PHYSICS

BOOKS - MODERN PUBLICATION

ELECTROMAGNETIC INDUCTION

Example

1. A magnetic field of flux density 10 T acts normal to a coil of 50 turns having $100 cm^2$

area. Find e.m.f. iduced, if the coil is removed from the magnetic field on 0.1 s.

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2. A metre gauge train is runing due north with a constant speed of $90kmh^{-1}$ on a horizontal track. If the vertical component of earth's magnetic ield is $3 \times 10^{-5} Wbm^{-2}$, calculate the e.m.f. induced across the axle of the train of length 1.25 cm.

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3. If a rate of change of current of 4 A s^{-1} induces an e.m.f. of 20 mV in a solenoid, what is the self-inductance of the solenoid?

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4. Calculate the mutual inductance between two coils, when a current of 4.0 A changes to 8.0 A in 0.5 s and induces an e.m.f. of 50 mV in the secondary coil.

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5. A flat coil of 500 turns each of area $50cm^2$ rotates in a uniform magnetic field of $0.14Wb/m^2$ at an angular speed of $150rad/\sec$. The coil has a resistance of 5 Omega. The induced e.m.f. is applied to an external resistance of 10 ohm. Calculate the peak current through the resistance.

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6. The magnetic flux through a coil perpendicular to its plane and directed into paper is varying according to the relation $\phi = (5t^2 + 10t + 5)$ milliweber. Calculate the e.m.f. induced in the loop at t = 2s, if the resistance of the coil is 5 ohm.

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7. A magnetic field of flux density 10 T acts normal to a coil of 50 turns having $100 cm^2$

area. Find e.m.f. iduced, if the coil is removed from the magnetic field on 0.1 s.

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8. A square loop of side 10 cm and resistance 0.70 ohm is placed vertically in the east -west plane. A uniform magnetic field of 0.10 T is set up across the plane in north-east direction. The magnetic field is decreased to zero in 0.7 sec. at a steady rate. Determine the magnitudes of induced e.m.f. and current during this time interval.

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9. A circular coil of radius 10 cm, 500 turns and resistance 2Ω is placed with its plane, perpendicular to the horizontal component of the earth's magnetic field. It is rotated about its vertical diameter through 180° in 0.25 s. The induced e.m.f. in the coil is ..... (Take $H_E = 3.0 \times 10^{-5} T$)

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10. A wire 40 cm long bent into a rectangular loop $15cm \times 5$ cm is placed perpendicular to the magnetic field whose flux density is $0.8Wbm^{-2}$. Within 1.0 second, the loop is changed into a 10 cm square and flux density increases to $1.4Wbm^{-2}$. Calculate the value of induced emf.

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11. A coil containing 20 turns of average diameter 0.02 m is placed perpendicular to a magnetic field of intensity $1.6 \times 10^4 T$. The magnetic field changes to $1.8 \times 10^3 T$in 4 s. A resistor of resistance 15 ohm is connected in sereis with the coil. If the resistance of the coil is 5 ohm, find the induced current passing through the resistor.

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12. A 10Ωresistance coil has 1000 turns and at a certain time 5.5×10^{-4} Wb of flux passes through it. If the flux falls to $0.5 \times 10^{-4} Wb \in 0.1.$ second find the emf generated in volts and the charge flown through the coil in coulombs.

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13. A metallic rod of length l is rotated at a constant angular speed ω, normal to a uniform magnetic field B. Derive an expressions for the current induced in the rod, if the resistance of the rod is R.

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14. A metal rod of length 1 m is rotated about one of its ends in a plane at right angles to a uniform magneic field of 2.5×10^{-3} Wb m^{-2}. If its makes 30 r.p.s. Calculate the induced e.m.f. between its ends.

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15. When a wheel with metal spokes 1.2 m long rotates in a magnetic field of flux density $5 \times 10^{-5} T$ normal to the plane of the wheel, an e.m.f. of $10^{-2} V$ is induced between the rim and the axle. Find the rate of rotation of the wheel.

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16. A wheel with 10 metallic spokes each 0.5 m long, is rotated with a speed of 120 rpm.

Please of the wheel is normal to earth's magnetic field at that place. If the magnitude of the field is 0.40 G, what is the induced emf between the axle and rim of the wheel?

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17. A circular copper disc 10 cm in radius rotates at $20\pi ra\frac{d}{s}$ about an axis through its centre and perpendicular to the disc. A uniform magnetic field of 0.2 T acts perpendicular to the disc.

Calculate the potential difference developed between the axis of the disc and the rim.

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18. A circular copper disc 10 cm in radius rotates at $20\pi ra\frac{d}{s}$ about an axis through its centre and perpendicular to the disc. A uniform magnetic field of 0.2 T acts perpendicular to the disc.

What is the induced current if the resistance of the disc is 2Ω?

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19. A train is moving in the north-south direction with a speed of $108 kmh^{-1}$. Find the e.m.f. generated between two wheels, if the length of the axle is 2m. Assume that the vertical component of earth's field is $8.0 \times 10^{-5} Wbm^{-2}$.

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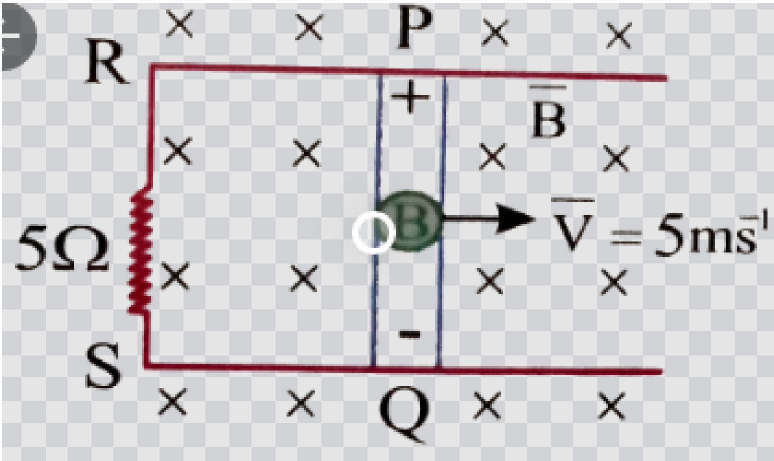
20. Figure shows a conducting rod PQ in contact with metal rails RP and SQ, which are 0.25 m apart in a uniform magnetic field of flux density 0.4T acting perpendicular to the plane of the paper. Ends R and S are connected through a 5Ω resistance. What is the emf when the rod moves to the right with a velocity of $5ms^{-1}$? What is the magnitude and direction of the current through the 5Ω resistance? If the rod PQ moves to the left with the same speed, what will be the new current and its direction?



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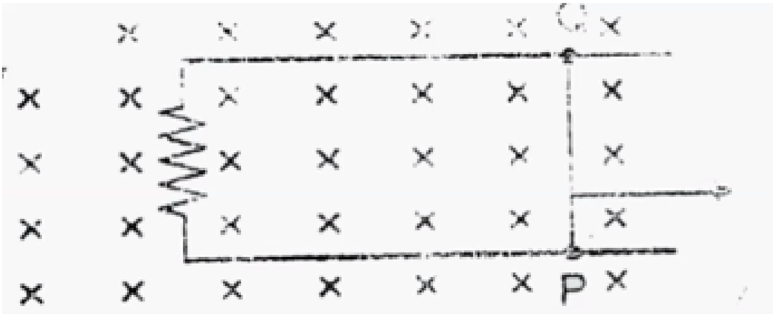
21. A 0.5m long metal rod PQ completes the circuit as shown in the figure. The area of the circuit is perpendicular to the magnetic field of flux density 0.15 T. If the resistance of the total circuit is 3Ω calculate the force needed to move the rod in the direction as indicated with a constant speed of $2ms^{-1}$



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22. The self inductance of an inductor having 100 turns is 20 mH. Calculate the total magnetic flux linked with the coil and the magnetic flux through the cross-section of the inductor corresponding to a current of 4 mA.

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23. Current in a 10 millihenry coil increases uniformly for zero to oe ampere in 0.01 second. Find the direction and value of self-induced e.m.f.

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24. A solenoidal coil has 50 turns er cm along its length and a cross-sectional area of $4cm^2$. 200 truns of another wire is wound round the first solenoid coaxially. The two coils are electrically insulated from each other. Calculate the mutual inductance between the two coils. given that $\mu_0 = 4\pi \times 10^{-7} NA^{-2}$

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25. A toroidal solenoid with an air core has an average radius of 15 cm , area of cross-section $12cm^2$ and 1200 turns . Ignoring the field variation across the cross-section of the toroid the self-inductance of the toroid .

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26. A second coil of 300 turns is wound closely on the toroid above. If the current in the primary coil is increased from zero to 2.0 A in

0.05 s, obtain the induced e.m.f. in the second coil.

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27. Two circular coils, one of radius r and other of radius R are placed coxially with their centres coinciding. For R >> r, obtain an expression for mutual inductance of the arrangement.

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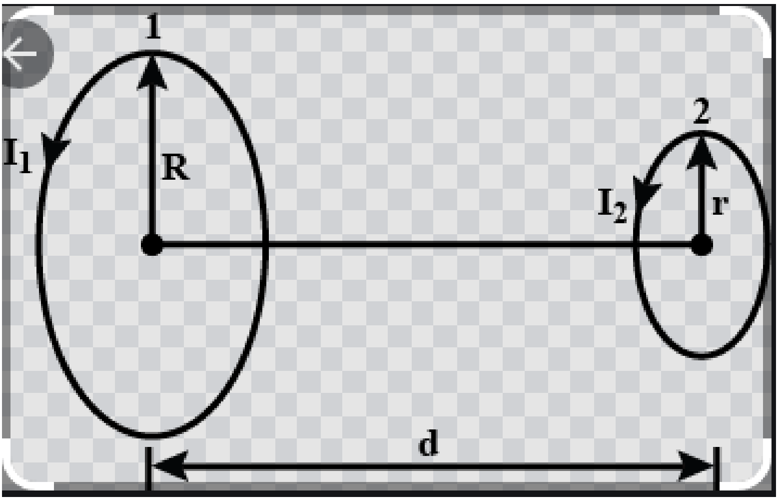
28. A circular loop of radius 0.3 cm lies parallel to amuch bigger circular loop of radius 20 cm. The centre of the small loop is on the axis of the bigger loop. The distance between their centres is 15 cm. If a current of 2.0 A flows through the smaller loop, then the flux linked with bigger loop



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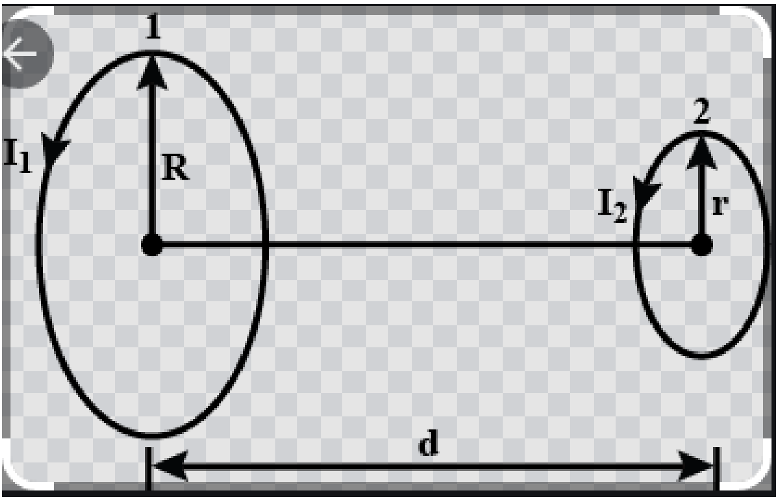
29. A circular loop of radius 0.3 cm lies parallel to amuch bigger circular loop of radius 20 cm. The centre of the small loop is on the axis of the bigger loop. Obtain the mutual inductance of the two loops.



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30. Two inductors L_1 and L_2 sufficient distance apart connected (i) in series (ii) in parallel. What is their equivalent inductance?

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31. Two inductors L_1 and L_2 sufficient distance apart connected (i) in series (ii) in parallel. What is their equivalent inductance?

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32. A 100 turn coil of area $0.1m^2$ rotates at half a revolution per second. It is placed in a magnetic field of 0.01 T perpendicular to the axis of rotation of the coil. Calculate the maximum voltage generated in the coil.

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33. A rectangular coil of dimensions $0.1m \times 0.5m$ consisting of 2000 turns rotates about and axis parallel to its long side, making

2100 revolutions per minute in a field of 0.1 T. What is the maximum emf indcuced in the coil? Also find the instantaneous emf, when the coil is 30° to the field.

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34. An a.c. generator consists of a coil of 100 turns and cross sectional area of $3m^2$, rotating at a constant angular speed of $60 rad/\sec$ in a uniform magnetic field of 0.04

T. The resistance of the coil is 500Ω. Calculate maximum current drawn from the generator.

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35. An a.c. generator consists of a coil of 100 turns and cross sectional area of $3m^2$, rotating at a constant angular speed of $60 rad / \sec$ in a uniform magnetic field of 0.04 T. The resistance of the coil is 500Ω. Calculate max. power dissipation in the coil.

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36. A circular coil of radius 8.0 cm and 20 turns is rotated about its vertical diameter with an angular speed of $50 rad s^{-1}$ in a uniform horizontal magnetic field of magnitude 3.0×10^{-2}. Obtain themaximum and average emf induced in the coil. If the coil forms a closed loop of resistance 10Ω, calculate the maximum value of current in the coil. Calculate the average power loss due to Joule heating. Where does this power come from?

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37. An a.c. generator consists of a coil of 50 turns and area $2.5m^2$ rotating att an angular speed of $60 rads^{-1}$ in a uniform magnetic field B = 0.3 T between two fixed pole pieces. The resistance of the circuit including that of coil is 500Ω. Find the max. current drawn from the generator.

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38. An a.c. generator consists of a coil of 50 turns and area $2.5m^2$ rotating att an angular speed of $60rads^{-1}$ in a uniform magnetic field B = 0.3 T between two fixed pole pieces. The resistance of the circuit including that of coil is 500Ω. Find What will be the orientaiton of the coil w.r.t. the magnetic field to have (a) maximum (b) zero magnetic flux ?

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39. An a.c. generator consists of a coil of 50 turns and area $2.5m^2$ rotating att an angular speed of $60rads^{-1}$ in a uniform magnetic field B = 0.3 T between two fixed pole pieces. The resistance of the circuit including that of coil is 500Ω. Find Would the generator work if the coil were stationary and instead, the pole pieces rotated together with the same speed as above ?

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40. A very small circular loop of area $5 \times I0^{-4} m^2$, resistance 2Omega and negligible inductance is initially coplanar and concentric with a much larger fixed circular loop of radius 0.1m . A constant current of 1A is passed in the bigger loop and the smaller loop is rotated with angular velocity $\omega rad / \sec$ about a diameter. Calculate the flux limked with the smaller loop.

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41. A very small circular loop of area $5 \times I0^{-4} m^2$, resistance 2Omega and negligible inductance is initially coplanar and concentric with a much larger fixed circular loop of radius 0.1m . A constant current of 1A is passed in the bigger loop and the smaller loop is rotated with angular velocity $\omega rad/\sec$ about a diameter. Calculate indced emf.

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42. A very small circular loop of area $5 \times I0^{-4} m^2$, resistance 2Omega and negligible inductance is initially coplanar and concentric with a much larger fixed circular loop of radius 0.1m . A constant current of 1A is passed in the bigger loop and the smaller loop is rotated with angular velocity $\omega rad/\sec$ about a diameter. Calculate induced current in the smaller loop, as a function of time.

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43. A current of 10 A is flowing in a long straight wire situated near a rectangular circuit whose two sides oflength 0.2m are parallel to the wire. One of them is at a distance of0.05m and the other at a distance of 0. lOm from the wire. The wire is in the plane of the rectangle. Find the magnetic flux through the rectangular circuit. If the current decays uniformly to zero in 0.02s, fmd the EMF induced in the circuit and indicate the direction in which the induced current flows.

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44. A pair of parallel horizontal conducting rails of negligible resistance shorted at one end is fixed on a table. The distance between the rails is L. A conducting massless rod of resistance R can slide on the rails frictionlessly. The rod is tied to a massless string which passes over a pulley fixed to the edge of the table, A mass m, tied to the other end of the string hanges vertically. A constant magnetic field B exists perpendicular to the table. If the system is released from rest, calculate.

the terminal velocity achieved by the rod.

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45. A pair of parallel horizontal conducting rails of negligible resistance shorted at one end is fixed on a table. The distance between the rails is L. A conducting massless rod of resistance R can slide on the rails frictionlessly. The rod is tied to a massless string which passes over a pulley fixed to the edge of the table, A mass m, tied to the other end of the string hanges vertically. A constant magnetic field B exists perpendicular to the table. If the system is released from rest, calculate.

the acceleration of the mass at the instant when the velocity of the rod is half the terminal velocity.

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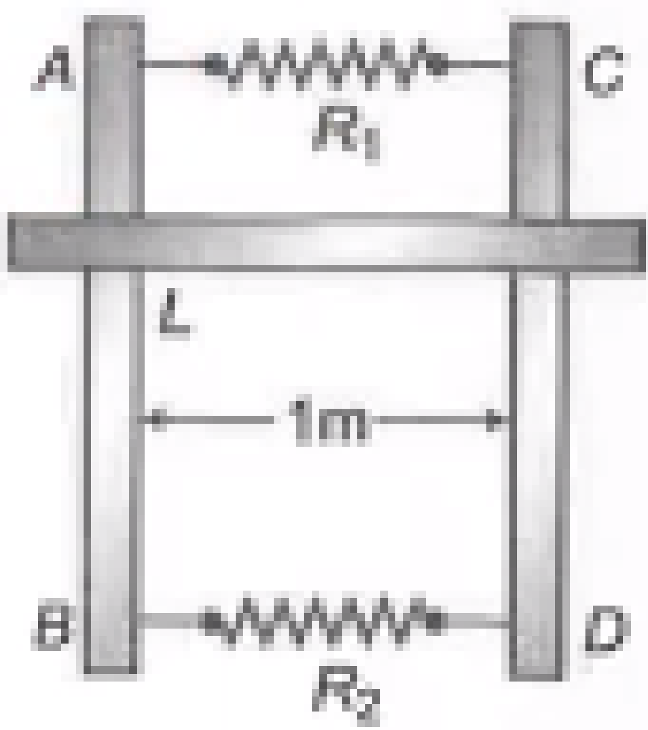
46. Two parallel vertical metallic rails AB and CD are separated by 1m. They are connected at the two ends by resistances R_1 and R_2 as shown in the figure. A horizontal metallic bar 1 of mass 0.2 kg slides without friction, vertically down the rails under the action of gravity. There is a uniform horizontal magnetic field of 0.6 T perpendicular to the plane of the rails. It is observed that when the terminal velocity is attained, the powers dissipated in R_1 and R_2 are 0.76W and 1.2W respectively $(g = 9.8m / s^2)$

The value of R_2 is



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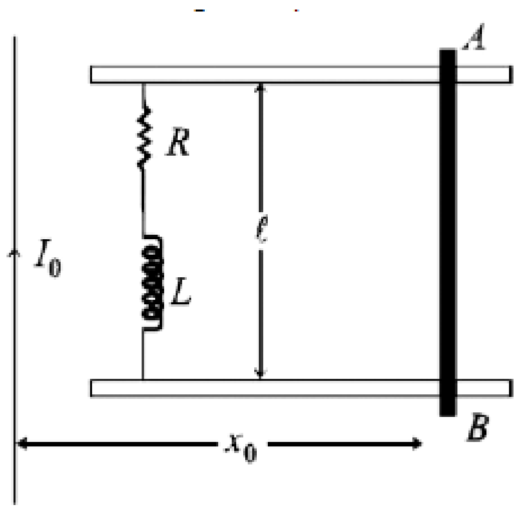
47. A metal bar AB can slide on two parallel thick metallic rails separated by a distance l. A resistance R and an inductance L are connected to the rails as shown in the figure. A long straight wire carrying a constant current I_0 is placed in the plane of the rails and perpendicular to them as shown. The bar AB is held at rest at a distance x_0 from the long wire. At t=0, it is made to slide on the rails away from wire. Answer the following questions.

Find a relation among i, $\frac{di}{dt}$ and $\frac{d\phi}{dt}$, where i is the current in the circuit and phi is the flux of the megnetic field due to the long wire through the circuit.



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48. A metal bar AB can slide on two parallel thick metallic rails separated by a distance l. A resistance R and an inductance L are connected to the rails as shown in the figure. A long straight wire carrying a constant current I_0 is placed in the plane of the rails and perpendicular to them as shown. The bar AB is held at rest at a distance x_0 from the long wire. At t=0, it is made to slide on the rails away from wire. Answer the following questions.

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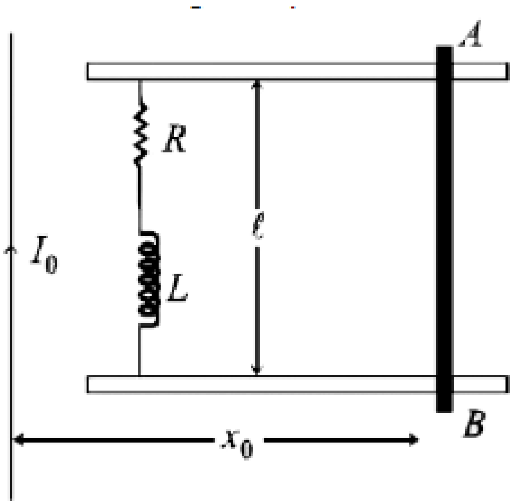

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49. A metal bar AB can slide on two parallel thick metallic rails separated by a distance l. A resistance R and an inductance L are connected to the rails as shown in the figure.

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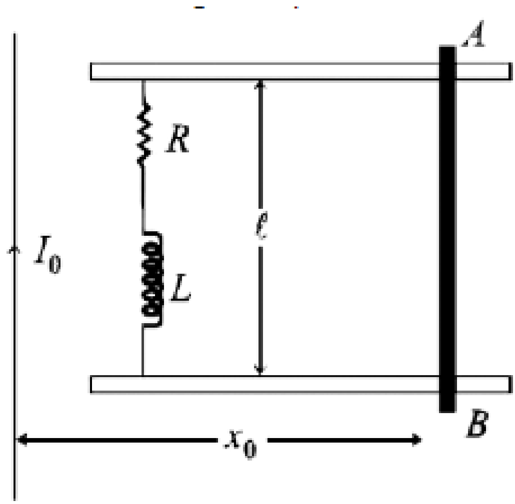

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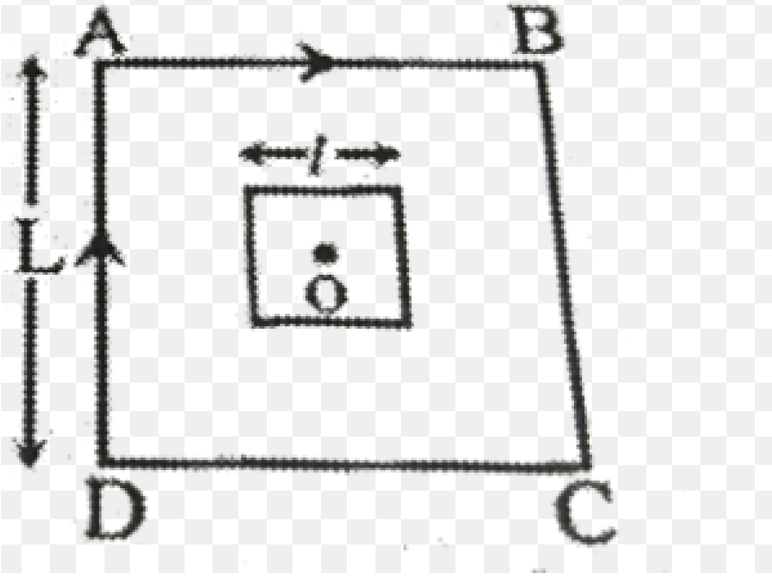
50. A small square loop of wire of side l is placed inside a large square loop of wire of side L(L>>l) .The loops are coplanar and their centers coincide.The mutual inductance of the system



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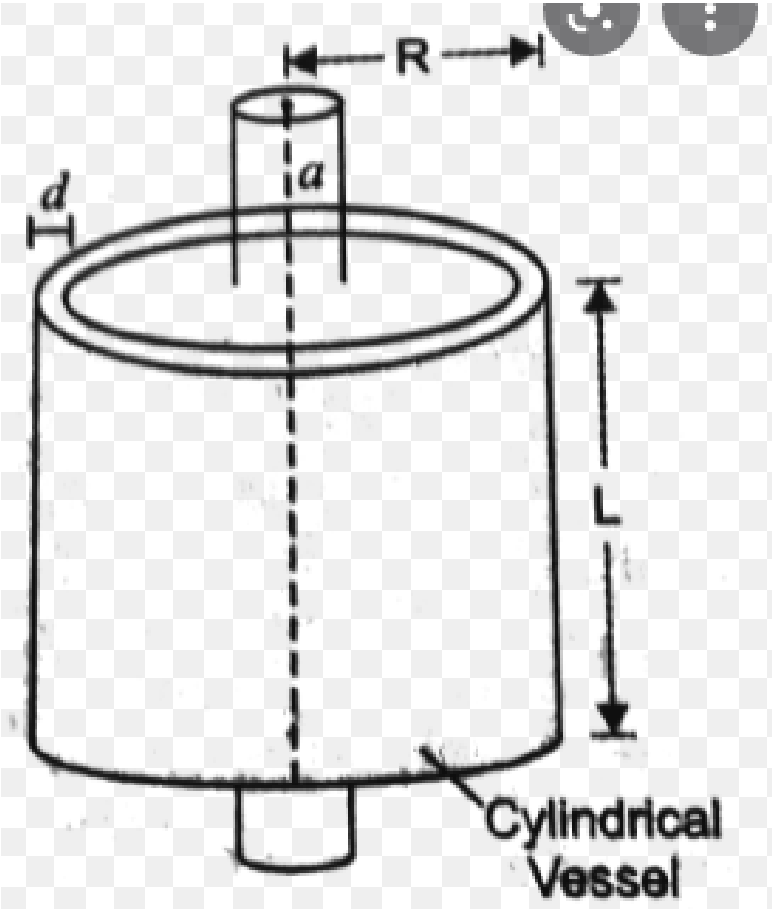
51. A long solenoid has n turns per unit length and radius a. A current $I = I_0 \sin \omega$ t flows through it. A cylindrical vessel of radius R, length L, thickness d $(d < < R)$ and resistivity ρ is kept coaxially shown int he figure. Find the induced current in the outer cylindrical vessel.



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52. What is meant by magnetic flux? State its S.I. unit.

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53. Weber is the unit of which physical quantity ?

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54. SI unit of magnetic flux is :

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55. What is S.I.unit of magnetic induction?

Watch Video Solution

56. SI unit of magnetic flux is :

Watch Video Solution

57. What is the unit of magnetic field strength in egs system and SI sysem ? State the relation between them.

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58. What is electromagnetic induction ? State its laws.

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59. What is the basic cause of induced e.m.f.?

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60. What factors govern the magnitude of the e.m.f. induced in an electric circuit.

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61. The magnetic flux threading a coil changes from to $12x10(-3)$ Wb to $6x10(-3)$ Wb in

0.015.Calculate the induced e.m.f.

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62. What is the magnitude of the induced currents in circular loop KLMN of radius r if the straight wire PQ carries a steady current of magnitude i ampere?

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63. A conducting loop is held stationary normal to the field between the NS poles of a fiexed permanent magnet. By choosing a magnet sufficiently strong, can we hope to generate current in the loop?

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64. Explain, whether an induced current will be developed in a conductor, if it is moved in a direction parallel to magnetic field.

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65. A closed conducting loop moves normal to the electric field between the plates of a large capacitor. Is a current induced in the loop, when it is wholly inside the capacitor. The electric field is nromal to the plane of the loop.

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66. A closed conducting loop moves normal to the electric field between the plates of a large capacitor. Is a current induced in the loop, when it is wholly inside the capacitor. The electric field is nromal to the plane of the loop.

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67. A bar magnet is quickly moved towards a conducting loop having a capacitor. Predict the polarity of the plates A and B of the capacitor.

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68. A straight conductor 1 meter long moves a right angles to both, its length and a uniform magnetic field. If the speed of the conductor is $2.0 m s^{-1}$ and the strength of the magnetic field is 10^4 gauss, find the value of induced emf in volt.

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69. Metallic wire 1m in length is moving normally across a field of 0.1 T with a speed of

$5ms^{-1}$. Find the e.m.f between the ends of the wire.

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70. A wire is cut across a flux of $0.2x10(-2)$ weber in 0.12 seconds. What is the e.m.f. induced in the wire ?

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71. State Lenz's law of electromagnetic induction.

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72. What factors govern the direction of e.m.f. ?

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73. State Lenz's law of electromagnetic induction.

Watch Video Solution

74. What factors govern the direction of e.m.f. ?

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75. Induced emf is called back emf, why?

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76. An induced current has no direction of its own. Explain, why?

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77. What are eddy currents ?

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78. What are eddy currents ? How are these produced ? How eddy currents can be minimized in a transformer.

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79. Why the oscillations of a copper disc in a magnetic field are highly damped?

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80. Why does a metallic piece become very hot, when it is surrounded by a coil carrying high frequency alternating current?

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81. Which of the following is not an application of eddy currents?

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82. What is one henry?

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83. What is self Inductance of a coil ? Define coefficient of self Induction.

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84. Define S.I. unit of self inductance.

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85. A magnetic flux of 5 microweber is linked with a coil when a current of 1 MA flows through it.What is the self inductance of the coil ?

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86. Why conducting wires are made of copper?

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87. A coil is wound on an iron core and looped back on itself so that the core has two sets of closely wound wires in series carrying current in the opposite senses. What do you expect about its self-inductance? Will it be large or small?

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88. Explain why resistance coils are usually double wound.

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89. Explain why resistance coils are usually double wound.

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90. A lamp connected in parallel with a large inductor glows brilliantly before going off, when the swithc is put off. Why?

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91. Why is a spark produced in the switch of a fan when it is put off?

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92. Why is a spark produced in the switch of a fan when it is put off?

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93. If the self-inductance of an iron ore inductor increases from 0.01 m H to 10mH on introducing the iron core into it, what is the relative permeability of the core used?

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94. Define mutual inductance and explain it?

Watch Video Solution

95. What is meant by mutual induction? Define coefficient of mutual induction. ALso define its S.I unit of mutual induction.

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96. What will be the coefficient of mutual inductance of a pair of coil if a current of 3 ampere in one coil cause the flux in the second coil of 1000 turns to change by $10(-4)$Wb in each turn ?

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97. What is meant by mutual induction? Define coefficient of mutual induction. ALso define its S.I unit of mutual induction.

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98. Calculate the mutual inductance between two coils, when a current of 4.0 A changes to 8.0 A in 0.5 s and induces an e.m.f. of 50 mV in the secondary coil.

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99. State the principle of electric generator

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100. From where does the electric energy come in a generator?

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101. At which position of the rotating coil in the magnetic field, the induced e.m.f. is maximum?

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102. How will you convert an a.c. generator into a d.c.generator?

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103. What is the dimensional formula of magnetic flux?

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104. State and explain Faraday's law of electromagnetic induction.

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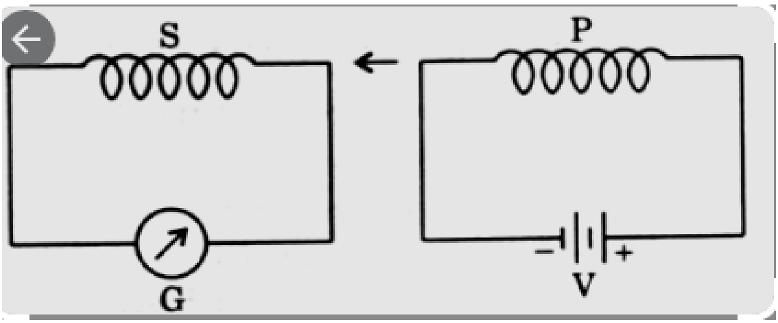
105. When primary coil P is moved towards secondary coil S (as shown in the Fig.) the galvanometer shows momentary deflection. What can be done to have larger deflection in the galvanometer with the same battery?



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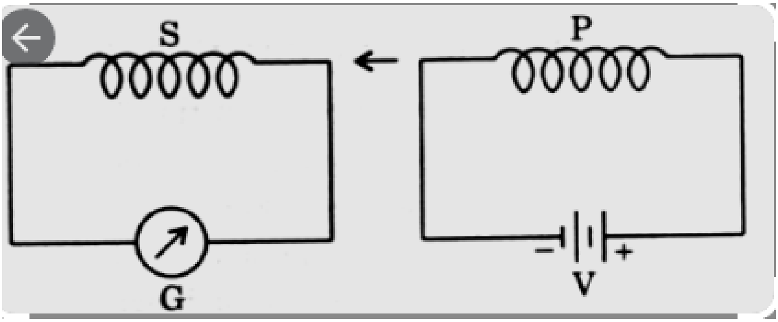
106. When primary coil P is moved towards secondary coil S (as shown in the Fig.) the galvanometer shows momentary deflection. State the related law.



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107. State Lenz’s law of electromagnetic induction.

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108. Show that Lenz's law obeys the law of conservation of energy.

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109. Is Lenz's law in accordance with the law of conservation of energy?

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110. Lenz's law is a consequence of the law of conservation of:

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111. Two spherical bobs, one metallic and the other of glass, of the same size are allowed to fall freely from the same height above the ground. Which of the two would reach earlier and why?

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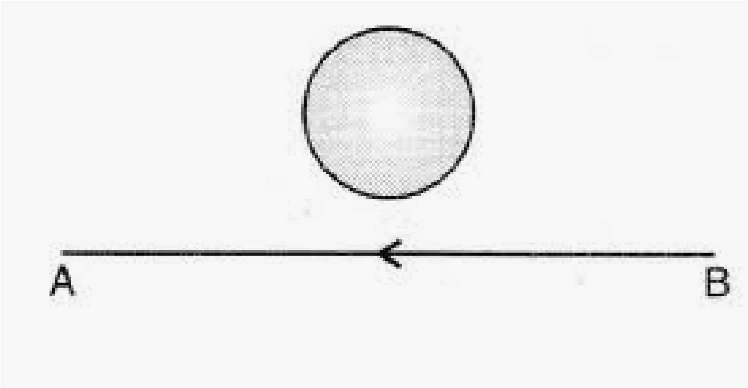
112. The electron current in the direction from B to A is decreasing. What is the direction of induced current in the metallic loop kept above the wire as shown in the figure.



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113. A conducting loop is held below a current carrying wire PQ. Predict the direction of the induced current in the loop, when the current in the wire is constantly increasing.

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114. Give the direction in which the induced current flows in the coil mounted on an insulated stand, when a bar magnet is quickly moved along the axis of the coil from one side to the other as shown in the figure.

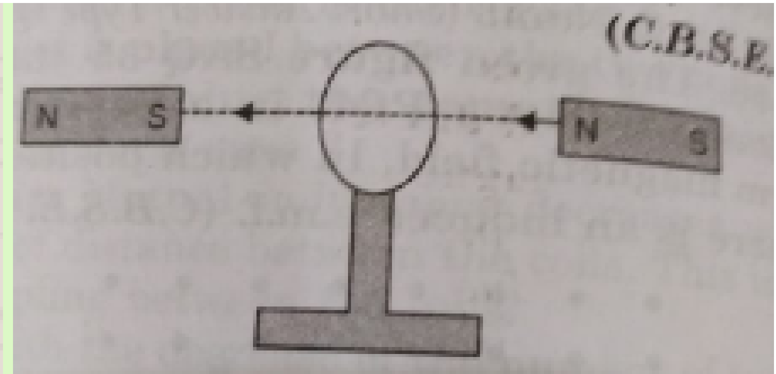

Fig. SAQ 44

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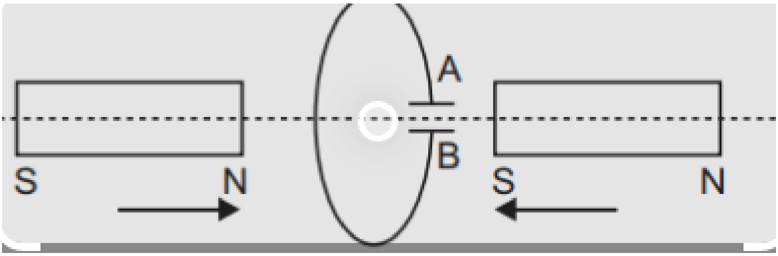
115. Predict the polarity of the capacitor when the two magnets are quickly moved in the direction marked by arrows.



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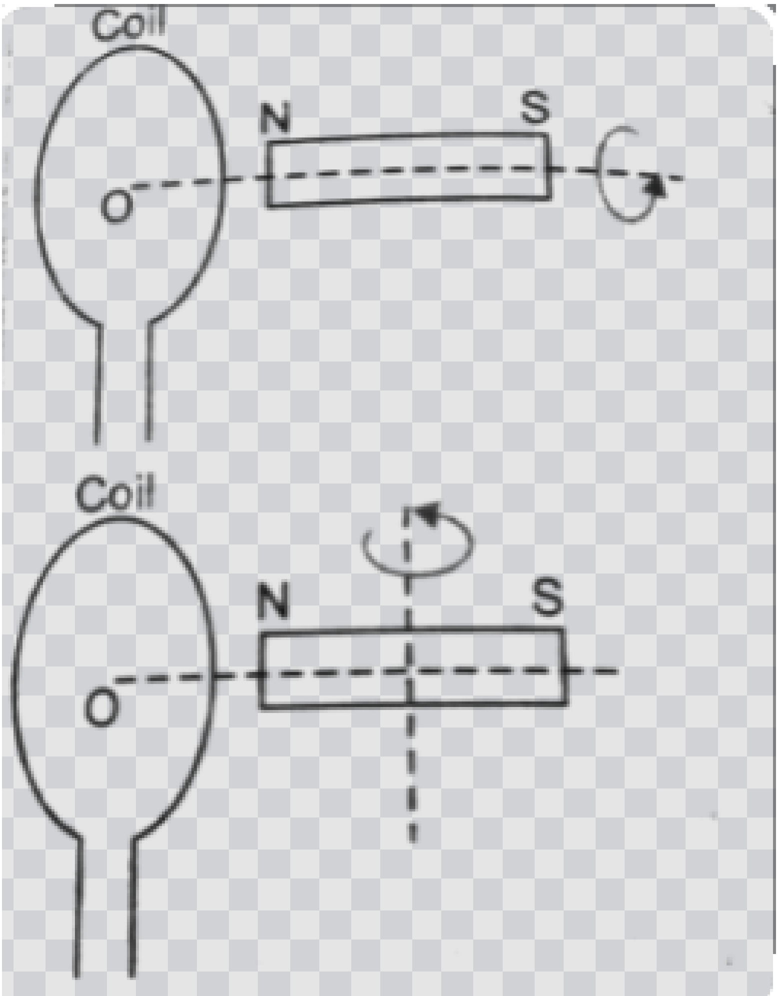
116. A cylindrical bar magnet is kept along the axis of a circular coil and near it as shown in the figure. Will there by an y iduced e.m.f. at the terminal of the coil, when the magnet is rotated about an axis perpendicular to the length of the magnet?



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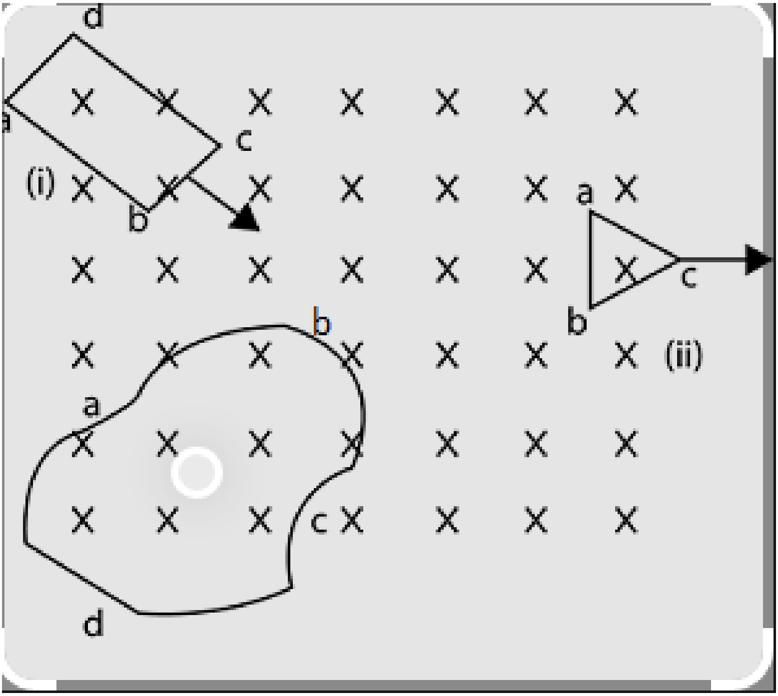
117. Fig. below shows planer loops of different shapes moving out or into a region of magnetic field, which is directed normal to the plane of the loop and away from the reader. Determine the direction of induced current. in each loop using Lenz's law.



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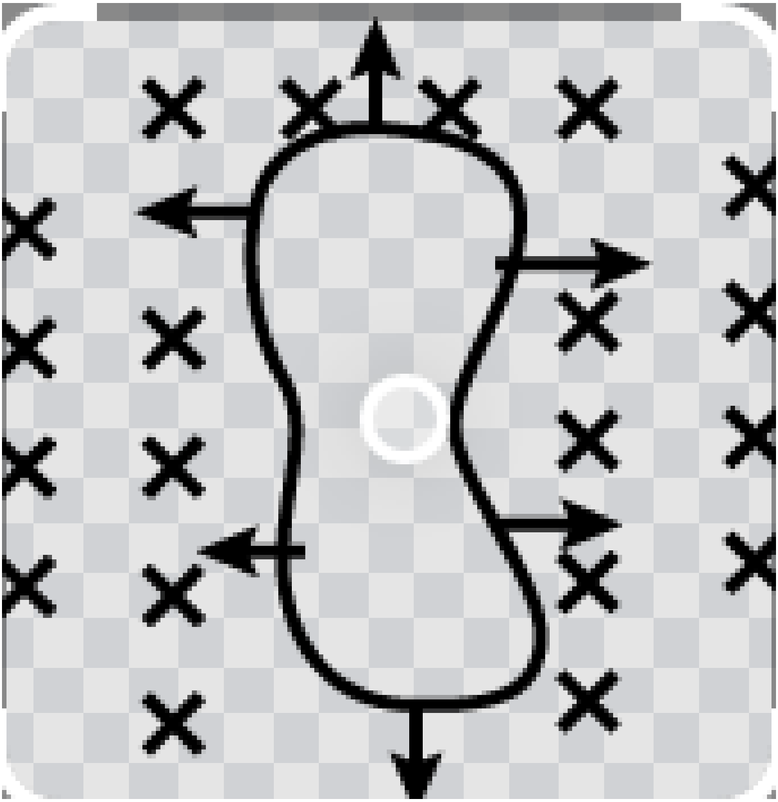
118. An irregular shaped wire PQRS shown in the figure. placed in a uniform magnetic field perpendicular to the plane of the paper changes into a circular shape. Show with reason the direction of the induced current in the loop.



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119. The closed loop PQRS is moving into a uniform magnetic field acting at right angles to the plane of the paper as shown in Fig 6.50 state the direction in which the induced current flows in the loop.

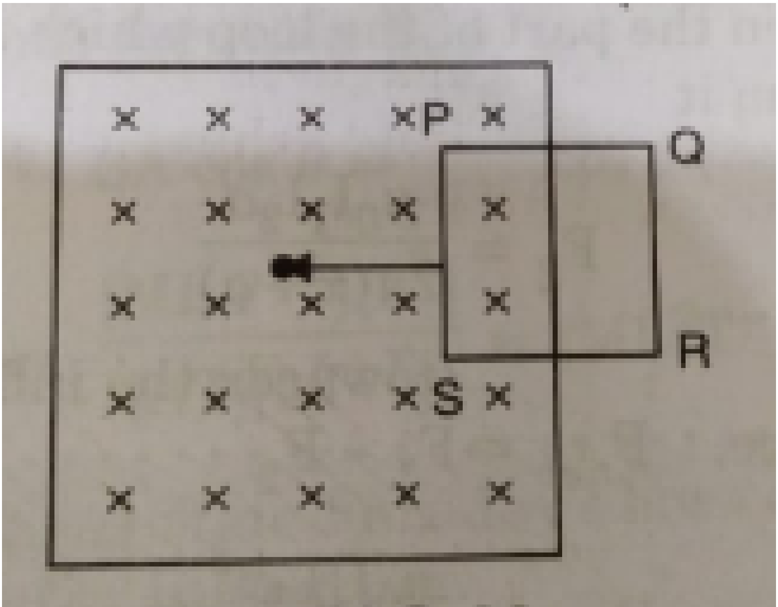

Fig SAQ 38

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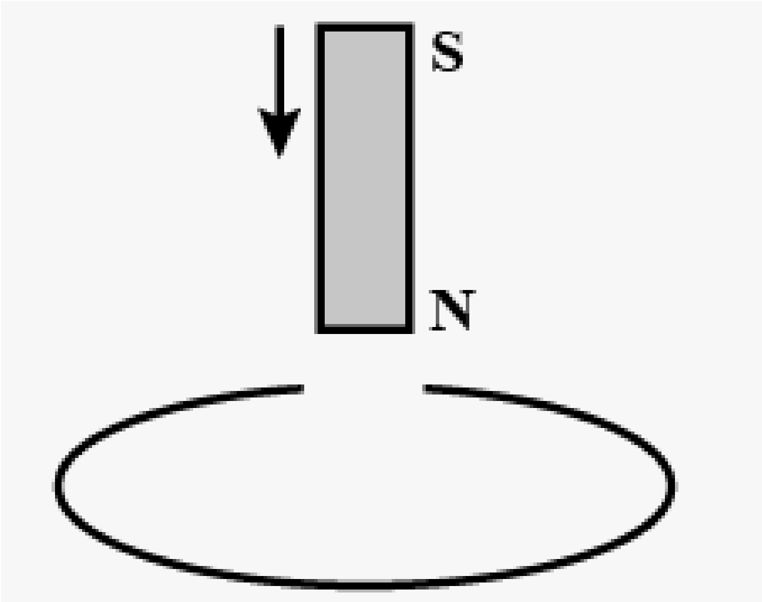
120. A copper ring is held horizontally and a bar magnetic is dropped through the ring with its length along the axis of the ring (shown in the figure) will the acceleration of the falling magnet be equal to , greater than or less than that due to gravity?



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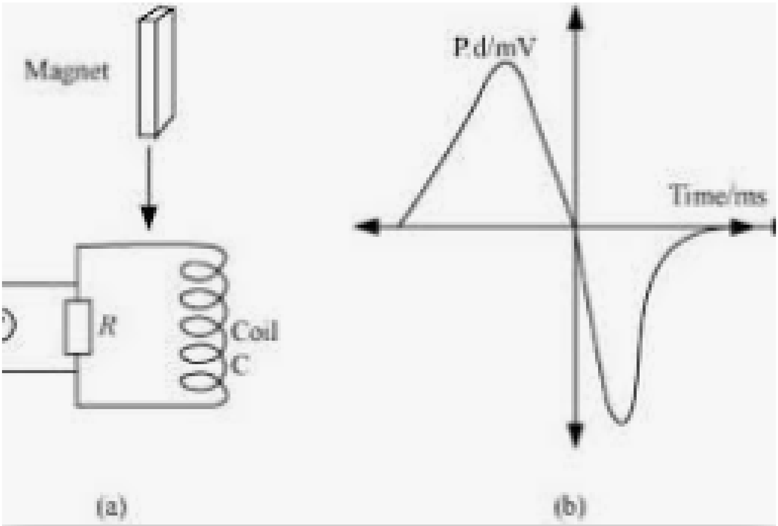
121. Why does the acceleration of a magnet falling through a long solenoid decrease?

Watch Video Solution

122. An iron bar falling vertically thorugh the hollow region of a thick cylindrical shell made of copper expereinces a retarding force. What can you conclude about the iron bar?

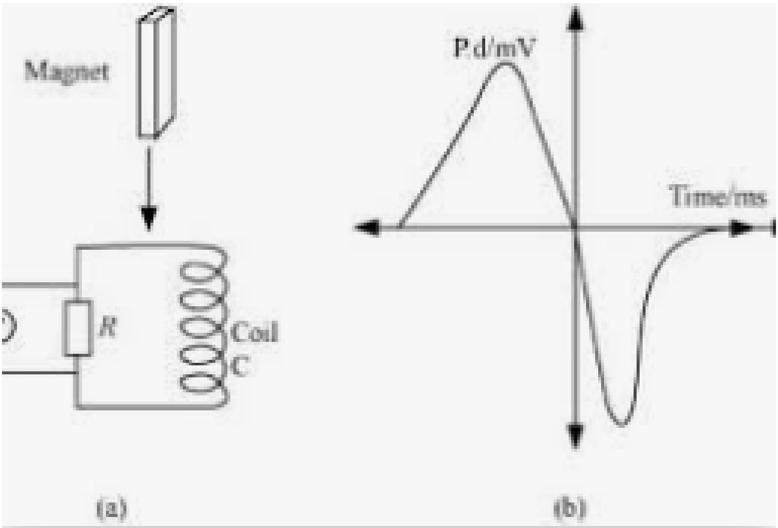
Watch Video Solution

123. A bar magnet M is dropped so that it falls vertically through the coil C. (Show in the figure). The graph obtained for voltage produced across the coil versus time is shown in the figure Why is the negative peak longer than the positive peak?



Watch Video Solution

124. A bar magnet M is dropped so that it falls vertically through the coil C. (Show in the figure). The graph obtained for voltage produced across the coil versus time is shown in the figure Why is the negative peak longer than the positive peak?



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125. An induced current has no direction of its own. Explain, why?

Watch Video Solution

126. What are eddy currents ?

Watch Video Solution

127. The motion of copper plate is damped, when it is allowed to oscillate between the two poles of a magnet. What is the cause of this damping?

Watch Video Solution

128. Why is the coil of a dead beat galvanometer wound on a metal frame?

Watch Video Solution

129. Why are the to and fro oscillations completely absent in better designed galvanometer?

Watch Video Solution

130. Consider a metal ring kept on the top of a fixed solenoid (say on a cardboard) (Fig. EP 6.14). The centre of the ring coincides with the axis of the solenoid. If the current is suddenly switched on, the metal ring jumps up. Explain.

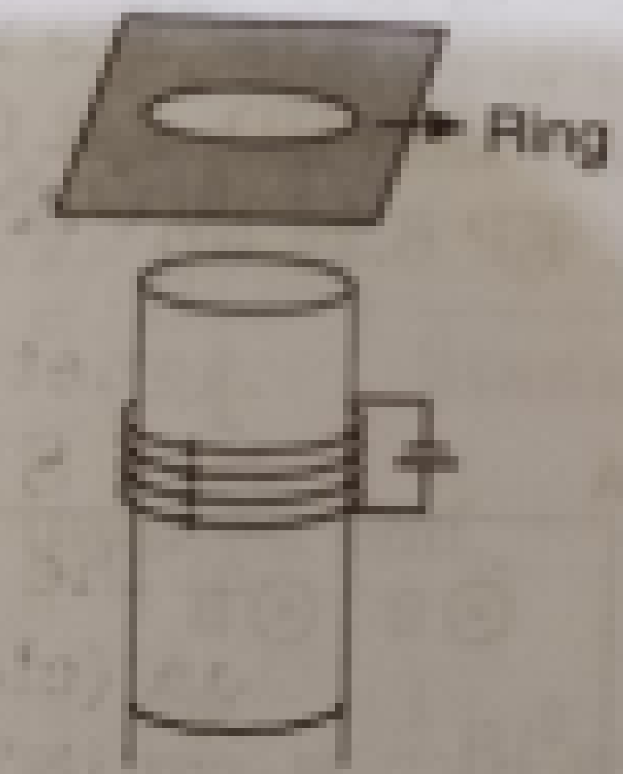

Fig. EP 6.14

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131. A coil A is connected to a voltmeter V and the other coil B to an alternating current source. If a large copper sheet C is placed between the two coils, how does the induced e.m.f. in the coil A change due to current in coil B?

Watch Video Solution

132. Define the term self-induction. Write its SI unit. Write two factors on which the self-inductance of a coil depends.

Watch Video Solution

133. What is inductance ? What are its dimensions and its SI unit?

Watch Video Solution

134. Can one have inductance without a resistance ? How about a resistance without an inductance?

Watch Video Solution

135. How does the self inductance of an air coil change, when the number of turns in the coil is decreased?

Watch Video Solution

136. How does the self inductance of an air coil change, when an iron rod is introduced in the coil?

Watch Video Solution

137. Derive expression for self inductance for a solenoid.

Watch Video Solution

138. Self-induction is called inertia of electricity. Explain why.

Watch Video Solution

139. How does the mutual inductacne of a pair of coils get affected when

distance between coils is increased? Explain your answer in each case?

Watch Video Solution

140. How does the mutual inductacne of a pair of coils get affected when

the number of turns in each coil is decreased? Explain your answer in each case?

Watch Video Solution

141. A secondary coil of N_2 turns is wound on a long solenoid of cross-section. A and having a primary coil n_1 turns per unit length. What is mutual inductance of the two coils?

Watch Video Solution

142. How does the mutual inductacne of a pair of coils get affected when

distance between coils is increased? Explain your answer in each case?

Watch Video Solution

143. How does the mutual inductacne of a pair of coils get affected when

the number of turns in each coil is decreased?

Explain your answer in each case?

Watch Video Solution

144. How does the mutual inductacne of a pair of coils get affected when

distance between coils is increased? Explain your answer in each case?

Watch Video Solution

145. How does the mutual inductacne of a pair of coils get affected when

distance between coils is increased? Explain your answer in each case?

Watch Video Solution

146. How does the mutual inductacne of a pair of coils get affected when

a tahin iron sheet is placed between the two coils, other factors remaining the same?

Watch Video Solution

147. An armature coil consists of 20 turns of wire, each of area $A = 0.09 m^2$ and total resistance 15 ohm . It rotates in a magnetic field of 0.5 T at a constant frequency of $150 / \pi$.

Calculate the value of maximum induced e.m.f. produced in the coil.

Watch Video Solution

148. An armature coil consists of 20 turns of wire, each of area $A = 0.09m^2$ and total resistance 15 ohm . It rotates in a magnetic field of 0.5 T at a constant frequency of $150 / \pi$. Calculate the value of average induced e.m.f. produced in the coil.

Watch Video Solution

149. Making or breaking of current in a coil produces a momentary current in the neighbouring coil of another circuit. Why?

Watch Video Solution

150. Define mutual inductance and explain it?

Watch Video Solution

151. What is non-inductive wiring of coils?

Watch Video Solution

152. A solenoid with an iron core and a bulb are connected to a d.c. source. How does the brightness of the bulb change, when the iron core is removed from the solenoid?

Watch Video Solution

153. State the factors on which induced e.m.f. in a coil rotating in a uniform magnetic field depends.

Watch Video Solution

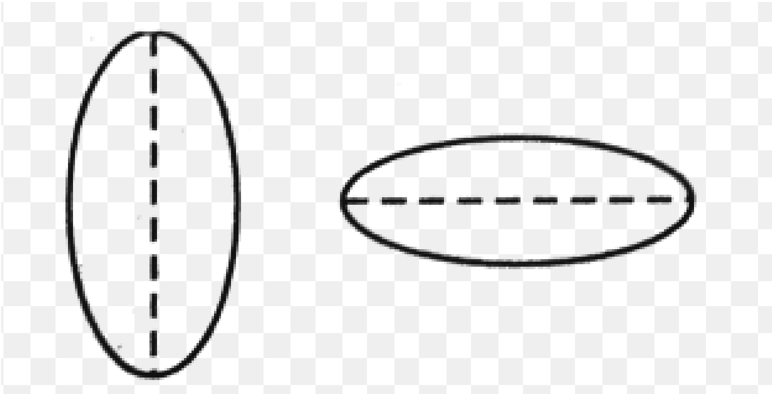
154. Define Fleming's right hand rule.

Watch Video Solution

155. Why is the e.m.f. zero, when maximum number of magnetic lines of force pass through the coil?

Watch Video Solution

156. Two circular conductors are perpendicular to each other as shown in the figure.If current in any one is changed, will there be induced current in the other ?



Watch Video Solution

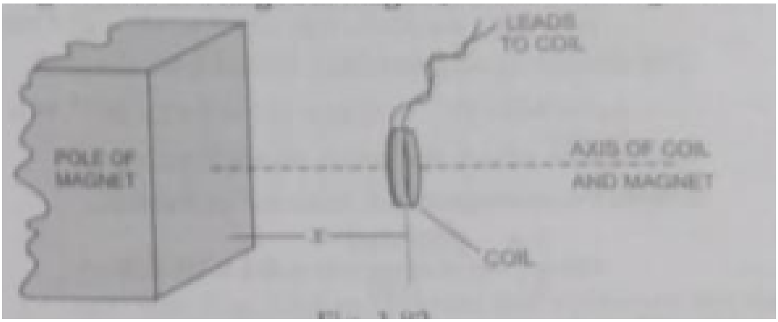
157. A circular coil of radius r and of negligible resistance is connected to a resistor of resistor R through is connected to a resistor of resistance R rough a key. A time varying magnetic field $B(t) = Be^{-t}$ established inside the coil. After a time t of closing key, find the induced current in the circuit

Watch Video Solution

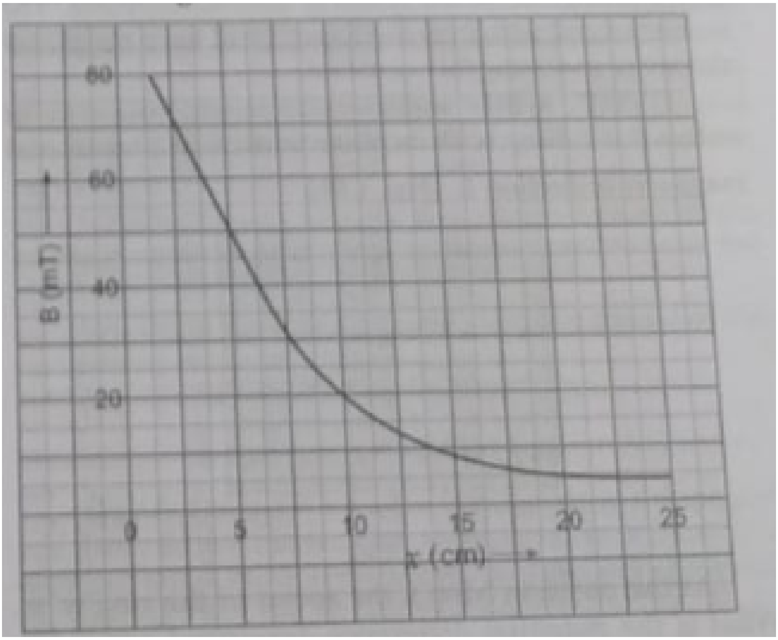
158. A circular coil of radius r and of negligible resistance is connected to a resistor of resistor R through is connected to a resistor of resistance R rough a key. A time varying magnetic field $B(t) = Be^{-t}$ established inside the coil. After a time t of closing key, the power dissipated across the resistor.

Watch Video Solution

159. A small coil is positionaed so that its axis lies along the axis of a large bar agnet, as shown in the figure.



The coil has a cross-sectional area of $0.40 cm^2$ and contains 150 turns of wire. The average magnetic flux density B through the coil aries with the distance x between the face of the magnet and the plane of the coil as shown in the figure.



The coil is 5.0 cm from the face of the magnet to determine the magnetic flux density in the coil.

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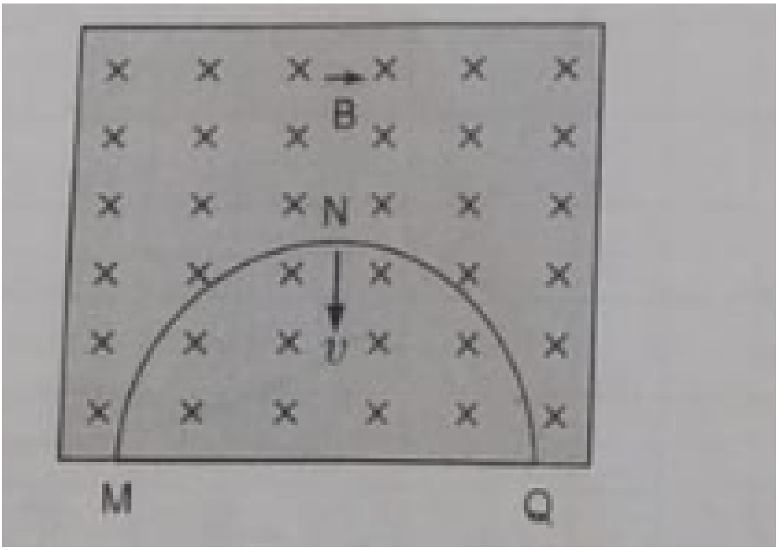
160. A thin semicircular conducting ring of radius R is falling with its plane vertical in a horizontal magnetic induction $\vec{B}$. At the position MNQ, the speed of the ring is v. What is the potential difference developed across the ring at the position MNQ?



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161. You are provided with a coil of wire, a bar magnet and a sensitive ammeter. Outline an experiment to verify Lenz's law.

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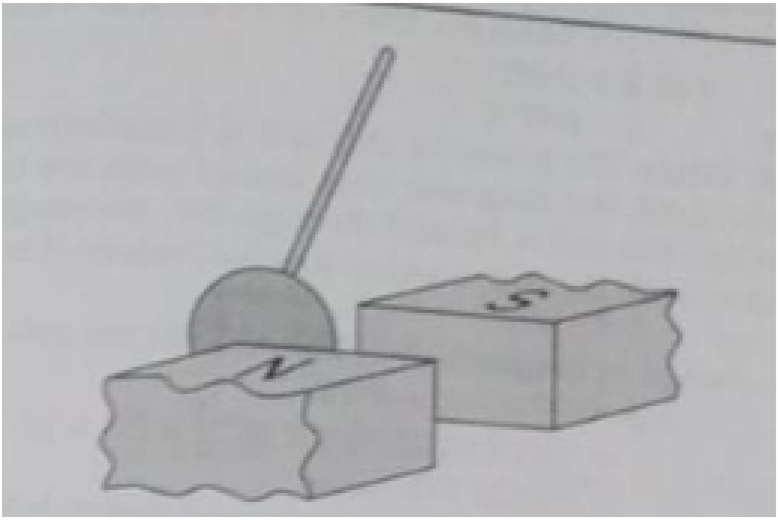
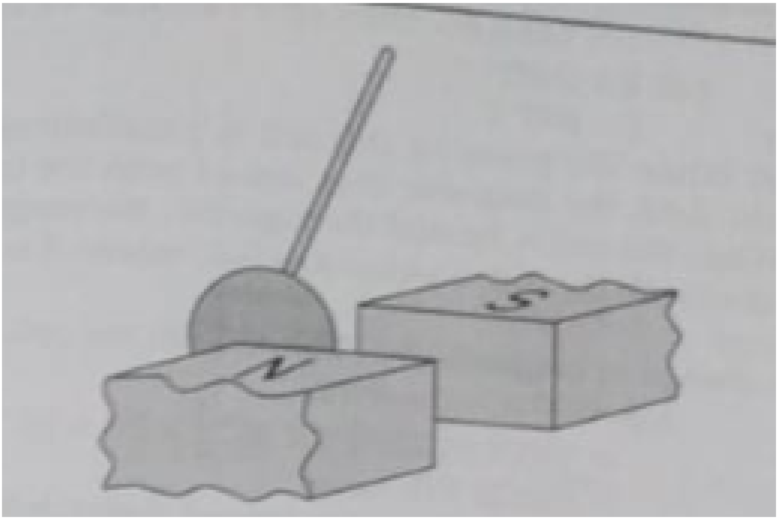
162. A metal disc is winging freely between the poles of an electromagnet, as shown in the figure. When the electromagnet is switched on, the disc comes to rest after a few oscillations. Use Faraday's law of electromagnetic induction to explain why an e.m.f. is induced in the disc.



Watch Video Solution

163. A metal disc is winging freely between the poles of an electromagnet, as shown in the

figure. When the electromagnet is switched on, the disc comes to rest after a few oscillations. Explain why eddy currents are induced in the metal disc.



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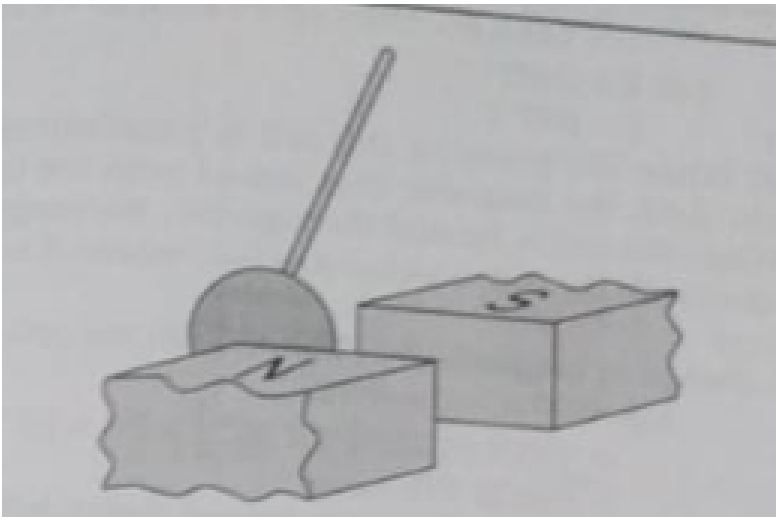
164. A metal disc is winging freely between the poles of an electromagnet, as shown in the figure. When the electromagnet is switched on, the disc comes to rest after a few oscillations. Explain why eddy currents are induced in the metal disc.



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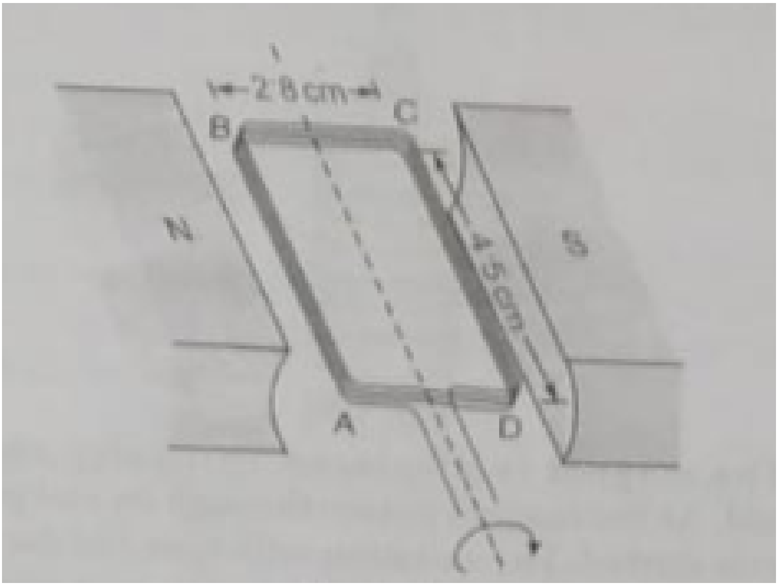
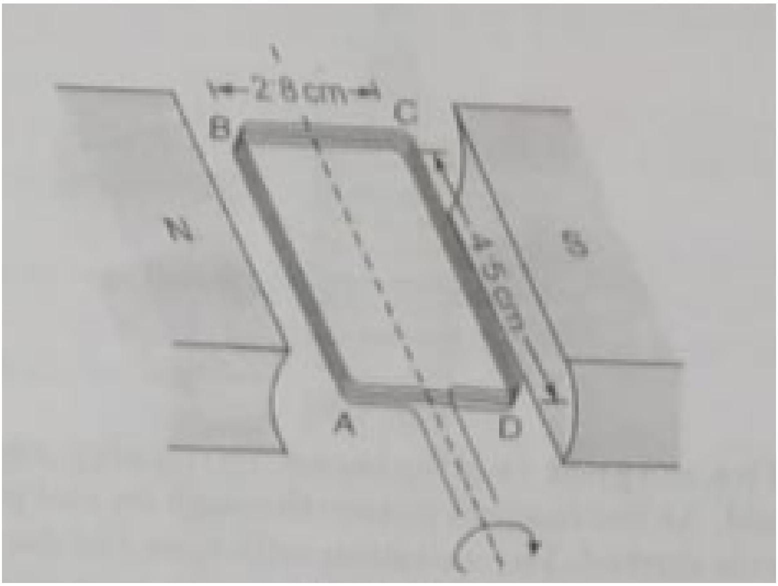
165. A small retangular coil ABCD contains 140 turns of wire. The sides AB and BC of the coil are of length 4.5 and 2.8 cm respectively, as shown in the figure



The coil is held between the poles of a large magnet so that the coil can rotate about an axis thorugh its centre. The magnet produces a uniform magnetic field of flux density B between its poles. When the current in the coil is 170 mA, the maximum torque produced in the coil is $2.1 \times 10^{-3} Nm$. For the coil in the position for maximum torque, state whether the plane of the coil is parallel to, or normal to , the direction of the magnetic field.

Watch Video Solution

166. A small retangular coil ABCD contains 140 turns of wire. The sides AB and BC of the coil are of length 4.5 and 2.8 cm respectively, as shown in the figure



The coil is held between the poles of a large magnet so that the coil can rotate about an axis thorugh its centre. The magnet produces a uniform magnetic field of flux density B between its poles. When the current in the coil is 170 mA, the maximum torque produced in the coil is $2.1 \times 10^{-3} Nm$. For the coil in the position shown in the figure. calculate the magnitude of the force on (i) side AB of the coil and (ii) side BC of the coil.

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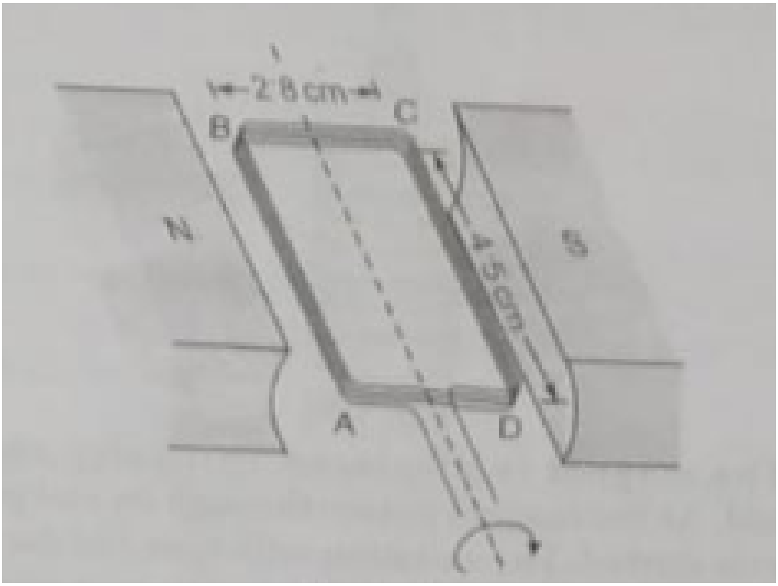
167. A small retangular coil ABCD contains 140 turns of wire. The sides AB and BC of the coil are of length 4.5 and 2.8 cm respectively, as shown in the figure



The coil is held between the poles of a large magnet so that the coil can rotate about an axis thorugh its centre. The magnet produces a uniform magnetic field of flux density B between its poles. When the current in the coil is 170 mA, the maximum torque produced in the coil is $2.1 \times 10^{-3} Nm$. Use your answer to show that the magnetic flux density B between the poles of the magnet is 70 mT.

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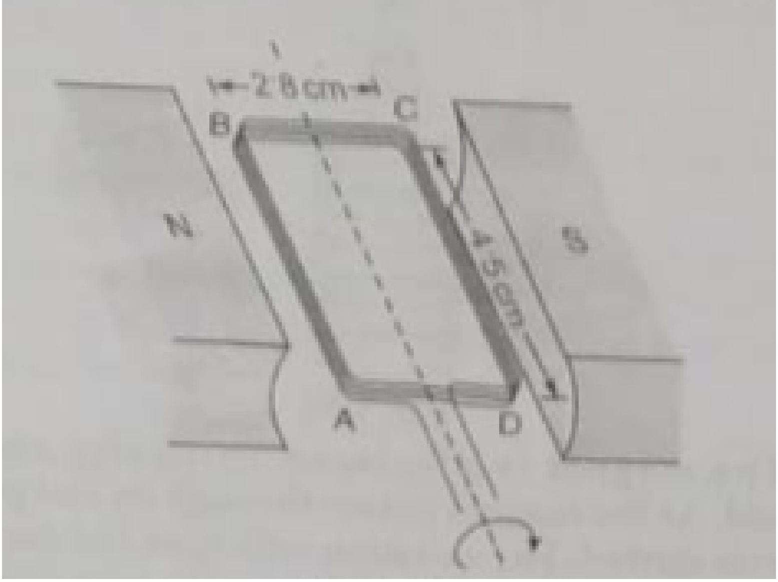
168. A small retangular coil ABCD contains 140 turns of wire. The sides AB and BC of the coil are of length 4.5 and 2.8 cm respectively, as shown in the figure



The coil is held between the poles of a large magnet so that the coil can rotate about an axis thorugh its centre. The magnet produces a uniform magnetic field of flux density B between its poles. When the current in the coil is 170 mA, the maximum torque produced in the coil is $2.1 \times 10^{-3} Nm$. The current in the coil in (a) is switched off and the coil s positioned as shown in the figure. The coil is then turned thorugh an angle of 90° in a time of 0.14 s. Calculate the average e.m.f. induced in the coil.

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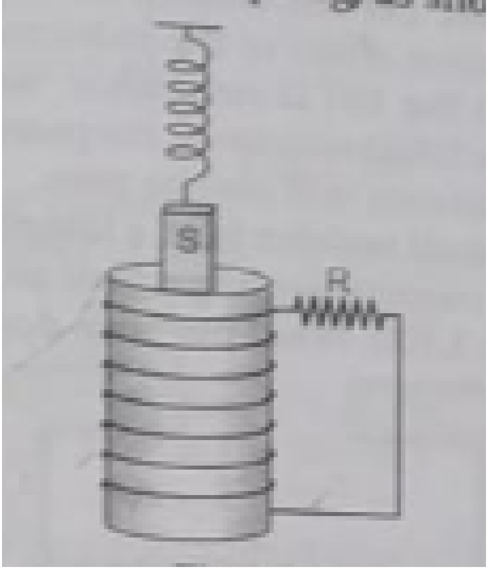
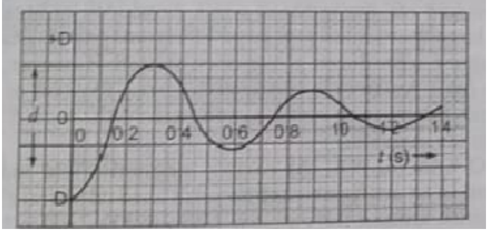
169. A magnet is suspended vertically from a fixed point by means of a spring, as shown in the figure.



One end of the magnet hangs inside a coil of wire. The coil is connected in series with a resistance R. The magnet is displaced vertically a small distance D and the released. shown in the figure variation with time t of the vertical displacement d of the magnet from its equilibrium position.



State and explain, by reference to electromagnetic induction, the nature of the oscillations of the magnet. Calculate the angular frequency ω_0 of the oscillations.

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170. An aircraft flies along the meridian. Will the potentials of the ends of its wings be the same?

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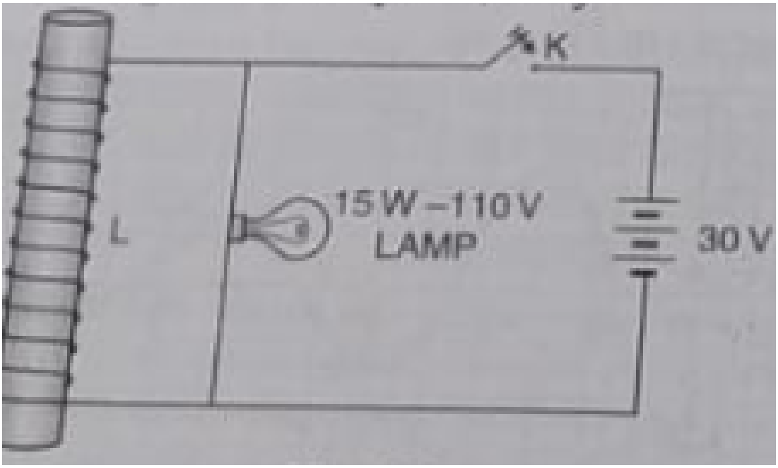
171. A copper coil L wound on a soft iron core and a 15 W - 110 V lamp are connected to a 30 V battery through a tapping key as shown in the figure. When the key is closed, the lamp glows dimly. But when the key is suddenly opend, the lamp flashes for an instant to much greater brightness. Explain, why.



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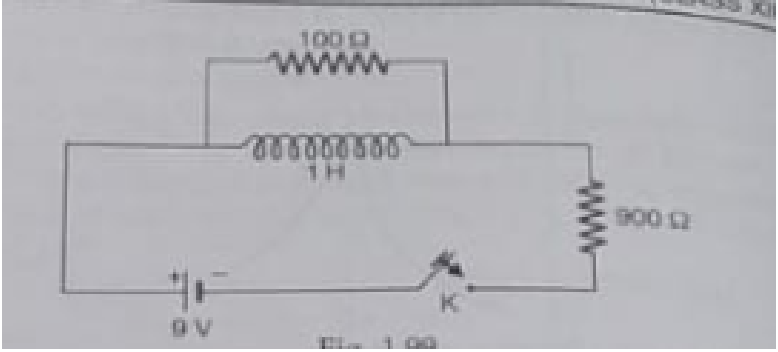
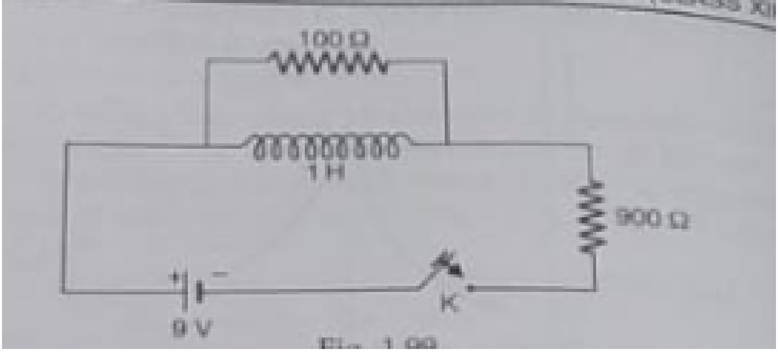
172. An ideal inductor of 1 H is connected across a resistance of 100 ohm as shown in the figure.



What is the current through the inductor as soon as key K is closed?

Watch Video Solution

173. An ideal inductor of 1 H is connected across a resistance of 100 ohm as shown in the figure.



What is the potential difference across the 100 ohm resistance, when the current has attained a steady value?

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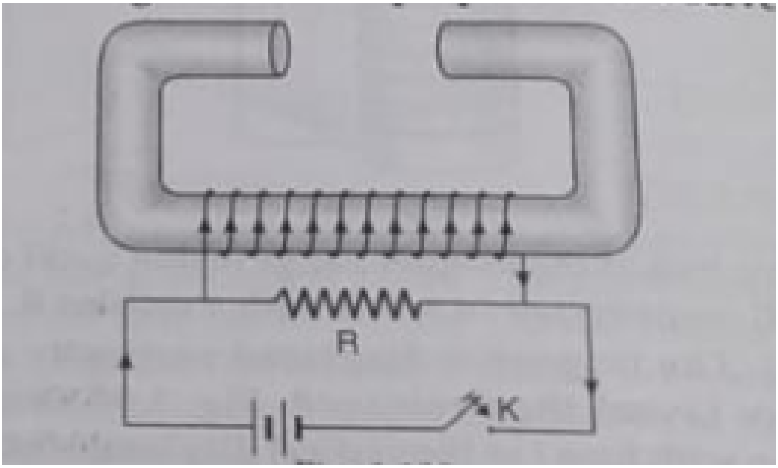
174. A small resistor is usually put in a parallel t the current carrying coil of an electromagnet as shown in the figure. What purpose does it serve?



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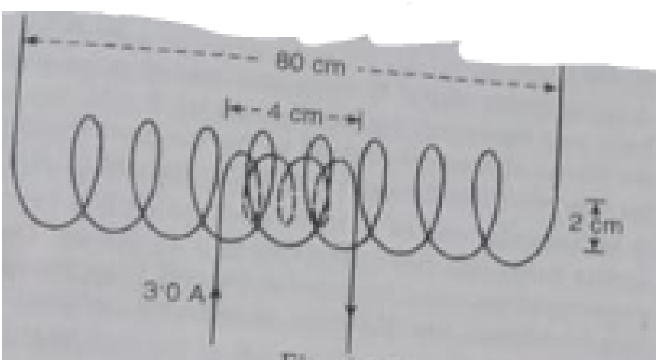
175. An artificial satellite with a metal surface has an orbit over the equator. Will the earth's magnetism induce a current in it?

Watch Video Solution

176. Figure shows a short solenoid of length 4 cm, radius 2.0 cm and number of turns 100., lying inside on the axis of a long solenoid, 80 cm long and number of turns 1,500. What is the flux through the long solenoid, if a current of 5.0 A flows through the short solenoid? Also obtain the mutual inductance of the two solenoids.



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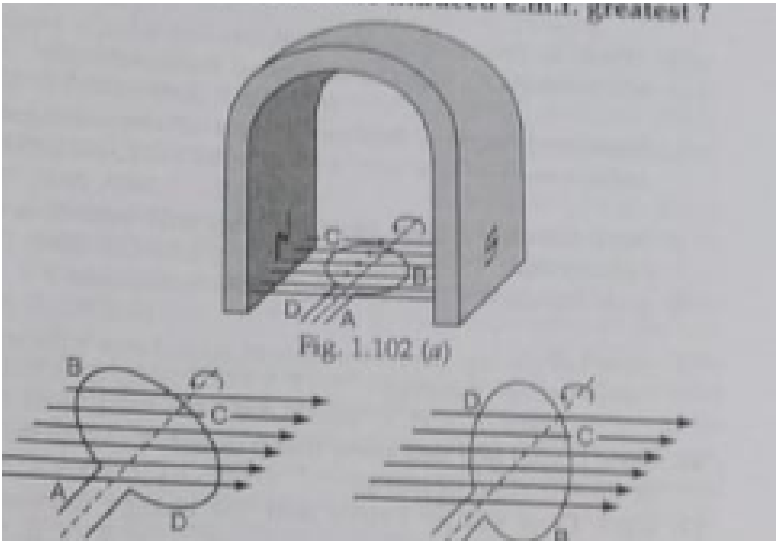
177. Figure shows three different orientations of a circular coil rotating in the magnetic field between the poles of a horse shoe magnet.

Determine the direction of induced current in the coil, if the rotation is anticlockwise as viewed by the reader.



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178. Figure shows three different orientations of a circular coil rotating in the magnetic field

between the poles of a horse shoe magnet.

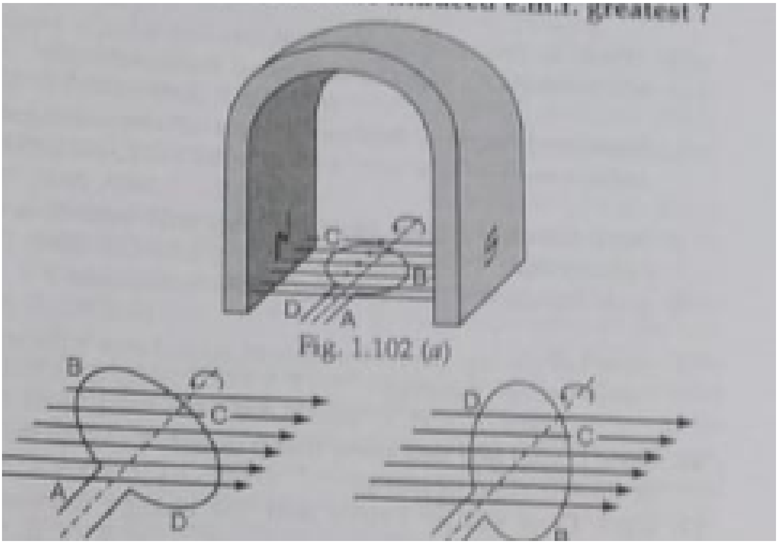

Fig. 1.102 (a)

In which orientation during rotation with uniform angular speed) is the induced e.m.f. greatest?

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Exercise

1. Explain the concept of magnetic flux linked with a surface.

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2. What is electromagnetic induction ? State its laws.

Watch Video Solution

3. What is electromagnetic induction ? State its laws.

Watch Video Solution

4. What is electro-magnetic induction?

Watch Video Solution

5. What is electromagnetic induction ? State its laws.

Watch Video Solution

6. State Lenz's law of electromagnetic induction.

Watch Video Solution

7. State and explain Faraday's law of electromagnetic induction.

Watch Video Solution

8. State and explain Faraday’s law of electromagnetic induction.

Watch Video Solution

9. Is Lenz's law in accordance with the law of conservation of energy?

Watch Video Solution

10. State Lenz’s law.Give one example to illustrate it.

Watch Video Solution

11. Show that Lenz's law obeys the law of conservation of energy.

Watch Video Solution

12. State Lenz's law of electromagnetic induction.

Watch Video Solution

13. Will an induced current be always produced whenever there is change of magnetic flux linked with a coil?

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14. Derive an expression for induced e.m.f. developed in a conductor of length l moving with velocity v in transverse magnetic field of strength B.

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15. Derivea expression for inducede.m.f. whenacoilrotates in a uniform magnetic field andprove it graphically that the e.m.f. induced is alternating in nature.

Watch Video Solution

16. Derive an expression for induced current, when a coductor of length l is moved with a uniform velocity v normal to the uniform magnetic field B. Assume the resistance of the conductor to be R.

Watch Video Solution

17. A straight conductor 1 meter long moves a right angles to both, its length and a uniform

magnetic field. If the speed of the conductor is $2.0ms^{-1}$ and the strength of the magnetic field is 10^4 gauss, find the value of induced emf in volt.

Watch Video Solution

18. What is electromagnetic induction ? State its Faraday's laws. Find an expression for the e.m.f. induced due to change in the area of a coil lying in a uniform magnetic field.

Watch Video Solution

19. What is electromagnetic induction ? State its Faraday's laws. Find an expression for the e.m.f. induced due to change in the area of a coil lying in a uniform magnetic field.

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20. A rectangular conductor LMNO is placed in a uniform magnetic field $\overrightarrow{B}$ directed perpendicular to the plane of conductor . Obtain an expression for the e.m.f. induced in the arm MN, when the arm is moved toward the left with a speed v.

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21. A rectangular coil of N turns and ara of cross-section A is held in a time-varying field given by $B = B_0 \cos \omega t$, with the plane of the coil noral to the magnetic field. Deduce an expression for the e.m.f. induced in the coil.

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22. A circular coil of N turns and radius R is kept normal to the magnetic field given by $B = B_0 \cos \omega t$. Deduce an expression for e.m.f. induced in the coil. State the rule which helps to detect the direction of induced current.

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23. A metallic rod of length l is rotated at a constant angular speed ω, normal to a uniform magnetic field B. Derive an expressions for the current induced in the rod, if the resistance of the rod is R.

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24. A coil of number of turns N, area A, is rotated at a constant angular speed omega, in a uniform magnetic field B, and connected to a resistor R. Deduce expressions for :

power dissipated in the coil.

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25. In an a.c. generator, coil of N turns and area A is rotated at v revolutions per second in a uniform magnetic field B. Write the expression for e.m.f. produced.

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26. What are eddy currents ?

Watch Video Solution

27. What are eddy currents ?

Watch Video Solution

28. What are eddy currents ?

Watch Video Solution

29. What are eddy currents ?

Watch Video Solution

30. Which of the following is not an application of eddy currents?

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31. What are eddy currents ? How are these produced ? How eddy currents can be minimized in a transformer.

Watch Video Solution

32. How eddy currents are useful in induction furnance

Watch Video Solution

33. How eddy currents are useful in electric power meters?

Watch Video Solution

34. What are eddy currents ? How are these produced ? How eddy currents can be minimized in a transformer.

Watch Video Solution

35. What are eddy currents ?

Watch Video Solution

36. What is self Inductance of a coil ? Define coefficient of self Induction.

Watch Video Solution

37. Explain self induction of a coil and give its unit.

Watch Video Solution

38. Define the term self-induction. Write its SI unit. Write two factors on which the self-inductance of a coil depends.

Watch Video Solution

39. Explain the phenomenon of self induction?

Watch Video Solution

40. Derive expression for self inductance for a solenoid.

Watch Video Solution

41. Derive expression for self inductance for a solenoid.

Watch Video Solution

42. What is self Inductance of a coil ? Define coefficient of self Induction.

Watch Video Solution

43. Derive expression for the coefficient of mutual inductance between two long solenoids.

Watch Video Solution

44. Derive expression for self inductance for a solenoid.

Watch Video Solution

45. Give the expression for the energy stored in a capacitor and an indicator.

Watch Video Solution

46. Show that in an electric circuit consisting of inductance, the coefficient of self induction is numerically equal to twice the work done in establishing the magnetic flux associated with unit current in the circuit.

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47. How is energy stored in an inductor and where does this energy reside? Obtain an expression for this energy and give an example, where this energy is made use of.

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48. Define the term self-inductance of a solenoid. Obtain the expression for the magnetidc energy stored in an inductor of self-inductance L to build up a current I through it.

Watch Video Solution

49. Define self-inductance of a coil. Show that magnetic energy required to build up the current I in a coil of self-inductance L is given by $\frac{1}{2}LI^2$

Watch Video Solution

50. Define self-inductance of a coil. Show that magnetic energy required to build up the current I in a coil of self-inductance L is given by $\frac{1}{2}LI^2$

Watch Video Solution

51. Show that energy stored in an inductor L, when a current is f established through it, is 1/2(LI ^2).

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52. Define self-inductance of a coil. Show that magnetic energy required to build up the current I in a coil of self-inductance L is given by $\frac{1}{2}LI^2$

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53. The current flowing through an inductor of self inductance L is continuously increasing. Plot a graph showing the variation magnetic flux versus the current

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54. The current flowing through an inductor of self inductance L is continuously increasing.

Plot a graph showing the variation induced emf versus dI/dt

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55. The current flowing through an inductor of self inductance L is continuously increasing. Plot a graph showing the variation magnetic potential energy stored versus the current.

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56. Define mutual inductance and explain it?

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57. What is meant by mutual induction? Define coefficient of mutual induction. ALso define its S.I unit of mutual induction.

Watch Video Solution

58. What is meant by mutual induction? Define coefficient of mutual induction. ALso define its S.I unit of mutual induction.

Watch Video Solution

59. Derive expression for the coefficient of mutual inductance between two long solenoids.

Watch Video Solution

60. Derive expression for the coefficient of mutual inductance between two long solenoids.

Watch Video Solution

61. Derive expression for self inductance for a solenoid.

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62. Draw a labelled diagram of a.c.generator.

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63. State the factors on which induced e.m.f. in a coil rotating in a uniform magnetic field depends.

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64. A conducting rod of 1 m length is rotated with a frequency of 50 rev/s, with one end hinged at the centre and the other end at the circumference of a circular metallic ring of radius 1 m, about an axis passing through the centre and perpendicular to the plane of the ring. A constant and uniform magnetic field of 1 T parallel to the axis is present everywhere. What is the emf between the centre and the metallic ring?

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65. A rectangular coil of n turns and area A is held in a uniform magnetic field B. If the coil is rotated at a steady angular velocity ω ,duduce an expression for induced emf in the coil at any instant of time

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66. Draw a labelled diagram of a.c.generator.

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67. What is electromagnetic induction ? State its laws.

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68. Name the methods of producing induced emf.

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69. State and explain Faraday’s law of electromagnetic induction.

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70. Explain Faraday's and lenz's law of electromagnetic induction by describing suitable experiments.

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71. What is Lenz's law? prove that Lenz's law is in accordance with the conservation of energy principle.

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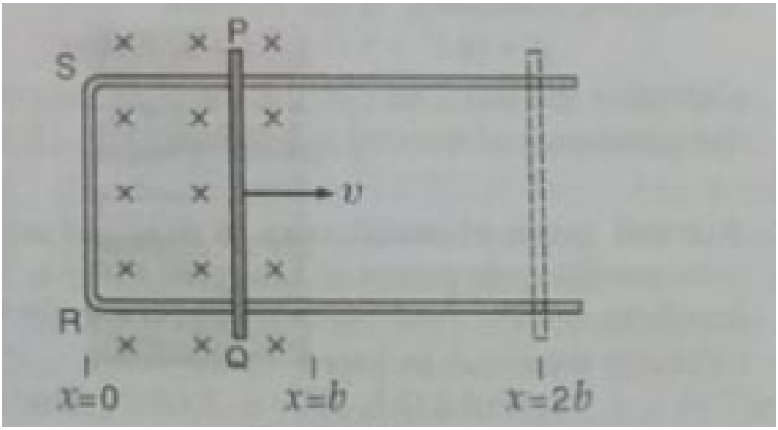
72. Figure shows a rectangular conductor PQRS in which the conductor PQ is free to move in a uniform magnetic field B perpendicular to the plane of the paper.The field extends from x=0 to x=b and is zero for x>b.Assume that only the arm PQ posses resistance r.When the arm PQ is pulled outward from x=0 with constant speed v, obtain the expressions for the flux and the induced emf with distance 0≤x≤2b



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73. What are eddy currents ?

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74. What is self Inductance of a coil ? Define coefficient of self Induction.

Watch Video Solution

75. Define self-inductance of a coil. Show that magnetic energy required to build up the current I in a coil of self-inductance L is given by $\frac{1}{2}LI^2$

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76. Using Ampere's circuital law, obtain an expression for the magnetic field along the axis of a current carrying solenoid of lenth l and having N number of turns.

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77. Derive expression for the coefficient of mutual inductance between two long solenoids.

Watch Video Solution

78. Derive expression for the coefficient of mutual inductance between two long solenoids.

Watch Video Solution

79. Derive expression for the coefficient of mutual inductance between two long solenoids.

Watch Video Solution

80. What is meant by mutual induction? Define coefficient of mutual induction. ALso define its S.I unit of mutual induction.

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81. Derive expression for the coefficient of mutual inductance between two long solenoids.

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82. What is an a.c. generator? With the help of a labelled diagram, explain the construction and working of an a.c. generator.

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83. What is an a.c. generator? With the help of a labelled diagram, explain the construction and working of an a.c. generator.

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84. Draw a labelled diagram of a.c.generator.

Watch Video Solution

85. Give the principle, construction and labelled diagram of AC generator.

Watch Video Solution

86. What is an a.c. generator? With the help of a labelled diagram, explain the construction and working of an a.c. generator.

Watch Video Solution

87. Give the principle, construction and working of an a.c. generator.

Watch Video Solution

88. Draw a labelled diagram of a.c.generator.

Watch Video Solution

89. Explain with the help of labelled diagram, the construction, working and theory of ac generator. Obtain an expression for induced e.m.f.

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Watch Video Solution

93. Give the principle, construction and working of an a.c. generator.

Watch Video Solution

94. Draw a shematic sketch of an a.c. generator describing its basi elements. State briefly its working principle. Show a plot of variation of magnetic flux

Watch Video Solution

95. Draw a shematric sketch of an a.c. generator describing its basic elements. State briefly its working principle. Show a plot of variation of alternating e.m.f. Versus time generated by a lopp of wire rotating in a magnetic field.

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96. Explain principal,construction and working of D.C.generator.

Watch Video Solution

97. Explain with the help of labelled diagram, the construction, working and theory of ac generator. Obtain an expression for induced e.m.f.

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98. State laws of electromagnetic induction. A rectangular loop of N turns of length 'a' and width 'b' is rotated with an angular velocity ω in a uniform magnetic field of induction B. Show that induced e.m.f. is given by $e = \omega NbaB \sin \omega t$

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99. The magnetic flux through a coil perpendicular to its plane is varying according to the relation $\phi = (4t^3 + 5t^2 + 8t + 5)$

weber Calculate the induced current through the coil at t = 2 s. if the resistance of the coil is 3.1 ohm.

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100. A small piece of metal wire is dragged across the gap between the pole pieces of a magnet in 0.5 s. The amgnetic flux between the pole pieces is known to be $8 \times 10^{-4} Wb$. Estimate the e.m.f. induced in the wire.

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101. A magnetic field of flux density $1.0 Wbm^{-2}$ acts normal to a 80 turns coil of $0.01 m^2$ area. Find the e.m.f. induced in it. If this coil is removed form the field in 0.1 second

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102. A magnetic field of flux density 10 T acts normal to a coil of 50 turns having $100 cm^2$ area. Find e.m.f. iduced, if the coil is removed from the magnetic field on 0.1 s.

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103. Find the magnitude of e.m.f. induced in a 200 turn coil with cross-sectional area of $0.16m^2$, if the magnetic field through the coil changes from $0.10Wbm^{-2}$ to 0.30 Wbm^{-2} at a uniform rate over a period of 0.05 s.

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104. A rectangular coil having 200 turns and size $0.30 \times 0.05m^2$ is placed perpendicular to a magnetic field. The field changes from $5x10^{-3}\ Wbm^{-2}$to $2x10(-3)\ Wbm(-2)$ in the time interval of 3 millisecond. Calculate the e.m.f. induced in the coil. If the resistance of the coil is 15Ω, find the value of current flowing through it.

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105. Find the e.m.f. induced in a coil of 20 turns and cross-sectional area $0.2m^2$, when a magnetic field perpendicular to the plane of the coil changes form $0.1Wbm^{-2}$ to $0.5Wbm^{-2}$ at a uniform rate over a period of 0.05 s.

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106. A wire 88cm long bent into a circular loop is placed perpendicular to the magnetic field of density 2.5 Wb m^{-2}. Within 0.5 s the loop is changed into square of each side 22 cm and the density is increased to $3Wbm - 2$. Calculate the value of e.m.f. induced.

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107. A square copper coil of each side 8 cm consists of 100 turns. The coil is initially in vertical plane, such that the plane of the coil is normal to uniform magnetic field of induction $0.4Wbm^{-2}$. The coil is turned throuugh 180°

about a horzontal axis in 0.2 s. Find the induced e.m.f.

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108. A conducting rod of 1 m length is rotated with a frequency of 50 rev/s, with one end hinged at the centre and the other end at the circumference of a circular metallic ring of radius 1 m, about an axis passing through the centre and perpendicular to the plane of the ring. A constant and uniform magnetic field of

1 T parallel to the axis is present everywhere. What is the emf between the centre and the metallic ring?

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109. A copper disc of radius 10 cm placed with its plane normal to a uniform magneic field completes 1,200 rotations per minute. If induced e.m.f. between the centre and edge of the disc in 6.284 m V, find the intensity of the magnetic field Take $\pi = 3.142$

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110. A copper rod of length 2 m fixed at one end is rotating with an angular speed $300rads^{-1}$ about an axis normal to the rod and passing thorugh its fixed end. The other end of the end. The other end of the rod is in contact with a circulr metallic ring. A constant magnetic field of 0.4 T parallel to the axis exists everywhere. calculate the e.m.f. developed between the centre and the ring.

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111. A metal disc of radius 200 cm is rotated at a constant angular speed of $60 rads^{-1}$ in a plane at right angles to an external field of magnetic induction $0.05 Wbm^{-1}$. Find the e.m.f. induced between the centre and a point on the rim.

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112. A metallic rod of length l is rotated at a constant angular speed ω, normal to a uniform magnetic field B. Derive an expressions for the current induced in the rod, if the resistance of the rod is R.

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113. A wheel with 8 matallic spokes each 50 cm long is rotated with a speed of$120 rev/min$ in a plane normal to horizontal component of earth's magnetic field. Earth's magnetic field at the phase is 0.4 G and angle of dip 60°. Calculate the emf induced between the axle and rim of the wheel. How is the emf affected if number of spokes is increased ?

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114. If a 10 m long metallic bar moves in a direction at right angle to the magnetic field with a speed of $5.0ms^{-1}$ 25 V e.m.f. is induced in it. Find the value of magnetic field intensity.

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115. A wire of length 0.1 m moves with a speed of $10ms^{-1}$ perpendicular to a magnetic field of induction $1Wbm^{-2}$. What is the value of induced e.m.f.?

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116. A conductor 2m long moves in a magnetic field of lfux density 0.5×10^{-4} tesla with a speedof 36 km per hour. Calculate the e.m.f.

induced in it, if it is perpendicular to both its length and field.

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117. A straight conductor 1 meter long moves a right angles to both, its length and a uniform magnetic field. If the speed of the conductor is $2.0 ms^{-1}$ and the strength of the magnetic field is 10^4 gauss, find the value of induced emf in volt.

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118. Calculate the e.m.f. induced between the ends of an axle 1.75 m long of a railway carriage travelling at the rate of $50kmh^{-1}$. The vertical component of the earth's magnetic field 0.5×10^{-4} weber m^{-2}

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119. An aircraft with a wingspan of 40 m flies with a speed of 1080 km/hr in the eastward direction at a constant altitude in the northern hemisphere, where the vertical component of the earth's magnetic field 1.75×10^{-5} . Then the emf developed between the tips of the wings is

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120. A satellite with a 40 cm long copper wire on its bottom is revolving around the earth at 7.8 km per second, such that the wire is perpendicular to the vertical component of earths' magnetic field. Determine the e.m.f.

induced across this wire, if the magnitude of the vertical component of magnetic field is 0.2 gauss.

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121. A railway track running North South has two parallel rails 1.0m apart. Calculate the value of induced e.m.f. between the rails when a train passes at a speed of $90kmh(-1)$. Horizontal component of earth's field at that place is $0.3 \times 1O(-4)$ $Wbm(-2)$ and angle of dip is 60°.

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122. A magnetic flux of 5 microweber is linked with a coil when a current of 1 MA flows through it.What is the self inductance of the coil ?

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123. The self inductance of an inductor having 100 turns is 20 mH. Calculate the total magnetic flux linked with the coil and the magnetic flux through the cross-section of the inductor corresponding to a current of 4 mA.

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124. A coil has an inductance of 1.5×10^{-2} H. Calculate the e.m.f. induced, when current in the coil changes at the rate 200 ampere per second.

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125. The current passing trhoguh a 20 H inductor changes form 9 A to 8 A in 20×10^{-3} s. What will be the value fo self induced e.m.f.?

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126. An e.m.f. of $250 \mu V$ is induced in a coil, when current in it changes from 10 A to 6 A in 0.4 s. What is the self inductance of the coil?

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127. A 5 henry inductor carries a steady current of 2 ampere. How can a 50 volt self induced e.m.f. be made to appear in the inductor?

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128. A coil has a self inductance of 10 mH. What is the maximum magnitude of the induced em.f. in the inductor, when a current I = 0.1 sin 200 t A is sent through it?

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129. A long solenoid of 10 turns / cm has a small loop of area 1 sq. cm placed inside with the normal of the loop parallel to the axis. Calculate the placed across the small loop if the current in the solenoid is changed from 1

A to 2 A in 0 .1 s, during the duration of this change.

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130. A coil has inductance of 5 henry and resistance 20 ohm. An e.m.f. of 100 volt is applied to it. What is the energy stored in the magnetic field, when the current has reached its final steady value?

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131. What will be the coefficient of mutual inductance of a pair of coil if a current of 3 ampere in one coil cause the flux in the second coil of 1000 turns to change by $10(-4)$Wb in each turn ?

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132. If the coefficient of mutual induction of primary and secondary of an induction coil is 6 henry and a current of 5 ampere is cut off in

2×10^{-4} s, ind the induced e.m.f. in the secondary coil.

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133. An e.m.f 0.5 V is developed in the secondary coil, when current in the primary coil changes from 5.0 A to 2.0 A in 300 millisecond. Calculate the mutual inductance of the two coils.

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134. An e.m.f. of 50 millivolt is induced in a coil, when the current int eh neighbouring coil changes form 10 ampere to 5 ampere in 0.1s . What is the mutual inductance of the coils?

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135. A conducting wire of 100 turns is wound over 1 cm near the centre of a solenoid of 100 cm length and 2 cm radius having 1,00 turns. Calculate coefficient of mutual inductance of the two solenoids.

136. An air-cored solenoid is of length 0.3 m area of cross-section $1.2 \times 10^{-3} m^2$ and has 2500 turns. Around tis central section, a coil of 350 turns is wound. The soelnoid and the coil are electrically insulated from each other. Calculate the e.m.f. induced in the coil , if the intial current of 3 A in the solenoid is reversed in 0.25 s.

137. A closely wound rectangular coil of 200 turns and size $0.3m \times 0.1$m is rotating in a magnetic field of induction $0.005Wbm^{-2}$ with a frequency of 1,800 r.p.m. about an axis normal to the field. Calculate the maximum value of induced e.m.f.

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138. A rectangular coil $25cm \times 10cm$ and having 700 turns rotates about an axis at right angles to a magnetic field of 20 gauss at 1,500revolutions per minute. Calculate the maximum vlaue of the e.m.f. generated in the coil.

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139. A rectangular coil of dimensions $40cm \times 25cm$having 1000 turns rotates in a uniform magnetic field of strength $0.08Wbm^{-2}$ about an axis perpendicular to the field. If the coil makes 300 revolution per minute, find the instantaneous emf when the plane of the coil make and angle of 0°

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140. A rectangular coil of dimensions $40cm \times 25cm$having 1000 turns rotates in a uniform magnetic field of strength $0.08Wbm^{-2}$ about an axis perpendicular to the field. If the coil makes 300 revolution per minute, find the instantaneous emf when the plane of the coil make and angle of 45°

141. A rectangular coil of dimensions $40cm \times 25cm$ having 1000 turns rotates in a uniform magnetic field of strength $0.08Wbm^{-2}$ about an axis perpendicular to the field. If the coil makes 300 revolution per minute, find the instantaneous emf when the plane of the coil make and angle of 90° with the magnetic lines of force.

142. An a.c. generator consists of a coil of 2,000 turns each of area $80cm^2$ and rotating at an angular speed of 200 r.p.m. in a uniform magnetic field of 4.8×10^{-2}T. Calculate the peak and r.m.s. value of e.m.f induced in the coil.

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143. A metallic wire bent in the form of a semicircle of raidus 0.1 m is moved into magnetic field of 20 mT in a direction parallel to its plane, but perpendicular to the magnetic field with a velocity of $10ms^{-1}$. Find the e.m.f. induced in the wire.

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144. A coil of wire of certain radius has 600 turns and a self inductance of 108 mH. What will be the self inductance of a similar coil, which has 500 turns?

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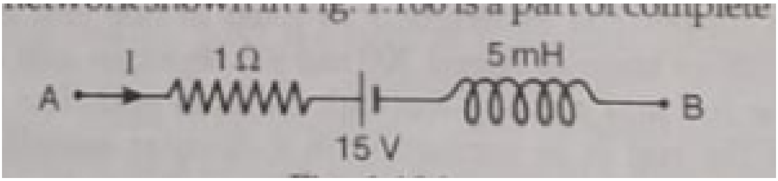
145. The network shown in the figure is a part of complete circuit. What is the potential difference $V_B - V_A$ when the current I is 5 A and is decreasing at a rate of $10^3 As^{-1}$?



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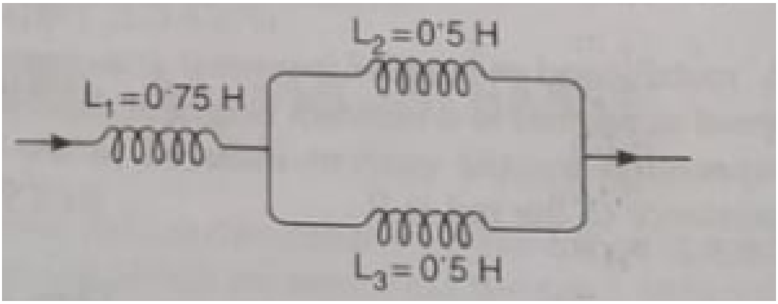
146. Three inductances are connected as shown in the figure 1.107 . Find the resultant inductance.



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