PHYSICS

BOOKS - D MUKHERJEE PHYSICS (HINGLISH)

ELECTROMAGNETISM

Others

1. If C the velocity of light, which of the following is correct?

A. $\mu_0\varepsilon_0 = c$

B. $\mu_0\varepsilon_0 = c^2$

C. $\mu_0\varepsilon_0 = \frac{1}{c}$

D. $\mu_0\varepsilon_0 = \frac{1}{c^2}$

Answer: D

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2. If E and B denote electric and magnetic fields respectively, which of the following is dimensionless?

A. $\sqrt{\mu_0 \varepsilon_0} \frac{E}{B}$

B. $\mu_0 \varepsilon_0 \frac{E}{B}$

C. $\mu_0 \varepsilon_0 \left(\frac{B}{E}\right)^2$

D. $E / (\varepsilon_0) \times \frac{\mu_0}{B}$

Answer: A

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3. A vertical wire carriers a current upwards. The magnetic field at a point due north of the wire is directed

A. upward

B. due south

C. due west

D. due east

Answer: C

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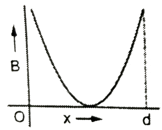
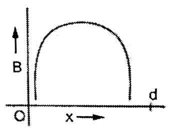
4. Two parallel beams of protons and electrons, carrying equal currents are fixed at a separation d. The protons and electrons move in opposite directions. There is a point P on the straight perpendicular line joining the two beams at a distance x from one beam. The magnetic field at this point is B.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

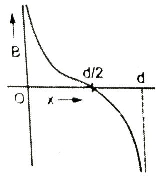
A. (a)



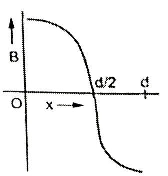
B. (b)



C. (c)



D. (d)



Answer: C

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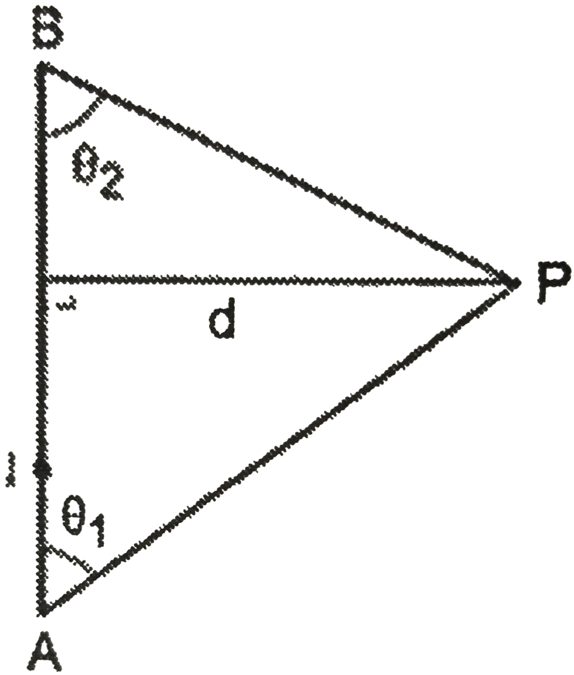

5.

AbB is a section of a straight wire carrying a current I. P is a point at a distance d from AB. The magnetic field at P due to AB has magnitude

A. $\frac{\mu_0 I}{4\pi d}(\cos\theta_1 + \cos\theta_2)$

B. $\frac{\mu_0 I}{4\pi d}(\cos\theta_1 - \cos\theta_2)$

C. $\frac{\mu_0 I}{4\pi d}(\sin\theta_1 + \sin\theta_2)$

D. $\frac{\mu_0 I}{4\pi d}(\sin\theta_1 - \sin\theta_2)$

Answer: A

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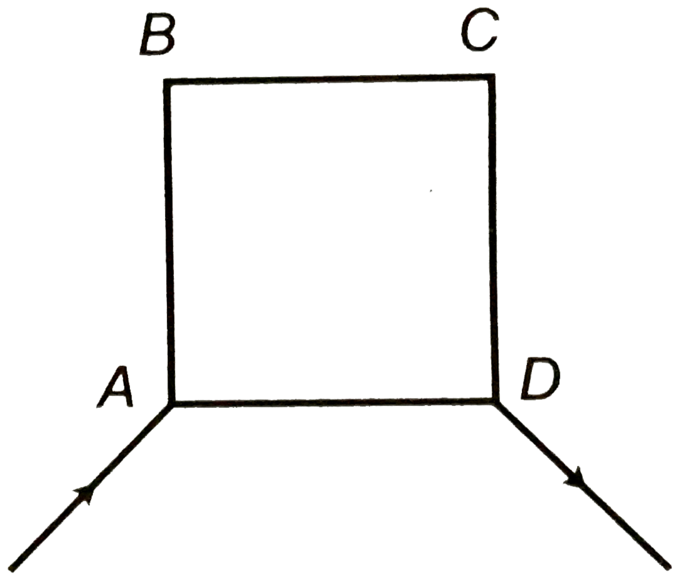
6. $ABCD$ is a square loop made of a uniform conducting wire. A current enters the loop at A and leaves at D. The magnetic field is



A. zero only at the centre of the loop

B. maximum at the centre of the loop

C. zero at all points outside the lop

D. zero at all points inside the loop

Answer: A

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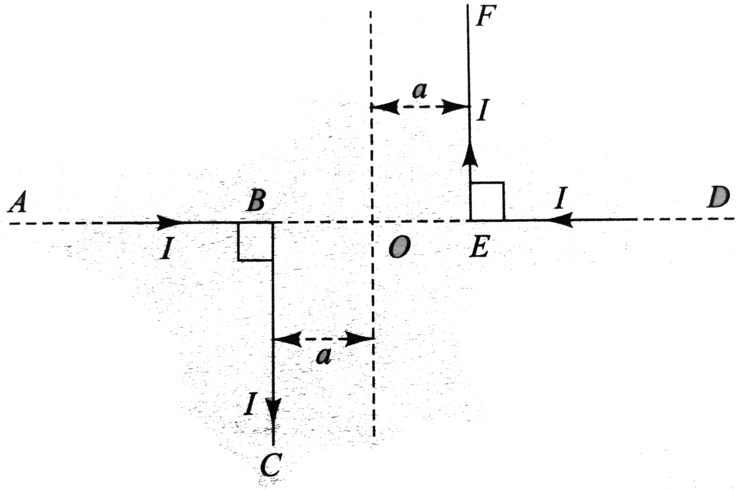
7. Two long thin wires ABC and DEF are arranged as shown in Fig. They carry equal currents I as shown. The magnitude of the magnetic field at O is



A. zero only at the centre of the loop

B. $\dfrac{\mu_0 I}{4\pi a}$

C. $\dfrac{\mu_0 I}{2\pi a}$

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

Answer: C

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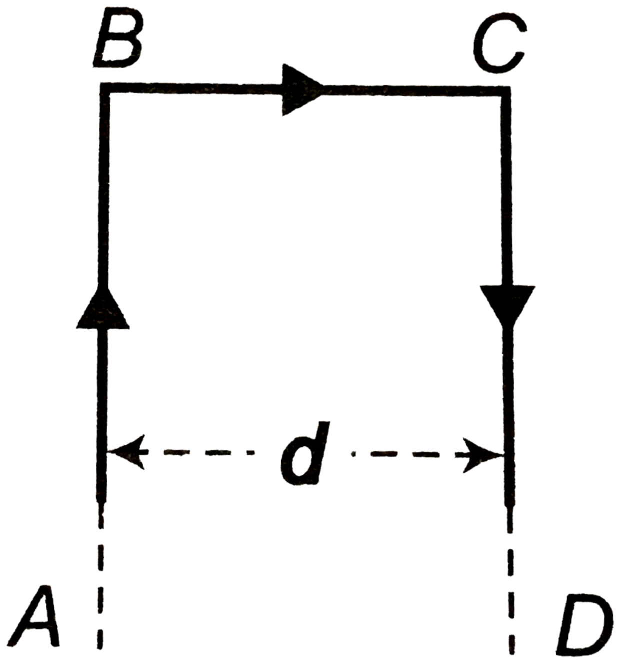
8. AB and CD are long staright conductors, distance d apart, carrying a current I. The magnetic field on BC due to the currents in

AB and CD



A. is zero at all points

B. is zero only at its midpoint

C. has different magnitudes at different points

D. is maximum at its midpoint

Answer: C

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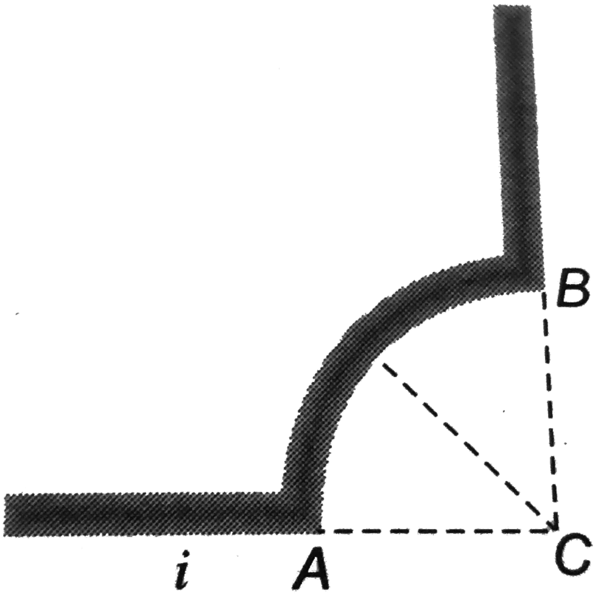
9. A wire carrying current I is shaped as shown. Section AB is a quarter circle of radius

r. The magnetic field is directed



A. along the bisector of the angle ACB, away from AB

B. along the bisector of the angle ACB, towards AB

C. perpendicular to the plane of the paper, directed into the paper

D. at an angle $\pi/4$ to the plane of the paper

Answer: C

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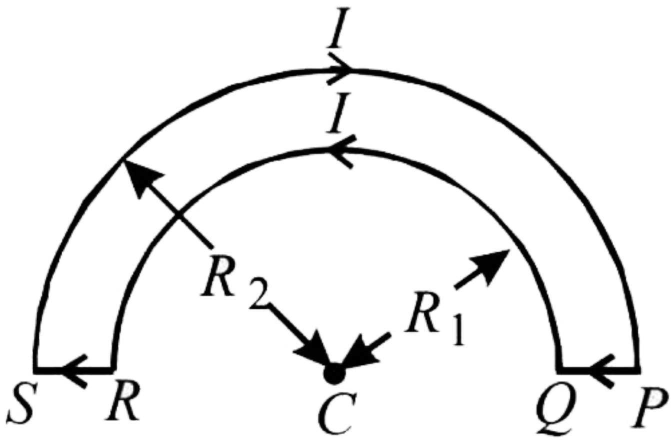
10. The wire loop $PQRSP$ formed by joining two semicircular wires of radii R_1 and R_2 carries a current I as shown . The magnitude of the magnetic induction at the center C is

....



A. $\frac{\mu_0 I}{2}\left(\frac{1}{R_1}+\frac{1}{R_2}\right)$

B. $\frac{\mu_0 I}{4}\left(\frac{1}{R_1}+\frac{1}{R_2}\right)$

C. $\frac{\mu_0 I}{2}\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$

D. $\frac{\mu_0 I}{4}\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$

Answer: D

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11. An electron moving in a circular orbit of radius r makes n rotation per secound. The magnetic field produced at the centre has magnitude

A. zero

B. $\frac{\mu_0 \text{ne}}{2\pi r}$

C. $\frac{\mu_0 \text{ne}}{2r}$

D. $\frac{\mu_0 n^2 e}{2r}$

Answer: C

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12. A circular coil of n turns and radius r carries a current I. The magnetic field at the centre is

A. $\pi r^2 ni$

B. $2\pi rni$

C. $\mu_0\left(\frac{ni}{2\pi r}\right)$

D. $\mu_0 \pi r^2 ni$

Answer: A

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13. A point P lies on the axis of a flat coil carrying a current. The magnetic moment of the coil is μ. The distance of P from the coil is d, which is large compared to the radius of the coil. The magnetic field at P has magnitude

A. $\frac{\mu_0}{2\pi}\left(\frac{\mu}{d^3}\right)$

B. $\frac{\mu_0}{4\pi}\left(\frac{\mu}{d^3}\right)$

C. $\frac{\mu_0}{2\pi}\left(\frac{\mu}{d^2}\right)$

D. $\frac{\mu_0}{4\pi}\left(\frac{\mu}{d^2}\right)$

Answer: A

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14. 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. $B \propto x, \text{ for } 0 < x < r$

B. $B \propto 1/x$, for $0 < x < r$

C. $B = 0, \text{ for } 0 \leq x < r$

D. $B = 0$, only for $x = 0$

Answer: C

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15. A coaxial cable consists of a thin inner conductor fixed along the axis of a hollow outer conductor. The two conductor carry equal currents in opposite directions. Let B_1 and B_2 be the magnetic fields in the region between the conductors and outside the conductor, respectively. Then,

A. $B_1 \neq 0, B_2 \neq 0$

B. $B_1 = B_2 = 0$

C. $B_1 \neq 0, B_2 = 0$

D. $B_1 = 0, B_2 \neq 0$

Answer: C

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16. A long straight conductor carrying a current lies along the axis of a ring. The conductor will exert a force on the ring if the ring

A. carries a current

B. has uniformly distributed charge

C. has non uniformly distributed charge

D. non of the above

Answer: D

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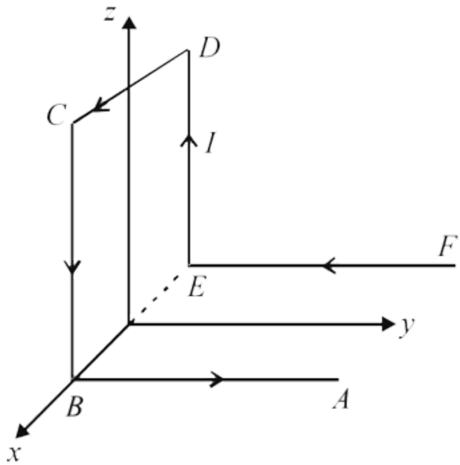
17. A wire $ABCDEF$ (with each side of length L) bent as shown in figure and carrying a current I is placed in a uniform magnetic induction B parallel to the positive

$y - direction.$ The force experienced by the wire is .... In the .... direction .



A. BIL in the positive y-direction

B. BIL in the positive z- direction

C. 3BIL

D. zero

Answer: A

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18. A closed loop lying in the xy plane carries a current. If a uniform magnetic field B is present in the region, the force acting on the will be zero if B is in

A. the x-direction

B. the y- direction

C. the z- direction

D. any of the above directions.

Answer: D

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19. An irregular closed loop carrying a current has a shape such that the entire loop cannot lie in a single plane. If it is a placed in a uniform magnetic field, the force acting on the loop

A. must be zero

B. can never be zero

C. may be zero

D. will be zero only for one particular direction of the magnetic field

Answer: A

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20. 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

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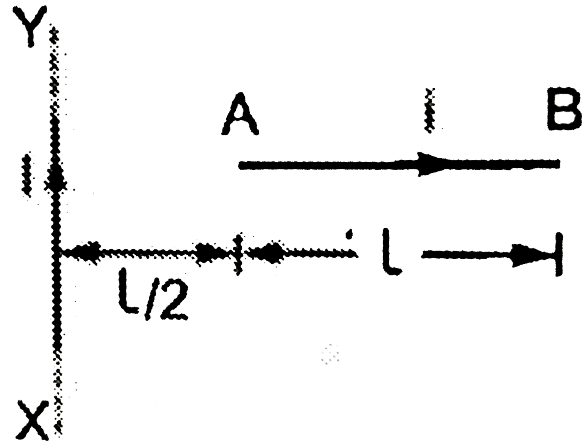
21.



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. upward

B. downward

C. to the right

D. to the left

Answer: A

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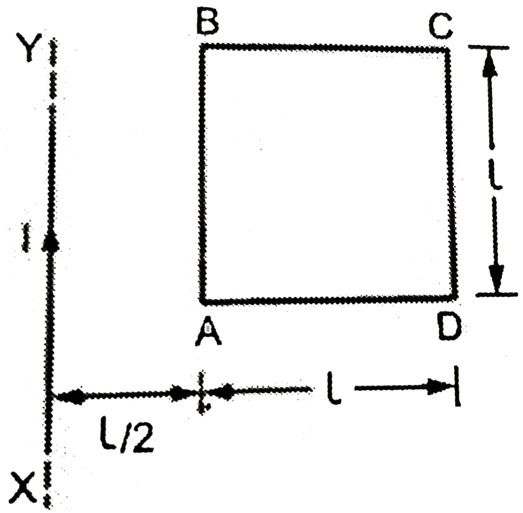

22.

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

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23. A flat coil of n turns, area A and carrying a current I is placed in a uniform magnetic field of magnitude B. The plane of the coil makes an angle θ with the direction of the field. The torque acting on the coil is

A. $B \in A \sin \theta$

B. $\frac{nAi}{B} \sin \theta$

C. $B \in A \cos \theta$

D. $B \in^2 A \cos \theta$

Answer: C

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24. A flat coil carrying a current has a magnetic moment μ. It is initially in equilibrium, with its plane perpendicular to a magnetic field of magnetic B, If it now rotated through an angle θ, the work done is

A. $\mu B\theta$

B. $\mu B \cos\theta$

C. $\mu B(1-\cos\theta)$

D. $\mu B\sin\theta$

Answer: C

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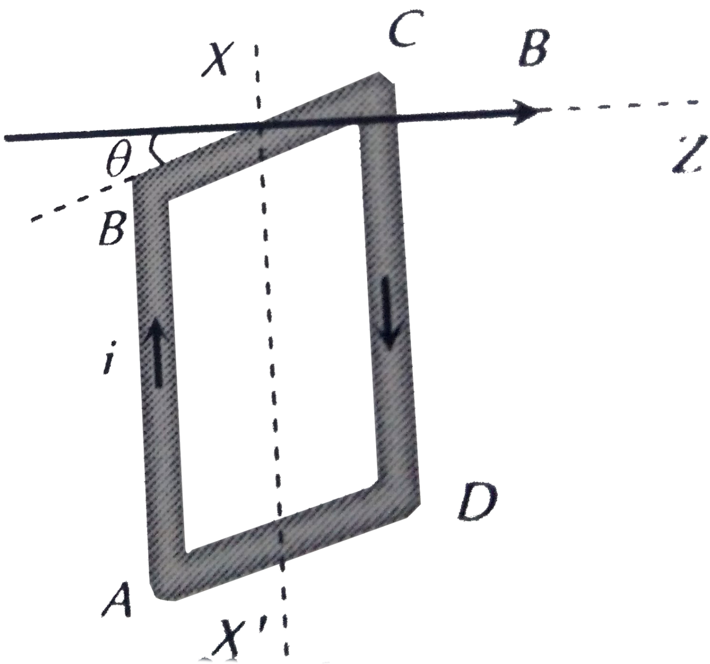
25. The square loop $ABCD$, carrying a current i, is placed in uniform magnetic field B, as shown. The loop can rotate about the axis XX'. The plane of the loop makes and angle $\theta(\theta < 90^{\circ})$ with the direction of B. Through what angle will the loop rotate by itself before the torque on it becomes zero



A. θ

B. $90^{\circ} - \theta$

C. $90^{\circ} + \theta$

D. $180^\circ - \theta$

Answer: C

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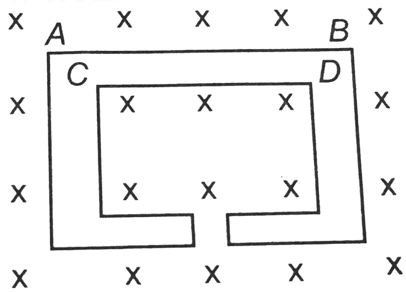
26. A wire is bent to form the double loop shown in figure. There is a uniform magnetic field directed into the plane of the loop. If the magnitude of this field is decreasing current will flow from:



A. A to B and C to D

B. B to A and D to C

C. A to B and D to C

D. B to A and C to D

Answer: C

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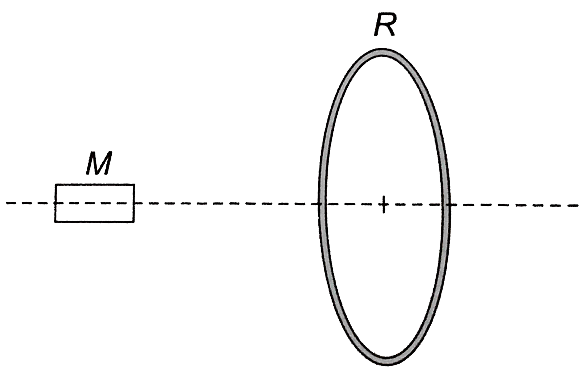
27. A conduting ring R is placed on the axis of a bar magnet M . The plane of R is perpendicular to this axis. M can move along this axis



A. M will repel R when it is moving towards R

B. M will attract R when it is moving towards R

C. M will repel R when moving towards as well as away from R

D. M will attract R when moving towards as well as away from R

Answer: A

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28. A conductor PQ , with $PQ = r$, moves with a velocity v in a uniform magnetic field of induced B . The emf induced in the rod is

A. $\left(\overrightarrow{v} \times \overrightarrow{B}\right).\overrightarrow{r}$

B. $\overrightarrow{v}.\left(\overrightarrow{r} \times \overrightarrow{B}\right)$

C. $\overrightarrow{B}.\left(\overrightarrow{r} \times \overrightarrow{v}\right)$

D. $\left|\overrightarrow{r} \times \left(\overrightarrow{v} \times \overrightarrow{B}\right)\right|$

Answer: A

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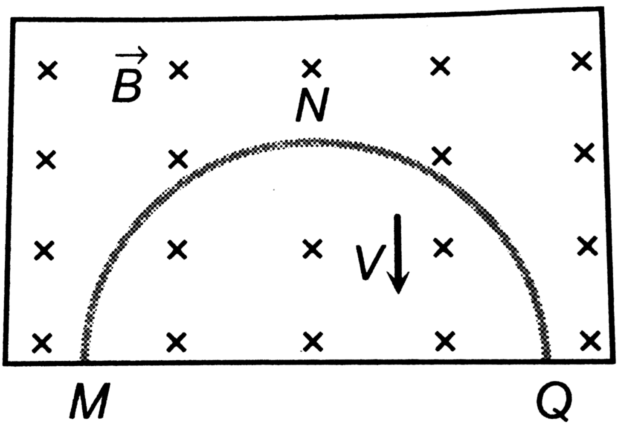
29. A thin semicircular conducting ring of radius R is falling with its plane verticle in a horizontal magnetic inducting B. At the position MNQ, the speed of the ring is V and the potential difference developed across the ring is



A. zero

B. $\frac{1}{2}Bv\pi R^2$, and M is at a higher potential

C. πRBv, and Q is at a higher potential

D. $2RBv$, and Q is at a higher potential

Answer: D

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30. The magnitude opf the earth's magnetic field at a place is B_0 and the angle of dip is δ. A horizontal conductor of length l, lying north-south, moves eastward with a velocity v .

The emf induced across the rod is

A. zero

B. $B_0 l v$

C. $B_0 l v \sin \delta$

D. $B_0 l v \cos \delta$

Answer: C

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31. The two ends of a horizontal conducting rod of length l are joined to a voltmeter. The whole arrangement moves with a horizontal velocity v , the direction of motion being perpendicular to the rod. The vertical component of the earth's magnetic field is B . The voltmeter reading is

A. Blv only if the rod moves eastward

B. Blv only if the rod moves westward

C. Blv if the rod moves in ,any direction

D. zero

Answer: D

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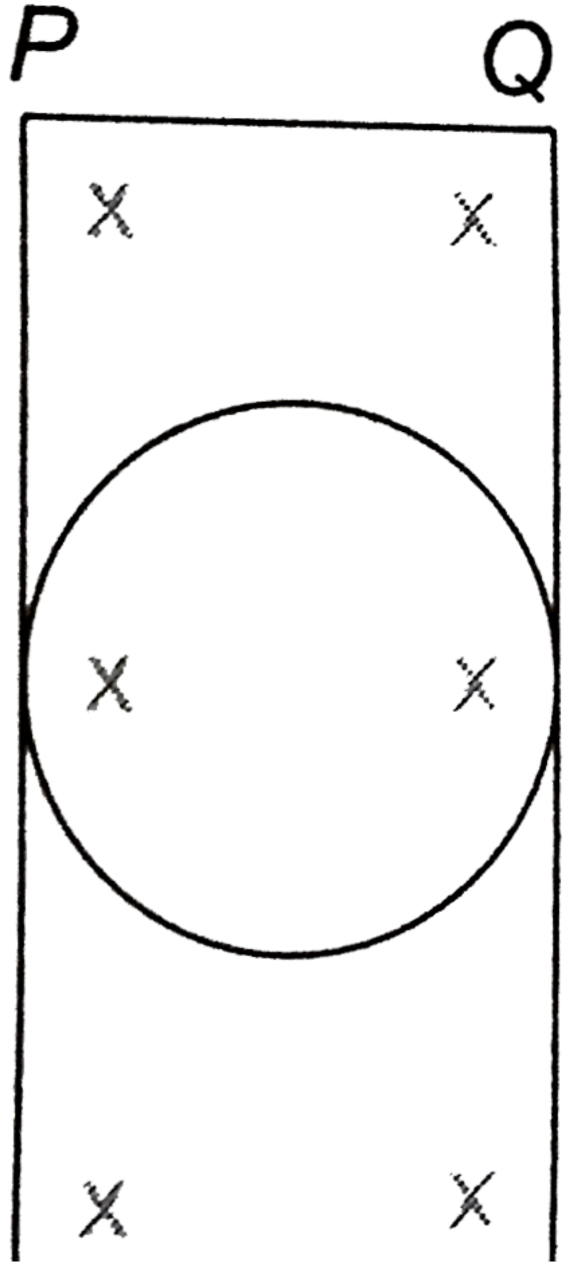
32. A vertical ring of radius r and resistance on R falls vertically. It is in contact with two vertical rails which are joined at the top. The rails are without friction and resistance. There is a horizontal uniform, magnetic field of magnitude B perpendicular to the plane of the ring and the rails. When the speed of the ring is v , the current in the section PQ is



A. zero

B. $\frac{2Brv}{R}$

C. $\frac{4Brv}{R}$

D. $\frac{8Brv}{R}$

Answer: D

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33. A horizontal ring of radius r spins about its axis with an angular velocity ω in a uniform vertical magnetic field of magnitude B. The emf induced in the ring is

A. zero

B. $\pi r^2 \omega B$

C. $\frac{1}{2} B r^2 \omega$

D. $B r^2 \omega$

Answer: A

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34. A metal rod of resistance R is fixed along a diameter of a conducting ring of radius r . There is a magnetic field of magnitude B perpendicular to the plane of the loop. The ring spins with an angular velocity ω about its axis. The centre of the ring is joined to its rim by an external wire W . The ring and W have no resistance. The current in W is

A. zero

B. $\frac{Br^2\omega}{2R}$

C. $\frac{Br^2\omega}{R}$

D. $\frac{2Br^2\omega}{R}$

Answer: D

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35. Three indential rings move with same speed on a horizontal magnetic field normal to plane of rings. The first (a) slips without rolling, the second(b) rolls without slipping and the third rolls with slipping:

A. The same emf is induced in all three rings

B. No emf is induced in any of the rings

C. In each ring all points are at the same potential.

D. B develops the maximum induced emf and A the least

Answer: A

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36. A long solenoid of N turns has a self-induced L and area of cross-section A. When a current i flows through the solenoid, magnetic field inside it has magnitude B . The current i is equal to

A. $\frac{BAN}{L}$

B. $BANL$

C. $\frac{BN}{AL}$

D. $\frac{B}{ANL}$

Answer: A

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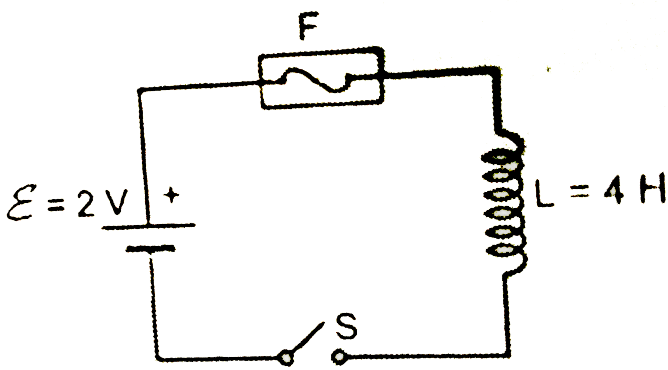
37. The network shown in the figure is part of a complete circuit. If at a certain instant, the current I is $5A$ and is decreasing at a rate $10^3 A/s$ then $V_B - V_A$ is



A. $20V$

B. $15V$

C. $10V$

D. $5V$

Answer: B

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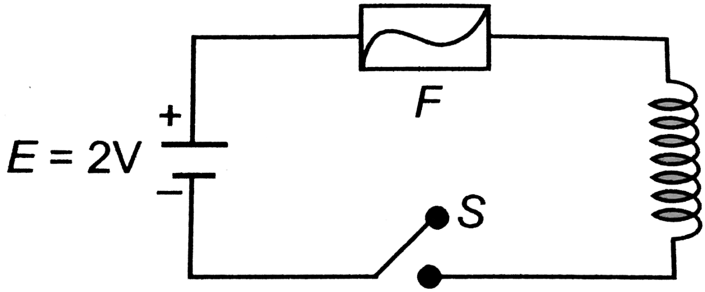
38. In the circuit shown, the cell is deal. The coil has an inductance of $4H$ and zero resistance. F is a fuse of zero resistance and will blow when the current through it reaches

$5A$. The switch is closed at $t = 0$. The fuse will blow:



A. almost at once

B. after $2s$

C. $5s$

D. after $10s$

Answer: D

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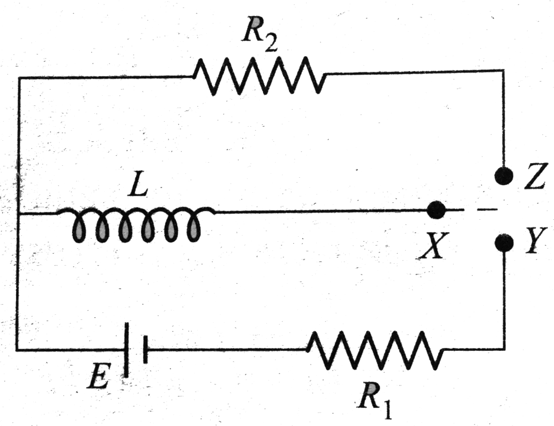
39. In the current shown Fig., X is joined to Y for a long time and then X is joined to Z. The total heat produced in R_2 is



A. $\dfrac{L\varepsilon^2}{2R_1^2}$

B. $\dfrac{L\varepsilon^2}{2R_2^2}$

C. $\dfrac{L\varepsilon^2}{2R_1R_2}$

D. $\dfrac{L\varepsilon^2 R_2}{2R_1^3}$

Answer: A

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40. Two coils X and Y are linked such that emf E is induced in Y when the current in X is changing at the rate $I'(=dI/dt)$. If a current I_0 is now made to flow through Y, the flux linked with X will be

A. $(\varepsilon / I)i$

B. εil

C. $(\varepsilon I)i$

D. iI / ε

Answer: A

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41. Two coils of inductances L_1, and L_2 are linked such that their mutual inductance is M

A. $M = L_1 + L_2$

B. $M = \frac{1}{2}(L_1 + L_2)$

C. The maximum value of M is $(L_1 + L_2)$

D. The maximum value of M is $\sqrt{L_1 L_2}$

Answer: D

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42. A small coil of radius r is placed at the centre of a large coil of radius R, where $R > > r$. The two coils are coplanar. The mutual inductance between the coils is proportional to

A. r / R

B. r^2 / R

C. r^2 / R^2

D. r / R^2

Answer: B

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43. A uniformly wound long solenoid of inductance L and resistance R is cut into two parts in the ratio $\eta : 1$, which are then connected in parallel. The combination is then connected to a cell of emf E. The time constant of the circuit is

A. L / R

B. $L / 2R$

C. $2\frac{L}{R}$

D. $L / 4R$

Answer: A

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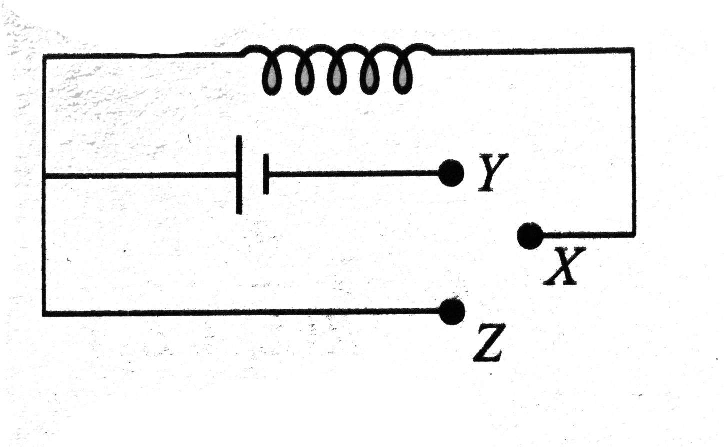
44. In the circuit shows in Fig, the coil has inductance and resistance. When X is joined to Y, the time constant is τ during the growth of current. When the steady state is reached, heat is produced in the coil at a rate P. X is now joined to Z. After joining X and Z:



A. The total heal produced in the coil is $P\tau$

B. The total heat producd in the coil is

$$\frac{1}{2}P\tau$$

C. The total heat produced in the coil is

$$2P\tau$$

D. The data given is not sufficeint to reach a conclusion

Answer: B

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45. When a coil is joined to a cell, the current through the cell grows with a tiem constant τ. The current will reach 10% of its steady-state value of time

A. 0.1τ

B. $\tau In(0.1)$

C. $\tau In(0.9)$

D. $\tau In(10-9)$

Answer: D

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46. At $t=0$, an inductor of zero resistance is joined to a cell of emf ε through a resistance.

The current increases with a time constant τ.

The emf across the coil after time t is

A. $\varepsilon t / \tau$

B. $\varepsilon\left(1 - e^{-\frac{t}{\tau}}\right)$

C. $\varepsilon e^{-t / \tau}$

D. $\varepsilon e^{-2 / \tau}$

Answer: C

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47. A coil carrying a steady current is short-circuited. The current in it decreases α times in time t_0. The time constant of the circuit is

A. $t_0 In\eta$

B. $\frac{t_0}{In\eta}$

C. $\frac{t_0}{\eta}$

D. $\frac{t_0}{\eta - 1}$

Answer: B

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48. When a coil is joined to a cell, current in it grows with a time constant τ. The coil is disconnected from the cell before the current has reached its steady-state value, and, it is then short-circuited. The current will now decrease with a time constant

A. τ

B. $> \tau$

C. $< \tau$

D. either (b) or (c) depending on the instant at which it was disconnected from the cell

Answer: A

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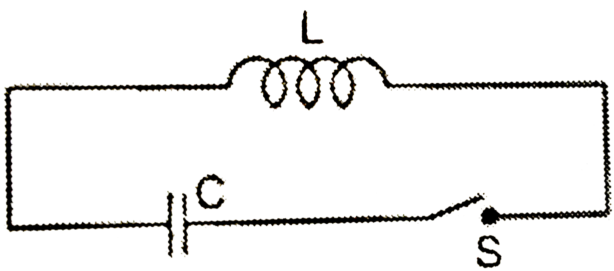
49. 

The capacitor of capacity C is given charge Q

and then connected to the coil of inductance L by closing the switch S. The maximum current flowing in the circuit at any later time will be

A. $\frac{Q}{2\sqrt{LC}}$

B. $\frac{Q}{\sqrt{LC}}$

C. $\frac{2Q}{\sqrt{LC}}$

D. $\frac{2}{\pi}\frac{Q}{\sqrt{LC}}$

Answer: B

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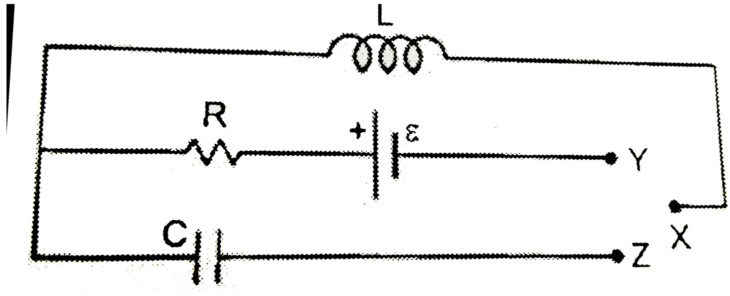
50. 

In the circuit shown, the symbols have their usual meanings. The cell has emf ε. X is initially joined to Y for a long time. Then X is joined to Z. The maximum charge on C at any later time will be

A. $\dfrac{\varepsilon}{R\sqrt{LC}}$

B. $\dfrac{\varepsilon R}{2\sqrt{LC}}$

C. $\frac{\varepsilon\sqrt{LC}}{2R}$

D. $\frac{\varepsilon\sqrt{LC}}{R}$

Answer: D

Watch Video Solution

51. A coil of self-inductance L is placed in an external magnetic field (no current flows in the coil). The total magnetic flux linked with the coil is φ. The magnetic field energy stored in the coil is

A. zero

B. $\frac{\varphi^2}{2L}$

C. $\frac{\varphi^2}{L}$

D. $\frac{2\varphi^2}{L}$

Answer: B

Watch Video Solution

52. When a charged capacitor is made to discharge through an inductance, the charge Q on the capacitor and the current i in the inducrtor vary sinusoidally. The phase different

between Q and i is

A. π

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

C. $\frac{\pi}{4}$

D. zero

Answer: B

Watch Video Solution

53. A charged capacitor discharges through a resistance R with time constant τ. The two are now placed in series across an AC source of angular frequency $\omega = \frac{1}{\tau}$. The impedance of the circuit will be

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

B. R

C. $\sqrt{2R}$

D. $2R$

Answer: C

Watch Video Solution

54. An electric lamp designed for operation on $10VAC$ is connected to a $220VAC$ supply, through a choke coil of inductance $2H$ for proper operation. The angular frequency of the AC is $100\sqrt{10}rad/s$. If a capacitor is to be used in place of the choke coil its cpacitance must be

A. $1\mu F$

B. $2\mu F$

C. $5\mu F$

D. $10\mu F$

Answer: C

Watch Video Solution

55. A resistance R draws power P when connected to an AC source. If an inductance is now placed in series with the resistance, such that the impedence of the circuit becomes Z, the power drawn will be

A. $P\left(\frac{R}{Z}\right)^2$

B. $P\left(\frac{R}{Z}\right)$

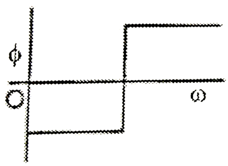
C. $P\sqrt{\frac{R}{Z}}$

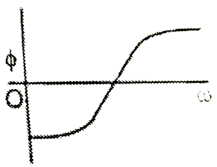
D. P

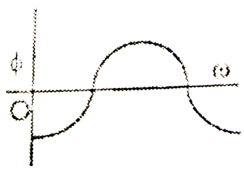
Answer: A

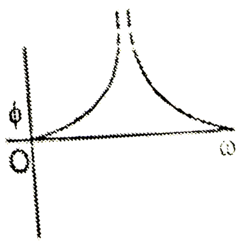
Watch Video Solution

56. An inductor and a capacitor are joined in series to an AC source. The frequency of the AC is gradually increased. The phase difference φ between the emf and the current is plotted against nthe angular frequency ω. Which of the following best represents the resulting curve?

A. 

B. 

C. 

D. 

Answer: A

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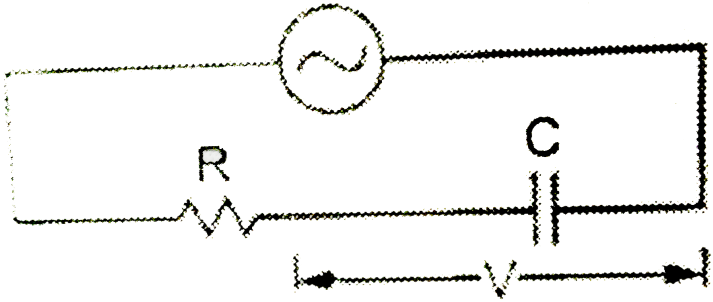
57. A resistance R and a capacitor C are joined to a source of AC of consant emf and variable frequency. The potential difference across C is V. If the frequency of AC is gradually increased V will



A. increase

B. decrease

C. remain constant

D. first increase and then decrease

Answer: B

Watch Video Solution

58. An inductance L, a cpacitance C and a resistance R may be connected to an AC souorce of angular frequency ω in three different combinations of RC, RL and LC in series. Assume that $\omega L = \frac{1}{\omega C}$. The power drawn by the three combinatios are P_1, P_2, P_3 respectively. THen

A. $P_1 > P_2 > P_3$

B. $P_1 = P_2 < P_1$

C. $P_1 = P_2 > P_1$

D. $P_1 = P_2 = P_3$

Answer: B

Watch Video Solution

59. An electrical heater and a capacitor are joined in series across a $220V, 50Hz, AC$ supply. The potential difference across the heater is $90V$. The potential difference across the capacitor will be about:

A. $200V$

B. $130V$

C. $110V$

D. $90V$

Answer: A

Watch Video Solution

60. In an AC circuit, the reactannce is equal to the resistance. The power factor of the circuit will be

A. 1

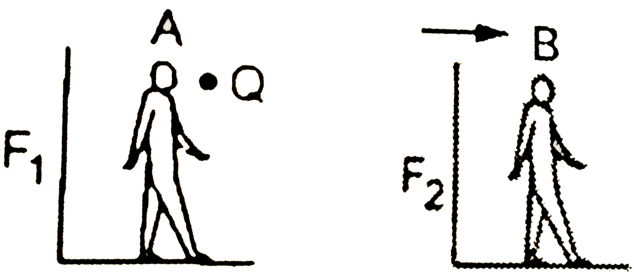
B. $\frac{1}{2}$

C. $\frac{1}{\sqrt{2}}$

D. zero

Answer: C

Watch Video Solution

61. 

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. Neigher A nor B wil observe magnetic fields.

D. B will observe a magnetic field, but A will not.

Answer: A::D

Watch Video Solution

62. 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

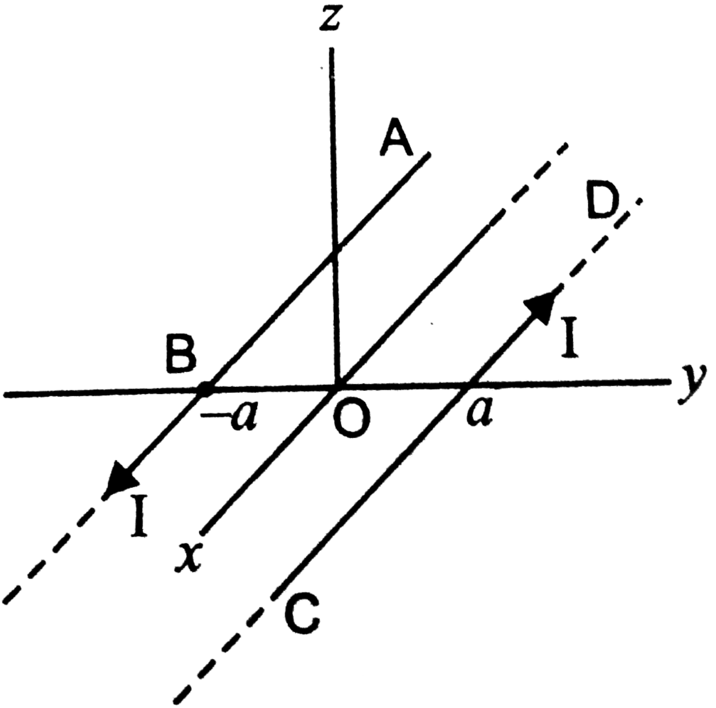
C. B and C

D. B and D

Answer: B::D

Watch Video Solution

63. Two long parallel wires, AB and CD, carry equal currents in opposite directions. They lie in the x-y plane, parallel to the x-axis, and pass through the points (0,-a,0) and (0,a,0) respectively, Figure. The resultant magnetic field is:



A. zero on the x-axis

B. maximum on the x — axis

C. directed along the x- axis at the origin

but not at other points on the$z$-axis

D. directed along the z- axis at al points on the z -axis

Answer: B::D

Watch Video Solution

64. 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 does not.

C. A and B observe magnetic fiels of the same magnitude but opposite directions

D. A and B do not observe any electric field.

Answer: A::D

Watch Video Solution

65. 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 ponts have magnetic fields in different directions.

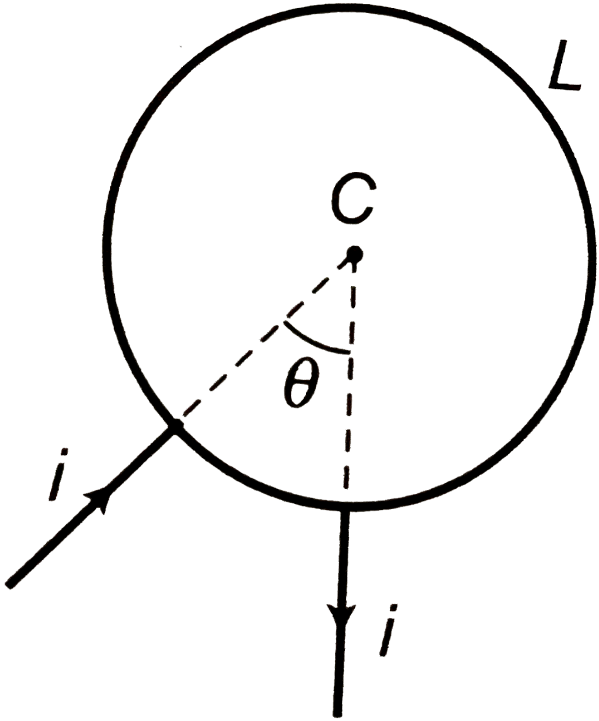
C. The magnetic field at A and C are in opposite directions.

D. The magnetic fields at A and B are mutually perpendicular.

Answer: A::B::C::D

Watch Video Solution

66. L is a circular ring made of a uniform wire, currents enters and leaves the ring through straight conductors which, if produces, would have passed through the centre C of ring. The magnetic field at C



(i) due to the straight conductors is zero

(ii) due to the loop is zero

(iii) due to the loop is proportional to θ

(iv) due to loop is proportional to $(\pi - \theta)$

A. due to the straight conductors is zero

B. due to the loop is zero

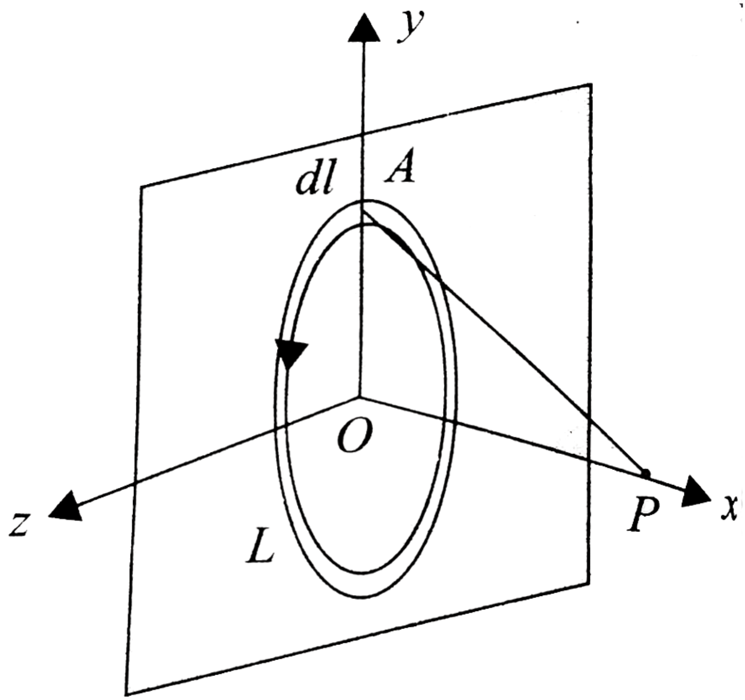
C. due to the loop is proportiona to θ

D. due to the loop is proportional to $(\pi - \theta)$

Answer: A::B

Watch Video Solution

67. L is a circular loop (in y-z plane) carrying an anticlockwise current. P is a point on its axis OX dl is an element of length on the loop at a point A on it. The magnetic field at P



A. due to L directed along OX

B. due to dl is directed along OX

C. due to dl is perpendicular to OX

D. due to dl is perpendiuclar to AP

Answer: A::D

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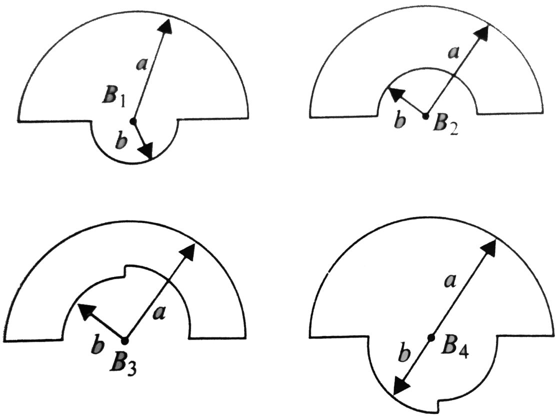
68. In the loops shown in fig. all curved section are either semicircles or quarter circles. All the loops carry same current. The magnetic fields at the centre have magnitudes

B_1, B_2, B_3 and B_4. Then,



A. B_4 is maximum

B. B_3 is minimum

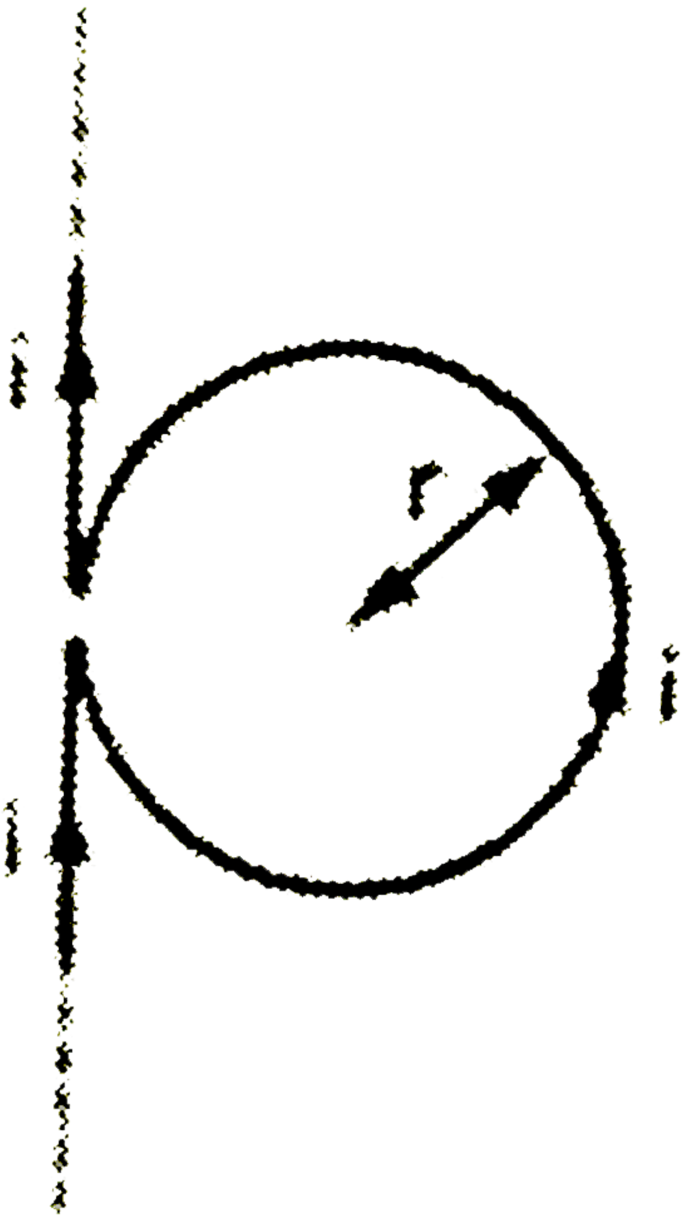
C. $B_4 > B_1 > B_2 > B_3$

D. $B_1 > B_4 > B_3 > B_2$

Answer: A::B::C

Watch Video Solution

69. 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: B::C

Watch Video Solution

70. 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 if the current in the coil is reversed.

Answer: B::C

Watch Video Solution

71. 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

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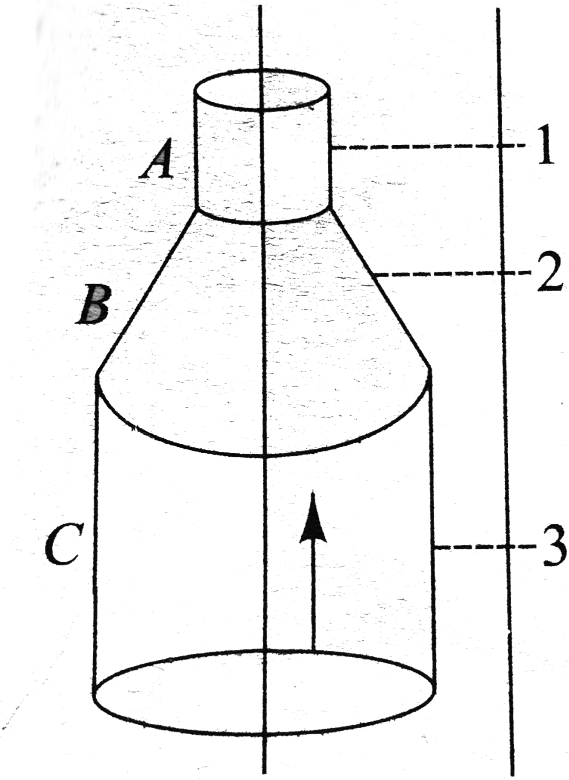
72. A long, straight, hollow conductor (tube) carrying a current has two sections A and C of unequal cross sections joined by a conical section B. 1,2 and 3 are points on a line parallel to the axis of the conductor. The magnetic fields at 1,2 and 3 have magnitudes

B_1, B_2 and B_3. Then,



A. $B_1 = B_2 = B_3$

B. $B_1 = B_2 \neq B_3$

C. $B_1 < B_2 < B_3$

D. B_2 cannot be found unless the dimensions of the section B are known.

Answer: A

Watch Video Solution

73. A conductor AB carries a current i in a magnetic field B. If $AB = r$ and the force on the conductor is F,

(i) $\overrightarrow{F}$ does not depend on shape of AB

(ii) $\overrightarrow{F} = i\left(\overrightarrow{r} \times \overrightarrow{B}\right)$

(iii) $\overrightarrow{F} = i\left(\overrightarrow{B} \times \overrightarrow{r}\right)$

(iv) $\left|\overrightarrow{F}\right| = irB$

A. $\overrightarrow{F}$ does not dependend on the shape of

AB

B. $\overrightarrow{F} = i\left(\overrightarrow{r} \times \overrightarrow{B}\right)$

C. $\overrightarrow{F} = i\left(\overrightarrow{B} \times \overrightarrow{r}\right)$

D. $\left|\overrightarrow{F}\right| = i\left(\overrightarrow{r} . \overrightarrow{B}\right)$

Answer: A::B

Watch Video Solution

74. 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 ber zero

B. can have the maximum magnitude $2Bir$

C. can have the maximum magnitude $Bi\pi r$

D. can have the maximum nmagnitude Bir

Answer: B

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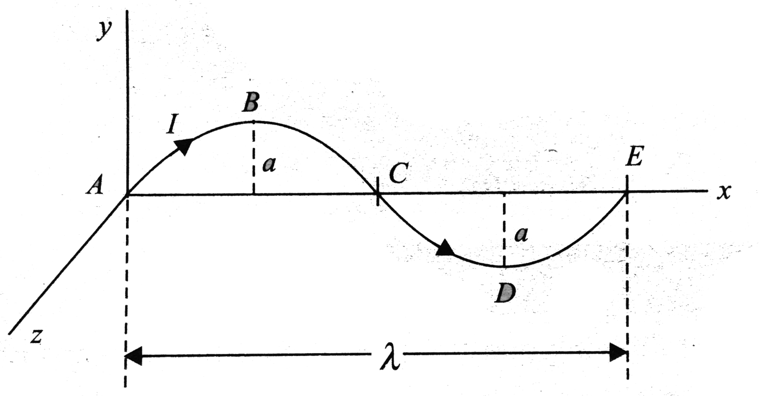
75. A conductor ABCDE, shaped as shown, carries current I. It is placed in the x-y plane with the end A and E on the x-axis. A uniform magnetic field of magnitude B exists in the region. The force acting on it will be



A. zero if B is in the x-direction

B. λBi in the z-direction, if B is in the y-direction

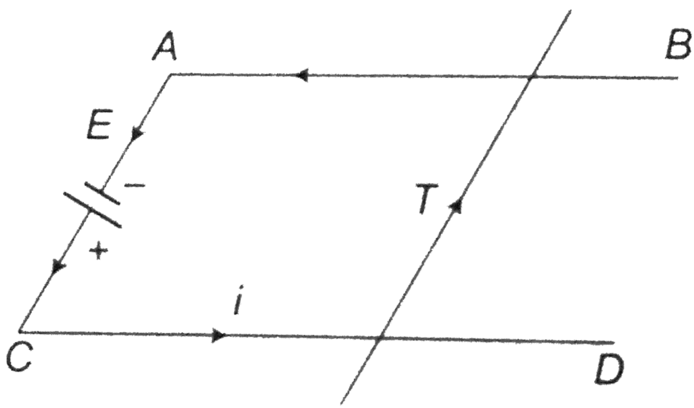
C. λBi in the negative y-direction if B is in the z-direction

D. $2aBi$, if B is in the x-direction

Answer: A::B::C

Watch Video Solution

76. AB and CD are smooth, parallel, horizontal rails on which a conductor T can slide. A cell, E, drives current I through the rails and T



(i) The current in the rails will set up a magnetic field over T

(ii) T will experienced a force to the right

(iii) T will experienced a force to the left

(iv) T will not experienced any force

A. The current in the rails will set up a magnetic field over T

B. T will experience a force to the right.

C. T will experience a force to the left

D. T will not experience any force

Answer: A::B

Watch Video Solution

77. Two long, thin parallel conductors, separated by a distance d, carrying currents i_1 and i_2. The force acting on unit length of any one conductor is F

A. F is attractive if i_1 and i_2 flow in the same direction.

B. F is attractive if i_1 and i_2 flow in opposite directions.

C. F is the same for both conductors

D. F is different for the two conductors

Answer: A::C

Watch Video Solution

78. A conducting gas is in the form of a long cylinder. Currents flows through the gas along the length of the cylinder. The current is distributed uniformly across the cross-section of the gas. Disregard 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

79. A current-carrying ring is placed in a magnetic field. The direction of the field is perpendicular to the plane of the ring

(i) There is no net force on the ring

(ii) The ring will tend to expand

(iii) The ring will tend to contract

(iv) Either (ii) or (iii) depending on the directions of the current in the ring and the magnetic field

A. There is no net forces on the rig

B. The ring will tend to expand.

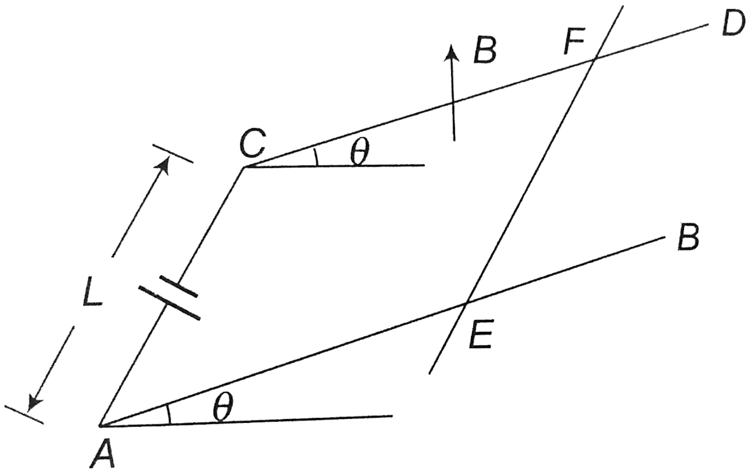
C. The ring will tend to contract

D. Either (b) or (c) depending on direction of the current in the ring and the magnetic field

Answer: A::D

Watch Video Solution

80. AB and CD are smooth, parallel rails, separated by a distance L and inclined to the horizontal at an angle θ. A uniform magnetic field of magnitude B, directed vertically upwards, exists in the region. EF is a conductor of mass m, carrying a current i. For EF to be in equilibrium



(i) i must flow from E to F

(ii) $BiL = mg\tan\theta$

(iii) $BiL = mg\sin\theta$

(iv) $BiL = mg$

A. i must flow from E and F

B. $Bil = mg\tan\theta$

C. $Bil = mg\sin\theta$

D. $Bil = mg$

Answer: A::B

Watch Video Solution

81. A flat coil carrying a current has a magnetic moment $\overrightarrow{\mu}$. It is placed in a magnetic field $\overrightarrow{B}$. The torque on the coil is $\overrightarrow{\tau}$

A. $\overrightarrow{\tau} = \overrightarrow{\mu} \times \overrightarrow{B}$

B. $\overrightarrow{\tau} \times \overrightarrow{B} \times \overrightarrow{\mu}$

C. $\left|\overrightarrow{\tau}\right| = \overrightarrow{\mu}\,.\,\overrightarrow{B}$

D. $\overrightarrow{\tau}$ is perpendicular to both $\overrightarrow{\mu}$ and $\overrightarrow{B}$

Answer: A::D

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82. A flat coil carrying a current has a magnetic moment μ. It is placed in a magnetic field B such that μ is anti-parallel to B. The coil is

A. not is equilibrium

B. in stable equilibrium

C. in unstable equilibrium

D. in neutral equilibrium

Answer: C

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83. The magnetic flux (ϕ) linked with the coil depends on time t as $\phi = at^n$, where a and n are constants. The emf induced in the coil is e

A. If $0 < n < 1, e = 0$

B. If $0 < n < 1, e \neq 0$ and $|e|$ decreases with time

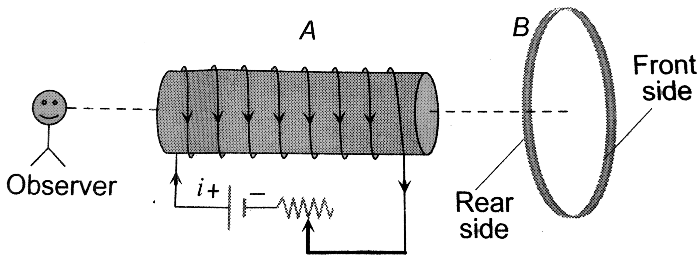
C. If $n = 1, e$ is constant

D. If $n > 1, |e|$ increases with time

Answer: B::C::D

Watch Video Solution

84. An aluminium ring B faces an electromagnet A. The current I through A can be altered



A. If i increases A will repel B

B. If i increaes A will attracted B

C. If i decreases A will attract B

D. If i decreases A will repel B

Answer: A::C

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85. A small magnet M is allowed to fall through a fixed horizontal conducting ring R. Let g be the acceleration due to gravity. The acceleration of M will be

A. $< g$ when it is above R and moving towards R

B. $> g$ when it is above R and moving towards R

C. $< g$ when it is below R and moving away from R

D. $> g$ when it is below R and moving away from R

Answer: A::C

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86. The magnetic flux linked with a coil is ϕ and the emf induced in it is e.

A. If $\phi = 0$, e must be 0

B. If $\phi \neq 0$, e cannot be 0

C. If e is not 0, ϕ may or may not be 0

D. None of the above is correct

Answer: C

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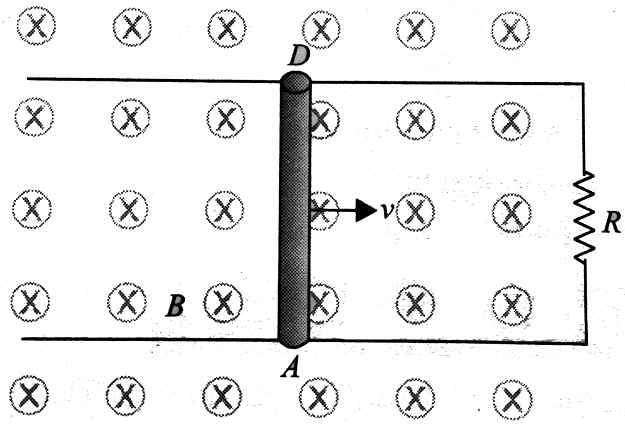
87. The counductor AD moves to the right in a uniform magnetic field directed into the plane of the paper.



A. The free electrons in AD will moves towards A

B. D will acquire a positive potential with respect to A

C. If D and A are joined by a conductor externally, a current will from A to D in AD

D. The current in AD flows from lower to higher potential

Answer: A::B::C::D

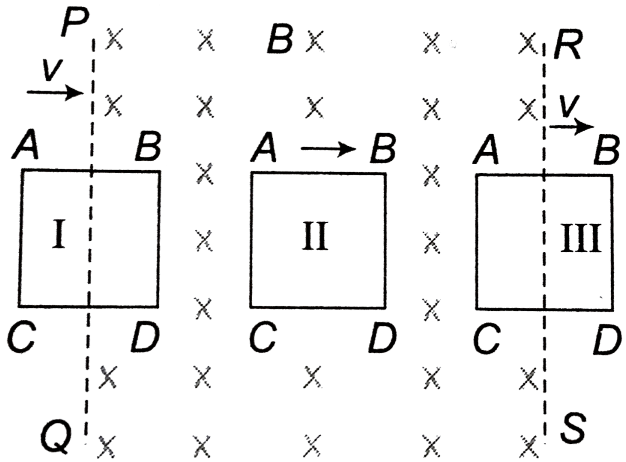
Watch Video Solution

88. A square loop $ABCD$ of edge a moves to the right with a velocity v parallel to AB . There is a uniform magnetic field of magnitude B , direction into the paper, in the region between PQ and RS only. I, II and III are three ppositions of the loop.

(i) The emf induced in the loop has magnitude B a v in all three position

(iii) Induced emf is anticlockwise in position II

(iv) The induced emf is clockwise in position III



A. The emf induced in the loop has magnitude Bav in all three positions.

B. The induced emf is zero in position II

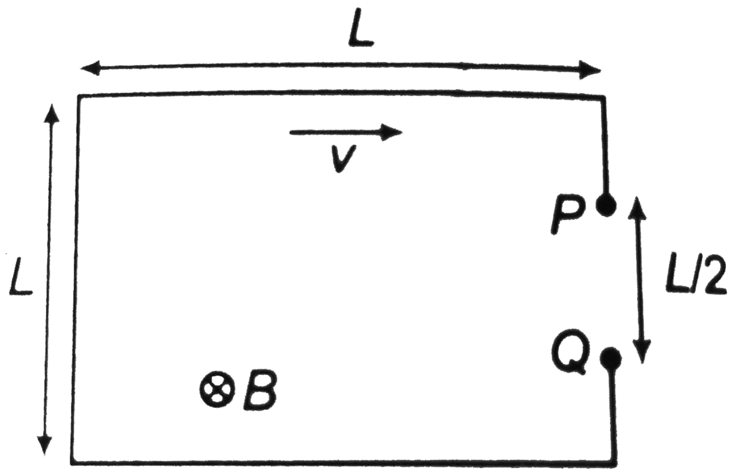
C. The induced emf is anticlockwise in positoin I

D. The induced emf is clockwise in position III

Answer: B::C::D

Watch Video Solution

89. The loop shown moves with a velocity v in a uniform magnetic field of magnitude B, directed into the paper. The potential differene between point P and Q is e. Then



A. $e = \frac{1}{2}Blv$

B. $e = Blv$

C. P is positive with respect to Q

D. Q is positive with respect to P

Answer: A::C

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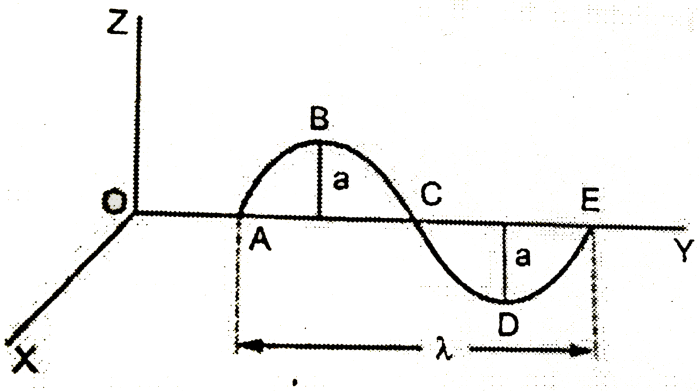
90. 

A conductor $ABCDE$ has the shape shown. It lies i the yz plane, with A and E on the y-axis . When it moves with a velocity v in a magnetic field B, an emf e is induced between A and E

A. $e = 0$ if v is in the y-direction and B is in the x-direction.

B. $e = 2Bav$, if v is in the y-direcrtion and B is in the x-direction

C. $e = B\lambda v$, if v is in the$z$- direction and b is in the x-direction.

D. $e = B\lambda v$,if v is in the x -direction and B is in the z- direction

Answer: A::C::D

View Text Solution

91. The magnitude of the earth's magnetic field at the north pole is B_0 . A horizontal conductor of length l moves with a velocity v . The direction of v is perpendicular to the conductor. The induced emf is

(i) zero, if v is vertical

(ii) $B_0 l v$, if v is vertical

(iii) zero, if v is horizontal

(iv) $B_0 l v$, if v is horizontal

A. zero, if v is vertical

B. $B_0 l v$ if v is vertical

C. Zero ,if v is horizontal

D. $B_0 l v$ if v is horizontal

Answer: A::D

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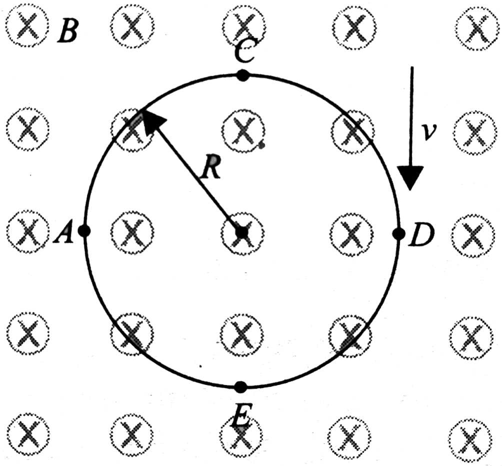
92. A vertical conducting ring of radius R falls vertically in a horizontal magnetic field of magnitude B. The direction of B is perpendicular to the plane of the ring. When the speed of the ring is `v,



A. no current flows in the ring

B. A and D are the same potential

C. C and E are the same potential

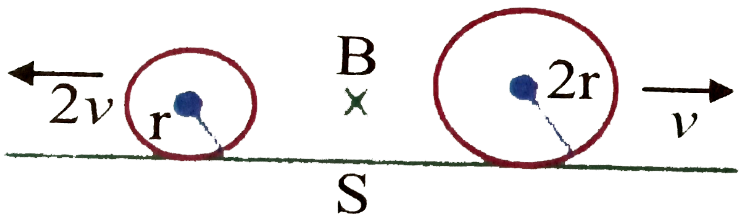
D. the potential differece between A and D

is $2BRv$ with D at a higher potential

Answer: C::D

Watch Video Solution

93. Two conducting rings of radii r and $2r$ move in apposite directions with velocities $2v$ and v respectively on a conducting surface S. There is a uniform magnetic field of magnitude B perpendicular to the plane of the rings. The potential difference between the highest points of the two rings is



A. zero

B. $2rvB$

C. $4rvB$

D. $8rvB$

Answer: D

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94. The magnetic field perpendicular to the plane of a conducting ring of radius r change ate the rate $\frac{dB}{dt}$

A. The emf induced in the ring is $\pi r^2 \frac{dB}{dt}$

B. The emf induced in the rintg is $2\pi r \frac{dB}{dt}$

C. The potential difference between diametrically opposite points on the ring is half of the induced emf.

D. All points on the ring are at the same potential.

Answer: A::D

View Text Solution

95. A nonconducting of radius r has charge Q. A magnetic field perpendicular to the plane of ring changes at the rate $\frac{dB}{dt}$. The torque experienced by the ring is

A. zero

B. $Qr^2 \frac{dB}{dt}$

C. $\frac{1}{2} Qr^2 \frac{dB}{dt}$

D. $\pi r^2 Q \frac{dB}{dt}$

Answer: C

View Text Solution

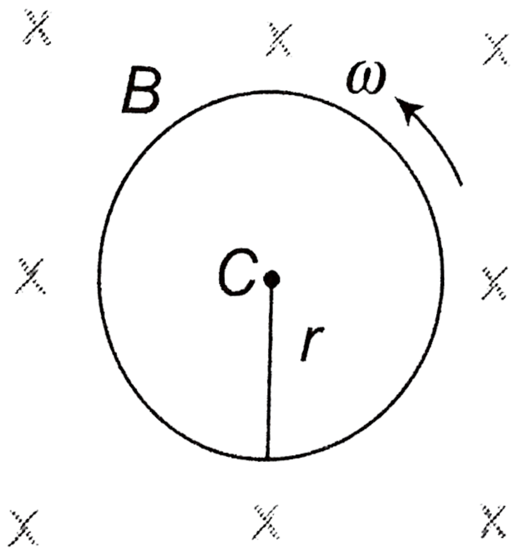
96. A conducting disc of radius r spins about its axis an angular velocity ω . There is a uniform magnetic field of magnitude B perpendicular to the plane of the disc C is the centre of the disc.

(i) No emf is induced in the disc

(ii) The potential difference between C and the rim is $1/2Br^2\omega$

C is at a higher potential than the rim

(iv) Current flows between C and the rim



A. No emf induced in the disc.

B. The potential difference between C and the rim is $\frac{1}{2}Br^2\omega$

C. C is at a higher potential than the rim

D. Current flows between C and the rim

Answer: B::C

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97. A flat coil, C, of n turns, area A and resistance R, is placed in a uniform magnetic field of magnitude B. The plane of the coil is initially perpendicular to B. The coil,is rotated by an angle θ about a diameter and charge of amount Q flows through it. Choose the correct alternatives.

A. If $\theta = 90^\circ, Q = \frac{BAn}{R}$

B. If $\theta = 180^\circ, Q = \frac{BAn}{R}$

C. If $\theta = 180^\circ, Q = 0$

D. If $\theta = 360^\circ, Q = 0$

Answer: A::B::D

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98. The SI unit of inductance, the henry can be written as

A. weber/ampere

B. volt second/ampere

C. $\text{joule}/\text{ampere}^2$

D. ohm second

Answer: A::B::C::D

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