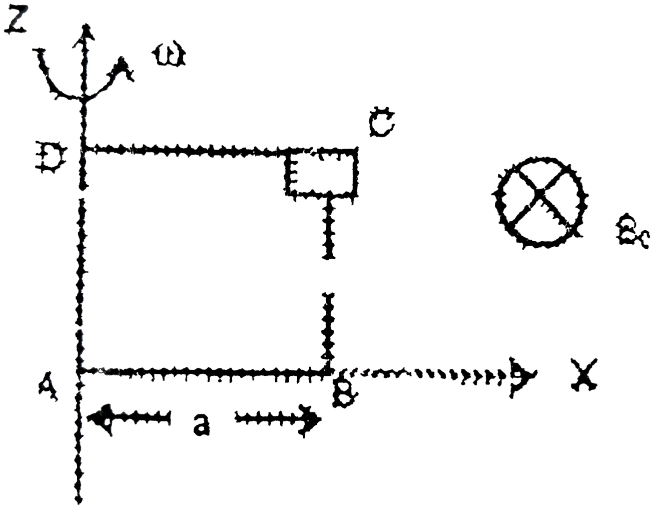
(a) What is the direction of the current I in PQ?

(b) Find the magnetic force on the arm RS.

(c) Find the expression for I in terms of B_0, a, b and m

Watch Video Solution

77. A insulated square frame $ABCD$ of side a is able to rotate about one of its side taken as positive z-axis. A magnetic field B is present in the region given by $\vec{B} = B_0\hat{j}$. A small block of mass m and charge q movable along side CB is initially near C, when frame lies in x - z plane. Now, frame is rotated by constant angular velocity ω about z-axis. Whole system lies in gravity free space. If after time t block reaches point B, find B_0 in terms of t.



Watch Video Solution

78. A bar of mass m slides on a smooth horizontal conducting rail. A constant current I is maintained in the rod using a constant current generator as shown. There is a long straight conductor carrying current I_0 parallel to the rod. Find the speed of the bar after it has travelled a distance D

Watch Video Solution

Watch Video Solution

79. An infinte wire place along z-axis has current I_1 in positive z-direction A conducting rod placed in xy plane parallel to y-axis has current I_2 in positive y-direction The ends of the rod subtend $+30^\circ$ and -60° at the origin with positive x direction The rod is at a distance a from the origin. Find net force on the rod .

Watch Video Solution

80. A charged particle carrying charge $q = 10\mu C$ moves with velocity $v_1 = 10^6, s^{-1}$ at angle 45° with x-axis in the xy plane and experience a force $F_1 = 5\sqrt{2}mN$ along the negative z-axis. When the same particle moves with velocity $v_2 = 10^6 ms^{-1}$ along the z-axis, it experiences a force F_2 in y-direction.

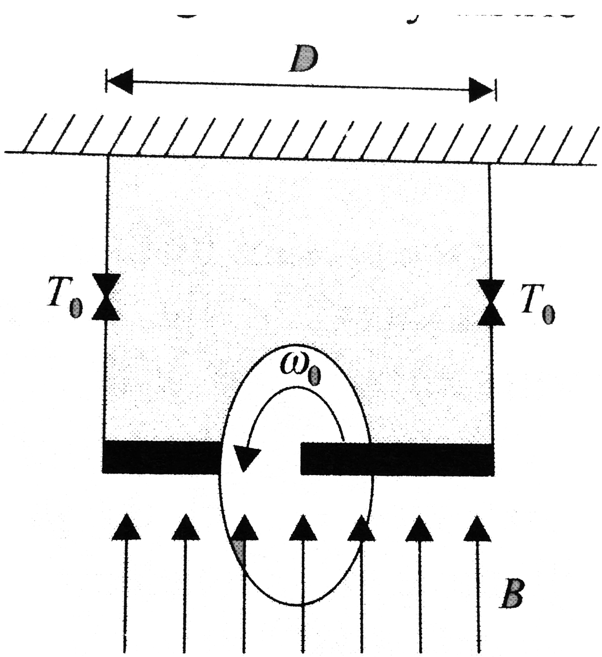
Find the magnitude of the force F_2.

Watch Video Solution

81. Deuterons in a cyclotron describes a circle of radius $32.0cm$. Just before emerging from the $D's$. The frequency of the applied alternating voltage is $10MHz$. Find, (a) the magnetic flux density $(i.e.,$ the magnetic field), (b) the energy and speed of the deuterons upon emergence.

Watch Video Solution

82. A ring of radius R having unifromly distributed charge Q is mounted on a rod suspended by two identical strings. The tension in strings in equilibrium is T_0. Now a vertical magnetic field is switched on and ring is rotated at constant angular velocity ω. Find the maximum ω with which the ring can be rotated if the strings can withstand a maximum tension of $3T_0/2$.



Watch Video Solution

83. The region between $x = o$ and $x = L$ is filled with uniform, steady magnetic field $B_0\hat{k}$. A particle of mass m, positive charge q and velocity $v_0\hat{i}$ travels along x - $a\xi s$ and enters the region of the magnetic field. Neglect gravity throughout the question .

(a) Find the value of L if the particle emerges from the region of magnetic field with its final velocity at angle 30° to its initial velocity.

(b) Find the velocity of the particle and the time spent by it in the magnetic field, if the magnetic field now extends upto $2.1L$.

Watch Video Solution

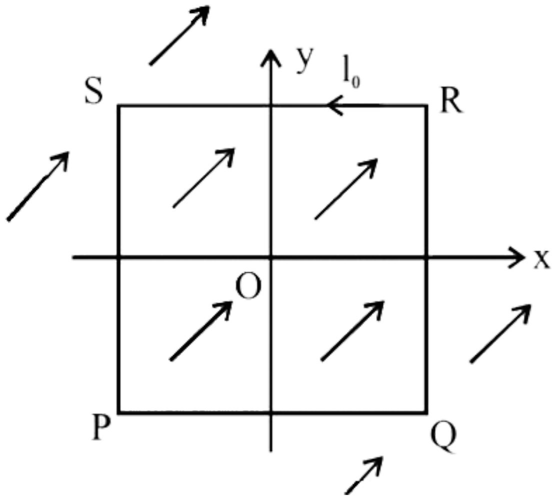
84. A uniform constant magnetic field B is directed at an angle of 45° to the $xa\xi s$ in the xy- plane . $PQRS$ is a rigid, square wire frame carrying a steady current I_0, with its centre at the origin O. At time $t = 0$, the frame is at rest in the position as shown in figure , with its sides parallel to the x and y axis. Each side of the frame is of mass M and length L.

(a) What is the torque τ about O acting on the frame due to the magnetic field?

(b) Find the angle by which the frame rotates under the action of this torque in a short interval of time Δt, and the axis about this rotation occurs .

$\left(\Delta tissosh \text{ or } tt\hat{a}nyvariation \in the \rightarrow rquedur \in gthis\int ervalmaybe\neg \leq cted.\right)Gi$

(4)/(3) ML^(2)`.

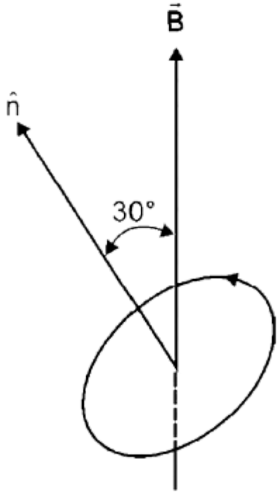


Watch Video Solution

85. An electron in the ground state of hydrogen atom is revolving in anticlock-wise direction in a circular orbit of radius R.

(i) Obtain an experssion for the orbital magnetic dipole moment of the electron.

(ii) The atom is placed in a uniform magnetic induction $\vec{B}$ such that the plane - normal of the electron - orbit makes an angle of 30° with the magnetic induction . Find the torque experienced by the orbiting electron.



Watch Video Solution

LEVEL-VI (SINGLE ANSWER QUESTION)

1. A battery is connected between two points A and B on the circumference of a uniform conducting ring of radius r and resistance R. One of the arcs AB of the ring subtends an angle θ at the centre . The value of the magnetic induction at the centre due to the current in the ring is

A. proportional to $2\left(180^{\circ} - \theta\right)$

B. Inversely proportional to r

C. zero only if $\theta = 180^{\circ}$

D. zero for all values of θ

Answer: D

Watch Video Solution

2. A coaxial cable made up of two conductors. The inner conductor is solid and is of radius R_1 and the outer conductor is hollow of inner radius R_2 and outer radius R_3. The space between the conductors is filled with air. The inner and outer conductors are carrying currents of equal magnitudes and in opposite directions. Then the variation of magnetic field with distance from the axis is best plotted as

A. 

B. 

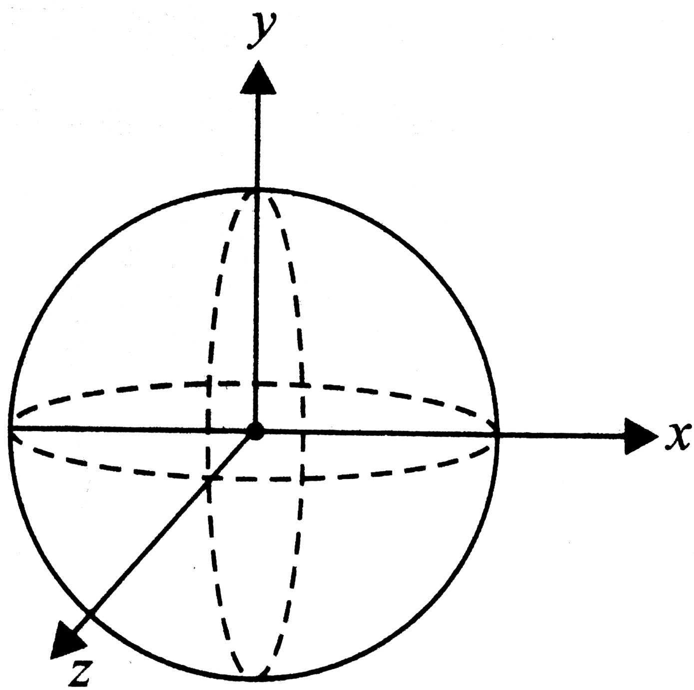
C.

D.

Answer: C

Watch Video Solution

3. Three rings, each having equal radius R, are placed mutually perpendicular to each other and each having its centre at the origin of coordinate system. If current I is flowing through each ring, then the magnitude of the magnetic field at the common centre is



A. $\sqrt{3}\frac{\mu_3 I}{2R}$

B. zero

C. $\left(\sqrt{2}-1\right)\frac{\mu_0 I}{2R}$

D. $\left(\sqrt{3}-\sqrt{2}\right)\frac{\mu_0 I}{2R}$

Answer: A

Watch Video Solution

4. The magnetic moment of the loop shown in the adjacent figure is :(length of each side is a)

A. $-3a^2I\hat{k}$

B. $-2a^2I\hat{k}$

C. $-2a^2I\hat{j}$

D. $-3a^2I\hat{j}$

Answer: A

View Text Solution

5. A wire carrying a current I is bent into the shape of an exponential spiral, $r = e^{\theta}$, from $\theta = 0$ to $\theta = 2\pi$ as shown in figure $(a0$. To complete a loop, the ends of the spiral are connected by a straight wire along the x -

axis. Find the magnitude and direction of $\vec{B}$ at the origin.

A. $\dfrac{\mu_0 I}{4\pi}\left(1 - e^{-2\pi}\right)$

B. $\dfrac{\mu_0 I}{3\pi}\left(1 - e^{-2\pi}\right)$

C. $\dfrac{\mu_0 I}{\pi}\left(1 - e^{-2\pi}\right)$

D. $\dfrac{\mu_0 I}{2\pi}\left(1 - e^{-2\pi}\right)$

Answer: A

View Text Solution

6. A star shaped loop (with $l =$ length of each section) carries current i.

Magnetic field at the centroid of the loop is

A. $\frac{3\mu_0 i}{\pi l}$

B. $\frac{3\mu_0 i}{2\pi l}$

C. $\left(3 - \sqrt{3}\right)\frac{\mu_0 i}{\pi l}$

D. $\left(3 + \sqrt{3}\right)\frac{\mu_0 i}{\pi l}$

Answer: C

Watch Video Solution

7. Circular regiions (1) and (2) have current densities J and $-J$ respectively, such that their region of intersection carries no current. Magnetic field in their region intersection is

A. Uniform, proportaional to $\left(r_1 + r_2\right) - d$

B. Uniform, proportional to d

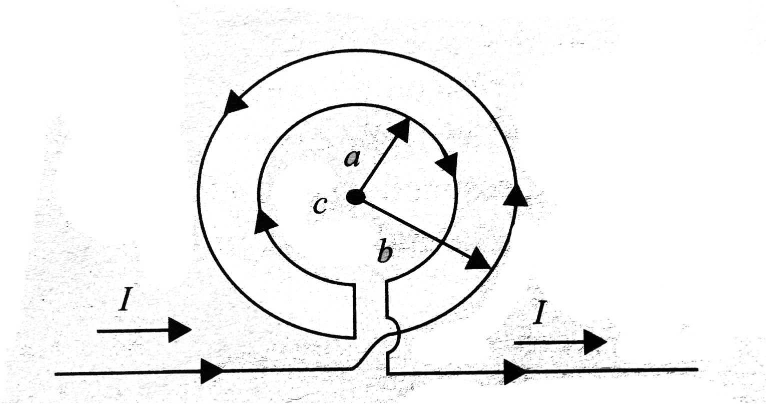
C. non- uniform

D. Zero

Answer: B

Watch Video Solution

8. An otherwise infinite, straight wire has two concentric loops of radii a and b carrying equal currents in opposite directions as shown in Fig. The magnetic field at the common centre is zero for



A. $\frac{a}{b} = \frac{\pi + 1}{\pi}$

B. $\frac{a}{b} = \frac{\pi}{\pi + 1}$

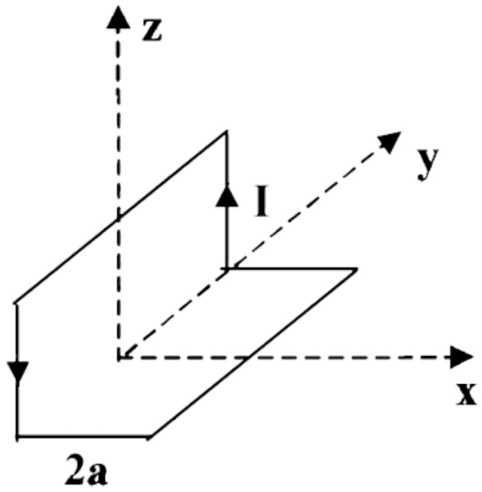
C. $\frac{a}{b} = \frac{\pi - 1}{\pi + 1}$

D. $\frac{a}{b} = \frac{\pi + 1}{\pi - 1}$

Answer: B

Watch Video Solution

9. A non - popular loop of conducting wire carrying a current I is placed as shown in the figure . Each of the straighrt sections of the loop is of the length $2a$. The magnetic field due to this loop at the point $P(a, 0, a)$ points in the direction



A. $\frac{1}{\sqrt{2}}\left(-\hat{j}+\hat{k}\right)$

B. $\frac{1}{\sqrt{3}}\left(-\hat{j}+\hat{k}+\hat{i}\right)$

C. $\frac{1}{\sqrt{3}}\left(\hat{i}+\hat{j}+\hat{k}\right)$

D. $\frac{1}{\sqrt{2}}\left(\hat{i}+\hat{k}\right)$

Answer: D

Watch Video Solution

10. In a region of space uniform electric field is present as $\vec{E} = E_0\hat{j}$ and uniform magnetci field is present as $\vec{B} = B_0\hat{j}$. An electron is released from rest at origin. Which of the following best represent the path followed by electron after released. $\left(E_0 \& B_0\right.$are positive constants)

A.

B.

C.

D.

Answer: D

Watch Video Solution

11. A potential difference of 500 V is applied across a paralle plate capacitor. The separation between the plates is $2 \times 10^{-3}m$. The plates of the capacitor are vertical. An electron is projected vertically upwards between the plates with a velocity of $10^5 m/a$ and it moves undeflected between the plates. The magnetic field acting perpendicular to the electric field has magnitude of

A. $0 \quad Wb/m^2$

B. $5/2 \quad Wb/m^2$

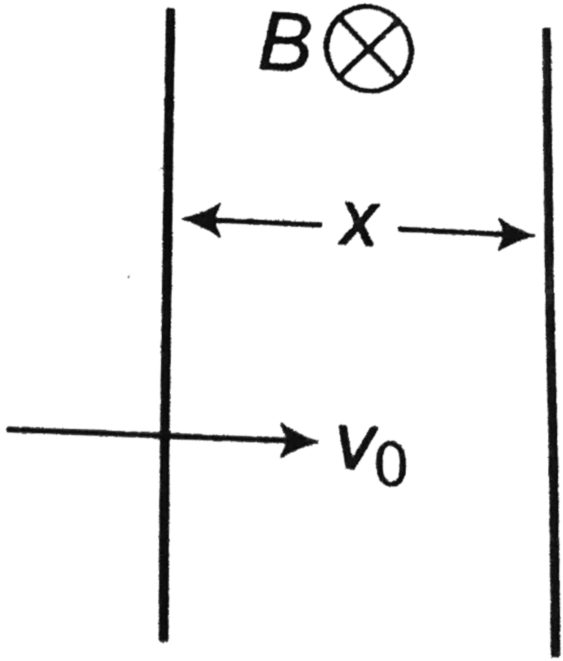
C. $10^{-6} \quad Wb/m^2$

D. $10^5 \quad Wb/m^2$

Answer: B

Watch Video Solution

12. A charged particle enters into a uniform magnetic field with velocity v_0 perpendicular to it , the length of magnetic field is $x = \frac{\sqrt{3}}{2}R$, where R is the radius of the circular path of the particle in the field .The magnitude of charge in velocity of the particle when it comes out of the field is



A. $2v_0$

B. $v_0/2$

C. $\sqrt{3}v_0/2$

D. v_0

Answer: D

Watch Video Solution

13. In a certain region uniform electric field E and magnetic field B are present in mutually opposite directions. At the instant $t = 0$, a particle of mass m carrying a charge q is given velocity v_0 at angle θ, with the y - axis, in the yz plane. The time after which the speed of the particle would be minimum is equal to

A. $\frac{mv_0}{qE}$

B. $\frac{mv_0 \sin\theta}{qE}$

C. $\frac{mv_0 \cos\theta}{qE}$

D. $\frac{2\pi m}{qB}$

Answer: B

Watch Video Solution

14. The figure shows a right angled isosceles triangle wire frame. The wire frame starts entering into the region of uniform magnetic field with constant velocity v at $t = 0$. If I is the instantaneous current through the frame, then choose the corrent graph between I & t.

A.

B.

C.

D.

Answer: D

Watch Video Solution

15. A particle of mass m and charge q is lying at the origin in a uniform magnetic field B directed along x-axis. At time t = 0, it is given a velocity v_0

, at an angleθ with the y-axis in the xy-plane. Find the coordinates of the particle after one revolution.

A. $\left(0, 0, \frac{2\pi m v_0 \sin\theta}{qB}\right)$

B. $\left(\frac{2\pi m v_0 \sin\theta}{qB}, 0, 0\right)$

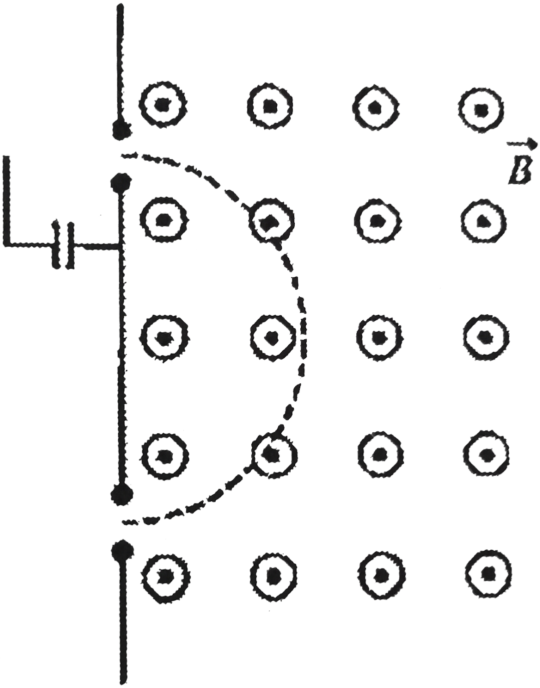
C. $\left(\frac{2\pi m v_0 \sin\theta}{qB}, 0, 4\right)$

D. $(0, 0, 0)$

Answer: B

Watch Video Solution

16. A mass spectrometer is a device which selelct particle of equal mass. An ion with an electric charge $q > 0$. Starts at rest from s ource S and is accelerated through a potential difference V. it passes thorugh a hole into a region of constant magnetic field $\vec{B}$ perpendicular to the plane of the paper as shown in the figure. The particle is deflected by the magnetic field and emerges thorugh the bottom hole at a distance d from the top hole. The mass of the particle is:



A. $\dfrac{qBd}{V}$

B. $\dfrac{qB^2d^2}{4V}$

C. $\dfrac{qB^2d^2}{8V}$

D. $\dfrac{qBd}{2V}$

Answer: C

Watch Video Solution

17. A square loop ABCD , carrying a current I, is placed near and coplanar with a long straight conductor XY carrying a current I.

A. There is no net force on the loop

B. The loop will be attracted by the conductor only if the current in the loop flows clockwise.

C. The loop will be attracted by the conductor only if the current in the loop flows anticlockwise

D. The loop will always be attracted by the conductor

Answer: B

Watch Video Solution

18. A very long current carrying wire is placed along z - axis having current of magnitude i_1 towards negative z - axis. A semicircular wire of radius R and having current i_2 is placed in x - y plane, such that line joining two end points of the semicircular wire passes through long wire as shown in figure. Nearest distance of semicircular wire from long wire is R. Net magnetic form on semicircular wire will be

A. $\frac{\mu_0 i_1 i_2}{2\pi} \ln 3$

B. $\frac{\mu_0 i_1 i_2}{2\pi} \ln. \frac{3}{2}$

C. zero

D. $\frac{\mu_0 i_1 i_2}{2\pi}$

Answer: A

Watch Video Solution

19. A metal ring is placed in a magnetic field, with its plane $\perp$ to the field. If the magnitude of the field begins to change, the ring will experience

A. a net force

B. a torque about it axis

C. a torque about a diameter

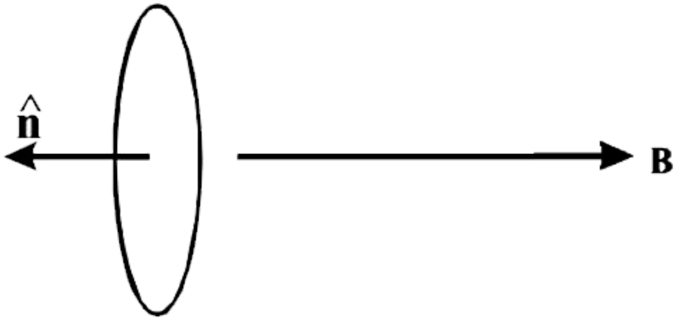
D. a tension along its length

Answer: D

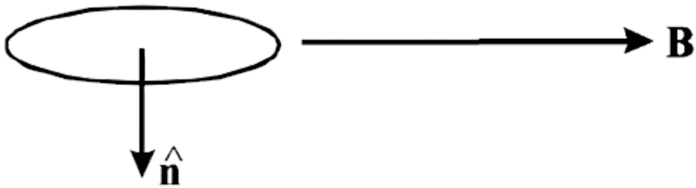
Watch Video Solution

20. A current carrying loop is placed in a uniform magnetic field in four different orientations , I,ii,iii & iv arrange them in the decreasing order of potential Energy`

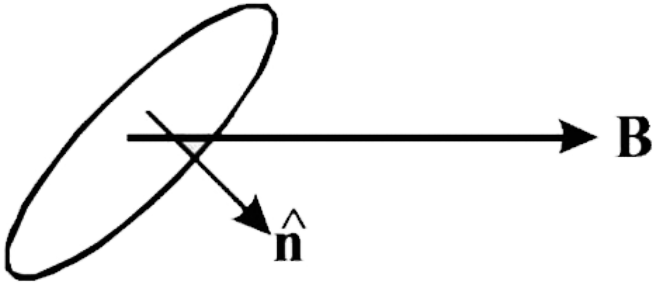
I.



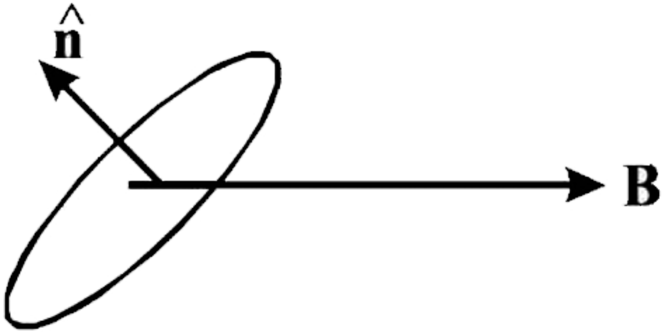
II.



III



IV



A. $I > III > II > IV$

B. $I > II > III > IV$

C. $I > IV > II > III$

D. $III > IV > II > I$

Answer: A

Watch Video Solution

21. A square frame carrying a current $I = 0.9A$ is located in the same plane as a long straight wire carrying a current, $I_0 = 5.0A$. The frame side has a length $a = 8.0cm$. The axis of the frame passing thorugh the midpoints of opposite sides is parallel to the wire and is separated from it by the distance which is $\eta = 1.5$ times greater than the side of the frame. FInd:

(a) Ampere force acting on the frame,

(b) the mechnical work to be performed in order to turn the frame throguh 180° about its axis, with the currents maintained constant.

A. $\dfrac{\mu_0\left(II_0\right)a}{\pi}\log_e(2)$

B. $\dfrac{\mu_0\left(II_0\right)a}{\pi}\log_e(3)$

C. $\dfrac{\mu_0\left(II_0\right)a}{\pi}\log_e(5)$

D. $\frac{\mu_0\left(II_0\right)a}{\pi}\log_e(4)$

Answer: A

Watch Video Solution

22. A particle of mass m and charge q moves with a constant velocity v along the positive x direction. It enters a region containing a uniform magnetic field B directed along the negative z direction, extending from $x = a$ to $x = b$. The minimum value of v required so that the particle can just enter the region $x > b$ is

A. $qb \quad B/m$

B. $q(b - a)B/m$

C. $qa \quad B/m$

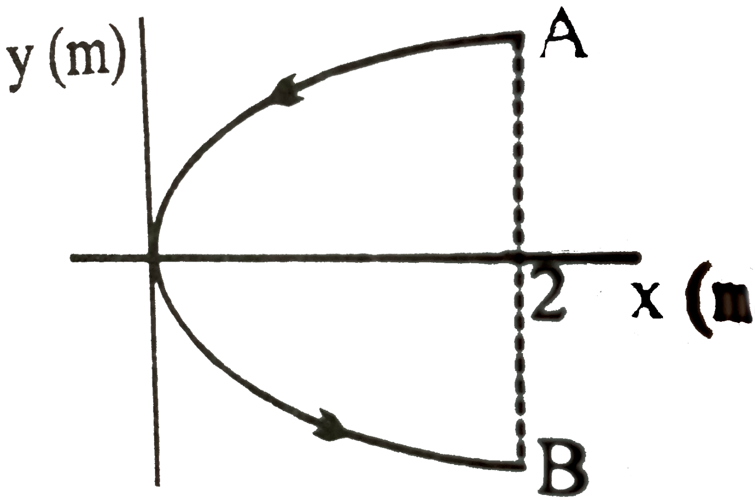
D. $q(b + a)B/2m$

Answer: B

Watch Video Solution

23. A conducting wire bent in the from of a parabola $y^2 = 2x$ carries a current $i = 2A$ as shown in figure This wire is placed in a unifrom magnetic field

$\vec{B} =$ - $4\hat{k}$ Tesla The magnetic force on the wire is (newton)



A. - $16\hat{i}$

B. $32\hat{i}$

C. - $32\hat{i}$

D. $16\hat{i}$

Answer: B

Watch Video Solution

24. A charged sphere of mass m and charge $-q$ starts sliding along the surface of a smooth hemispherical bowl, at position P. The region has a transverse uniform magnetic field B. Normal force by the surface of bowl on the sphere at position Q is

A. $mg\sin\theta + qB\sqrt{2gR\sin\theta}$

B. $3mg\sin\theta + qB\sqrt{2gR\sin\theta}$

C. $mg\sin\theta - qB\sqrt{2gR\sin\theta}$

D. $3mg\sin\theta - qB\sqrt{2gR\sin\theta}$

Answer: B

View Text Solution

25. A square loop of side l carrying current I is part of the shown arrangement . Minium current I to just move the block up the inclined plane is

A. $\dfrac{mg\sin\theta + \mu mg\cos\theta}{Bl}$

B. $\dfrac{mg\sin\theta + \mu mg\cos\theta}{2Bl}$

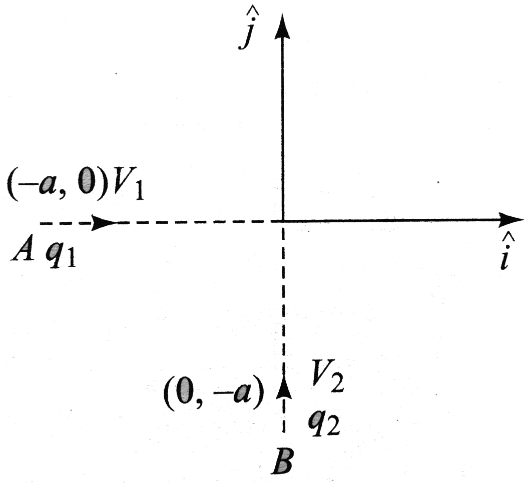
C. $\dfrac{2mg\sin\theta + 2\mu mg\cos\theta}{Bl}$

D. $\dfrac{mg\sin\theta - \mu mg\cos\theta}{Bl}$

Answer: C

View Text Solution

26. Two positive charges q_1 and q_2 are moving with velocities v_1 and v_2 when they are at points A and B, respectively, as shown in Fig. The magnetic force experienced by charge q_1 due to the other charge q_2 is



A. $\dfrac{\mu_0 q_1 q_2 v_1 v_2}{8\sqrt{2}\pi a^2}$

B. $\dfrac{\mu_0 q_1 q_2 v_1 v_2}{4\sqrt{2}\pi a^2}$

C. $\dfrac{\mu_0 q_1 q_2 v_1 v_2}{2\sqrt{2}\pi a^2}$

D. $\dfrac{\mu_0 q_1 q_2 v_1 v_2}{\sqrt{2}\pi a^2}$

Answer: A

Watch Video Solution

27. A steady current i flows in a small square lopp of wire of side L in a horizontal plane. The loop is now folded about its middle such that half of it lies in a vertical plane. Let $\vec{\mu}_1$ and $\vec{\mu}_2$ respectively denote the magnetic moments due to the current loop before and after folding. Then

A. $\vec{\mu}_2 = 0$

B. $\vec{\mu}_1$ and $\vec{\mu}_2$ are in the same direction

C. $\left|\vec{\mu}_1\right| / \left|\vec{\mu}_2\right| = \sqrt{2}$

D. $\left|\vec{\mu}_1\right| / \left|\vec{\mu}_2\right| = \left(1/\sqrt{2}\right)$

Answer: C

Watch Video Solution

28. A horizontal straight conductor of mass m and length l is placed in a uniform vertical magnetic firled of magnitude B. An amount of charge Q passes through the rod in a very short time such that the conductor begins to move only after all the charge has passed throught is. Its initial velocity will be

A. $BQlm$

B. $\frac{BQ}{lm}$

C. $\frac{BQl}{m}$

D. $\frac{Bl}{mQ}$

Answer: C

Watch Video Solution

29. A coil having N turns is wound tightly in the form of a spiral with inner and outer radii a and b respectively. A current I passes through the coil. The magnetic moment of the spriral is

A. $M = \frac{\mu_0 NI}{3} \frac{b^3 - a^3}{(b - a)^3}$

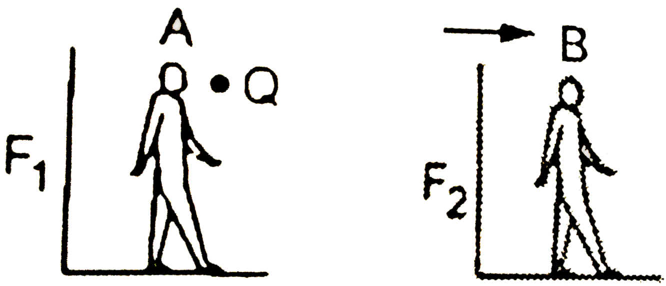
B. $M = \frac{\pi NI}{3} \frac{(b - a)^3}{b^3 - a^3}$

C. $M = \frac{\pi NI}{3} \frac{(b^3 - a^3)}{(b - a)^3}$

D. $M = \frac{\mu_0 NI}{3} \frac{(b - a)^3}{b^3 - a^3}$

Answer: C

Watch Video Solution



30.

An observer A and a charge Q are fixed in a stationary frame F_1. An observer B is fixed in a frame F_2 which is moving with respect to F_1

A. Both A and B will observe electric fields

B. Both A and B will observe magnetic fields

C. Neither A nor B will observe magnetic fields

D. B will observe a magnetic field, but A will no

Answer: A,C

Watch Video Solution

31. A straight conductor carriers a current alon the z-axis Consider the points $A(a, 0, 0), B(0, -a, 0), C(-a, 0, 0)$ and $D(0, a, 0)$

(i) All four points have magnetic fields of the same magnitude.

(ii) All four points have magnetic fields of the different direction.

(iii) The magnetic fields at A and C are in opposite directions

(iv) The magnetic fields at A and B are mutually perpendicular

A. All four points have magnetic fields of the same magnitude

B. All four points have magnetic fields in different directions

C. The magnetic fields at A and C are in opposite directions

D. The magnetic fields at A and B are mutually perpendicular

Answer: A,B,C,D

Watch Video Solution

32. A straight conductor carries a current. Assume that all free electrons in the conductor move with the same drift velocity v. A and B are two observers on a striaght line XY parallel to the conductor. A is stationary B moves along XY with a velocity v in the direction of the free electrons.

A. A and B observe the same magnetic field

B. A observes a magnetic field, B doess not

C. A and B observe magnetic fields of the same magntidue but opposite directions.

D. A and B do not observe any electric field

Answer: A,D

Watch Video Solution

33. A conducting gas is in the form of a long length of the cylinder. The current is distributed uniformly across the cross - section of the gas. Disgard thermal and electrostatic forces among the gas molecules. Due to the magnetic fields set up inside the gas and the forces which they exert on the moving ions, the gas will tend to

A. expand

B. Contract

C. expand and contract alternately

D. none of the above

Answer: B

View Text Solution

34. A charged particle is fired at an angle θ to a uniform magnetic field directed along the x - axis. During its motion along a helical path, if the pitch of the helical path is equal to the maximum distance of the particle from the x - axis

A. $\cos\theta = \frac{1}{\pi}$

B. $\sin\theta = \frac{1}{\pi}$

C. $\tan\theta = \frac{1}{\pi}$

D. $\tan\theta = \pi$

Answer: D

Watch Video Solution

35. Two long, thin,parallel conductor are kept very close to each other, without touching. One carries a current I, and the other has charge λ per unit length. An electron moving parallel to the conductors is undeflected. Let $C =$ velocity of light.

A. $v = \frac{\lambda c^2}{i}$

B. $v = \frac{i}{\lambda}$

C. $c = \frac{i}{\lambda}$

D. The electron may be at any distance from the conductor

Answer: A,D

Watch Video Solution

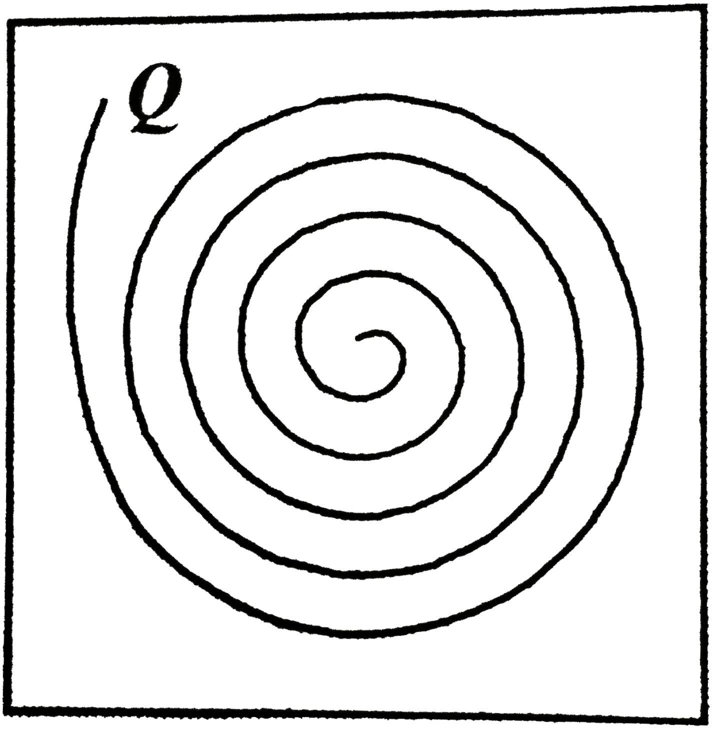
36. A charged particle enters a region which offers a resistance against its motion and a uniform mangetic field exists in the region. The particle traces a spiral path as shown in Fig. 1.29. State the following statements as True or False.

a. Component of magnetic field in the plane of spiral is zero.

(b) Particle enters the region at Q.

If magnetic field is outwards, then the particle is positively charged.

(d) If magnetic field is outwards, then the particle is negatively charged.



A. Component of magnetic field in the plane of spiral is zero.

B. Particle enters the region at Q

C. If magnetic is outwards then the particle is positively charged.

D. If magnetic field is outwards then the particle is negatively charged.

Answer: A,B,C,D

Watch Video Solution

37. A charged particle is projected in a magnetic field $\vec{B} = 10\hat{k}T$ from the origin in $x - y$ plane. The particle moves in a circle and just touches a straight line $y = 5(m)$ at $x = 5\sqrt{3}(m)$. Then (mass of particle $= 5 \times 10^{5-} kg$, charge $= 1\mu C$)

A. the particle is projected at an angle $60\ ^{\circ}$ with x - axis

B. the radius of curvature at $\left(5\sqrt{3}, 5\right)$ is $10m$

C. the speed of the particle is $2m/s$

D. the particle moves in a helical path.

Answer: A,C

Watch Video Solution

38. A circular conducting loop of radius R and resistance per unit length λ is pulled out from the regio of uniform magnetic filed with constant velocity v. The situation shown in the figure corresponds to that is at $t = 0$. Mark out the correct statement (s)

A. Just after $t = 0 i.e.,$ the motion starts, the induced current in the loop is $\frac{\sqrt{3}Bv}{2\pi\lambda}$

B. Current will be induced in the loop for $\frac{3R}{2v}$ sec.

C. At any time t, the current induced in the loop is given by $\frac{Bv\sqrt{3R^2 - 4v^2t^2 + 4Rvt}}{\lambda \times 2\pi R}$ and is in clockwise direction.

D. Induced current is in clockwise direction for $t = 0$ to $\frac{R}{2v}$ and thereafter it becomes in anticlockwise direction.

Answer: A,B,C,D

View Text Solution

39. A time varying magnetic field is present in a cylindrical region of radius R as shown in figure (cross - sectional view). B is increasing with time, mark out the correct statement (s) for the given situation, r being the distance from centre of cylindrical region.

A. For $r < R$, the induced electric field is proportional to r

B. For $r > R$, the induced electric field is proprotional to $\frac{1}{R}$

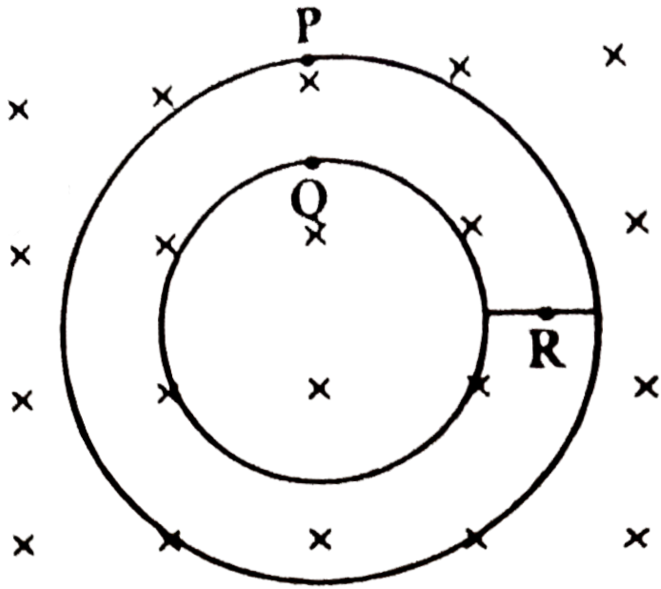
C. For $r = R$, the induced electric field is maximum

D. If a coaxial "non- conducting"ring of radius $\frac{R}{2}$ is placed in the magnetic field region, then emf induced in the ring is $\frac{\pi \alpha R^2}{4}$

Answer: A,B,C,D

View Text Solution

40. Figure shown plane figure made of a conductor located in a magnetic field along the inward normal to the plane of the figure. The magnetic field starts diminishing. Then the induced current



A. at point P is clockwise

B. at point Q is anticlockwise

C. at point Q is clockwise

D. at point R is zero

Answer: A

Watch Video Solution

41. There is region of space where uniform magnetic field of induction B exists. The field exists at all points for which x - coordingates are positive. The direction of field ia along negative z axis.

Now a certain charged particle of mass m and charge q a certain speed enters in this region. A magnetic field at a point whose coordinates are $x = 0, y = -d$ and $z = 0$. Magnetic force will start acting on the particle and particle moves in a uniform circular motion, such that origin becomes centre of circular path described by it

The speed of the charge particle will be

A. $\frac{qB}{m}$

B. $\frac{qd}{m}$

C. $\frac{qbd}{2m}$

D. $\frac{qBd}{m}$

Answer: D

Watch Video Solution

42. There is region of space where uniform magnetic field of induction B exists. The field exists at all points for which x - coordingates are positive. The direction of field ia along negative z axis.

Now a certain charged particle of mass m and charge q a certain speed enters in this region. A magnetic field at a point whose coordinates are $x = 0, y = -d$ and $z = 0$. Magnetic force will start acting on the particle and particle moves in a uniform circular motion, such that origin becomes centre of circular path described by it

The particle enters into the region of magnetic field along a direction

A. parallel to y - axis

B. at an angle 37° with x - axis

C. along x - axis

D. along a direction of 45° with x - axis

Answer: C

View Text Solution

43. There is region of space where uniform magnetic field of induction B exists. The field exists at all points for which x - coordingates are positive. The direction of field ia along negative z axis.

Now a certain charged particle of mass m and charge q a certain speed enters in this region. A magnetic field at a point whose coordinates are $x = 0, y = -d$ and $z = 0$. Magnetic force will start acting on the particle and particle moves in a uniform circular motion, such that origin becomes centre of circular path described by it

The speed of the charge particle will be

A. particle will come out from the region of uniform magnetic field at a point $(a = 0, y = d, z = 0)$ with speed $\frac{2qBd}{m}$

B. particle does not remain always in the x - y plane

C. The x - coordinate of location of particle will be d at a time $t = \frac{\pi m}{qB}$

D. particle will emerge out of the region of field after a time $\frac{\pi m}{qB}$ with speed $\frac{qBd}{m}$

Answer: D

Watch Video Solution

44. A charged particle of mass m and charge q is projected on a rough horizontal XY plane. Both electric and magnetic fields are given by $\vec{E} = -10\hat{k}N/C$ and magnetic field $\vec{B} = -5\vec{k}$ tesla are present in the region. The particle enters into the magnetic field at $(4, 0, 0)m$ with a velocity $50\vec{j}\,m/\text{sec}$. The particle starts into a curved path on the plane. If coefficietn of friction $\mu = \frac{1}{3}$ between particle and plane, then $\left(qE = 2mg, g = 10m/s^2\right)$.

Radius of curvature of the path followed by particle, initially is

A. 5m

B. $2.5m$

C. $1.25m$

D. $10m$

Answer: A

Watch Video Solution

45. A charged particle of mass m and charge q is projected on a rough horizontal XY plane. Both electric and magnetic fields are given by $\vec{E} = -10\hat{k} N/C$ and magnetic field $\vec{B} = -5\vec{k}$ tesla are present in the region. The particle enters into the magnetic field at $(4, 0, 0)m$ with a velocity $50\vec{j}\, m/\sec$. The particle starts into a curved path on the plane. If coefficietn of friction $\mu = \frac{1}{3}$ between particle and plane, then $\left(qE = 2mg, g = 10m/s^2\right)$.

The time after which particle comes to rest, is

A. $5s$

B. $4s$

C. $3s$

D. $1s$

Answer: A

Watch Video Solution

46. A charged particle of mass m and charge q is projected on a rough horizontal XY plane. Both electric and magnetic fields are given by $\vec{E} = -10\hat{k} N/C$ and magnetic field $\vec{B} = -5\vec{k}$ tesla are present in the region. The particle enters into the magnetic field at $(4, 0, 0)m$ with a velocity $50\vec{j}\, m/\text{sec}$. The particle starts into a curved path on the plane. If coefficietn of friction $\mu = \frac{1}{3}$ between particle and plane, then $\left(qE = 2mg, g = 10m/s^2\right)$.

Total work done by electric force on the particle is

A. $250J$

B. zero

C. $125J$

D. none

Answer: B

Watch Video Solution

47. A charged particle of mass m and charge q is projected on a rough horizontal XY plane. Both electric and magnetic fields are given by $\vec{E} = -10\hat{k} N/C$ and magnetic field $\vec{B} = -5\vec{k}$ tesla are present in the region. The particle enters into the magnetic field at $(4, 0, 0)m$ with a velocity $50\vec{j}\, m/\text{sec}$. The particle starts into a curved path on the plane. If coefficietn of friction $\mu = \frac{1}{3}$ between particle and plane, then $\left(qE = 2mg, g = 10m/s^2\right)$.

Total distance covered by the particle is

A. $100m$

B. $125m$

C. $200m$

D. $50m$

Answer: B

Watch Video Solution

48. A particle with mass m and positive charge q released from rest at the origin as shown in figure. There is a uniform electric field E_0 in $+y$ direction and uniform magnetic field B_0 directed out of the page. The path of the particle as shown is called cycloid. The particle always moves in x - y plane. The velocity at any time t after the start is given as

Speed of the particle at a general point $P(x, y)$ is given by

A. $\sqrt{\frac{2qE_0\sqrt{x^2+y^2}}{m}}$

B. $\sqrt{\frac{2qE_0 y}{m}}$

C. $\sqrt{\frac{2qE_0 x}{m}}$

D. $\frac{E_0}{B_0}$

Answer: B

Watch Video Solution

49. A particle with mass m and positive charge q released from rest at the origin as shown in figure. There is a uniform electric field E_0in $+y$ direction and uniform magnetic field B_0 directed out of the page. The path of the particle as shown is called cycloid. The particle always moves in x - y plane. The velocity at any time t after the start is given as

The y - coordinate at the highest point of trajectory is

A. $\frac{4m}{qB_0^2}$

B. $\frac{2m}{qB_0^2}$

C. $\frac{mE_0}{qB_0^2}$

D. $\frac{4mE_0}{qB_0}$

Answer: C

View Text Solution

50. A particle with mass m and positive charge q released from rest at the origin as shown in figure. There is a uniform electric field E_0in $+y$ direction and uniform magnetic field B_0 directed out of the page. The path of the particle as shown is called cycloid. The particle always moves in x - y plane. The velocity at any time t after the start is given as

The time for which the y - coordinate of the particle bomes maximum for the first time is

A. $\frac{m\pi}{qB_0}$

B. $\frac{2\pi m}{qB_0}$

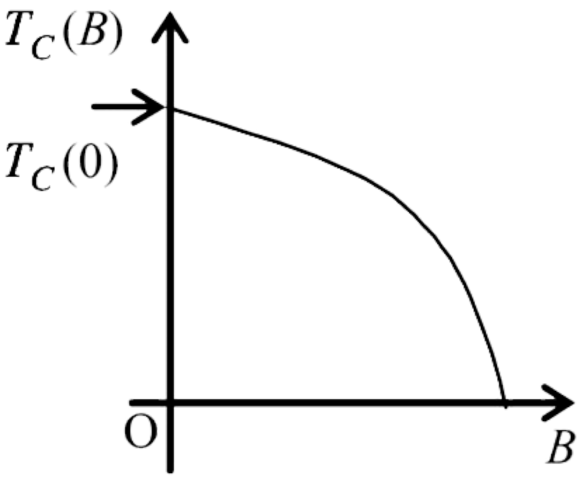
C. $\frac{\pi m}{qE_0}$

D. $\frac{2\pi m}{3qB_0}$

Answer: A

Watch Video Solution

51. Electrical resistance of certain materials, known as superconductors, changes abruptly from a nonzero value of zero as their temperature is lowered below a critical temperature $T_C(0)$. An interesting property of super conductors is that their critical temperature becomes smaller than $T_C(0)$ if they are placed in a magnetic field, i.e., the critical temperature $T_C(B)$ is a function of the magnetic field strength B. The dependence of $T_C(B)$ on B is shown in the figure.



In the graphs below, the resistance R of a superconductor is shown as a function of its temperature T for two different magnetic fields B_1(solid line) and B_2 (dashed line). If B_2 is larget than B_1 which of the following graphs shows the correct variation of R with T in these fields?

A.

B.

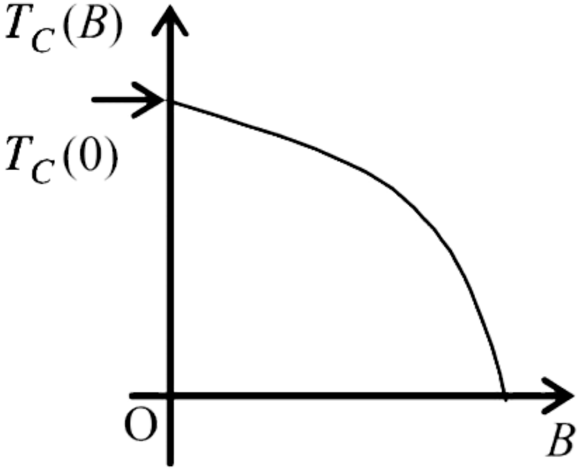
C.

D.

Answer: A

Watch Video Solution

52. Electrical resistance of certain materials, known as superconductors, changes abruptly from a nonzero value of zero as their temperature is lowered below a critical temperature $T_C(0)$. An interesting property of super conductors is that their critical temperature becomes smaller than $T_C(0)$ if they are placed in a magnetic field, i.e., the critical temperature $T_C(B)$ is a function of the magnetic field strength B. The dependence of $T_C(B)$ on B is shown in the figure.



A superconductor has $T_C(0) = 100K$. When a magnetic field of 7.5 Tesla is applied , its T_C decreases to 75 K. For this material one can difinitely say that when

A. $B = 5T, T_C(B) = 80K$

B. $B = 5T, 75K < T_c(B) < 100K$

C. $B = 10T, 75K < T_c < 100K$

D. $B = 10T, T_c = 70K$

Answer: B

Watch Video Solution

53. A fan operates at 200 volt (DC) consuming $1000W$ when running at full speed . It's internal wiring has resistance 1Ω . When the fan runs at full speed , its speed becomes constant. This is because the torque due to magnetic field inside tha fan is balanced by the torque due to air resistance on the blades of the fan and torque due to friction between the fixed part and the shaft of the fan. The electrical power going into the fan is spent (i) in the internal resistance as heat, call it $P_1(ii)$ in doing work against internal friction and air resistance producing heat, sound etc. call it P_2. When the coil of fan rotates, an emf is also induced in the coil. This opposes the external emf applied to snd the current into the fan. This emf is called back-emf,call it $'e'$.

Answer the following questions when the fan is running at full speed.

The current flowing into the fan and the value of back emf e is

A. $200A$, 5 volt

B. $5A$, 200 volt

C. $5A$, 195volt

D. $1A$, 0volt

Answer: C

Watch Video Solution

54. A fan operates at 200 volt (DC) consuming $1000W$ when running at full speed . It's internal wiring has resistance 1Ω . When the fan runs at full speed , its speed becomes constant. This is because the torque due to magnetic field inside tha fan is balanced by the torque due to air resistance on the blades of the fan and torque due to friction between the fixed part and the shaft of the fan. The electrical power going into the fan is spent (i) in the internal resistance as heat, call it $P_1(ii)$ in doing work against internal friction and air resistance producing heat, sound etc. call it P_2. When the coil of fan rotates, an emf is also induced in the coil. This opposes the external emf applied to snd the current into the fan. This emf is called back-emf,call it $'e'$.

Answer the following questions when the fan is running at full speed.

The value of power P_1 is

A. $1000W$

B. $975W$

C. $25W$

D. $200W$

Answer: C

Watch Video Solution

55. A fan operates at 200 volt (DC) consuming $1000W$ when running at full speed . It's internal wiring has resistance 1Ω . When the fan runs at full speed , its speed becomes constant. This is because the torque due to magnetic field inside tha fan is balanced by the torque due to air resistance on the blades of the fan and torque due to friction between the fixed part and the shaft of the fan. The electrical power going into the fan is spent (i) in the internal resistance as heat, call it $P_1 (ii)$ in doing work against internal friction and air resistance producing heat, sound etc. call it P_2. When the coil of fan rotates, an emf is also induced in the coil. This opposes the external emf applied to snd the current into the fan. This emf is called back-emf,call it $'e'$.

Answer the following questions when the fan is running at full speed.

The value of power P_2 si

A. $1000W$

B. $975W$

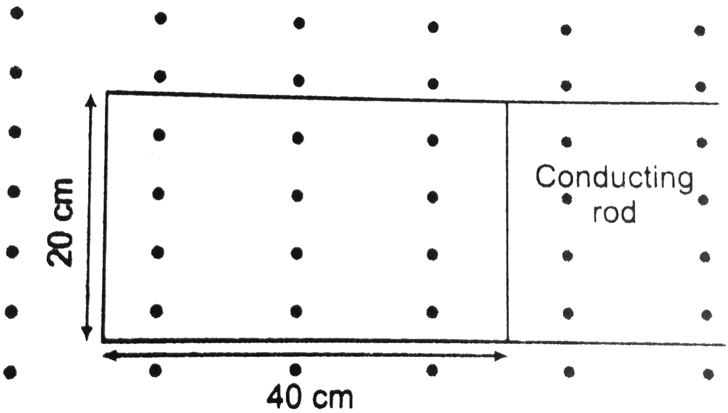
C. $25W$

D. $200W$

Answer: B

Watch Video Solution

56. Figure shows a conducting rod of negligible resistance that can slide on smooth U-shaped rail made of wire of resistance $1\Omega/m$. Position of the conducting rod at $t = 0$ is shown. A time dependent magnetic field $B = 2t$ tesla is switched on at $t = 0$



The current in the loop at $t = 0$ due to induced emf is

A. $0.16A$, clockwise

B. $0.08A$, clockwise

C. $0.08A$, anticlockwise

D. zero

Answer: A

Watch Video Solution

57. Figure shows a conducting rod of negligible resistance that can slide on smooth U - shaped rail made of wire of resistance $1\Omega/m$. Position of the conducting rod at $t = 0$ is shown. A time t dependent magnetic filed $B = 2t$Tesla is switeched on $t = 0$

At $t = 0$, when the magnetic field to switched on, the conducting rod is moved to the left at constant speed $5cm/s$ by some external means. The rod moves perpendicular to the rails. At $t = 2s$, induced emf has magnitude.

A. $0.12V$

B. $0.08V$

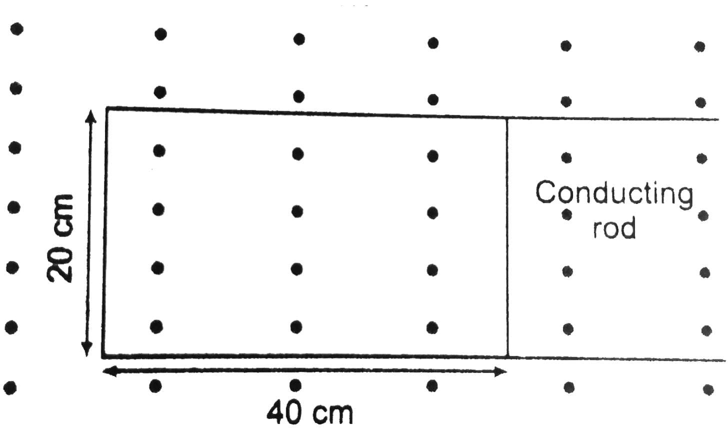
C. $0.04V$

D. $0.02V$

Answer: B

View Text Solution

58. Figure shows a conducting rod of negligible resistance that can slide on smooth U-shaped rail made of wire of resistance $1\Omega/m$. Position of the conducting rod at $t = 0$ is shown. A time dependent magnetic field $B = 2t$ tesla is switched on at $t = 0$



The magnitude of the force required to move the conducting rod at constant speed 5cm/s at the same instant $t = 2s$, is equal to

A. $0.16N$

B. $0.12N$

C. $0.08N$

D. $0.06N$

Answer: C

Watch Video Solution

59. A train of mass 100 tons (1 tons $= 1000kg$) runs on a meter gauge track (distance between the two rails is $1m$). The coefficient of friction between the rails and the train is 0045. The train is powered by an electric engine of 90% efficiency. The train is moving with uniform speed of $72kmph$ at its highest speed limilt . Horizontal and vertical component of earth's magnetic field and $B_H = 10^{-5}T$ and $B_V = 2 \times 10^{-5}T$. Assume the body of the train and rails to be perfectly conducting.

The electrical power consumed by the trains is

A. $1.11MW$

B. $1MW$

C. $0.50MW$

D. $0.90MW$

Answer: B

Watch Video Solution

60. A train of mass 100 tons $(1 \text{ tons } = 1000kg)$ runs on a meter gauge track (distance between the two rails is $1m$). The coefficient of friction between the rails and the train is 0045. The train is powered by an electric engine of 90% efficiency. The train is moving with uniform speed of $72kmph$ at its highest speed limilt . Horizontal and vertical component of earth's magnetic field and $B_H = 10^{-5}T$ and $B_V = 2 \times 10^{-5}T$. Assume the body of the train and rails to be perfectly conducting.

The potential difference between the two rails is

A. $100\mu V$

B. $200\mu V$

C. $400\mu V$

D. $800\mu V$

Answer: C

Watch Video Solution

61. A train of mass 100 tons $(1 \text{ tons } = 1000 kg)$ runs on a meter gauge track (distance between the two rails is $1m$). The coefficient of friction between the rails and the train is 0045. The train is powered by an electric engine of 90% efficiency. The train is moving with uniform speed of $72 kmph$ at its highest speed limilt . Horizontal and vertical component of earth's magnetic field and $B_H = 10^{-5} T$ and $B_V = 2 \times 10^{-5} T$. Assume the body of the train and rails to be perfectly conducting.

If now a resistor of $10^{-3}\Omega$ is attached of between the rwo rails, the extra units of energy (electricity) consumed dueing a $324 km$ rund of the train is (1 unit of power $= 1 kW$ Hour) (assume the speed of train to remain unchanged.

A. $8 \times 10^{-4} KW$hour

B. 8×10^{-5} KW hour

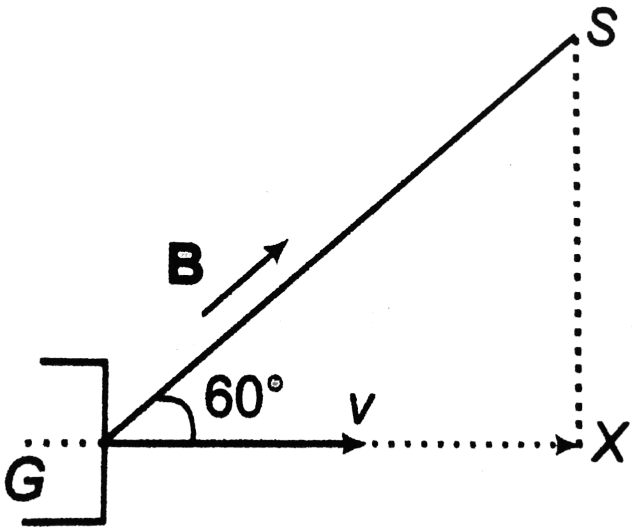
C. $8 \times 10^{-6} KW$ hour

D. $8 \times 10^{-7} KW$ hour

Answer: D

Watch Video Solution

62. An electron gun G emits electons of energy $2keV$ travelling in the positive x-direction. The electons are required to hit the spot S where $GS = 0.1m$, and the line GS makes an angle of 60° with the x-axis as shown in figure. A uniform magnetic field B parallel to GS exists in the region outside the electron gun.



find the minimum value of B needed to make the electrons hit S.

Watch Video Solution

63. A coil carrying a current of $i = 10mA$ is placed in uniform magnetic field so that its axis consists of only one turn and is made of copper. The diameter of the wire is $0.1mm$, the radius of coil is $R = 3cm$. An approximate external field B will rupture the coil is found $y \times 10^3$. Find y, Breaking stress $= 3 \times 10^8 N/m^2$.

Watch Video Solution

64. A particle of mass m and charge q enters a region of electric field $\vec{E}$ as shown in the figure with some velocity at point P. At the moment the particle collides elastically with smooth surface at N, the electric field $\vec{E}$ is switched off and a magnetic field $\vec{B}$ perpendicular to the plane of paper aoutomatically switched on. If the particle hits the surface at point O, then if $B = x\sqrt{\frac{mE}{qd}}$. What is the value of x^1

View Text Solution

65. A uniform but time varying magnetic field $B = C - Kt$, where K and C are positive constants and t is time (in second) , is applied perpendicular to the plane of a circular loop of radius $'a'$ and resistance R. Find the total charge (in coulomb) that will pass through any point of loop by the time B becomes zero.

[Given $a = 2m, R = \pi\Omega, C = 2T$]

Watch Video Solution

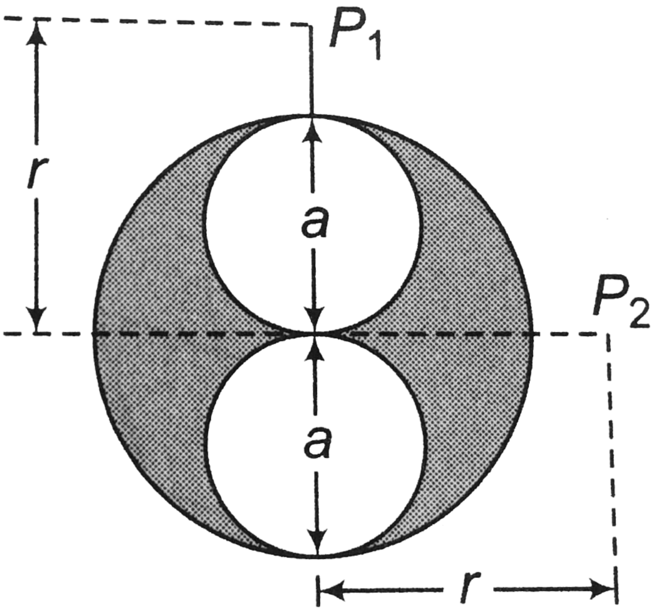
66. The inductor in a $L - C$ oscillation has a maximum potential difference of $16V$ and maximum energy of $640\mu J$. Find the value of capacitor in μF in $L - C$ circuit.

Watch Video Solution

67. Consider the circuit shown in figure . With switch S_1 closed and the other two switches open, the circuit has a time constant 0.05sec. With switch S_2 closed and the other two switches open, the circuit has a time constant 2 sec. With switch S_3 closed and the other two switches open, the circuit oscillates with a period T. Find T (in sec) . (Take $\pi^2 = 10$)

View Text Solution

68. A long cylindrical conductor of radius a has two cylindrical cavities of diameter a through its entire length as shown in cross-section in figure. A current I is directed out of the page and is uniform throughout the cross-section of the conductor. Find the magnitude and direction of the magnetic field in terms of μ_0, I, r and a.



(a) at point P_1 and (b) at point P_2

Watch Video Solution

69. A particle of mass m and charge q is moving in a region where uniform, constant electric and mangetic fields $\vec{E}$ and $\vec{B}$ are present. $\vec{E}$ and $\vec{B}$ are parallel to each other. At time $t = 0$, the velocity $\vec{v}_0$ of the particle is perpendicular to $\vec{E}$ (Assume that its speed is always $< < c$, the speed of light in vacuum). Find the velocity $\vec{v}$ of the particle at time t. You must express your answer in terms of $t, q, m,$ the vector $\vec{v}_0, \vec{E}$ and $\vec{B}$ and their magnitudes $\vec{v}_0, \vec{E}$ and $\vec{B}$.

Watch Video Solution

70. A coil of radius R carries current i_1. Another concentric coil of radius $r(r < < R)$ carries current i_2. Planes of two coils are mutually perpendicular and both the coil are free to rotate about common diametre. Find maximum kinetic energy of smaller coil when both the coils are released, masses of coils are M and m, respectively.

Watch Video Solution

71. Kinetic energy of each electron in a beam of television picture tube is $12.0keV$. The electrons are emitted horizontally from geomagnetic south to geomagnetic north. The vertial componenet of earths magnetic field points down and has a magnitude $55.0\mu T$. (a) In which direction will the electrons deflect ? (b) How far will the beam deflect in moving $20.00cm$ through the television tube ?

View Text Solution

72. Two long concentric cylindrical conductors of radii a and b $(b < a)$ are maintained at a potential difference V and carry equal opposite current I. Show that an electron with a particular velocity u parallel to the axis may travel undeviated in the evacuated region between the conductors.

Watch Video Solution

73. A charged particle of mass m and charge q is projected on a rough horizontally xy - plane surface with z - axis in the vertically upward direction. Both electric and magnetic fields are acting in the region and given by $\vec{E} = -E_0\hat{k}$ and $\vec{B} = -B_0\hat{k}$ respectively. The particle enters into the field at $(a, 0, 0)$ with velocity $\vec{v} = v_0\hat{j}$. The particle starts moving into a circular path on the plane. If the coefficient of friction between the particle and the plane is μ. Then calculate tha :

(a) time when the particle will come to rest

(b) time when the particle will hit the centre.

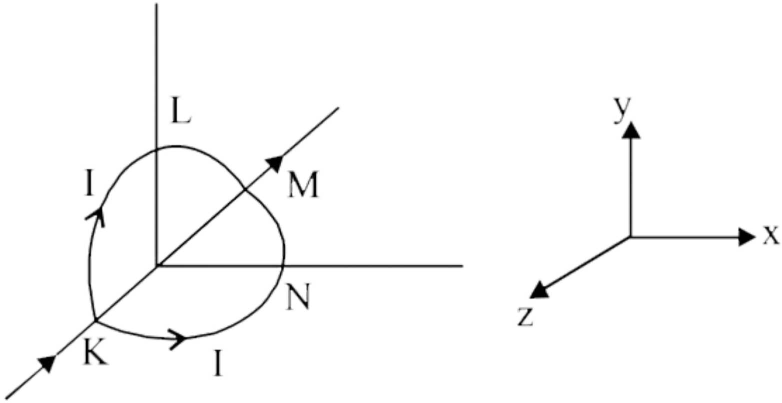
(c) distance travelled by the particle when it comes to rest.

View Text Solution

74. A circular loop of radius R is bent along a diameter and given a shapes as shown in the figure. One of the semicircles (KNM) lies in the x - z plane with their centres and the other one (KLM) in the y - z plane with their centres at the origin. current I is flowing through each of the semi circles as shown in figure.

(a) A particle of charge q is released at the origin with a velocity $\vec{v} = -v_0\hat{i}$. Find the instantaneous force $\vec{F}$ on the particle . Assume that space is gravity free.

(b) If an external uniform magnetic field $B_0\hat{j}$ is applied , determine the force $\vec{F}_1$ and $\vec{F}_2$ on the semicircles KLM and KNM due to the field and the net force $\vec{F}$ on the loop.



Watch Video Solution

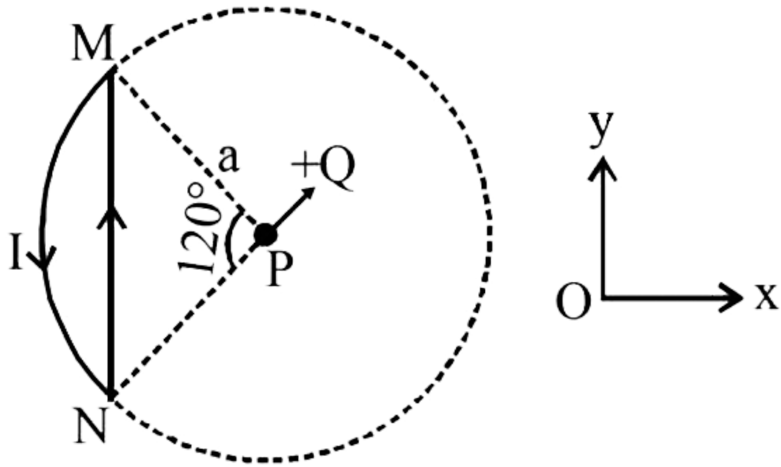
75. A conductor carries a current I parallel to a current strip of current per unit width j and width w, as shown in figure . Find an expression for the force per unit length on the conductor. Discuss the result when the width w approaches infinity.

View Text Solution

76. A wire loop carrying I is placed in the x - $y$plane as shown in fig.

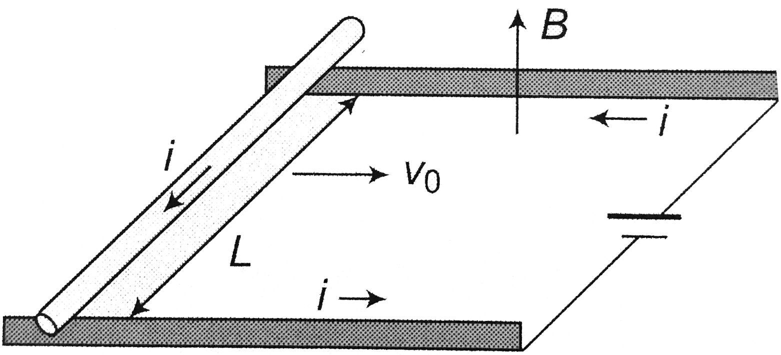
(a) If a particle with charge $+Q$ and mass m is placed at the centre P and given a velocity $\vec{v}$ along NP(see figure), find its instantaneous acceleration.

(b) If an external uniform magnetic induction field $\vec{B} = B\hat{i}$ is applied , find the force and the torque acting on the loop due to this field.



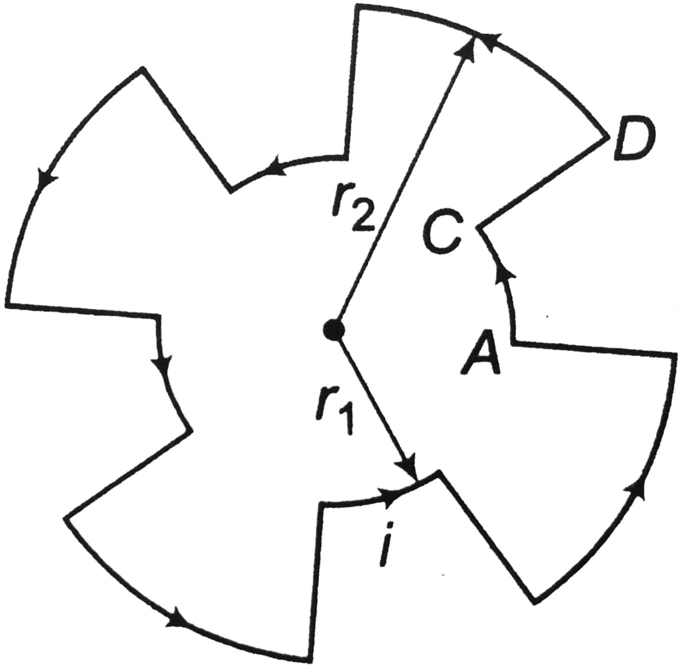
Watch Video Solution

77. A constant current i flows through a metal rod of length L and mass m that slides on frictionless rails as shown in Fig. If the initial speed of the rod is v_0 towards right and a magnetic field B acts vertically up, find (a) the speed of the rod as a function of time, (b) the total distance moved by the rod before coming to a stop.



Watch Video Solution

78. A current of $10A$ flows around a closed path in a circuit which is in the horizontal plane as shown in the figure. The circuit consists oif eight alternating arcs of radii $r_1 = 0.08m$ and $r_2 = 0.12m$. Each subtends the same angle at the centre.



a. Find the magnetic field produced by this circuit at the centre.

b. An infinitely long straight wire carryin as current of $10A$ is passing through the centre of the above circuit vertically with the direction of the current being into the pane of the circuit. what is the force acting on the wire at the centre due to the current in the circuit? What is the force acting on the arc AC and the straight segment CD due to the current at the centre?

Watch Video Solution

79. Three infinitely long thin wires, each carrying current i in the same direction, are in the x - y plane of a gravity free space . The central wire is along the y - $a\xi s$ while the other two are along $x = \pm d$.

(i) Find the locus of the points for which the magnetic field B is zero.

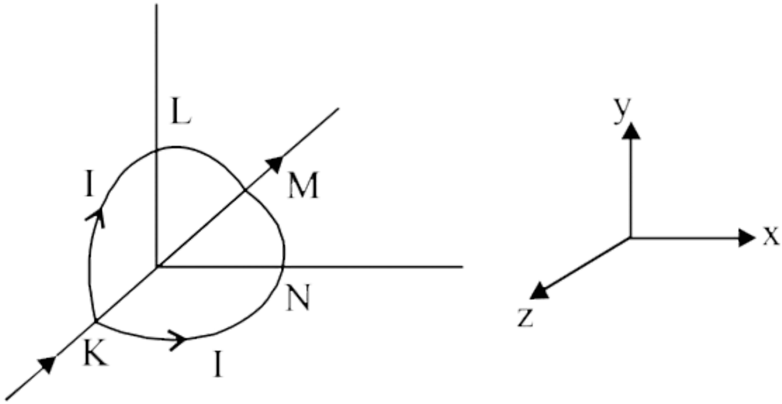
(ii) If the central wire is displaced along the Z - $direction$ by a small amount and released, show that it will excecute simple harmonic motion . If the linear density of the wires is λ, find the frequency of oscillation.

Watch Video Solution

80. A circular loop of radius R is bent along a diameter and given a shapes as shown in the figure. One of the semicircles (KNM) lies in the x - z plane with their centres and the other one (KLM) in the y - z plane with their centres at the origin. current I is flowing through each of the semi circles as shown in figure.

(a) A particle of charge q is released at the origin with a velocity $\vec{v} = - v_0\hat{i}$. Find the instantaneous force $\vec{F}$ on the particle . Assume that space is gravity free.

(b) If an external uniform magnetic field $B_0\hat{j}$ is applied , determine the force $\vec{F}_1$ and $\vec{F}_2$ on the semicircles KLM and KNM due to the field and the net force $\vec{F}$ on the loop.



Watch Video Solution

81. In a moving coil galvanometer, torque on the coil can be experessed as $\tau = ki$, where i is current through the wire and k is constant . The rectangular coil of the galvanometer having number of turns N , area A and moment of interia I is placed in magnetic field B. Find

(a) k in terms of given parameters N, I, A and B

(b) the torsion constant of the spring , if a current i_0 produces a deflection of $(\pi)/(2)$ in the coil .

(c) the maximum angle through which the coil is deflected, if charge Q is passed through the coil almost instaneously. (ignore the daming in mechinal oscillations).

Watch Video Solution

Level =I (H.W)

1. A north pole of strengtπAm, is moved around a circle of radius $10cm$ which lies around a long straight conductor carrying a current of $10A$. The work doen is nearly

A. $4\mu J$

B. $80\mu J$

C. $400\mu J$

D. $0.4\mu J$

Answer: 2

Watch Video Solution

2. Two long straight conductors carry currents $4A$ and$2A$ into the plane of paper. A circular path is imagined to be enclosing these currents. The value of `oint bar(B).bar(dl) is

A. $6\mu_0$

B. $7\mu_0$

C. $5\mu_0$

D. $2\mu_0$

Answer: 1

Watch Video Solution

3. Three long straight conductors are kept perpendicular to the plane of paper. Currents $2A, 3A$ are passing through the two conductors into the plane of paper in first two conductors and $5A$ current passes through thirst conductor, directed out of the paper. A closed loop encloses the conductors, then the value of $\oint \bar{B}.\bar{dl}$ over the closed loop is (assume current into the paper as negative and out of the paper as positive)

A. $2\mu_0$

B. zero

C. $-\mu_0$

D. $+\mu_0$

Answer: 2

Watch Video Solution

4. A long straight wire carries an electric current of $2A$. The magnetic induction at a perpendicular distance of $5m$ from the wire is $\left(\mu_0 4\pi \times 10^7 Hm^{-1}\right)$

A. $4 \times 10^{-8} T$

B. $8 \times 10^{-8} T$

C. $12 \times 10^{-8} T$

D. $16 \times 10^{-8} T$

Answer: 2

Watch Video Solution

5. a $2A$ current is flowing through a circular coil of radius $10cm$ containing 100 turns. Find the magnetic flux density at the centre of the coil.

A. 0.126×10^{-2}

B. 1.26×10^{-2}

C. 1.26×10^{-4}

D. 1.26×10^{-5}

Answer: 1

Watch Video Solution

6. A coil of radius π meters, 100 turns carries a current of $3A$. The magnetic induction at a point on its axis at a distance equal to $\sqrt{3}$ times its radius from its centre is

A. $7.2 \times 10^{-6} wbm^{-2}$

B. $7.4 \times 10^{-6} wbm^{-2}$

C. $7.5 \times 10^{-6} wbm^{-2}$

D. $7.8 \times 10^{-6} wbm^{-2}$

Answer: 3

Watch Video Solution

7. The coils A and B having the radii in the ratio $1:2$ carrying currents in the ratio $5:1$ and have the number of turns in the ration $1:5$. The ratio of magnetic inductions at their centres is `

A. $1:2$

B. $2:1$

C. $1:5$

D. $5:1$

Answer: 2

Watch Video Solution

8. The intensity of magnetic induction at the centre of a current - carrying circular coil is B_1 and at a point on its axis at a distance equal to its radius from the centre is B_2, then B_1/B_2 is

A. $2\sqrt{2}$

B. $\frac{1}{2\sqrt{2}}$

C. $\frac{1}{\sqrt{2}}$

D. $\sqrt{2}$

Answer: 1

Watch Video Solution

9. The magnetic induction at a point distance $'X'$ from the centre , on the axis of a circular current carrying coil is inversely proportional to (if $X >> $ radius of coil)

A. X

B. X^2

C. X^3

D. $X^{3/2}$

Answer: 3

Watch Video Solution

10. A circular coil of radius $5cm$ has 169 turns carries a current of $2.6A$. The magnetic induction at a point on the axis at a distance of $12cm$ from the centre of the coil is

A. $1T$

B. $4.2T$

C. 3.14×10^{-4}

D. $3.14 \times 10^{-2}T$

Answer: C

Watch Video Solution

11. A TG has 50 turns each of diameter $15cms$. When a certain current is passed through its coil, the deflection of the needle is 45°. If $B_{H}) = 4\pi\mu T$ the value of current is

A. $77.44mA$

B. $44.77mA$

C. $74.74mA$

D. $60mA$

Answer: 4

Watch Video Solution

12. A tangent galvanometer propertly adjusted gives a deflection of 30° when a certain current is passed through it. When the current is changed, then it gives a deflection of 45°. The ratio of the currents in the two cases is

A. $2:3$

B. $1:\sqrt{2}$

C. $1:\sqrt{3}$

D. $\sqrt{3}:1$

Answer: 3

Watch Video Solution

13. In a tangent galvanometer a deflection of 30° is obtained wth a certain current flowing through the coil. If the current is tripled, the deflection obtained will be

A. 45°

B. 60°

C. 90°

D. 30°

Answer: 2

Watch Video Solution

14. An electron of charge e has a time period of revolution of T in a Bohr orbit of radius r. The dipole moment of the electron is

A. $\pi r^2 e T$

B. $\pi r^2 e / T$

C. $\pi r^2 T / e$

D. $T / \pi r^2 e$

Answer: 2

Watch Video Solution

15. A circular coil of wire n turns has a radius r and carries a current I. Its magnetic dipole moment is M.Now the coil is unwound and again rewound into a circular coil of half the initial radius and the same current is passed throught is, then the dipole moment of this new coil is

A. $M/2$

B. $M/4$

C. M

D. $2M$

Answer: 1

Watch Video Solution

Watch Video Solution

16. A long solenoid has 20 turns per cm and carries a current i. the magnetic field at its centre is $6.28 \times 10^{-2} Wb/m^2$. 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. $1.05 \times 10^{-4} Wb/m^2$

B. $1.05 \times 10^{-2} Wb/m^2$

C. $1. -5 \times 10^{-5} Wb/m^2$

D. $1.05 \times 10^{-6} Wb/m^2$

Answer: B

Watch Video Solution

17. A proton and an α - particle enter a uniform magnetic field at right angles to the field with same speed. The ratio of the periods of α -

particle and proton is

A. $1:1$

B. $1:4$

C. $1:2$

D. $2:1$

Answer: 4

Watch Video Solution

18. A proton takes $10^{-12}s$ to complete one revolution in uniform magnetic field. The time taken in another orbit of double the radius in the same field is

A. $0.5 \times 10^{-12}\text{sec}$

B. $2 \times 10^{-12}\text{sec}$

C. $4 \times 10^{-12}\text{sec}$

D. 10^{-12}sec

Answer: 4

Watch Video Solution

19. A charged particle , having charge q accelerated through a potential difference V enters a perpendicular magnetic field in which it experiences a force F. If V is increased to $5V$, the particle will experience a force.

A. F

B. $5F$

C. $F/5$

D. $\sqrt{5}F$

Answer: 4

Watch Video Solution

20. A proton moving with a velocity of $2 \times 10^6 ms^{-1}$ describes circle of radius R in a magnetic field. The speed of an α - particle to describe a circle of same radius in the same magnitude field is

A. $1 \times 10^6 m/s$

B. $2 \times 10^6 m/s$

C. $4 \times 10^6 m/s$

D. $8 \times 10^6 m/s$

Answer: 1

Watch Video Solution

21. A particle of charge 16×10^{-18} coulomb moving with velocity $10 m/s$ 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 $10^1/m^{-1}$ is along the negative Z - axis. If the charged particle continues moving along the X - axis, the magnitude to B is

A. $1 Wb/m^2$

B. $10^5 Wb/M^2$

C. $10^6 Wb/m^2$

D. $10^{-3} Wb/m^2$

Answer: 1

Watch Video Solution

22. A proton is rotating along a circular path with kinetic energy K in a uniform magnetic field B. If the magnetic is made four times, the kinetic energy of rotation of proton is

A. $16K$

B. $8K$

C. $4K$

D. K

Answer: 4

Watch Video Solution

23. In a cyclotron , if the frequency of proton is $5MHz$, the magnetic field necessary for resosnance is

A. $0.528T$

B. $2.32T$

C. $0.389T$

D. $0.327T$

Answer: D

Watch Video Solution

24. A cyclotron's oscillator frequency is $10MHz$. The operating magnetic field for accelerating protons is

A. $0.66T$

B. $0.12T$

C. $1.67T$

D. $0.36T$

Answer: 1

Watch Video Solution

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

A. $2.4N$

B. $1.2N$

C. $3.0N$

D. $2.0N$

Answer: B

Watch Video Solution

26. Two parallel conductor carrying $5A$ each , repel with a force of $0.25Nm^{-1}$. The distance between them is

A. $4 \times 10^{-5}m$

B. $3 \times 10^{-5}m$

C. $2 \times 10^{-5}m$

D. $1 \times 10^{-5}m$

Answer: C

Watch Video Solution

27. Two straight parallel wires carry currents of $200mA$ and $1A$ in opposite direction. If the wires are $20cm$ apart, the distance of the neutral point from the $1A$ wire is (in cm)

A. 5

B. 15

C. 20

D. 25

Answer: 4

Watch Video Solution

28. Two long parallel copper wires carry currents of $5A$ each in opposite directions. If the wires are separated by a distance of $0.5m$, then the force between the two wires is

A. $10^{-5}N/m$ attractive

B. $10^{-5}N/m$ repulsive

C. $2 \times 10^{-6}N/m$ attractive

D. $2 \times 10^{-5} N/m$ repulsive.

Answer: 2

Watch Video Solution

29. A rectangular coil of wire of area $400 cm^2$ contain 500 turns. It is places in a magnetic field of induction $4 \times 10^{-3} T$ and it makes an angle 60° with the field. A current of $0.2A$ is passed through is. The torque on the coil is

A. $8\sqrt{3} \times 10^{-3} Nm$

B. $8 \times 10^{-3} Nm$

C. $8\sqrt{3} \times 10^{-4} Nm$

D. $8 \times 10^{-4} Nm$

Answer: 2

Watch Video Solution

30. A rectangular coil of wire carrying a current is suspended in a uniform magnetic field. The plane of the coil is making an angle of 30° with the direction of the field and the torque experienced by it is τ_1 and when the plane of the coil is making an angle of 60° with the direction of the field the torque experienced by it is τ_2. Then the ratio $\tau_1 : \tau_2$ is

A. $1:\sqrt{3}$

B. $\sqrt{3}:1$

C. $1:3$

D. $3:1$

Answer: 2

Watch Video Solution

31. A vertical rectangular coil of sides $5cm \times 2cm$ has 10 turns and carries a current of $2A$. The torque (couple) on the coil when it is placed in a uniform horizontal magnetic field of $0.1T$ with its plane perpendicular to the field is

A. $4 \times 10^{-3} N - m$

B. Zero

C. $2 \times 10^{-3} N - m$

D. $10^{-3} N - m$

Answer: 2

Watch Video Solution

32. The coil in a MCG has an area of $4cm^2$ and 500 turns. The intensity of magnetic induction is $2T$. When a current of $10^{-4} A$ is passes through it, the deflection is 20°. The couple per unit twist is $(N - m)$

A. 3×10^{-6}

B. 2×10^{-6}

C. 4×10^{-6}

D. 5×10^{-6}

Answer: 2

Watch Video Solution

33. The area of the coil in a moving coil galvanometer is $15cm^2$ and has 20 turns. The magnetic induction is $0.2T$ and the couple per unit twist of the suspended wire is $10^{-6}Nm$ per degree. If the deflection is 45°, the current passing through it is

A. $75 \times 10^{-4}A$

B. $7.5 \times 10^{-4}A$

C. $0.75 \times 10^{-4}A$

D. $750 \times 10^{-4}A$

Answer: 1

Watch Video Solution

34. The sensitivity of a galvanometer of resistance 990Ω is increased by 10 times. The shunt used is

A. 100Ω

B. 120Ω

C. 110Ω

D. 50Ω

Answer: 3

Watch Video Solution

35. A galvanometer of resistance 50Ω gives full scale deflection when a current $10^{-3}A$ is passed through it converted into an ammeter to measure $0.5A$ current.

A. $50/499\Omega$ in parallel

B. $9/20\Omega$ in parallel

C. $2/99\Omega$ in parallel

D. $20/99\Omega$ in parallel

Answer: 1

Watch Video Solution

36. A galvanometer of resistance 20Ω is shunted by a 2Ω resistor. What part of the main current flows through the galvanometer ?

A. $1/10$ part

B. $1/11$ part

C. $1/12$ part

D. $1/13$ part

Answer: 2

Watch Video Solution

37. A galvanometer has a resistance 50Ω and it shunted by a 0.5Ω resistor. The fraction of the main current that flows throught the galvanometer is

A. $1/100$

B. $1/101$

C. $1/10$

D. $1/11$

Answer: 2

Watch Video Solution

38. A galvanometer having a coil resistance of 100ω gives a full scale deflection , when a current of $1mA$ is passed through it. The value of the resistance, which can convert this galvanometer into ammeter giving a full scale deflection for a current of $10A$, is :

A. 0.01

B. 0.001

C. 0.1

D. 0.099

Answer: 1

Watch Video Solution

39. A galvanometer has a resistance of 49Ω.If 2% of the main current is to be passed through the meter, The value of the shunt will be

A. 2Ω

B. 1Ω

C. $\frac{1}{2}\Omega$

D. $\frac{1}{4}\Omega$

Answer: 2

Watch Video Solution

40. In an ammeter 5% of the total current is passing through the galvanometer of resistance G. The resistance of shunt (S) required will be

A. $19G$

B. $G/19$

C. $20G$

D. $G/20$

Answer: 2

Watch Video Solution

41. A galvanometer of internal resistance 100Ω has a full scale deflection current of $1mA$. To convert it into a voltmeter of range $0 - 10V$, the resistance to be connected is

A. 9000Ω in Series

B. $10, 000\Omega$ in Series

C. $9, 900\Omega$ in Series

D. $9, 800\Omega$ in Series

Answer: 3

Watch Video Solution

42. When a high resistance $'R'$ is connected in series with a volmeter of resistance $'G'$, the range of the volmeter increases 5times. Then $G:R$ will be

A. $4:1$

B. $1:2$

C. $8:1$

D. $1:4$

Answer: 4

Watch Video Solution

Level -II (H.W)

1. A current of $30A$ is flowing in a vertical straight wire. If the horizontal component of earths magnetic is $2 \times 10^{-5}T$, then the position of null point will be

A. $0.9m$

B. $0.3mm$

C. $0.3cm$

D. $0.3m$

Answer: D

Watch Video Solution

2. The magnetic field at the centre of the coil in the figure shown below is (the wires crossing at p are insulated from each other)

A. $\frac{\mu_0}{4\pi}\frac{2I}{r}(1 + \pi)$

B. $\frac{\mu_0}{4\pi}\frac{2I}{r}(\pi - 1)$

C. $\frac{\mu_0}{4\pi}\frac{2I}{r}\left(\pi^2 + 1\right)$

D. $\frac{\mu_0}{4\pi}\frac{2\pi I}{r}$

Answer: 1

Watch Video Solution

3. Due to a straight vertical current carrying conductor, a null point occurred at P on east of the conductor. The net magnetic induction at a point $'Q'$ which is at same distance on north of the conductor is

A. 0

B. $\sqrt{2}B_H$

C. B_H

D. $\sqrt{2}B_H$

Answer: 4

Watch Video Solution

4. The wire shown in figure carries a current of $40A$. If $r = 3.14cm$ the magnetic field at point p will be

A. $1.6 \times 10^{-3}T$

B. $3.2 \times 10^{-3}T$

C. $6 \times 10^{-4}T$

D. $4.8 \times 10^{-3}T$

Answer: C

Watch Video Solution

5. The magnetic field at the centre of semicircle o in the figure is

A. $B = \frac{\mu_0 i}{4r}$

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

C. $\frac{\mu_0 i}{4\pi r}(\pi - 2)$

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

Answer: 4

Watch Video Solution

6. A cube made of wire of equal length is connected to a battery as shown in figure.The magnetic field at the centre of the cube is

A. $\frac{12}{\sqrt{2}} \frac{\mu_0 I}{\pi L}$

B. $\frac{6\mu_0 I}{\sqrt{2}\pi L}$

C. $\frac{6\mu_0 I}{\pi L}$

D. zero

Answer: 4

Watch Video Solution

7. In the Bohr model of the hydrogen atom, the electron circuulates around the nucleus in a path of radius $5 \times 10^{-11} m$ at a frequency of $6.8 \times 10^{15} Hz.$

a. What value of magnetic field is set up at the centre of the orbit?

b. What is the equivalent magnetic dipole moment?

A. $12.27T$

B. $10.8T$

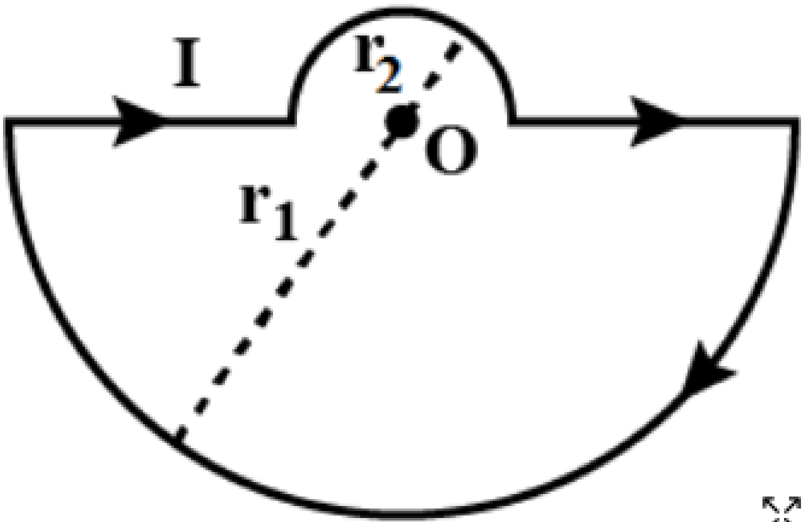
C. $13.2T$

D. $13.6T$

Answer: 4

Watch Video Solution

8. In the given loop the magnetic field at the centre O is



A. $\frac{\mu_I}{4}\left(\frac{r_1 + r_2}{r_1 r_2}\right)$ out of the page

B. $\frac{\mu_0 I}{4}\left(\frac{r_1 + r_2}{r_1 r_2}\right)$ into the page

C. $\frac{\mu_0 I}{4}\left(\frac{r_1 - r_2}{r_1 r_2}\right)$ out of the page

D. $\frac{\mu_0 I}{4}\left(\frac{r_1 - r_2}{r_1 r_2}\right)$ into the page

Answer: B

Watch Video Solution

9. The field normal to the plane of a wire of n turns and radis r which carriers i is measured on the axis of the coil at a small distance h from the centre of the coil. This is smaller than the field at the centre by the fraction.

A. $\frac{3}{2}\frac{h^2}{r^2}$

B. $\frac{2}{3}\frac{h^2}{r^2}$

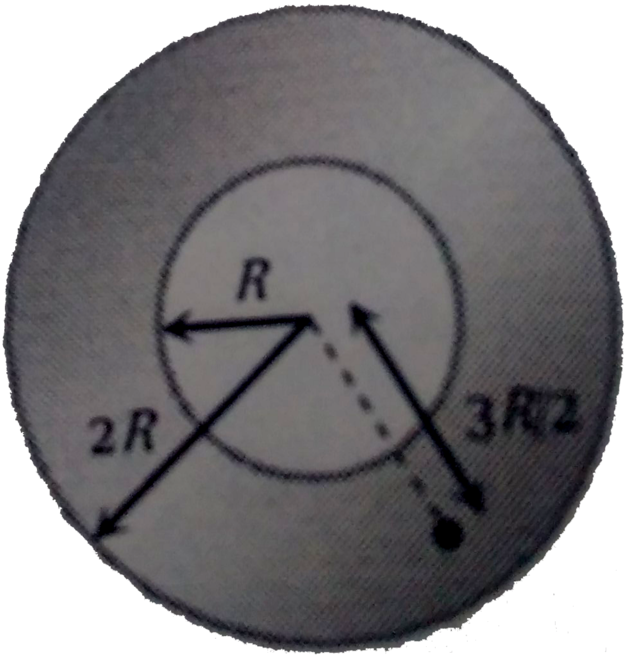
C. $\frac{3}{2}\frac{r^2}{h^2}$

D. $\frac{2}{3}\frac{r^2}{h^2}$

Answer: 1

Watch Video Solution

10. Figure shows the cross-sectional view of the hollow cylindrical conductor with inner radius $'R'$ and outer radius $'2R'$, cylinder carrying uniformly distributed current along it's axis. The magnetic induction at point $'P'$ at a distance $\frac{3R}{2}$ from the axis of the cylinder will be



A. Zero

B. $\frac{5\mu_0 i}{72\pi R}$

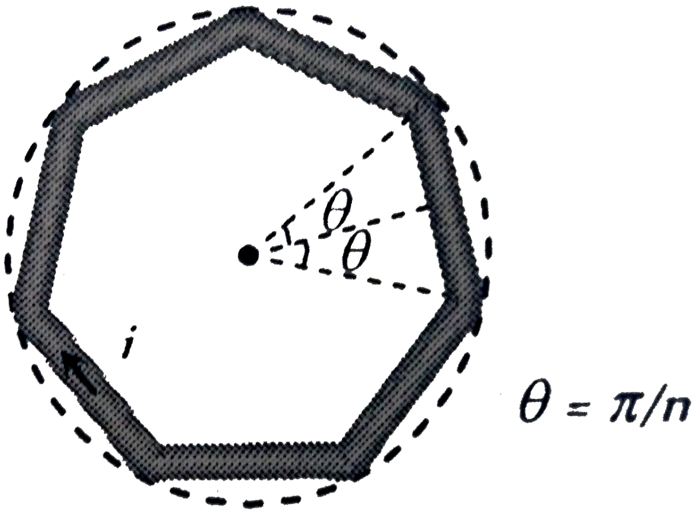
C. $\frac{7\mu_0 i}{18\pi R}$

D. $\frac{5\mu_0 i}{36\pi R}$

Answer: 4

Watch Video Solution

11. In the following figure a wire bent in the form of a regular polygon of n sides is inscribed in a circle of radius a. Net magnetic field at centre will be



A. $B = \frac{\mu_0 i}{2\pi a} \tan. \frac{\pi}{n}$

B. $B = \frac{\mu_0 n i}{2\pi a} \tan. \frac{\pi}{n}$

C. $B = \frac{2\mu_0 n i}{\pi a} \tan. \frac{\pi}{n}$

D. $B = \frac{\mu_0 n i}{2a} \tan. \frac{\pi}{n}$

Answer: 2

Watch Video Solution

12. Two concentric coils of 10 turns each are placed in the same plane. Their radii are $20cm$ and $40cm$ and carry 0.2 and 0.2 amp. Current respectively in opposite directions. The magnetic induction (in Tesla) at the centre is

A. $\frac{3}{4}\mu_0$

B. $\frac{5}{4}\mu_0$

C. $\frac{5}{3}\mu_0$

D. $\frac{5}{2}\mu_0$

Answer: 4

Watch Video Solution

13. Two tangent galvanometers having coils of the same radius are connected in series. A current flowing in them produces deflections of 60° and 45° respectively. The ratio of the number of turns in the coils is

A. $\frac{\sqrt{3}}{1}$

B. $\frac{1}{\sqrt{3}}$

C. $\frac{\sqrt{3}+1}{1}$

D. $\frac{1}{\sqrt{3}+1}$

Answer: 1

Watch Video Solution

14. A tangent galvanometer carrying a certain current gave a defelction of 30°. If the galvanometer is taken to another location where the earth's horizontal component of magnetic induction is one thrid of the previous value, The deflection for the same current will be

A. 60°

B. 45°

C. 90°

D. 30°

Answer: 1

Watch Video Solution

15. A wire length $6.28m$ is bent into a circular coil of 2 turns. If a current of $0.5A$ exists in the coil, the magnetic moment of the coil is, in Am^2:

A. $\frac{\pi}{4}$

B. $\frac{1}{4}$

C. π

D. 4π

Answer: 1

Watch Video Solution

16. A wire length $6.28m$ is bent into a circular coil of 2 turns. If a current of $0.5A$ exists in the coil, the magnetic moment of the coil is, in Am^2:

A. $\frac{\pi}{4}$

B. $\frac{1}{4}$

C. π

D. 4π

Answer: 1

Watch Video Solution

17. A solenoid of 1000 turns is wound uniformly on a glass tube $50cm$ long and $10cm$ diameter. The strength of magentic field at the centre of solenoid when a current of $0.1A$. Flows through it is

A. $100A/m$

B. $200A/m$

C. $400A/m$

D. $50A/m$

Answer: B

Watch Video Solution

18. A long solenoid has $200 turnspercm$ and carries a current i. The magnetic field at its centre is $6.28 \times 10^{-2} weber/cm^2$. Another long soloenoid has $100 turnspercm$ and it carries a current $\frac{i}{3}$. The value of the magnetic field at its centre is

A. $1.05 \times 10^{-2} wb/m^2$

B. $1.05 \times 10^{-5} wb/m^2$

C. $1.05 \times 10^{-3} wb/m^2$

D. $1.05 \times 10^{-4} Wb/m^2$

Answer: 1

Watch Video Solution

19. A proton moving in a perpendicular magnetic field possesses kinetic energy E . The magnetic field is increased 8 times. But the proton is constratined to move in the path of same radius. The radius energy will increase.

A. $1/8$ times

B. 8 times

C. 16 times

D. 64 times.

Answer: 4

Watch Video Solution

20. Electrons accelerated by a potential differnece V enter a uniform magnetic field of flux density B at right angles to the field. They describe a circular path of radius $'r'$. If now $'V'$ is doubled and B is also doubled, the radius of the new circular path is

A. $4r$

B. $2r$

C. $2\sqrt{2r}$

D. $r/\sqrt{2}$

Answer: 4

Watch Video Solution

21. An electron is shot in steady electric and magnetic field E and magnetic field B mutually perpendicular. The magnitude of E is 1 volt / cm and that of B is 2 tesla. Now it happens that the Lorentz (Magnetic) force cancels with the electro static force on the electron, then the velocity of the electron is

A. $50ms^{-1}$

B. $2cm^{-1}$

C. $0.5cm^{-1}$

D. $200ms^{-1}$

Answer: 1

Watch Video Solution

22. A beam of protons with a velocity of $4X10^5 ms^{-1}$ enters a uniform magnetic field of 0.3 T. The velocity makes an angle of 60° with the magnetic field. Find the radius of the helicla path taken by the proton beam and the pitch of the helix.

A. $4.7m$

B. $0.47m$

C. $0.047m$

D. $0.0047m$

Answer: 3

Watch Video Solution

23. A unifrom magnetic field B is acting from south to north and is of magntitdue $1.5 Wb/m^2$. If a proton having mass $= 1.7 \times 10^{-27} kg$ and charge $= 1.6 \times 10^{-19} C$ moves in this field vertically downwards with energy $5 MeV$, then the force acting on it will be

A. $7.4 \times 10^{12} N$

B. $7.4 \times 10^{-12} N$

C. $7.4 \times 10^{19} N$

D. $7.4 \times 10^{-19} N$

Answer: 2

Watch Video Solution

24. An electron travelloing with a velocity $\bar{V} = 10^7\hat{i}m/s$ enter a magnetic field of induction $\bar{B} = 2\bar{j}$. The force on electron is

A. $1.6 \times 10^{-12}\bar{j}N$

B. $3.2 \times 10^{-12}\bar{k}N$

C. $6.4 \times 10^{-12}\bar{K}N$

D. $-3.2 \times 10^{-12}\bar{K}N$

Answer: 4

Watch Video Solution

25. A magnetic field of $\left(4.0 \times 10^{-3}\hat{k}\right)T$ exerts a force $\left(4.0\hat{i} + 3.0\hat{j}\right) \times 10^{-10}N$ on a particle having a charge $10^{-9}C$ and moving in te $x - y$ plane. Find the velocity of the particle.

A. $-75\hat{i} + 100\hat{j}$

B. $100\hat{i} + 75\hat{j}$

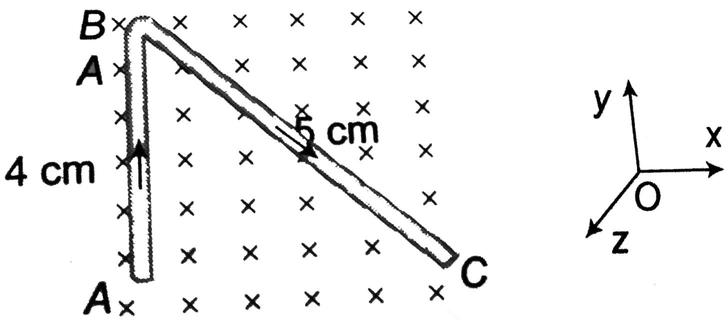
C. $75\hat{j} + 100\hat{j}$

D. $100\hat{i} - 75\hat{j}$

Answer: 1

Watch Video Solution

26. A unifrom conducting wire ABC has a mass of $10g$. A current of $2A$ flows through it. The wire is kept in a unifrom magnetic field $B = 2T$. The accleration of the wire will be



A. Zero

B. $12ms^{-2}$ along y - axis

C. $1.2 \times 10^{-3}ms^{-2}$ along y - axis

D. $0.6 \times 10^{-3} ms^{-2}$ along y - axis

Answer: 2

Watch Video Solution

27. A straight conductor carrying a current is kept in a uniform magnetic field so as to experience maximum force. If now the conductor is turned in its own plane such that the force acting on it is half of the maximum force, then the angle made by the conductor in the final position with respect to the field is

A. 60°

B. 45°

C. 30°

D. 90°

Answer: 3

Watch Video Solution

28. Two long parallel wires are separated by a distance of 2m. They carry a current of $1A$ each in opposite direction. The magnetic induction at the midpoint of a straight line connecting these two wires is

A. zero

B. $2 \times 10^{-7} T$

C. $4 \times 10^{-5} T$

D. $4 \times 10^{-7} T$

Answer: 4

Watch Video Solution

29. Three very long straight thin wires are connected parallel to each other through a battary of negligible internal resistance. The resistance of the wired are 2Ω, 3Ω and 4Ω. The ratio of distance of middle wire from the first and thrid wires if resusltant magnetic force on the middle wire is zero is :

A. $2:1$

B. $3:4$

C. $2:3$

D. $3:5$

Answer: 1

Watch Video Solution

30. Three long straight conductors are arranged parallel to each other in the same plane and carryin currents of $1A, 2A$ and$3A$ all in the same direction. The distance betweent eh first two conductros is x and the distance between the second and third conductors$\mathrm{y}$. If the middle conductor is in equilibrium, the ratio $x:y$ is

A. $1:3$

B. $3:1$

C. $1:\sqrt{3}$

D. $\sqrt{3}:1$

Answer: 1

Watch Video Solution

31. A wire of length l is bent in the form a circular coil of some turns. A current I flows through the coil. The coil is placed in a uniform magnetic field B. The maximum torqur on the coil can be

A. $\frac{IBL^2}{4\pi}$

B. $\frac{IBL^2}{\pi}$

C. $\frac{IBL^2}{2\pi}$

D. $\frac{2IBL^2}{\pi}$

Answer: 1

Watch Video Solution

32. A moving coil galvanometer A has 100 turns and resistance 10Ω. Another goal galvanometer B has 50 turns and 5Ω. The other quantities are same in both the cases. Then the voltange sensitivity of

A. A is greater than that of B

B. B is greater than that of A

C. A and B in Same

D. Cannot be compared

Answer: 3

Watch Video Solution

33. The coild of a galvanometer consists of 100 turn and effective area $1cm^2$. The restoring couple is $10^{-8}n-m/rad$. The magnetic field between the pole pieces 5 tesla. The current sensitivty per micro ampere.

A. 5×10^4 radian per micro ampere

B. 5×10^6 radian per micro ampere

C. 2×10^{-7} radian per micro ampere

D. 5 radian per micro ampere

Answer: 4

Watch Video Solution

34. The deflection in a moving coil galvanometer falls from 100 divisions to 20 divitation when a shunt of 12Ω is used. The resistance of the galvanometer coilds is

A. 3Ω

B. 12Ω

C. 48Ω

D. $48/5\Omega$

Answer: 3

Watch Video Solution

35. A galvaono metre required $10\mu A$. for one division of its scale. It is be used to measure a current of amp. To the full scale deflection. The scale has 100 divisions. The value of shunt if the resistance of the galvanometer is 999Ω.

A. 2Ω

B. 3Ω

C. 1Ω

D. 4Ω

Answer: 3

Watch Video Solution

36. The scale of a galvanometer of resistance $100 ohms$ contains 25 divisions. It gives a defelction of one division on passing a current of 4×10^{-4} amperes. The resistance in ohms to be added to it, so that it may become a voltmeter of range 2.5 volts is

A. 100

B. 150

C. 250

D. 300

Answer: 2

Watch Video Solution

37. A microammeter has as resistance of 100Ω and full scale range of $50\mu A$. It can be used a voltmeter or as ahigher range ammeter provided a resistance is added to it. Pick the correct range and resistance combinations

50 V range with $10k\Omega$ resistance in series

b.$10V$ range with $200k\Omega$ resistance in series

c. 5mA rangw with 1Ω resistance in parallel

$10mA$ range with 1Ω resistance in parallel

A. 50 Volt range with $10K\Omega$ resistance in series

B. 5 Volt range with $200K\Omega$ resistance in series

C. $5Ma$ range with1Ω resistance in parallel

D. $10Ma$ range with 1Ω resistance in parallel

Answer: 3

Watch Video Solution

ILLUSTRATION

1. Eight wires cut the page perpendicular to the points shown. Each wire carries current i_0. Odd currents are out of the page and even current into the page. Find the line integral $\oint \vec{B}.\overrightarrow{dl}$ along the loop.

Watch Video Solution

2. Find the magnetic induction due to a straight condutor of length $16cm$ carrying current of $5A$ at a distance of $6cm$ from the midpoint of conductor.

Watch Video Solution

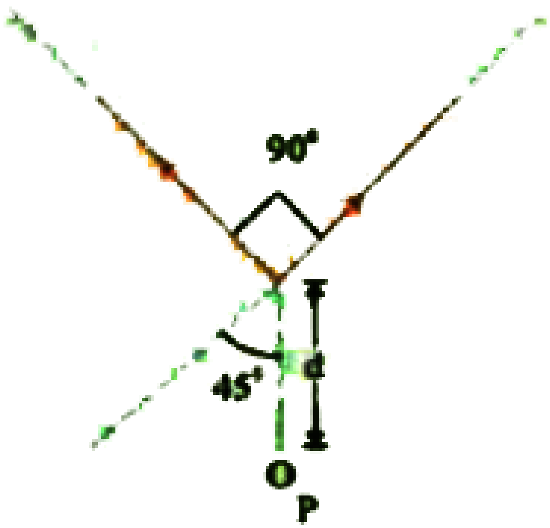
3. If a straight conductor of length $40cm$ bent in the form of a square and the current $2A$ is allowed to pass through square, then find the magnetic induction at the centre of the square loop.

Watch Video Solution

4. If a thin uniform wire of length 1 m is bent into an equilateral triangle and carries a current of $\sqrt{3}A$ in anitclockwise direction, find the net magnetic induction at the centroid

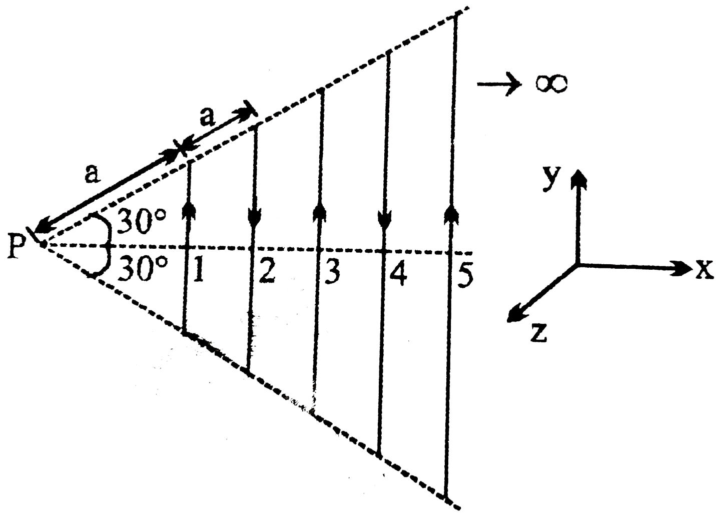
Watch Video Solution

5. A large straight current carrying conductor is bent in the form of L shape. Find $\vec{B}$at P.



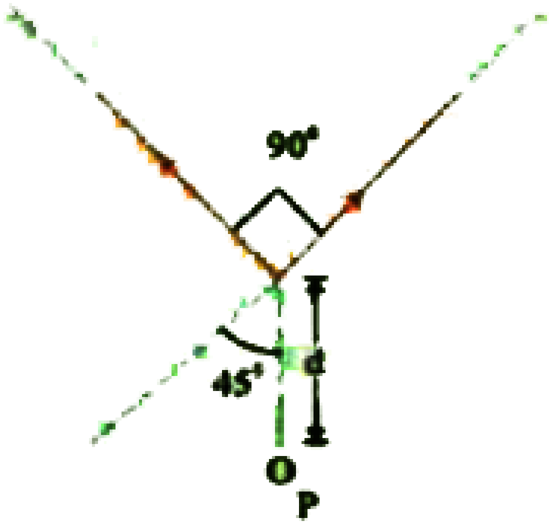
Watch Video Solution

6. Infinite number of straight wires each carrying current I are equally placed as shown in the figure Adjacent wires have current in opposite direction Net magnetic field at point P is



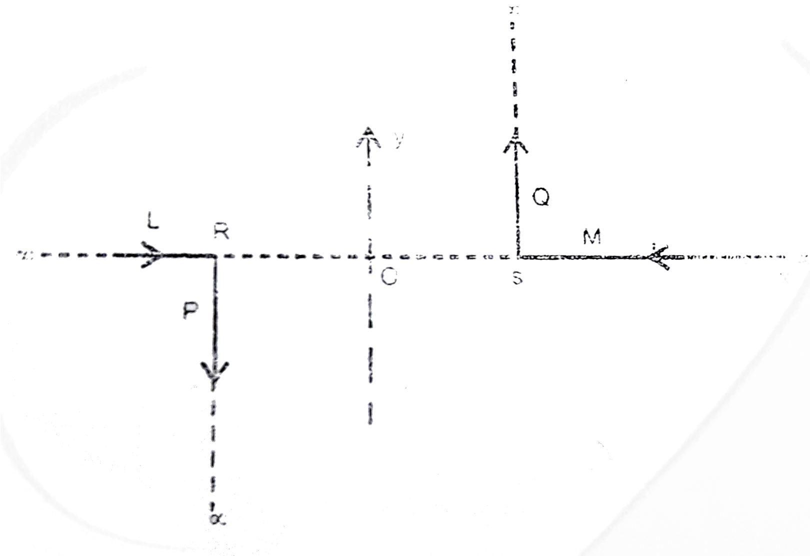
Watch Video Solution

7. Find the magnetic field at P due to the arrangement shown



Watch Video Solution

8. A pair of stationary and infinitely long bent wires is placed in the X - Y plane as shown in figure.The wires carry currents of $10A$ each as shown.The segments L and M are along the x-axis.The segments P and Q are pallel to the Y-axis such that $OS = OR = 0.02m$.Find the magnitude and direction of the magnetic induction at the origin O.

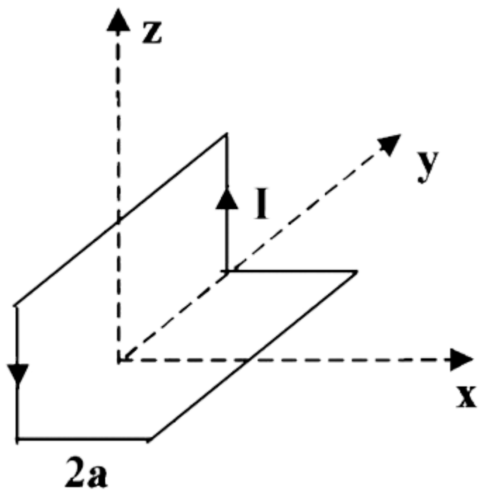


Watch Video Solution

9. An equilateral triangle of side length l is formed from a piece of wire of uniform resistance. The current I is as shown in figure. Find the magnitude of the magnetic field at its centre O.

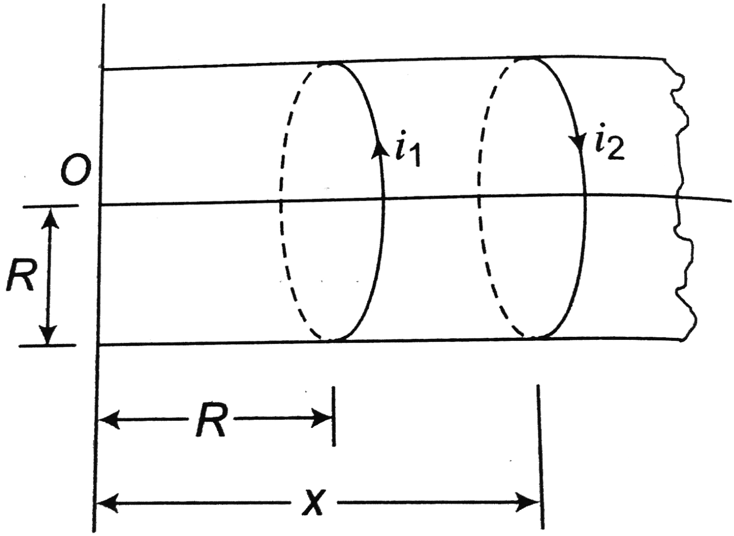
Watch Video Solution

10. A non - popular loop of conducting wire carrying a current I is placed as shown in the figure . Each of the straighrt sections of the loop is of the length $2a$. The magnetic field due to this loop at the point $P(a, 0, a)$ points in the direction



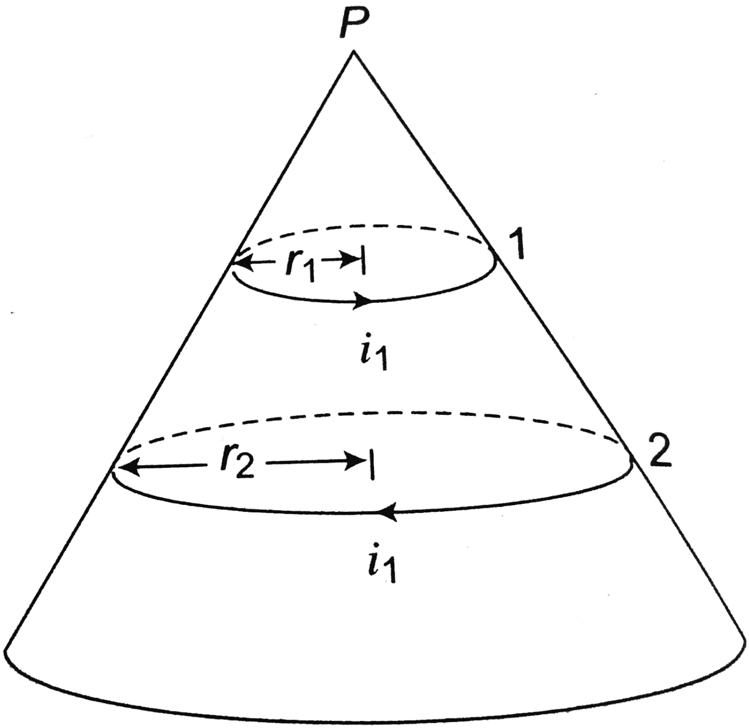
Watch Video Solution

11. Two wires are wrapped over wooden cylinder to form two co-axial loops carrying currents i_1 and i_2. If $i_2 = 8i_1$ the value of x for $B = 0$ at the origin O is:



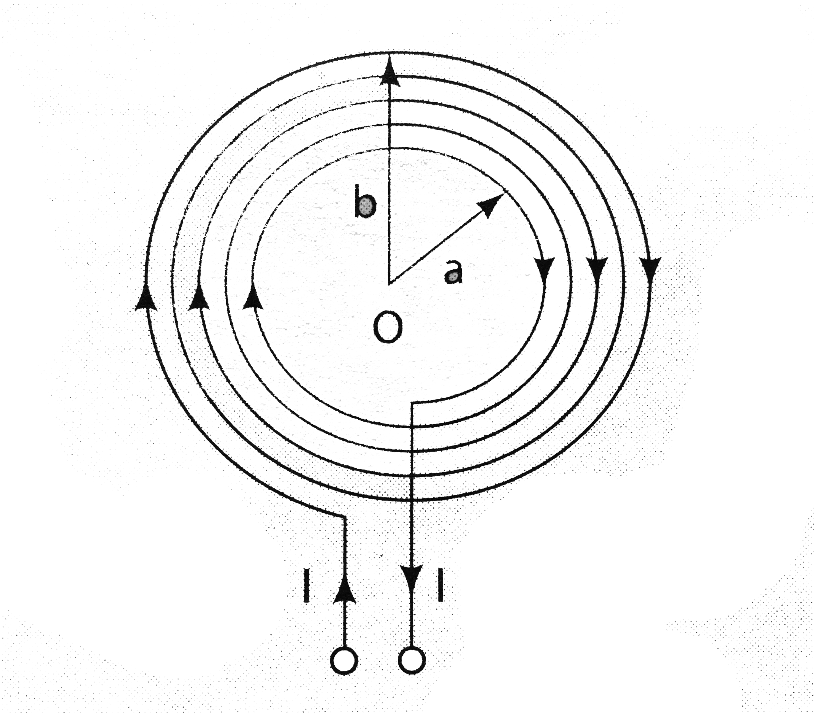
Watch Video Solution

12. Two wires wrapped over a conical frame from the coils 1 and 2. If they produce no net magnetic field at the apex P, the value of



Watch Video Solution

13. A thin insulated wire forms a plane spiral of $N = 100$ turns carrying a current $i = 8mA$. The inner and outer radii are equal to $a = 5cm$ and $b = 10cm$. Find the magnetic induction at the centre of the spiral



Watch Video Solution

14. A plastic disc of radius $'R'$ has a charge $'q'$ uniformly distributed over its surface. If the disc is rotated with a frequency $'f'$ about its axis, then the magnetic induction at the centre of the disc is given by

Watch Video Solution

15. A charge of $1C$ is placed at one end of a non conducting rod of length $0.6m$. The rod is rotated in a vertical plane about a horizontal axis passing through the other end of the rod with angular frequency $10^4 \pi rad/s$. Find the magnetic field at a point on the axis of rotation at a distance of $0.8m$ from the centre of the path.

Watch Video Solution

16. Two circular coils made of same material having radii $20cm \& 30cm$ have turns $100 \& 50$ respectively. If they are connected a) in series b) in parallel c) separately across a source of same emf find the ratio of magnetic inductions at the centre of circles in each case

Watch Video Solution

17. Two circular coils are made from a uniform wire the ratio of radii of circular coils are $2:3 \&$ no. of turns is $3:4$. If they are connected in parallel across a battery.

A: Find ratio of magnetic inductions at their centres

B: Find the ratio magnetic moments of 2 coils.

Watch Video Solution

18. Figure shows a square current carrying loop $ABCD$ of side $2m$ and current$i = \frac{1}{2}A$. The magnetic moment $\vec{M}$ of the loop is

Watch Video Solution

19. If two charged particles each of charge q mass m are connected to the ends of a rigid massless rod and is rotated about an axid passing through the centre and $\perp$ to length. Then find the ratio of magnetic moment to angular momentum.

Watch Video Solution

20. Find the magnetic dipole moment of the spiral of total number of turns$N$, carrying current i having inner and outer radii a and b respectively.

Watch Video Solution

21. Consider a non conducting plate of radius a and mass m which has a charge q distributed uniformly over it, The plate is rotated about its own axis with a angular speed ω. Show that the magnetic moment M and the angular momentum L of the plate are related as $\frac{M}{L} = \frac{q}{2m}$.

Watch Video Solution

22. A magnetic needle is arranged at the centre of a current carrying coil having 50 turns with radius of coil $20cm$ arranged along magnetic meridian. When a current of $0.5mA$ is allowed to pass through the coil the deflection is observed to be 30°. Find the horizontal component of earth's magnetic field

Watch Video Solution

23. A solenoid of length $8cm$ has 100 turns in it. If radius of coil is $3cm$ and if it is carrying a current of $2A$, find the magnetic induction at a point $4cm$ from the end on the axis of the solenoid.

Watch Video Solution

24. A solenoid 60 cm long and of radius 4 cm has 3 layer of windings 300 turns each. A 2.3 cm long wire of mass 2.5g lies inside the solenoide near its centre normal to its axis, both the wire and the axis of the solenoid are in the horizontal plane. The wire is connected through two leads parallel to the axis of the solenoid to an external battery which supplies a current of 6A in the wire. What value of current (with appropriate sense of circulation) in the windings of the solenoid can support the weight of the wire?

Watch Video Solution

25. A toroid of non ferromagnetic has core of inner radius $25cm$ and outer radius $26cm$. It has 3500 turns & carries a current of $11A$, then find the magnetic field at a point

(i) In the internal cavity of toroid

(ii) At the midpoint of the windings

(iii) At a point which is at a distance of $30cm$ from the centred of toroid.

Watch Video Solution

26. A solenoid of $2m$ long $\&3cm$ diameter has 5 layers of winding of 500 turns per metre length in each layer & carries a current of $5A$. Find intensity of magnetic field at the centre of the solenoid.

Watch Video Solution

27. A magnetic field of $\left(4.0 \times 10^{-3}\hat{k}\right)T$ exerts a force $\left(4.0\hat{i} + 3.0\hat{j}\right) \times 10^{-10}N$ on a particle having a charge $10^{-9}C$ and moving in te x - y plane. Find the velocity of the particle.

Watch Video Solution

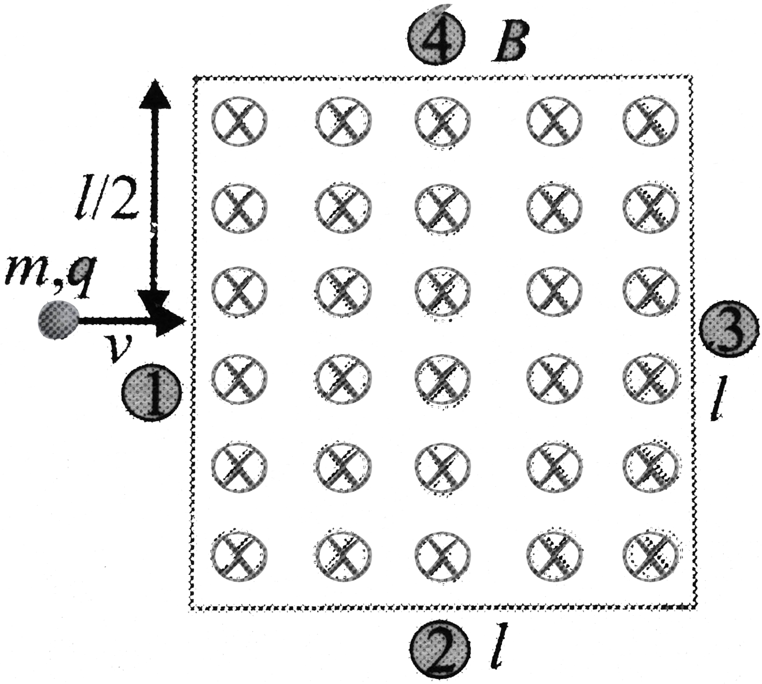
28. If a particle of charge $1\mu C$ is projected into a magnetic field $\vec{B} = \left(2\hat{i} + y\hat{j} - z\hat{k}\right)T$ with a velocity $\vec{V} = \left(4\hat{i} + 2\hat{j} - 6\hat{k}\right)ms^{-1}$, then it passes undeviated. If it is now projected with a velocity $\vec{V} = \hat{i} + \hat{j}$, then find the force experienced by it

Watch Video Solution

29. An α - particle is accelerated by a potential difference of $10^4 V$. Find the change in its direction of motion, if it enters normally in a region of thickness 0.1 m having transverse magnetic induction of 0.1 tesla. (Given: mass of α - particle 6.4×10^{-27}kg).

Watch Video Solution

30. The magnetic field is confirmed in a square region. A positive charged particle of charge q and mass m the limiting velocities of the particles so that it may come out of face (1), (2), (3), and (4).



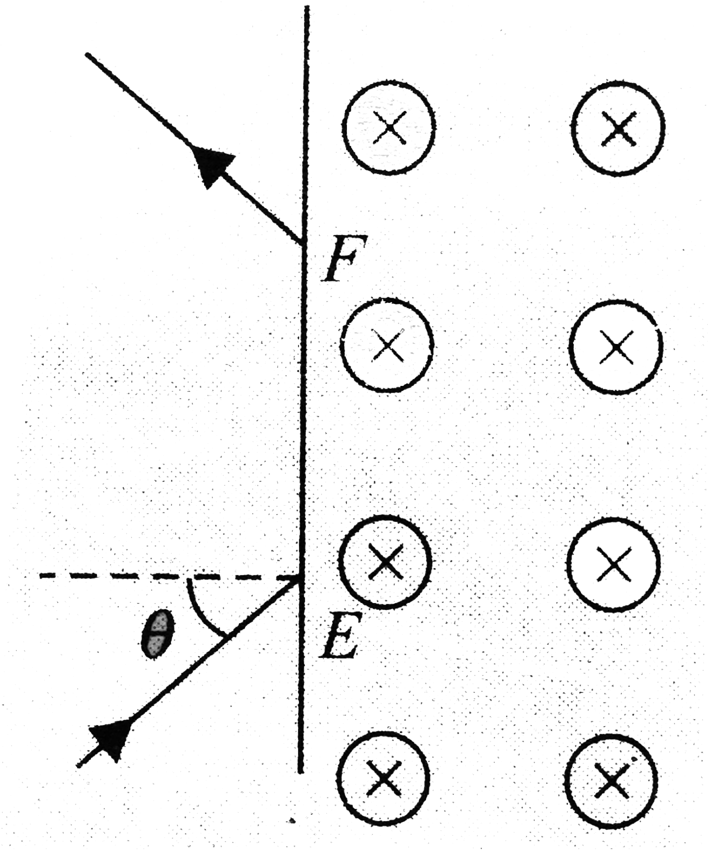
Watch Video Solution

31. A particle of mass m and charge +q enters a region of magnetic field with a velocity v, as shown in Fig. 1.93.

a. Find the angle subtended by the circular arc described by it in the magnetic field.

b. How long does the particle stay inside the magnetic field?

c. If the particle enters at E, what is the intercept EF?

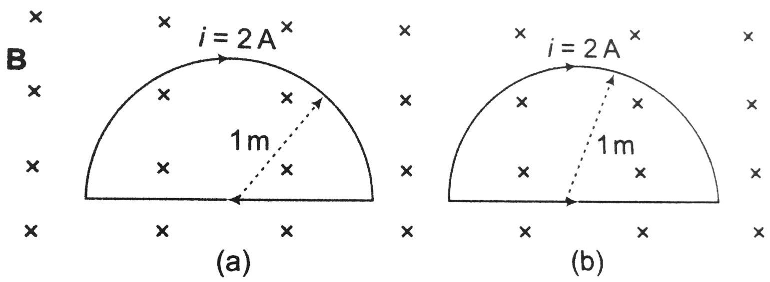


Watch Video Solution

32. Find the force experienced by the wire carrying a current $2A$ if the ends P and Q of the wire have coordinates $(1, 2 - 3)m$ and $(-2, -5, 1)m$ respectively when it is placed in a magnetic field $\vec{B} = \left(\hat{i} + \hat{j} + \hat{k}\right)T$

Watch Video Solution

33. In the figure shown a semicircular wire loop is placed in a uniform magnetic field $B = 1.0T$. The plane of the loop is perpendicular to the magnetic field. Current $i = 2A$ flows in the loop in the directions shown. Find the magnitude of the magnetic force in both the cases a and b. The radius of the loop is 1.0 m

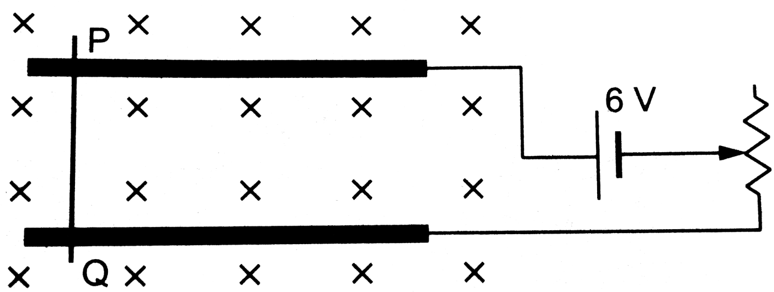


Watch Video Solution

34. A rough inclined plane inclined at angle of 37° with horizontal has a metallic wire of length $20cm$ with its length $\perp$ to length of inclines plane $(\mu = 0.1)$ When a current of its passing through the wire and a magnetic field is applied normal to the plane upwards, the wire starts moving up with uniform velocity for $B = 0.5T$. The find the magnitude of current i, (mass of the wire $= 50g$)

Watch Video Solution

35. A matel wire PQ of mass 10g lies at rest on two horizontal metal rails separated by 4.90 cm . A vertically downward magnetic field of magnitude 0.800 T exists in the space. The resistance of the circuit is slowly decreased and it is found that when the resistance goes below20.0Ω, the wire PQ starts sliding on the rails. Find the coefficient of friction.



Watch Video Solution

36. A current carrying conductor of mass m, length 1 carrying a current i hangs by two identical springs each of stiffness k. For an outward magnetic field B find the deformation of the springs. Put $m = 50gm. g = 10m/s^2, l = 1/2m, i = 1A$ and $B = 1T$ and $k = 50N/m$

Watch Video Solution

37. A square loop of side a hangs from an insulating hanger of spring balance. The magnetic field of strength B occurs only at the lower edge. It carries a current I . Find the change in the reading of the spring balance if the direction of current is reversed.

Watch Video Solution

38. A rod CD of length b carrying a current I_2 is placed in a magentic field due to a thin long wire AB carrying current I_1 as shown in figure. Then find the net force experience by the wire

Watch Video Solution

39. A long straight conductor carrying a current of $2A$ is in parallel to another conductor of length $5cm$. And carrying a current $3A$. They are separated by a distance of $10cm$. Calculate $(a)B$ due to first conductor at second conductor (b) the force on the short conductor.

Watch Video Solution

40. Two long straight parallel current carrying conductors each of length l and current i are placed at a distance r_0. Show that the total work done by an external agent in slowly reducing their distance of separation to $\frac{r_0}{2}$ is $\frac{\mu_0}{2\pi} i^2 \ln(2)$

Watch Video Solution

41. Two parallel horizontal conductors are suspended by two light vertical threads each 75 cm long. Each conductor has a mass of $40gm$, and when there is no current they are 0.5 cm apart. Equal current in the two wires result in a separation of 1.5 cm. Find the values and directions of currents. Take $g = 9.8ms^{-2}$.

Watch Video Solution

42. A conductor AB of length $10cm$ at a distance of $10cm$ from an infinitely long parallel conductor carrying a current $10A$. What work must be done to move AB to a distance of $20cm$ if it carries $5A$?

Watch Video Solution

43. Three long straight wires are connected parallel to each other across a battery of negligible internal resistance. The ratio of their resistances are $3:4:5$. What is the ratio of distances of middle wire from the others if the net forces experienced by it is zero.

Watch Video Solution

44. A circular loop of area $1cm^2$ carrying a current of $10A$ is placed in a magnetic field of $2T\hat{i}$. The loop is in xy plane with current in clockwise direction . Fing the torque on the loop

Watch Video Solution

45. A metallic wire is folded to form a square loop a side $'a'$. It carries a current $'I'$ and is kept perpendicular to a uniform magnetic field. If the shape of the loop is changed from square to a circle without changing the length of thw wire and current, the amount of work done in doing so is

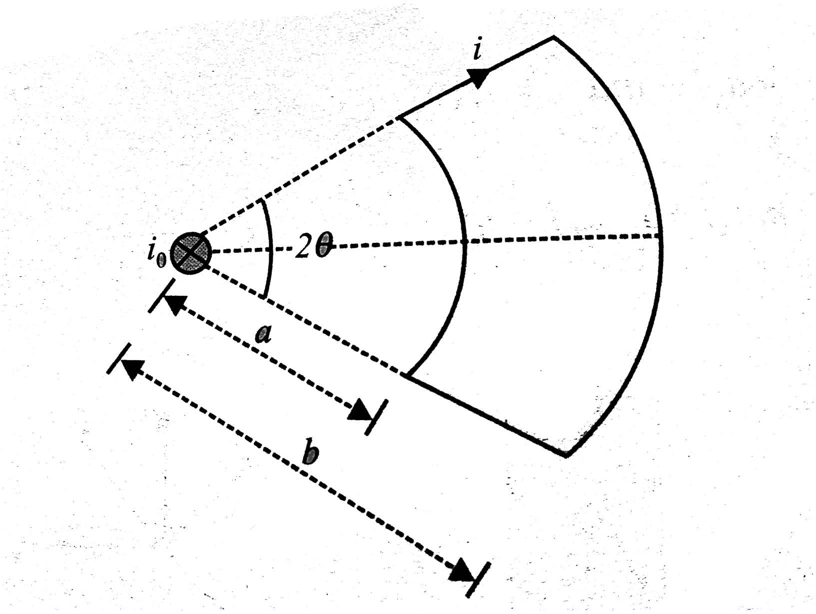
Watch Video Solution

46. A flat insulating disc of radius $'a'$ carries an excess charge on its surface is of surface charge density $\sigma C/m^2$. Consider disc to rotate around the perpendicular to its plane with angular speed $\omega rad/s$/ If magnetic field $\vec{B}$ is directed perpendicular to the roation axis, then find the torque acting on the disc.

Watch Video Solution

47. A loop, carring a current i, lying in the plane of the paper, is in the field of a long straight wire with current i_0 (inward) as shown in Fig. Find the

torque acting on the loop.



Watch Video Solution

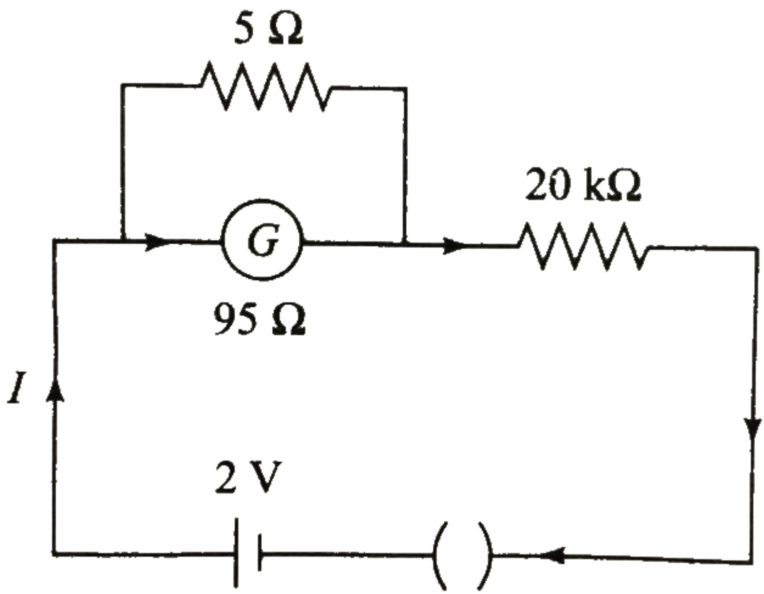
48. The area of the coil in a moving coil galvanometer is $16cm^2$ and has 20 turns. The magnetic induction is 0.2T and the couple per unit twist of the suspended wire is 10^{-6}Nm per degree. If the deflection is 45° calculate the current passing through it

Watch Video Solution

49. A coil of area $100cm^2$ having 500 turns carries a current of $1mA$. It is suspended in a uniform magnetic field of induction $10^{-3}wb/m^2$. Its plane makes an angle fo 60° with the lines of induction. The torque acting on the coil is

Watch Video Solution

50. A galvanometer of resistance 95Ω, shunted resistance of 5Ω, gives a deflection of 50 divisions when joined in series with a resistance of $20k\Omega$ and a $2V$ accumulator. What is the current sensitivity of the galvanomter (in div/μA)?



Watch Video Solution

51. A galvanometer of resistance 20Ω is shunted by a 2Ω resistor. What part of the main current flows through the galvanometer ?

Watch Video Solution

52. A galvanometer has resistance $500ohm$. It is shunted so that its senstivity decreases by 100 times. Find the shunt resistance.

Watch Video Solution

53. The resistance of galvanometer is 999Ω. A shunt of 1Ω is connected to it.If the main current current is $10^{-2}A$, what is the current flowing through the galvanometer .

Watch Video Solution

54. A galvanometer has a resistance of 98Ω. If 2% of the main current is to be passed through the meter, what should be the value of the shunt ?

Watch Video Solution

55. A maximum current point 0.5 mA can be passed through a galvanometer of resistance 20 Ω . The resistance to be connected in series to convert it in to voltmeter of range 0-5V.is

Watch Video Solution

56. A galvanometer has a resistance of 100 Ω . A current of 10^{-3} A pass through the galvanometer How can it be converted into (A) ammeter of range 10A and (b) voltmeter of range 10v

Watch Video Solution

57. A galvanometer having 30 divisions has current sensitivity of 20 μA/ division. It has a resistance of 25 ohm. How will you convert it into an ammeter measuring voltmeter reading upto 1V?

View Text Solution

58. What is the value of the shunt that passes 10% of the main current through a galvenomenter of 99Ω?

Watch Video Solution

C.U.Q (AMPERE.S CIRCUITAL LAW MAGNETIC FIELD DUE TO STRAIGHT CONDUCTOR)

1. The work done in maving a unit n - pole round a conductor carrying current in a circle of radius $10cm$ is w. The work done in moving it in a circle of radius $20cm$ is

A. w

B. 2w

C. w/2

D. 4w

Answer: A

Watch Video Solution

2. 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

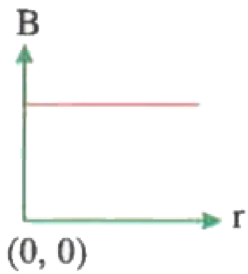
C. $\frac{\mu_0}{4\pi}\frac{2I}{r}$

D. $\frac{2I}{r}$

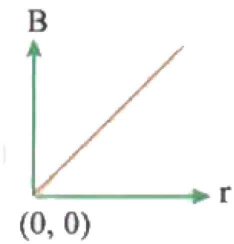
Answer: B

Watch Video Solution

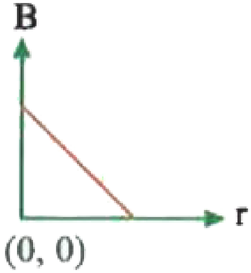
3. A long thin hollow metallic cylinder of radius $'R'$ has a current i ampere. The magnetic induction $'B'$ -away from the axis at a distance r from the axis varies as shown in



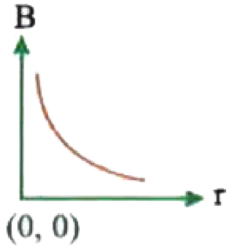
A.



B.



C.

D. 

Answer: D

Watch Video Solution

4. A current carrying wire produces in the neighbourhood

A. Electric and magnetic fields

B. Electric field only

C. Magnetic field only

D. No field

Answer: C

Watch Video Solution

5. A vertical straight conductor carries a current vertically upwards. A point P lies to the east of it at a small distance and another point Q lies to the west at the same distance. The magnetic field at P is

A. Greater than at Q

B. Same as at Q

C. Less than at Q

D. Greater or less than at Q depending upon the magnetic field of the current.

Answer: A

Watch Video Solution

6. A current carrying power line carries current from west to east. The direction of magnetic field $1m$ above is

A. north to south

B. south to north

C. east to west

D. west to east

Answer: A

Watch Video Solution

7. Magnetic lines of force due to a straight conductor carrying current are

A. Straight lines

B. Elliptical

C. Circular

D. Parabolic

Answer: C

Watch Video Solution

8. A current $'I'$ flows along an infinitely long straight conductor. If r is the perpendicular distance of a point, very far from the ends of the conductor then the magnetic induction B is given by

A. $B = \frac{\mu_0}{4\pi} \frac{2i}{r}$

B. $B = \frac{\mu_0}{4\pi} \frac{i}{r}$

C. $B = \frac{\mu_0}{4\pi} \frac{\pi i}{r}$

D. $B = \frac{\mu_0}{4\pi} \frac{2\pi i}{r}$

Answer: A

Watch Video Solution

9. A current $'I'$ flows along an infinitely long straight conductor. If $'r'$ is the perpendicular distance of a point from the lower end of the conductor, then the magnetic induction B is given by

A. $B = \frac{\mu_0}{4\pi} \frac{2i}{r}$

B. $B = \frac{\mu_0}{4\pi} \frac{i}{r}$

C. $B = \frac{\mu_0}{4\pi} \frac{\pi i}{r}$

D. $B = \frac{\mu_0}{4\pi} \frac{2\pi i}{r}$

Answer: B

Watch Video Solution

10. A long straight wire of circular cross- section carries a current along its length. On the axis inside the wire, it follows that

A. strength of electric and magnetic fields are zero

B. strength of electric field is zero but magnetic field is non-zero

C. strength of electric and magnetic fields is nonzero

D. strength of electric field is non-zero but magnetic field is zero

Answer: A

Watch Video Solution

11. Magnetic field at a point on the line of current carrying conductor is

A. maximum

B. infinity

C. zero

D. finite value

Answer: C

Watch Video Solution

12. If a long hollow copper pipe carriers a direct current, the magnetic field associated with the current will be:

A. Inside the pipe only

B. Outside the pipe only

C. Neither inside nor outside the pipe.

D. Both inside and outside the pipe.

Answer: B

Watch Video Solution

— —

13. The magnetic field dB due to a small current element dl at a distance $\vec{r}$ and carrying current $'I'$ is

A. $\overrightarrow{dB} = \frac{\mu_0}{4\pi} i \left(\frac{\overrightarrow{dl} \times \vec{r}}{r} \right)$

B. $\overrightarrow{dB} = \frac{\mu_0}{4\pi} i^2 \left(\frac{\vec{dl} \times \vec{r}}{r^2} \right)$

C. $\vec{dB} = \frac{\mu_0}{4\pi} i^3 \left(\frac{\vec{dl} \times \vec{r}}{r} \right)$

D. $\vec{dB} = \frac{\mu_0}{4\pi} i \left(\frac{\vec{dl} \times \vec{r}}{r^3} \right)$

Answer: D

Watch Video Solution

14. For a given distance from a current element, the magnetic induction is maximum at an angle measured with respect to axis of the current carrying conductor.

A. $3\pi/4$

B. $\pi/4$

C. $\pi/2$

D. 2π

Answer: C

Watch Video Solution

15. If we double the radius of a current carrying coil keeping the current unchanged, the magnetic field at its centre

A. becomes four times

B. doubled

C. remains unchanged

D. halved

Answer: D

Watch Video Solution

16. A current carrying coil is placed with its plane in the magnetic meridian of the earth. When seen from the east side a clockwise current is set up in the coil. The magnetic field at its centre with be directed towards

A. north

B. south

C. west

D. east

Answer: C

Watch Video Solution

17. A unit N - pole is placed on the axis of a circular coil carrying current in anti - clockwise direction. It experiences a force

A. towards the coil

B. perpendicular to the coil

C. inclined to axis

D. parallel to the coil.

Answer: C

Watch Video Solution

18. If we double the radius of the coil keeping the current through it unchanged, the magnetic field on its axis at very very far away points

A. becomes four times

B. is doubled

C. remains unchanged

D. halved

Answer: A

Watch Video Solution

19. Two concentric circular loops of radiir_1 and r_2 carry clockwise and anticlockwise currents i_1 and i_2. If the centre is a null point, i_1/i_2 must be equal to

A. r_2/r_1

B. r_2^2/r_1^2

C. r_1^2/r_2^2

D. r_1/r_2

Answer: D

Watch Video Solution

20. A length of wire carries a steady current. It is first bent to form a circular coil of one turn. The same length is now bent more sharply to give a loop of two turns of smaller radius. The magentic field at the centre caused by the same current now will be

A. a quarter of its first value

B. same as that of the first value

C. four times the first value

D. double of its first value

Answer: C

Watch Video Solution

21. A charge $'e'$ moves round a circle of radius $'r'$ with a uniform speed $'v'$. The magnitude of the magnetic induction at the centre of the circle is

A. $\mu_0 ev/4\pi r$

B. $\mu_0 ev/4\pi r^2$

C. $\mu_0 ev/4\pi r^3$

D. $\mu_0 er/4\pi v$

Answer: B

Watch Video Solution

22. An electron of charge e moves in a circular orbit of radius r round a nucleus the magnetic field due to orbit motion off the electron at the site of the nucleus is B. The angular velocity ω of the electron is

A. $\omega = \dfrac{\mu_0 eB}{4\pi r}$

B. $\omega = \dfrac{\mu_0 eB}{\pi r}$

C. $\omega = \dfrac{4\pi rB}{\mu_0 e}$

D. $\omega = \dfrac{2\pi rB}{\mu_0 e}$

Answer: C

Watch Video Solution

23. A particle of charge q and mass m moves in a circular orbit of radius r with angular speed ω. The ratio of the magnitude of its magnetic moment to that of its angular momentum depends on

A. $\omega : q$

B. $\omega q : m$

C. $q : 2m$

D. $\omega : m$

Answer: C

Watch Video Solution

24. A loosly wound helix made of stiff wire is mounted vertically with the lower end just touching a dish of mercury when a current from the battery is started in the coil through the mercury

A. the wire oscillates

B. the wire continues making contact

C. the wire breaks contact just when the current is passed

D. the mercury will expand by heating due to passage of current

Answer: A

Watch Video Solution

25. Two very thin metallic wires placed along X and Y axes carry equal currents as shown AB and CD are lines at 45° with the axes having origin at O the magnetic field will be zero on the line

A. AB

B. CD

C. straight segment OB only of line AB

D. straight segment OC only of line CD

Answer: A

Watch Video Solution

26. A positively charged particle enters at the middle as shown in Figure. With speed $10^5 m/s$ will bend

A. towards 1 A wire

B. upwards the plane of wires

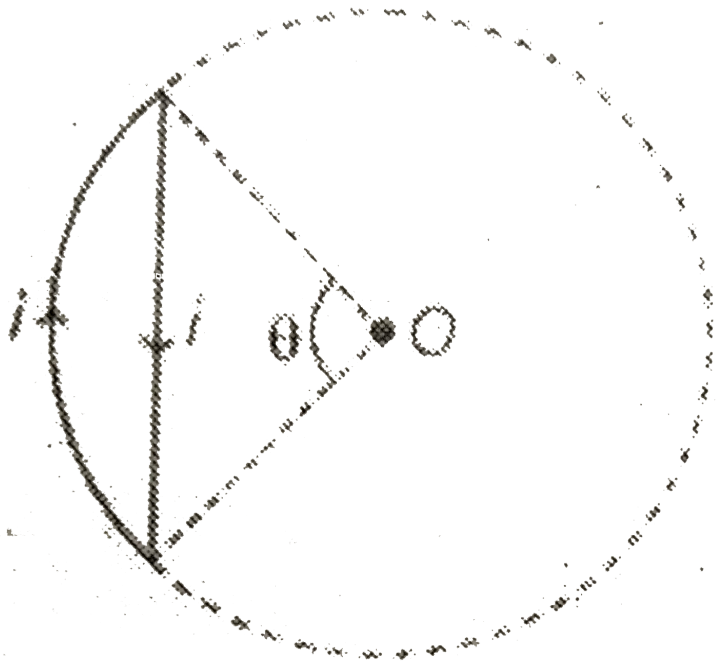
C. towards 3 A wire

D. down wards the plane of wires

Answer: C

Watch Video Solution

27. Net magnetic fields at the centre of the circles O due to a current carrying loop as show in figure is $\left(\theta < 180^\circ\right)$



A. zero

B. perpendicular to paper inwards

C. perpendicular to paper outwards

D. perpendicular to the paper inwards if $\theta \leq 90^{\circ}$ and perpendicular to paper outwards if $90^{\circ} \leq \theta \leq 180^{\circ}$

Answer: B

Watch Video Solution

28. Match the following and find the correct pairs.

List - I

a) Fleming's left hand rule

b) Right hand thumb rule

c) Biot - Savart law

d) Fleming's right hand rule

List - II

e) Direction of induced current

f) Magnitude and direction of magnetic induction

g) Direction of force due to magnetic induction

h) Direction of magnetic lines due to current

A. a-g, b-e, c-f, d-h

B. a-g, b-h, c-f, d-e

C. a-f, b-h, c-g, d-e

D. a-h, b-g, c-e, d-f

Answer: B

Watch Video Solution

C.U.Q (TANGENT GALVANOMETER)

1. The reduction factor of a tangent galvanometer may be defined as the current passing through it to produce a deflection of

A. 90°

B. 45°

C. 30°

D. 60°

Answer: B

Watch Video Solution

2. A tangent galvanometer is taken from equator to the north pole. During this the sensitivity of the tangent galvanometer

A. decreases because its reduction factor decreases

B. increases because its reduction factor decreases

C. decreases because its reduction factor increases

D. increases because its reduction factor increases

Answer: B

Watch Video Solution

3. In a tangent galvanometer, the circular coils is unwound and rewound to have twice the previous radius. As a result of this the reduction factor (K) of the tangent galvanometer if

A. unaffected

B. doubled

C. quadrupled

D. halved

Answer: C

Watch Video Solution

4. The sensitivity of a tangent galvanometer increases if

A. number of turns decreases

B. number of turns increases

C. field increases

D. number of turns remains same.

Answer: B

Watch Video Solution

5. The plane of the coild of tangent galvanometer is parallel to the magnetic meridian

A. to avoid the influence of earth's magnetic field.

B. to increase the magnetic field due to the current in the coil.

C. to make earth's magnetic field perpendicular to that due to the current in the coil.

D. for some other reason.

Answer: C

Watch Video Solution

6. The galvanometer constant of a tangent galvanometer depends upon

A. earth's magnetic field

B. current in the coil

C. magnetic field of the coil

D. deflection of the magnetic needle

Answer: A

Watch Video Solution

7. The sensitivity of tangent galvanometer will be maximum if deflection in it is tending to........... and reading is accurate for $\theta = \ldots\ldots\ldots\ldots\ldots\ldots.$

A. $0^{\circ}, 45^{\circ}$

B. $30^{\circ}, 0^{\circ}$

C. $45^{\circ}, 0^{\circ}$

D. $60^\circ, 45^\circ$

Answer: A

Watch Video Solution

8. A tangen galvanometer of reduction factor $1A$ is placed with plane of its coil perpendicular to the magnetic meridian when a current of $1A$ is passed through it. The deflection produced is

A. 45°

B. 0

C. 30°

D. 60°

Answer: B

Watch Video Solution

C.U.Q (FORCE ON A MOVING CHARGE IN MAGNETIC FIELD)

1. An electric charge in uniformmotion produces

A. an electric field only

B. a magnetic field only

C. both electric and magnetic fields.

D. no such field at all

Answer: C

Watch Video Solution

2. The force acting on a charge 'q' moving with a velocity V in a magnetic field of induction B is given by

A. $\frac{q}{\vec{V} \times \vec{B}}$

B. $\vec{V} \times \vec{B} \frac{)}{q}$

C. $q\left(\vec{V} \times \vec{B}\right)$

D. $\left(\vec{V}.\vec{B}\right)q$

Answer: C

Watch Video Solution

3. A magnetic field exerts no force on

A. a stream of electrons

B. a stream of protons

C. unmagnetised piece of iron

D. stationary charge

Answer: D

Watch Video Solution

4. If the direction of the initial velocity of a charged particle is neither along nor perpendicular to that of the magnetic field, then the orbit will be

A. a straight line

B. an ellipse

C. a circle

D. a helix.

Answer: D

Watch Video Solution

5. A charge moving with veloity V in X direction is subjected to a field of magnetic induction in the negative X direction . As a result the charge will

A. remain unaffected

B. start moving in a circular path in y-z plane

C. retard along X-axis

D. move along a helical path around X - axis

Answer: A

Watch Video Solution

6. The mono energetic beams of electrons moving along $+y$ direction enter a region of uniform electric and magnetic fields. If the beam goes straight through these simultaneously then field B and E are directed respectively along.

A. -y axis and -z axis

B. $+z$ axis and -x axis

C. $+x$ axis and - x axis

D. -x axis and -y axis

Answer: B

Watch Video Solution

7. An α - particle moves from E to W in a magnetic field perpendicular to the plane of the paper and into the paper. The particle is defelcted towards

A. East

B. West

C. South

D. North

Answer: C

Watch Video Solution

8. A positively charged particle falls vertically downwards. The horizontal component of earth's magnetic field will deflect it towards

A. East

B. West

C. South

D. North

Answer: B

Watch Video Solution

9. An electron and a proton enter a magnetic field with equal velocities. The particle that experiences more force is

A. electron

B. proton

C. both experience same force

D. it cannot be predicted.

Answer: C

Watch Video Solution

10. An electron and a proton enter a magnetic field at right angles to the field with the same kinetic energy

A. trajectory of electron is less curved

B. trajectory of proton is less curved

C. both are equally curved

D. both move along straight line paths

Answer: B

Watch Video Solution

11. A charged particle moving in a magnetic field experiences a resultant force

A. in the direction opposite to that of the field.

B. in the direction opposite to that of its velocity

C. in the direction perpendicular to both field & its velocity

D. in the direction parallel to the field

Answer: C

Watch Video Solution

12. An electron of mass $'m'$ is accelerated through a potential difference of V and then it enters a magnetic field of induction$B$. Normal to the lines of force. Then the radius of the circular path is

A. $\sqrt{\frac{2eV}{m}}$

B. $\sqrt{\frac{2Vm}{eB^2}}$

C. $\sqrt{\frac{2Vm}{eB}}$

D. $\sqrt{\frac{2Vm}{e^2B}}$

Answer: B

Watch Video Solution

13. Among the following, one characteristic is independecnt of the angle between $\vec{V}$ and $\vec{B}$

A. Momentum

B. Radius of helical path

C. Angular speed

D. Both 1 and 2.

Answer: C

Watch Video Solution

14. A charged particle enters into a uniform magnetic field the parameter that remains constant is

A. velocity

B. momentum

C. kinetic energy

D. angular velocity

Answer: C

Watch Video Solution

15. A free charged particle moves through a magnetic field. The particle may undergo a change in

A. speed

B. energy

C. direction of motion

D. magnitude of the velocity

Answer: C

Watch Video Solution

16. An electron is projected parallel to electric and uniform magnetic fields acting simultaneously in the same direction. The electron.

A. gains kinetic energy

B. loses kinetic energy

C. moves along circular path

D. moves along a parabolic path

Answer: B

Watch Video Solution

17. A charged particle is moving with velocity' V' in a magnetic field of induction B. The force on the paricle will be maximum when

A. V and B are in the same direction

B. V and B are in Opposite direction

C. V and B are perpendicular

D. V and B are at an angle of 45°

Answer: C

Watch Video Solution

18. If electron velocity is $2i + 4j$ and it is subjected to magnetic field of $4k$, then its

A. speed will change

B. path will change

C. velocity is Constant

D. momentum is Constant

Answer: B

Watch Video Solution

19. A proton (or charged particle) moving with velocity v is acted upon by electric field E and magnetic field B. The proton will move indeflected if

A. is perpendicular to B and E parallel to V

B. E is parallel to V and perpendicular to B

C. E and B both are parallel to V

D. E, V and B are mutually perpendicular and V=E/B

Answer: D

Watch Video Solution

20. A protn and an alpha particle enter into a uniform magnetic field with the same velocity. The period of rotation of the alpha particle will be

A. four times that of proton

B. two times that of proton

C. three times that of proton

D. same as that of proton

Answer: B

Watch Video Solution

21. A uniform electric field and a uniform magneitc field exist in a region in the same direction An electron is projected with velocity pointed in the same direction the electron will

A. turn to its right

B. turn to its left

C. keep moving in the same direction but its speed will increase

D. keep moving in the same direction but its speed will decrease

Answer: D

Watch Video Solution

22. Imagine that you are seated in a room and there is a uniform magnetic field pointing vertically down wards in it at the centre of the room an electron is projected horizontally from left to right with a certain speed. Discuss the speed and the path of the electron in this field.

A. electron moves in anticlockwise path

B. electron moves in clockwise path

C. electron moves left wards

D. electron moves right wards

Answer: B

Watch Video Solution

Watch Video Solution

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

A. $\vec{v} = \left(\vec{E} \times \vec{B}\right)/B^2$

B. $\vec{v} = \left(\vec{B} \times \vec{E}\right)/B^2$

C. $\vec{v} = \left(\vec{E} \times \vec{B}\right)/E^2$

D. vecv = (vecB xx vecE) //E^2`

Answer: A

Watch Video Solution

24. An electron of charge$e$, revolves round in an orbit of radius r with a uniform angular velocity ω. The magnetic dipole moment of the electron in the orbit is

A. $e\omega r/2$

B. $e\omega r^2/2$

C. $e\omega^2 r/2$

D. $e\omega^2/2$

Answer: B

Watch Video Solution

25. A proton and a deuteron are projected with same speeds normal to a uniform magnetic field. Which of the following statements is / are true

a) The ratio of their respective time periods is $1:2$

b) The ratio of their respective angular momenta about the centres of their circular path is $1:4$

c) The ratio of their respective radii of their circular is $1:2$

A. only a

B. only c

C. only a, b

D. All are true

Answer: D

Watch Video Solution

26. If a charged particle is projected perpendicular to a uniform magnetic field, then a) it revolves in circular path

b) its $K.E.$ remains constant

c) its momentum remains constant

d) its path is psiral

A. only a, b are correct

B. only a, c are correct

C. only b, d are correct

D. only a, d are correct

Answer: A

Watch Video Solution

27. When a positively charged particle enters a uniform magnetic field with uniform velocity, its trajectory can be

a) a straight line b) a circle c) a helix

A. a only

B. a or b

C. a or c

D. any one of a, b and c

Answer: D

Watch Video Solution

C.U.Q (FORCE ON A CURRENT CARRYING CONDUCTOR IN A MAGNETIC FIELD)

1. A circular coil of wire carries a current . PQ is a part of very long wire carrying a current and passing close to the circular coil. If the direction of currents are those shown in figure, then the direction of the force acting on PQ is

A. parallel to PQ, towards p

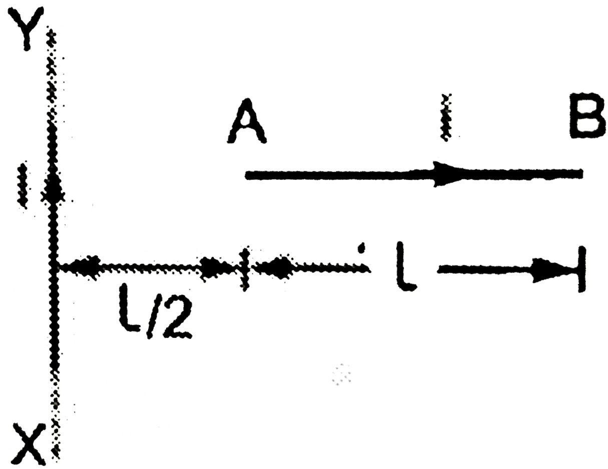
B. parallel to PQ, towards Q

C. at right angles to PQ, to the right

D. at right angles to PQ, to the left

Answer: D

Watch Video Solution



2.

A conductor AB of length l carrying a current i is placed perpendicular to a long straight conductor XY carrying a current I, as shown. The force on AB will act

A. along x to y

B. along y to x

C. to the right

D. to the left

Answer: A

Watch Video Solution

3. A conducting circular loop of radius r carries a constant current i. It is placed in a uniform magnetic field B such that B is perpendicular to the plane of loop. What is the magnetic force acting on the loop?

A. BIR

B. $2\pi(BIR)$

C. 0

D. $\pi(BIR)$

Answer: C

Watch Video Solution

C.U.Q (FORCE BETWEEN TWO PARALLEL CURRENT CARRYING CONDUCTORS)

1. Two coplanar circular coils of equal radius carrying currents i_1, i_2 in opposite directions are at a large distance $'d'$. The distance from the first coil where the resultant magnetic induction is zero is

A. $\dfrac{d}{1+\dfrac{i_2}{i_1}}$

B. $\dfrac{d}{1+\sqrt{\dfrac{i_2}{i_1}}}$

C. $\dfrac{d}{1+\left(\dfrac{i_2}{i_1}\right)^{\frac{1}{3}}}$

D. $\dfrac{d}{1+\left(\dfrac{i_2}{i_1}\right)^{2}}$

Answer: C

Watch Video Solution

2. A rectangular loop carryinig current I is located near an infinite long straight conductor carrying current I as shown in the figure. The loop,

A. remain stationary

B. is attracted towards the wire

C. is repelled away from the wire

D. will rotate about an axis parallel to the wire

Answer: B

Watch Video Solution

3. If two steams of proton move parallel to each other in the same direction, then they

A. attract each other

B. repel each other

C. neither attract nor repel

D. rotate

Answer: B

Watch Video Solution

4. Two streams of electrons are moving parallel to each other in the same direction. They

A. attract each other

B. repel each other

C. cancel the electric field of each other

D. cancel the magnetic field of each other

Answer: B

Watch Video Solution

5. A light body is hanging at the lower end of a vertical spring . On passing current in the spring, the body

A. rises up

B. goes down

C. no change

D. oscillates up & down

Answer: A

Watch Video Solution

6. A current carrying wire is placed along east and west in a magnetic field directed north wards. If the current in the wire is directed east wards, the direction of force on the wire is

A. due west

B. due south

C. vertically upwards

D. vertically downwards

Answer: C

Watch Video Solution

7. Two parallel, long wires carry currents i_1 & $i_2(i_1 > i_2)$ when the currents are in the same direction, the magnetic induction at a point midway between the two wires is X. If the direction of i_2 is reversed, the magnetic induction becomes 2x, then i_1/i_2 is

A. 1

B. 2

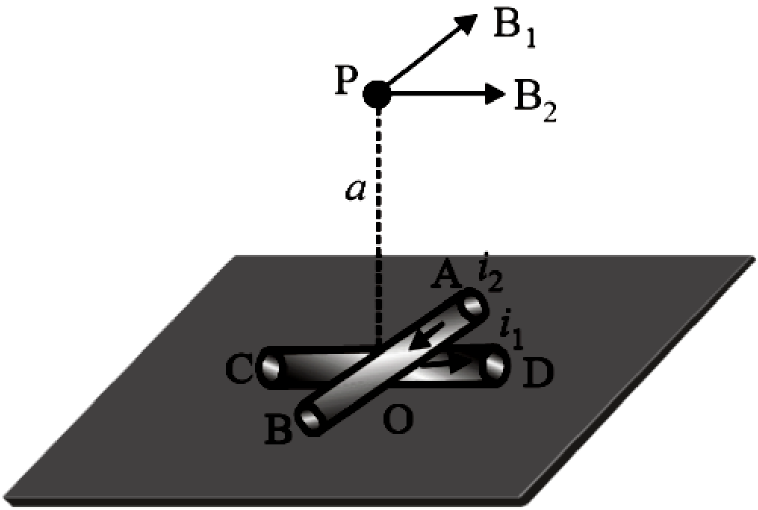
C. 3

D. 4

Answer: C

View Text Solution

8. The straight long conductors AOB and COD are perpendicular to each other and carry current i_1 and i_2. The magnitude of the magnetic induction at point P at a distance a from the point O in a direction perpendicular to the plane ACBD is



A. $\left(\mu_0/2\pi a\right)\left(i_1 + i_2\right)$

B. $\left(\mu_0/2\pi a\right)\left(i_1 - i_2\right)$

C. $\left(\mu_0/2\pi a\right)\left(i_1^2 + i_1^2\right)^{1/2}$

D. $\left(\mu_0/2\pi a\right)\left[i_1 i_2/\left(i_1 + i_2\right)\right]$

Answer: C

Watch Video Solution

9. Two parallel wires carrying current I and 2I in same direction have magnetic field B at the midpoint between them. If the current 2I is switched off, the magnetic field at that point will be

A. B/2

B. B

C. 2B

D. 3B

Answer: B

Watch Video Solution

10. Two long straight horizontal parallel wires one above the other are separated by a distance $'2a'$. If the wires carry equal currents in opposite directions, the magnitude of the magnitude induction in the plane of the wires at a distance $'a'$ above the upper wire is

A. $\frac{\mu_0 i}{2\pi a}$

B. $\frac{\mu_0 i}{2\pi a} + \frac{\mu_0 i}{4\pi a}$

C. $\frac{\mu_0 i}{2\pi a} - \frac{\mu_0 i}{4\pi a}$

D. $\frac{\mu_0 i}{3\pi a}$

Answer: D

Watch Video Solution

11. Choose the correct statement. There will be no force experienced if

A. two parallel wires carry currents in the same direction

B. two parallel wires carry currents in the opposite direction

C. a positive charge is projected between the pole pieces of bar magnet

D. a positive charge is projected along the axis of a solenoid carrying current

Answer: D

Watch Video Solution

C.U.Q (CURRENT LOOP AND MAGNETIC DIPOLE)

1. If the angular momentum of an electron revolving in a circular orbit is L, then its magnetic moment is

A. eLm

B. eL/m

C. eL/2m

D. zero

Answer: C

Watch Video Solution

2. The magnetic dipole moment of current loop is independent of

A. current in the loop

B. number of turns

C. area of the loop

D. magnetic field in which it is situated

Answer: D

Watch Video Solution

3. Tangent law is applicable to a dipole placed in two magnetic field $\vec{B}$ and $\overrightarrow{Bo}$ when

A. $\vec{B} = \vec{B}_0$

B. $\vec{B}$ and $\vec{B}_0$ are perpendicular to each other

C. $\vec{B}$ makes any angle with $\vec{B}_0$

D. $\vec{B}$ is directed opposite to $\vec{B}_0$

Answer: B

Watch Video Solution

4. A magnetic dipole placed in two perpendicular magnetic fields $\vec{B}$ and $\vec{B}_o$ is in equilibrium making an angle θ with $\vec{B}$ then.

A. $B = \vec{B}_0$

B. $B\cos\theta = B_0\sin\theta$

C. $B\sin\theta = B\cos\theta$

D. $B = B_0\tan\theta$

Answer: C

Watch Video Solution

5. A current loop placed in a magnetic field behaves like a

A. magnetic dipole

B. magnetic substance

C. magnetic pole

D. non magnetic substance

Answer: A

Watch Video Solution

6. Singly ionized heliium (x), ionized deuteron(y), alpha(z) particles are projected into a uniform magnetic field 3×10^{-4} tesla with velocities $10^5 ms^{-1}$, $0.4 \times 10^4 ms^{-1}$ and $2 \times 10^3 ms^{-2}$ respectively. The correct relation between the ration of the angular momentum to the magnetic moment of the particles is

A. $x > y = z$

B. x lt y lt z`

C. y lt x lt z`

D. $z > x > y$

Answer: A

Watch Video Solution

7. A small coil of N turns has area A and a current I flows through it. The magnetic dipole moment of this coil will be

A. iNA

B. i^2NA

C. iN^2A

D. iN/A

Answer: A

Watch Video Solution

C.U.Q (TORQUE ON CURRENT LOOP)

1. A straight horizontal conductor of length L meter and mass mkg carries a current $'I'$ ampere. The minimum magnetic induction which must exist in the region to balance its weight

A. mg/iL

B. iL/mg

C. mgL/i

D. mL/ig

Answer: A

Watch Video Solution

2. A current carrying loop in a uniform magnetic field will experience

A. force only

B. torque only

C. both torque and force

D. neither torque nor force

Answer: B

Watch Video Solution

3. The torque acting on a magnetic dipole of moment P_m when placed in a magnetic field is

A. $P_m B$

B. $\vec{P}_m \times \vec{B}$

C. $\vec{P}_m . \vec{B}$

D. P_m / B

Answer: B

Watch Video Solution

4. A coil of area A, turns N and carrying current i is placed with its face parallelt to the lines of magnetic induction B. The work done in rotating the coil through an angle of 180° is

A. iNAB

B. 2iNAB

C. iNAB/2

D. 0

Answer: B

Watch Video Solution

5. A conducting circular loop of radiius r carries a constant current i. It is placed in a uniform magnetic field $\vec{B}_0$ such that $\vec{B}_0$ is perpendicular to the plane of the loop . The magnetic force acting on the loop is

A. irB_0

B. πriB_0

C. 0

D. πriB_0

Answer: A

Watch Video Solution

6. A current carrying loop is free to turn in a uniform magnetic field. The loop will then come into equilibrium when its plane is inclined at

A. 0° to the direction of the field.

B. 45° to the direction of the field.

C. 90° to the direction of the field.

D. 60° to the direction of the field.

Answer: C

Watch Video Solution

7. When a current carrying coil is placed in a uniform magnetic field of induction B, then a torque τ acts on it. If I is the current, n is the number of turns and A is the face area of the coil and the normal to the coil makes an angle θ with B, Then

A. $\tau = BInA$

B. $\tau = BInA\sin\theta$

C. $\tau = BInA\cos\theta$

D. $\tau = BInA\tan\theta$

Answer: B

Watch Video Solution

8. A moving coil type of galvanometer is based upon the principle that

A. a coil carrying current experiences a torque in magnetic field.

B. a coil carrying current produces a magnetic field.

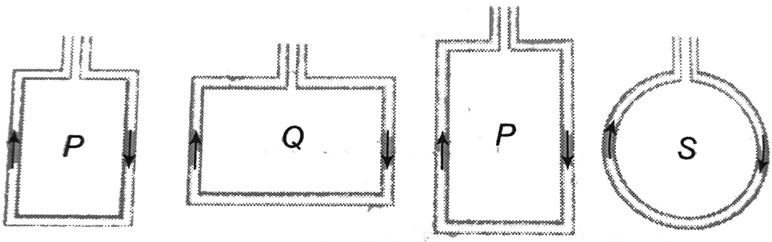
C. a coil carrying current experiences impulse in a magnetic field.

D. a coil carrying current experiences a force in magnetic field.

Answer: A

Watch Video Solution

9. Four wires each of length 2.0 meters area bent into four loops P, Q, R and S and then suspended into uniform magnetic field. Same current is passed in each loop. Which statement is correct?



A. couple on loop P will be highest

B. couple on loop Q will be highest

C. couple on loop R will be highest

D. couple on loop S will be highest

Answer: D

Watch Video Solution

10. Two circular coils carrying currents are of nearly same radius have common centre and released from rest with their planes perpendicular . Assuming that they can freely rotate about their diameter, select the wrong alternative.

A. Each will exert a torque on the other

B. Through out their rotation, angular momentum of the system is conserved

C. Angular momentum of system initially increases and then decreases

D. Potential energy of system first decreases

Answer: C

Watch Video Solution

11. A current carrying circular coil, suspended freely in a uniform external magnetic field orients to a position of stable equilibrium. In this state :

A. the plane of the coil is normal to the external magnetic field

B. the plane of the coil is parallel to the external magnetic field

C. flux through the coil is minimum

D. torque on the coil is maximum

Answer: A

Watch Video Solution

12. A conducting wire of length l is turned in the form of a circular coil and a current I is passed through it. For the torque, due to magnetic field

produced at its centre, to be maximum, the number of turns in the coil will be

A. 1

B. 2

C. infinity

D. 0

Answer: A

Watch Video Solution

13. When a current loop is placed in a uniform magnetic field

$(i)\ \ \vec{F}_R = 0$ and $\vec{\tau} = 0, (ii) \vec{F}_R = 0$ but $\vec{\tau} = 0$

$(iii) \vec{F}_R = 0$ but $\tau = 0, (iv) \vec{F}_R = 0$ and $\tau = 0$

A. only i & ii are true

B. only ii & iii are true

C. only iii & iv are true

D. only i & iv are true

Answer: B

Watch Video Solution

14. When a current carrying coil is situated in a uniform magnetic field with its magnetic moment antiparallel to the field

$i)$ Torque on it is maximum

$ii)$ Torque on it is minimum

$iii) PE$ of loop is maximum

$iv) PE$ of loop is minimum

A. only i and ii are true

B. only ii and iii are true

C. only iii and iv are true

D. only i, ii and iii are true

Answer: B

Watch Video Solution

C.U.Q (MOVING COIL GALVANOMETER)

1. In a moving coil galvanometer a radial magnetic field is applied with concave magnetic poles, to have

A) uniform magnetic field

B) the plane of the coil parallel to field

A. A, B true

B. A,B false

C. A true, B false

D. A false B true

Answer: A

Watch Video Solution

2. A current carrying coil tends to set itself

A. parallel to an external magnetic field.

B. parallel to its own magnetic field

C. perpendicular to the external magnetic field.

D. perpendicular to the geographic meridian

Answer: C

Watch Video Solution

3. The restoring couple in the moving coil galvanometer is due to

A. current in the coil

B. magnetic field of the magnet

C. material of the coil.

D. twist produced in the suspension wire

Answer: D

Watch Video Solution

4. A wire of length $'L'$ is made in the form of a coil in a moving coil galvanometer . To have maximum sensitive the shape of the coil is

A. circular

B. elliptical

C. rectangular

D. square

Answer: A

Watch Video Solution

5. What is the relation between voltage sensitivity S_v and the current sensitivity S of a moving coil galvanometer ? (Given that G is the resistance of the galvanometer.)

A. $\sigma_v = G\sigma_i$

B. $\sigma_v = \sigma_i / G$

C. $\sigma_v \sigma_i = G$

D. $\sigma_v \sigma_i = 1/G$

Answer: B

Watch Video Solution

6. The resistance of an ideal voltmeter is

A. zero

B. infinity

C. finite, very small

D. finite and large

Answer: B

Watch Video Solution

7. The sensitivity of a moving coil galvanometer increases with the decrease in

A. number of turns

B. area of coil

C. magnetic field

D. couple per unit twist

Answer: D

Watch Video Solution

8. If a galvanometer is shunted then among the following which statement is not true

A. effective range increases.

B. equivalent resistance decreases.

C. galvanometer becomes more sensitive

D. galvanometer becomes more protective.

Answer: C

Watch Video Solution

9. The purpose of soft iron cylinder between the pole pieces of the horse - shoe magnet in a moving coil galvanometer is

A. to increase the magnetic induction in the polar gap

B. to evenly distribute the magnetic lines of force

C. to provide a radial magnetic field

D. to reduce the magnetic flux leakage in the polar gap

Answer: A

Watch Video Solution

10. The radial magnetic field is used in a suspended coil galvanometer to provide

A. a uniform torque on the coil

B. maximum torque on the coil in all positions

C. a uniform and maximum torque in all positions of the coil

D. a non uniform torque on the coil

Answer: A

Watch Video Solution

11. Assertion (A): In $M.C.G.$, the deflection $'\theta'$ is directly proportional to the strength of the current

Reason (R): In $M.C.G.$, the torque experience by the loop is $BiAN\cos\theta$

A. Both A and Rare correct, R is correct reason of A

B. Both are wrong

C. Both A and R are correct and R is not the correct reason of A

D. A is correct, R is wrong

Answer: D

Watch Video Solution

C.U.Q (CONVERSION OF MCG INTO AMMETER)

1. To measure the resistance of a device using $Ohm's$ law the mode of connection used is

A. ammeter in series, voltmeter in parallel

B. voltmeter in series, ammeter in parallel

C. both ammeter and voltmeter in series

D. both ammeter and voltmeter in parallel

Answer: A

Watch Video Solution

2. To increase the range of an ammeter, we need to connect a suitable

A. low resistance in parallel

B. low resistance in series

C. high resistance in parallel

D. high resistance in series.

Answer: A

Watch Video Solution

3. An ammeter has a resistance of G ohm and a range of 'i' ampere. The value of resistance used in parallel, to convert into an ammeter of range 'ni' ampere is

A. nG

B. (n-1)G

C. G/n

D. G/n-1

Answer: D

Watch Video Solution

C.U.Q (CONVERSION OF MCG INTO VOLTMETER)

1. Among the following the false statement is

A. ammeter is connected in series and maximum current flows through it

B. voltmeter is connected in parallel and potential is maximum

C. ammeter is connected in series and current through it is negligible

D. voltmeter is connected in parallel and current through it is negligible.

Answer: C

Watch Video Solution

2. A galvanometer has a resistance of G ohm and range of V volt. Calculate the resistance to be used in seres with it to extend its range its renge to nV volt.

A. ng

B. g(n-1)

C. $\frac{g}{h}$

D. $\frac{g}{n-1}$

Answer: B

Watch Video Solution

3. In an electrical circuit containing a source of emf and a load resistance, the voltmeter is connected by mistake in series with the load across the source and ammeter is connected parallel to the load. Then which meter burns out

A. ammeter

B. voltmeter

C. both ammeter and voltmeter

D. neither ammeter nor voltmeter

Answer: D

Watch Video Solution

4. If a voltmeter, in advertently mistaken for an ammeter, were inserted into the circuit, the current

A. increases

B. remains same

C. decreases

D. becomes zero

Answer: B

Watch Video Solution

5. An ammeter and a voltmeter of resistance R are connected in series to an electric cell of negligible internal resistance . Their readings are A and V respectively. If another resistance R is connected in parallel with the voltmeter , then

A. Both A and V increases

B. Both A and V decreases

C. A decreases but V increases

D. A increases but V decreases.

Answer: D

Watch Video Solution

6. A moving coil voltmeter is generally used to measure the potential difference across a conductor of resistance 'r' carrying a current i. The resistance of voltmeter is R. For more correct measurement of potential difference

A. R=r

B. Rgtgtr

C. R ltlt r

D. R = 0

Answer: B

View Text Solution

7. The resistance of an ideal voltmeter is

A. Zero

B. infinity

C. 1000Ω

D. 10000Ω

Answer: B

Watch Video Solution

8. If G, r_A and r_V denote the internal resistances of a galvanometer, an ammeter and a voltmeter among the following the correct relationship is

A. $G < r_A < r_V$

B. $r_A < r_V < G$

C. $r_A < G < r_V$

D. $r_V < r_A < G$

Answer: C

View Text Solution

9. Among the following the true statement is,

A. ammeter is a high resistance galvanometer and voltmeter is a low resistance galvanometer

B. ammeter is a low resistance galvanometer and voltmeter is a high resistance galvanometer.

C. ammeter and voltmeter cannot be distinguished on the basis of their resistance,

D. ammeter and voltmeter have same resistance

Answer: B

Watch Video Solution

EXERCISE - 1(C.W) (AMPERE.S CIRCUITAL LAW BIOT-SAVART LAW AND ITS APPLICATIONS)

1. A north pole of strengtπAm, is moved around a circle of radius $10cm$ which lies around a long straight conductor carrying a current of $10A$. The work doen is nearly

A. $4\mu J$

B. $40\mu J$

C. $400\mu J$

D. $0.4\mu J$

Answer: B

Watch Video Solution

2. A closed circuit is in the form of a regular hexagon of side r. If the circuit carries current I, what is the magnetic field induction at the centre of the hexagon?

A. $\frac{\sqrt{3}\mu_0 I}{4\pi a}$

B. $\frac{\sqrt{3}\mu_0 I}{2\pi a}$

C. $\frac{\sqrt{3}\mu_0 I}{3\pi a}$

D. $\frac{\sqrt{3}\mu_0 I}{\pi a}$

Answer: D

Watch Video Solution

3. A current of $1/(4\pi)$ ampere is flowing in a long straight conductor. The line integral of magnetic induction around a closed path enclosing the current carrying conductor is

A. $4\pi \times 10^{-7} Wb/m$

B. $10^{-7} Wb/m$

C. $16\pi^2 \times 10^{-7} Wb/m$

D. 0

Answer: B

Watch Video Solution

4. A wire in the form of a square of side $'2m'$ carries a current $2A$. Then the magentic induction at the centre of the square wire is (magnetic permeability of free space $= \mu_0$)

A. $\frac{\mu_0}{2\pi}$

B. $\frac{\mu_0\sqrt{2}}{\pi}$

C. $\frac{2\sqrt{2}\mu_0}{\pi}$

D. $\frac{\mu_0}{\sqrt{2}\pi}$

Answer: C

Watch Video Solution

5. An electric current passes through a long straight wire. At a distance 5 cm from the wire the magnetic field is B. The field at 20 cm from the wire would be

A. 2B

B. B/4

C. B/2

D. B

Answer: B

Watch Video Solution

6. A current of one ampere is passed through a straight wire of length $2 \cdot 0$ metre. Find the magnetic field at a point in air at a distance 3 metre from one end of wire but lying on the axis of the wire.

A. $\mu_0 / 2\pi$

B. $\mu_0/4\pi$

C. $\mu_0/8\pi$

D. 0

Answer: D

Watch Video Solution

7. A straight vertical conductor carries a current. At a point $5cm$ due north of it, the magnetic induction is founded to be $20\mu T$ due east. The magnetic induction at a point $10cm$ east of its will be

A. 5μ T north

B. $10\mu T$ north

C. 5μT north

D. 10μT north

Answer: D

Watch Video Solution

8. A circular coil of radius $25cm$, carries a current of 50 ampere. If it has 35 turns, the flux density at the centre of the coil is $\left(inWb/m^2\right)$

A. $\pi \times 10^{-3}$

B. $1.4\pi \times 10^{-3}$

C. $14\pi \times 10^{-3}$

D. $2\pi \times 10^{-3}$

Answer: B

Watch Video Solution

9. A circular coil of radius R carries a current i. The magnetic field at its centre is B. The distance from the centre on the axis of the coil where the magnetic field will be $B/8$ is

A. $\sqrt{2}R$

B. $\sqrt{3}R$

C. $2R$

D. $3R$

Answer: B

Watch Video Solution

10. Two circular coils are made of two identical wires of same length and carry same current. If the number of turns of the two coils are 4 and 2, then the ratio of magnetic induction at the centres will be

A. $2:1$

B. $1:2$

C. $1:1$

D. $4:1$

Answer: D

Watch Video Solution

11. Two circular coils have diameters $10cm$ and $20cm$ with same number of turns. The ratio of the magnetic field induction produced at the centre of the coils when connected in series is

A. $1:2$

B. $2:1$

C. $4:1$

D. $1:4$

Answer: B

Watch Video Solution

12. A wire carrying a current of $4A$ is in the form of the circle. It is necessary to have a magnetic field of induction $\pi \times 10^{-5} T$ at the centre. The radius of the circle must be

A. 0.08 cm

B. 0.8 cm

C. 8 cm

D. 80 cm

Answer: C

Watch Video Solution

13. Two concentric circular coils A and B have radii $25cm$ and $15cm$ and carry currents $10A$ and $15A$ respectively. A has 24 turns and B has 18 turns. The direction of currents are in opposite order. The magnetic induction at the common centre of the coil is

A. $120\mu_0 T$

B. $480\mu_0 T$

C. $420\mu_0 T$

D. $\mu_0 T$

Answer: C

Watch Video Solution

14. A wire carrying a current of 140 ampere is bent into the form of a circle of radius $6cm$. The flux density at a distance of $8cm$ on the axis passing through the centre of the coil and perpendicular to its plane is $\left(InWb/m^2\right.$(approximately))

A. $\pi \times 10^{-4}$

B. $2\pi \times 10^{-4}$

C. $\frac{\pi}{2} \times 10^{-4}$

D. $\frac{1}{\pi} \times 10^{-4}$

Answer: A

Watch Video Solution

15. The magnetic induction at a point at a large distance d on the axial line of circular coil of small radius carrying current is $120\mu T$. At a distance $2d$ the magnetic induction would be

A. $60\mu T$

B. $30\mu T$

C. $15\mu T$

D. $240\mu T$

Answer: C

Watch Video Solution

16. A particle having charge 100 times that of an electron is revolving in a circular path of radius 0.8m with one rotation per second. The magnetic field produced at the centre is

A. $10^{-7}/\mu_0$

B. $10^{-17}\mu_0$

C. $10^{-6}\mu_0$

D. $10^{-15}/\mu_0$

Answer: B

Watch Video Solution

17. A battery is connected between two points A and B on the circumference of a uniform conducting ring of radius r and resistance R. One of the arcs AB of the ring subtends an angle θ at the centre . The value of the magnetic induction at the centre due to the current in the ring is

A. proportional to 2 $\left(180^\circ - \theta\right)$

B. Inversely proportional to τ

C. zero only if $\theta = 180^\circ$

D. zero for all values of θ

Answer: D

Watch Video Solution

EXERCISE - 1(C.W) (TANGENT GALVANOMETER)

1. A TG has 500 turns, each of radius $2\pi cm$. If $B_H = 3.6 \times 10^{-5} Wb/m^2$, The deflection due to $7.2 mA$ current is

A. 60°

B. 30°

C. 45°

D. 0

Answer: C

Watch Video Solution

2. In a propertly adjusted tangent galvanometer, the deflection for $1A$ current is found to 30°. Now the coil is turned through 90° about the vertical axis, the deflection for the same current will be

A. 60°

B. 30°

C. 90°

D. 0°

Answer: D

Watch Video Solution

3. Two tangent galvanometer are connetected in series across a battery. The deflections in them found to be 30° and 60° respectively. The ratio of their reduction factors is

A. $\sqrt{3}:1$

B. $1:\sqrt{3}$

C. $3:1$

D. $1:3$

Answer: C

Watch Video Solution

4. In a tangent galvanometer, the magnetic induction produced by the coil of wire situated in the magnetic meridian is found to be equal to the horizontal component of the earth's magnetic field. The deflection produced in it will be

A. 30°

B. 60°

C. 45°

D. 90°

Answer: C

Watch Video Solution

EXERCISE - 1(C.W) (CURRENT LOOP AND MAGNETIC DIPOLE)

1. If an electron is revolving in a circular orbit of radius $0.5A^{\circ}$ with a velocity of $2.2 \times 10^{6} m/s$. The magnetic dipole moment of the revolving electron is

A. $8.8 \times 10^{-24} Am$

B. $8.8 \times 10^{-23} Am$

C. $8.8 \times 10^{-22} Am$

D. $8.8 \times 10^{-21} Am$

Answer: A

Watch Video Solution

2. Magnetic induction at the centre of a circular loop of area π square meter is 0.1 tesla . The magnetic moment of the loop is $(\mu_0$ is permeability of air)

A. $\frac{0.1\pi}{\mu_0}$

B. $\frac{0.2\pi}{\mu_0}$

C. $\frac{0.3\pi}{\mu_0}$

D. $\frac{0.4\pi}{\mu_0}$

Answer: B

Watch Video Solution

EXERCISE - 1(C.W) (SOLENOID AND TOROID)

1. The length of a solenoid is $0.1m$ and its diameter is very small . A wire is wound over in two layers. The number of turns in the inner layer is 50 and that on the outer layer is 40. The strength of current flowing in two layers in the same direction is 3 ampere. The magnetic induction in the middle of the solenoid will be

A. $3.4 \times 10^{-3}T$

B. 3.4×10^{-3} gauss

C. $3.4 \times 10^{3}T$

D. 3.4×10^{3} gauss

Answer: A

Watch Video Solution

2. The magnetic induction at the centre of a solenoid is B. If the length of the solenoid is reduced to half and the same wire is would in two layers the new magnetic induction is

A. B

B. 2B

C. B/2

D. 4B

Answer: B

Watch Video Solution

EXERCISE - 1(C.W) (FORCE ACTING A MOVING CHARGE IN MAGNETIC FIELD)

1. A proton is fired with a speed of $2 \times 10^6 m/s$ at an angle of 60° to the X - axis . If a uniform magnetic field of 0.1 tesla is aplied along the Y - axis, the force acting on the proton is

A. $1.603 \times 10^{-14} N$

B. $1.6 \times 10^{-14} N$

C. $3.203 \times 10^{-14} N$

D. $3.2 \times 10^{-14} N$

Answer: B

Watch Video Solution

2. A conducting circular loop of radiius r carries a constant current i. It is placed in a uniform magnetic field $\vec{B}_0$ such that $\vec{B}_0$ is perpendicular to the plane of the loop . The magnetic force acting on the loop is

A. $ir\vec{B}$

B. $2\pi ri\vec{B}$

C. 0

D. $\pi ri\vec{B}$

Answer: C

Watch Video Solution

3. A proton enters a magnetic field with a velocity of $2.5 \times 10^{7} ms^{-1}$ making an angle 30° with the magnetic field. The force on the proton is $(B = 25T)$

A. $1.25 \times 10^{-11} N$

B. $25 \times 10^{-11} N$

C. $5.0 \times 10^{-11} N$

D. $7.5 \times 10^{-11} N$

Answer: C

Watch Video Solution

4. A doubly ionised He^{+2} atom travels at right angles to a magnetic field of induction $0.4T$ with a velcoity of $10^5 ms^{-1}$ describing a circle of radius r. A proton travelling with same speed in same direction in the same field will describe a circle of radius.

A. r/4

B. r/2

C. r

D. 2r

Answer: B

Watch Video Solution

5. A proton is projected with a velocity $10^7 ms^{-1}$, at right angles to a uniform magnetic field of induction $100mT$. The time (in second) taken by the proton to traverse 90° are is :(Mass of proton $= 1.65 \times 10^{-27} kg$ an charge of proton $= 1.6 \times 10^{-19} C$)

A. 0.81×10^{-7}

B. 1.62×10^{-7}

C. 2.43×10^{-7}

D. 3.24×10^{-7}

Answer: B

Watch Video Solution

6. A proton of energy $2MeV$ is moving perpendicular to uniform magnetic field of $2.5T$. The form on the proton is $\left(Mp = 1.6 \times 10^{-27} Kg\right.$ and $\left.q = e = 1.6 \times 10^{-19} C\right)$

A. 2.5×10^{-10} newton

B. 8×10^{-11} newton

C. 2.5×10^{-11}newton

D. 8×10^{-12} newton

Answer: D

Watch Video Solution

EXERCISE - 1(C.W) (CYCLOTRON)

1. A cyclotron in which protons are accelerated has a flux density of $1.57t$. The variation of frequency of electric field is (in Hz)

A. 4.8×10^8

B. 8.4×10^8

C. 2.5×10^7

D. 4.8×10^5

Answer: C

Watch Video Solution

2. Cyclotron is adjusted to give proton beam, magnetic induction is $0.15 wbsm^{-2}$ and the extreme radius is $1.5m$ The energy of emergent proton ini MeV will be

A. 34.2

B. 3.42

C. 2.43

D. 24.3

Answer: C

Watch Video Solution

3. A cyclotron has an oscillator frequency $12MHz$ and a dee of radius $50cm$. Calculate the magnetic induction needed to accelerate deuterons of mass $3.3 \times 10^{-27} kg$ and charge $1.6 \times 10^{-19} C$

A. $1.55 wb/m^2$

B. $2.55wb/m^2$

C. $0.55wb/m^2$

D. $3.55wb/m^2$

Answer: A

Watch Video Solution

EXERCISE - 1(C.W) (FORCE ON A CURRENT CARRYING CONDUCTOR IN A MAGNETIC FIELD)

1. A straight wire (conductor) length $10cm$ is kept in a uniform magnetic field of induction $0.02T$. The angle between the conductor and the field direction is 30°. A current of $5A$ is passed through the conductor . Th force on the conductor is (in N)

A. $4x10^{-3}$

B. 5×10^{-3}

C. 6×10^{-3}

D. 7×10^{-3}

Answer: B

Watch Video Solution

2. A ciruclar coil of 20 turns and radius $10cm$ is placed in a uniform magnetic field of $0.1T$ normal to the plane of the coil . If the current in the coil is $5.0A$ what is the average force on each electron in the coil due to the magnetic field (The coil is made of copper wire of cross - sectional area $10^{-5}m^2$ and the free electron density in copper is given to be about $10^{29}m^{-3}\big)$.

A. $2.5 \times 10^{-25}N$

B. $7.5 \times 10^{-25}N$

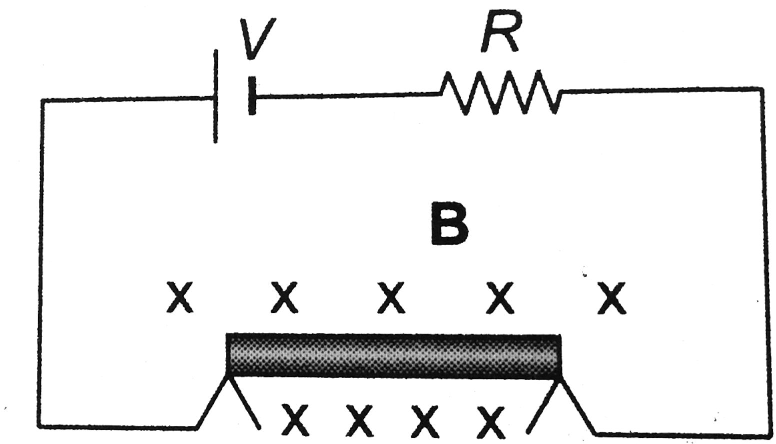
C. $5 \times 10^{-25}N$

D. $10^{-25}N$

Answer: C

Watch Video Solution

3. A thin, $50.0cm$ long metal bar with mass $750g$ rests on, but is not attached to, two metal supports in a $0.450T$ magnetic field as shown in figure. A battery and a resistance $R = 25.0\Omega$ in series are connected to the supports.



(a) What is the largest voltage the battery can have without breaking the circuit at the supper

(b) The battery voltage has this maximum value calculated. Decreasing the resistance to 2.0Ω the initial acceleration of the bar.

A. 817

B. 718

C. 827

D. 837

Answer: A

Watch Video Solution

EXERCISE - 1(C.W) (FORCE BETWEEN TWO PARALLEL CURRENT CARRYING CONDUCTORS)

1. The magnitude of the force between a pair of conductors, each of length 110 cm, carrying a current of 10A and seperated by a distance of 10 cm is

A. $55 \times 10^{-5} N$

B. $44 \times 10^{-5} N$

C. $33 \times 10^{-5} N$

D. $22 \times 10^{-5} N$

Answer: D

Watch Video Solution

2. Two parallel conductors A and B separated by $5cm$ carry electric current of $6A$ and $2A$ in the same direction. The point between A and B where the field is zero at

A. 0.25 cm from B

B. 1 cm from B

C. 1.25 cm from B

D. 3.75 cm from B

Answer: C

Watch Video Solution

3. The distance between the wires of electric mains is $12cm$. These wires experience $4mgwt$ per unit length. The value of current flowing in each wire will be if they carry current in same direction

A. 4.85 A

B. 0

C. $4.85 \times 10^{-2}A$

D. $8.5 \times 10^{-4}A$

Answer: A

Watch Video Solution

4. Two long straight conductors are held parallel to each other $7cm$ apart. The conductors carry currents of $9A$ and $16A$ in opposite directions. The distance of neutral point from the conductor carrying $16A$ current is

A. 9cm

B. 16cm

C. 25cm

D. 63/25cm

Answer: B

Watch Video Solution

EXERCISE - 1(C.W) (TORQUE ON CURRENT LOOP)

1. A rectangular coil of wire of 500 turns of area $10 \times 5cm^2$ carries a current of $2A$ in a magnetic field of induction $2 \times 10^{-3}T$. If the plane of the coild is parallel to the field. The torque on the coil is $(in)Nm$.

A. 0.1

B. 0.01

C. 0.001

D. 1

Answer: B

Watch Video Solution

2. A coil of area $100cm^2$ having 500 turns carries a current of $1mA$. It is suspended in a uniform magnetic field of induction $10^{-3}wb/m^2$. Its plane makes an angle fo 60° with the lines of induction. The torque acting on the coil is

A. $250 \times 10^{-8}Nm$

B. $25 \times 10^{-8}Nm$

C. $2.5 \times 10^{-8}Nm$

D. $0.2 \times 10^{-8}Nm$

Answer: A

Watch Video Solution

3. A circular coil of 1 turn and area $0.01m^2$ carries a current of $10A$. It is placed in a uniform magnetic field of induction 0.1 tesla such that the plane of the circle is perpendicular to the direction of the field, the torque acting on the coil is

A. 0.1 Nm

B. 0.001 Nm

C. 0.01 Nm

D. 0

Answer: D

Watch Video Solution

EXERCISE - 1(C.W) (MOVING COIL GALVANOMETER)

1. A current of $10^{-5}A$ produced a deflection of 10° in a moving coil galvanometer . A current of $10^{-6}amp$ in the same galvanometer produces a deflection of 1°

A. 1°

B. 0.1°

C. 10°

D. $(1/100)^{\circ}$

Answer: A

Watch Video Solution

2. The coils made of same material in two moving coil galvanometer have their area in the ratio of $2:3$ and number of turns in the ratio $4:5$. These two coils carry the same current and are situated in the same field. The deflections produced by these two coils willl be in the ratio of

A. $8:15$

B. $15:8$

C. $8:1$

D. $1:4$

Answer: A

Watch Video Solution

EXERCISE - 1(C.W) (CONVERSION OF MCG INTO AMMETER AND VOLTMETER)

1. A galvanometer has a resistance of 400Ω. The value of shunt so that its sensitivity is to be reduced by $1/50$ times

A. 6.16Ω

B. 7.16Ω

C. 8.16Ω

D. 9.16Ω

Answer: C

Watch Video Solution

2. A galvanometer of resistance 20Ω is to be shunted so that only 1% of the current passes through it. Shunt connected is $99/20\Omega$

A. $\frac{99}{20}\Omega$

B. $\frac{9}{20}\Omega$

C. $20/99\Omega$

D. $\frac{2}{99}\Omega$

Answer: C

Watch Video Solution

3. The resistance of a moving coil galvanometer is $5ohm$. The maximum current it can measure is $0.015A$. To convert it into an ammeter to measure $1.5A$

A. connected 5/99 ohm in serie

B. connected 99/50 ohm in parallel

C. connected 5/99 ohm in parallel

D. connected 99/50 ohm in series

Answer: C

Watch Video Solution

4. A galvanometer of coil resistance 100Ω is connected to a shunt of resistance 10Ω . The current through the galvanometer is i_1 , the current through the shunt is i_2 and the total current into the combination is i_3 , then the ratio $i_1 : i_2 : i_3$ is

A. $1 : 10 : 11$

B. $10 : 1 : 11$

C. $11 : 10 : 1$

D. $10 : 11 : 1$

Answer: A

View Text Solution

5. The resistance of a galvanometer is 100Ω. A shunt of 5Ω is connected to it to convert it into an ammeter. The internal resistance of the ammeter is

A. 5.2Ω

B. 4.8Ω

C. 4.6Ω

D. 4.2Ω

Answer: B

Watch Video Solution

6. A galvanometer of resistance $100 ohms$ is shunted so that only $1/11$ of the main current flows through the galvanometer. The resistance of the shunt is

A. 1 ohm

B. 11 ohms

C. 10 ohms

D. 9 ohms

Answer: C

Watch Video Solution

7. If a shunt is to be applied to a galvanometer of resistance 50Ω so that only 5% of total current passes through the galvanometer. The resistance of shunt should be

A. 1.63Ω

B. 4.2Ω

C. 3.5Ω

D. 2.63Ω

Answer: D

Watch Video Solution

8. If only 2% of the main current is to be passed through a galvanometer of resistance G, then the resistance of the shunt will be

A. G/50

B. G/49

C. 50G

D. `49G

Answer: B

Watch Video Solution

9. A maximum current point $0.5 mA$ can be passed through a galvanometer of resistance 20Ω . The resistance to be connected in series to convert it in the voltmeter of range $0 - 5V$ is

A. 980Ω

B. 9980Ω

C. 990Ω

D. 9990Ω

Answer: B

Watch Video Solution

10. The maximum potential that can be measured with a voltmeter of resistance 1000 Ω is 6V. Resistance that must be connected to measure a potential of 30V with it is

A. 4000Ω in series

B. 6000Ω in series

C. 12000Ω in series

D. 2000Ω in series

Answer: A

Watch Video Solution

11. A voltmeter has an internal resistance of 1000Ω and gives full scale deflection when $2V$ is applied across the terminals. Now a resistance of 4000Ω is connected in series with it. Then it gives full scale deflection with

A. 8V

B. 10V

C. 6V

D. 4V

Answer: B

Watch Video Solution

12. To convert a voltmeter measuring $15V$ into a voltmeter measuring $150V$, if the resistance of the voltmeter is 1000Ω, the resistance to be connected is

A. $10, 000\Omega$ in series

B. $9, 000\Omega$ in series

C. 11000Ω in series

D. 8000Ω in series

Answer: B

Watch Video Solution

EXERCISE - 1(H.W) (AMPERE.S CIRCUITAL LAW BIOT-SAVART LAW AND ITS APPLICATIONS

1. A north pole of strengtπAm, is moved around a circle of radius $10cm$ which lies around a long straight conductor carrying a current of $10A$. The work doen is nearly

A. $4\mu J$

B. $80\mu J$

C. $400\mu J$

D. $0.4\mu J$

Answer: B

Watch Video Solution

2. Two long straight conductors carry currents $4A$ and$2A$ into the plane of paper. A circular path is imagined to be enclosing these currents. The value of $\oint \bar{B}.\overline{dl}$ is

A. $6\mu_0$

B. $7\mu_0$

C. $5\mu_0$

D. $2\mu_0$

Answer: A

Watch Video Solution

3. Three long straight conductors are kept perpendicular to the plane of paper. Currents $2A, 3A$ are passing through the two conductors into the plane of paper in first two conductors and $5A$ current passes through thirst conductor, directed out of the paper. A closed loop encloses the conductors, then the value of $\oint \bar{B}.\,\overline{dl}$ over the closed loop is (assume current into the paper as negative and out of the paper as positive)

A. $2\mu_0$

B. 0

C. $-\mu_0$

D. $+\mu_0$

Answer: B

Watch Video Solution

4. A long straight wire carries an electric current of $2A$. The magnetic induction at a perpendicular distance of $5m$ from the wire is $\left(\mu_0 4\pi \times 10^7 Hm^{-1}\right)$

A. $4 \times 10^{-8} T$

B. $8 \times 10^{-8} T$

C. $12 \times 10^{-8} T$

D. $16 \times 10^{-8} T$

Answer: B

Watch Video Solution

5. A current of 2 amperes is flowing through a circular coil of radius 10 cm containing 100 turns. The magnetic flux density at the centre of the coil is

A. 0.126×10^{-2}

B. 1.26×10^{-2}

C. 1.26×10^{-4}

D. 1.26×10^{-5}

Answer: A

Watch Video Solution

6. A coil of radius π meters, 100 turns carries a current of $3A$. The magnetic induction at a point on its axis at a distance equal to $\sqrt{3}$ times its radius from its centre is

A. $7.2 \times 10^{-8} wbm^{-2}$

B. $7.2 \times 10^{-6} wbm^{-2}$

C. $7.5 \times 10^{-8} wbm^{-2}$

D. $7.83 \times 10^{-8} wbm^{-2}$

Answer: C

Watch Video Solution

7. A circular coil of wire n turns has a radius r and carries a current I . Its magnetic dipole moment is M .Now the coil is unwound and again rewound into a circular coil of half the initial radius and the same current is passed through it, then the dipole moment of this new coil is 1

A. M/2

B. M/4

C. M

D. 2M

Answer: B

Watch Video Solution

EXERCISE - 1(H.W) (SOLENOID AND TOROID)

1. A long solenoid has 20 turns per cm and carries a current i. the magnetic field at its centre is $6.28 \times 10^{-2} Wb/m^2$. 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. $1.05 \times 10^{-4} Wb/m^2$

B. $1.05 \times 10^{-2} Wb/m^2$

C. $1.05 \times 10^{-5} Wb/m^2$

D. $1.05 \times 10^{-6} Wb/m^2$

Answer: B

Watch Video Solution

EXERCISE - 1(H.W) (FORCE ACTING ON A MOVING CHARGE IN MAGNETIC FIELD)

1. A proton and an α - particle enter a uniform magnetic field at right angles to the field with same speed. The ratio of the periods of α - particle and proton is

A. $1:1$

B. $1:4$

C. $1:2$

D. $2:1$

Answer: D

Watch Video Solution

2. A proton takes $10^{-12}s$ to complete one revolution in uniform magnetic field. The time taken in another orbit of double the radius in the same field is

A. 0.5×10^{-12}sec

B. 2×10^{-12}sec

C. 4×10^{-12}sec

D. 10^{-12}sec

Answer: D

Watch Video Solution

3. A charged particle , having charge q accelerated through a potential difference V enters a perpendicular magnetic field in which it experiences a force F. If V is increased to $5V$, the particle will experience a force.

A. F

B. 5F

C. F/5

D. $\sqrt{5}F$

Answer: D

Watch Video Solution

4. A proton moving with a velocity of $2 \times 10^6 ms^{-1}$ describes circle of radius R in a magnetic field. The speed of an α - particle to describe a circle of same radius in the same magnitude field is

A. $1 \times 10^6 m/s$

B. $2 \times 10^6 m/s$

C. $4 \times 10^6 m/s$

D. $8 \times 10^6 m/s$

Answer: A

Watch Video Solution

5. A particle of charge 16×10^{-18} coulomb moving with velocity $10 m/s$ 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 $10/m^{-1}$ is along the negative Z - axis. If the charged particle continues moving along the X - axis, the magnitude to B is

A. $1 Wb/m^2$

B. $10^5 Wb/m^2$

C. $10^6 Wb/m^2$

D. $10^{-3} Wb/m^2$

Answer: A

Watch Video Solution

6. A proton is rotating along a circular path with kinetic energy K in a uniform magnetic field B. If the magnetic is made four times, the kinetic energy of rotation of proton is

A. 16K

B. 8K

C. 4K

D. K

Answer: D

Watch Video Solution

EXERCISE - 1(H.W) (CYCLOTRON)

1. In a cyclotron , if the frequency of proton is $5MHz$, the magnetic field necessary for resosnance is

A. 0.528T

B. 2.32T

C. 0.389T

D. 0.327T

Answer: D

Watch Video Solution

2. A cyclotron's oscillator frequency is $10MHz$. The operating magnetic field for accelerating protons is

A. 0.66T

B. 0.12T

C. 1.67T

D. 0.36 T

Answer: A

Watch Video Solution

EXERCISE - 1(H.W) (FORCE ON CURRENT CARRYING CONDUCTOR IN A MAGNETIC FIELD)

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

A. 2.4 N

B. 1.2 N

C. 3.0 N

D. 2.0 N

Answer: B

Watch Video Solution

EXERCISE - 1(H.W) (FORCE BETWEEN TWO PARALLEL CURRENT CARRYING CONDUCTORS)

1. Two parallel conductor carrying $5A$ each , repel with a force of $0.25Nm^{-1}$. The distance between them is

A. $4 \times 10^{-5}m$

B. $3 \times 10^{-5} m$

C. $2 \times 10^{-5} m$

D. $1 \times 10^{-5} m$

Answer: C

Watch Video Solution

2. Two straight parallel wires carry currents of $200 mA$ and $1 A$ in opposite direction. If the wires are $20 cm$ apart, the distance of the neutral point from the $1 A$ wire is (in cm)

A. 5

B. 15

C. 20

D. 25

Answer: D

Watch Video Solution

3. Two long parallel copper wires carry currents of $5A$ each in opposite directions. If the wires are separated by a distance of $0.5m$, then the force between the two wires is

A. 10^{-5} N/m attractive

B. 10^{-5} N/m repulsive

C. 2×10^{-5} N/m attractive

D. 2×10^{-5} N/m repulsive.

Answer: B

Watch Video Solution

EXERCISE - 1(H.W) (TORQUE ON CURRENT LOOP)

1. A rectangular coil of wire of area $400 cm^2$ contain 500 turns. It is places in a magnetic field of induction $4 \times 10^{-3} T$ and it makes an angle 60° with the field. A current of $0.2 A$ is passed through is. The torque on the coil is

A. $8\sqrt{3} \times 10^{-3} Nm$

B. $8 \times 10^{-3} Nm$

C. $8\sqrt{3} \times 10^{-4} Nm$

D. $8 \times 10^{-4} Nm$

Answer: B

Watch Video Solution

2. A rectangular coil of wire carrying a current is suspended in a uniform magnetic field. The plane of the coil is making an angle of 30° with the direction of the field and the torque experienced by it is τ_1 and when the plane of the coil is making an angle of 60° with the direction of the field the torque experienced by it is τ_2. Then the ratio $\tau_1 : \tau_2$ is

A. $1:\sqrt{3}$

B. $\sqrt{3}:1$

C. $1:3$

D. $3:1$

Answer: B

Watch Video Solution

3. A vertical rectangular coil of sides $5cm \times 2cm$ has 10 turns and carries a current of $2A$. The torque (couple) on the coil when it is placed in a uniform horizontal magnetic field of $0.1T$ with its plane perpendicular to the field is

A. $4 \times 10^{-3} Nm$

B. 0

C. $2 \times 10^{-3} Nm$

D. $10^{-3} Nm$

Answer: B

Watch Video Solution

EXERCISE - 1(H.W) (MOVING COIL GALVANOMETER)

1. The coil in a MCG has an area of $4cm^2$ and 500 turns. The intensity of magnetic induction is $2T$. When a current of $10^{-4}A$ is passes through it, the deflection is 20°. The couple per unit twist is $(N - m)$

A. 3×10^{-6}

B. 2×10^{-6}

C. 4×10^{-6}

D. 5×10^{-6}

Answer: B

Watch Video Solution

2. The area of the coil in a moving coil galvanometer is $15cm^2$ and has 20 turns. The magnetic induction is $0.2T$ and the couple per unit twist of the suspended wire is $10^{-6}Nm$ per degree. If the deflection is 45°, the current passing through it is

A. $75 \times 10^{-4}A$

B. $7.5 \times 10^{-4}A$

C. $0.75 \times 10^{-4}A$

D. $750 \times 10^{-4}A$

Answer: A

Watch Video Solution

EXERCISE - 1(H.W) (CONVERSION OF MCG INTO AMMETER AND VOLTMETER)

1. The sensitivity of a galvanometer of resistance 990Ω is increased by 10 times. The shunt used is

A. 100Ω

B. 120Ω

C. 110Ω

D. 50Ω

Answer: C

Watch Video Solution

2. A galvanometer of resistance 50Ω gives full scale deflection when a current $10^{-3}A$ is passed through it converted into an ammeter to measure $0.5A$ current.

A. 50/499 Ω in parallel

B. 9/20 Ω in parallel

C. 2/99 Ω in parallel

D. 20/99 Ω in parallel

Answer: A

Watch Video Solution

3. A galvanometer of resistance 20Ω is shunted by a 2Ω resistor. What part of the main current flows through the galvanometer ?

A. 1/10 part

B. 1/11 part

C. 1/12 part

D. 1/13 part

Answer: B

Watch Video Solution

4. A galvanometer has a resistance 50Ω and it shunted by a 0.5Ω resistor. The fraction of the main current that flows throught the galvanometer is

A. 1/100

B. 1/101

C. $1/10$

D. $1/11$

Answer: B

Watch Video Solution

5. A galvanometer having a coil resistance of 100ω gives a full scale deflection , when a current of $1mA$ is passed through it. The value of the resistance, which can convert this galvanometer into ammeter giving a full scale deflection for a current of $10A$, is :

A. 0.01

B. 0.001

C. 0.1

D. 0.099

Answer: A

Watch Video Solution

6. A galvanometer has a resistance of 49Ω.If $2\ \%$ of the main current is to be passed through the meter, The value of the shunt will be

A. 2Ω

B. 1Ω

C. $1/2\Omega$

D. $1/4\Omega$

Answer: B

Watch Video Solution

7. In a galvanometer 5% of the total current in the circuit passes through it . If the resistance of the galvanometer is G, the shunt resistance S connected to the galvanometer is

A. 19G

B. G/49

C. 20G

D. G/20

Answer: B

Watch Video Solution

8. A galvanometer of internal resistance 100Ω has a full scale deflection current of $1mA$. To convert it into a voltmeter of range $0 - 10V$, the resistance to be connected is

A. 9000 Ω in Series

B. 10,000 Ω in Series

C. 9,900 Ω in Series

D. 9,800 Ω in Series

Answer: C

Watch Video Solution

9. When a high resistance $'R'$ is connected in series with a volmeter of resistance $'G'$, the range of the volmeter increases 5times. Then $G:R$ will be

A. $4:1$

B. $1:2$

C. $8:1$

D. $1:4$

Answer: D

Watch Video Solution

EXERCISE - 2(C.W) (AMPERE.S CIRCUITAL LAW BIO-SAVART LAW AND ITS APPLICATIONS)

1. A thin straight vertical conductor has $10amp$ current flows vertically upwards. It is present at a place where $B_H = 4 \times 10^{-6}T$. Arrange the net magnetic induction at the following points in ascending order

$a)$ at $0.5m$ on south of conductor

$b)$ at $0.5m$ on west of conductor

$c)$ at $0.5m$ on east of conductor

$d)$ at $0.5m$ on north - east of conductor

A. a,b,c,d

B. a,b,d,c

C. a,c,b,d

D. b,a,d,c

Answer: D

Watch Video Solution

2. A long straight wire carrying current of $30A$ is placed in an external unifrom magnetic field of induction $4 \times 10^{4}T$. The magnetic field is acting parallel to the direction of current. The maggnetic of the resultant magnetic inuduction in tesla at a point $2.0cm$ away form the wire is

A. 10^{-4}

B. 3×10^{-4}

C. 5×10^{-4}

D. 6×10^{-4}

Answer: C

Watch Video Solution

3. A straight section PQ of a circuit lise along the X-axis from $x = -\frac{a}{2}$ to $x = \frac{a}{2}$ and carriers a steady current i. The magnetic field due to the section PQ at a point $X = +a$ will be

A. proportional to a

B. proportional to I/a

C. proportional to a^2

D. zero

Answer: D

Watch Video Solution

4. $ABCD$ is a square of side L. A very long straight conductor carrying a current i passes through the vertex A of the square and is perpendicular to its plane. The minimum magnetic induction at a vertex of the square is

A. $\frac{\mu_0}{4\pi}\frac{2\sqrt{2}i}{L}$

B. $\frac{\mu_0}{4\pi}\frac{\sqrt{2}i}{L}$

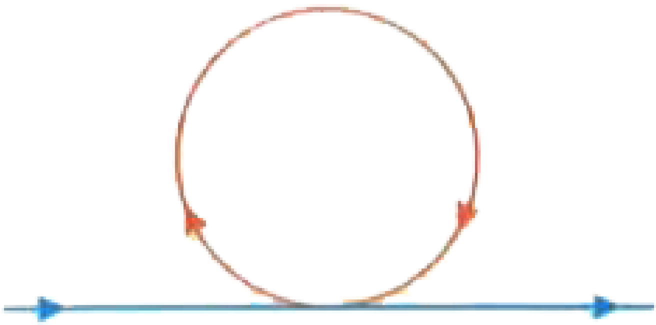
C. $\frac{\mu_0}{4\pi}\frac{4\sqrt{2}i}{L}$

D. $\frac{\mu_0}{4\pi}\frac{2i}{L}$

Answer: B

Watch Video Solution

5. The magnetic field at the centre of circular loop in the circuit shown below is



A. $\frac{\mu_0}{4\pi}\frac{2I}{r}(1+\pi)$

B. $\frac{\mu_0}{4\pi}\frac{2I}{r}(\pi - 1)$

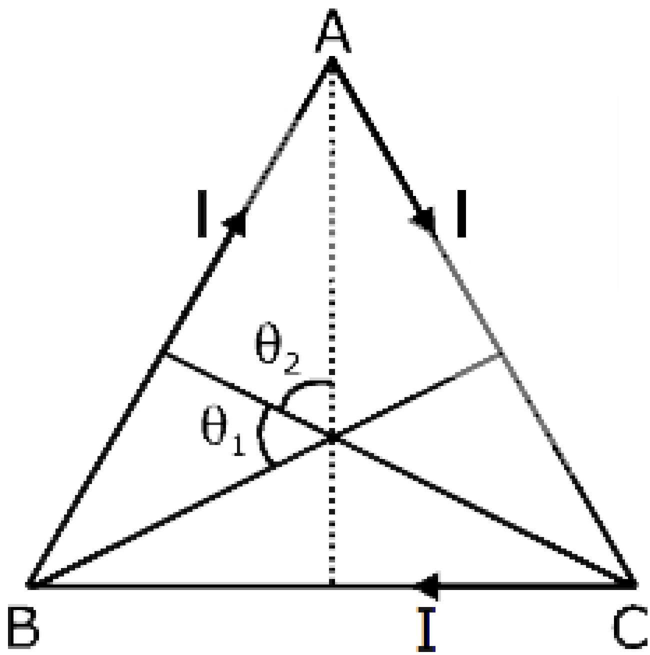
C. $\frac{\mu_0}{4\pi}\frac{2I}{r}$

D. $\frac{\mu_0}{4\pi}\frac{I}{r}(\pi + 1)$

Answer: B

Watch Video Solution

6. A current of 1A is flowing in the sides of equilateral triangle of side $4.5 \times 10^{-2} m$. The magnetic induction at centroid of the triangle:



A. $4 \times 10^{-5} T$

B. $40 T$

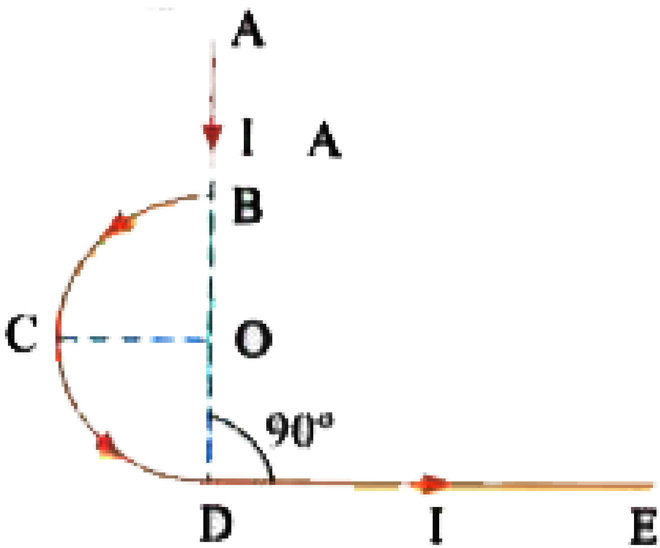
C. $0.4 \times 10^{-3} T$

D. $4 \times 10^{-2} T$

Answer: A

Watch Video Solution

7. In the given figure the magnetic induction at the point O is



A. $\frac{\mu_0 I}{4\pi a}$

B. $\frac{\mu_0 I}{4r} + \frac{\mu_0 I}{2\pi r}$

C. $\frac{\mu_0 I}{4r} + \frac{\mu_0 I}{4\pi r}$

D. $\frac{\mu_0 I}{4r} - \frac{\mu_0 I}{4\pi r}$

Answer: C

Watch Video Solution

8. Figure shows a coil of radius $2cm$ concentric with a coil of radius $7cm$ Each coil has 1000 turns with a current of $5A$. In larger coil, then the current needed in the smaller coil to give the total magnetic field at the centre equal to $2mT$ is

A. 1.49A

B. 1.84A

C. 2.88A

D. 3.4A

Answer: A

Watch Video Solution

Watch Video Solution

9. Two identical coils carry equal currents have a common centre and their planes are at right angles to each other. The ratio of the magnitude of the resulatant magnetic field at the centre and the field due to one coil is

A. $2:1$

B. $1:2$

C. $\sqrt{2}:1$

D. $1:\sqrt{2}$

Answer: C

Watch Video Solution

10. A uniform wire of resistance 12Ω is bent in the form of a square. A cell of $emf 6V$ having negligible innternal resistance connected across the diagonal of the square. The magnetic induction at its centre (in tesla).

A. 0

B. 10^{-7}

C. 5×10^{-7}

D. $\frac{\mu_0}{4\pi} \times 5 \times 10^{-2}$

Answer: A

Watch Video Solution

11. A wire of length $10cm$ is bent into an arc of a circle such that it subtends an angle of 1 radian at the centre. If a current of $1A$ is passed through the wire, the magnetic induction at the centre of the circle will be

A. 2×10^{-4} tesla

B. 1×10^{-6} tesla

C. 1×10^{-4} tesla

D. 2×10^{-6} tesla

Answer: B

Watch Video Solution

12. A circular coil of radius $'r'$ having $'n'$ turns carries a current $'I'$. The magnetic induction at the center of the coil is $'B'$. Now the coil is unwound and rewound with half the original radius. If the magnetic induction at the center of the coil is to be the same, the current that should be passed through the coil is

A. 2i

B. i

C. i/2

D. i/4

Answer: D

Watch Video Solution

13. Two wires A and B are of lengths $40cm$ and $30cm$. A is bent into a circle of radius r and B into an arc of radius r. A current i_1 is passed through A and i_{20} through B. To have the same magnetic inductions at the centre, the ratio of $i_1 : i_2$ is

A. $3:4$

B. $3:5$

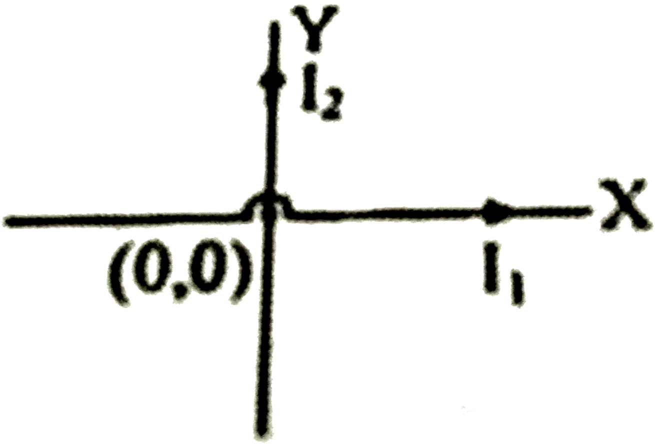
C. $2:3$

D. $4:3$

Answer: A

Watch Video Solution

14. Two long straight conductors with corrents I_1 and I_2 are placed along X and Y axes. The equation of locus of points of zero magnetic induction is :



A. Y = X

B. $Y = \frac{I_2 X}{I_1}$

C. $Y = \frac{I_1}{I_2} X$

D. $Y = \frac{X}{I_1 I_2}$

Answer: C

Watch Video Solution

15. Magnetic field induction at the center of a circular coil of radius $5cm$ and carrying a current $0.9A$ is (in $S.I.$ units in$)\left(\in_0 =\right.$ absolute permitivity of air in $S.I.$ units : velocity of light $\left.= 3 \times 10^8 ms^{-1}\right)$

A. $\dfrac{1}{\in_0 10^{16}}$

B. $\dfrac{10^{16}}{\in_0}$

C. $\dfrac{\in_0}{10^{16}}$

D. $10^{16} \in_0$

Answer: A

Watch Video Solution

16. The magnetic induction at the centre of a current carrying circular coil of radius $10cm$ is $5\sqrt{5}$ times the magnetic induction at a point on its axis. The distance of the point from the centre of the coild in cm is

A. 5

B. 10

C. 20

D. 25

Answer: C

Watch Video Solution

17. Same current i is flowing in the three infinitely long wires along positive x-,y- and z-directions. The magnetic filed at a point (0,0,-a) would be

A. $\frac{\mu_0 i}{2\pi a}\left(\hat{j} - \hat{i}\right)$

B. $\frac{\mu_0 i}{2\pi a}\left(\hat{i} - \hat{j}\right)$

C. $\frac{\mu_0 i}{2\pi a}\left(\hat{i} - \hat{j}\right)$

D. $\frac{\mu_0 i}{2\pi a}\left(\hat{i} - \hat{j} + \hat{k}\right)$

Answer: A

Watch Video Solution

18. Two long straight wires are connected by a circular section which has a radius R. All the three segments lie in the same plane and carry a current I. The magnetic induction at the centre O of the circular segments is

A. $\frac{\mu_0 I}{4\pi R}$

B. $\frac{\alpha\mu_0 I}{4\pi R}$

C. $\alpha\mu_0 I\frac{)}{R}$

D. $\frac{\alpha\mu_0 I}{2\pi R}$

Answer: B

Watch Video Solution

19. If B is the magnetic induction, at the centre of a circular coil of radius $'r'$ carrying a current is $1T$, then its value at a distance of $\sqrt{3}r$ on the axis from the centre of the coil is

A. $\frac{1}{8}T$

B. $\frac{1}{16}T$

C. $8T$

D. $\frac{1}{4}T$

Answer: A

Watch Video Solution

EXERCISE - 2(C.W) (TANGENT GALVANOMETER)

1. A cell of negligible internal resistance is connected to a tangent galvanometer and the deflection produced is 30°. If theree such cells are connected in series and the combination is connected to the same galvanometer, the deflection will be

A. 30°

B. 60°

C. 90°

D. 45°

Answer: B

Watch Video Solution

2. The resistance of the coil of a tangent galvanometer is 60Ω. It is connected to a battery of negligible internal resistance. The deflection is found to be 60°. Now a shunt resistance of 30Ω is connected across the coil of the tangent galvanometer. The deflection produced will be

A. 30°

B. 45°

C. 60°

D. 37°

Answer: C

Watch Video Solution

EXERCISE - 2(C.W) (CURRENT LOOP AND MAGNETIC DIPOLE)

1. Magnetic induction at the center of a circular loop carrying a current is $'B'$. If $'A'$ is the area of the coil, the magnetic dipole moment of the loop is

A. $\dfrac{BA^2}{\mu_0 \pi}$

B. $\dfrac{BA\sqrt{A}}{\mu_0}$

C. $\dfrac{BA\sqrt{A}}{\mu_0 \pi}$

D. $\dfrac{2BA}{\mu_0}\sqrt{\dfrac{A}{\pi}}$

Answer: D

Watch Video Solution

2. A circular current loop of magnetic moment M is in an arbitrary orientation in an external magnetic field $\vec{B}$. The work done to rotate the loop by 30° about an axis perpendicular to its plane is :

A. MB

B. $\sqrt{3}\frac{MB}{2}$

C. $\frac{MB}{2}$

D. 0

Answer: D

Watch Video Solution

EXERCISE - 2(C.W) (SOLENOID AND TOROID)

1. A solenoid of length $20cm$ and radius $2cm$ is closely wound with 200 turns. The magnetic field intensity at either end of the solenoid when the current in the winding is $5amp$. Is

A. 2500 Amp/ m

B. 2000 Amp/m

C. 1750 Amp/m

D. 2940 Amp/m

Answer: A

Watch Video Solution

2. A solenoid of length 0.5 m has a radius of 1 cm and is made up of 500 turns. It carries a current of 5 A. The magnetic field inside the solenoid is

A. $3.14 \times 10^{-3} T$

B. $6.28 \times 10^{-3} T$

C. $9.14 \times 10^{-3} T$

D. $1.68 \times 10^{-3} T$

Answer: B

Watch Video Solution

3. The length of a solenoid is $0.1 m$ and its diameter is very small . A wire is wound over in two layers. The number of turns in the inner layer is 50 and that on the outer layer is 40. The strength of current flowing in two layers in the same direction is 3 ampere. The magnetic induction in the middle of the solenoid will be

A. $3.4 \times 10^{-3} T$

B. 3.4×10^{-3} gauss

C. $3.4 \times 10^{3} T$

D. 3.4×10^{3} gauss

Answer: A

Watch Video Solution

4. A long solenoid has 20 turns per cm and carries a current i. the magnetic field at its centre is $6.28 \times 10^{-2} Wb/m^2$. 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. $1.05 \times 10^{-4} Wb/m^2$

B. $1.05 \times 10^{-2} Wb/m^2$

C. $1.05 \times 10^{-5} Wb/m^2$

D. $1.05 \times 10^{-4} Wb/m^2$

Answer: B

Watch Video Solution

5. A toroidal solenoid has 3000 turns and a mean radius of $10 cm$. It has a soft iron core of relative magnetic permeability 2000. Find the magnitude of the magnetic field in the core when a current of $1.0 amp.$ is passed through the solenoid.

A. 20T

B. 12T

C. 6T

D. 3T

Answer: B

Watch Video Solution

EXERCISE - 2(C.W) (FORCE ACTING ON A MOVING CHARGE IN MAGNETIC FIELD)

1. A particle of mass $1 \times 10^{26} kg$ and charge $1.6 \times 10^{-19} C$ travelling with a velocity $1.28 \times 10^{6} cm^{-1}$ along the positive X - axis enters a region in which a uniform electric field $\vec{E} = -102.4 \times 10^{3} kNC^{-1}$ and magnetic field $B = 8 \times 10^{-2} jWbm^{-2}$, the direction of motion of the particle is :

A. x-axis

B. y-axis

C. z-axis

D. $-x-$ axis

Answer: A

Watch Video Solution

2. Two particle X and Y having equal charge, after being accelerated through the same potential difference enter a region of uniform magnetic field and describe circular paths of radii R_1 and R_2 respectively. The ratio of the mass of X to that of Y is

A. $(R_1/R_2)^{1/2}$

B. (R_2/R_1)

C. $(R_1/R_2)^2$

D. (R_1/R_2)

Answer: C

Watch Video Solution

3. A charged particle moving at right angles to a uniform magnetic field and starts moving along a circular arc of radius of curvature $'r'$. In the field it now penetrates a layer of lead and loses $3/4$ of its initial kinetic energy. The radius of curvature of its path now will be

A. 4r

B. 2r

C. r/4

D. r/2

Answer: D

Watch Video Solution

4. Two particles having same charge and KE enter at right angles into the same magnetic field and travel in circular paths of radii $2cm$ and $3cm$ respectively. The ratio of their masses is .

A. $2:3$

B. $3:2$

C. $4:9$

D. $9:4$

Answer: C

Watch Video Solution

5. Two electrons move parallel to each other with equal speed $'V'$ the ratio of magnetic & electric force between them is

A. V/C

B. C/V

C. V^2 / C^2

D. C^2 / V^2

Answer: C

Watch Video Solution

6. A proton, a deuteron and an α particle are accelerated through same potential difference and then they enter a normal uniform magnetic field, the ratio of their kinetic energies will be

A. $2:1:3$

B. $1:1:2$

C. $1:1:1$

D. $1:2:4$

Answer: B

Watch Video Solution

7. A proton of energy $8eV$ is moving in a circular path in a uniform magnetic field. The energy of an alpha particle moving in the same magnetic field and along the same path will be

A. 4eV

B. 2eV

C. 8eV

D. 6eV

Answer: C

Watch Video Solution

8. A charged particle of charge $10mC$ enters a uniform magnetic field of induction $\bar{B} = 4\hat{i} + y\hat{j} + z\hat{k}$ tesla with a velocity $\bar{V} = 2\hat{i} + 3\hat{j} - 6\hat{k}$. If the particle continues to move undeviated then the strength of the magnetic field induction in tesla

A. 4

B. 8

C. 14

D. 30

Answer: C

Watch Video Solution

9. Magnetic induction field is existing along $+Z$ axis in a region $0 \leq x \leq a(a$ is positive). A point charge q is projected with a velocity $'v'$ at origin along positive x - axis , choose the correct alternative regarding its deviation.

A. maximum deviation is π rad independent of value of a

B. maximum deviaiton is $\pi/2$ rad independent of value of a

C. maximum deviation is $\pi/2$ rad if a is greater than its radius of curvature

D. Maximum deviation is $\pi/2$ rad only if a is equal to its radius of curvature

Answer: C

Watch Video Solution

10. A proton moving with a velocity of $(6i + 8j)x10^5 ms^{-1}$ enters uniform magnetic field of induction $5 \times 10^{-3}\hat{k}$ tesla. The magnitude of the force acting on the proton is (I, j and k are unit vectors along X, Y, Z directions respectively)

A. 0

B. $8 \times 10^{-16} N$

C. $3 \times 10^{-16} N$

D. $4 \times 10^{-16} N$

Answer: B

Watch Video Solution

Watch Video Solution

11. A proton of energy $2MeV$ is moving perpendicular to uniform magnetic field of $2.5T$. The form on the proton is $\left(Mp = 1.6 \times 10^{-27} Kg\right.$ and $\left. q = e = 1.6 \times 10^{-19} C\right)$

A. $2.5 \times 10^{-16} N$

B. 8×10^{-11}N

C. 2.5×10^{-11}newton

D. 8×10^{-12} newton

Answer: D

Watch Video Solution

12. Acceleration experienced by a particle with specific charge$1 \times 10^{7} C/kg$ when fired perpendicular to a magnetic field of induction $100 \mu T$ with a velocity $10^{5} ms^{-1}$ is

A. $10^{8} ms^{-2}$

B. $10^{-6} ms^{-2}$

C. $10^{14} ms^{-2}$

D. $10^{-8} ms^{-2}$

Answer: A

Watch Video Solution

13. When two electrons enter into a magnetic field with different velocieis, they deflect in different circular paths, in such a way that the radius of one path is double that of the other. $1X10^{7} ms^{-1}$ is the velocity of the electron in smaller of radius $2 \times 10^{3} m$. The velocity of electron in the other circular path is :

A. $4 \times 10^{7} ms^{-1}$

B. $4 \times 10^{6} ms^{-1}$

C. $2 \times 10^{7} ms^{-1}$

D. $2 \times 10^{-6} ms^{-1}$

Answer: C

Watch Video Solution

14. A beam of charged particle, having kinetic energy $10^3 eV$, contains masses $8 \times 10^{-27} kg$ and $1.6 \times 10^{-26} kg$ emerge from the end of an accelerator tube. There is a plate at distance $10^2 m$ from the end of the tube and placed perpendicular to the beam. Calculate the magnitude of the smallest magnetic field which can prevent the beam from striking the plate.

A. 1.414T

B. 2.414T

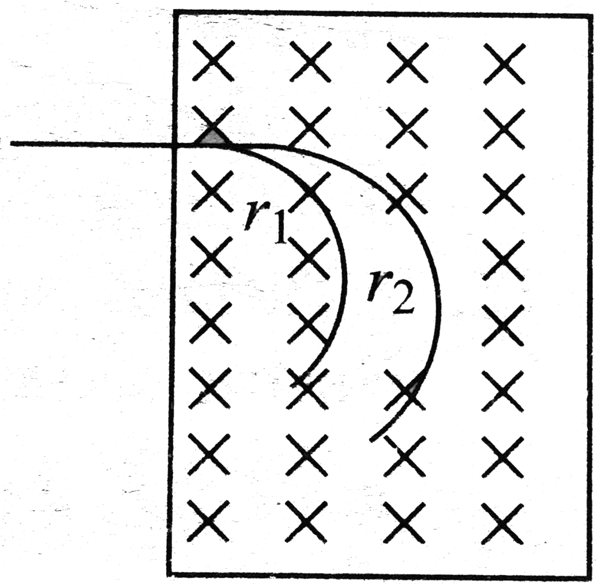
C. 3.414T

D. 4.414T

Answer: A

Watch Video Solution

15. A beam of mixture of α particle and protons are accelerted through same potential difference before entering into the magnetic field of strength B. if $r_1 = 5$ cm then r_2 is



A. 5cm

B. $5\sqrt{2}cm$

C. $10\sqrt{2}cm$

D. 20 cm

Answer: B

Watch Video Solution

EXERCISE - 2(C.W) (FORCE BETWEEN TWO PARALLEL CURRENT CARRYING CONDUCTORS)

1. A horizontal wire of length $0.5m$ carries a current of $5A$. If the mass of the wire is $10mg$, the minimum magnetic field required to support the weight of the wire is $\left(g = 10m/g^2\right)$

A. $4 \times 10^{-4}T$

B. $25 \times 10^{-4}T$

C. $4 \times 10^{-1}T$

D. $25 \times 10^{-1}T$

Answer: A

Watch Video Solution

2. Currents of $10A, 2A$ are passed through two parallel wires A and B respectively in opposite directions. If the wire A is infinitely long and the length of the wire B is 2 metre, the force on the conductor B, which is situated at $10cm$ distance from A will be

A. 8×10^{-5}N

B. $5 \times 10^{-5}N$

C. $8\pi \times 10^{-7}N$

D. $4\pi \times 10^{-7}N$

Answer: A

Watch Video Solution

3. Two long parallel conductors carry currents i and $2I$ in the same direction. The magnetic induction at a point exactly mid way between them is B. If the current in the first conductor is reversed in direction, the magnetic induction at the same point will be

A. B/3

B. 2B

C. 3B

D. B/2

Answer: C

Watch Video Solution

4. A horizontal wire carries $200 amp$ current below which another wire of linear density $20 \times 10^{-5} kgm^{-1}$ carrying a current is kept at $2cm$ distance. If the wire kept below hangs in air. The current in this wire is

A. 100A

B. 9.8 A

C. 98A

D. 48A

Answer: C

Watch Video Solution

5. Two long parallel conductors are placed at right angles to a metre scale at the $2cm$ and $6cm$ marks, as shown in the figure

They carry currents of $1A$ and $3A$ respectively. They will produce zero magnetic field at the (ignore the earth's magnetic field)

A. 5 cm mark

B. 3 cm mark

C. 1 cm mark

D. 8 cm mark

Answer: B

Watch Video Solution

6. A rectangular loop of wire of size $4cm / 10cm$ carries a steady current of $2A$. A straight long wire carrying $5A$ current is kept near the loop (as shown in figu). If the loop and the wire are coplanar, find the net force on the loop

A. $3.2 \times 10^{-5}N$

B. $1.6 \times 10^{-3}N$

C. $0.4 \times 10^{-4}N$

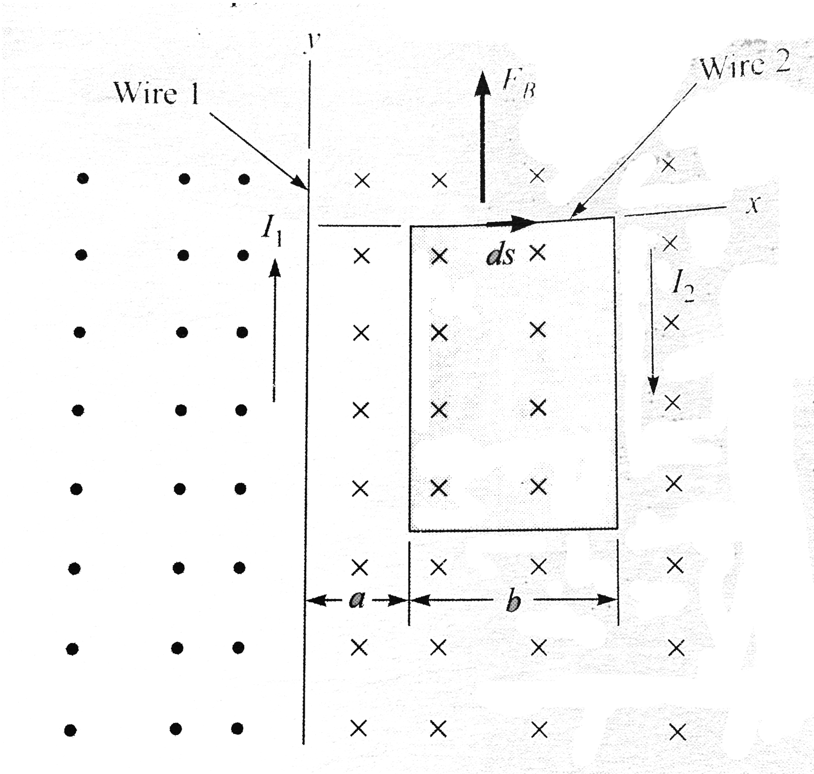
D. $4 \times 10^{-5}N$

Answer: B

Watch Video Solution

7. Wire 1 in Fig. is oriented along the y-axis and carries a steady current I_1. A rectangular loop located to right of the wire and in the x-y plane carries a current I_2. Find the magnetic force exerted by wire (1) on the top wire

(1) on the top wire of length b in the loop, labeled "wire (2)" in the figure.



A. $\left[\frac{\mu_0 I_1 I_2}{2\pi}\ln\left(1+\frac{b}{a}\right)\hat{j}\right]$

B. $\left[\frac{\mu_0 I_1 I_2}{2\pi}\ln\left(1+\frac{b}{a}\right)(-\hat{j})\right]$

C. $\left[\frac{\mu_0 I_1 I_2}{2\pi}\ln\left(1+\frac{b}{a}\right)(-\hat{i})\right]$

D. $\left[\frac{\mu_0 I_1 I_2}{2\pi}\ln\left(1+\frac{b}{a}\right)(\hat{i})\right]$

Answer: A

Watch Video Solution

EXERCISE - 2(C.W) (TORQUE ON CURRENT LOOP)

1. A square loop of side L carries a current I. Another smaller square loop of side $l(l < \, < L)$ carrying a current i is placed inside the bigger loop such that they are coplanar with their centre coinciding. If the currents in the loops are in the same direction, the magnitude of the torque on the smaller loop is

A. $\dfrac{\mu_0 I i l^2}{\sqrt{2}\pi L}$

B. $\dfrac{\mu_0 I i l^2}{2\pi L}$

C. $\left(\mu_0 I i l^2\right).\left(\sqrt{3}\pi L\right)$

D. 0

Answer: D

Watch Video Solution

2. A coil in the shape of an equilateral triangle of side 0.02 m is suspended from a vertex such that it is hanging in a vertical plane between the pole pieces of a permanent magnet producing a horizontal magnetic field of $5 \times 10^{-2}T$. Find the couple acting on the coil when a current of 0.1 A is passed through it and the magnetic field is parallel to its plane.

A. $0.866 \times 10^{-6} Nm$

B. $1.732 \times 10^{-4} Nm$

C. $0.422 \times 10^{-6} Nm$

D. $0.866 \times 10^{-2} Nm$

Answer: A

Watch Video Solution

EXERCISE - 2(C.W) (MOVING COIL GALVANOMETER)

1. A moving coil galvanometer A has 200 turns and resistance 100Ω. Another meter B has 100 turns and resistance 40Ω. All the other quantities are same in both the cases. The current sensitivity of

A. B is double as that of A

B. A is 2 times of B

C. A is 5 times of B

D. B is 5 times of A.

Answer: B

Watch Video Solution

2. A rectangular coil of size $3 \times 3cm$ consisting of 100 turns caries $0.1A$. If it produces a deflection 10^0, in a field of induction $0.1T$, the couple per unit twist is

A. 9×10^{-2}Nm / degree

B. 9×10^{-5}Nm/degree

C. 9×10^{-5} Nm/rad

D. `0.9 Nm/degree

Answer: B

Watch Video Solution

3. To increase the current sensitivity of a moving coil galvanometer by $50\ \%$ its resistance is increased so that the new resistance becomes twice its initial resistance. By what factor does its voltage sensitivity change?

A. decreased by 75%

B. Increased by 75%

C. decreased by 25%

D. Increased by 25%

Answer: C

Watch Video Solution

EXERCISE - 2(C.W) (CONVERSION OF MCG INTO AMMETER AND VOLTMETER)

1. A galvanometer of resistance 25Ω is connected to a battery of 2 volt along with a resistance in series. When the value of this resistance is 3000Ω, a full scale deflection of 30 units is obtained in the galvanometer. In order to reduce this deflection to 20 units, the resistance in series will be

A. 4513ohm

B. 5413ohm

C. 2000ohm

D. 6000ohm

Answer: A

Watch Video Solution

2. A voltmeter has range 0 → V with a series resistance R. With a series resistance 2R, the range is 0 → V'. The correct relation between v and v' is

A. $V' = 2V$

B. $V' > 2V$

C. $V' < 2V$

D. $V' > > 2V$

Answer: C

Watch Video Solution

3. A $100V$ voltmeter having an internal resistance of $20k\Omega$ is connected in series with a large resistance R across a $110V$ line. What is the magnitude of resistance R if the voltmeter reads $5V$?

A. $210k\Omega$

B. $315k\Omega$

C. $420k\Omega$

D. $440k\Omega$

Answer: C

Watch Video Solution

4. A galvanometer has resistance G and Current I_g produces full scale deflection. S_1 is the value of the shunt which converts it into an ammeter of range $0 - I$ and S_2 is the value of shunt for the range $0 - 2I$. The ratio of S_1 and S_2 is

A. $\frac{1}{2}\left(\frac{I - I_g}{2I - I_g}\right)$

B. $\frac{2I - I_g}{I - I_g}$

C. $I/2$

D. 2

Answer: B

Watch Video Solution

5. The scale of galvanometer is divided into 150 equal divisions. The galvanometer has a current sensitivity of 10divisions/mA and the voltage sensitivity of 2divisions/mV. How the galvanometer be designed to read (i) 6A per division and (ii) 1 V per division?

A. $S = 8.3 \times 10^{-5}\Omega, R = 9995\Omega$

B. $S = 8.3 \times 10^{-2}\Omega, R = 995\Omega$

C. $S - 4.3 \times 10^{-5}\Omega, R = 9950\Omega$

D. $R = 8.3 \times 10^{-5}\Omega, S = 995\Omega$

Answer: A

Watch Video Solution

6. In an ammeter 5% of the main current is passing through the galvanometer. If the resistance of galvanometer is G, then the resistance of shunt S will be

A. 19G

B. G/19

C. 20G

D. G/20

Answer: B

Watch Video Solution

7. The Senstivity of a galvanometer is $60 \text{div}/Ampere$. When a shunt is used, its sensitivity becomes $10 \text{div}/Ampere$. If the resistance of the galvanometer is20Ω,then the value of the shunt used is

A. 4Ω

B. 5Ω

C. 20Ω

D. 2Ω

Answer: B

Watch Video Solution

8. The sensitivity of a galvanometer that measures current is decreased by $1/40$ times by using shunt ressitance of 10Ω. Then, value of resistance of the galvanometer is

A. 400Ω

B. 410Ω

C. 30Ω

D. 390Ω

Answer: D

Watch Video Solution

EXERCISE - 2(H.W) (AMPERE.S CIRCUITAL LAW BIO-SAVART LAW AND ITS APPLICATIONS)

1. A current of $30A$ is flowing in a vertical straight wire. If the horizontal component of earths magnetic is $2 \times 10^{-5}T$, then the position of null point will be

A. 0.9m

B. 0.3mm

C. 0.3cm

D. 0.3m

Answer: D

Watch Video Solution

2. The magnetic field at the centre of the coil in the figure shown below is (the wires crossing at p are insulated from each other)

A. $\frac{\mu_0}{4\pi}\frac{2I}{r}(1 + \pi)$

B. $\frac{\mu_0}{4\pi}\frac{2I}{r}(\pi - 1)$

C. $\frac{\mu_0}{4\pi}\frac{2I}{r}\left(\pi^2 + 1\right)$

D. $\frac{\mu_0}{4\pi}\frac{2\pi I}{r}$

Answer: A

Watch Video Solution

3. Due to a straight vertical current carrying conductor, a null point occurred at P on east of the conductor. The net magnetic induction at a point $'Q'$ which is at same distance on north of the conductor is

A. 0

B. $\sqrt{3}B_H$

C. B_H

D. $\sqrt{2}B_H$

Answer: D

Watch Video Solution

4. The wire shown in figure carries a current of $40A$. If $r = 3.14cm$ the magnetic field at point p will be

A. $1.6 \times 10^{-3}T$

B. $3.2 \times 10^{-3}T$

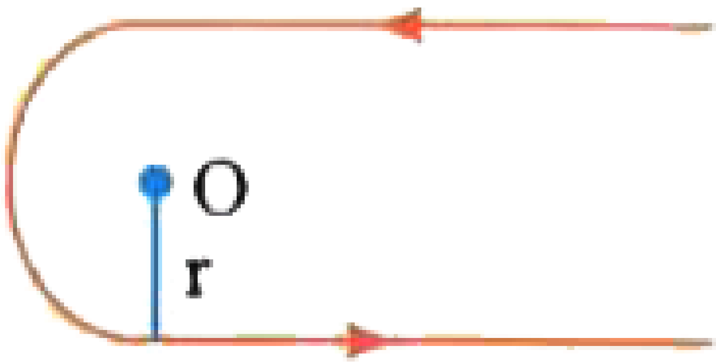
C. $6 \times 10^{-4}T$

D. $4.8 \times 10^{-3}T$

Answer: C

Watch Video Solution

5. The magnetic field at the centre of semicircle o in the figure is



A. $B = \frac{\mu_0 i}{4r}$

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

C. $\frac{\mu_0 i}{4\pi r}(\pi - 2)$

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

Answer: D

Watch Video Solution

6. A cube made of wire of equal length is connected to a battery as shown in figure.The magnetic field at the centre of the cube is

A. $\frac{12}{\sqrt{2}}\frac{\mu_0 I}{\pi L}$

B. $\frac{6\mu_0 I}{\sqrt{2}\pi L}$

C. $\frac{6\mu_0 I}{\pi L}$

D. 0

Answer: D

Watch Video Solution

7. In the Bohr model of the hydrogen atom, the electron circuulates around the nucleus in a path of radius $5 \times 10^{-11} m$ at a frequency of $6.8 \times 10^{15} Hz$.

a. What value of magnetic field is set up at the centre of the orbit?

b. What is the equivalent magnetic dipole moment?

A. 12.27 T

B. 10.8 T

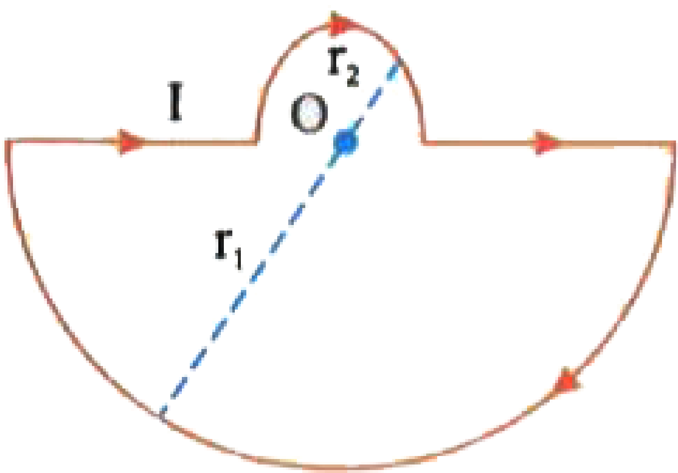
C. 13.2 T

D. 13.6T

Answer: D

Watch Video Solution

8. In the given loop the magnetic field at the centre O is



1) $\frac{\mu_0 I}{4}\left(\frac{r_1 + r_2}{r_1 r_2}\right)$ out of the page

2) $\frac{\mu_0 I}{4}\left(\frac{r_1 + r_2}{r_1 r_2}\right)$ into the page

3) $\frac{\mu_0 I}{4}\left(\frac{r_1 - r_2}{r_1 r_2}\right)$ out of the page

4) $\frac{\mu_0 I}{4}\left(\frac{r_1 - r_2}{r_1 r_2}\right)$ into the page

Watch Video Solution

9. Two concentric coils of 10 turns each are placed in the same plane. Their radii are $20cm$ and $40cm$ and carry 0.2 and 0.2 amp. Current respectively in opposite directions. The magnetic induction (in Tesla) at the centre is

A. $\frac{3}{4}\mu_0$

B. $\frac{5}{4}\mu_0$

C. $\frac{7}{4}\mu_0$

D. $\frac{9}{4}\mu_0$

Answer: B

Watch Video Solution

EXERCISE - 2(H.W) (TANGENT GALVANOMETER)

1. Two tangent galvanometers having coils of the same radius are connected in series. A current flowing in them produces deflections of 60° and 45° respectively. The ratio of the number of turns in the coils is

A. $\frac{\sqrt{3}}{1}$

B. $\frac{1}{\sqrt{3}}$

C. $\frac{\sqrt{3}+1}{1}$

D. $\frac{1}{\sqrt{3}+1}$

Answer: A

Watch Video Solution

2. A tangent galvanometer carrying a certain current gave a defelction of 30°. If the galvanometer is taken to another location where the earth's horizontal component of magnetic induction is one thrid of the previous value, The deflection for the same current will be

A. 60°

B. 45°

C. 90°

D. 30°

Answer: A

Watch Video Solution

EXERCISE - 2(H.W) (CURRENT LOOP AND MAGNETIC DIPOLE)

1. A wire length $6.28m$ is bent into a circular coil of 2 turns. If a current of $0.5A$ exists in the coil, the magnetic moment of the coil is, in Am^2:

A. $\frac{\pi}{4}$

B. $\frac{1}{4}$

C. π

D. 4π

Answer: A

Watch Video Solution

2. A wire length $6.28m$ is bent into a circular coil of 2 turns. If a current of $0.5A$ exists in the coil, the magnetic moment of the coil is, in Am^2:

A. $\frac{\pi}{4}$

B. $\frac{1}{4}$

C. π

D. 4π

Answer: A

Watch Video Solution

EXERCISE - 2(H.W) (SOLENOID AND TOROID)

1. A solenoid of 1000 turns is wound uniformly on a glass tube $50cm$ long and $10cm$ diameter. The strength of magentic field at the centre of solenoid when a current of $0.1A$. Flows through it is

A. 100 A/m

B. 200 A/m

C. 400 A/m

D. 50 A/m

Answer: B

Watch Video Solution

Watch Video Solution

2. A long solenoid has 20 turns per cm and carries a current i. the magnetic field at its centre is $6.28 \times 10^{-2} Wb/m^2$. 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. $1.05 \times 10^{-2} wb/m^2$

B. $1.05 \times 10^{-5} wb/m^2$

C. $1.05 \times 10^{-3} wb/m^2$

D. $1.05 \times 10^{-4} Wb/m^2$

Answer: A

Watch Video Solution

EXERCISE - 2(H.W) (FORCE ACTING A MOVING CHARGE IN MAGNETIC FIELD)

1. A proton moving in a perpendicular magnetic field possesses kinetic energy E . The magnetic field is increased 8 times. But the proton is constratined to move in the path of same radius. The radius energy will increase.

A. 1/8 times

B. 8 times

C. 16 times

D. 64 times

Answer: D

Watch Video Solution

2. Electrons accelerated by a potential differnece V enter a uniform magnetic field of flux density B at right angles to the field. They describe a circular path of radius $'r'$. If now $'V'$ is doubled and B is also doubled, the radius of the new circular path is

A. $4r$

B. $2r$

C. $2\sqrt{2}r$

D. $r/\sqrt{2}$

Answer: D

Watch Video Solution

3. An electron is shot in steady electric and magnetic field E and magnetic field B mutually perpendicular. The magnitude of E is 1 volt / cm and that of B is 2 tesla. Now it happens that the Lorentz (Magnetic) force cancels with the electro static force on the electron, then the velocity of the electron is

A. $50ms^{-1}$

B. $2cms^{-1}$

C. $0.5cms^{-1}$

D. $200ms^{-1}$

Answer: A

Watch Video Solution

4. A beam of protons enters a uniform magnetic field of 0.3T with velocity of $4 \times 10^5 m/s$ in a direction making an angle of 60° with the direction of magnetic field. The path of motion of the particle will be

A. 4.7m

B. 0.47m

C. 0.047m

D. 0.0047 m

Answer: C

Watch Video Solution

5. A unifrom magnetic field B is acting from south to north and is of magntitdue $1.5Wb/m^2$. If a proton having mass $= 1.7 \times 10^{-27}kg$ and charge $= 1.6 \times 10^{-19}C$ moves in this field vertically downwards with energy $5MeV$, then the force acting on it will be

A. $7.4 \times 10^{12}N$

B. $7.4 \times 10^{-12}N$

C. $7.4 \times 10^{19}N$

D. $7.4 \times 10^{-19}N$

Answer: B

Watch Video Solution

6. An electron travelloing with a velocity $\bar{V} = 10^7\hat{i}m/s$ enter a magnetic field of induction $\bar{B} = 2\bar{j}$. The force on electron is

A. $1.6 \times 10^{-12}\vec{j}N$

B. $3.2 \times 10^{-12}\vec{K}N$

C. $6.4 \times 10^{-12}\vec{K}N$

D. $-3.2 \times 10^{-12}\vec{K}N$

Answer: D

Watch Video Solution

7. A magnetic field $4 \times 10^{-3}\hat{k}$ T exerts a force $\left(4\hat{i} + 3\hat{j}\right) \times 10^{-10}$ N on a particle having a charge 10^{-9} C and going on the XY plane The velocity of the particle is

A. $-75\hat{i} + 100\hat{j}$

B. $100\hat{i} + 75\hat{j}$

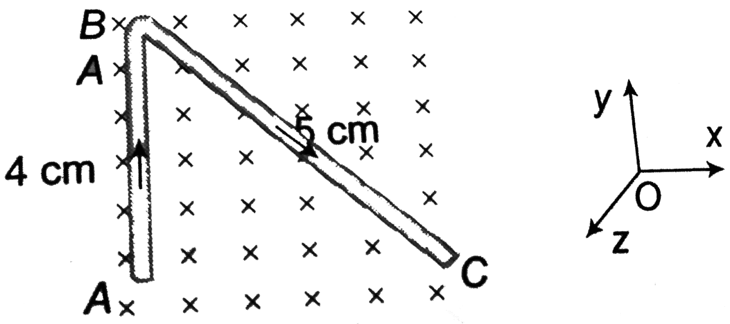
C. $75\hat{i} + 100\hat{j}$

D. $100\hat{i} - 75\hat{j}$

Answer: A

Watch Video Solution

8. A unifrom conducting wire ABC has a mass of $10g$. A current of $2A$ flows through it. The wire is kept in a unifrom magnetic field $B = 2T$. The accleration of the wire will be



A. 0

B. $12ms^{-2}$ along y-axis

C. $1.2 \times 10^{-3}ms^{-2}$ along y- axis

D. $0.6 \times 10^{-3}ms^{-2}$along y - axis

Answer: B::C

Watch Video Solution

9. A straight conductor carrying a current is kept in a uniform magnetic field so as to experience maximum force. If now the conductor is turned in its own plane such that the force acting on it is half of the maximum force, then the angle made by the conductor in the final position with respect to the field is

A. 60°

B. 45°

C. 30°

D. 90°

Answer: D

Watch Video Solution

10. Two long parallel wires are separated by a distance of 2m. They carry a current of $1A$ each in opposite direction. The magnetic induction at the midpoint of a straight line connecting these two wires is

A. 0

B. $2 \times 10^{-7} T$

C. $4 \times 10^{-5} T$

D. $4 \times 10^{-7} T$

Answer: A

Watch Video Solution

11. Three very long straight thin wires are connected parallel to each other through a battary of negligible internal resistance. The resistance of the wired are 2Ω, 3Ω and 4Ω. The ratio of distance of middle wire from the first and thrid wires if resusltant magnetic force on the middle wire is zero is :

A. $2:1$

B. $3:4$

C. $2:3$

D. $3:5$

Answer: A

Watch Video Solution

12. A galvaono metre required $10\mu A.$ for one division of its scale. It is be used to measure a current of amp. To the full scale deflection. The scale has 100 divisions. The value of shunt if the resistance of the galvanometer is 999Ω.

A. 2Ω

B. 3Ω

C. 1Ω

D. 4Ω

Answer: C

Watch Video Solution

13. The scale of a galvanometer of resistance 100 ohms contains 25 divisions. It gives a deflection of one division on passing a current of 4×10^{-4} amperes. The resistance in ohms to be added to it, so that it may become a voltmeter of range 2.5 volts is

A. 100

B. 150

C. 250

D. 300

Answer: B

Watch Video Solution

14. A microammeter has as resistance of 100Ω and full scale range of $50\mu A$. It can be used a voltmeter or as ahigher range ammeter provided a resistance is added to it. Pick the correct range and resistance combinations

50 V range with $10k\Omega$ resistance in series

b.$10V$ range with $200k\Omega$ resistance in series

c. 5mA rangw with 1Ω resistance in parallel

$10mA$ range with 1Ω resistance in parallel

A. 50 Volt range with 10 KΩ resistance in series

B. Volt range with 200K Ω resistance in series

C. 5 mA range with 1 Ω resistance in parallel

D. 10 mA range with 1 Ω resistance in parallel

Answer: C

Watch Video Solution

EXERCISE - 3

1. Under the influence of a unifrom magnetic field a charged particle is moving on a circle of radius R with Constnant speed v. The time period of the motion

A. depends on K and not on V

B. depends on V and not on R

C. depends on both R and V

D. is independent of both R and V

Answer: D

Watch Video Solution

2. A charged particle (charge q) is moving in a circle of radius R with unifrom speed v. The associated magnetic moment μ is given by

A. qvR

B. $qvR/2$

C. qvR^2

D. $qvR^2/2$

Answer: B

Watch Video Solution

3. A beam of electrons passes underfected throgh unifromly perpendicular electric and magnetic fields. If the electric field is swiched off, and the same magnetic field is maintained the electrons move:

A. along a straight line

B. in an elliptical orbit

C. in a circular orbit

D. along a parabolic path

Answer: C

Watch Video Solution

4. In mass spectrometer used for measuring the masses of ions, the ions are initaily accerlerated by an electric potential V and then made to describe semicircular paths of radius R using a magnetic field B.if V and B are kept constant, the ratio $\left(\frac{\text{charg e on the ion}}{\text{mass of the ion}}\right)$ will be propertional to:

A. R

B. $\frac{1}{R}$

C. $\frac{1}{R^2}$

D. R^2

Answer: C

Watch Video Solution

5. A particle of mass m, charge q and kinetic energy T enters in a transverse uniform magnetic field of induction B. After the 3 s, the kinetic energy of the particle will be

A. 4T

B. 3T

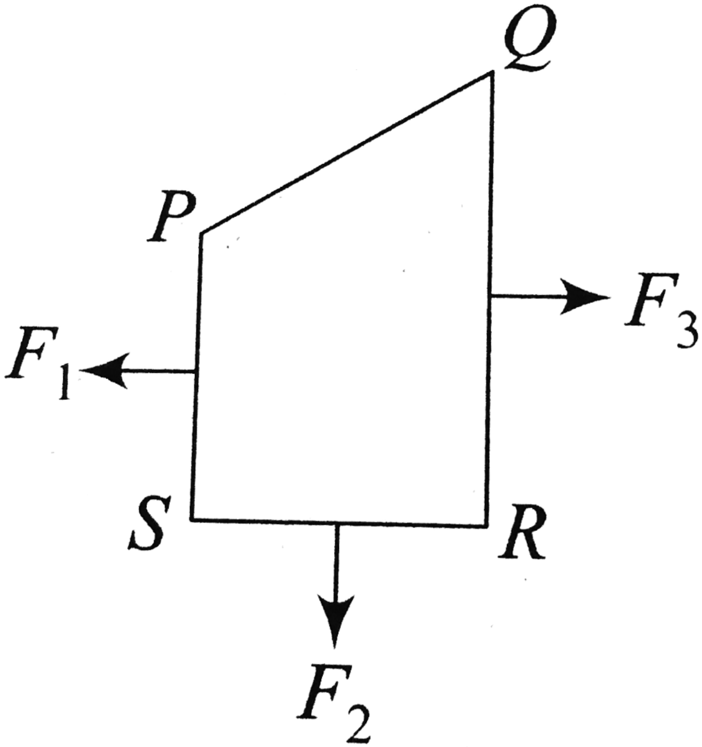
C. 2T

D. T

Answer: D

Watch Video Solution

6. A closed loop $PQRS$ carrying a current is place in a unifrom magnetic forces on segments PS, SR and RQ are F_1, F_2 and F_3 respectively and are in the plane of the paper and along the directions shown, the force on the segment QP is



A. $F_3 - F_1 + F_2$

B. $F_3 - F_1 - F_2$

C. $\sqrt{(F_3 - F_1)^2 + F_2^2}$

D. $\sqrt{(F_3 - F_1)^2 - F_2^2}$

Answer: C

Watch Video Solution

7. A galvanometer of resistance 50Ω is connected to a b attery of 3V alongwith a resistance of 2950Ω in series. A full scale deflection of 30 division is obtained in the galvanometer in order to reduce this deflection to 20 division. The resistance in sereis. should be:-

A. 4450Ω

B. 5050Ω

C. 5550Ω

D. 6050Ω

Answer: A

Watch Video Solution

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

A. N in-z direction

B. 4N in z direction

C. N in y direction

D. 8 in z direction

Answer: A

Watch Video Solution

9. A galvanometer having a coil resistance of 60Ω shows full scale defection when a current of $1.0A$ passes thoguth it. It can vbe convered into an ammeter to read currents up to $5.0A$ by

A. putting in parallel a resistance of 240Ω

B. putting in series a resistance of 15Ω

C. putting in series a resistance of 240Ω

D. putting in parallel a resistance of 15Ω

Answer: D

Watch Video Solution

10. A galvanometer coil has a resistance of 10A and the meter shows full scale deflection for a current of 1mA. The shunt resistance required to convert the galvanometer into an ammeter of range 0-100mA is about

A. 10Ω

B. 1Ω

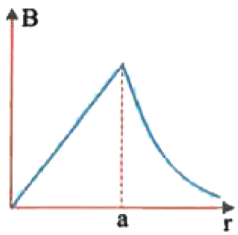
C. 0.1Ω

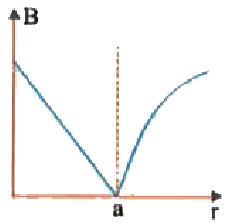
D. 0.01Ω

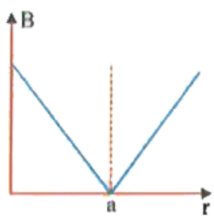
Answer: C

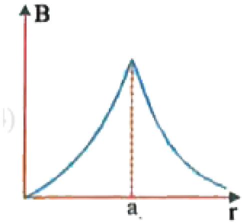
Watch Video Solution

11. A long straight wire of a circular cross-section (radius a) carries a steady current I and the current I is uniformly distributed across this cross-section. Which of the following plots represents the variation of magnitude of magnetic field B with distance r from the centre of the wire?

A. 

B. 

C. 

D. 

Answer: A

Watch Video Solution

12. The gyromagnetic ratio of an electron of charge e and mass m is equal to

A. $\frac{e^2}{2m}$

B. $\frac{e}{2m^2}$

C. $\frac{e}{4m}$

D. $\frac{e}{2m}$

Answer: D

Watch Video Solution

13. A beam of cathode rays is subjected to crossed electric (E) and magnetic fields (B). The fields are adjusted such that the beam is not deflected. The specific charge of the cathode rays is given by

A. $\frac{B^2}{2VE^2}$

B. $\frac{2VB^2}{E^2}$

C. $\frac{2VE^2}{B^2}$

D. $\frac{E^2}{2VB^2}$

Answer: D

Watch Video Solution

14. A thin ring of radius R metre has charge q coulomb uniformly spread on it. The ring rotates about its axis with a constant frequency of f revolution/s. The value of magnetic induction in Wbm^{-2} at the centre of the ring is

A. $\frac{\mu_0 q f}{2\pi R}$

B. $\frac{\mu_0 q}{2\pi f R}$

C. $\frac{\mu_0 q}{2 f R}$

D. $\frac{\mu_0 q f}{2R}$

Answer: D

Watch Video Solution

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

A. 900Ω

B. 1800Ω

C. 500Ω

D. 1000Ω

Answer: A

Watch Video Solution

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

A. $3\vec{F}$

B. $-\vec{F}$

C. $-3\vec{F}$

D. $\vec{F}$

Answer: B

Watch Video Solution

17. Charge q is uniformly spread on a thin ring of radius R. The ring rotates about its axis with a uniform frequency f Hz. The magnitude of magnetic induction at the center of the ring is:

A. $\frac{\mu_0 q f}{2R}$

B. $\frac{\mu_0 q}{2fR}$

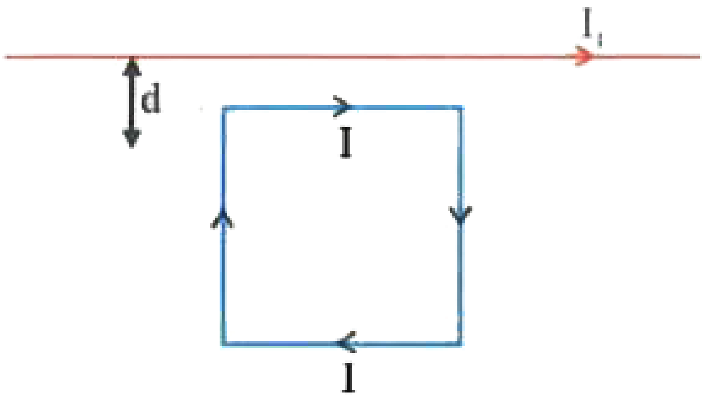
C. $\frac{\mu_0 q}{2\pi f R}$

D. $\frac{\mu_0 q f}{2\pi R}$

Answer: A

Watch Video Solution

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



A. a net repulsive force away from the conductor

B. a net torque acting upward perpendicular to the horizontal plane

C. a net torque acting downward normal to the horizontal plane

D. a net attractive force towards the conductor

Answer: D

Watch Video Solution

19. A uniform electric field and a uniform magnetic field are acting along the same direction in a certain region. If an electron is projected in the same direction then the electron

A. speed will increase

B. will turn towards left of direction of motion

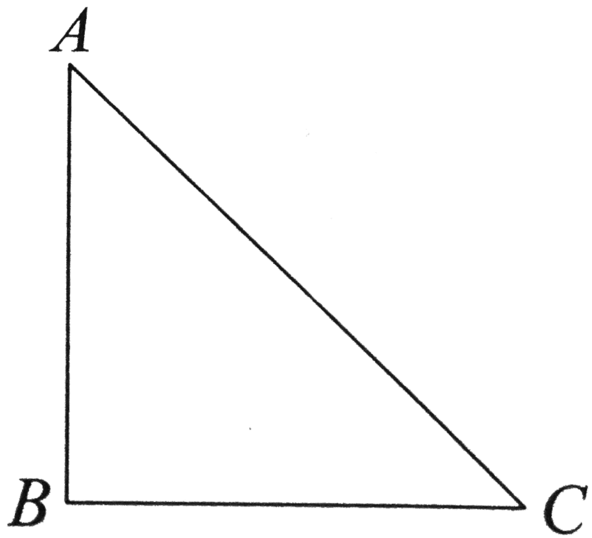
C. will turn towards right of direction of motion

D. speed will decrease

Answer: D

Watch Video Solution

20. A current carrying closed loop in the from of a right angle isoseles triangle ABC is placed in a unifrom magnetic fild acting along AB. If the magnetic force on the arm BC is F, the force on the arm AC is



A. $\vec{F}$

B. $\sqrt{2}F$

C. $-\sqrt{2}\vec{F}$

D. $-\vec{F}$

Answer: D

Watch Video Solution

21. An alternating electric field, of frequency v, is applied across the dees (radius=R) of a cyclotron that is being used to accelerate protons (mass=m) the operating magnetic field (B) used in the cyclotron and the kinetic energy (K) of the proton beam, produced by it, are given by:

A. $B = \frac{2\pi m v}{e}$ and $K = m^2 \pi v R^2$

B. $B = \frac{2\pi m v}{e}$ and $K = 2m\pi^2 v^2 R^2$

C. $B = \frac{mv}{e}$ and $K = m^2 \pi v R^2$

D. $B = \frac{mv}{e}$ and $K = 2m\pi^2 v^2 R^2$

Answer: B

Watch Video Solution

22. Two similar coils of radius R are lying concentriclaly with their planes at right angels to each other. The currents flowing in them are I and $2I$ respectively. The resulant magntic field induction at the centre will be

A. $\frac{3\mu_0 I}{2R}$

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

C. $\frac{\mu_0 I}{R}$

D. $\frac{\sqrt{5}\mu_0 I}{2R}$

Answer: D

Watch Video Solution

23. A current loop in a magnetic field

A. can be in equilibrium in one orientation

B. can be in equilibrium in two orientations, both the equilibrium states are unstable.

C. can be in equilibrium in two orientations, one stable while the other is unstable.

D. experiences a torque whether the field is uniform or non uniform in all orientations.

Answer: B

Watch Video Solution

24. Two identical long conducting wires AOB and Cod are placed at right angles to each other, with one above other such that O is their common point for the two. The wires carry I_1 and I_2 currents, respectively. Points P is lying at distance d form O along a direction perpendicular to the plane containing the wires. The magnetic field at the point P will be

A. $\frac{\mu_0}{2\pi d}\left(I_1^2 + I_2^2\right)^{\frac{1}{2}}$

B. $\frac{\mu_0}{2\pi d}\left(I_1/I_2\right)$

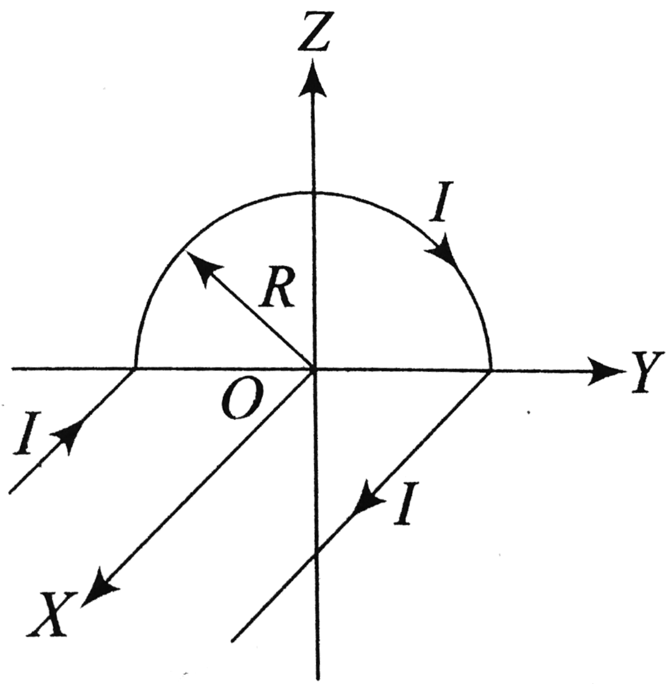
C. $\frac{\mu_0}{2\pi d}\left(I_1 + I_2\right)$

D. $\frac{\mu_0}{2\pi d}\left(I_1^2 - I_2^2\right)$

Answer: A

Watch Video Solution

25. A wire carrying current I has the shape as shown in the adjoining figure. Linear parts of the wire are very long and parallel to X-axis while semicicular portion of radius R is lying in Y - Z plane. Magnetic field at point O is



A. $\vec{B} = -\frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i} + 2\hat{k}\right)$

B. $\vec{B} = \frac{\mu_0 I}{4\pi R}\left(\pi\hat{i} - 2\hat{k}\right)$

C. $\vec{B} = \frac{\mu_0 I}{4\pi R}\left(\pi\hat{i} + 2\hat{k}\right)$

D. $\vec{B} = -\frac{\mu_0 I}{4\pi R}\left(\pi\hat{i} - 2\hat{k}\right)$

Answer: A

Watch Video Solution

26. A long wire carries a steady curent . 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. $2n^2B$

B. nB

C. n^2B

D. $2nB$

Answer: C

Watch Video Solution

27. An electron is moving in a circular path under the influence of a transverse magnetic field of 3.57×10^{-2} T.If the value of e/m is 1.76×10^{11} c/kg, the frequency of revolution of the electron is

A. 6.82 MHz

B. 1 GHz

C. 100 MHz `

D. 62.8 MHz

Answer: B

Watch Video Solution

28. A long staright wire of radius a carries a steady current I. The curent is unifromly distributed over its cross-section. The ratio of the magnetic fields B and B' , at radial distances $\frac{a}{2}$ and $2a$ respectively from the axis of the wire is:

A. $\frac{1}{4}$

B. $\frac{1}{2}$

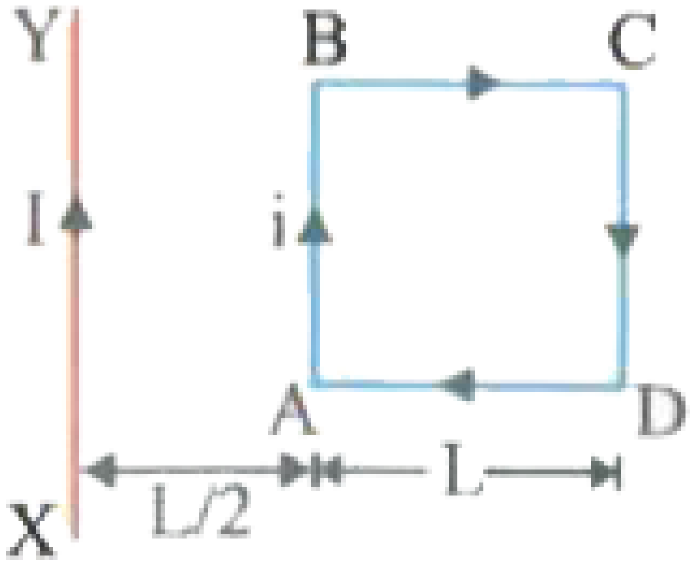
C. 1

D. 4

Answer: C

Watch Video Solution

29. A square loop of ABCD carrying a current i, is placed near and coplanar with a long straight conductor XY carrying a current I, the net force on the loop will be



A. $\frac{2\mu_0 Ii}{3\pi}$

B. $\frac{\mu_0 Ii}{2\pi}$

C. $\frac{2\mu_0 IiL}{3\pi}$

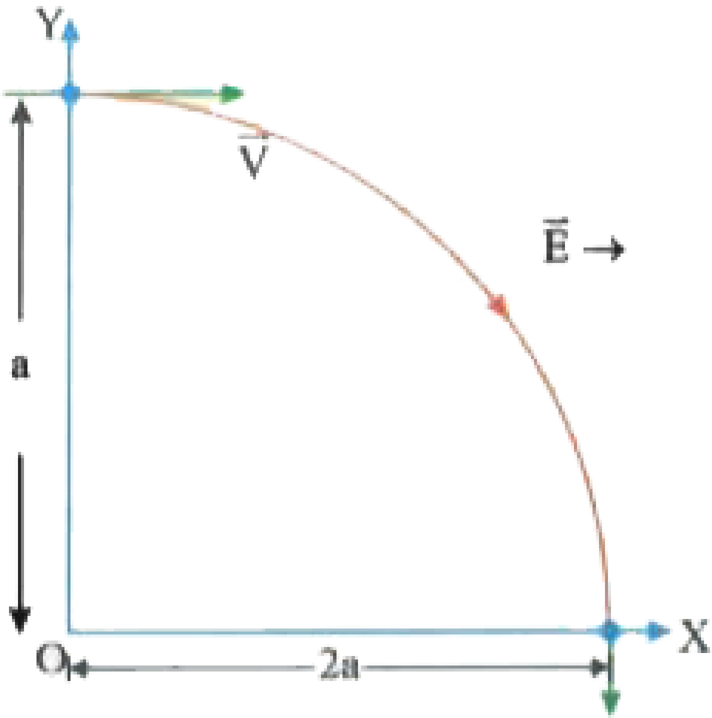
D. $\frac{\mu_0 IiL}{2\pi}$

Answer: A

Watch Video Solution

EXERCISE - 4

1. A particle of charge +q and mass m moving under the influnce of a uniform electric field $E\hat{i}$ and a uniform magnetic field $B\hat{k}$ follows trajectory from P to Q as shown in figure. The velocities at P and Q $v\hat{i}$ and $-2v\hat{j}$ respectively. Which of the following statement(s) is/are correct



A. $E = \frac{3}{4}\frac{mv^2}{qa}$

B. Rate of work done by electric field at Pis $\frac{3}{4}\frac{mv^3}{a}$

C. Rate of work done by electric field at P is zero

D. Rate of work done by both the fields at Q is zero

Answer: A::B::D

Watch Video Solution

2. Two coaxil solenoids 1 and 2 of the same length are set so that one is inside the other. The number of turns per unit length are n_1 and n_2. The current i_1 and i_2 are flowing in opposite directions. The magnetic field inside the inner coil is zero. This is possible when

A. $I_1 \neq i_2 \text{ and} n_1 = n_2$

B. $i_1 = i_2$ and $n_1 \neq n_2$

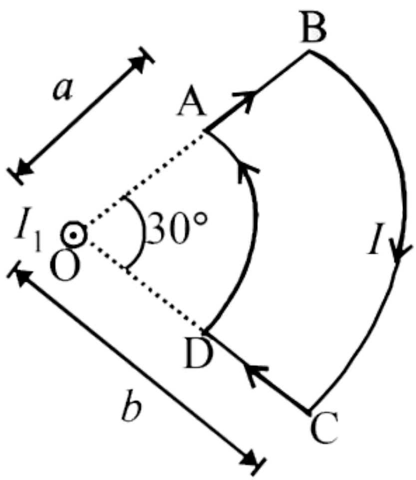
C. $i_1 = i_2$ and $n_1 = n_2$

D. $i_1 n_1 = i_2 n_2$

Answer: C::D

Watch Video Solution

3. A current loop $ABCD$ is held fixed on the plane of the paper as shown in figure. The arcs $BC(radius = b)$ and $DA(radius = a)$ of the loop are joined by two straight wires AB and CD at the origin O is 30^(@) $. A \neg herstraightth \in wirewithsteadycurrent$I_(1)` flowing out of the plane of the paper is kept at the origin .



Due to the process of the current I_1 at the origin:

A. 0

B. $\frac{\mu_0(b - a)i}{24ab}$

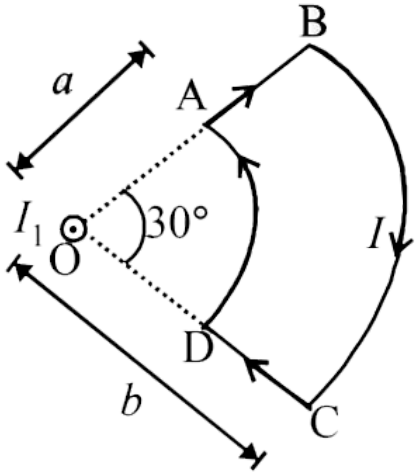
C. $\frac{\mu_0 I}{4\pi}\left[\frac{b - a}{ab}\right]$

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

Answer: C

Watch Video Solution

4. A current loop $ABCD$ is held fixed on the plane of the paper as shown in figure. The arcs $BC(radius = b)$ and $DA(radius = a)$ of the loop are joined by two straight wires AB and CD at the origin O is 30^(@) $. A \neg herstraightth \in wirewithsteadycurrent$I_(1)` flowing out of the plane of the paper is kept at the origin .



Due to the process 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

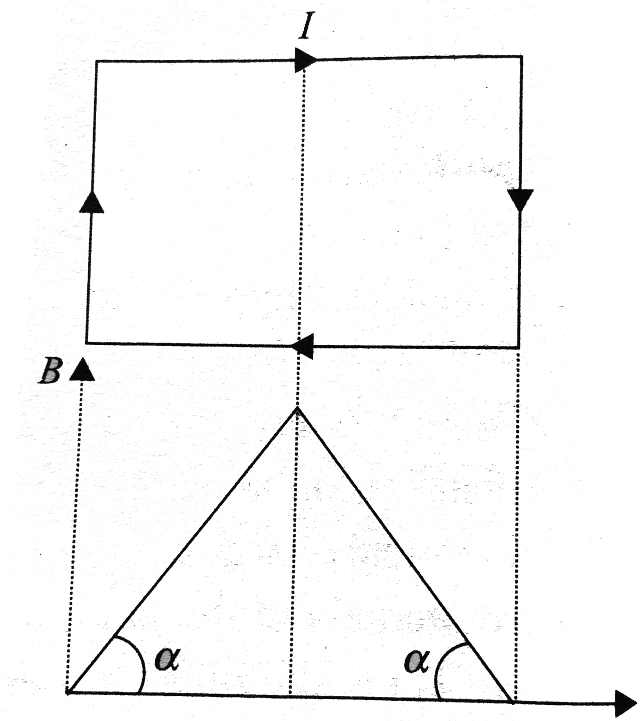
$$\frac{\mu_0 I I_1}{4\pi}\left[2(b-a)+\frac{\pi}{3}(a+b)\right]$$

D. The magnitude of the net force on the loop is given by

$$\frac{\mu_0 I I_1}{4\pi}\left[\frac{b-a}{ab}\right]$$

Watch Video Solution

5. A current carrying loop is placed in the non-uniform magnetic field whose variation in space is shown in fig. Direction of magnetic field is into the plane of paper. The magnetic of paper. The magnetic force experienced by the loop is



A. non-zero

B. zero

C. cannot say anything

D. none of the above

Answer: A

Watch Video Solution

6. Electric field strength $\vec{E} = E_0\hat{i}$ and $\vec{B} = B_0\hat{i}$ exists in a region. A charge is projected with a velocity $\vec{v} = v_0\hat{j}$ origin, then

A. It moves along helix with constant pitch

B. It moves along circular path in Y Z plane

C. It moves along helix with increasing pitch

D. It moves along helix with decreasing pitch

Answer: C

Watch Video Solution

7. Two moving coil metres M_1 and M_2 have the following particular

$R_1 = 10\Omega, N_1 = 30, A_1 = 3.6 \times 10^{-3}m^2, B_1 = 0.25T,$

$R_2 = 14\Omega, N_2 = 42, A_2 = 1.8 \times 10^{-3} m^2, B_2 = 0.50T$

The spring constants are identical for the two metres. What is the ratio of current sensitivity and voltage sensitivity of M_2 toM_1?

A. 1.4,1

B. 1,1.4

C. $1:1$

D. $1:4$

Answer: C

Watch Video Solution

8. A circular coil of 30 turns and radius 8.0 cm carrying a current of 6.0 A is suspended vertically in a uniform horizontal magnetic field of magnitude 1.0T. The field lines make an angle of 60° with the normal of the coil. Calculate the magnitude of the counter torque that must be applied to prevent the coil from turning.

A. 3.13 Nm

B. 1.13 Nm

C. 2.13 Nm

D. 4.13Nm

Answer: A

Watch Video Solution

9. Two Concentric circular coils X and Y of radii $16cm$ and $10cm$ lie in the same vertical plane containing N - S direction X has 20 turns and carries $16A$. Y has 25 truns & carries $18A$. X has current in anticlockwise direction and Y has current in clockwise direction for the observer, looking at the coils facing the west. The magnitude of net magnetic field at their common centre is .

A. 1.6×10^{-5} west

B. 1.6×10^{-3} east

C. 1.6×10^{-3} west

D. 1.6×10^{-5} east

Answer: C

Watch Video Solution

10. Toroid has a core (non-ferromagnetic) of inner radius 25 cm and outer radius 26 cm, around which 3500 turns of a wire wound. If the current in the wire is 11A, what is the magnetic field (a) outside the toroid, (b) inside the core of the toroid, and (c) in the empty space surrounded by the torroid.

A. $\left(0, 0, 3 \times 10^{-2} T\right)$

B. $(0, 0, 0)$

C. $\left(0, 3 \times 10^{-2} T, 0\right)$

D. $\left(3 \times 10^{-2} T, 0, 3 \times 10^{-2} T\right)$

Answer: C

Watch Video Solution

11. A uniform magnetic field of $1 \cdot 5T$ is in cylindrical region of radius $10 \cdot 0 cm$ with its direction parallel to the axis along east to west. A wire carrying current of $7 \cdot 0A$ in the north to south direction passes through this region. What is the magnitude and direction of the force on the wire if (a) the wire intersects the axes, (b) the wire is turned from N-S to north east-south west direction, (c) the wire in the N-S direction is lowered from the axis by a distance $6 \cdot 0 cm$?

A. $2.1N \downarrow$, $2.1N \downarrow$, $1.68N \downarrow$

B. $1.68 \downarrow$, $2.1N \downarrow$, $2.1N \downarrow$

C. $2.1N \downarrow$, $1.68N \downarrow$, $2.1N \uparrow$

D. $2.1N \uparrow$, $1.68N \downarrow$, $2.1N \uparrow$

Answer: C

Watch Video Solution

12. A cubical region of space is filled with some uniform electric and magnetic fields. An electron enters the cube across one of its faces with velocity $\vec{v}$ and a positron enters via opposite face with velocity - $\vec{v}$. At this instant,

A. (a,b,c)

B. (b,c,d)

C. (a, d)

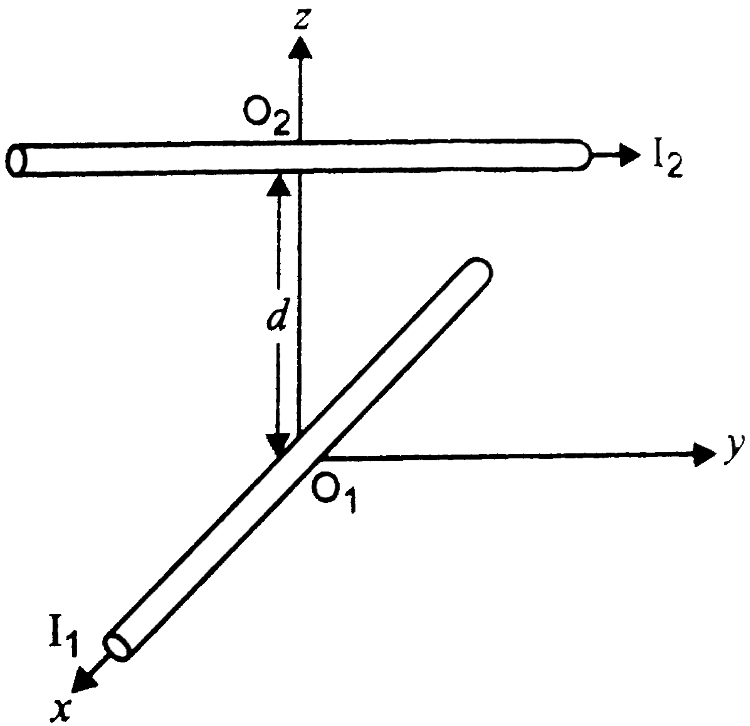
D. (a, c, d)

Answer: B

Watch Video Solution

13. Two long wires carrying current I_1 and I_2 are arranged as shown in figure. The one carrying current I_1 is along the x-axis. The other carrying current I_2 is along a line parallel to the y-axis given by $x = 0$ and $z = d$.

Find the force exerted at O_2 because of the wire along the x-axis.



A. Bil

B. $2Bil$

C. 0

D. $\sqrt{2}Bil$

Answer: C

Watch Video Solution

14. A current carrying loop consists of 3 identical quarter circles of radius R, lying in the positive quadrants of the x-y, y-z and z-x planes with their centres at the origin, joined together. Find the direction and magnitude to $\vec{B}$ at the origin.

A. $\frac{1}{4}\left(\frac{\mu_0 I}{2R}\right)\left(\hat{i}+\hat{j}+\hat{k}\right)$

B. $2\left(\frac{\mu_0 I}{2R}\right)\left(\hat{i}+\hat{j}+\hat{k}\right)$

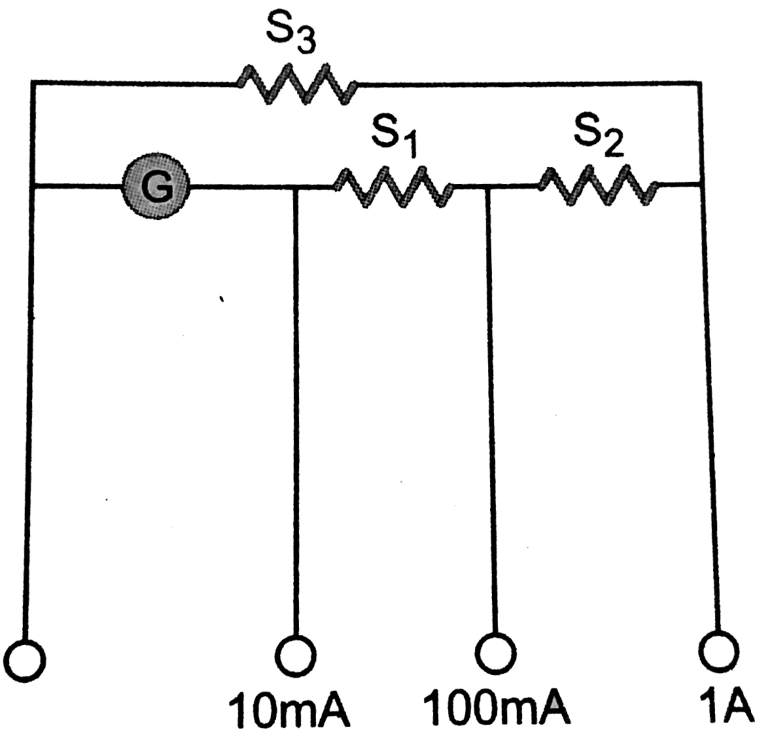
C. $\frac{1}{2}\left(\frac{\mu_0 I}{2R}\right)\left(\hat{i}+\hat{j}+\hat{k}\right)$

D. $3\left(\frac{\mu_0 I}{2R}\right)\left(\hat{i}+\hat{j}+\hat{k}\right)$

Answer: A

Watch Video Solution

15. A multirange current meter can be constructed by using a galvanometer circuit as shown in figure. We want a current meter that can measure $10mA$, $100mA$ and $1A$ using a galvanometer of resistance 10Ω and that produces maximum deflection for current of $1mA$. Find S_1, S_2 and S_3 that have to be used.



A. $18K\Omega$

B. $180k\Omega$

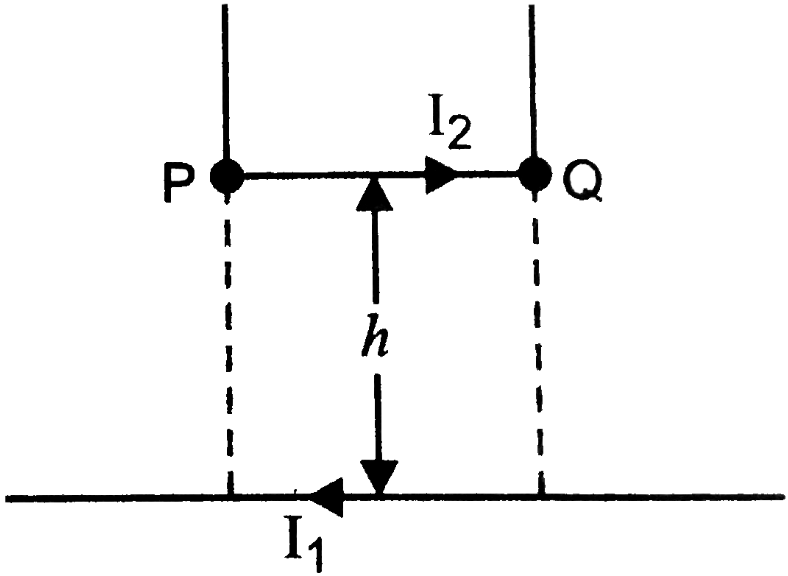
C. $1.8k\Omega$

D. $1800k\Omega$

Answer: A

Watch Video Solution

16. A long straight wire carrying current of $25A$ rests on a table as shown in figure. Another wire PQ of length 1m, mass $2 \cdot 5g$ carries the same current but in the opposite direction. The wire PQ is free to slide up and down. To what height will PQ rise?



A. 1.5m

B. 2.5m

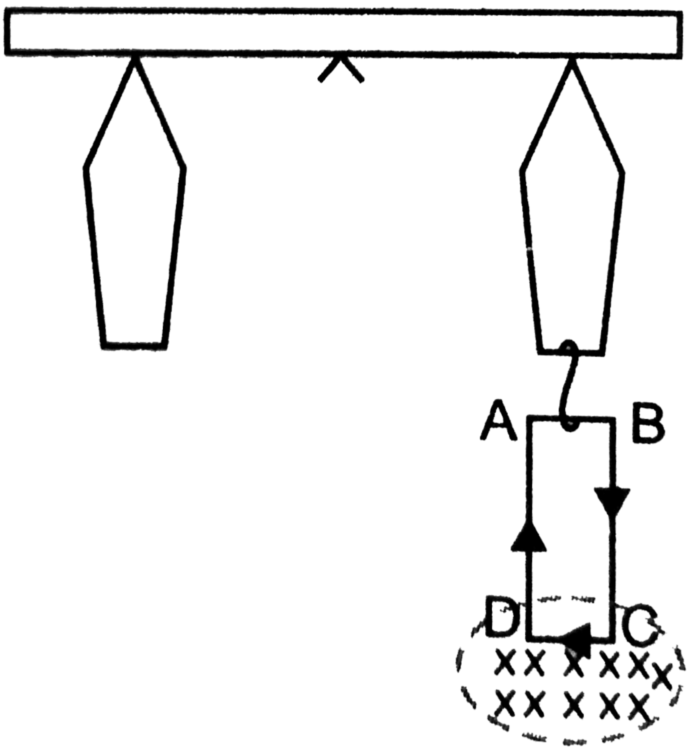
C. 0.51m

D. 1m

Answer: C

Watch Video Solution

17. A 100 turn rectangular coil ABCD (in XY plane) is hung from one arm of a balance (figure). A mass $500g$ is added to the other arm to balance the weight of the coil. A current $4 \cdot 9A$ passes through the coil and a constant magnetic field of $0 \cdot 2T$ acting inward (in xz plane) is switched on such that only arm CD of length $1cm$ lies in the field. How much additional mass 'm' must be added to regain the balance?



A. 1kg

B. 1gm

C. 2kg

D. 2gm

Answer: B

Watch Video Solution

18. A rectangular conducting loop consists of two wires on two opposite sides of length l joined together by rods of length d. The wires are each of the same material but with cross-sections differing by a factor of 2. The thicker wire has a resistance R and the rods are of low resistance, which in turn are connected to a constant voltage source V_0. The loop is placed in a uniform magnetic field B at 45° to its plane. Find τ, the torque exerted by the magnetic field on the loop about an axis through the centres of rods.

A. $\frac{V_0AB}{4\sqrt{2}R}$

B. $\frac{V_0AB}{\sqrt{2}R}$

C. $\frac{V_0AB}{2\sqrt{2}R}$

D. $\frac{3V_0AB}{\sqrt{2}R}$

Answer: A

Watch Video Solution

19. An electron and a position are released from (0, 0, 0) and $(0, 0, 1 \cdot 5R)$ respectively, in a uniform magnetic field $\vec{B} = B_0\hat{i}$, each with an equal momentum of magnitude $p = eBR$. Under what conditions on the direction of momentum will the orbits be non-intersecting circles?

A. $\cos\theta < \frac{3}{8}$

B. $2\cos\theta < \frac{1}{8}$

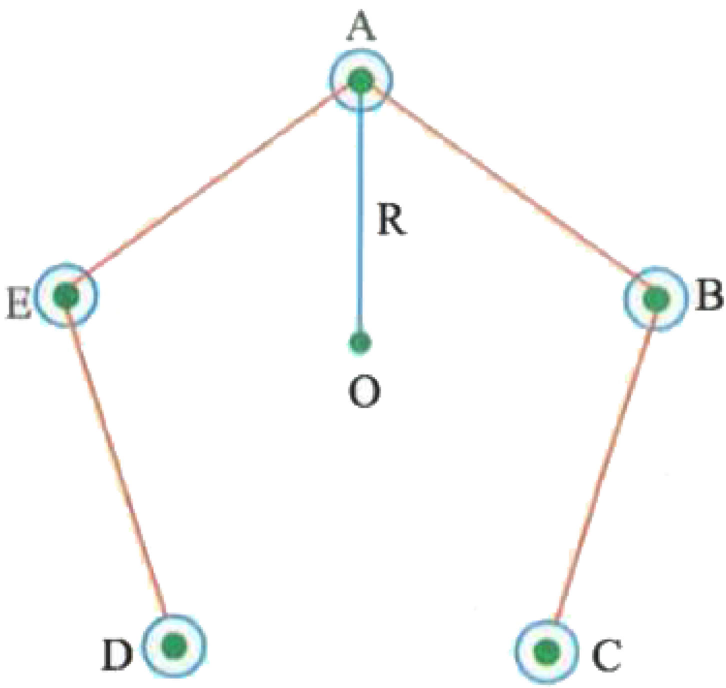
C. $\cos\theta > \frac{1}{8}$

D. $\cos\theta > \frac{3}{8}$

Answer: A

Watch Video Solution

20. Five long wires A, B, C, D and E, each carrying currentl I are arranged to form edges of a pentagonal prism as shown in figure. Each carries current out of the plane of paper.



a) What will be magnetic induction at a point on the axis O? Axis is at a distance R from each wire. b) What will be the field if current in one of the wires (say A) is switched off? c) What is current in one of the wire (say) A is reversed?

A. $0, \dfrac{\mu_0 I}{2\pi R}, \dfrac{\mu_0 I}{2\pi R}, \dfrac{\mu_0 I}{\pi R}$

B. $\dfrac{\mu_0 I}{2\pi R}, 0, \dfrac{\mu_0 I}{\pi R}$

C. $\dfrac{\mu_0 I}{2\pi R}, \dfrac{\mu_0 I}{\pi R}, \dfrac{\mu_0 I}{\pi R}$

D. $\dfrac{\mu_0 I}{2\pi R}, \dfrac{\mu_0 I}{2\pi R}, \dfrac{\mu_0 I}{\pi R}$

Answer: A

View Text Solution