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PHYSICS

BOOKS - A2Z PHYSICS (HINGLISH)

ELECTROMAGNETIC INDUCTION

Lenz'S And Faraday'S Law

1. Lenz's law is consequence of the law of conservation of

A. Charge

B. momentum

C. mass

D. energy

Answer: D

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2. Two circular, similar, coaxial loops carry equal currents in the same direction. If the loops are brought nearer, what will happen?

A. current will increase in each loop

B. current will decrease in each loop

C. current will remain same in each loop

D. current will increase in one and decrease in the other

Answer: B

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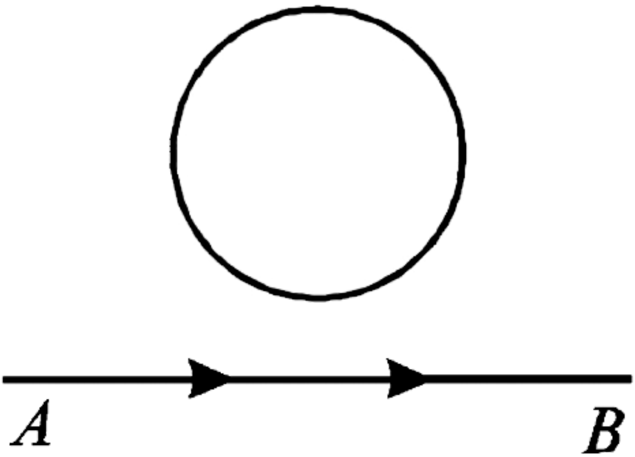
3. A current from A to B is increasing in magnitude. What is the direction of induced current, If any, in the loop as shown in the figure?



A. No current will be induced

B. the current will be clockwise

C. the current will be anticlockwise

D. the current will change direction as the electron passes by

Answer: D

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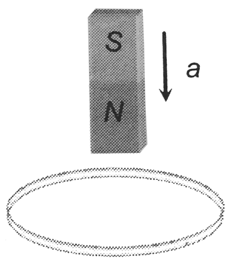
4. A metallic ring is attached with the wall of a room. When the north pole of a magnet is brought near to it, the induced current in the ring will be



A. First clock then anticlockwise

B. in clockwise direction

C. in anticlockwise direction

D. first anticlockwise then clockwise

Answer: C

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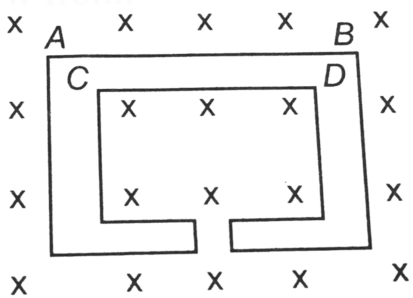
5. A wire is bent to form the double loop shown in figure. There is a uniform magnetic field directed into the plane of the loop. If the magnitude of this field is decreasing current will flow from:



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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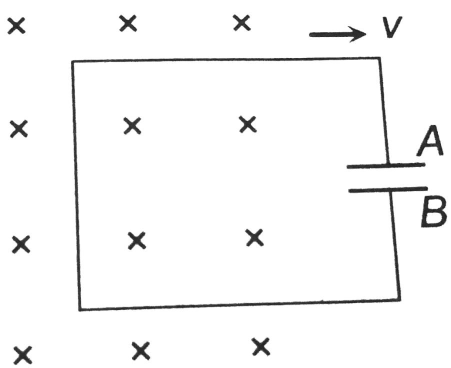
6. A conductuing loop having a capacitor is moving outward from the magnetic field. Which plate of the capacitor will be positive?



A. plate-A

B. plate-B

C. plate-A and plate -B both

D. none

Answer: A

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7. 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 e.m.f. is induced in all three rings.

B. no e.m.f. is induced in any of the rings.

C. in each ring all points are at same potential

D. B develops max, induced e.m.f. and A, the least.

Answer: A

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8. The current flowing in two coaxial coils in the same direction. On increasing the distance the two, the electric current will

A. increase

B. decrease

C. remain unchanged

D. the information is incomplete

Answer: A

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9. A magnet is brought towards a coil (i) speedily (ii) slowly then the induced e.m.f.//induced charge will be respectively

A. more in first case//more in first case

B. more in first case //equal in both case

C. less in first case //more in second case

D. less in first case // equal in both case

Answer: B

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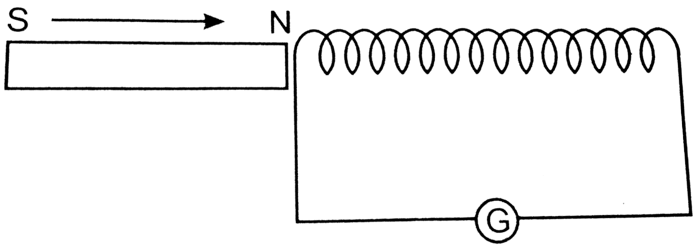
10. As shown in the figure, a magnetic is moved with a a fast speed towards a coil at rest. Due to this, induced electromotive force, induced charge in the coil are E, I and Q respectively. If the speed of magnetic is doubled, the incorrect statement is



A. E increases

B. I increase

C. Q remains same

D. Q increases

Answer: D

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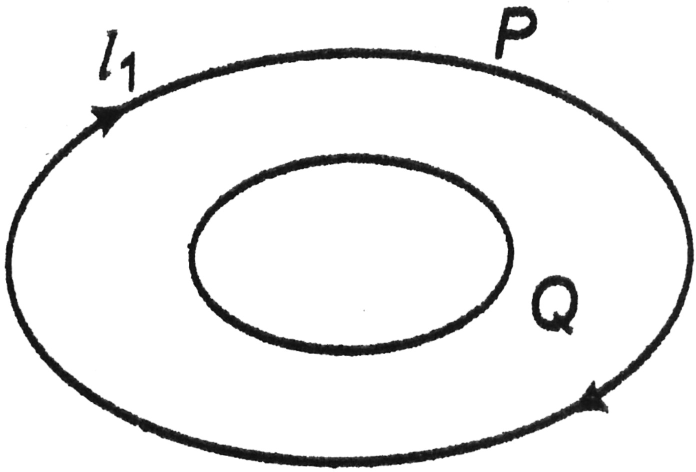
11. Two circular loops P and Q are concentric and coplanar as shown in figure. The loop Q is smaller than. P. If the current I_1 flowing in loop P is decreasing with time, then the current I_2 in the loop Q



A. Clockwise

B. zero

C. counter clockwise

D. in a direction that depends on the ratio of the loop radii

Answer: C

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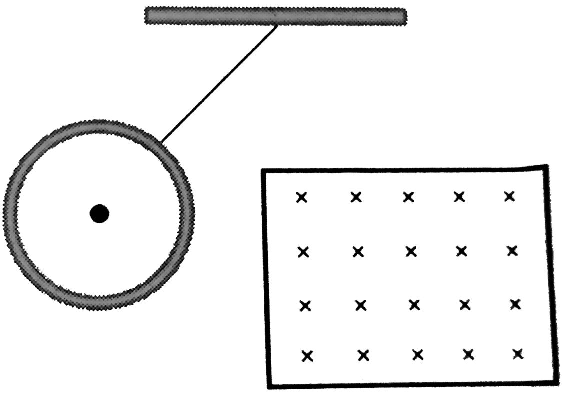
12. A metallic ring connected to a rod oscillates freely like a pendulum. If now a magnetic field is applied in horizontal direction so that the pendulum now swings through the field, the pendulum will



A. keep oscillating with the old time period

B. keep oscillating with a smaller time period

C. keep oscillating with a larger time period

D. come to rest very soon

Answer: D

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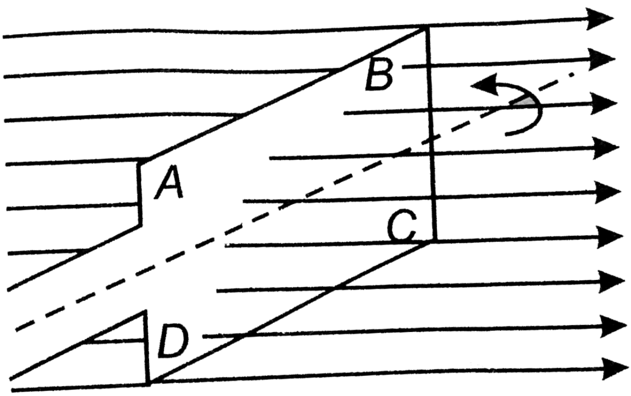
13. A rectangular coil ABCD is rotated anticlockwise with a uniform angular velocity about the axis shown In the fig. the axis of rotation of the coil as well as the magnetic field B are horizontally.the induced emf in the coilwould be minimum when the plane of the coil



A. is horizontal

B. makes an angle of 45° with the direction of magnetic field

C. is at right angle to the magnetic field

D. makes an angle of 30° with the magnetic field.

Answer: C

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14. Lenz's law is consequence of the law of conservation of

A. energy

B. energy and magnetic field

C. charge

D. magnetic field

Answer: A

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15. A magnet is dropped down an infinitely long vertical copper tube

A. the magnet moves with continuously increasing velocity and ultimately acquires a constant terminal velocity

B. the magnet moves with continuously decreasing velocity and ultimately comes to rest

C. the magnet moves with continuously increasing velocity but constatnt accleration

D. the magnet moves with continuously increasing velocity and acceleration

Answer: A

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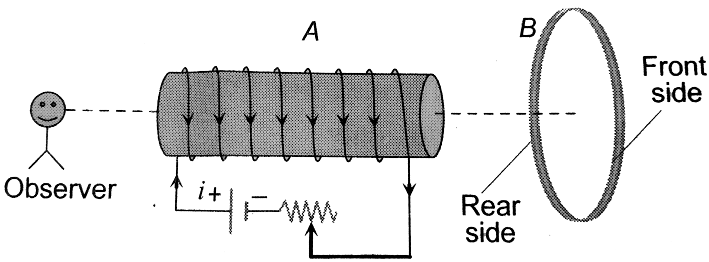
16. An Aluminium ring B faces an electromagnet A. The current I through A can be altered



A. wheter I increases or decreases, B will not experience any force

B. If I decreases, A will repel B

C. If I increasing , A will attract B

D. If I increasing , A will repel B

Answer: D

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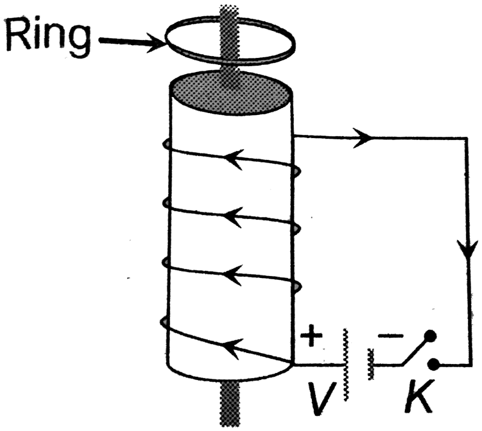
17. A conducting ring is placed around the core of an electromagnet as shown in fig. when key K is pressed, the ring



A. remain stationary

B. is attracted towards the electromagnet

C. jumps out of the core

D. none of the above

Answer: C

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18. A circular coil and a bar magnet placed nearby are made to move in the same direction. The coil covers a distance of $1m$ in $0.5 \sec$ and the magnet a distance of $2m$ in $1 \sec$. The induced emf produced in the coil

A. zero

B. $I\ V$

C. $0.5V$

D. cannot be determined from the given information

Answer: A

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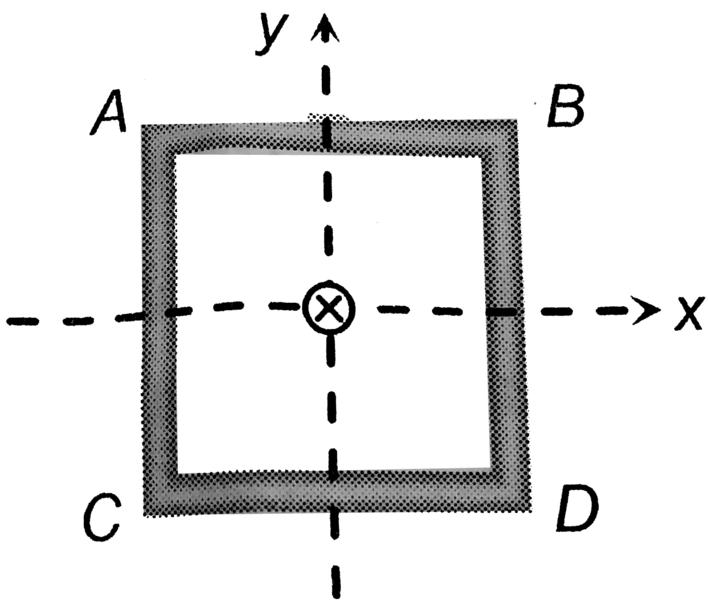
19. A square coil ABCD lying in $x - y$ plane with its centre at origin. A long straight wire passing through origin carries a current $i = 2t$ in negative z-direction. The induced current in the coil is



A. clockwise

B. anticlockwise

C. alternating

D. zero

Answer: D

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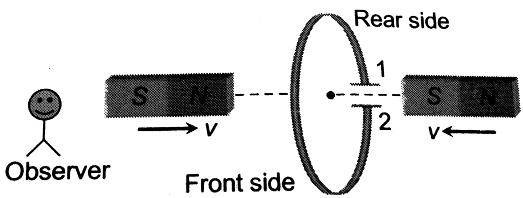
20. The north and south poles of two identical magnets approach a coil, containing a condenser, with equal speeds from opposite sides. Then



A. Plate 1 will be negative and plate 2 positive

B. Plate 1 will be positive and plate 2 negative

C. both the plates will be positive

D. both the plates will be negative

Answer: B

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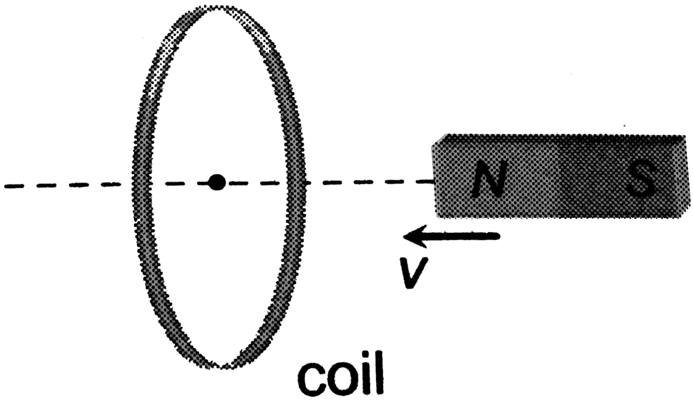
21. In the following figure, the magnet is moved towards the coil with a speed v and induced emf is e. if magnet and coil reced away from one another each moving with speed v, the induced emf in the coil will be



A. e

B. $2e$

C. $e/2$

D. $4e$

Answer: B

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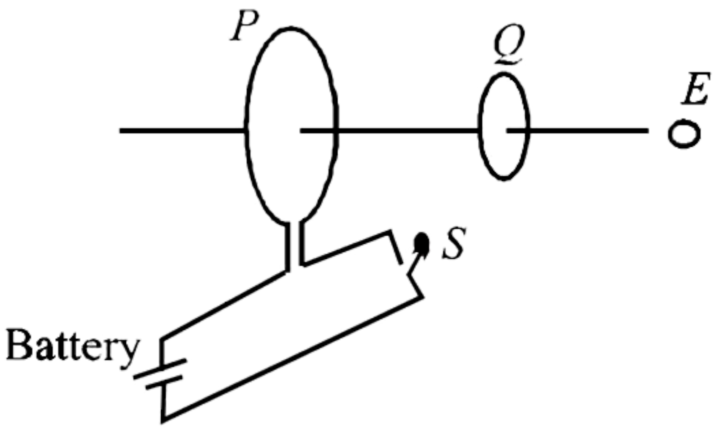
22. As shown in the figure, P and Q are two coaxial conducting loops separated by some distance. When the switch S is closed, a clockwise current I_P (as seen by E) and an induced current I_{Q1} flows in Q. The switch remains closed for a long time. when S is opened, a current I_{Q2} flows in Q. Then the direction IQ_1 and IQ_2 (as seen by E) are



A. Respectively clockwise and anticlockwise

B. both clockwise

C. both anticlockwise

D. respectively anticlockwise and clockwise

Answer: D

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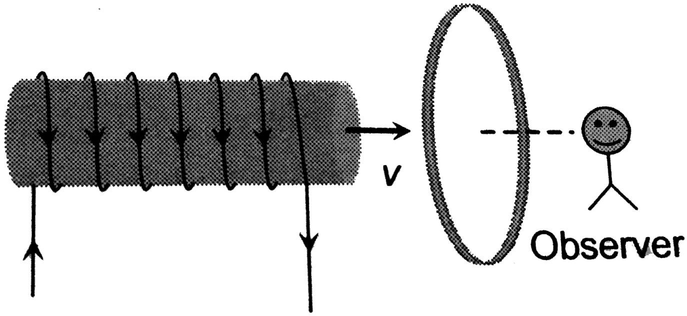
23. A current carrying solenoid is approaching a conducting loop as shown in the figure. The direction of induced current as observed by an observer on the other side of the loop will be



A. Anticlockwise

B. clockwise

C. east

D. west

Answer: B

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24. If a copper ring is moved quickly towards south pole of a powerful stationary bar magnet, then

A. current flows through the copper ring

B. voltage in the magnet increase

C. current flows in the magnet

D. copper ring will get magnetized

Answer: A

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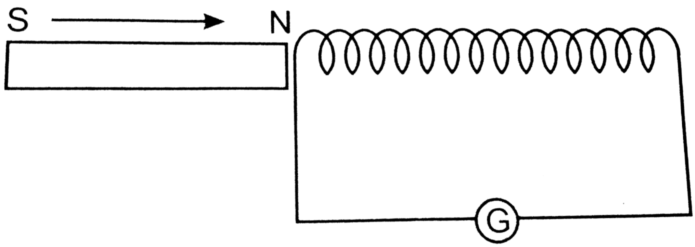
25. As shown in the figure, a magnetic is moved with a a fast speed towards a coil at rest. Due to this, induced electromotive force, induced charge in the coil are E, I and Q respectively. If the speed of magnetic is doubled, the incorrect statement is



A. E increases

B. I increases

C. Q remains same

D. Q increases

Answer: D

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26. Magnetic flux in a circuit containing a coil of resistance 2Ω change from $2.0Wb$ to $10Wb$ in $0.2\,\text{sec.}$ The charge passed through the coil in this time is

A. $0.8C$

B. $1.0C$

C. $5.0C$

D. $4.0C$

Answer: D

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27. The magnetic flux linked with a circuit of resistance $100 ohm$ increase from 10 to 60 webers. The amount of induced charge that flows in the circuit is (in coulomb)`

A. 0.5

B. 5

C. 50

D. 100

Answer: A

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28. A circular coil opf 500 turns of wire has an enclosed area of $0.1m^2$ per turn. It is kept perpendicular to a magnetic field of induction $0.2T$ and rotated by 180° about a diameter perpendicular to the field in 0.1 sec. how much charge will pass when the coil is connected to a gavanometer with a combined resistance of $50ohms$

A. $0.2C$

B. $0.4C$

C. $2C$

D. $4C$

Answer: B

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29. Magnetic flux in a circuit containing a coil of resistance 2Ωchange from $2.0Wb$ to $10Wb$ in 0.2sec. The charge passed through the coil in this time is

A. 5.0 coulomb

B. 4.0 coulomb

C. 1.0 coulomb

D. 0.8 coulomb

Answer: B

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30. A coil of 40Ω resistance has 100 turns and radius $6mm$ is connected to ammeter of resistance of $160ohms$. Coil is placed perpendicular to the magnetic field. When coil is taken out of the field, $32\mu C$ charge flows through it. The intensity of magnetic field will be

A. $6.55T$

B. $5.66T$

C. $0.655T$

D. $0.565T$

Answer: D

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31. The total charge induced in a conducting loop when it is moved in magnetic field depends on

A. The rate of change of magnetic flux

B. initial magnetic flux only

C. the total change in magnetic flux

D. final magnetic flux only

Answer: C

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32. In a magnetic field of $0.05T$, area of a coil changes from $101cm^2$ to $100m^2$ without changing the resistance which is 2Ω. The amount of charge that flow during this period is

A. 2.5×10^{-6} coulomb

B. 2×10^{-6} coulomb

C. 10^{-6} coulomb

D. 8×10^{-6} coulomb

Answer: A

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33. If a coil of 40 turns and area $4.0 cm^2$ is suddenly remove from a magnetic field, it is observed that a charge of $2.0 \times 10^{-4} C$ flows into the coil. If the resistance of the coil is 80Ω, the magnetic flux density in Wb/m^2 is

A. 0.5

B. 1.0

C. 1.5

D. 2.0

Answer: B

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34. In electromagnetic induction, the induced charge in a coil is independent of

A. change in the flux

B. time

C. resistance in the circuite

D. none of the above

Answer: B

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35. A thin circular ring of area A is perpendicular to uniform magnetic field of induction B. A small cut is made in the ring and a galvanometer is connected across the ends such that the total resistance of circuit is R. When the ring is suddenly squeezed to zero area, the charge flowing through galvanometer is:

A. $\frac{BR}{A}$

B. $\frac{AB}{R}$

C. ABR

D. $\frac{B^2 A}{R^2}$

Answer: B

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36. A flate circular coil of $10cm$ radius has 200 turns of wire the coil is connected to a capacitor of $20\mu F$ placed in a uniform magnetic field whise induction decreases at a rate of $0.01Ts^{-1}$ Find the charge on capacitor

A. $0.51\mu C$

B. $0.75\mu C$

C. $0.92\mu C$

D. $1.25\mu C$

Answer: D

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37. Magnetic flux ϕ (in weber) linked with a closed circuit of resistance $10 ohm$ varies with time t (in seconds) as

$\phi = 5t^2 - 4t + 1$

The induced electromotive force in the circuit at $t = 0.2$ sec. is

A. 0.4 volts

B. -0.4 volts

C. -2.0 volts

D. 2.0 volts

Answer: D

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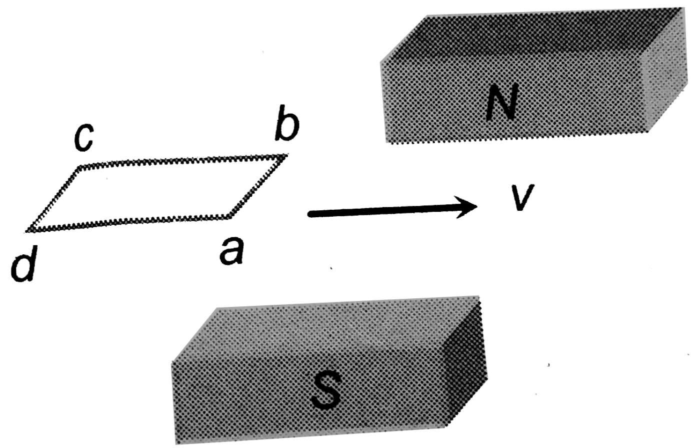
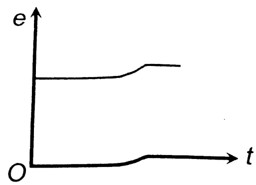
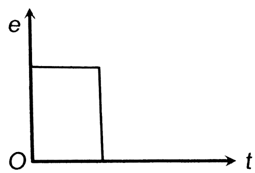
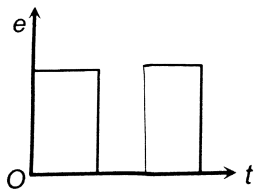
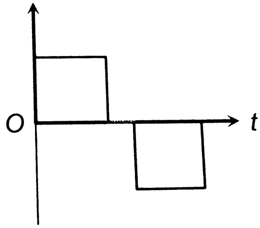
38. A loop $abcd$ is moved across the pole pieces of a magnet as shown in fig. with a constant speed v. When the edge ab of the loop enters the pole pieces at time $t = 0$ sec. which one of the following graphs represents correctly the induced e.m.f. in the coil if magnetic field lines pass through the loop if it is in between two magnets?



A. 

B. 

C. 

D. 

Answer: D

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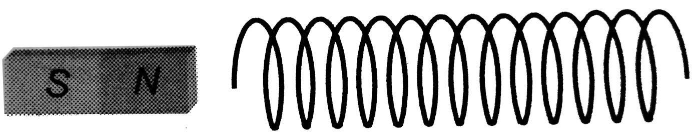
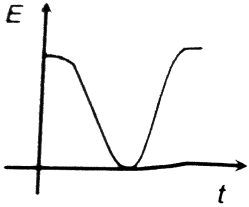
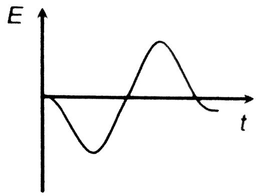
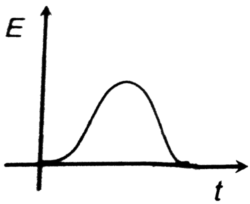
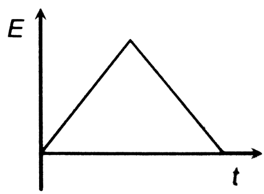
39. The variation of induced emf (F) with time (t) in a coil if a short bar magnet is moved along its axis with a constant velocity is best represent as



A. 

B. 

C. 

D. 

Answer: B

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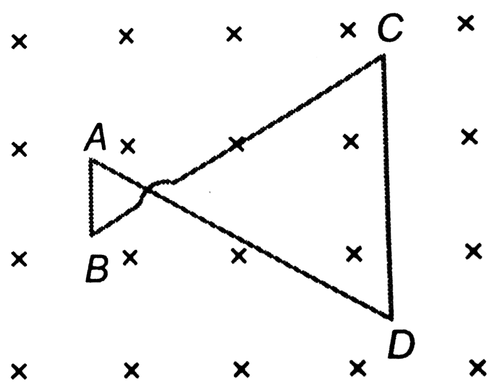
40. A conducting wire frame is placed in a magnetic field which is directed into the paper. The magnetic field is increasing at a constant rate. The direction of induced current in wire AB and CD are



A. B to A and D to C

B. A to B and C to D

C. A to B and D to C

D. B to A and C to D

Answer: A

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41. Magnetic flux ϕ (in weber) linked with a closed circuit of resistance $10 ohm$ varies with time t (in seconds) as

$\phi = 5t^2 - 4t + 1$

The induced electromotive force in the circuit at $t = 0.2$ sec is

A. $-40V$

B. $40V$

C. $140V$

D. $300V$

Answer: B

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42. The flux linked with a coil at any instant 't' is given by $\phi = 10t^2 - 50t + 250$

The induced emf at $t = 3s$ is

A. $10V$

B. $30V$

C. $45V$

D. $90V$

Answer: A

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43. A coil having an area A_0 is placed in a magnetic field which changes from B_0 to $4B_0$ in a time interval t. The e.m.f. induced in the coil will be

A. $\frac{3A_0B_0}{t}$

B. $\frac{4A_0B_0}{t}$

C. $\frac{3B_0}{A_0t}$

D. $\frac{4B_0}{A_0t}$

Answer: A

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44. A coil of area $10cm^2$ and 10 turns is in magnetic field directed perpendicular to the plane and changing at a rate of $10^8 gauss / s$. The resistance of coil is 20Ω. The current in the coil will be

A. 5 amp

B. 0.5 amp

C. 0.05 amp

D. 5×10^8 amp

Answer: A

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45. A coil having 500 square loops each of side $10cm$ is placed normal to a magnetic flux which increase at the rate of $1.0(tesla)/(\sec ond)$. The induced r.m.f. in volts is

A. 0.1

B. 0.5

C. 1

D. 5

Answer: D

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46. A coil of area $100cm^2$ has 500 turns. Magnetic field of $0.1 \text{weber} / \text{meter}^2$ is perpendicular to the coil. The field is reduced to zero in 0.1 second. The induced $e.m.f.$ in the coil is

A. $1V$

B. $5V$

C. $50V$

D. zero

Answer: B

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47. A coil of area $100cm^2$ has 500 turns. Magnetic field of $0.1\text{weber}/\text{metre}^2$ is perpendicular to the coil. The field is reduced to zero in 0.1 second. The induced $e.\ m.\ f.$ in the coil is

A. 1.77 volts

B. 17.7 volt

C. 177 volts

D. 0.177 volts

Answer: B

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48. A coil having an area A_0 is placed in a magnetic field which changes from B_0 to $4B_0$ in a time interval t. The e.m.f. induced in the coil will be

A. $4V$

B. $3V$

C. $1.5V$

D. $2V$

Answer: B

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49. A coil has 2000 turns and area of $70cm^2$. The magnetic field perpendicular to the plane of the coil is $0.3Wb/m^2$ and takes 0.1 sec to rotate through 180^0. The value of the induced e.m.f. will be

A. $8.4V$

B. $84V$

C. $42V$

D. $4.2V$

Answer: B

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50. A coil of area $100cm^2$ has 500 turns. Magnetic field of $0.1 \text{weber} / \text{metre}^2$ is perpendicular to the coil. The field is reduced to zero in 0.1 second. The induced $e. m. f.$ in the coil is

A. $10^4 V$

B. $1.2V$

C. $1.0V$

D. $10^{-2} V$

Answer: C

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51. A rectangular coil of 20 turns and area of cross-section $25cm^2$ has a resistance of $100ohm$. If a magnetic field which is perpendicular to the plane of the coil changes at the rate of 1000 tesla per second, the current in the coil is

A. 1.0 ampere

B. 50 ampere

C. 0.5 ampere

D. 5.0 ampere

Answer: C

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52. A coil has 2000 turns and area of $70cm^2$. The magnetic field perpendicular to the plane of the coil is $0.3Wb/m^2$ and takes 0.1 sec to rotate through 180^0. The value of the induced e.m.f. will be

A. $8.4V$

B. $84V$

C. $4.2V$

D. $42V$

Answer: B

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53. A 800 turn coil of effective area $0.05m^2$ is kept perpendicular to a magnetic field 5×10^{-5} T. When the plane of the coil is rotated by 90° around any of its coplanar axis in 0.1 s, the emf induced in the coil will be:

A. $0.012V$

B. $0.05V$

C. 0.1 V`

D. $0.2V$

Answer: D

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54. A conducing circular loop is placed in a uniform magnetic field of indution B tesla with its plane normal to the field. Now, radius of the loop starts shrinking at the rate (dr/dt). Then the induced e.m.f. at the instant when the radius is r is:

A. $\pi r B\left(\frac{dr}{dt}\right)$

B. $2\pi r B\left(\frac{dr}{dt}\right)$

C. $\pi r^2 B\left(\frac{dr}{dt}\right)$

D. $\pi r B\frac{r^2}{2}\left(\frac{dr}{dt}\right)$

Answer: B

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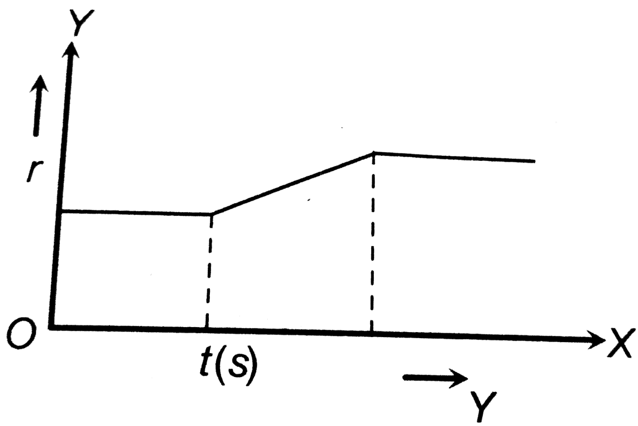
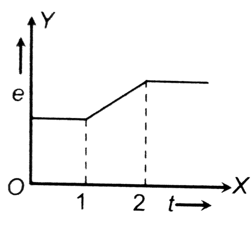
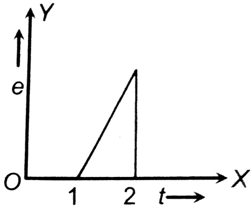
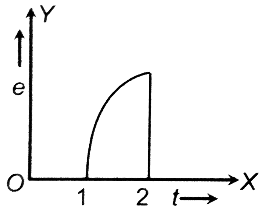
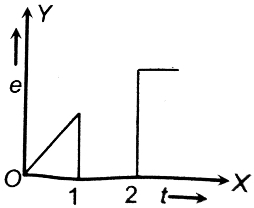
55. A flexible wire bent in the form of a circle is placed in a uniform magnetic field perpendicular to the plane of the coil. The radius of the coil changing as shown in figure. The graph of induced emf in the coil is represented by



A. 

B. 

C. 

D. 

Answer: B

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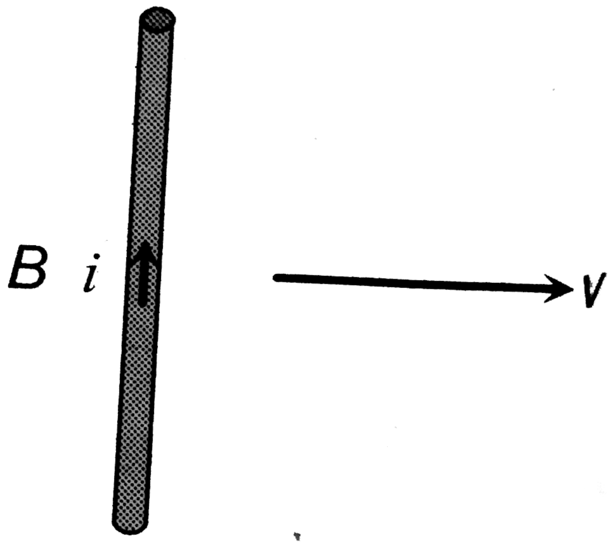
Motional And Rotational Emf

1. A conducting wire is moving towards right in a magnetic field B. The direction of induced current in the wire is shown in the figure. The direction of magnetic field will be



A. In the plane of paper pointing towards right

B. In the plane of paper pointing towards left

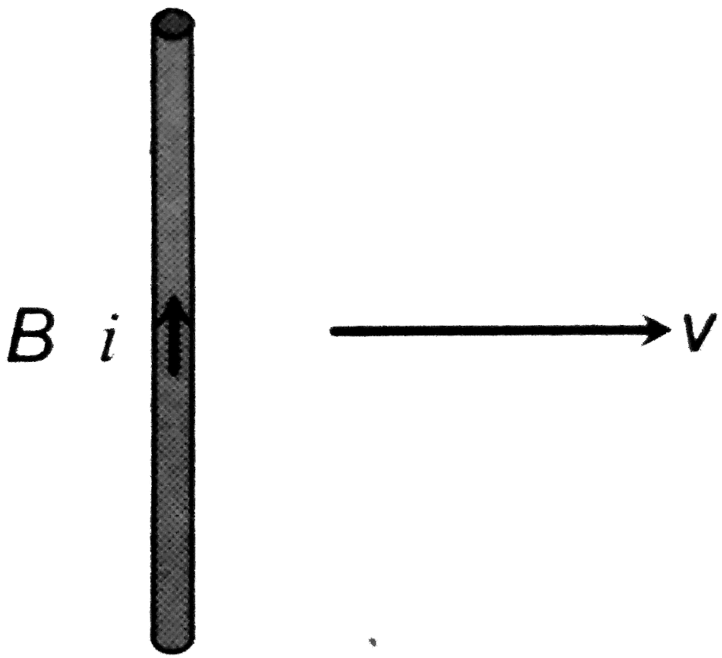
C. perpendicular to the plane of paper and downwards

D. perpendicular to the plane of paper and upwards

Answer: C

Watch Video Solution

2. The current carrying wire and the rod AB are in the same plane. The rod moves parallel to the wire with a velocity v. Which one of the following statements is true about induced e.m.f. in the rod?



A. End A will be at lower potential with respect to

B

B. A and B will be at the same potential

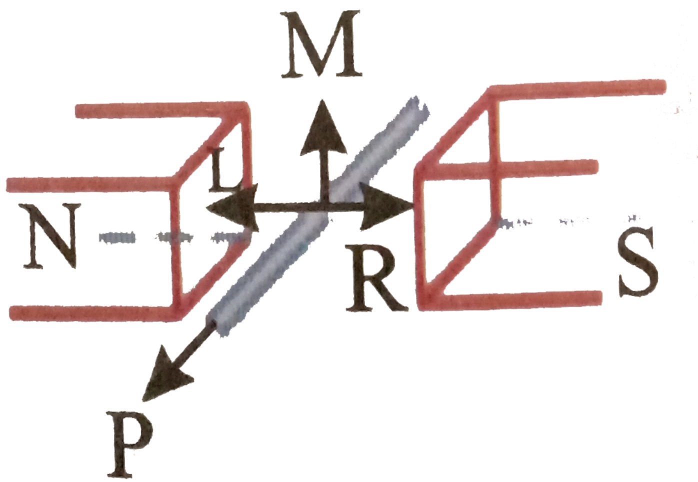
C. there will be no induced e.mf. In the rod

D. potential at A will be higer than that at B

Answer: D

View Text Solution

3. An electric potential difference will be induced between the ends of the conductor shown in the figure, if the conductor moves in the direction shown by



A. P

B. Q

C. L

D. M

Answer: D

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4. A horizontal wire $0.8m$ long is falling at a speed of $5m/s$ perpendicular to a uniform magnetic field of $1.1T$, which is directed from east to west. Calculate the magnitude of the induced ernf. Is the north or south end of the wire positive?

A. $0.15V$

B. $1.5mV$

C. $1.5V$

D. $15.0V$

Answer: B

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5. A conductor of $3m$ in length is moving perpendicularly to magnetic field of 10^{-4} tesla with the speed of $10^2 m/s$, then the e.m.f. produced across the ends of conductor will be

A. 0.03 volt

B. 0.3 volt

C. 3×10^{-3} volt

D. 3 volt

Answer: B

Watch Video Solution

6. A long horizontal metallic rod with length along the east-west direction is falling under gravity. The potential difference between its two ends will

A. Be zero

B. Be constant

C. Increase with time

D. Decrease with time

Answer: C

Watch Video Solution

7. A conductor of $3m$ in length is moving perpendicularly to magnetic field of 10^{-4} tesla with the speed of $10^2 m/s$, then the e.m.f. produced across the ends of conductor will be

A. $0.5vo <$

B. $0.1vo <$

C. $1vo <$

D. $2vo <$

Answer: C

Watch Video Solution

8. A conductor of $3m$ in length is moving perpendicularly to magnetic field of 10^{-4} tesla with the speed of $10^{2}m/s$, then the e.m.f. produced across the ends of conductor will be

A. $0.3V$

B. $0.03V$

C. $3V$

D. $2.52V$

Answer: B

Watch Video Solution

9. The magnitude of the earth's magnetic field at a place is B_0 and the angle of dip is φ. 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. $B_0 lv \sin \varphi$

C. $B_0 lv$

D. $B_0 lv \cos \varphi$

Answer: B

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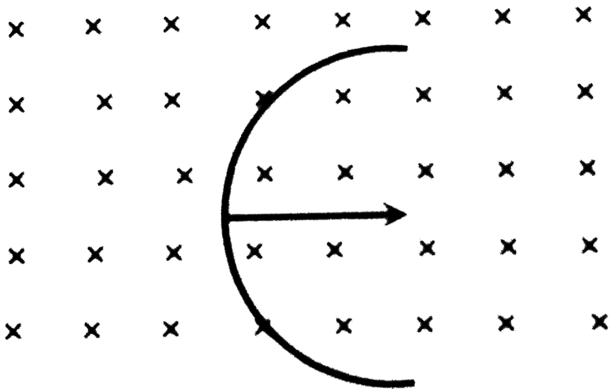
10. A straight wire of length L is bent into a semicircle. It is moved in a uniform magnetic field with speed v with diameter perpendicular to the field. The induced emf between the ends of the wire is



A. BLv

B. $2BKv$

C. $2\pi BLv$

D. $\frac{2BvL}{\pi}$

Answer: D

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11. Choose the correct option:

A rectangular coil of copper wires is rotated in a magnetic field. The direction of the induced current changes once in each:

A. $\frac{1}{4} revolution$

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

C. $1 revolution$

D. $2 revolution$

Answer: B

Watch Video Solution

12. An aeroplane in which the distance between the tips of wings is $50m$ is flying horizontal with a speed of $360km/hr$ over a place where the vertical components of earth magnetic field is $2.0 \times 10^{-4} webr/m^2$. The potential different between the tips of wings would be

A. $0.1V$

B. $1.0V$

C. $0.2V$

D. $0.01V$

Answer: B

Watch Video Solution

13. A copper disc of radius $0.1m$ rotates about its centre with 10 revolutuion per second in a uniform magnetic field of 0.1 tesla. The emf induced across the radius of the disc is

A. $\frac{\pi}{10}V$

B. $\frac{2\pi}{10}V$

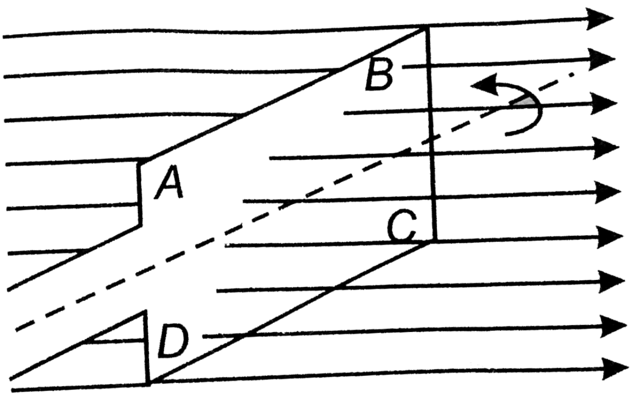
C. $10\pi mV$

D. $20\pi mV$

Answer: C

Watch Video Solution

14. A rectangular coil ABCD is rotated anticlockwise with a uniform angular velocity about the axis shown In the fig. the axis of rotation of the coil as well as the magnetic field B are horizontally.the induced emf in the coilwould be minimum when the plane of the coil



A. The plane of the coil is horizontal

B. the plane of the coil makes an angle of 45° with the magnetic field

C. The plane of the coil is at right angles to the magnetic field

D. The plane of the coil makes an angle of 30° with the magnetic field

Answer: A

Watch Video Solution

15. A copper disc of radius $0.1m$ rotates about its centre with 10 revolutuion per second in a uniform magnetic field of 0.1 tesla with its plane perpendicular to the field. The emf induced across the radius of the disc is

A. $\frac{\pi}{10}V$

B. $\frac{2\pi}{10}V$

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

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

Answer: C

Watch Video Solution

16. A coil of area 80 square cm and 50 turns is rotating with 2000 revolution per minut about an axis perpendicular to a magnetic field field of 0.05 Telsa. The maximum value of the e.m.f. developed in it is

A. 200πvolt

B. $\frac{10\pi}{3}$volts

C. $\frac{4\pi}{3}$volts

D. $\frac{2}{3}$volt

Answer: C

Watch Video Solution

17. A wheel with 10 metallic spokes each 0.5 m long is rotated with a speed of 120 rpm, in a plane normal to earth's magnetic field at the place. If the megnitude of the field is 0.40 gauss, what is the induced e.m.f. between the axle and rim of the wheel.

A. $1.256 \times 10^{-3} V$

B. $6.25 \times 10^{-4} V$

C. $1.256 \times 10^{-4} V$

D. $6.28 \times 10^{-5} V$

Answer: D

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18. A metal rod of length $2m$ is rotating with an angular velocity of $100 rad/\sec$ in a plane perpendicular to a uniform magnetic field of $0.3T$. The potential difference between the ends of the rod is

A. $30V$

B. $40V$

C. $60V$

D. $600V$

Answer: C

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19. A rectangular coil of 300 turns has an average area of average area of $25cm \times 10cm$ the cooil rotates with a speed of $50cps$ in a uniform magnetic field of strength $4 \times 10^{-2}T$ about an axis perpendicular of the field. The peak value of the induced e.m.f. is (in volt)`

A. 3000π

B. 300π

C. 30π

D. 3π

Answer: C

Watch Video Solution

20. A metal rod of length $2m$ is rotating with an angular velocity of $100 rad / \sec$ in a plane perpendicular to a uniform magnetic field of $0.3T$. The potential difference between the ends of the rod is

A. $2.28V$

B. $4.28V$

C. $6.28V$

D. $2.5V$

Answer: C

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21. A circular coil of mean radius of $7cm$ and having 4000 turns Is rotate at the rate of 1800 revolution per minute in the earth 's magnetic field (B=0.5 gauss), the maximum e.m.f. induced in coil will be

A. $1.158V$

B. $0.58V$

C. $0.29V$

D. $5.8V$

Answer: B

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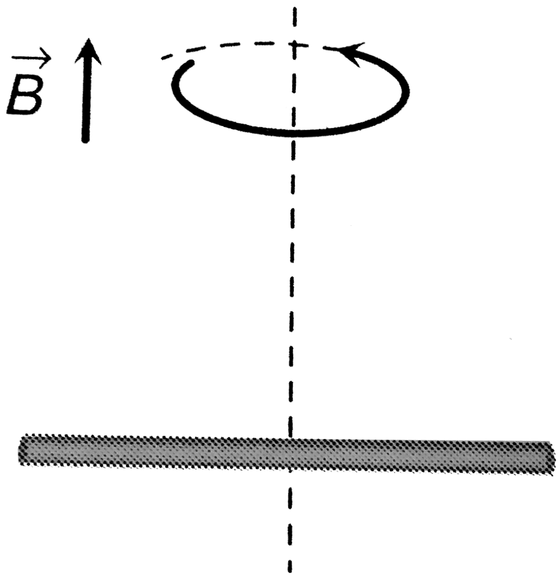
22. A conducting rod of length $2l$ is rotating with constant angular speed w about its perpendicular bisector. A uniform magnetic field B exists parallel to the axis of rotation. The e.m.f. induced between two ends of the rod is



A. $B\omega l^2$

B. $\frac{1}{2}B\omega l^2$

C. $\frac{1}{8}B\omega l^2$

D. zero

Answer: D

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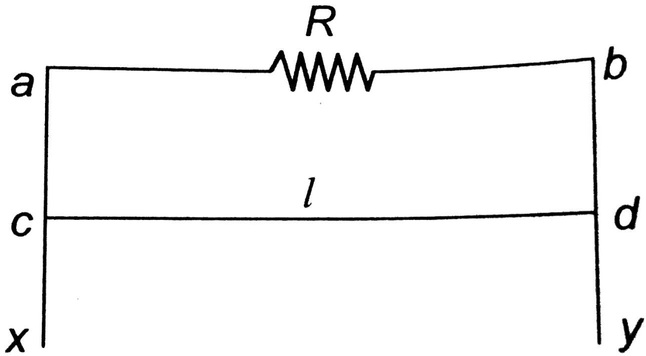
23. A wire cd of length l and mass m is sliding without friction on conducting rails ax and by as shown. The verticle rails are connected to each other with a resistance R between a and b. A uniform magnetic field B is applied perpendicular to the plane $abcd$ such that cd moves with a constant velocity of



A. $\frac{mgR}{Bl}$

B. $\frac{mgR}{B^2l^2}$

C. $\frac{mgR}{B^3l^3}$

D. $\left.\frac{mgR}{B^2l}\right)$

Answer: B

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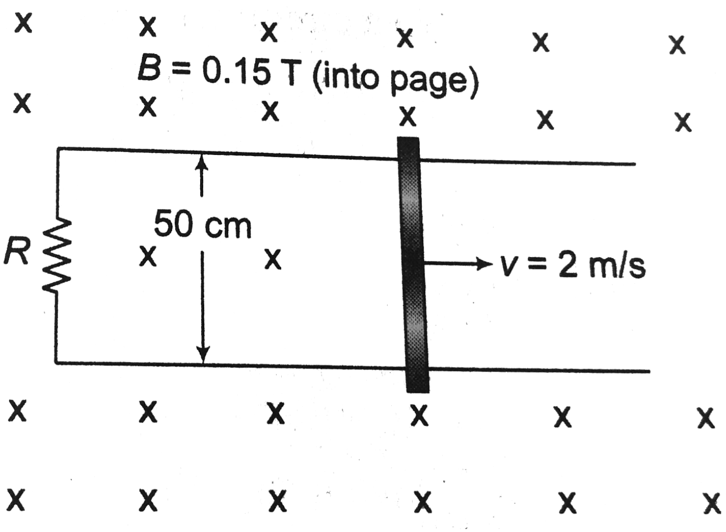
24. As shown in figure, a metal rod completes the circuit. The circuit area is perpendicular to a magnetic field with $B = 0.15T$. If the resistance of the total circuit is 3Ω, how large a force is needed to move the rod as indicated with a constant speed of 2 m/s?



A. $3.75 \times 10^{-3} N$

B. $3.75 \times 10^{-2} N$

C. $3.75 \times 10^{2} N$

D. 3.75×10^{-4}

Answer: A

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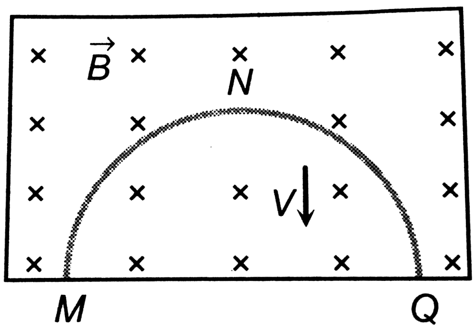
25. A thin semicircular conducting ring of radius R is falling with its plane vertical in a horizontal magnetic induction B. At the position MNQ, the speed of the ring is V and the potential difference developed across the ring is



A. Zero

B. $Bv\pi R^2 / 2$ and M is at higer potential

C. πRBV and Q is at higer potential

D. $2RBV$ and Q is at higer potential

Answer: D

Watch Video Solution

26. At a plane the value of horizontal component of the eart's magnetic field H is $3 \times 10^{-5} weber / m^2$. A metallic rod AB of length $2m$ placed in east-west direction, having the end A towards east, falls vertically downward with a constant velocity of $50m / s$

. which end of the rod becomes positively charged and what is the value of induced potential difference between the two ends?

A. $End A, 3 \times 10^{-2}$

B. $End A, 3mV$

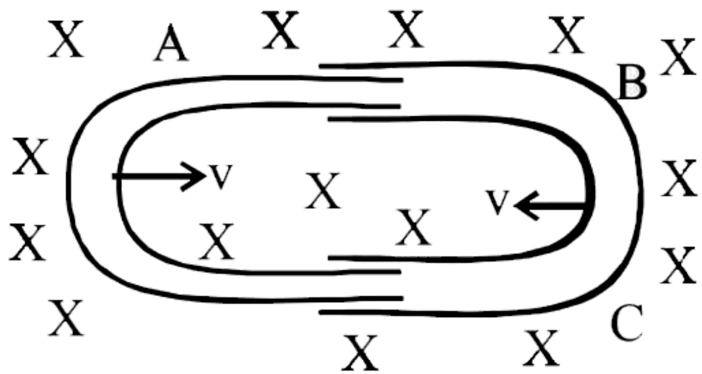
C. $End B, 3 \times 10^{-3} mV$

D. $End B, 3mV$

Answer: B

Watch Video Solution

27. One conducting U tube can slide inside another as shown in figure, maintaining electrical contacts between the tubes. The magnetic field B is perpendicular to the plane of the figure. If each tube moves towards the other at a constant speed v. Then the emf induced in the circuit in terms of B, l and v where l is the width of each tube will be



A. $zero$

B. $2Blv$

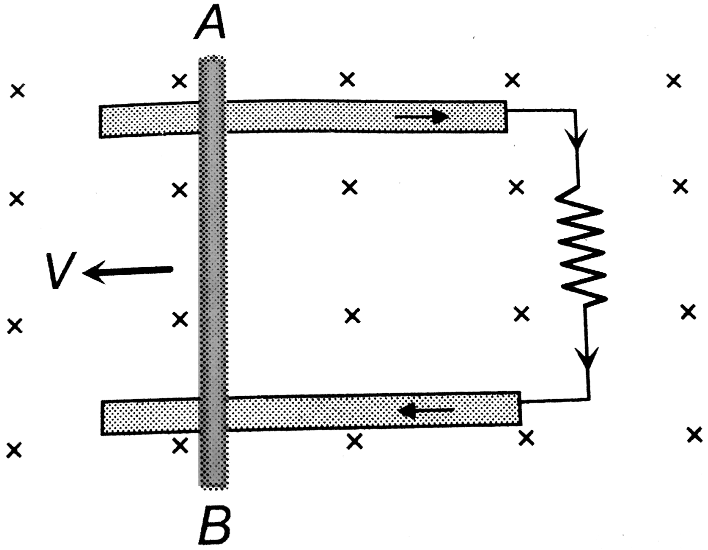
C. B / v

D. $-B / v$

Answer: B

Watch Video Solution

28. Consider the situation shown in the figure. The wire Ab is sliding on the fixed rails with a constant velocity. If the wire AB is replaced by semicircular wire, the magnitude of the induced current will



A. *Increase*

B. Remain the same

C. decrease

D. Increase or decrease depending on wheather the semicircle bulges towards the resistance or away from it

Answer: B

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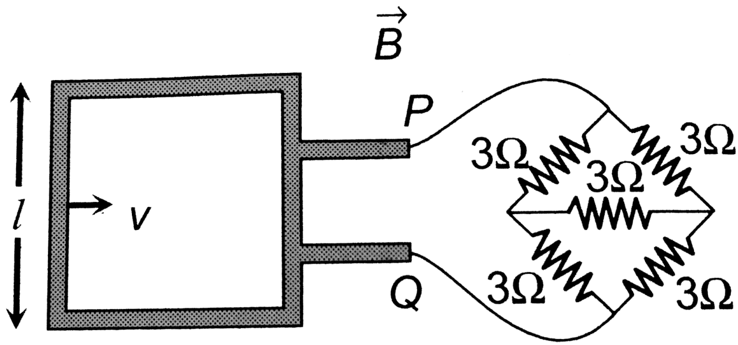
29. A square metallic wire loop of side $0.1m$ and resistance of $1W$ is moved with a constant velocity in a magnetic field of $2wb/m^2$ as shown in figure. The magnetic field field is perpendicular to the plane of the loop, loop is connected to a network of resistances. what should be the velocity of loop so as to have a steady current of $1mA$ in loop?



A. $1cm/\sec$

B. $2cm/\sec$

C. $3cm/\sec$

D. $4cm/\sec$

Answer: B

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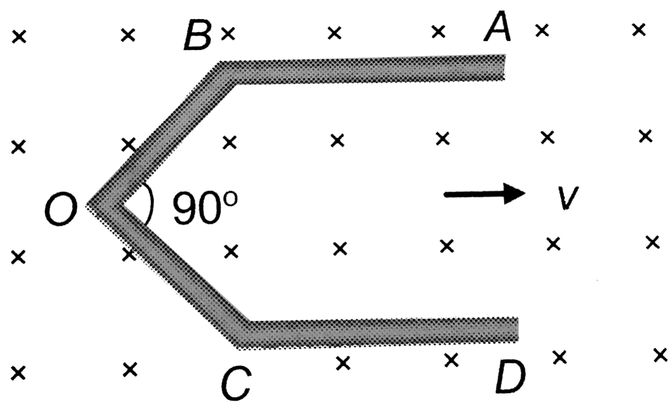
30. A conductor $ABOCD$ moves along its bisector with a velocity of $1m/s$ through a perpendicular magnetic field of $1wb/m^2$, as shown in fig. if all the four sides are of $1m$ length each, then the induced emf between points A and D is



A. 0

B. 1.41 volt

C. 0.71 volt

D. none of these

Answer: B

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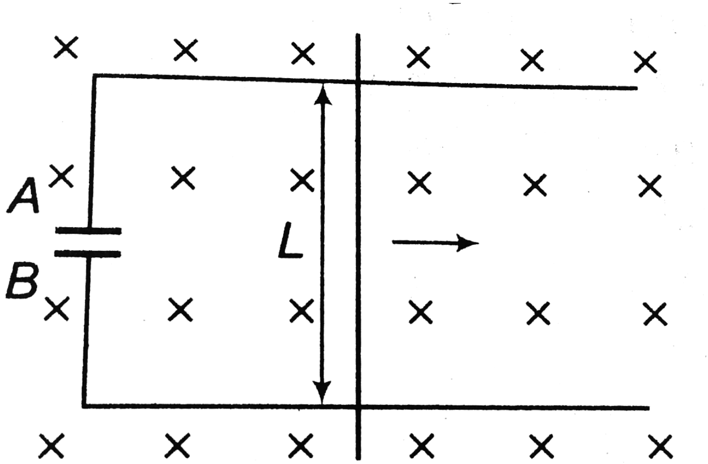
31. A conducting rod of length $L = 0.1m$ is moving with a uniform sped $v = 0.2m/s$ on conducting rail a magnetic field $B = 0.5T$ as shown. On one side, the end of the rails is connected to a capacitor of capacitance $C = 20\mu F$. Then, the charge on the capacitor's plates are



A. $q_A = +80\mu C$ and $q_B = -80\mu C$

B. $q_A = -80\mu C$ and $q_B = +80\mu C$

C. $q_A = 0 = q_B$

D. Charge stored in the capacitor increase exponentially with time

Answer: A

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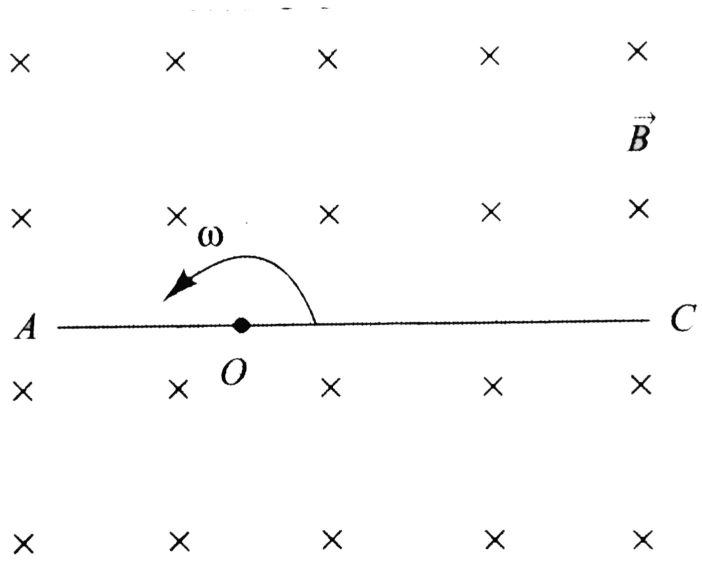
32. A conducting rod AC of length $4l$ is rotated about point O in a uniform magnetic field $\overrightarrow{B}$ directed into the plane of the paper. $AO = l$ and $OC = 3l$. Find $V_A - V_C$.



A. $V_A - V_o = \frac{B\omega l^2}{2}$

B. $V_o - V_C = \frac{7}{2} B\omega l^2$

C. $V_A - V_c = 4B\omega l^2$

D. $V_c - V_o = \frac{9}{2} B\omega l^2$

Answer: C

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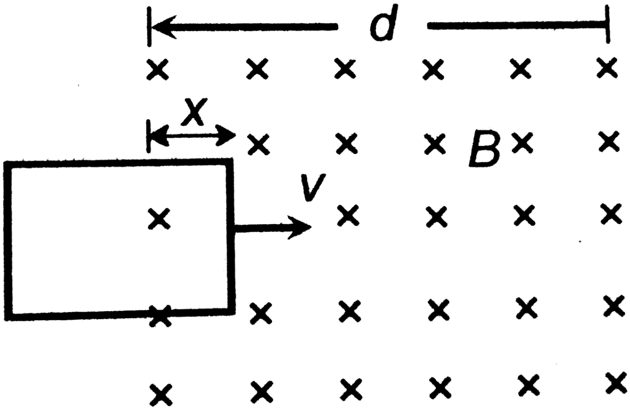
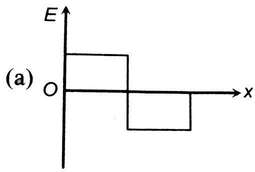
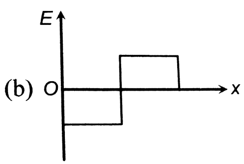
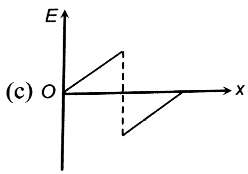
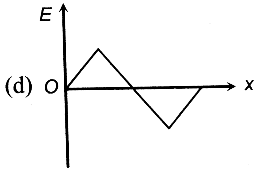
33. A rectangular loop is being pulled at a constant speed v, through a region of certain thickness d, in which a uniform magnetic field B is set up. The graph between position x of the right hand edge of the loop and the induced e.m.f. E will be



A. 

B. 

C. 

D. 

Answer: B

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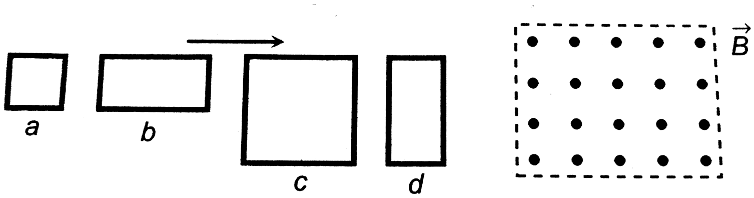
34. The figure shows four wire loops, with edge length of either L or $2L$. All four loops will move through a region of uniform magnetic field $\vec{B}$ (directed out of the page) at the same constant velocity . Rank the four loops according to the maximum magnitude of the e.m.f. induced as they move through the field, greatest first



A. $(e_c = e_d) < (e_a = e_b)$

B. $(e_c = e_d) > (e_a = e_b)$

C. $e_c > e_d > e_b > e_a$

D. $e_c < e_d < e_b < e_a$

Answer: B

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35. A rod of length l rotates with a small but uniform angular velocity ω about its perpendicular bisector. A uniform magnetic field B exists parallel to the axis of rotation. The potential difference between the centre of the rod and an end is

A. $\frac{1}{2}B\omega l^2$

B. $\frac{3}{4}B\omega l^2$

C. $B\omega l^2$

D. $2B\omega l^2$

Answer: A

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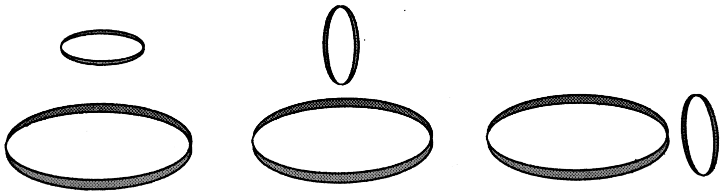
36. Two circular coils can be arranged in any of the three situation shown in the figure. Their mutual inductance will be



A. Maximum in situation (A)

B. Maximum in situation (B)

C. Maximum in situation (C)

D. The same in all situations

Answer: A

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37. The back e.m.f. induced in a coil, when current change from 1 ampere to zero in one millisecond , is 4 volt, the self-inductance of the coil is

A. $1H$

B. $4H$

C. $10^{-3}H$

D. $4 \times 10^{-3}H$

Answer: D

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38. An e.m.f. of 5volt is produced by a self-inductance, when the current changes at a steady rate from $3A$ to $2A$ 1millisecond. The value of self-inductance is

A. Zero

B. $5H$

C. $5000H$

D. $5mH$

Answer: D

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39. Calculate the energy stored in an inductor of inductance 50 mH when a current of 2.0 A is passed through it.

A. 1

B. 0.1

C. 0.05

D. 0.5

Answer: B

Watch Video Solution

40. The current passing through a choke coil of 5 henry is decreasing at the rate of $2ampere/\sec$. The e.m.f. developing across the coil is

A. $10V$

B. $-10V$

C. $2.5V$

D. $-2.5V$

Answer: A

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41. Average energy stored in a pure inductance L when current i flows through it, is

A. Li^2

B. $2Li^2$

C. $\frac{Li^2}{4}$

D. $\frac{Li^2}{2}$

Answer: D

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42. A solenoid has 2000 turns wound over a length of $0.3m$. Its cross-sectional area is equal to $1.2 \times 10^{-3} m^2$. Around its central cross-section a coil of 300 turns in wound. If an initial current of $2A$ flowing in the solenoid is reversed in $0.25s$, the emf induced in the coil is

A. $60mV$

B. $4.8mV$

C. $6mV$

D. $48mV$

Answer: D

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43. A coil is wound as a transformer of rectangular cross section. If all the linear dimension of the transformer are increased by a factor 2 and the number of turns per unit length of the coil remain the same, the self-inductance increased by a factor of

A. 16

B. 12

C. 8

D. 4

Answer: C

Watch Video Solution

44. Two coils of self-inductance L_1 and L_2 are placed closed to each other so that total flux in one coil is completely linked with other. If M is mutual inductance between them, then

A. $M = L_1 L_2$

B. $M = L_1 / L_2$

C. $M = \sqrt{L_1 L_2}$

D. $M = (L_1 L_2)^2$

Answer: C

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45. The coefficient of self-inductance of a solenoid is $0.18 mH$. If a crude of soft iron of relative permeability 900 is inserted, then the coefficient of self-inductance will become nearly

A. $5.4 mH$

B. $162 mH$

C. $0.006 mH$

D. $0.0002 MH$

Answer: B

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46. In a transformer , the coefficient of mutual inductance between the primary and the secondary coil is 0.2 henry. When the current changes by 5 ampere//second in the primary, the induced e.m.f. in the secondary will be

A. $5V$

B. $1V$

C. $25V$

D. $10V$

Answer: B

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47. When the current in a coil changeg from 8 amperes to 2 amperes in 3×10^{-2} seconds, the e.m.f. induced in the coil is 2 volt. The self-inductance of the coil (in millihenry) is

A. 1

B. 5

C. 20

D. 10

Answer: D

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48. The mutual inductance between two coils is 1.25 henry. If the current in the primary changes at the rate of 80 ampere/second, then the induced e.m.f. in the secondary is

A. $12.5V$

B. $64.0V$

C. $0.016V$

D. $100.0V$

Answer: D

Watch Video Solution

49. A coil of wire of a certain radius has 600 turns and a self-inductance of $108 mH$. The self-inductance of a 2^{nd} similar coil of 500 turns will be

A. $74 mh$

B. $75 mH$

C. $76 mH$

D. $77 mH$

Answer: B

Watch Video Solution

50. When the number of turns in a coil is doubled without any change in the length of the coil, its self-inductance becomes

A. four times

B. `doubled

C. halved

D. unchanged

Answer: A

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51. The average e.m.f. induced in a coil in which the current changes from 2 amperes to 4 amperes in 0.05 seconds is 8 volts. What is the self-inductance of the coil?

A. $0.1H$

B. $0.2H$

C. $0.4H$

D. $0.8H$

Answer: B

Watch Video Solution

52. If a current of 3.0 amperes flowing in the primary coil is reduced to zero in 0.001 second, then the induced e.m.f. in the secondary coil is 15000volts. The mutual inductance between the two coils is

A. 0.5 Henry

B. 5 Henry

C. 1.5 Henry

D. 10 Henry

Answer: B

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53. An e.m.f. of 12volts is induced in a given coil when the current in it changes at the rate of 48 amperes per minute. The self-inductance of the coil is

A. $0.25 henry$

B. $15 henry$

C. $1.5 henry$

D. $9.6 henry$

Answer: B

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54. A closely wound coil of 100 turns and area of cross-section $1cm^3$ has a coefficient of self-induction $1mH$. The magnetic induction in the centre of the core of the coil when a current of $2A$ flows in it, will be

A. $0.022Wbm^{-2}$

B. $0.4Wbm^{-2}$

C. $0.8WbM^{-2}$

D. $1Wbm^{-2}$

Answer: A

Watch Video Solution

55. Two circuits have coefficient of mutual induction of 0.09 henry. Average e.m.f. induced in the secondary by a change of current from 0 to 20 ampere in 0.006 second in the primary will be

A. $120V$

B. $80V$

C. $200V$

D. $300V$

Answer: D

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56. When current in a coil changes to 2 ampere from 8 ampere in 3×10^{-3}, the e.m.f. induced in the coil is 2 volt. The self-inductance of the coil in millihenry is

A. 1

B. 5

C. 20

D. 10

Answer: A

Watch Video Solution

57. The inductance of a coil is $60 \mu H$. A current in this coil increase from $1.0 A$ to $1.5 A$ in 0.1 second. The magnitude of the induced e.m.f. is

A. $60 \times 106(- 60V$

B. $300 \times 10^{-4} V$

C. $30 \times 10^{-4} V$

D. $3 \times 10^{-4} V$

Answer: D

Watch Video Solution

58. A circular coil of radius 5 cm has 500 turns of a wire. The approximate value of the coefficient of self-induction of the coil will be

A. $25 millihenry$

B. 25×10^{-3} millihenry

C. 50×10^{-3} millihenry

D. 50×10^{-3} henry

Answer: A

Watch Video Solution

59. An e.m.f. of 100 millivolts is induced in a coil when the current in another nearby coil becomes 10 ampere from zero in 0.1 second. The coefficient of mutual induction between the two coils will be

A. 1 millihenry

B. 10 millihenry

C. 100 millihenry

D. 1000 millihenry

Answer: A

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60. In a coil of self-inuctance 0.5 henry, the current varies at a constant rate from zero to 10 amperes in 2 seconds. The e.m.f. generated in the coil is

A. 10 volts

B. 5 volts

C. 2.5 volts

D. 1.25 volts

Answer: C

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61. A coil of self-inductance 50 henry is joined to the terminals of a battery of e.m.f. 2 volts through a resistance of $10 ohm$ and a steady current is flowing through the circuit. If the battery is now disconnected, the time in which the current will decay to $1/e$ of its steady value is

A. 500 seconds

B. 50 seconds

C. 5 seconds

D. 0.5 seconds

Answer: C

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Watch Video Solution

62. When the number of turns in a coil is doubled without any change in the length of the coil, its self-inductance becomes

A. $\frac{1}{4}L$

B. L

C. $4L$

D. $16L$

Answer: C

Watch Video Solution

63. The mutual inductance between a primary and secondary circuit is $0.5H$. The resistance of the primary and the secondary circuits are $20ohms$ and $5ohms$ respectvely. To genrate a current of $0.4A$ in the secondary,current in the primary must be changed at the rate of

A. $4.0A/s$

B. $16.0A/s$

C. $1.6A/s$

D. $8.0A/s$

Answer: A

Watch Video Solution

64. Calculate the energy stored in an inductor of inductance 50 mH when a current of 2.0 A is passed through it.

A. $0.4J$

B. $4.0J$

C. $0.8J$

D. $0.04J$

Answer: A

Watch Video Solution

65. The average e.m.f. induced in a coil in which the current changes from 2 amperes to 4 amperes in 0.05 seconds is 8 volts. What is the self-inductance of the coil?

A. $0.1H$

B. $0.2H$

C. $0.4H$

D. $0.8H$

Answer: B

Watch Video Solution

66. If the current is halved in a coil, then the energy stored is how much times the previous value

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

B. $\frac{1}{4}$

C. 2

D. 4

Answer: B

Watch Video Solution

67. The average e.m.f. induced in a coil in which the current changes from 2 amperes to 4 amperes in 0.05 seconds is 8 volts. What is the self-inductance of the coil?

A. $5H$

B. $10H$

C. $11H$

D. $12H$

Answer: C

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68. When the number of turns and the length of the solenoid are doubled keeping the area of cross-section same, the inductance

A. remains the same

B. is halved

C. is doubled

D. becomes four times

Answer: C

Watch Video Solution

69. A $100mH$ coil carries a current of 1 ampere. Energy stored in its magnetic field is

A. $0.5J$

B. $1J$

C. $0.05J$

D. $0.1J$

Answer: C

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70. In a transformer , the coefficient of mutual inductance between the primary and the secondary coil is 0.2 henry. When the current changes by 5 ampere//second in the primary, the induced e.m.f. in the secondary will be

A. $2500V$

B. $25000V$

C. $2510V$

D. $Zero$

Answer: B

Watch Video Solution

71. The self-inductance of a straight conductor is

A. zero

B. very large

C. infinity

D. very small

Answer: A

Watch Video Solution

72. The current in a coil changes from 4 ampere to zero in $0.1s$. If the average e.m.f. induced is $100vo <$, what is the self-inductance of the coil?

A. $2.5H$

B. $25H$

C. $400H$

D. $40H$

Answer: A

Watch Video Solution

73. A varying current at the rate of $3A/s$ in a coil generates an e.m.f. of $8mV$ in a nearby coil. The mutual inductance of the two coils is

A. $2.66 \times 10^{-3} H$

B. $2.66 \times 10^{-3} mH$

C. $2.66 H$

D. $0.266 H$

Answer: A

Watch Video Solution

74. If a current of $10A$ flows in one second through a coil and the induced e.m.f. is $10V$, then the self-inductance of the coil is

A. $\frac{2}{5}H$

B. $\frac{4}{5}H$

C. $\frac{5}{4}H$

D. $1H$

Answer: D

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75. the inductance of a closed-packed coil of 400 turns is $8mH$. A current of $5mA$ is passed through it. The magnetic flux through each turn of the coil is

A. $\frac{1}{4\pi}\mu_0 Wb$

B. $\frac{1}{2\pi}\mu_0 Wb$

C. $\frac{1}{3\pi}\mu_0 Wb$

D. $0.4\mu_0 Wb$

Answer: A

Watch Video Solution

76. If in a coil rate of change of area is $5m^2 / milli\sec ond$ and current become $1amp$ from $2amp$ in 2×10^{-3} sec. magnitude of field id $1teslsa$ then self-inductance of the coil is

A. $2H$

B. $5H$

C. $20H$

D. $10H$

Answer: D

Watch Video Solution

77. The inductance of a solenoid $0.5m$ long of cross-sectional area $20cm^2$ and with 500 turns is

A. $12.5mH$

B. $1.25mH$

C. $15.0mH$

D. $0.12mH$

Answer: B

Watch Video Solution

78. An e.m.f. of 12volts is produced in a coil when the current in it changes at the rate of $45amp/\min ute$. The inductance of the coil is

A. 0.25 henry

B. 1.5 henry

C. 9.6 henry

D. 16.0henry

Answer: D

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79. If a change in current of $0.01A$ in one coil produces change in magnetic flux of $1.2 \times 10^{-2} Wb$ in the other coil, then the mutual inductance of the two coils in henry

A. 0

B. 0.5

C. 1.2

D. 3

Answer: C

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80. A $100mH$ coil carries a current of 1 ampere. Energy stored in its magnetic field is

A. $0.8J$

B. $8J$

C. $0.08J$

D. $80J$

Answer: C

Watch Video Solution

81. A solenoid of length l metre has self-inductance L henry. If number of turns are doubled, its self-inductance

A. remains same

B. becomes $2L$henry

C. becomes $4L$ henry

D. becomes $\frac{L}{\sqrt{2}}$ henry

Answer: C

Watch Video Solution

82. Two coils A and B having turns 300 and 600 respectively are placed near each other, on passing a current of 3.0 ampere in A, the flux linked with A is 1.2×10^{-4} and with B it is 9.0×10^{-5} weber. The mutual inductance of the system is

A. 2×10^{-5}henry

B. 3×10^{-5}henry

C. 4×10^{-5}henry

D. 6×10^{-5}henry

Answer: B

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83. The coefficient of mutual inductance of two coils is $6 mH$. If the current flowing in one is 2 ampere, then the induced e.m.f. in the second coil will be

A. $3mV$

B. $2mV$

C. $3V$

D. $Zero$

Answer: D

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84. The current in a coil of inductance $5H$ decreases at the rate of $2A / a$. The induced e.m.f. is

A. $2V$

B. $5V$

C. $10V$

D. $-10V$

Answer: C

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85. The self-induced e.m.f in a $0.1H$ coil when the current in it is changing at the rate of $200 ampere / \sec ond$ is

A. $8 \times 10^{-4} V$

B. $8 \times 10^{-5} V$

C. $20V$

D. $125V$

Answer: C

Watch Video Solution

86. Two circuits have coefficient of mutual induction of 0.09 henry. Average e.m.f. induced in the secondary by a change of current from 0 to 20 ampere in 0.006 second in the primary will be

A. $240V$

B. $230V$

C. $100V$

D. $300V$

Answer: C

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87. An air core solenoid has 1000turns and is one metre long. Its cross-sectional area is $10cm^2$. Its self-inductance is

A. $0.1256mH$

B. $12.56mH$

C. $1.256mH$

D. $125.6mH$

Answer: C

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88. When the current changes from +2A to -2A in 0.5 second an emf of 8V is induced in a coil. The coefficient of selfinduction of the coil is

A. $0.1H$

B. $0.2H$

C. $0.4H$

D. $0.8H$

Answer: A

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89. A coil resistance $20W$ and inductance $5H$ is connected with a $100V$ battery. Energy stored in the coil will be

A. $41.5J$

B. $62.50J$

C. $125J$

D. $250J$

Answer: B

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90. When the current in a coil changeg from 8 amperes to 2 amperes in 3×10^{-2} seconds, the e.m.f. induced in the coil is 2 volt. The self-inductance of the coil (in millihenry) is

A. $5H$

B. $2.5H$

C. $1.5H$

D. $2H$

Answer: A

Watch Video Solution

91. When the current in a coil changeg from 8 amperes to 2 amperes in 3×10^{-2} seconds, the e.m.f. induced in the coil is 2 volt. The self-inductance of the coil (in millihenry) is

A. $5H$

B. $3H$

C. $4H$

D. $2H$

Answer: C

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92. A coil of $N = 100$ turns carries a current $I = 5A$ and creates a magnetic flux $\varphi = 10^{-5} Tm^{-2}$ per turn. The value of its inductance L will be

A. $0.05 mH$

B. $0.10 mH$

C. $0.15 MH$

D. $0.20 mH$

Answer: D

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93. Two identicaly induction coils each of inductance L joined in series are placed very close to each other such that the winding direction of one is exactly opposite to that of the other, what is the net inductance?

A. L^2

B. $2L$

C. $L/2$

D. $Zero$

Answer: D

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94. A coil of Cu wire (radius r, self-inductance L) is bent in two concentric turns each having radius $\frac{r}{2}$. The self-inductance now

A. $2L$

B. L

C. $4L$

D. $L/2$

Answer: A

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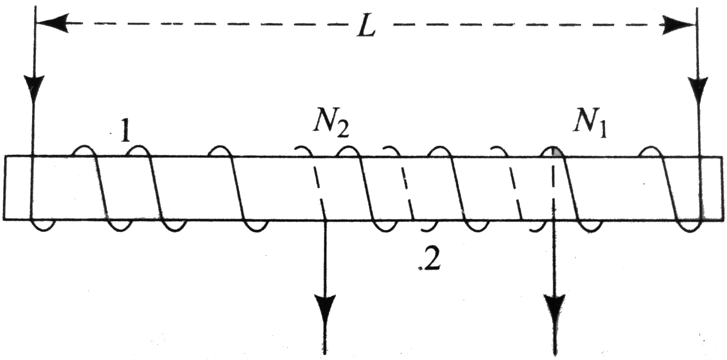
95. A long solenoid of length L, cross section A having N_1 turns has about its center a small coil of N_2 turns as shows in Fig The mutual inductance of two circuits is



A. $\frac{\mu_0 A(N_1)/N_2}{L}$

B. $\frac{\mu_0 A N_1 N_2}{L}$

C. $\mu_0 A N_1 N_2 L$

D. $\frac{\mu_0 A N_1 / N_1^2}{L}$

Answer: B

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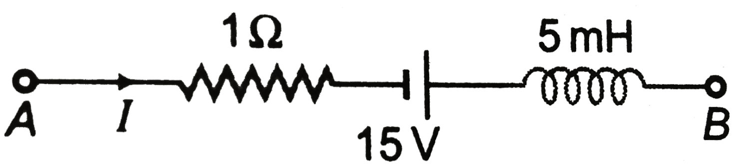
Inductor Circuits

1. The network shown in the figure is a part of complete circuit. What is the potential difference $V_B - V_A$ when the current I is $5A$ and is decreasing at a rate of $10^3 A / s$?



A. $5V$

B. $10V$

C. $15V$

D. $20V$

Answer: C

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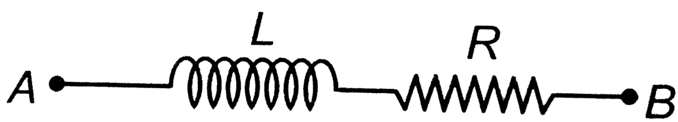
2. In an AC sub circuit, the resistance $R = 0.2\Omega$. At a certain instant $(V_{A-V_B} = 0.5$ volt, $I = 0.5 amp$ and $(\Delta I / \Delta t) = 8A / s$. Find the inductance of the coil:



A. $0.01H$

B. $0.02H$

C. $0.05H$

D. $0.5H$

Answer: C

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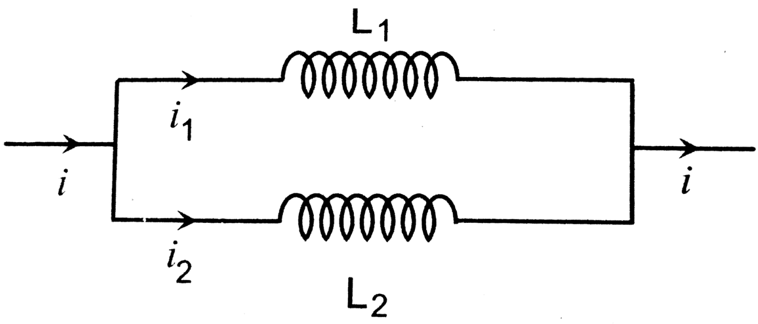
3. Two inductors L_1 and L_2 are connected in parallel and a time varying current flows as shown.

the ratio of current i_1 / i_2



A. L_1 / L_2

B. L_2 / L_1

C. $\dfrac{L_1^2}{(L_1 + L_2^2)}$

D. $\dfrac{L_2^2}{(L_1 + L_2^2)}$

Answer: B

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4. An ideal coil of 10 henry is joined in series with a resistance of 5 ohm and a battery of 5 volt. 2 second after joining, the current flowing in ampere in the circuit will be

A. e^{-1}

B. $(1 - e^{-1})$

C. $(1 - e)$

D. e

Answer: B

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5. A coil has an inductance of $2.5H$ and a resistance of $0.5r$. If the coil is suddenly connected across a 6.0 volt battery, then the time required for the current to rise 0.63 of its final value is

A. 3.5 sec

B. 4.0 sec

C. 4.5 sec

D. 5.0 sec

Answer: D

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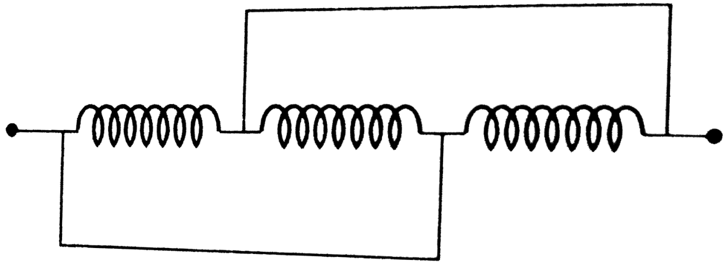
6. Pure inductance of $3.0H$ is connected as shown below. The equivalent inductance of the circuit is



A. $1H$

B. $2H$

C. $3H$

D. $9H$

Answer: A

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7. The equivalent inductance of two inductances is 2.4 henry when connected in parallel and 10 henry when connected in series. The difference between the two inductance is

A. 2 henry

B. 3 henry

C. 4 henry

D. 5 henry

Answer: A

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8. the resistance and inductance of series circuit are 5Ω and $20H$ respectively. At the instant of closing the switch, the current is increasing at the rate $4A - s$. The supply voltage is

A. $20V$

B. $80V$

C. $120V$

D. $100V$

Answer: B

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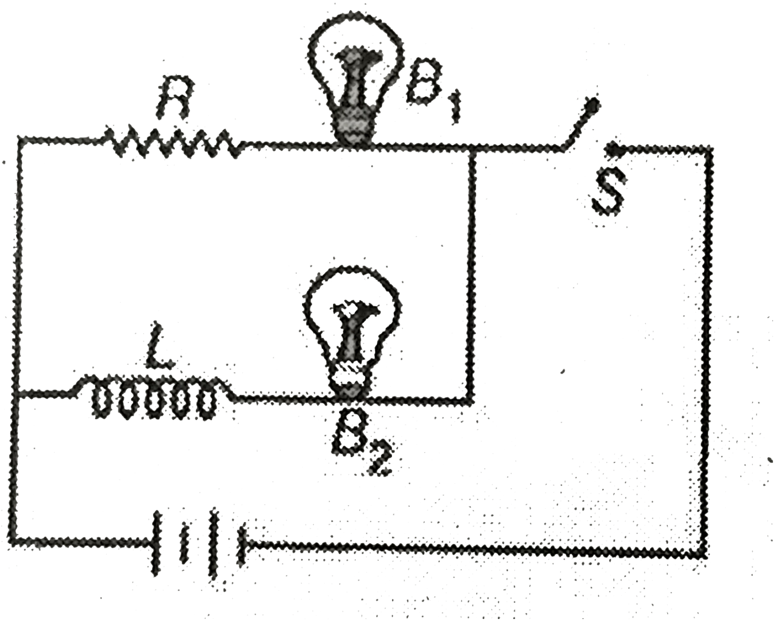
9. Figure represents two bulbs B_1 and B_2resister R and inductor L. When the switch S in turned off, then



A. Both B_1 and B_2 die out promptly

B. Both B_1 and B_2 die out with some delay

C. B_1 dies out promptly but B_2 with some delay

D. B_2 dies out promptly but B_1 with some delay

Answer: C

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10. An inductance L and a resistance R are first connected to a battery. After some time the battery is disconnected but L and R remain connected in a closed circuit. Then the current reduces to 37% of its initial value in

A. $RL \sec$

B. $\frac{R}{L}$sec

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

D. $\frac{1}{LR}$sec

Answer: C

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11. In an LR-circuit, time constant is that time in which current grows from zero to the value (where I_0 is the steady state current)

A. $0.63I_0$

B. $0.50I_0$

C. $0.37I_0$

D. I_0

Answer: A

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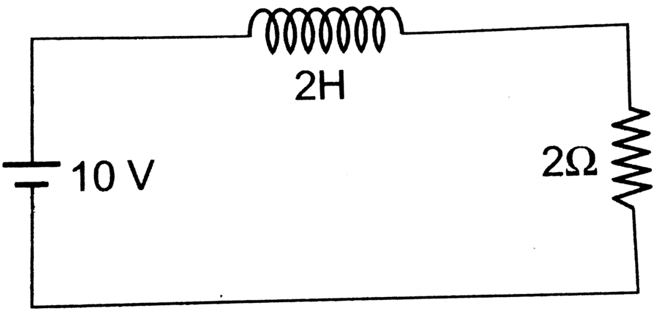
12. In the figure magnetic energy stored in the coil is



A. zero

B. infinite

C. 25 joules

D. none of the above

Answer: C

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13. A LC circuit is in the state of resonance. If $C = 0.1\mu F$ and $L = 0.25$ henry. Neglecting ohmic resistance of circuit what is the frequency of oscillations?

A. $1007Hz$

B. $100Hz$

C. $109Hz$

D. $500Hz$

Answer: A

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14. An oscillator circuit consists of an inductance of $0.5mH$ and a capacitor of $20\mu F$. The resonant frequency of the circuit is nearly

A. $15.92Hz$

B. $159.2Hz$

C. $1592Hz$

D. $15910Hz$

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15. A coil of inductance 300mH and resistance `2 Omega. The current reaches half of its steady state value in

A. $0.15s$

B. $0.3s$

C. $0.05s$

D. $0.1s$

Answer: D

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16. In series with $20 ohm$ resitor a 5 henry inductor is placed. To the combination an e.m.f. of 5 volt is applied. What will be the rate of increase of current at $t = 0.25 \sec?$

A. e

B. e^{-2}

C. e^{-1}

D. none of these

Answer: C

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17. A50 volt potential difference is suddenly applied to a coil with $L = 5 \times 10^{-3}$ henry and $R = 180 ohm$. The rate of increase of current after 0.001 second is

A. $27.3 amp/\sec$

B. $27.8 amp/\sec$

C. $2.73 amp/\sec$

D. none of the above

Answer: D

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18. The current in a LR circuit builds up to $\frac{3}{4th}$ of its steady state value ion $4s$. The time constant of this circuit is

A. $\frac{1}{\text{in}2}s$

B. $\frac{2}{\text{in}2}s$

C. $\frac{3}{\text{in}2}s$

D. $\frac{4}{In2}s$

Answer: B

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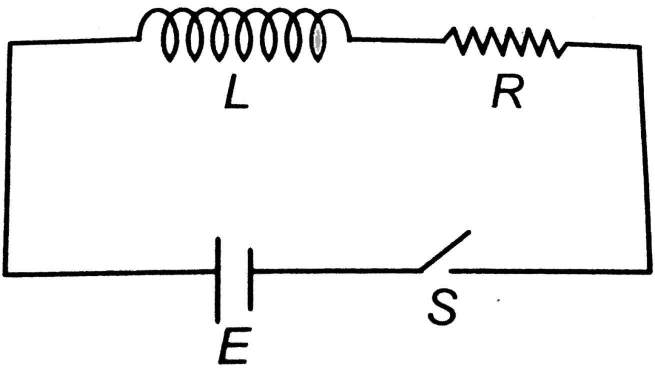
19. In the circuit shown in figure switch S is closed at time $t = 0$. The charge which passes through the battery in one time constant is



A. $\frac{eR^2E}{L}$

B. $E\left(\frac{L}{R}\right)$

C. $\frac{EL}{eR^2}$

D. $\frac{eL}{ER}$

Answer: C

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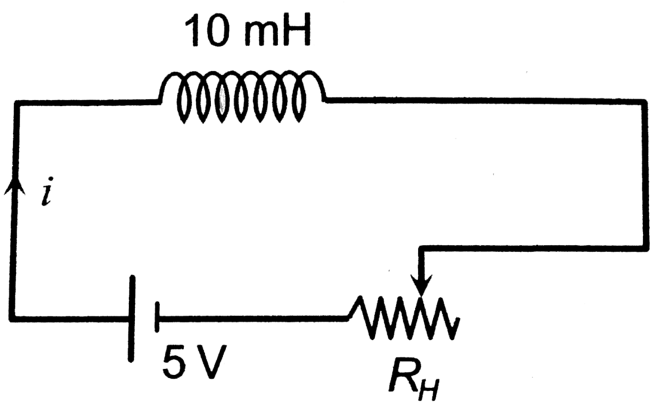
20. The resistance in the following circuit is increase at a particle instant. At this instant the value of resistanc eis 10Ω. The current in the circuit will be now



A. $i = 0.5A$

B. $i > 0.5A$

C. $i < 0.5A$

D. $i = 0$

Answer: B

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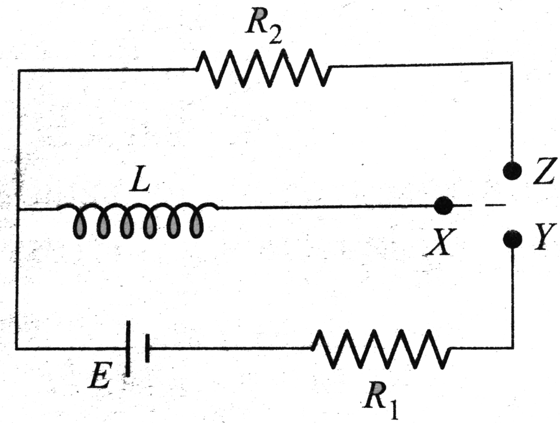
21. In the current shown Fig., X is joined to Y for a long time and then X is joined to Z. The total heat produced in R_2 is



A. $\dfrac{LE^2}{2R_1^2}$

B. $\dfrac{LE^2}{2R_2^2}$

C. $\dfrac{LE^2}{2R_1R_2}$

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

Answer: A

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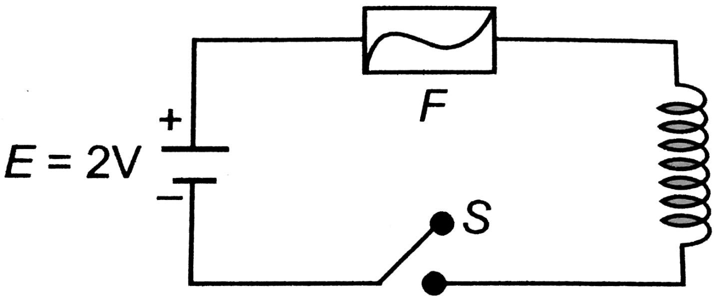
22. In the circuit shown, the cell is deal. The coil has an inductance of $4H$ and zero resistance. F is a fuse of zero resistance and will blow when the current through it reaches $5A$. The switch is closed at $t = 0$. The fuse will blow:



A. almost at once

B. after 2 sec

C. after 5 sec

D. after 10 sec

Answer: D

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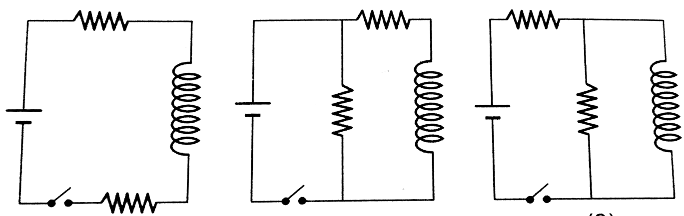
23. The figure shows three circuit with identical batteries, inductors, and resistors. Rank the circuit according to the current through the battery (i) just after the switch is closed and (ii) a long time later, greatest first



(1) (2) (3)

A. $(i) i_2 > i_3 > i_1 (i_1 = 0) (ii) i_2 > i_3 > i_1$

B. $(i) i_2 > i_3 > i_1 (i_1 \neq 0) (ii) i_2 > i_3 > i_1$

C. $(i) i_2 = i_3 = i_1 (i_1 = 0) (ii) i_2 > i_3 > i_1$

D. $(i) i_2 = i_3 = i_1 (i_1 \neq 0) (ii) i_2 > i_3 > i_1$

Answer: A

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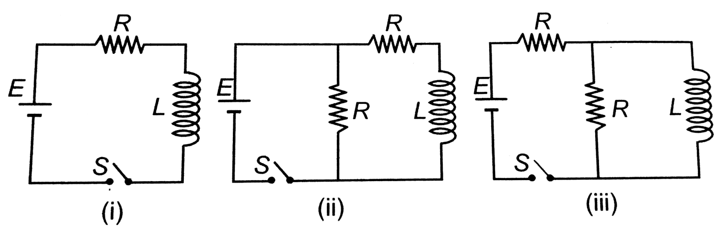
24. In which of the following circuits is the current maximum just after the switch S is closed?



A. (i)

B. (ii)

C. (iii)

D. Both(ii)and(iii)

Answer: B

Watch Video Solution

25. An e.m.f. of 15 volt is applied in a circuit containing 5 henry inductance and 10 ohm resistance. The ratio of the current at time $t = \infty$ and at $t = 1$ second is

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

B. $\dfrac{e^2}{e^2 - 1}$

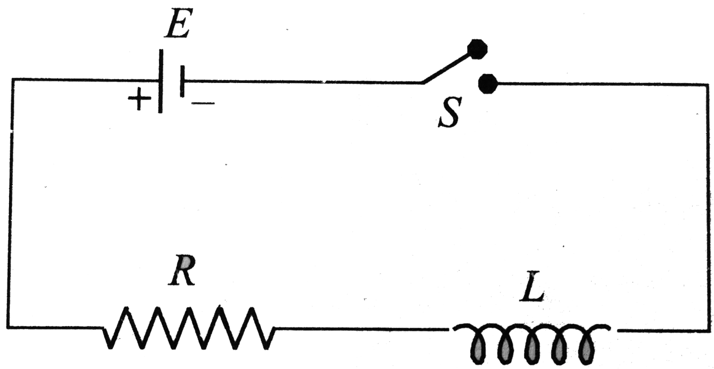
C. $(1 - e^{-1})$

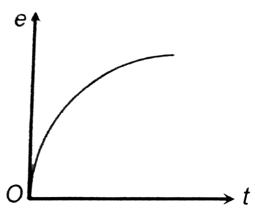
D. e^{-1}

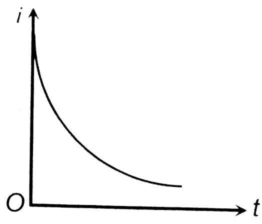
Answer: B

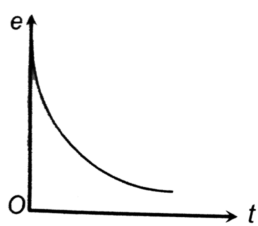
Watch Video Solution

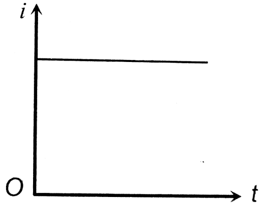
26. Switch S of the circuit shows in Fig. is closed at $t = 0$. If e denotes the induced emf in L and i the current flowing through the circuit at time t, then which of the following graphs correctly represents the variation of e with i?



A. 

B. 

C. 

D. 

Answer: C

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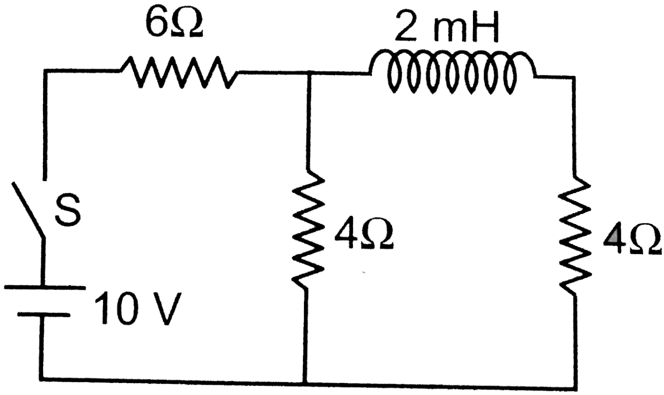
27. In the given circuit, let i_1 be the current drawn battery at time $t = 0$ and i_2 be steady current at

$t = \infty$ then the ratio $\frac{i_1}{i_2}$ is



A. 1.0

B. 0.8

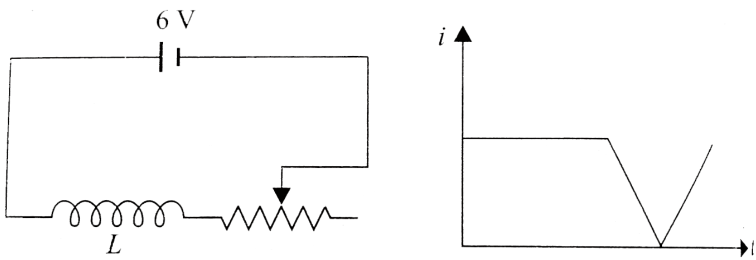
C. 1.2

D. 1.5

Answer: B

Watch Video Solution

28. In the circuit shown in Fig. Sliding contact is moving with uniform velocity towards right. Its value at some instance is $12(\Omega)$. The current in the circuit at this instant of time will be



A. $0.5A$

B. More than $0.5A$

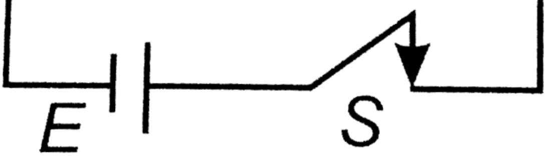
C. less than $0.5A$

D. may be less or more than $0.5A$ depending on the value of L.

Answer: B

Watch Video Solution

29. Consider the circuit shown in figure. The current through the battery a long time after the switch S is closed is:



A. $\frac{E}{R_1}$

B. $\frac{E}{R_2}$

C. $\frac{E}{R_1 + R_2}$

D. $\frac{E(R_1 + R_2)}{(R_1 R_2)}$

Answer: D

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30. in the previous question, suppose the switch is again opened at `t=0, then time constant of discharging circuit is:

A. $\frac{L}{R_1}$

B. $\frac{L}{R_2}$

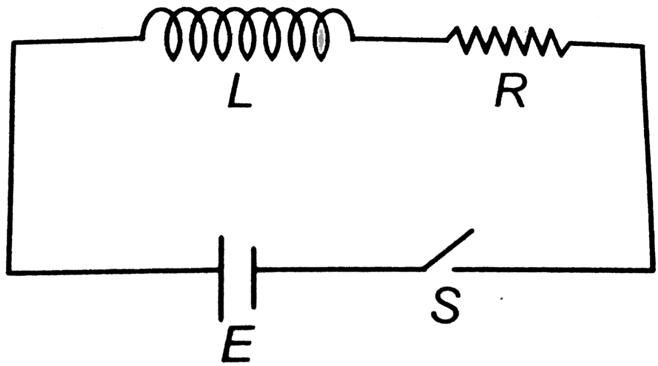
C. $\frac{L}{R_1 + R_2}$

D. $\frac{L(R_1 + R_2)}{(R_1 R_2)}$

Answer: C

View Text Solution

31. In the circuit shown in figure switch S is closed at time $t = 0$. The charge which passes through the battery in one time constant is



A. $\dfrac{eR^2E}{L}$

B. $E\left(\dfrac{L}{R}\right)$

C. $\dfrac{EL}{eR^2}$

D. $\frac{eL}{ER}$

Answer: C

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Applications Of Emi

1. Which of the following does not depend upon the magnetic effect of some sort

A. moving coil glavanometer

B. hot wire ammeter

C. dynamo

D. electric motor

Answer: B

Watch Video Solution

2. plane of eddy currents make an angle with the plane of magnetic lines of force equal to

A. 40°

B. 0°

C. 90°

D. 180°

Answer: C

Watch Video Solution

3. which of ther following is constructed on the principle of electromagnetic induction?

A. Galvanometer

B. Electric motor

C. Generator

D. voltmeter

Answer: C

Watch Video Solution

4. The core of any transformaer is laminated so as to

A. Eddy currents

B. Hysteresis

C. Resistance in winding

D. None of these

Answer: A

Watch Video Solution

5. The working of dynamo is based on principle of

A. Electromagnetic induction

B. Conversion of energy into electricity

C. Magneting effects of current

D. Heating effects of current

Answer: A

Watch Video Solution

6. when the speed of a dc motor increase the armature current

A. Increase

B. decrease

C. Does not change

D. Increase and decreases continuously

Answer: B

Watch Video Solution

7. The output of a dunamo using a splitting commutator is

A. dc

B. ac

C. Fluctuating dc

D. Half-wave rectified voltage

Answer: C

View Text Solution

8. which of the following statements is incorrect?

A. Both ac and dc dynamo have a field magnet

B. Both ac and dc dynamo have an armature

C. Both ac and dc dynamo convert mechanical energy into electrical energy

D. Both ac and dc dynamo have slip rings

Answer: D

Watch Video Solution

Watch Video Solution

9. The coil of dynamo is rotating in a magnetic field. The devloped induced e.m.f. changes and the number of magnetic lines of force also changes. Which of the following conditions is correct?

A. Lines of force mnimum but induced e.m.f. Is zero

B. Lines of force maximum but induced e.m.f. Is zero

C. Lines of force maximum but induced e.m.f. Is not zero

D. Lines of force maximum but induced e.m.f. Is also maximum

Answer: B

View Text Solution

10. Armature current in dc motor will be maximum when

A. Motor has acquired maximum speed

B. Motor has acquired intermediate speed

C. Motor has just strarted moving

D. Moving is switched off

Answer: C

Watch Video Solution

11. The armature of dc motor has 20Ω resistance. It draws current of 1.5 ampere when run by 220 volts dc supply.

the value of back e.m.f. induced in it will be

A. $150V$

B. $170V$

C. $180V$

D. $190V$

Answer: D

Watch Video Solution

12. The number of turns in the coil of an ac genrator is 5000 and the area of the coil is $0.25m^2$. The coil is rotate at the rate of $100\text{cycles}/\text{sec}$ in a magnetic field of $0.2W/m^2$. The peak value of the emf generated is nearly

A. $786kV$

B. $440kV$

C. $220kV$

D. $187.1kV$

Answer: D

Watch Video Solution

13. In a dc motor, induced e.m.f. will be maximum

A. when motor takes maximum speed

B. when motor starts rotating

C. when speed of motor increase

D. when motor is switched off

Answer: A

Watch Video Solution

14. An electric motor operating on a $60V$ dc supply draws a currrent of $10A$. If the effeciency of the motor is 50%, the resistance of its winding is

A. 3Ω

B. 6Ω

C. 15Ω

D. 30Ω

Answer: A

Watch Video Solution

15. An electric motor operating on a $60V$ dc supply draws a currrent of $10A$. If the effeciency of the motor is 50%, the resistance of its winding is

A. 6Ω

B. 4Ω

C. 2.9Ω

D. 3.1Ω

Answer: C

Watch Video Solution

16. A motor having an armature of resistance 2Ω is designed to operate at $220V$ mains. At full speed, it devlops a back e.m.f. of $210V$. When the motor is running at full speed, the current in the armature is

A. $5A$

B. $105A$

C. $110A$

D. $215A$

Answer: A

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17. A transformer is employed to

A. obtain a suitable dc voltage

B. convert dc into ac

C. obtain a suitable ac voltage

D. convert ac into dc

Answer: C

Watch Video Solution

18. What is increase in step-down transformer?

A. voltage

B. current

C. power

D. current density

Answer: B

Watch Video Solution

19. The transformation ratio in the step-down transformer is

A. 1

B. greater than one

C. less than one

D. the ratio greater ot less than one depends on the other factors

Answer: B

Watch Video Solution

20. In a transformer 220 ac voltage is increased to 2200 volts. If the number of turns in the secondary are `2000, then the number of turns in the primary will be

A. 200

B. 100

C. 50

D. 20

Answer: A

Watch Video Solution

21. The ratio of secondary to the primary turns in a transformer is $3:2$. If the power output be P, then the input power neglecting all loses must be equal to

A. $5P$

B. $1.5P$

C. P

D. $\frac{2}{5}P$

Answer: C

Watch Video Solution

22. The primary winding of a transformer has 100 turns and its secondary winding has $200V$ turns. The primary is connected to an ac supply of $120V$ and the current flowing in it is $10A$. The voltage and the current in the secondary are

A. $240V, 5A$

B. $240V, 10A$

C. $60V, 20A$

D. $120V, 20A$

Answer: A

Watch Video Solution

23. A step-down transformer is connected to 2400 volts line and 80 amperes of current is found to flow in output load. The ratio of the turns in primary and secondary coil is $20:1$. if transformer efficiency is 100%, then the current flowing in primary coil will be

A. $1600A$

B. $20A$

C. $4A$

D. $1.5A$

Answer: C

Watch Video Solution

24. A loss free transformer has 500 turns on its primary winding and 2500 in secondary. The meters of the secondary indicate 200 volts at 8 amperes under these condition. The voltage and current in the primary is

A. $100V, 16A$

B. $40V, 40A$

C. $160V, 10A$

D. $80V, 20A$

Answer: B

Watch Video Solution

25. An ideal transformer has 100 turns in the primary and 250 turns in the secondary. The peak value of the ac is $28V$. The r.m.s. secondary voltage is nearest to

A. $50V$

B. $70V$

C. $100V$

D. $40V$

Answer: A

Watch Video Solution

26. A transformer is employed to reduce $220V$ to $11V$. The primary draws a current of $5A$ and the secondary $90A$. The efficiency of the transformer is

A. $20\ \%$

B. $40\ \%$

C. $70\ \%$

D. $90\ \%$

Answer: D

Watch Video Solution

27. in a step-up transformer, the turn ratio is $1:2A$ leclanche cell (e.m.f. 1.5V) is connected across the primary. The voltage devloped in the secondary would be

A. $3.0V$

B. $0.75V$

C. $1.5V$

D. zero

Answer: D

Watch Video Solution

28. A 100% efficient transformer has 100 turns in the primary and 25 turns in its secondary coil. Of the current in the secondary coil is 4 amp, then the current in the primary coil is

A. 1 amp

B. 4 amp

C. 8 amp

D. 16 amp

Answer: A

Watch Video Solution

29. In a lossless transformer an alternating current of 2 amp is flowing in the primary coil. The number of turns in the primary and secondary coils are 100 and 20 respectively. The value of the current in the secondary coil is

A. $0.08A$

B. $0.4A$

C. $5A$

D. $10A$

Answer: D

Watch Video Solution

30. A transformer connected to 220 volt line shows an output of $2A$ at 11000 volt. The efficiency is 100%. The current drawn from from the line is

A. $100A$

B. $200A$

C. $22A$

D. $11A$

Answer: A

Watch Video Solution

31. The coils of a step down transformer have 500 and 5000 turns. In the primary coil an ac of 4 ampere at 2200 volts is sent. The value of the current and potential difference in the secondary coil will be

A. $20A, 220V$

B. $0.4A, 22000v$

C. $40A, 220V$

D. $40A, 22000V$

Answer: C

Watch Video Solution

32. A power transformer is used to step up an alternating e.m.f. of $220V$ to $11kv$ to trannsmit $4.4kW$ of power. If the primary coil has 1000 turns, what is the current rating of the secondary?(Assume 100% efficiency for the transformer)

A. $4A$

B. $0.4A$

C. $0.04A$

D. $0.2A$

Answer: B

Watch Video Solution

33. A step up transformer connected to a $220 V A C$ line is to supply $22 k V$ for a neon sign in secondary circuit. In primary circuit a fuse wire is connected which is to blow when the current in the secondary circuit exceeds $10 m A$. The turn ratio of the transformer is

A. 50

B. 100

C. 150

D. 200

Answer: B

Watch Video Solution

34. A step-down transformer is connected to 2400 volts line and 80 amperes of current is found to flow in output load. The ratio of the turns in primary and secondary coil is $20:1$. if transformer efficiency is 100%, then the current flowing in primary coil will be

A. $15A$

B. $50A$

C. $25A$

D. 12.5A`

Answer: B

Watch Video Solution

35. The number of turns in the primary coil of a transformer is 200 and the number of turns in the secondary coil is 1.0 if 240 volt AC is applied to the primary, the output from the secondary will be

A. $48V$

B. $24V$

C. $12V$

D. $6V$

Answer: C

Watch Video Solution

36. The primary winding of transformer has 500 turns whereas its secondary has 5000 turns. The primary is connected to an ac supply of $20V, 50Hz$. The secondary will have an output of

A. $200V, 50Hz$

B. $2V, 50Hz$

C. $200V, 500Hz$

D. $2V, 5Hz$

Answer: A

Watch Video Solution

37. A step-up transformer has transformation ratio of $3:2$ what is the voltage in secondary if voltage in primary is $30V$?

A. $45V$

B. $15V$

C. $90V$

D. $300V$

Answer: A

Watch Video Solution

38. In a transformer, the number of turns in primary coil and secondary coil are 5 and `4

A. $4:5$

B. $5:4$

C. $5:9$

D. $9:5$

Answer: A

View Text Solution

39. A step-down transformer is connected to main supply $200V$ to operate a $6V$, 30W` bulb. The current in primary is

A. $3A$

B. $1.5A$

C. $0.3A$

D. $0.15A$

Answer: D

Watch Video Solution

40. The number of turns in primary and secondary coils of a transformer are 100 and 20 respectively. If an alternating potential of 200 volt is applied to the primary, the induced potential in secondary will be

A. $10V$

B. $40V$

C. $1000V$

D. $20, 000V$

Answer: B

Watch Video Solution

41. The ratio of secondry to the primary turns in a trans is $9:4$. If the power input be P, what will be the ratio of power output (neglect all losses) to power input

A. $4:9$

B. $9:4$

C. $5:4$

D. $1:1$

Answer: D

Watch Video Solution

42. A transformer has turn ration $100/1$. If secondary coil has $4amp$ current then current in primary coil is

A. $4A$

B. $0.04A$

C. $0.4A$

D. $400A$

Answer: B

Watch Video Solution

43. In a step-up transformer the turn ratio is $1:10$. A resistance of 200 ohm connected across the secondary is drawing a current of $0.5A$. What is the primary voltage and current?

A. $50V$, 1amp

B. $10V$, 5amp

C. $25V$, 4amp

D. $20V$, 2amp

Answer: B

Watch Video Solution

44. In a step-up transformer the voltage in the primary is $220V$ and the currrent is $5A$. The secondary voltage is found to be $22000V$. The current in the secondary (neglect losses)is

A. $5A$

B. $50A$

C. $500A$

D. $0.05A$

Answer: D

Watch Video Solution

45. A transformer has 100 turns in the primary coil and carries $8A$ current. If input power is one kilowatt, the number of turns required in the secondary coil to have $500V$ output will be

A. 100

B. 200

C. 400

D. 300

Answer: C

Watch Video Solution

46. An ideal transformer has 500 and 5000 turn in primary and secondary windings respectively. If the primary voltage is connected to a $6V$ battery then the secondary voltage is

A. 0

B. $60V$

C. $0.6V$

D. $6.0V$

Answer: A

Watch Video Solution

47. In a primary coil $5A$ current is flowing on 220 volts. In the secondary coil $2200V$ voltage produces. Then ratio of number of turns in secondary coil and primary coil will be

A. $1:10$

B. $10:1$

C. $1:1$

D. $11:1$

Answer: B

Watch Video Solution

48. A step up transformer has transformation ration $5:3$. What is voltage in secondary if voltage in primary is

A. $20V$

B. $60V$

C. $100V$

D. $180V$

Answer: C

Watch Video Solution

49. In a step up transformers, $220V$ is converted into $200V$. The number of turns in primary coil is 600. What is the number of turns in the secondary coil?

A. 60

B. 600

C. 6000

D. 100

Answer: C

Watch Video Solution

50. The output voltage of a transformer connected to 220 voltl line is 1100 volt at 1amp current. Its efficiency is $100\ \%$ the current coming from the line is

A. $20A$

B. $10A$

C. $11A$

D. $22A$

Answer: B

Watch Video Solution

51. In a region of uniform magnetic induction $B = 10^2$ tesla, a circular coil of radius $30cm$ and resistance π^2 ohm is rotated about an axis which is perpendicular to the directon of B and which form a diameter of the coil. If the coil rotates at $200r \pm$ the amplitude of the alternating current induced in the coil is

A. $4\pi^2 mA$

B. $30mA$

C. $6mA$

D. $200mA$

Answer: C

Watch Video Solution

Watch Video Solution

52. In a transformer, the number of turns in primary and secondary are 500 and 2000 respectively. If current in primary is $48A$, the current in the secondary is

A. $12A$

B. $24A$

C. $48A$

D. $144A$

Answer: A

Watch Video Solution

53. In an inductor of inductance $L = 100 mH$, a current of $I = 10A$ is flowing. The energy stored in the inductor is

A. $5J$

B. $10J$

C. $100J$

D. $1000J$

Answer: A

Watch Video Solution

54. The turn ratio of a transformers is given as $2:3$. If the current through the primary coil is $3A$, thus calculate the current through load resistance

A. $1A$

B. $4.5A$

C. $2A$

D. 1.5A`

Answer: C

Watch Video Solution

55. A transformer with efficiency 80% works at $4kW$ and $100V$. If the secondary voltage is $200V$, then the primary and secondary currents are respectively

A. $40A, 16A$

B. $16A, 40A$

C. $20A, 40A$

D. $40A, 20A$

Answer: A

Watch Video Solution

56. In a step up transformer, if ratio of turns of primary to secondary is $1:10$ and primary voltage si $230V$. If the load current is $2A$. Then the current in primary is

A. $20A$

B. $10A$

C. $2A$

D. $1A$

Answer: A

Watch Video Solution

57. If a coil made of conducting wires is rotated between poles pieces of the permanent magnet. The motion will generated a current and this device is called

A. `An electric motor

B. An electric generator

C. An electromagnet

D. All of above

Answer: B

Watch Video Solution

58. A step-down transformer is used on a $1000V$ line to deliver $20A$ at $120V$ at the secondary coil. If the efficiency of the transformer is 80% the current drawn from the line is.

A. $3A$

B. $30A$

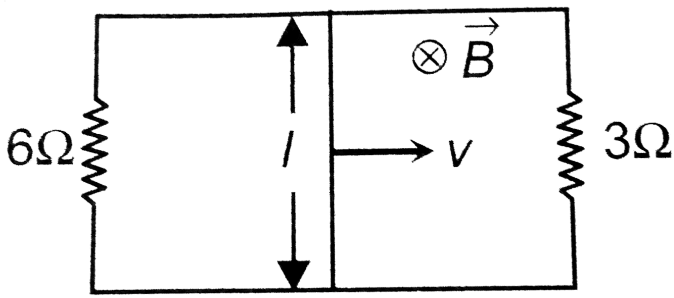
C. $0.3A$

D. $2.4A$

Answer: A

Watch Video Solution

1. A rectangle loop with a sliding connector of length $l = 1.0m$ is situated in a uniform magnetic field $B = 2T$ perpendicular to the plane of loop. Resistance of connector is $r = 2\Omega$. Two resistance of 6Ω and 3Ω are connected as shown in figure. the external force required to keep the connector moving with a constant velocity $v = 2m/s$ is



A. $6N$

B. $4N$

C. $2N$

D. $1N$

Answer: C

Watch Video Solution

2. A metal rod of resistance 20Ω is fixed along a diameter of a conducting ring of radius $0.1m$ and lies on $x-y$ plane. There is a magnetic field $\overrightarrow{B}=(50T)\overrightarrow{k}$. The ring rotates with an angular velocity $\omega=20rads^{-1}$ about its axis. An external resistance of 10Ω is connected across the center of the ring and rim. The current external resistance is

A. $\frac{1}{4}$

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

C. $\frac{1}{3}$

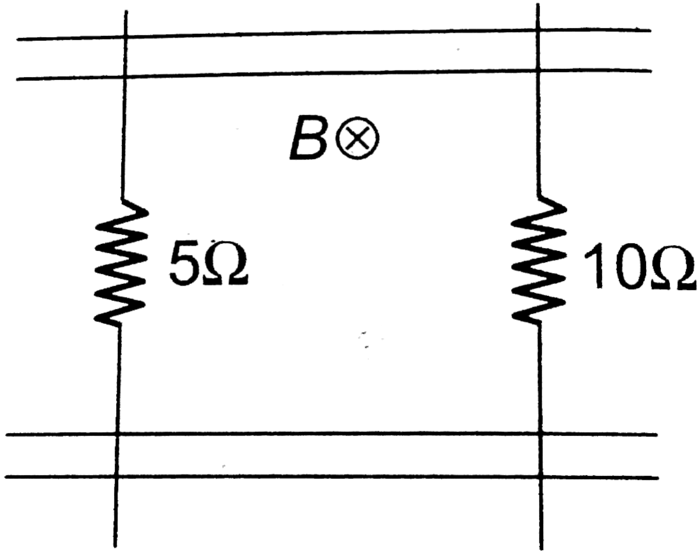
D. zero

Answer: C

Watch Video Solution

3. A pair of parallel conducting rails lie at right angle to a uniform magnetic field of $2.0T$ as shown in the fig.

two resistor 10Ω and 5Ω are to slide without friction along the rail. The distance between the conducting rails is $0.1m$. Then



A. Induced current $= \frac{1}{150} A$ directed clockwise if

10Ω

resistor is pulled to the right with speed

$0.5ms^{-1}$ and resistor is held fixed

B. Induced current $= \frac{1}{300}A$ directed anti-

clockwise if

10Ω resistor is pulled to the right with speed

$0.5ms^{-1}$ and 10Ω resistor is held fixed

C. Induced current $= \frac{1}{300}A$ directed clockwise if

5Ω

resistor is pulled to the left at $0.5ms^{-1}$ and 10Ω

resistor is held at res

D. Induced current $= \frac{1}{150}A$ directed anti-

clockwise if5Ω

resistor is pulled to the left at $0.5 m s^{-1}$ and 10Ω

resistor is held at rest

Answer: D

Watch Video Solution

4. A short magnet is allowed to fall along the axis of a horizontal metalic ring. Starting from rest, the distance fallen by the magnet in one second may be

A. $4m$

B. $5m$

C. $6m$

D. $7m$

Answer: A

Watch Video Solution

5. The horizontal component of the earth's magnetic field at a place is $3 \times 10^{-4}T$ and the dip is $\tan^{-1}\left(\frac{4}{3}\right)$. A metal rod of length $0.25m$ placed in the north -south position and is moved at a constant speed of $10cm/s$ towards the east. The emf induced in the rod will be

A. zero

B. $1\mu V$

C. $5\mu V$

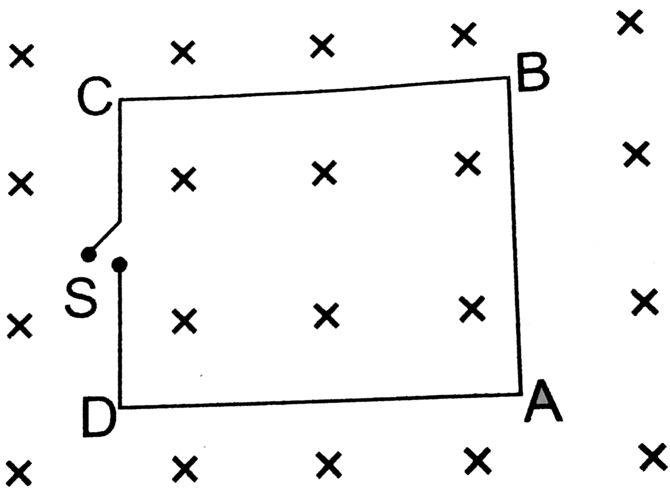
D. $10\mu V$

Answer: D

Watch Video Solution

6. The magnetic field in the cylindrical region shown in figure increase at a constant rate of $20mT/\sec$. Each side of the square loop $ABCD$ has a length of $1cm$ and resistance of 4Ω. Find the current in the wire AB

if the switch S is closed



A. $1.25 \times 10^{-7} A$,(anticlockwise)

B. $1.25 \times 10^{-7} A$ (clockwise)

C. $2.5 \times 10^{-7} A$(anticlockwise)

D. $2.5 \times 10^{-7} A$(clockwise)

Answer: A

Watch Video Solution

7. A metal disc of radius a rotates with a constant angular velocity ω about its axis. The potential difference between the center and the rim of the disc is $(\mathrm{m} = \text{mass of electron}, \mathrm{e} = \text{charge on electro})$

A. $\dfrac{m\omega^2 a^2}{e}$

B. $\dfrac{1}{2}\dfrac{m\omega^2 a^2}{e}$

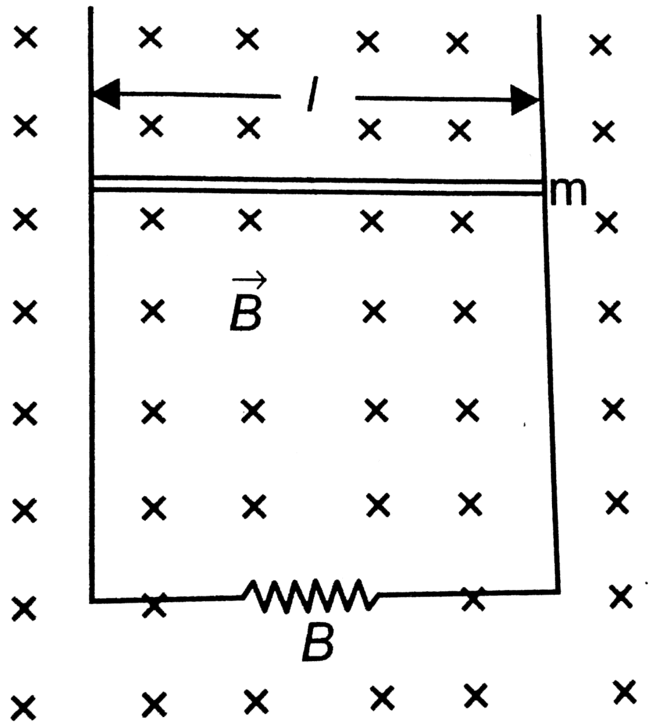
C. $\dfrac{e\omega^2 a^2}{2m}$

D. $\dfrac{e\omega^2 a^2}{m}$

Answer: B

Watch Video Solution

8. A horizontal wire is free to slide on the vertical rails of a conducting frame as shown in figure. The wire has a mass m and length l and the resistance of the circuit is R. If a uniform magnetic field B is directed perpendicular to the frame, the terminal speed of the wire as it falls under the force of gravity is



A. $\frac{mgR}{Bl}$

B. $\frac{mgl}{BR}$

C. $\frac{B^2l^2}{mgR}$

D. $\frac{mgR}{B^2l^2}$

Answer: D

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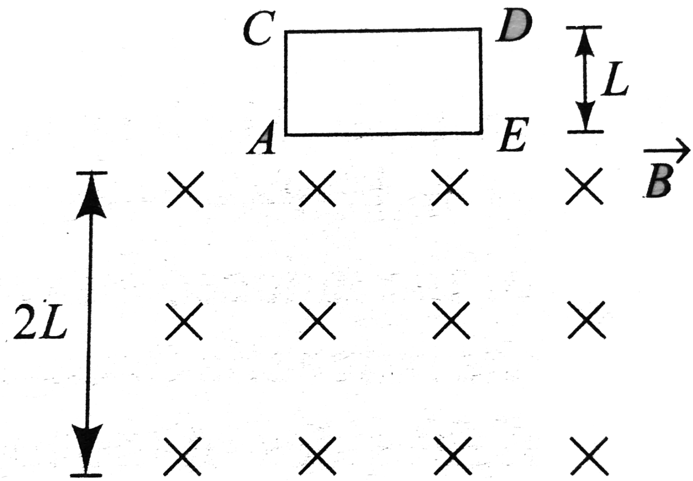
9. A square coil $ACDE$ with its plane vertically is released from rest in a horizontal uniform magnetic field $\vec{B}$ of length $2L$. The acceleration of the coilis



A. less than g for all the time till the loop crosses the magnetic field completely

B. less than g when it enters the field and greater than g when it comes out of the field

C. g all the time

D. less than g when it enters and comes out of the field but equal to g when it is within the field

Answer: D

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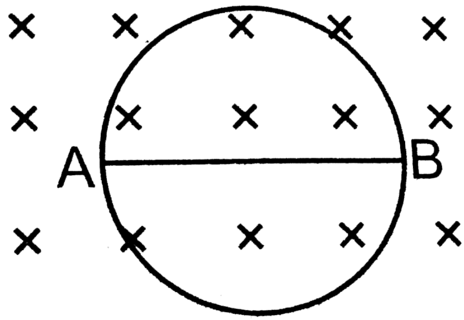
10. The radius of the circular conducting loop shown in figure is R. Magnetic field is decreasing at a constant rate α. Resistance per unit length of the loop is ρ. then current in wire AB is $(AB$ is one of the diameter)



A. $\frac{R\alpha}{2\rho}$ from A to B

B. $\frac{R\alpha}{2\rho}$ from B to A

C. $\frac{2R\alpha}{2\rho}$ from A to B

D. zero

Answer: D

View Text Solution

11. A current of $2A$ is increasing at a rate of $4A/s$ through a coil of inductance $2H$. The energy stored in the inductor per unit time is

A. $2J/s$

B. $1J/s$

C. $16J/s$

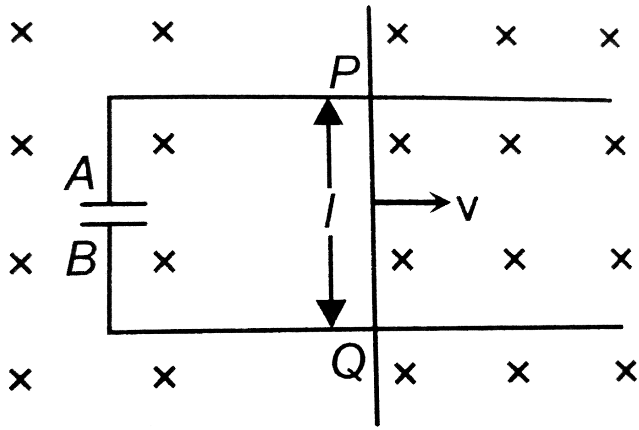
D. $4J/s$

Answer: C

Watch Video Solution

12. A conducting rod PQ of length $l = 1.0m$ is moving with a uniform speed $v2.0m/s$ in a uniform magnetic field $B = 4.0T$ directed into the paper.

A capacitor of capacity $C = 10\mu F$ is connected as shown in figure. Then



A. $q_A = +80\mu C$ and $q_B = -80\mu C$

B. $q_A = -80\mu C$ and $q_B = +80\mu C$

C. $qA = 0 = qB$

D. Charge stored in the capacitor increase exponentially with time

Answer: A

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13. Two conducting circular loops of radii R_1 and R_2 are placed in the same plane with their centres coincident. Find the mutual inductance between them assuming $R_2 < < R_1$.

A. R_1 / R_2

B. R_2 / R_1

C. R_1^2 / R_2

D. $R_2^2 /_1$

Answer: D

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14. A circular loop of radius R, carrying current I, lies in $x - y$ plane with its center at origin. The total magnetic flux through $x - y$ plane is

A. Directly proportinal to I

B. Directly proportional to R

C. Directly proportional to R^2

D. zero

Answer: D

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15. Two identical circular loops of metal wire are lying on a table without touching each other. Loop-A carries a current which increases with time. In response, the loop-B

A. Remains stationary

B. is attracted by the loop-A

C. is repelled by the loop-A

D. rotates about its CM, with Cm fixed

Answer: C

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16. Two coils have a mutual inductance $0.005H$. The current changes in the first coil according to equation $I = I_0 \sin \omega t$, where $I_0 = 10A$ and $\omega = 100\pi$ $radian / \sec$. The maximum value of e.m.f. in the second coil is

A. 2π

B. 5π

C. π

D. 4π

Answer: B

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17. A wire of length $1m$ is moving at a speed of $2ms^{-1}$ perpendicular to its length and a homogeneous magnetic field of $0.5T$. The ends of the wire are joined to a circuit of resistance 6Ω. The rate at which work is being done to keep the wire moving at constant speed is

A. $\frac{1}{12}W$

B. $\frac{1}{6}W$

C. $\frac{1}{3}W$

D. $1W$

Answer: B

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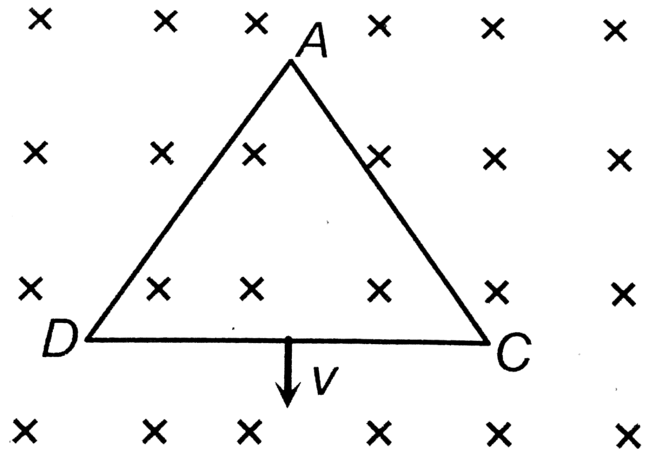
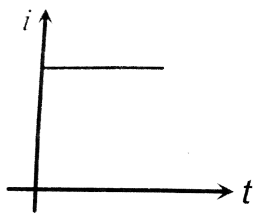
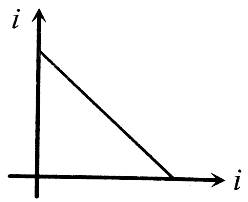
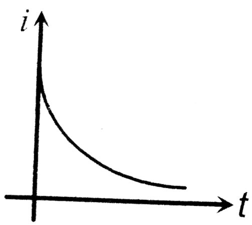
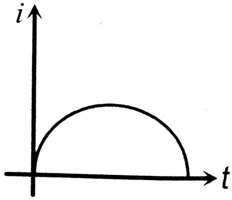
18. An equilateral tringular loop ADC having some resistance is pulled with a constant velocity v out of a uniform magnetic field directed into the paper. At time $t = 0$, side DC of the loop is at edge of the magnetic field.



A. 

B. 

C. 

D. 

Answer: B

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19. A coil of wire having inductance and resistance has a conducting ring placed coaxially within it. The coil is connected to a battery at time t=0, so that a time-dependent current $1_1(t)$ starts following through the coil. If $I_2(t)$ is the current induced in the ring, and B (t) is the magnetic field at the axis of the coil due to $I_1(t)$

then as a function of time $(t > 0)$, the product $I_2(t)B(t)$

A. Increase with time

B. decreases with time

C. Does not vary with time

D. passes through a maximum

Answer: D

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20. A coil of inductance $8.4 mH$ and resistance $6\ \Omega$ is connected to a $12 V$ battery. The current in the coil is

$1.0A$ at approximately the time.

A. 500sec

B. 20 sec

C. 35 millisec

D. 1 millisec

Answer: D

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21. An inductor of 2 henry and a resistance of 10 ohms are connected in series with a battery of 5 volts. The initial rate of change of current is

A. $0.5 amp / \sec$

B. $2.0 amp / \sec$

C. $2.5 amp / \sec$

D. $0.25 amp / \sec$

Answer: C

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22. A short-circuited coil is placed in a time-varying magnetic field. Electrical power is dissipated due to the current induced in the coil. If the number of turns were to be quadrupled and the wire radius halved, the electrical power dissipated would be

A. Halved

B. the same

C. doubled

D. quadrupled

Answer: B

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23. An electric motor runs a $D.C.$ source of e.m.f. $200V$ and draws a current of $10A$. If the efficiency is 40%, then ressistance of the armature is:

A. 5Ω

B. 12Ω

C. 120Ω

D. 160Ω

Answer: B

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24. The approximate formula expressing the formula of mutual inductance of two coaxial loops of the same redius a when their centers are separated by a distance l with $l > > a$ is

A. $\frac{1}{2}\frac{\mu_0 pa^4}{l^3}$

B. $\frac{1}{2}\frac{\mu_0 a^4}{l^2}$

C. $\frac{\mu_0}{4\pi}\frac{\pi a^4}{l^2}$

D. $\frac{\mu_0}{\pi}\frac{a^4}{l^3}$

Answer: A

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25. The length of a thin wire required to manufacture a solenoid of length $l = 100 cm$ and inductance $L = 1 mH$, if the solenoid's cross-sectional diameter is considerably less than its length is

A. 1.0 km

B. 0.10 km

C. 0.010 km

D. 10 km

Answer: B

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26. Magnetic flux linked with a stationary loop of resistance R varies with respect to time during the time period T as follows:

$\phi = aT(T - r)$

Find the amount of heat generated in the loop during that time. Inductance of the coil is negligible.

A. $\frac{aT}{3R}$

B. $\frac{a^2T^2}{3R}$

C. $\left(a^2T^2\right)$

D. $\left(a^2T^{92}\right)\frac{)}{3R}$

Answer: D

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27. A physicist works in a laboratory where the magnetic field is $2T$. She wears a necklace enclosing area $0.01m^2$ in such a way that the plane of the necklace is normal to the field and is having a resistance $R = 0.01\Omega$. Because of power failure, the field decays to $1T$ in time 10^{-3} seconds.

The what is the total heat produced in her necklace?

$(T = tesla)$

A. $10J$

B. $20J$

C. $30J$

D. $40J$

Answer: A

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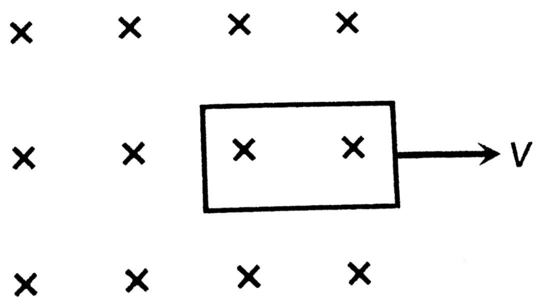
28. Figure show a square loop of side $0.5m$ and resistance 10Ω. The magnetic field has a magnitude $B = 1.0T$. The work done in pulling the loop out of the field slowly and uniformly in $2.0s$ is



A. $3.125 \times 10^{-3} J$

B. $6.25 \times 10^{-4} J$

C. $1.25 \times 10^{-2} J$

D. $5.0 \times 10^{-4} J$

Answer: A

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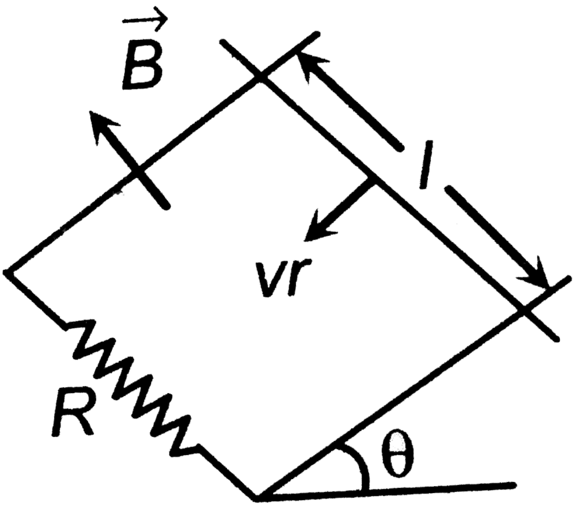
29. A copper rod of mass m slides under gravity on two smooth parallel rails l distance apart set at an angle θ to the horizontal. At the bottom, the rails are joined by a resistance R.



There is a uniform magnetic field perpendicular to the plane of the rails. the terminal valocity of the rod is

A. $\frac{mgR\cos\theta}{B^2l^2}$

B. $\frac{mgR\sin\theta}{B^2l^2}$

C. $\frac{mgR\tan\theta}{B^2l^2}$

D. $\frac{mgR\cot\theta}{B^2l^2}$

Answer: A

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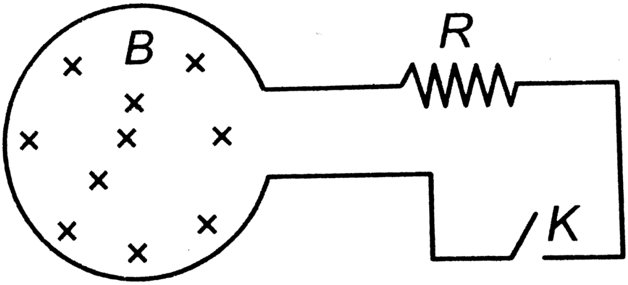
30. Shown in the figure is a circular loop of radius r and resistance R. A varible magnetic field of induction

$B = B_0 e^{-1}$ is established inside the coil. If the key (K) is closed, the electrical power devloped right after closing the switch is equal to



A. $\dfrac{B_0^2 \pi r^2}{R}$

B. $\dfrac{B_0 10 r^3}{R}$

C. $\dfrac{B_0^2 \pi^2 r^4 R}{5}$

D. $\dfrac{B_0^2 \pi^2 r^4}{R}$

Answer: D

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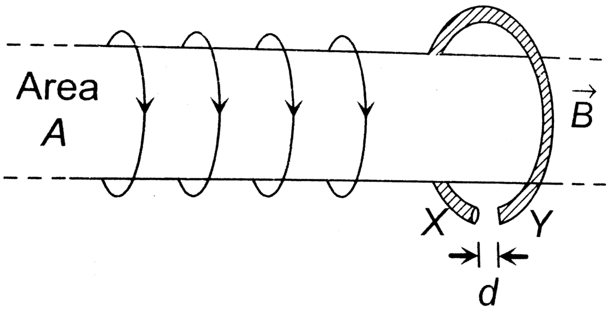
31. A highly conucting ring of radius R is perpendicular to and concentric with the axis of a long solenoid as shown in fig. the ring has a narrow gap of width d in its circumference. The solenoid has cross sectional area A and a uniform internal field of magnitude B_0. Now beginning at $t = 0$, the solenoid current is steadily increased to so that the field magnitude at any time t is given by $B(t) = B_0 + \alpha t$ where $\alpha > 0$. Assuming that no charge can flow across the gap, the end of ring which has excess of positive charge and the magnitude of induced e.m.f. in the ring are respectively



A. $x, \ A\alpha$

B. $X\pi R^2 a$

C. $Y, pA^2\alpha$

D. $Y, \pi R^2 a$

Answer: A

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32. How much length of a very thin wire is required to obtain a solenoid of length l_0 and inductance L

A. $\sqrt{\frac{2\pi L l_0}{\mu_0}}$

B. $\sqrt{\frac{4\pi L l_0}{\mu_0^2}}$

C. $\sqrt{\frac{4\pi L l_0}{\mu_0}}$

D. $\sqrt{\frac{8\pi L l_0}{\mu_0}}$

Answer: C

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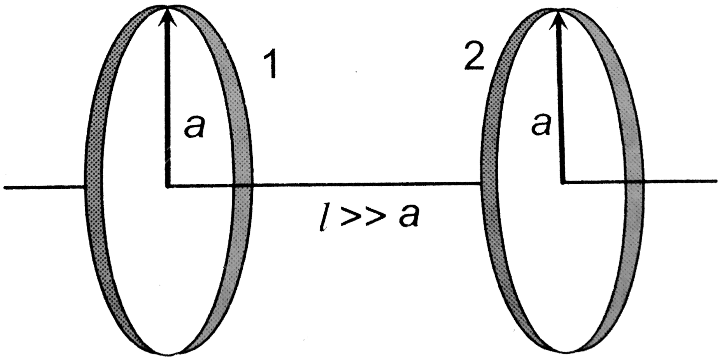
33. What is the mutual inductance of a two-loop system as shown with centre separation l?



A. $\dfrac{\mu_0 \pi a^4}{8l^3}$

B. $\dfrac{\mu_0 \pi a^4}{4l^3}$

C. $\dfrac{\mu_0 \pi a^4}{6l^3}$

D. $\dfrac{\mu_0 \pi a^4}{(2l^3)}$

Answer: D

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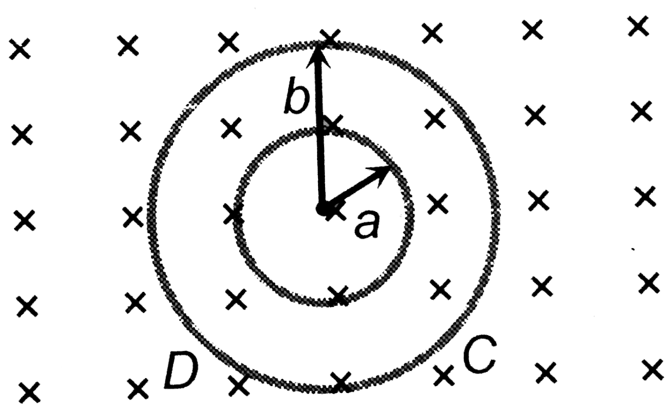
34. Plane figures made of thin wires of resistance $R = 50$ milliohm//metre are located in a uniform magnetic field perpendicular into the plane of the figures and which decrease at the rate $dB/dt = 0.1mT/s$. Then currents in the inner and outer boundary are. (The inner radius $a = 10cm$ and outer radius $b = 20cm$)



A. $10^{-4}A(clockwise), 2\times10^{-4}A(clockwise)$

B. $10^{-4}A(Anticlockwise), 2\times10^{-4}A(clockwise)$

C. $2\times10^{-4}A(clockwise), 10^{-4}A(Anticlockwise)$

D.

$2\times10^{-4}A(Anticlockwise), 10^{-4}A(\text{anticlockwise})$

Answer: A

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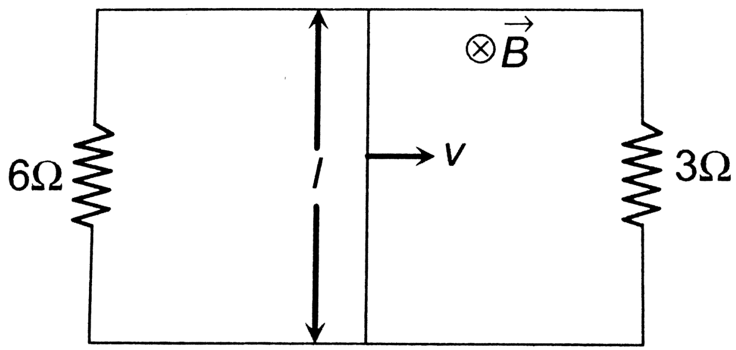
35. A rectangular loop with a sliding connector of length $l = 1.0m$ is situated in a uniform magnetic field $B = 2T$ perpendicular to the plane of loop.

Resistance of connector is $r = 2\Omega$.Two resistance of 6Ω and 3Ω are connector is $r = 2\Omega$. two resistance of 6Ω and 3Ω are connected as shown in figure. the external force required to keep the connector moving with a constant velocity $v = 2m/s$ is



A. $6N$

B. $4N$

C. $2N$

D. $1N$

Answer: C

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36. A Conducting ring of radius 1 meter is placed in an uniform magnetic field B of 0.01 tesla oscillating with frequency $100Hz$ with its plane at right angles to B. What will be the induced electric field?

A. π volt /m

B. 2 volt/m

C. 10 volt/m

D. 62 volt/m

Answer: B

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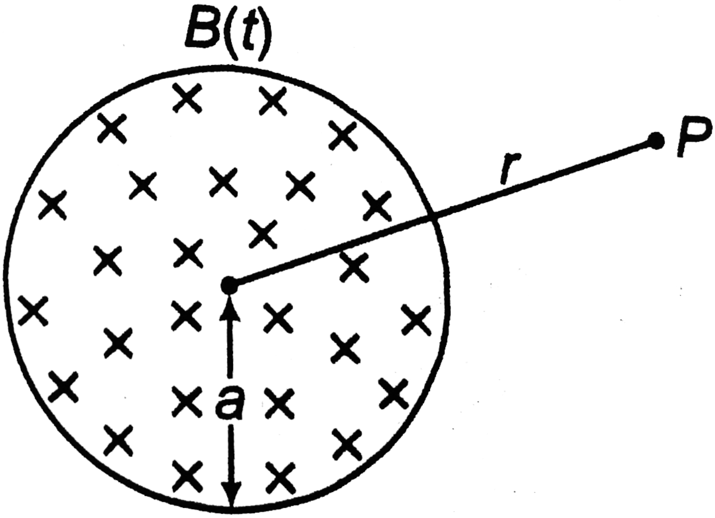
37. A uniform but time varying magnetic field $B(t)$ exist in a circular region of radius a and is directed into the plane of the paper as shown. The magnitude of the induced electric field at point P at a distance r

form the centre of the circular region.



A. is zero

B. decreases as r increases

C. increase as r increases

D. none of the above

Answer: B

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Section B - Assertion Reasoning

1. Assertion: Only a charge in magnetic flux will maintain an induced current in the coil.

Reason: The presence of large magnetic flux through a coil maintains a current in the coil if the circuit is continuous.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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2. Asseration:Magnetic flux can produce induce e.m.f.

Reason:Faraday establishid induced e.m.f. experimentally.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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3. Asseration:The induced e.m.f. and curent will be same in two identical loops of copper and aluminium, when rotated with same speed in the same magnetic field.

Reason:Induced e.m.f. is proportional to rate of change of magnetic field while induced current depends on resistance of wire.

A. If both asseration and reason are true and reason is the correct explanation of assertion.
B. If both asseration and reason are true but reason is not the correct explanation of assertion.
C. If assertion is true but reason is false.
D. If assertion is false but reason is true.

Answer: D

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4. Asseration:Induced coil are made of copper.

Reason:Induced current is more in wire having less resistance.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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5. Asseration:Self-inductance is called the inertia of electricity.

Reason:self-inductance is the phenomenon, according to which an opposing induced e.m.f. is produced in a coil as a result of change in current or magnetic flux linked in the coil.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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6. Asseration: When two coils are wound on each other, the mutual induction between the coils is maximum.

Reason: Mutual induction does not depend on the orientation of the coils.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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7. Assertion: An aircraft files along the meridian, the potential at the ends of its wings will be the same.

Reason: whenever there is change in the magnetic flux e.m.f. induces.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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8. Assertion: A spark occur between the poles of a switch when the switch is opened.

Reason: current flowing in the conductor produces magnetic field.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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9. Asseration:In the phenomenon of mutual induction, self-induction of each of the coil persist.

Reason:self-induction arises when strength of current in same coil changes. In mutual induction, current is changing in both the individual coils.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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10. Lenz's law violates the principle of conservation of energy.

Reason: Induced e.m.f. opposes always the change in magnetic flux responsible for its production.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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11. Asseration: The induced emf in a conducting loop of wire will be non zero when it rotates in a uniform magnetic field.

Reason: The emf is induced due to change in magnetic flux.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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12. Asseration: An artificial satellite with a metal surface is moving above the earth in a circular orbit. A current will be induced in satellite if the plane of the orbit is inclined to the plane of the equator.

Reason: The current will be induced only when the speed of satellite is more than $8km/\sec$

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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13. Asseration A bar magnetic is dropped into a long vertical copper tube. Even taking air resistance as negligible, the magnet attains a constant terminal velocity gets increased.

Reason: The terminal velocity depends on eddy current produced in bar magnet.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

View Text Solution

14. Asseration: A metal piece and a non-metal (stone) piece are dropped from the same height near earth's surface. Both will reach the earth's surface simultaneousely.

Reason: There is no effect of earth's magnetic field on freely falling body.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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15. Asseration: A transformer cannot work on dc supply.

Reason: there is no effect of earth's magnetic field on freely falling body.

A. If both asseration and reason are true and reason is the correct explanation of assertion.
B. If both asseration and reason are true but reason is not the correct explanation of assertion.
C. If assertion is true but reason is false.
D. If assertion is false but reason is true.

Answer: A

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16. Assertion: Soft iron is used as transformer core.

Reason: Soft iron has narrow hysteresis loop.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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17. Asseration: The magnetic flux through a loop of conducting wire of a fixed resistance changes by $\Delta\phi_B$ in a time Δt. Then $\Delta\phi_B$ is proportional to the current through the loop.

Reason: $I = -\frac{\Delta\phi_B}{R})$

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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18. Asseration: An emf is induced in a along solenoid by a bar magnet that moves while totally inside it along the solenoid axis.

Reason: As the magnet moves inside the solenoid the flux through individual turns of the solenoid changes.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

Watch Video Solution

19. Asseration:Lenz's law violates the principle of conservation of energy.

Reason: Induced e.m.f. opposes always the change in magnetic flux responsible for its production.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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20. Assertion: Only a charge in magnetic flux will maintain an induced current in the coil.

Reason: The presence of large magnetic flux through a coil maintains a current in the coil if the circuit is continuous.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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21. Statement I: An eletric lamp is connected in series with a long solenoid of copper with air core and then connected to an ac source. If an iron rod is inserted in the solenoid, the lamp will become dim.

Satement II: If an iron rod is inserted in the solenoid, the inductance of the solenoid increases.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

Watch Video Solution

22. Asseration: The self-inductance (L) is given by ϕ (magnetic flux) =L i (current).

Reason: When current is increased, self-inductance increases.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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23. Asseraton: The work done by a charge in a closed (induced) current carrying loop is non-zero.

Reason: Induced electric field is non-conservative in nature.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

Watch Video Solution

24. Asseration:Lenz's law violates the principle of conservation of energy.

Reason: Induced e.m.f. opposes always the change in magnetic flux responsible for its production.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

Watch Video Solution

25. Asseration: The growth of current in (R_L) circuite is uniform.

Reason: Inductor (L) opposes the growth of current.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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26. Asseration: Magnetic flux linked to closed surface is zero.

Reason: Direction of induced current due to change of magnetic flux is given by faraday's law.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

Watch Video Solution

27. Asseration: Time dependent magnetic field generates electric field.

Reason: Direction of electric field generated from time variable magnetic field does not obey Lenz's law.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

Watch Video Solution

28. Asseration: Induced potential across a coil and therefore induced current is always opposite to the direction of current due to external source.

Reason: Lenz's law states that it always opposes the cause due to which it is being produced.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

Watch Video Solution

29. Asseration: When two coils are wound on each other, the mutual induction between the coils is maximum.

Reason: Mutual induction does not depend on the orientation of the coils.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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30. Asseration: The induced emf in a conducting loop of wire will be non zero when it rotates in a uniform magnetic field.

Reason: The emf is induced due to change in magnetic flux.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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31. Asseration: The direction of induced e.m.f. is always such as to oppose the change that causes it.

Reason: The direction of induced e.m.f. is given by Lenz's Law.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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AIPMTNEET Questions

1. A magnetic field of $2 \times 10^{-2} T$ acts at right angles to a coil of area $100 cm^2$ with 50 turns. The average emf induced in the coil is $0.1 V$, when it is removed from the field in time t. The value of t is

A. 0.1 sec

B. 0.01 sec

C. 1 sec

D. 20 sec

Answer: A

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2. A coil has an area of $0.05m^2$ and it has 800 turns. It is placed perpendicular in a magnitude field of strength $4 \times 10^{-5} Wb/m^2$, it is rotated through 90° in 0.1 sec. the average e.m.f. induced in the coil is

A. $0.056V$

B. $0.046V$

C. $0.026V$

D. $0.016V$

Answer: D

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3. An average induced e.m.f. of $1V$ appears in a coil when the current in it is changed from $10\ A$ in one direction to $10A$ in opposite direction in 0.5 sec. self-inductance of the coil is

A. $25mH$

B. $50mH$

C. $75mH$

D. $100mH$

Answer: A

Watch Video Solution

4. A coil of resistance 10Ω and an inductance $5H$ is connected to a 100 volt battery. Then energy stored in the coil is

A. $12.5J$

B. $125J$

C. $25.0J$

D. $250J$

Answer: D

Watch Video Solution

5. The magnetic flux linked with a coil, in weber, is given by the equation $f = 3T^2 + 4t + 9$. Then the magnitude of induced e.m.f. at $t = 2$ second will be

A. 2 volt

B. 4 votl

C. 8 volt

D. 16 volt

Answer: D

Watch Video Solution

6. The wing span of an aeroplane is 20 metre. It is flying in a field, where the verticle component of magnetic field of earth is 5×10^{-5} tesla, with velocity $360 km / h$. The potential difference produced between the blades will be

A. $0.10V$

B. $0.15V$

C. $0.20V$

D. $0.30V$

Answer: A

Watch Video Solution

7. The magnetic flux through a circuit of resistance R changes by an amount $\Delta\phi$ in a time Δt. Then the total quantity of electric charge Q that passes any point in the circuit during the time Δt is represent by

A. $Q = \frac{1}{r} \cdot \frac{\Delta\phi}{\Delta t}$

B. $Q = \frac{\Delta\phi}{R}$

C. $Q = \frac{\Delta\phi}{\Delta t}$

D. $Q = (R) \cdot \frac{\Delta\phi}{\Delta t}$

Answer: D

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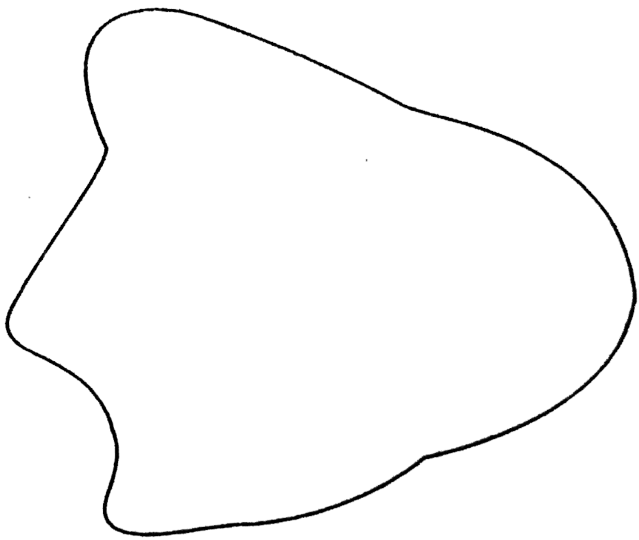
8. As a rejult of change in the magnetic flux linked to the closed loop shown in the figure, an emf V volt is induced in the loop. The work done (joules) in taking a charge Q coulomb once along the loop is



A. QV

B. $zero$

C. $2QV$

D. $\frac{QV}{2}$

Answer: A

View Text Solution

9. Two coils of self-inductance $2mH$ and $8mH$ are placed so close together that the effective flux in one coil is completely linked with the other. The mutual inductance between these coil is

A. $10mH$

B. $6mH$

C. $4mH$

D. $16mH$

Answer: C

Watch Video Solution

10. A long solenoid has 500 turns. When a current of $2A$ is passed through it, the resulting magnetic flux linked with each turn of the solenoid is $4 \times 10^{-3} Wb$. The self-inductance of the solenoid is

A. $2.5H$

B. $2.0H$

C. $1.0H$

D. $4.0H$

Answer: C

Watch Video Solution

11. A rectangular, a square , a circular and an elliptical loop, all in the $(x - y)$ plane, are moving out of a uniform magnetic field with a constant velocity $\overrightarrow{v} = v\hat{i}$. The magnetic field is directed along the negative z-axis direction. The induced emf, during the passage of these loops , out of the field region, will not remain constant for :

A. The rectangular, circular and elliptical loop

B. the circular and the elliptical loops

C. only the elliptical loop

D. any of the four loop

Answer: B

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12. A conducting circular loop is placed in a uniform magnetic field $0.04T$ with its plane perpendicular to the magnetic field. The radius of the loop starts shrinking at $2mm/\sec$. The induced emf in the loop when the radius is $2cm$ is

A. $3.2\pi\mu V$

B. $4.8\pi\mu V$

C. $0.8\pi\mu V$

D. $1.6\pi\mu V$

Answer: A

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13. A conducting circular loop is placed in a uniform magnetic field, $B = 0.025T$ with its plane perpendicular to the loop. The radius of the loop is made to shrink at a constant rate of $1mms^{-1}$. The induced emf when the radius is $2cm$ is

A. $2\pi\mu V$

B. $\pi\mu V$

C. $\frac{\pi}{2}\mu V$

D. $2\mu V$

Answer: B

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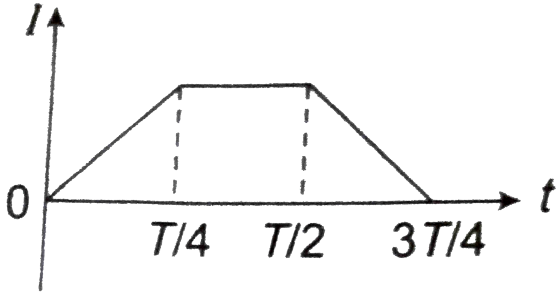
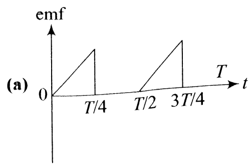
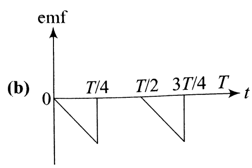
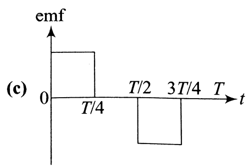
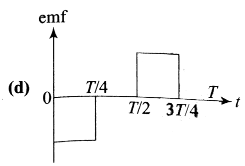
14. The current i in a coil varies with time as shown in the figure. The variation of induced emf with time would be



A. 

B. 

C. 

D. 

Answer: D

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15. A coil of resistance 400Ω is placed in a magnetic field. If the magnetic flux ϕ (wb) linked with the coil varies with time t (sec) as $f = 50t^2 + 4$, the current in the coil at $t = 2$ sec is

A. $1A$

B. $0.5A$

C. $0.1A$

D. $2A$

Answer: B

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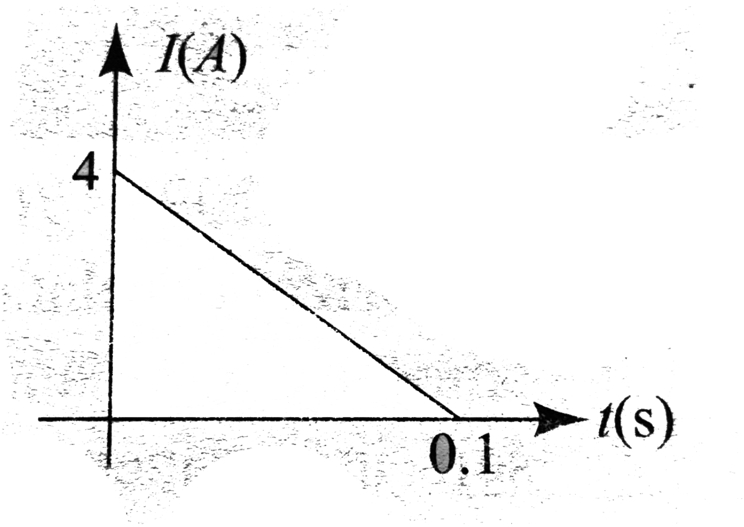
16. Some magnetic flux is changed from a coil of resitance 10Ω. As a result, an induced current is developed it, which varies with time as shown in Fig. 3.213. Find the magnitude of the change in flux through ythe coil in weber.



A. 8

B. 2

C. 6

D. 4

Answer: B

Watch Video Solution

17. A wire loop is rotated in magneitc field. The frequency of change of direction of the induced e.m.f. is.

A. Once per revolution

B. twce per revolution

C. four times per revolution

D. six times per revolution

Answer: B

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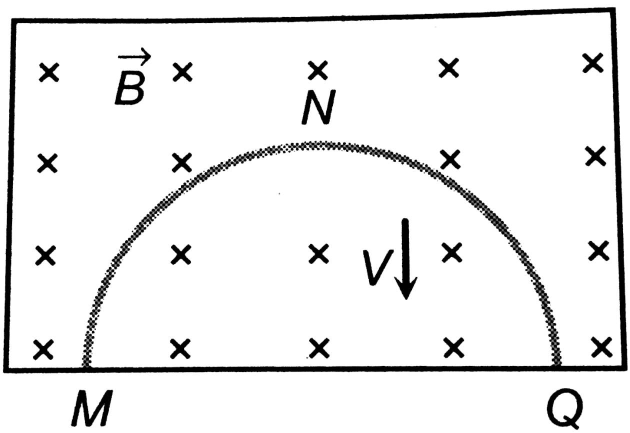
18. A thin semicircular conducting ring of radius R is falling with its plane verticle in a horizontal magnetic inducting B. At the position MNQ, the speed of the ring is V and the potential difference developed across the ring is



A. zero

B. $B v \pi R^2 / 2$ and P is at higer potential

C. $\pi R B v$ and R is at higer potential

D. $2rBv$ and R is at higer potential

Answer: D

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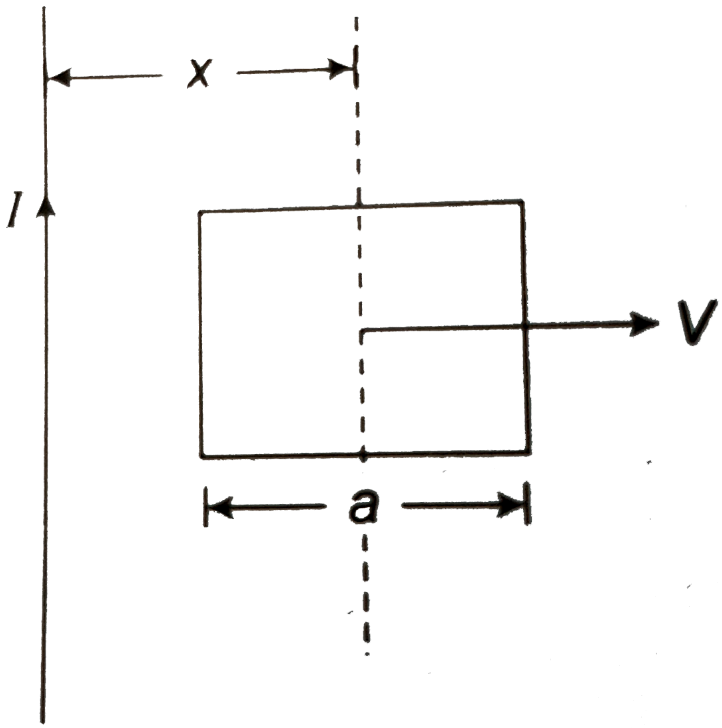
19. A conducting square frame of side $'a'$ and a long straight wire carrying current I are located in the same plane as shown in the figure. The frame moves to the right with a constant velocity $'V'$. The emf induced in the frame will be proportional to



A. $\dfrac{1}{x^2}$

B. $\dfrac{1}{(2x-a)6(2)}$

C. $\dfrac{1}{(2x+a)^2}$

D. $\dfrac{1}{(2x-a)(2x+a)}$

Answer: D

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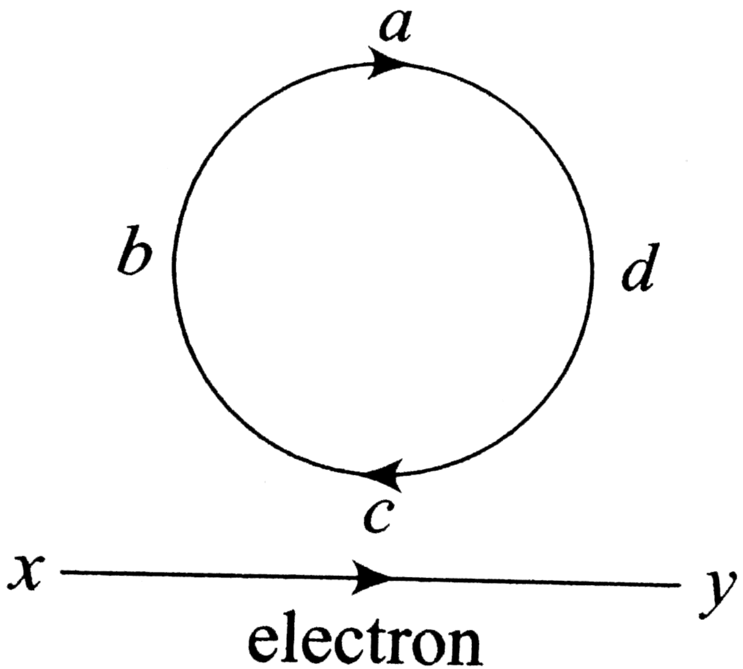
20. An electron moves on a straight line path XY as shown. The $abcd$ is a adjacent to the path of electron. What will be the direction of current, if any, induced in the coil?



A. no current induced

B. $abcd$

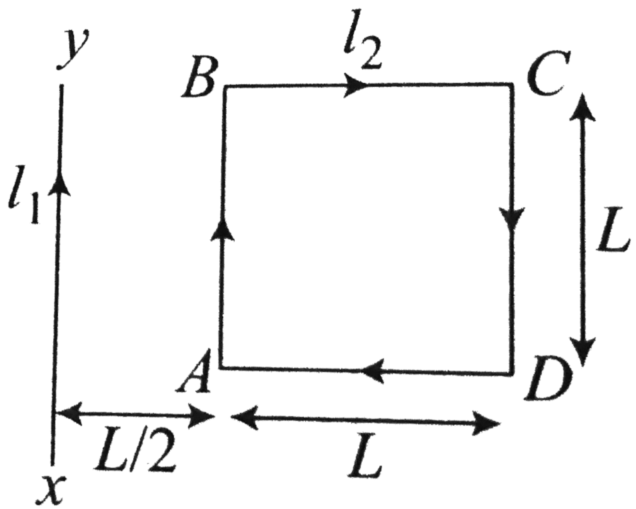
C. $adcb$

D. the current will revers its direction as the electron goes past the coil

Answer: D

Watch Video Solution

21. A sqaure loop $ABCD$, carrying a current I_2 is placed near and coplanar with a long straight conductor XY, carrying a current I_1 as shwon in Figure. The net force on the loop will be



A. $\dfrac{2\mu_0 Li}{3\pi}$

B. $\dfrac{\mu_0 Ii}{2\pi}$

C. $\dfrac{\mu_0 Ii}{2\pi}$

D. $\dfrac{2\mu_0 IiL}{3\pi}$

Answer: A

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22. A long solenoid has 1000 turns. When a current of $4A$ flows through it, the magnetic flux linked with each turn of the solenoid is $4 \times 10^{-3} Wb$. The self-inductance of the solenoid is

A. $1H$

B. $4H$

C. $3H$

D. $2H$

Answer: A

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23. A uniform magnetic field is restricted with a region of radius r. The magnetic field change with time at a rate $d\frac{\overrightarrow{B}}{dt}$. Loop 1 of radius $R > r$ encloses the region r and loop 2 of radius R is outside the region of magnetic field as shown in the figure below. then the e.m.f. genrated is

]

A. $-\frac{\overrightarrow{dB}}{dt}\pi R^2$ in loop 1 and zero in loop 2

B. $-\frac{\overrightarrow{dB}}{dt}\pi r^2$ in loop 1 and zero in loop 2

C. zero in loop 1 and zero in loop 2

D. $-\frac{\overrightarrow{dB}}{dt}\pi R^2$ in loop 1 and $\frac{\overrightarrow{dB}}{dt0\pi r^2}$ in loop 2

Answer: B

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24. A long solenoid of diameter 0.1 m has 2×10^4 turns per meter. At centre of the solenoid is 100 turns coil of radius 0.01 m placed with its axis coinciding with solenoid axis. The current in the solenoid reduce at a constant rate to 0A from 4 A in 0.05 s . If the resistance of the coil is $10\pi^2\Omega$, the total charge flowing through the coil during this time is

A. $16\mu C$

B. $32\mu C$

C. $16\pi\mu C$

D. $32\pi\mu C$

Answer: B

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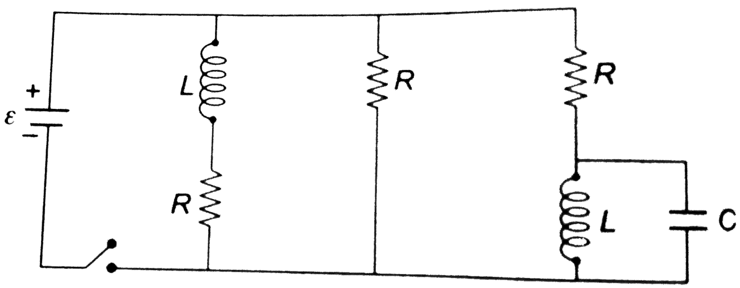
25. Figure shows a circuit that contains three identical resistors with resistance $R = 9.0\Omega$ each, two identical inductors with inductance $L = 2.0 mH$ each, and an ideal battery with emf $e = 18V$. The current i through the battery just after the switch closed is,.....:



A. $0.2A$

B. $2A$

C. 0 ampere

D. $2mA$

View Text Solution

26. The magnetic potential energy stored in a certain inductor is $25mJ$, when the current in the inductor is $60mA$. This inductor is of inductance

A. $13.89H$

B. $0.138H$

C. $1.389H$

D. $138.88H$

Answer: A

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27. An inductor $20mH$, a capacitor $100\mu F$ and a resistor 50Ω are connected in series across a source of emf $V = 10\sin 314t$. The power loss in the circuit is

A. $1.13W$

B. $0.81W$

C. $2.74W$

D. $0.43W$

Answer: B

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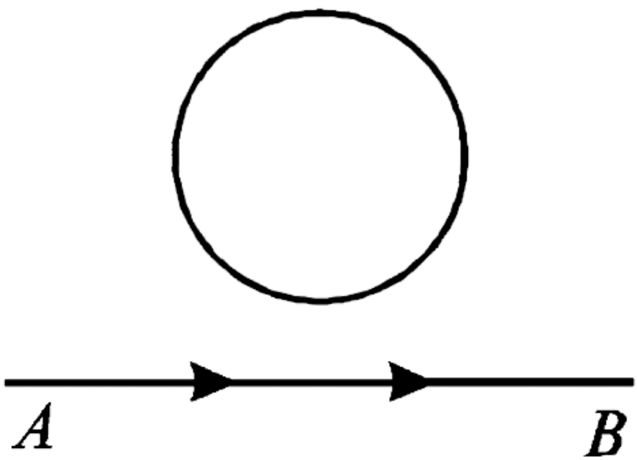
AIIMS Questions

1. A current from A to B is increasing in magnitude. What is the direction of induced current. If any,in the loop as shown in the figure?



A. clockwise

B. anti-clockwise

C. straight line

D. none of the above

Answer: A

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2. In a circuit the coil of a choke

A. increase the current

B. has high resistance to DC circuit

C. decrease the current

D. no effect with the current

Answer: C

View Text Solution

3. The coefficient of mutual inductance when magnetic flux change by $2 \times 10^{-2} Wb$ and current changes by $0.01 A$, will be

A. $4H$

B. $3H$

C. $8H$

D. $2H$

Answer: D

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4. A lamp consumes only 50% of peak power in an $a.c.$ circuit. What is the phase difference between the applied voltage and the circuit current

A. $\frac{\pi}{6}$

B. $\frac{\pi}{3}$

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

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

Answer: B

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5. A conducting ring of radius $1m$ is placed in a uniform magnetic field B of $0.01T$ oscillating with frequency $100Hz$ with its plane at right angle to B. What will be the induced electric field?

A. $\pi V / m$

B. $10V / m$

C. $2V / m$

D. $62V / m$

Answer: C

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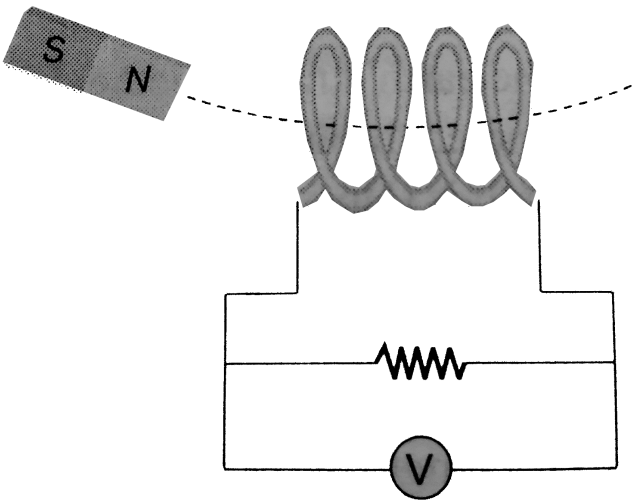
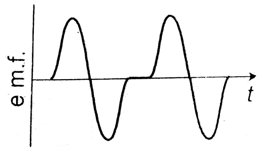
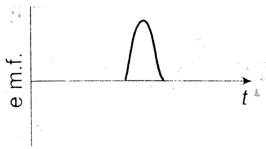
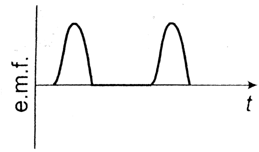
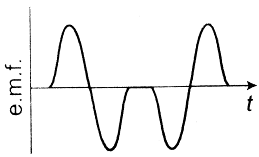
6. A magnetic is made to oscillate with a particular frequency, passing through a coil as shown in figure. The time variation of the magnitude of e.m.f. generated across the coil during one cycle is



A. 

B. 

C. 

D. 

Answer: A

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7. A conducting ring of radius 1 meter is placed in an uniform magnetic field B of 0.01 tesla coscilliating with frequency $100Hz$ with its plane at right angles to B. What will be the induced electric field.

A. $\pi vo < \ / m$

B. $2vo < \ / m$

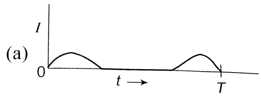
C. $10vo < \ / m$

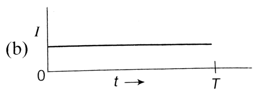
D. $20vo < \ / m$

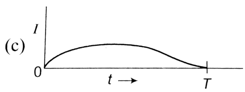
Answer: B

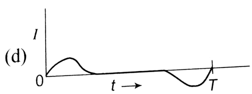
View Text Solution

8. A metalic ring is dropped down, keeping its plane perpendicular to a constant and horizontal magnetic field. The ring enters the region of mangetic fied at $t = 0$ and completely emerges out $t = Ts$. The current in the ring varies as:

A. 

B. 

C. 

D. 

Answer: D

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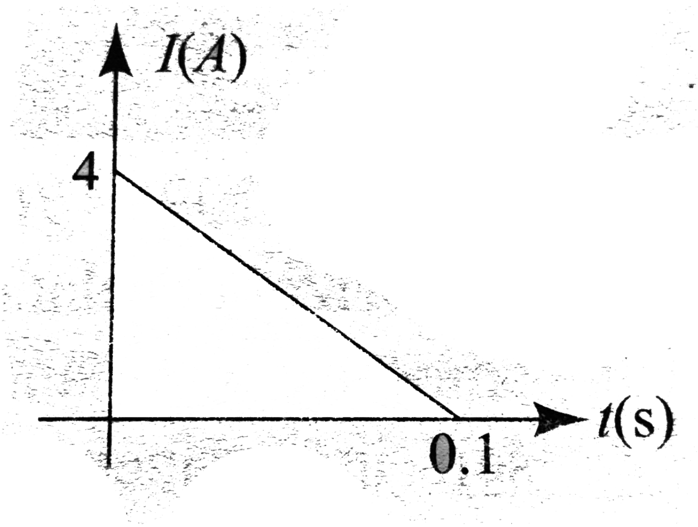
9. Some magnetic flux is changed from a coil of resitance 10Ω. As a result, an induced current is developed it, which varies with time as shown in Fig. 3.213. Find the magnitude of the change in flux through ythe coil in weber.



A. 2

B. 4

C. 6

D. none of these

Answer: A

Watch Video Solution

10. The primary winding of a transformer has 100 turns and its secondary winding has 200 turns. The primary is connected to an ac supply of $120V$ and the current flowing in it is $10A$. The voltage and the current in the secondary are

A. $240V, 5A$

B. $240V, 10A$

C. $60V, 20A$

D. $120V, 20A$

Answer: A

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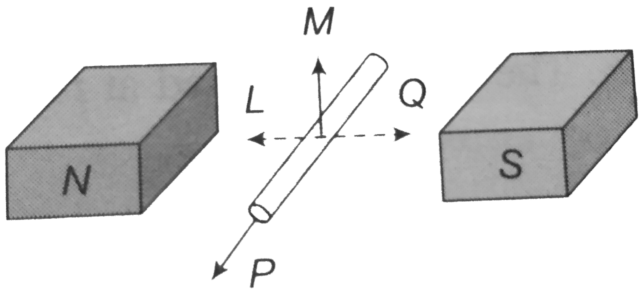
11. An electric potential difference will be induced between the ends of the conductor shown in the diagram, when the conductor moves in the direction



A. P

B. Q

C. L

D. M

Answer: D

View Text Solution

12. Two identical circular loops of metal wire are lying on a table without touching each other. Loop-A carries a current which increases with time. In response, the loop-B

A. remains stationary

B. is attracted by the loop-A

C. is repelled by the loop-A

D. rotates about its CM, with Cm fixed (CM is the centre of mass)

Answer: C

Watch Video Solution

13. Two conducting circular loops of radii R_1 and R_2 are placed in the same plane with their centres coincidingt. Find the mutual inductane between them assuming $R_2 < \; < R_1$.

A. $\frac{-(1)}{R_2}$

B. $\frac{R_2}{R_1}$

C. $\frac{R_1^2}{R_2}$

D. $\frac{R_2^2}{R_1}$

Answer: D

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14. The two rails of a railway track, insulated from each other and the ground, are connected to a milli voltmeter. What is the reading of the milli voltmeter when a train travels at a speed of $180 km / hours$ along the track, given that the vertical components of earth's magnitic field is $0.2 \times 10^{-4} weber / m^2$ & the rails are separated by 1 meter?

A. 10^{-2}volt

B. 10^{-4}volt

C. 10^{-3} volt

D. 1 volt

Answer: C

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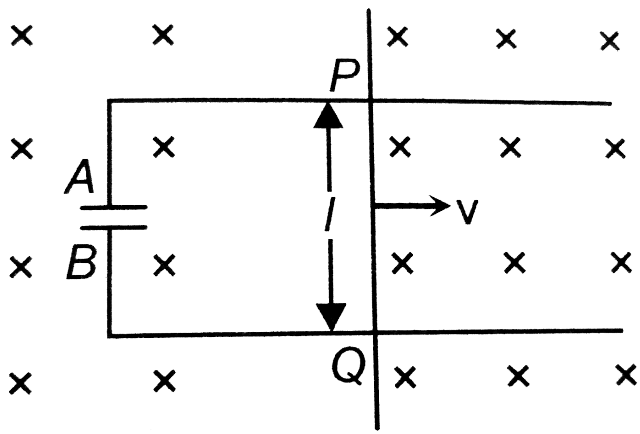
15. A conducting rod PQ of length $l = 1.0m$ is moving with a uniform speed $v2.0m/s$ in a uniform magnetic field $B = 4.0T$ directed into the paper.

A capacitor of capacity $C = 10\mu F$ is connected as shown in figure. Then



A. $q_A = +80\mu C$ and $q_B = -80\mu C$

B. $q_A = -80\mu C$ and $q_B = +80\mu C$

C. $q_A = 0 = q_B$

D. Charge stored in the capacitor increase exponentially with time

Answer: A

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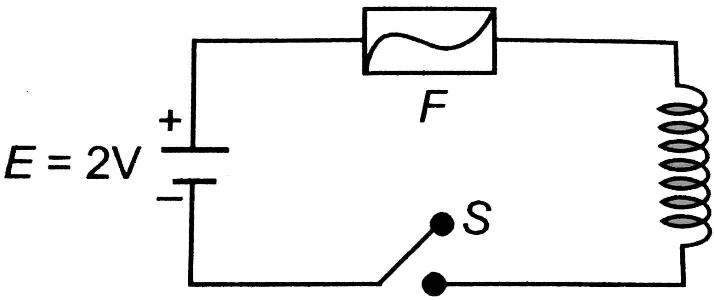
16. In the circuit shown, the cell is deal. The coil has an inductance of $4H$ and zero resistance. F is a fuse of zero resistance and will blow when the current through it reaches $5A$. The switch is closed at $t = 0$.

The fuse will blow:



A. almost at once

B. after 2 sec

C. after 5 sec

D. after 10 sec

Answer: D

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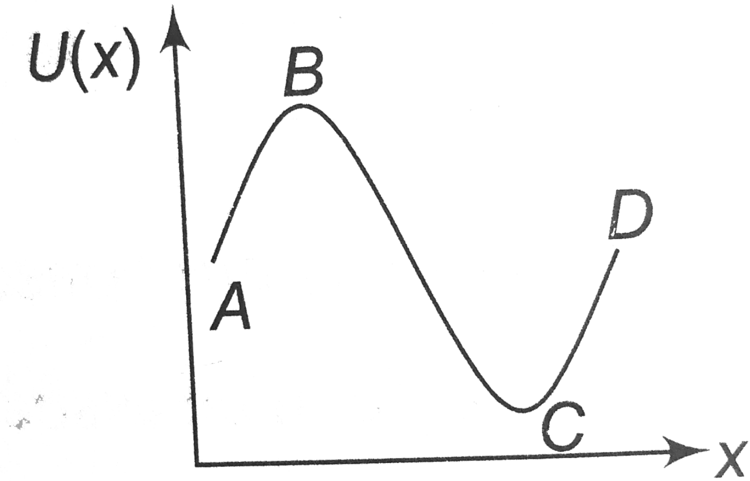
17. The potential energy of a partical veries with distance x as shown in the graph.



The force acting on the partical is zero at

A. C

B. B

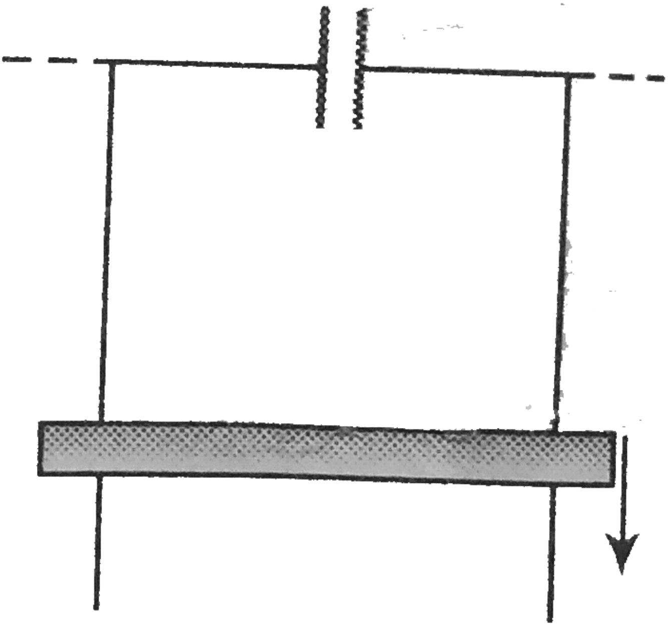
C. B and C

D. A abd D

Answer: C

Watch Video Solution

18. Two vertical conducting rails separted by distance $1.0m$ are placed parallel to z-axis as shown in figure. At $z = 0$, a capacitor of $0.15F$ is connected between the rails and a metal rod of mass $100g$ placed across the rails slides down along the rails. if a constant magnetic fields of $2.0\,T$ exists perpendicular to the plane of the rails, what is the acceleration of the rod?



A. $2.5m / s^2$

B. $zero$

C. $9.8m / s^2)$

D. $1.4m / s^2)$

Answer: D

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19. A patient is slowly pushed in a time of $10s$ within the coils of the magnet of MRI machine where magnetic field is $B = 2.0T$. If the patient's trunk is $0.8m$ in circumference, the induced emf around the patient's trunk is

A. $10.18 \times 10^{-3} V$

B. $10.18 \times 10^{-2} V$

C. $9.66 \times 10^{2} V$

D. $1.51 \times 10^{-2} V$

Answer: A

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20. A circular coil of radius 10 cm, 500 turns and resistance 2 Omega is placed with its plane prependicular to the horizontal component of the earth's magnetic field. It is rotated about its vertical diameter through 180° in 0.25 s. Estimate the magnitude of the e.m.f and current induced in the coil. Horizotal component of earth's magnetic field at the place is $3 \times 10^{-5} T$.

A. $3.9 \times 10^{-3} A$

B. $2.9 \times 10^{-3} A$

C. $1.9 \times 106(-3) A$

D. $4.9 \times 10^{-3} A$

Answer: C

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21. A wire of some length is bent in the form of a ring of diameter $2a$ having self inductance L, then L will depend upon a as:

A. a^{0}

B. a^{-1}

C. a^2

D. a^{-2}

Answer: B

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22. In a series LR circuit $(L = 3H, R = 1.5\Omega)$ and DC voltage $= 1V$. Find current at $T = 2$ seconds.

A. $0.1A$

B. $2A$

C. $3A$

D. $0.4A$

Answer: D

Watch Video Solution

23. Assertion: The probability of an electric bulb fusing is higher at the time of switching ON and OFF.

Reason: Inductive effects produce a surge at the time of switch OFF and switch ON.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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24. Assertion : An electric motor will have maximum efficiency when back emf becomes equal to half of applied emf.

Reason : Efficiency of electric motor depends only on magnitude of back emf.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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25. Assertion: In electric circuits, wires carrying currents in opposite directions are often twised together.

Reason: If the wires are not twisted together, the combination of the wires formes a current loop, the magnetic field generated by the loop might affect adjacent circuits of components.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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26. Assertion: Only a charge in magnetic flux will maintain an induced current in the coil.

Reason: The presence of large magnetic flux through a coil maintains a current in the coil if the circuit is continuous.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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27. Assertion: In series LCR circuit resonance can take place.

Reason: Resonance takes place if inductance and capacitive reactance are equal and opposite.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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Section D - Chapter End Test

1. Two pure inductors each of self-inductance L are connected in parallel but are well separted from each other. The total inductance is

A. $2L$

B. L

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

D. $\frac{L}{4}$

Answer: C

Watch Video Solution

2. A coil and a bulb are connected in series with a dc source, a soft iron core is then inserted in the coil. Then

A. Intensity of the bulb remains in the same

B. intensity of the bulb decreases

C. intensity of the bulb increases

D. the bulb ceases to glow

Answer: B

Watch Video Solution

3. The current flowing in a coil of self-inductance $0.4 mH$ is increased by $250 mA$ in 0.1 sec. the e.m.f. induced will be

A. $+1V$

B. $-1V$

C. $+1mV$

D. $-1mV$

Answer: D

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4. $5cm$ long solenoid having 10 ohm resistance and $5mH$ induced is joined to a 10 volt battery. At steady state the current through the solenoid in apmpere will be

A. 5

B. 1

C. 2

D. zero

Answer: B

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5. A solenoid has an inductance of 60 henrys and a resistance of 30 ohms. If it is connected to a 100 volt battery. How long will it take for the current to reach $\frac{e-1}{e} \cong 63.2\%$ of its final value

A. 1 second

B. 2 seconds

C. e seconds

D. $2e$ seconds

Answer: B

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6. In a circular conducting coil, when current increases from $2A$ to $18A$ in 0.05 sec., the induced e.m.f. is $20V$. The self-inductance of the coil is

A. $62.5mH$

B. $6.25mH$

C. $50mH$

D. none of these

Answer: A

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7. Find out the e.m.f. produced when the current change from 0 to $1A$ in 10 second, given L=10mH`

A. $1V$

B. μV

C. $1mV$

D. $0.1V$

Answer: B

Watch Video Solution

8. A coil of 100 turns carries a current of $5mA$ and creates a magnetic flux of 10^{-5}weber. The inductance is

A. $0.2mH$

B. $2.0mH$

C. $0.02mH$

D. none of these

Answer: B

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9. If the current $30A$ flowing in the primary coil is made zero in 0.1 sec. the emf induced in the secondary coil is 1.5 volt. The mutual inductance between the coil is

A. $0.005H$

B. $1.05H$

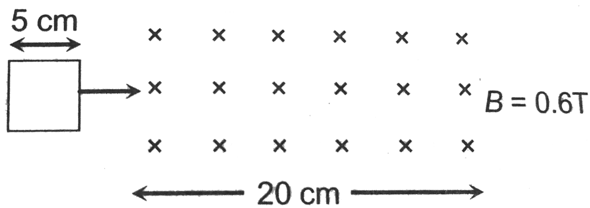
C. $0.1H$

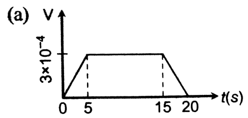
D. $0.2H$

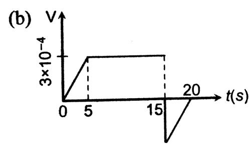
Answer: A

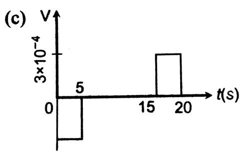
Watch Video Solution

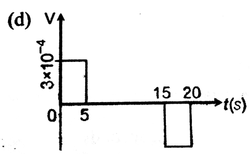
10. A square loop of side 5 cm enters a magnetic field with $1cms^{-1}$. The front edge enters the magnetic emf?



A. 

B. 

C. 

D. 

Answer: C

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11. A small coil is introduced between the poles of an electromagnet so that its axis coincides with the magnetic field direction. The number of turns is n and the cross sectional area of the coil is A. When the coil turns through 180° about its diameter, the charge flowing through the coil is Q. the total resistance of the circuit is R. what is the magnitude of the magnetic induction?

A. $\frac{QR}{nA}$

B. $\frac{2QR}{nA}$

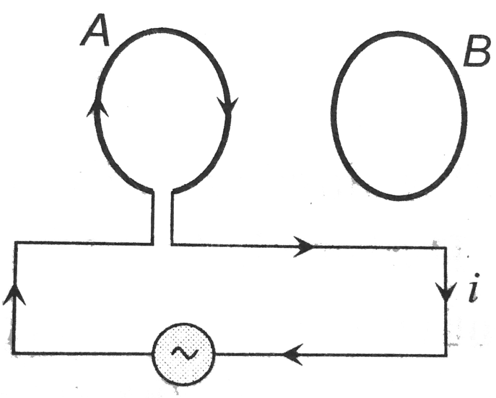
C. $\frac{Qn}{2RA}$

D. $\frac{QR}{2nA}$

Answer: D

Watch Video Solution

12. Two circular coils A and B are facing each other as shown in figure. The current i through A can be altered



A. There will be repulsion between A and B if i is increased

B. There will be attraction between A and B if i is increased

C. There will be neither attraction nor repulsion when i is changed

D. Attraction or replusion between A and B dependes on the direction of current. If does not depend wheter the current is increase or decreased

Answer: A

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13. If in a coil rate of change of area is $\frac{5meter^2}{milli\sec ond}$ and current become $1amp$ from $2amp$ in 2×10^{-3} sec. if magnetic field is 1 Tesla then self-inductance of the coil is

A. $2H$

B. $5H$

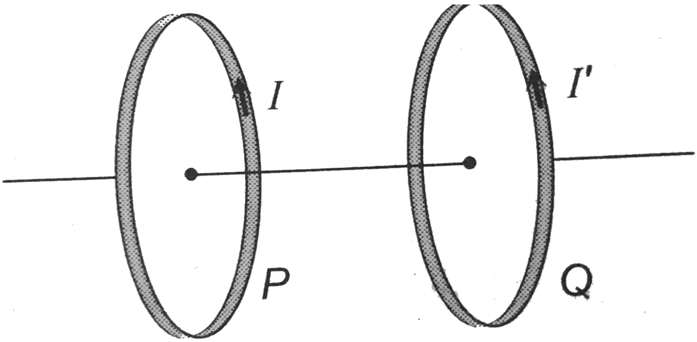
C. $20H$

D. $10H$

Answer: D

Watch Video Solution

14. Two coils P and Q are placed co-axially and carry current I and I' respectively



A. If $I'=0$ and P moves towards Q, a current in the same direction as I is induced in Q

B. If $I'=0$ and Q moves towards P, a current in the same direction as I is induced in P

C. When $I = 0$ and $I' \neq 0$ are in the same direction, then two coil tend to move apart

D. none of these

Answer: B

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15. The phase difference between the flux linkage and the induced e.m.f. in a rotating coil in a uniform magnetic field

A. π

B. $\pi / 2$

C. $\pi / 4$

D. $\pi / 6$

Answer: B

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16. A hundred turns of insulated copper wire are wrapped around an iron cylinder of area $1 \times 10^{-3} m^2$ and are connected to a resistor. The total resistance in the circuit is 10 ohms. If the longitudinal magnetic induction in the iron changes from 1 weber m^{-2}, in one direction to 1 weber m^{-2} in the opposite direction, how much charge flows through the circuit

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

B. $2 \times 10^{-3} C$

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

D. $2 \times 10^{-5} C$

Answer: A

Watch Video Solution

17. In circular coil, when no. of turns is doubled and resistance becomes $\frac{1}{4}th$ of initial, then inductance becomes

A. 4time

B. 2 times

C. 8 times

D. no change

Answer: A

Watch Video Solution

18. In a transformer, number of turns in the primary coil are 140 and that in the secondary coil are 280. If current in the primary coil is 4A, then that in the secondary coil is

A. $4A$

B. $2A$

C. $6A$

D. $10A$

Answer: B

Watch Video Solution

19. Two coil are placed close to each other. The mutual inductance of the pair of coils depends upon.

A. The currents in the two coils

B. The rates at which currents are changing in the two coils

C. Relative position and orientation of the two coils

D. the material of the wires of the coils

Answer: C

Watch Video Solution

20. When the current changes from $+2A$ to $-2A$ in 0.05 second, an e.m.f. of $8V$ is induced in a coil. The coefficient of self-induction of the coil is

A. $0.1H$

B. $0.2H$

C. $0.4H$

D. $0.8H$

Answer: A

Watch Video Solution

21. A coil having n turns and resistance $R\Omega$ is connected with a galvanometer of resistance $4R\Omega$. This combination is moved in time t seconds from a magnetic field W_1 weber to W_2 weber. The induced current in the circuit is

A. $-\dfrac{W_2 - W_1}{5Rnt}$

B. $-\dfrac{n(W_2 - W_1)}{5rt}$

C. $-\frac{(W_2 - W_1)}{Rnt}$

D. $-\frac{n(W - (2) - W_1)}{Rt}$

Answer: B

Watch Video Solution

22. A metal conductor of length 1m rotates vertically about one of its ends at angular velocity 5 radians per second. If the horizontal component of earth's magnetic field is $0.2 \times 10^{-4} T$, then the emf developed between the two ends of the conductor is

A. $5mV$

B. $5 \times 10V$

C. $50mV$

D. $50\mu V$

Answer: D

Watch Video Solution

23. A coil of inductance $300mh$ and resistance 2Ω is connected to a source of voltage $2V$. The current reaches half of its steady state value is

A. $0.15s$

B. $0.3s$

C. $0.05s$

D. $0.1s$

Answer: D

Watch Video Solution

24. A small square loop of wire of side l is placed inside a large square loop of wire of side $L(L > > l)$. The loops are coplanar and their centre coincide. What is the mutual inductance of the system ?

A. l / L

B. l^2 / L

C. L/l

D. L^2/l

Answer: B

Watch Video Solution

25. A circular loop of radius R, carrying current I, lies in $x-y$ plane with its center at origin. The total magnetic flux through $x-y$ plane is

A. directly proportional to I

B. directly proportional to R

C. directly proportional to R^2

D. zero

Answer: D

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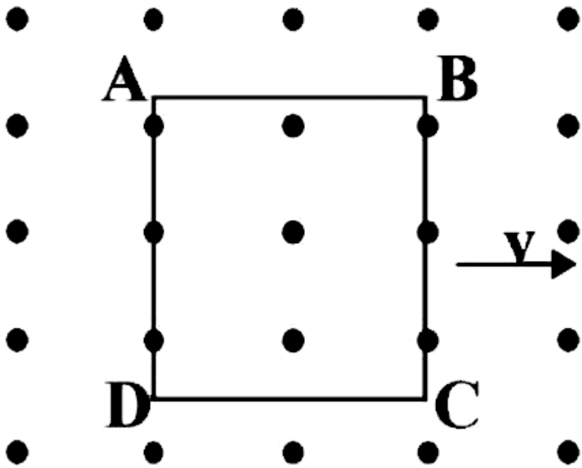
26. A metallic square loop ABCD is moving in its own plane with velocity v in a uniform magnetic field perpendicular to its plane as shown in the figure. An electric field is induced



A. in AD, but not in BC

B. In BC, but not in AD

C. neither in AD nor in BC

D. in both AD and BC

Answer: D

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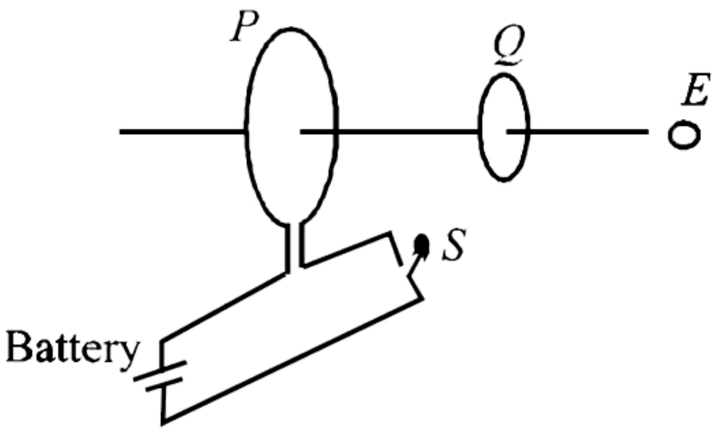
27. As shown in the figure, P and Q are two coaxial conducting loops separated by some distance. When the switch S is closed, a clockwise current I_P (as seen by E) and an induced current I_{Q1} flows in Q. The switch remains closed for a long time. when S is opened, a current I_{Q2} flows in Q. Then the direction IQ_1 and IQ_2 (as seen by E) are



A. Respectively clockwise and anticlockwise

B. both clockwise

C. both anticlockwise

D. respectively anticlockwise and clockwise

Answer: D

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28. A short-circuited coil is placed in a time-varying magnetic field. Electrical power is dissipated due to the current induced in the coil. If the number of turns were to be quadrupled and the wire radius halved, the electrical power dissipated would be

A. Halved

B. the same

C. doubled

D. quadrupled

Answer: B

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29. Assertion: The quantity L/R possesses dimensions of time.

Reason: To reduce the rate of increases of current through a solenoide should increase the time constant (L/R).

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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30. Asseration: Acceleration of a magnet falling through a long soleneoid decreases.

Reason: the induced current produced in a circuit always flow in such direction that it opposes the change or the cause the produced it.

A. If both asseration and reason are true and reason is the correct explanation of assertion.

B. If both asseration and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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Others

1. Lenz's law is consequence of the law of conservation of

A. Charge

B. momentum

C. mass

D. energy

Answer: D

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2. Two circular, similar, coaxial loops carry equal currents in the same direction. If the loops are brought nearer, what will happen?

A. current will increase in each loop

B. current will decrease in each loop

C. current will remain same in each loop

D. current will increase in one and decrease in the other

Answer: B

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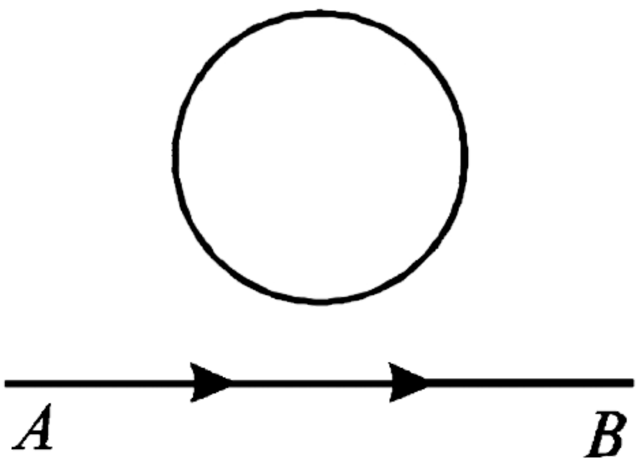
3. A current from A to B is increasing in magnitude. What is the direction of induced current, If any, in the loop as shown in the figure?



A. No current will be induced

B. the current will be clockwise

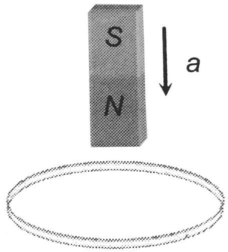
C. the current will be anticlockwise

D. the current will change direction as the electron passes by

Answer: D

Watch Video Solution

4. A metallic ring is attached with the wall of a room. When the north pole of a magnet is brought near to it, the induced current in the ring will be



A. First clock then anticlockwise

B. in clockwise direction

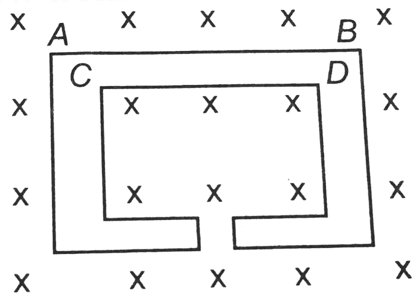
C. in anticlockwise direction

D. first anticlockwise then clockwise

Answer: C

Watch Video Solution

5. 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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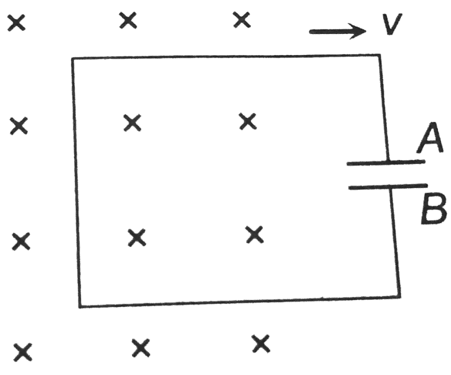
6. A conductuing loop having a capacitor is moving outward from the magnetic field. Which plate of the capacitor will be positive?



A. plate-A

B. plate-B

C. plate-A and plate -B both

D. none

Answer: A

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7. 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 e.m.f. is induced in all three rings.

B. no e.m.f. is induced in any of the rings.

C. in each ring all points are at same potential

D. B develops max, induced e.m.f. and A, the least.

Answer: A

Watch Video Solution

8. The current flowing in two coaxial coils in the same direction. On increasing the distance the two, the electric current will

A. increase

B. decrease

C. remain unchanged

D. the information is incomplete

Answer: A

Watch Video Solution

9. A magnet is brought towards a coil (i) speedily (ii) slowly then the induced e.m.f.//induced charge will be respectively

A. more in first case//more in first case

B. more in first case //equal in both case

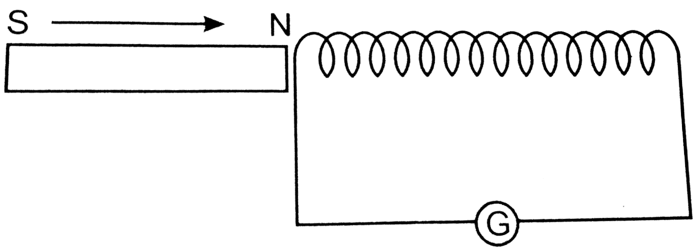
C. less in first case //more in second case

D. less in first case // equal in both case

Answer: B

Watch Video Solution

10. As shown in the figure, a magnetic is moved with a a fast speed towards a coil at rest. Due to this, induced electromotive force, induced charge in the coil are E, I and Q respectively. If the speed of magnetic is doubled, the incorrect statement is



A. E increases

B. I increase

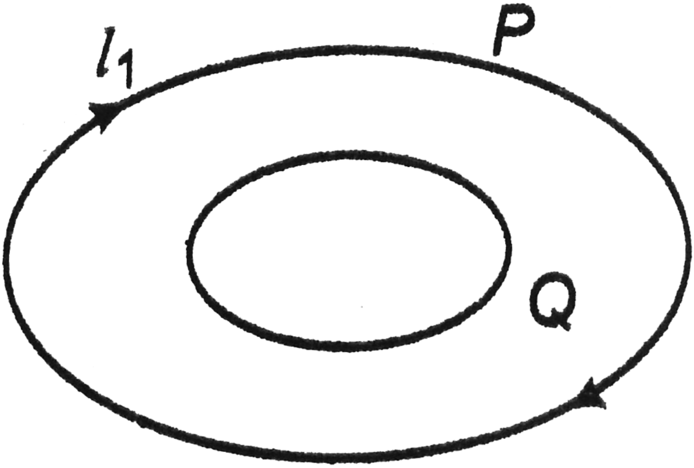
C. Q remains same

D. Q increases

Answer: D

Watch Video Solution

11. Two circular loops P and Q are concentric and coplanar as shown in figure. The loop Q is smaller than. P. If the current I_1 flowing in loop P is decreasing with time, then the current I_2 in the loop Q



A. Clockwise

B. zero

C. counter clockwise

D. in a direction that depends on the ratio of the loop radii

Answer: C

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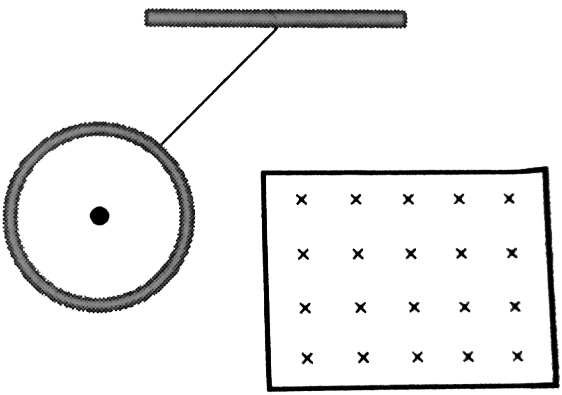
12. A metallic ring connected to a rod oscillates freely like a pendulum. If now a magnetic field is applied in horizontal direction so that the pendulum now swings through the field, the pendulum will



A. keep oscillating with the old time period

B. keep oscillating with a smaller time period

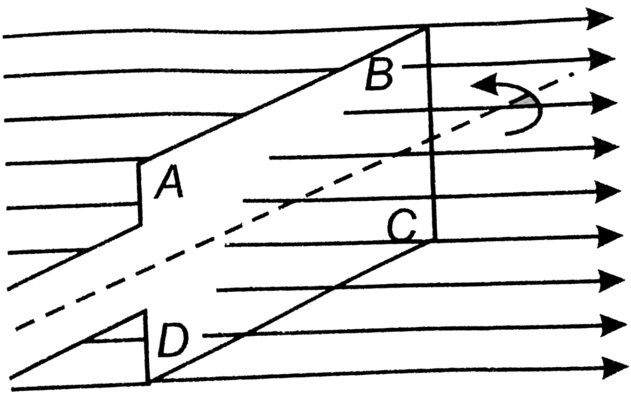
C. keep oscillating with a larger time period

D. come to rest very soon

Answer: D

Watch Video Solution

13. A rectangular coil ABCD is rotated anticlockwise with a uniform angular velocity about the axis shown In the fig. the axis of rotation of the coil as well as the magnetic field B are horizontally.the induced emf in the coilwould be minimum when the plane of the coil



A. is horizontal

B. makes an angle of 45° with the direction of magnetic field

C. is at right angle to the magnetic field

D. makes an angle of 30° with the magnetic field.

Answer: C

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14. Lenz's law is consequence of the law of conservation of

A. energy

B. energy and magnetic field

C. charge

D. magnetic field

Answer: A

Watch Video Solution

15. A magnet is dropped down an infinitely long vertical copper tube

A. the magnet moves with continuously increasing velocity and ultimately acquires a constant terminal velocity

B. the magnet moves with continuously decreasing velocity and ultimately comes to rest

C. the magnet moves with continuously increasing velocity but constatnt accleration

D. the magnet moves with continuously increasing velocity and acceleration

Answer: A

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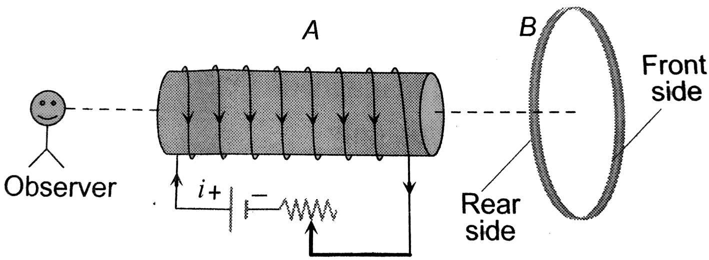
16. An Aluminium ring B faces an electromagnet A. The current I through A can be altered



A. wheter I increases or decreases, B will not experience any force

B. If I decreases, A will repel B

C. If I increasing , A will attract B

D. If I increasing , A will repel B

Answer: D

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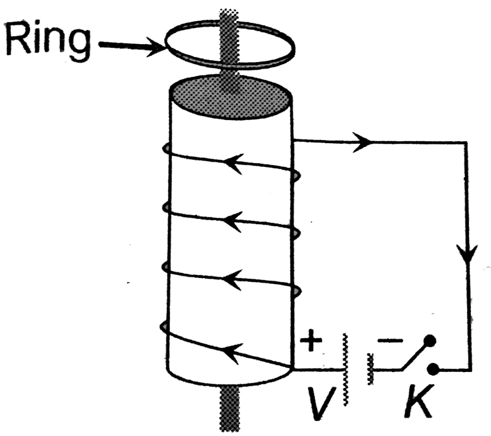
17. A conducting ring is placed around the core of an electromagnet as shown in fig. when key K is pressed, the ring



A. remain stationary

B. is attracted towards the electromagnet

C. jumps out of the core

D. none of the above

Answer: C

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18. A circular coil and a bar magnet placed nearby are made to move in the same direction. The coil covers a distance of $1m$ in $0.5 \sec$ and the magnet a distance of $2m$ in $1 \sec$. The induced emf produced in the coil

A. zero

B. $I\ V$

C. $0.5V$

D. cannot be determined from the given information

Answer: A

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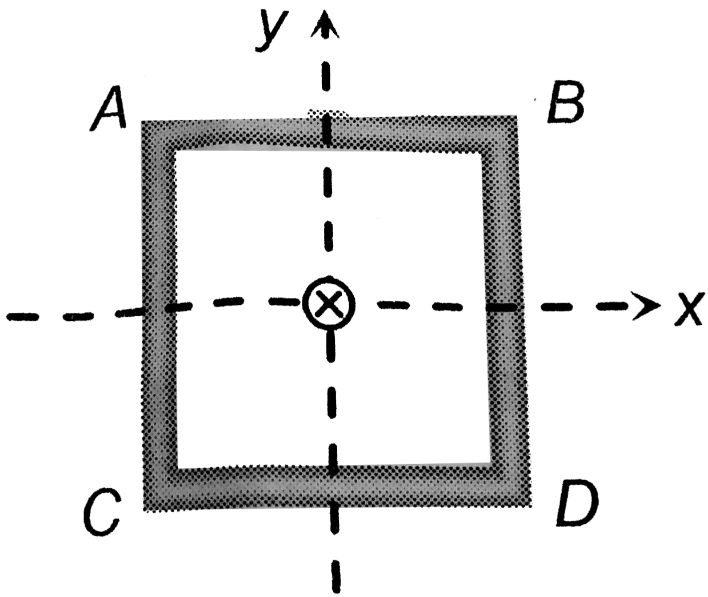
19. A square coil ABCD lying in $x-y$ plane with its centre at origin. A long straight wire passing through origin carries a current $i=2t$ in negative z-direction.

The induced current in the coil is



A. clockwise

B. anticlockwise

C. alternating

D. zero

Answer: D

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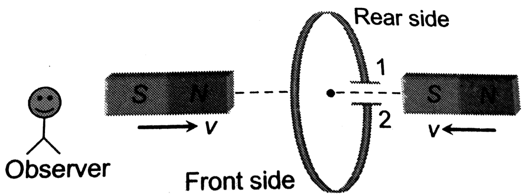
20. The north and south poles of two identical magnets approach a coil, containing a condenser, with equal speeds from opposite sides. Then



A. Plate 1 will be negative and plate 2 positive

B. Plate 1 will be positive and plate 2 negative

C. both the plates will be positive

D. both the plates will be negative

Answer: B

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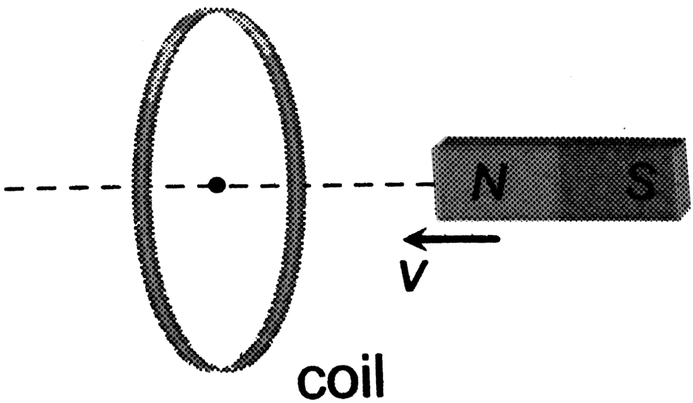
21. In the following figure, the magnet is moved towards the coil with a speed v and induced emf is e. if magnet and coil reced away from one another each moving with speed v, the induced emf in the coil will be



A. e

B. $2e$

C. $e/2$

D. $4e$

Answer: B

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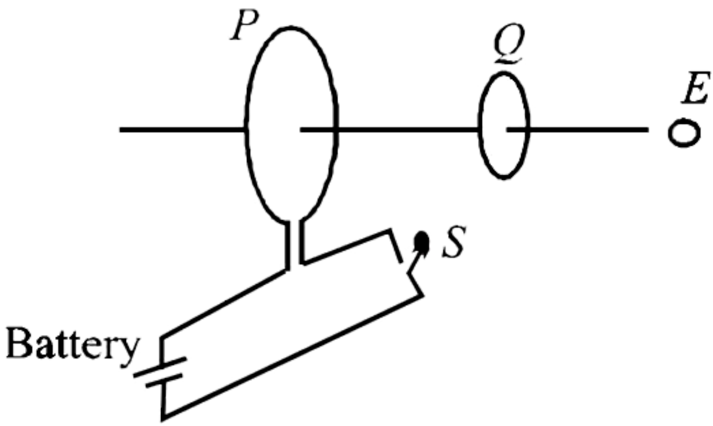
22. As shown in the figure, P and Q are two coaxial conducting loops separated by some distance. When the switch S is closed, a clockwise current I_P (as seen by E) and an induced current I_{Q1} flows in Q. The switch remains closed for a long time. when S is opened, a current I_{Q2} flows in Q. Then the direction IQ_1 and IQ_2 (as seen by E) are



A. Respectively clockwise and anticlockwise

B. both clockwise

C. both anticlockwise

D. respectively anticlockwise and clockwise

Answer: D

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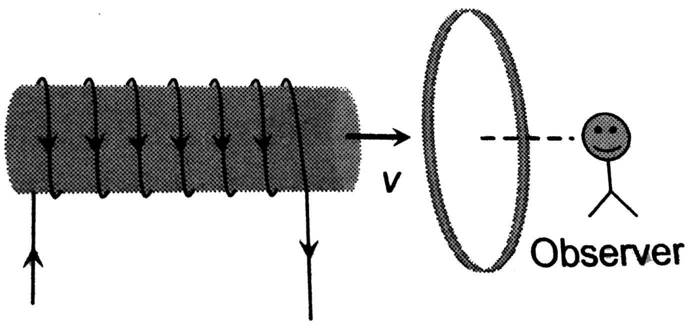
23. A current carrying solenoid is approaching a conducting loop as shown in the figure. The direction of induced current as observed by an observer on the other side of the loop will be



A. Anticlockwise

B. clockwise

C. east

D. west

Answer: B

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24. If a copper ring is moved quickly towards south pole of a powerful stationary bar magnet, then

A. current flows through the copper ring

B. voltage in the magnet increase

C. current flows in the magnet

D. copper ring will get magnetized

Answer: A

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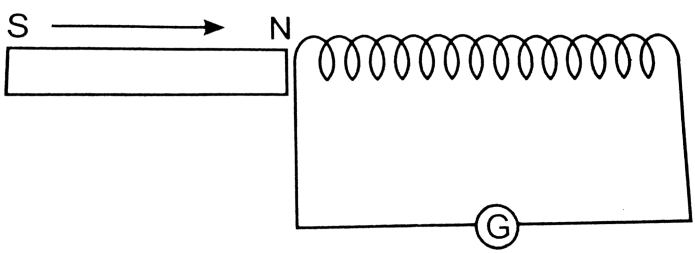
25. As shown in the figure, a magnetic is moved with a a fast speed towards a coil at rest. Due to this, induced electromotive force, induced charge in the coil are E, I and Q respectively. If the speed of magnetic is doubled, the incorrect statement is



A. E increases

B. I increases

C. Q remains same

D. Q increases

Answer: D

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26. Magnetic flux in a circuit containing a coil of resistance 2Ω change from $2.0Wb$ to $10Wb$ in $0.2\,\text{sec.}$ The charge passed through the coil in this time is

A. $0.8C$

B. $1.0C$

C. $5.0C$

D. $4.0C$

Answer: D

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27. The magnetic flux linked with a circuit of resistance $100 ohm$ increase from 10 to 60 webers. The amount of induced charge that flows in the circuit is (in coulomb)`

A. 0.5

B. 5

C. 50

D. 100

Answer: A

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28. A circular coil opf 500 turns of wire has an enclosed area of $0.1m^2$ per turn. It is kept perpendicular to a magnetic field of induction $0.2T$ and rotated by 180° about a diameter perpendicular to the field in 0.1 sec. how much charge will pass when the coil is connected to a gavanometer with a combined resistance of $50 ohms$

A. $0.2C$

B. $0.4C$

C. $2C$

D. $4C$

Answer: B

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29. Magnetic flux in a circuit containing a coil of resistance 2Ωchange from $2.0Wb$ to $10Wb$ in $0.2\,\text{sec.}$ The charge passed through the coil in this time is

A. 5.0 coulomb

B. 4.0 coulomb

C. 1.0 coulomb

D. 0.8 coulomb

Answer: B

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30. A coil of 40Ω resistance has 100 turns and radius $6mm$ is connected to ammeter of resistance of $160 ohms$. Coil is placed perpendicular to the magnetic field. When coil is taken out of the field, $32\mu C$ charge flows through it. The intensity of magnetic field will be

A. $6.55T$

B. $5.66T$

C. $0.655T$

D. $0.565T$

Answer: D

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31. The total charge induced in a conducting loop when it is moved in magnetic field depends on

A. The rate of change of magnetic flux

B. initial magnetic flux only

C. the total change in magnetic flux

D. final magnetic flux only

Answer: C

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32. In a magnetic field of $0.05T$, area of a coil changes from $101cm^2$ to $100m^2$ without changing the resistance which is 2Ω. The amount of charge that flow during this period is

A. 2.5×10^{-6} coulomb

B. 2×10^{-6} coulomb

C. 10^{-6} coulomb

D. 8×10^{-6} coulomb

Answer: A

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33. If a coil of 40 turns and area $4.0 cm^2$ is suddenly remove from a magnetic field, it is observed that a charge of $2.0 \times 10^{-4} C$ flows into the coil. If the resistance of the coil is 80Ω, the magnetic flux density in Wb/m^2 is

A. 0.5

B. 1.0

C. 1.5

D. 2.0

Answer: B

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34. In electromagnetic induction, the induced charge in a coil is independent of

A. change in the flux

B. time

C. resistance in the circuite

D. none of the above

Answer: B

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35. A thin circular ring of area A is perpendicular to uniform magnetic field of induction B. A small cut is made in the ring and a galvanometer is connected across the ends such that the total resistance of circuit is R. When the ring is suddenly squeezed to zero area, the charge flowing through galvanometer is:

A. $\frac{BR}{A}$

B. $\frac{AB}{R}$

C. ABR

D. $\frac{B^2 A}{R^2}$

Answer: B

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36. A flate circular coil of $10cm$ radius has 200 turns of wire the coil is connected to a capacitor of $20\mu F$ placed in a uniform magnetic field whise induction decreases at a rate of $0.01Ts^{-1}$ Find the charge on capacitor

A. $0.51\mu C$

B. $0.75\mu C$

C. $0.92\mu C$

D. $1.25\mu C$

Answer: D

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37. Magnetic flux ϕ (in weber) linked with a closed circuit of resistance $10 ohm$ varies with time t (in seconds) as

$\phi = 5t^2 - 4t + 1$

The induced electromotive force in the circuit at $t = 0.2$ sec. is

A. 0.4 volts

B. -0.4 volts

C. -2.0 volts

D. 2.0 volts

Answer: D

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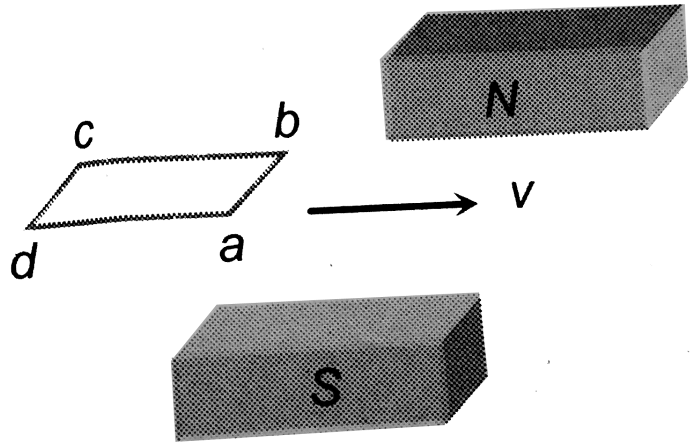
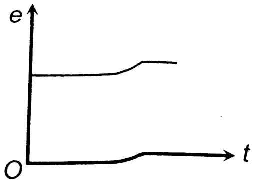
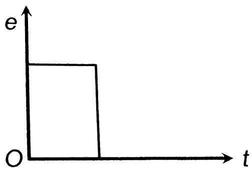
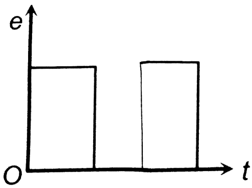
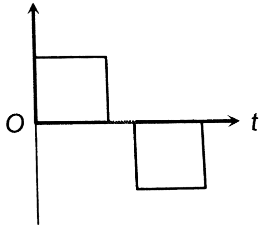
38. A loop $abcd$ is moved across the pole pieces of a magnet as shown in fig. with a constant speed v. When the edge ab of the loop enters the pole pieces at time $t = 0$ sec. which one of the following graphs represents correctly the induced e.m.f. in the coil if magnetic field lines pass through the loop if it is in between two magnets?



A. 

B. 

C. 

D. 

Answer: D

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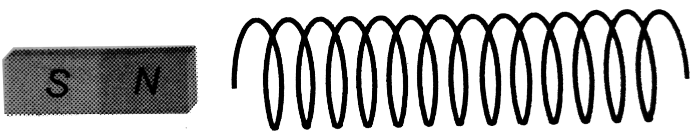
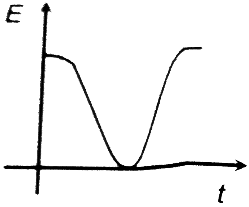
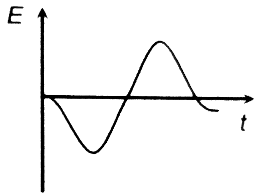
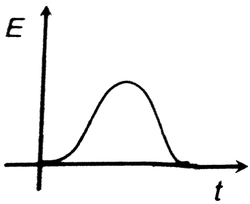
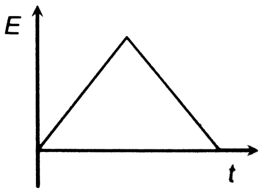
39. The variation of induced emf (F) with time (t) in a coil if a short bar magnet is moved along its axis with a constant velocity is best represent as



A. 

B. 

C. 

D. 

Answer: B

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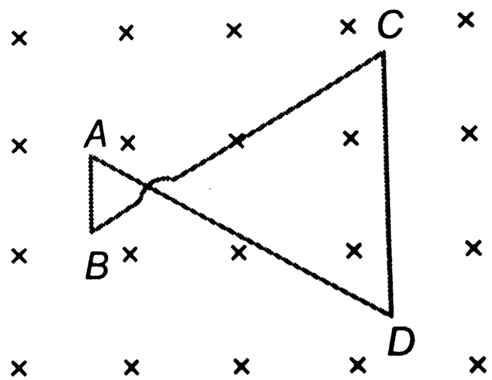
40. A conducting wire frame is placed in a magnetic field which is directed into the paper. The magnetic field is increasing at a constant rate. The direction of induced current in wire AB and CD are



A. B to A and D to C

B. A to B and C to D

C. A to B and D to C

D. B to A and C to D

Answer: A

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41. Magnetic flux ϕ (in weber) linked with a closed circuit of resistance $10 ohm$ varies with time t (in seconds) as

$\phi = 5t^2 - 4t + 1$

The induced electromotive force in the circuit at $t = 0.2$ sec is

A. $-40V$

B. $40V$

C. $140V$

D. $300V$

Answer: B

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42. The flux linked with a coil at any instant 't' is given by $\phi = 10t^2 - 50t + 250$

The induced emf at $t = 3s$ is

A. $10V$

B. $30V$

C. $45V$

D. $90V$

Answer: A

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43. A coil having an area A_0 is placed in a magnetic field which changes from B_0 to $4B_0$ in a time interval t. The e.m.f. induced in the coil will be

A. $\dfrac{3A_0B_0}{t}$

B. $\dfrac{4A_0B_0}{t}$

C. $\dfrac{3B_0}{A_0t}$

D. $\dfrac{4B_0}{A_0t}$

Answer: A

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44. A coil of area $10cm^2$ and 10 turns is in magnetic field directed perpendicular to the plane and changing at a rate of $10^8 gauss / s$. The resistance of coil is 20Ω. The current in the coil will be

A. 5 amp

B. 0.5 amp

C. 0.05 amp

D. 5×10^8 amp

Answer: A

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45. A coil having 500 square loops each of side $10cm$ is placed normal to a magnetic flux which increase at the rate of $1.0(tesla)/(\sec ond)$. The induced r.m.f. in volts is

A. 0.1

B. 0.5

C. 1

D. 5

Answer: D

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46. A coil of area $100 cm^2$ has 500 turns. Magnetic field of $0.1 \text{weber} / \text{meter}^2$ is perpendicular to the coil. The field is reduced to zero in 0.1 second. The induced $e. m. f.$ in the coil is

A. $1V$

B. $5V$

C. $50V$

D. zero

Answer: B

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47. A coil of area $100cm^2$ has 500 turns. Magnetic field of $0.1 \text{weber} / \text{metre}^2$ is perpendicular to the coil. The field is reduced to zero in 0.1 second. The induced $e.m.f.$ in the coil is

A. 1.77 volts

B. 17.7 volt

C. 177 volts

D. 0.177 volts

Answer: B

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48. A coil having an area A_0 is placed in a magnetic field which changes from B_0 to $4B_0$ in a time interval t. The e.m.f. induced in the coil will be

A. $4V$

B. $3V$

C. $1.5V$

D. $2V$

Answer: B

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49. A coil has 2000 turns and area of $70cm^2$. The magnetic field perpendicular to the plane of the coil is $0.3Wb/m^2$ and takes 0.1 sec to rotate through 180^0. The value of the induced e.m.f. will be

A. $8.4V$

B. $84V$

C. $42V$

D. $4.2V$

Answer: B

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50. A coil of area $100cm^2$ has 500 turns. Magnetic field of $0.1 \text{weber} / \text{metre}^2$ is perpendicular to the coil. The field is reduced to zero in 0.1 second. The induced $e.m.f.$ in the coil is

A. $10^4 V$

B. $1.2V$

C. $1.0V$

D. $10^{-2} V$

Answer: C

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51. A rectangular coil of 20 turns and area of cross-section $25cm^2$ has a resistance of $100ohm$. If a magnetic field which is perpendicular to the plane of the coil changes at the rate of 1000 tesla per second, the current in the coil is

A. 1.0 ampere

B. 50 ampere

C. 0.5 ampere

D. 5.0 ampere

Answer: C

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52. A coil has 2000 turns and area of $70cm^2$. The magnetic field perpendicular to the plane of the coil is $0.3Wb/m^2$ and takes 0.1 sec to rotate through 180^0. The value of the induced e.m.f. will be

A. $8.4V$

B. $84V$

C. $4.2V$

D. $42V$

Answer: B

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53. A 800 turn coil of effective area $0.05m^2$ is kept perpendicular to a magnetic field 5×10^{-5} T. When the plane of the coil is rotated by 90° around any of its coplanar axis in 0.1 s, the emf induced in the coil will be:

A. $0.012V$

B. $0.05V$

C. 0.1 V`

D. $0.2V$

Answer: D

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54. A conducing circular loop is placed in a uniform magnetic field of indution B tesla with its plane normal to the field. Now, radius of the loop starts shrinking at the rate (dr / dt). Then the induced e.m.f. at the instant when the radius is r is:

A. $\pi r B\left(\frac{dr}{dt}\right)$

B. $2\pi r B\left(\frac{dr}{dt}\right)$

C. $\pi r^2 B\left(\frac{dr}{dt}\right)$

D. $\pi r B\frac{r^2}{2}\left(\frac{dr}{dt}\right)$

Answer: B

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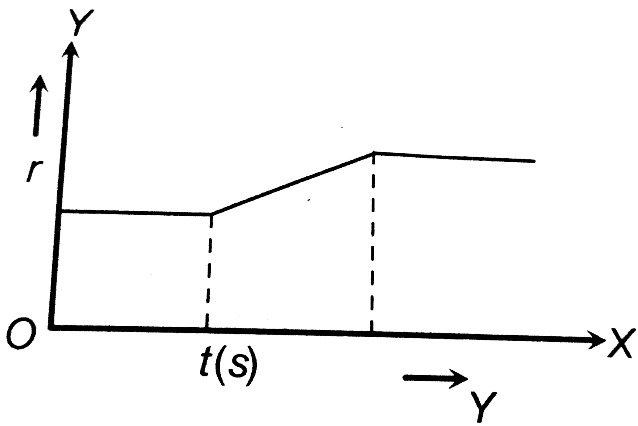
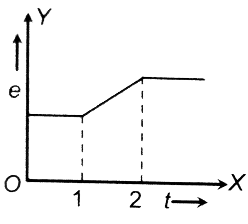
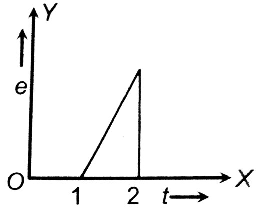
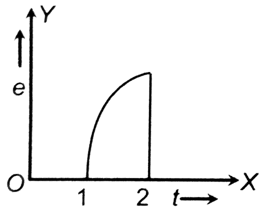
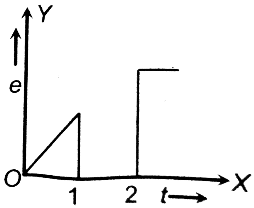
55. A flexible wire bent in the form of a circle is placed in a uniform magnetic field perpendicular to the plane of the coil. The radius of the coil changing as shown in figure. The graph of induced emf in the coil is represented by



A. 

B. 

C. 

D. 

Answer: B

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