PHYSICS

BOOKS - MODERN PUBLICATION

FORCE ON A CURRENT

Example

1. A horizontal wire 0.1 m long carries a current of 5 A. Find the magntiude and diretion of the magnetic field, which can support the weight

of the wire. Assume wire to be of mass $3 \times 10^{-3} kgm^{-1}$

Watch Video Solution

2. Calculate the force per unit length on a long straight wire caerrying current of 4 A due to a parallel wire carrying 6 A current. Distance between the wires = 3 cm.

Watch Video Solution

3. Calculate the torque on a 100 turn rectangular coil of length 40 cm and breadth 20 cm, carrying a current of 10 A, when placed making an angle of 60° with a magnetic field of 5 T

Watch Video Solution

4. A rectangular coil of area$5.0 \times 10^{-4} m^2$and 60 turns is pivoted about one of its vertical sides. The coil is in a radial horizontal field of

90 G (radial here means the field liners are in the plane of the coil for any rotation). What is the torsional constant of the hair spring connected to the coil if a current of 2.0 mA produces an angular deflection of 18°?

Watch Video Solution

5. A galvanometer of resistance 15Ω gives full scale difflection for a current of 2 mA. Calculate shunt resistance required to convert it into an ammeter of range $0.5A$.

Watch Video Solution

6. A galvanometer coil has a resistance of 12Ω and the meter shows full scale deflection for a current of 2 mA. How will you convert the meter into a voltmeter of range 0 to 18 V?

Watch Video Solution

7. An electric motor operating at 200 V draws a current of 5 A at its full speed. The resistance

of the armature is 10Ω. Calculate the back e.m.f. and efficiency of the motor?

Watch Video Solution

8. A straight horizontal conducting rod of length 0.45 m and mass 60 g is suspended by two vertical wires at its ends. A current of 5.0 A is set up in the rod through the wires. What magnetic field should be set up normal to the conductor in order that the tension in the wires is zero?

Watch Video Solution

9. A straight horizontal conducting rod of length 0.45 m and mass 60 g is suspended by two vertical wires at its ends. A current of 5.0 A is set up in the rod through the wires. What will be the total tension in the wires if the direction of current is reversed keeping the magnetic field same as before? (Ignore the mass of the wires.) $g = 9.8ms^{-2}$.

Watch Video Solution

10. On a smooth inclined plane at 30° with the horizontal a thin current carrying metallic rod is placed parallel to the horizontal ground. The plane is located in a uniform magnetic field of0.15tesla in the vertical direction. For what value of current can the rod ramain stationary? The mass per unit length of rod is $0.30 kgm^{-1}$.

Watch Video Solution

11. Two long parallel wires are 0.4 m apart in air and carry currents of 5 A and 12 A respectively. Calculate the force on each metre of the wire, fi the currents are in the same direction .

Watch Video Solution

12. Two long parallel wires are 0.4 m apart in air and carry currents of 5 A and 12 A respectively. Calculate the force per metre of

wire if currents are in the opposite direction. Given $\mu_0 = 4\pi 10^{-7} TA^{-1}$ m.

Watch Video Solution

13. The wires which connect the battery of an automobile to its starting motor carry a current of 300 A (for a short time). What is the force per unit length between the wires if they are 70 cm long and 1.5 cm apart? Is the force attractive or repulsive?

Watch Video Solution

14. Two long parallel straight wires X and Y separated by a distance of 5 cm in air carry current of 10 A and 5 A respectively in opposite directions. Calculate the magnetic force and direction of the force on a 20 cm

length of the wire Y.

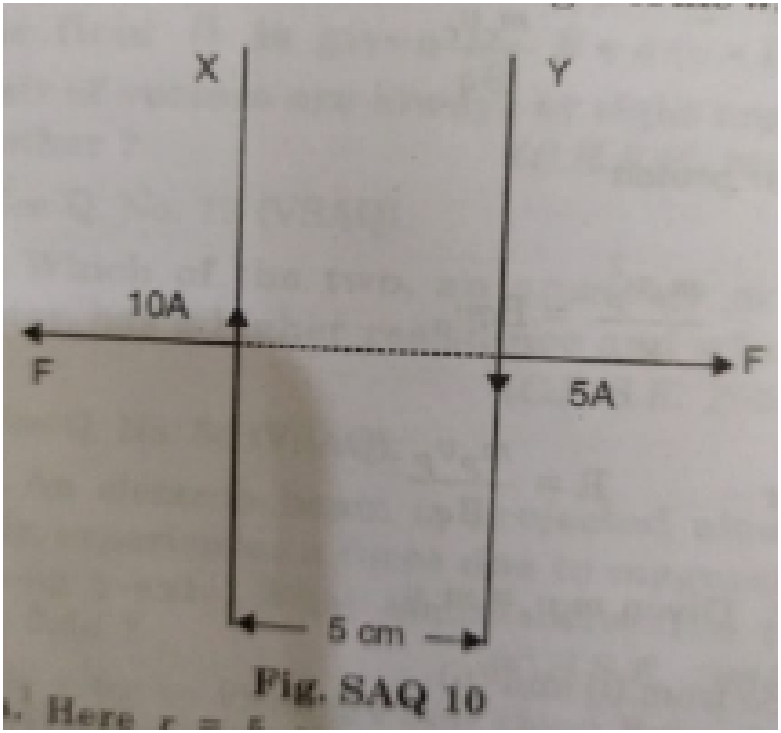


Fig. SAQ 10

Watch Video Solution

15. A short conductor of length 5.0cm is placed parallel to a long conductor of length 1.5cm

near its centre. The conductors carry currents 4.0A and 3.0A respectively in the same direction. What is the total force experienced by the long conductor, when they are 3.0cm apart?

Watch Video Solution

16. A rectangular loop of sides 25 cm and 10 cm carrying current of 15A is placed with its longer side parallel to a long straight

conductor 2.0 cm apart carrying a current of 25A. What is the new force on the loop ?

Watch Video Solution

17. A current balance is a device to measure magnetic forces. It is constructed from two parallel coils, each with an average radius of 12.5 cm. The lower coil rests on a balance, it has 20 turns and carries a constant current of 4.0 A. The upper coil, suspended 0.314 cm above the lower coil, has 50 turns and a

current that can be varied. The reading of the balance changes as the. magnetic force on the lower coil changes. What current is needed in the upper coil to exert a force of 1.0 N on the bottom coil?

Watch Video Solution

18. A solenoid 60 cm long and of radius 4.0 cm has 3 layers of windings of 300 turns each. A 2.0 cm long wire of mass 2.5 g lies inside the solenoid (near its centre) normal to its axis,

both the wire and the axis of the solenoid are in the horizontal plane. The wire is connected through two leads parallel to the axis of the solenoid to an external battery which supplies a current of 6.0 A in the wire. What value of current (with appropriate sense of circulation) in the windings of the solenoid can support the weight of the wire? $g = 9.8ms^{-2}$.

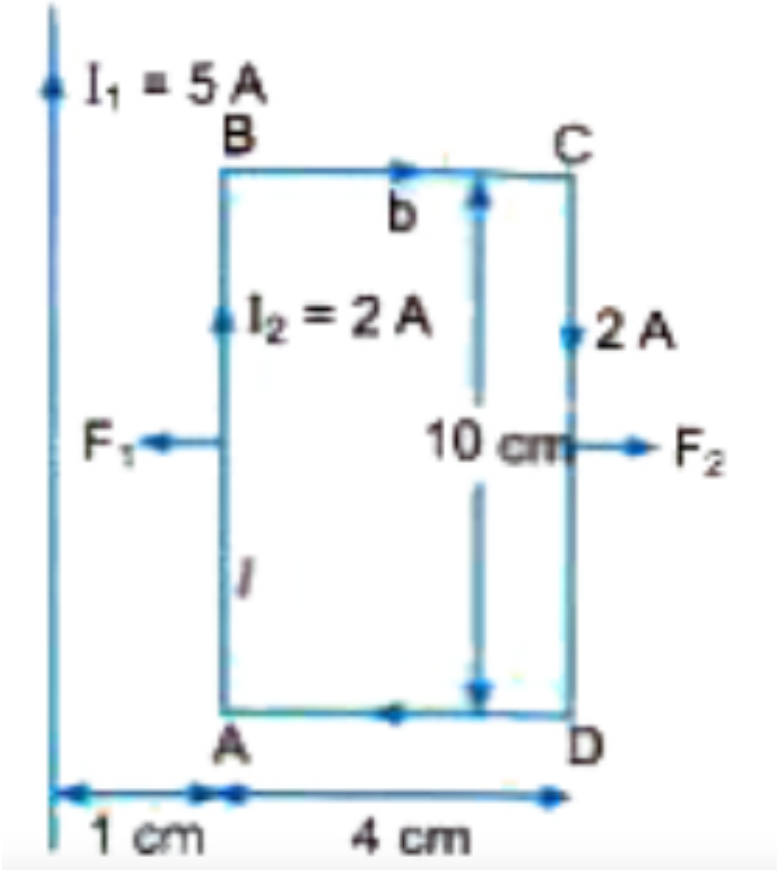
Watch Video Solution

19. A rectangular loop of wire of size $4cm \times 10cm$ carries a steady current of 2A. A straight long wire carrying 5A current is kept near the loop If the loop and the wire are coplanar, find

(i) the torque acting on the loop and

(ii) the magnitude and direction of the force on the loop due to the current carrying

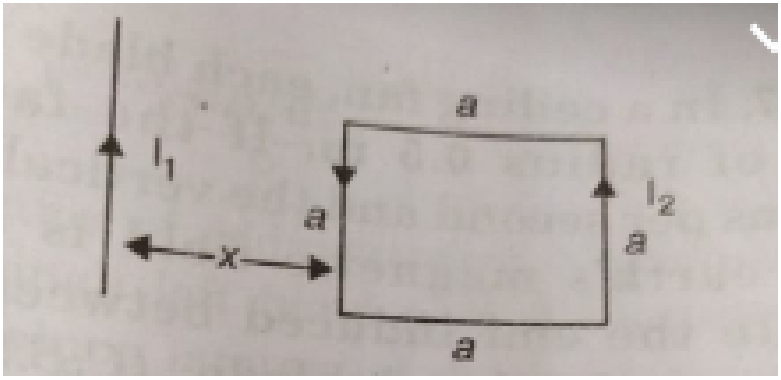
wire(fig).



Watch Video Solution

20. Define mutual inductance and write its SI unit.

A square loop of side 'a' carrying a current I_2 is kept at distance x from an infinitely long straight wire carrying a current I_1 as shown in the figure SAQ 41. Obtain the expression for the resultant force acting on the loop.



Watch Video Solution

21. A circular coil of 30 turns and radius 8.0 cm carrying a current of 6.0 A is suspended vertically in a uniform horizontal magnetic field of magnitude 1.0 T. The field lines make an angle of 60° with the normal of the coil. Calculate the magnitude of the counter torque that must be applied to prevent the coil from turning.

Watch Video Solution

22. A circular coil of 30 turns and radius 8.0 cm carrying a current of 6.0 A is suspended vertically in a uniform horizontal magnetic field of magnitude 1.0 T. The field lines make an angle of 60° with the normal of the coil. Calculate the magnitude of the counter torque that must be applied to prevent the coil from turning. Would your answer change, if the circular coil in (a) were replaced by a planar coil of some irregular shape that encloses the same area? (All other particulars are also unaltered.)

Watch Video Solution

23. Given a uniform magnetic field of 100 G in a east to west direction and a 44 cm long wire with a current carrying capacity of at most 10 A. What is the shape and oreintation of the loop made of this wire, which yields maximum turning effect on the loop? What is the magnitude of the maximum torque?

Watch Video Solution

24. A circular coil of 20 turns and radius 10 cm is placed in a uniform magnetic field of 0.10 T normal to the plane of the coil. If the current in the coil is 5.0 A, what is the total torque on the coil, (The coil is made of copper wire of cross-sectional area $10^{-5}m^2$, and the free electron density in copper is given to be about $10^{29}m^{-3}$.)

Watch Video Solution

25. A circular coil of 20 turns and radius 10 cm is placed in a uniform magnetic field of 0.10 T normal to the plane of the coil. If the current in the coil is 5.0 A, what is the total force on the coil, (The coil is made of copper wire of cross-sectional area $10^{-5}m^2$, and the free electron density in copper is given to be about $10^{29}m^{-3}$.)

Watch Video Solution

26. A circular coil of 20 turns and radius 10 cm is placed in a uniform magnetic field of 0.10 T normal to the plane of the coil. If the current in the coil is 5.0 A, what is the average force on each electron in the coil due to the magnetic field? (The coil is made of copper wire of cross-sectional area $10^{-5}m^2$, and the free electron density in copper is given to be about $10^{29}m^{-3}$.)

Watch Video Solution

27. The coil of a galvanometer is $0.02 \times 0.06 m^2$. It consits of 200 turns of fine wire and is in a magnetic field of 0.2 tesla. The restoring torque constant of the suspension fibre is 10^{-6} N m per degree. Assuming the magnetic field to be radial. What is the maxium current that can be measured by this galvanometer, if the scale can accommodate 30° deflection?

Watch Video Solution

28. The coil of a galvanometer is $0.02 \times 0.06 m^2$. It consits of 200 turns of fine wire and is in a magnetic field of 0.2 tesla. The restoring torque constant of the suspension fibre is 10^{-6} N m per degree. Assuming the magnetic field to be radial.What is the smallest current that can be detected, if the minimum observable deflection is 0.1°?

Watch Video Solution

29. The current sensitivity of a moving coil galvanometer increases by 20% , when its resistance is increased by a factor of two. Calculate by what factor, the voltage sensitivity changes.

Watch Video Solution

30. A galvanometer has a resistnace of 100 ohm. A difference of potential of 100 millovolt between its terminals gives a full scale

deflection. Calculate shunt resistance, which will enable the instrument to read upto 5 ampere.

Watch Video Solution

31. A n ammeter of resistance 100Ω can measure a maximum current of 5 mA. What will you do to measurea maximum current of 5 A .

Watch Video Solution

32. A galvanometer has a resistance of 60 ohm and a full scale deflection is produced by 1.0 mA. How will yo convert it into an ammeter to read 1 A (full scale)

Watch Video Solution

33. A galvanometer has a resistance of 60 ohm and a full scale deflection is produced by 1.0 mA. how will you convert it into Voltemeter to read 3 V (full scale)?

Watch Video Solution

34. A moving coil galvanometer of resistance 10 ohm produces full scale deflection, when a current of 25 mA is passed through it. How will your convert the galvanometer into a voltmeter reading upto 120 V

Watch Video Solution

35. A moving coil galvanometer of resistance 10 ohm produces full scale deflection, when a

current of 25 mA is passed through it. How will you convert the galvanometer into an ammeter reading upto 20 A.

Watch Video Solution

36. A galvanometer of resistance G is converted into a voltmeter to measure upto V volts by connecting a resistance R_1 in series with the coil. If a resistance R_2 s connected in series with it then it can measure upto $\frac{V}{2}$ volts Find the resistance R, in terms of R_1 and

R_2 required to convert it into a voltmeter that can read upto 2V volts.

Watch Video Solution

37. A galvanometer of resistance G is converted into a voltmeter to measure upto V volts by connecting a resistance R_1 in series with the coil. If a resistance R_2 s connected in series with it then it can measure upto $\frac{V}{2}$ volts Find the resistance R, in terms of R_1 and

R_2 required to convert it into a voltmeter that can read upto 2V volts.

Watch Video Solution

38. A voltmeter reads 5.0 V at full scale deflection and is graded according to its resistance per volt at full scale deflection as $5,000\Omega V^{-1}$. How will you convert it into a voltmeter that reads 20 V at full scale deflection? Will it still be graded as

$5,000\Omega s^{-1}$? Will you prefer this voltmeter to one that is graded as $2,000\Omega V^{-1}$?

Watch Video Solution

39. A battery of e.m.f. 3 volt and internal resistance r is conneted inseries with a resistance of 55 ohm through an ammeter of resistance 1 ohm. The ammeter reads 50 mA. Draw the circuit diagram and calculate the value of r.

Watch Video Solution

40. In a circuit shown in the figure voltmeter reads 30 V, when it is connected across 400 ohm resistance. Calculate what the same votlmeter will read, when connected across the 300 ohm resistance?

Watch Video Solution

41. A d.c. supply of 120 V is connected to a large resistance X. A voltmeter of resistance

$10k\Omega$ placed in series in the ciruuit reads 4 V. What is the value of X?

Watch Video Solution

42. What do you think is the purpose of using a voltmeter, instead of an ammeter, to determine the large resistance X?

Watch Video Solution

43. A voltemeter of resitance 400Ω connected for measurement to a section of a ciruit having a resistance of 20 ohm shows a reading of 100 V. What is the error in the reading of the voltmeter, if the current in the main circit is assumed to remain constant before and after connecting the voltmeter?

 Watch Video Solution

44. The back e.m.f. of a d.c. motor delivering 5 kW of mechanical power is 200 v, when operating on a 220 V line. Determine the armatre current and the motor resistsance.

Watch Video Solution

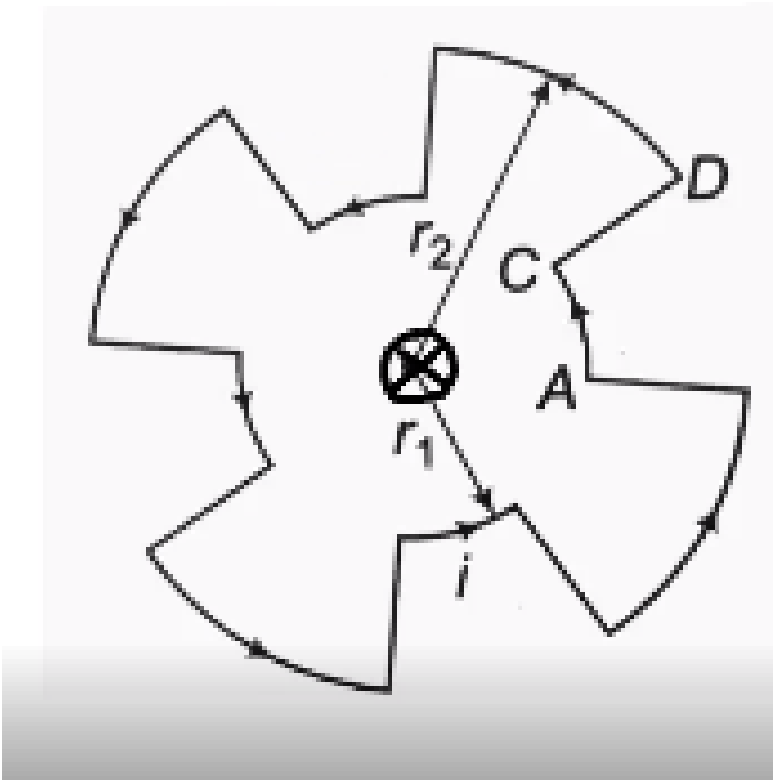
45. A small d.c. motor operating at 200 V draws a current of 5.0 A at its full speed of 3,000 r.p.m. The resistance of the armature of the motor is 8.5 Omega. Determine the back

e.m.f. of the motor. Obtain the power input, power output (mechanical) and the efficiency of the motor.

Watch Video Solution

46. A current of 10 A flow around a closed path in a circuit which is in the horizontal plane as shown in the figure. The circuit consists of eight alternative arcs of radii $r_1 = 0.8m$ and $r_2 = 0.12m$. Each subtends the same angle at the centre. Find the

magnetic fied produced by this circuit at the centre.

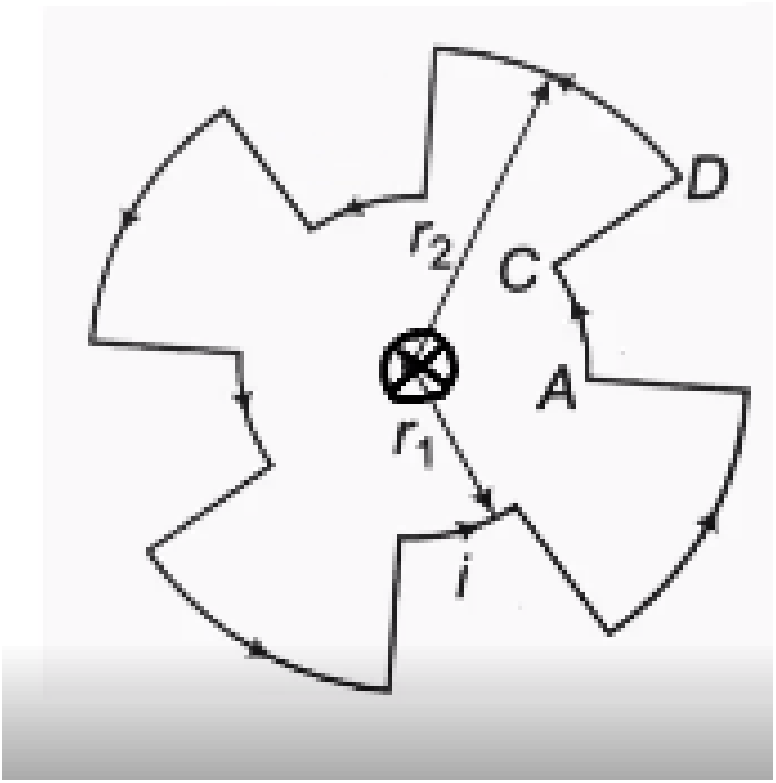


Watch Video Solution

47. A current of 10 A flow around a closed path in a circuit which is in the horizontal plane as shown in the figure. The circuit consists of eight alternative arcs of radii $r_1 = 0.08m$ and $r_2 = 0.12m$. Each subtends the same angle at the centre. An infinitely long straight wire carrying a current of 10 A is passing throgh the entre of the above circuit vertically with the direction of the current being into the plane of the circuit. What is the force acting on the wire at the centre due to the current in the circuit? What is the force

acting on the arc AC and the straight segment

CD due to the current at the centre?

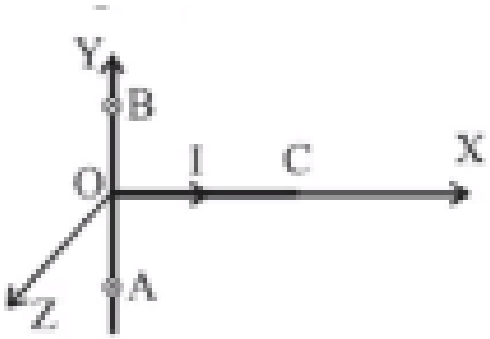


Watch Video Solution

48. A straight segment OC(of length L meter) of a circuit carrying a current I amp is placed along the x- axis (fig.). Two infinitely long straight wires A and B , each extending from $z = -\infty$ to $+\infty$, are fixed at y = -a meter and y = +a meter respectively, as shown in the figure.

If the wires A and B each carry a current I amp into the plane of the paper, obtain the expression for the force acting on the segment OC. What will be the force on OC if

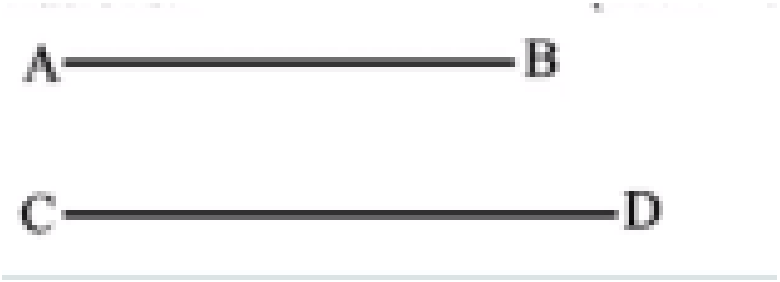
the current in the wire B is reversed?



Watch Video Solution

49. A long horizontal wire AB, which is free to move in a vertical plane and carries a steady current of 20 A, is in equilibrium at a height of 0.01 m over another parallel long wire CD which is fixed in a horizontal plane and carries

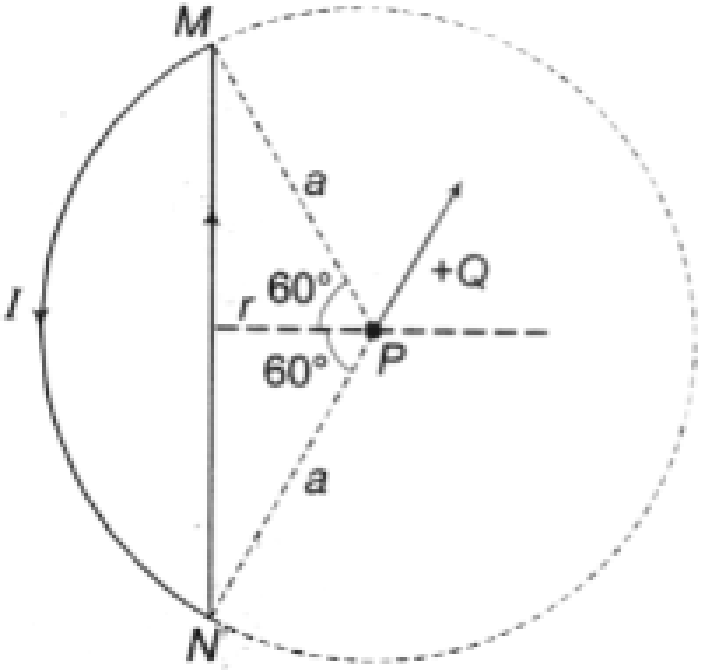
a steady current of 30 A, as shown in figure. Shown that when AB is slightly depressed, it executes simple harmonic motion. Find the period of oscillations.



Watch Video Solution

50. A wire loop carrying a current I is placed in the xy-plane as shown in figure

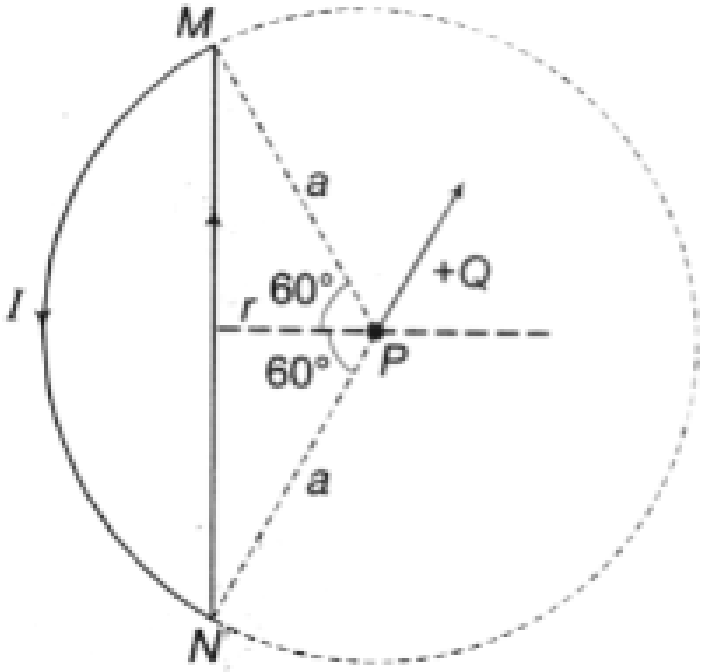
If a particle charge +Q and mass m is placed at in centre P and given a velocity v along NP (see figure), find its instaneous acceleration.



Watch Video Solution

51. A wire loop carrying a current I is placed in the xy-plane as shown in figure

If an external uniform magnetic induction field $B = B\hat{i}$ is applied, find the force acting on the loop due to this field.



Watch Video Solution

52. Two resistances of 400 ohm and 800 ohm are connected in series with 6 volt battery of negligible internal resistance. A voltmeter of resistance 10,000ohm is used to measure the potential difference across 400 ohm. The error in the measurement of potential difference in volt approximately .

Watch Video Solution

53. State Fleming's left hand rule.

Watch Video Solution

54. WHat is the direction of force between two parallel conductors carrying current in same direction

Watch Video Solution

55. WHat is the direction of force between two parallel conductors carrying current in opposite direction?

Watch Video Solution

56. Define an ampere in terms of the force between current carrying conductors.

Watch Video Solution

57. Does the torque acting on a loop carrying current in a magnetic field depend upon the shape of the loop.

Watch Video Solution

58. What is the main function of soft iron core used in a moving coil galvanometer?

Watch Video Solution

59. A current carrying loop free to turn is placed in a uniform magnetic field $\vec{b}$. What will be its orientation relative to $\vec{B}$ in the equilirbium state?

Watch Video Solution

60. Under what circumstances, will a current carrying loop not rotate in the magnetic field?

Watch Video Solution

61. State the principle of moving coil galvanometer?

Watch Video Solution

62. What is the nature of magnetic field in a moving coil galvanometer?

Watch Video Solution

63. State two properties of the material of the wire used for suspension of the coil in a moving coil galvanometer?

Watch Video Solution

64. Why should the spring/suspension wire in a moving coil gavanometer have a low torsional constant?

Watch Video Solution

65. Define current senstivity of a moving coil galvanometer and state its S.I. units.

66. Define current senstivity of a moving coil galvanometer and state its S.I. units.

67. What do you mean by current sensitivity of a moving coil galvanometer? On what factors does it depend?

Watch Video Solution

68. Give two factors by which voltage sensitivity of a moving coil galvanometer can be increased?

Watch Video Solution

69. Define current sensitivity and voltage sensitivity of a galvanometer. Increasing the current sensitivity may not necessarily increase the voltage sensitivity of a galvanometer. Justify,

Watch Video Solution

70. Give two factors by which voltage sensitivity of a moving coil galvanometer can be increased?

Watch Video Solution

71. What is shunt? State its S.I.units.

Watch Video Solution

72. How can a galvanometer be converted into an ammeter?

Watch Video Solution

73. Is the resistance of an ammeter greater than or less than that of the galvanometer of which it is formed?

Watch Video Solution

74. Why should an ammeter have a low resistance?

Watch Video Solution

75. How is an ammeter connenctned in an electric circuit?

Watch Video Solution

76. What is a voltmeter? How a galvanometer is converted into a voltmeter? Why is a voltmeter connected in parallel in a circuit?

Watch Video Solution

77. Is the resistance of a voltmeter greater than or less than that of the galvanometer of which it is formed?

Watch Video Solution

78. What isi the resistance of an ideal voltmeter and an ammeter?

Watch Video Solution

79. How is a voltmeter connected in an electric circuit?

Watch Video Solution

80. How does an ammeter, a voltmeter differ from a galvanometer?

Watch Video Solution

81. How does an ammeter, a voltmeter differ from a galvanometer?

Watch Video Solution

82. Find the force acting on a current carrying conductor placed in an uniform magnetic field.

Watch Video Solution

83. In the figure. The straight wire AB is fixed, while the loop is free to move under the influence of the electric currents flowing in them. In which direction doe the loop begin to move? Give reason for your answer.

Watch Video Solution

84. What is the magnitude of magnetic force per unit length on a wire carrying a current of

8 A and making an angle of 30° with the direction of a uniform magnetic field of 0.15 T?

Watch Video Solution

85. WHat is the direction of force between two parallel conductors carrying current in same direction

Watch Video Solution

86. Define an ampere in terms of the force between current carrying conductors.

Watch Video Solution

87. Two parallel wires carrying currents in the same direction attract each other because of:

Watch Video Solution

88. Two parallel wires carrying currents in the same direction attract each other because of:

Watch Video Solution

89. Explain why two long parallel straight conductors carrying current in opposite direction in air repel?

Watch Video Solution

90. Two parallel wires carryiing current in the same direction attract each other, while two beams of electrons travelling in the same diection repel each other. WHy? Give reasons.

Watch Video Solution

91. why a solenoid tends to constract when a current is passed through it?

Watch Video Solution

92. A loop of iregular shape carrying current is located in an external magnetic field. If the wire is flexible, why does it change to a circular shape?

Watch Video Solution

93. A rectangular loop of area A, having N turns and carrying a current of I ampere is held in a uniform magnetic field B. Write down the expression for the maximum torque experiened by the loop.

Watch Video Solution

94. A current carrying loop free to turn is placed in a uniform magnetic field $\vec{b}$. What will be its orientation relative to $\vec{B}$ in the equilirbium state?

Watch Video Solution

95. A current carrying loop free to turn is placed in a uniform magnetic field $\vec{b}$. What

will be its orientation relative to $\vec{B}$ in the equilirbium state?

Watch Video Solution

96. A current carrying loop free to turn is placed in a uniform magnetic field $\vec{b}$. What will be its orientation relative to $\vec{B}$ in the equilirbium state?

Watch Video Solution

97. A current carrying ciruclar loop lies on a smooth horizontal plane. Can a uniform magnetic field be set up in such a manner that the loop turns around itself (i.e. turns about the vertical axis).

Watch Video Solution

98. Why earth's magnetic field does not affect the working of the moving coil galvanometer?

Watch Video Solution

99. What is the nature of magnetic field in a moving coil galvanometer?

Watch Video Solution

100. What isi the importance of radial magnetic field in moving coil galvanometer?

Watch Video Solution

101. What isi the importance of radial magnetic field in moving coil galvanometer?

Watch Video Solution

102. What is the main function of soft iron core used in a moving coil galvanometer?

Watch Video Solution

103. What is the main function of soft iron core used in a moving coil galvanometer?

Watch Video Solution

104. Define current sensitivity and voltage sensitivity of a galvanometer. Increasing the current sensitivity may not necessarily increase the voltage sensitivity of a galvanometer. Justify,

Watch Video Solution

105. Explain the action of a shunt.

Watch Video Solution

106. It is desried to pass only 5% the current through a galvanometer of resitance 95 ohm. What shunt resistance should be connected across it?

Watch Video Solution

107. A galvanometer has a resistance of 50 ohm. A resistance of 5 ohm is connected across its terminals . What part of total current will flow thorugh the galvanometer?

Watch Video Solution

108. A galvanometer coil has a resistance of 15Ω and the metre shows full scale deflection for a current of 4mA. How will you convert the metre into an ammmeter of range 0 to 6 A?

Watch Video Solution

109. A galvanometer has a resistance of 100 ohm. A resistance of 1Ω is connected across its terminals. WHich part of the total current flows through the galvanometer? Draw the diagram.

Watch Video Solution

110. Why should an ammeter have a low resistance?

Watch Video Solution

111. Which of the two, an ammeter or a milliammeter, has a higher resistance and why?

Watch Video Solution

112. Which of the two, an ammeter or a milliammeter, has a higher resistance and why?

Watch Video Solution

113. When a ammeter is put in a circuit, does it read slightly less or more than the actual current in the original circuit? Explain.

Watch Video Solution

114. A moving coil galvanometer, having a resistance G, produces full scale deflection when a current Ig flows through it. This galvanometer can be converted into

(i) An ammeter of range 0 to $I_0\left(I_0 > I_g\right)$by connecting a shunt resistance R_A to it and

(ii) Into a voltmeter of range 0 to $V(V = GI_0)$ by connecting a series resistanceR_V to it. T

Watch Video Solution

115. A galvanometer gives full scale deflection with the current I_g. Can it be converted into an ammeter of range $I < I_g$?

Watch Video Solution

116. Can we increase/decrease the range of a given ammeter?

Watch Video Solution

117. How does an ammeter, a voltmeter differ from a galvanometer?

Watch Video Solution

118. Give two points to compare a voltmeter and ammeter.

Watch Video Solution

119. You are given a low resistance R_1, a high resistance R_2 and a moving coil galvanometer. Suggest how would you use these to have an instrument that will be able to measure current?

Watch Video Solution

120. You are given a low resistance R_1, a high resistance R_2 and a moving coil galvanometer. Suggest how would you use these to have an instrument that will be able to measure potential difference?

Watch Video Solution

121. Explain how a Galvanometer can be converted into Voltmeter.

Watch Video Solution

122. Which of the two, an ammeter or a milliammeter, has a higher resistance and why?

Watch Video Solution

123. A voltmeter of resistance R is to be used to meaure a voltage 100 times as large as it can measure without an additional resistance

in seires. How alrge a resistance is to be used in series with the meter?

Watch Video Solution

124. What do you think is the purpose of using a voltmeter, instead of an ammeter, to determine the large resistance X?

Watch Video Solution

125. When a voltemeter is put across a part of the circuit, does it read slightly less or more than the original voltage drop across the part? Explain.

Watch Video Solution

126. Draw a circuit, showing how an ammeter and a voltemter can be connected to a resistor to measure the current and voltage at a given instant.

Watch Video Solution

127. By mistake a voltmeter is connected in series and an ammeter is connected in parallel, with a resistance in an electrical circuit. What will happen to the intruments?

Watch Video Solution

128. Can we increase/decrease the range of a given voltmeter?

Watch Video Solution

129. Although direction of current through the armature reverses after each half cycle, yet it keeps on rotating in one direction. Why?

Watch Video Solution

130. What is back emf ?

Watch Video Solution

131. When a motor is at its full speed, a lesser current flows through the arature. Why?

Watch Video Solution

132. When the motor of an electric refrigerator starts, the lights in the house become dim momentarily. Why?

Watch Video Solution

133. What is the use of a starter?

Watch Video Solution

134. What is the function of starter in a motor.

Watch Video Solution

135. A beam of electron is moving with a velocity of $3 \times 10^{6} ms^{-1}$ and carries a current of $1 \mu A$.

How many electrons per second pass a given point ?

Watch Video Solution

136. A beam of electron is moving with a velocity of $3 \times 10^6 ms^{-1}$ and carries a current of $1 \mu A$.

How many electrons are in 1 m of the beam?

Watch Video Solution

137. A beam of electron is moving with a velocity of $3 \times 10^6 ms^{-1}$ and carries a current of $1 \mu A$.

How many electrons per second pass a given point ?

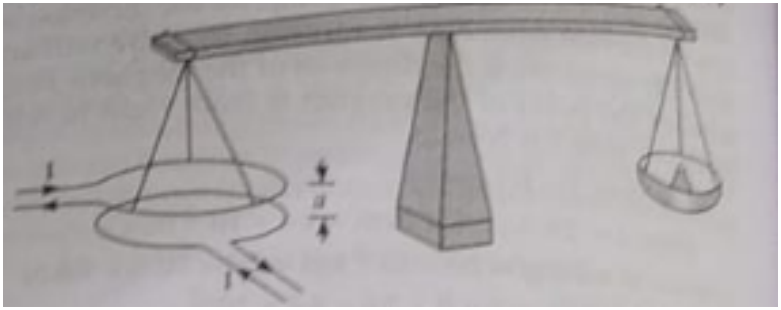
Watch Video Solution

138. Define one Tesla.

Watch Video Solution

139. The two parallel circular loops of wire shown in fig each have a radius R = 20 cm and are separated by a distance a = 0.5 cm. The bottom loop is held fixed and the top loop hangs from one end of the arm of an equal arm balance. Since a is much smaller than R, the magnetic field produced by one loop at the other is practically the same as if both were long straight wires. if the curret in each loop is 20 A, how big is the force of attraction

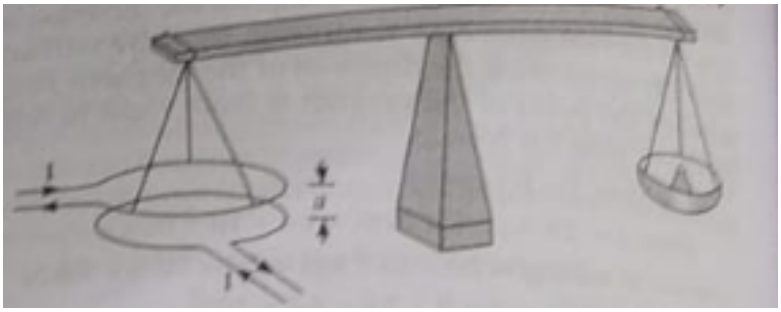
of one loop for the other?



Watch Video Solution

140. The two parallel circular loops of wire shown in fig each have a radius R = 20 cm and are separated by a distance a = 0.5 cm. The bottom loop is held fixed and the top loop hangs from one end of the arm of an equal

arm balance. Since a is much smaller than R, the magnetic field produced by one loop at the other is practically the same as if both were long straight wires. if the current in each loop is 20 A. How much additional mass m must be added to the right-hand pan of the balance to keep the loops separated by 0.5 cm, when the currents are turned on?

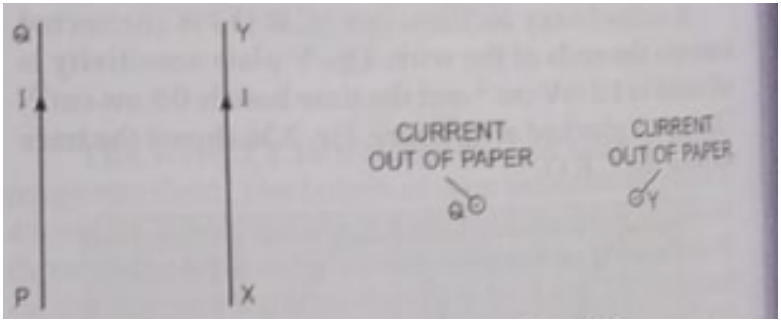


Watch Video Solution

141. Two long straight, current-carrying conductors , PQ and XY, are held a constant distance apart as shown in the figure. The conductors carry the magnitude of current in the same direction . A plan view form above the conductors is shown in the figure. Draw arrows, one in each case, to show the direction of the magnetic field at Q due to the current in wire XY.

the force at Q as a result of the magnetic field

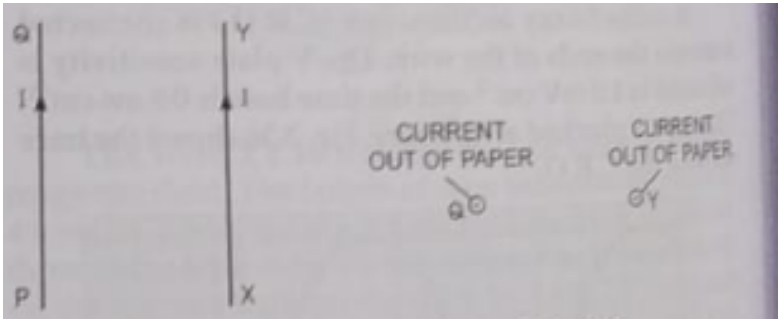
due to the current in wire XY.



Watch Video Solution

142. Two long straight, current-carrying conductors , PQ and XY, are held a constant distance apart as shown in the figure. The conductors carry the magnitude of current in the same direction . A plan view form above

the conductors is shown in the figure.

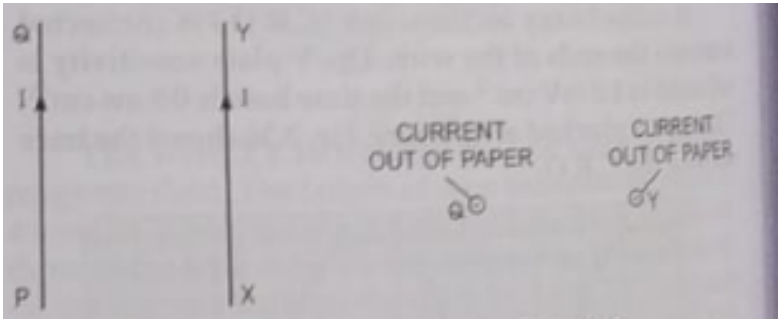


Use Newton's third law of motion to state the direction of the force on wire XY.

Watch Video Solution

143. Two long straight, current-carrying condcutors , PQ and XY, are held a constant distance apart as shown in the figure. The

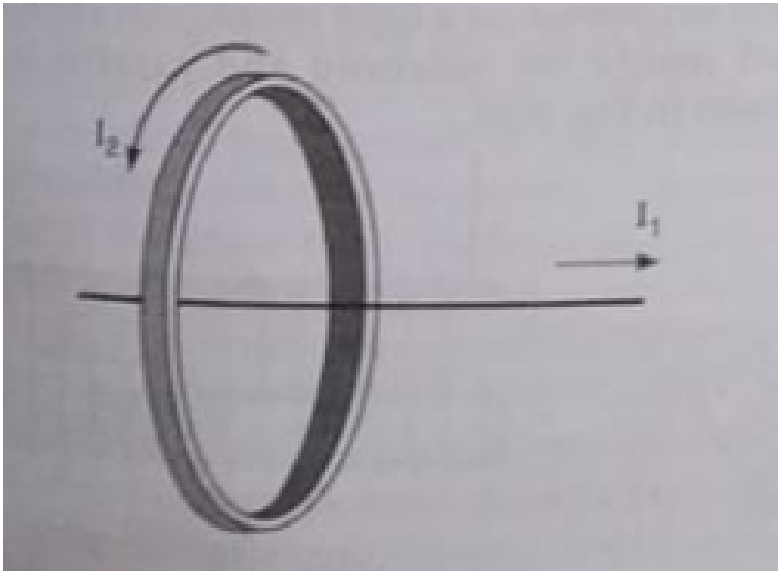
conductors carry the magnitude of current in the same direction . A plan view form above the conductors is shown in the figure.



The magnetic flux density B at a distance d from a long straight wire carrying a current I is given by $B = 2.0 \times 10^{-7} \frac{I}{d}$ Use this expression to explain why, under normal circumstances, wires carrying alternating current are not seen to vibrate.

Watch Video Solution

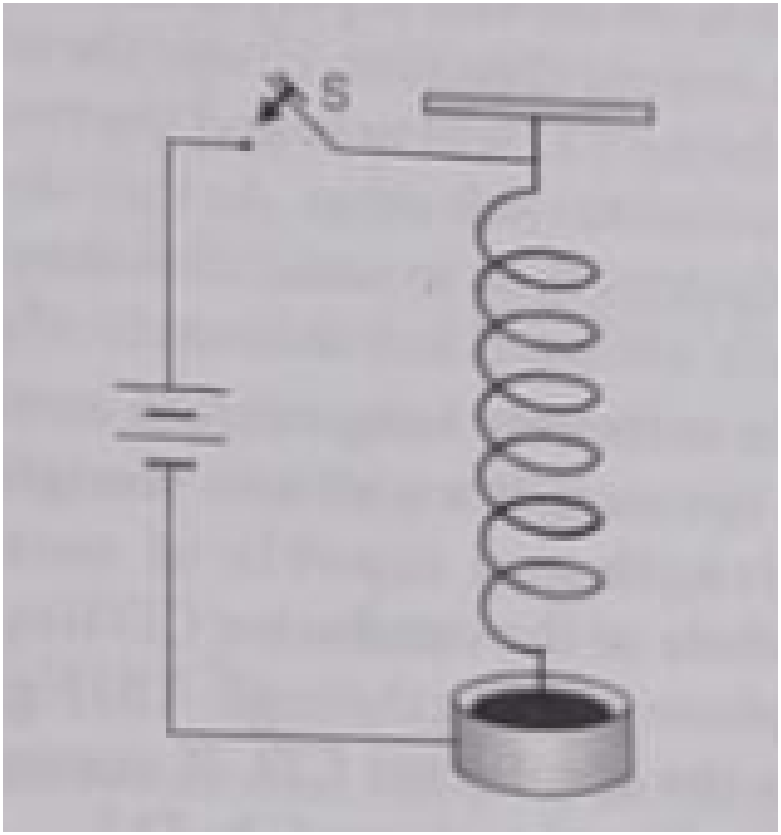
144. A stragiht conductor carrying current I_1 is passed along the axis of a circular conductor carrying current I_2. With what fore are the currents interacting?



Watch Video Solution

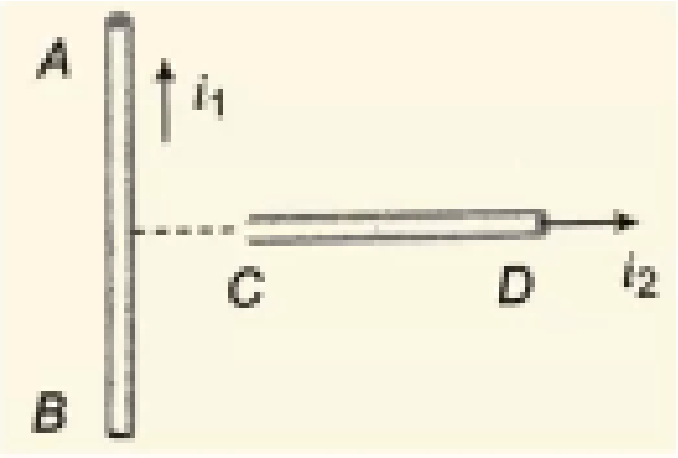
145. A soft spiral spring hangs freely. The lower end of the spring is immersed in a cup of mercury. The spring and the cup are connected to a source of direct current as shown in Fig.. What will happen to the spring

after switch K is closed?



Watch Video Solution

146. An infinitely long, straight conductor AB is fixed and a current is passed through it. Another movable straight wire CD of finite length and carrying current is held perpendicular to it and released. Neglect weight of the wire



A. The rod CD will move upwards parallel to itself

B. The rod CD will move downward parallel to itself

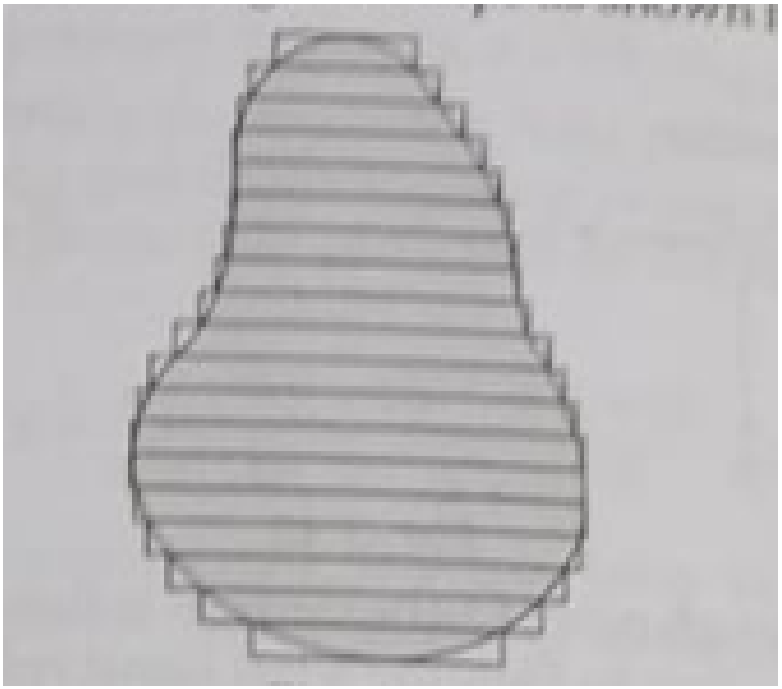
C. The rod CD will move upward and turn clockwise at the same time

D. The rod CD will move upward and turn anticlockwise at the same time

Answer:

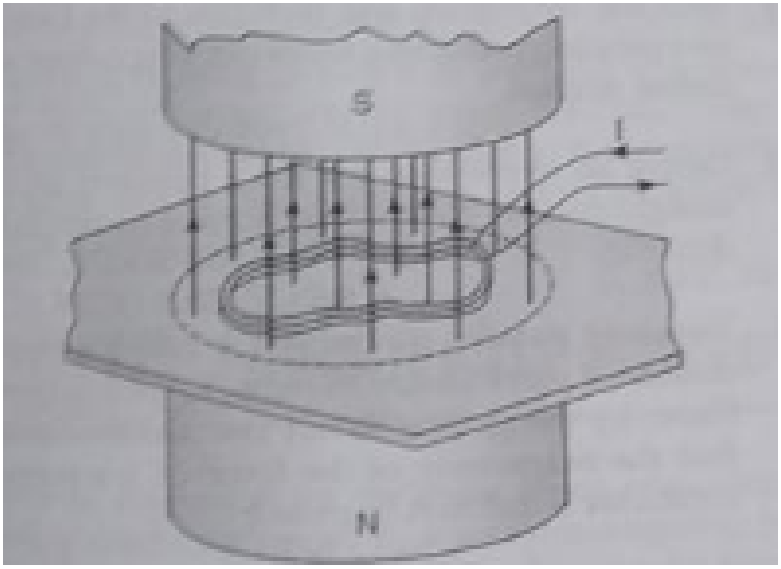
Watch Video Solution

147. The torque on a planar current loop depends upon its ara and is indpeendent of the shape of the loop of the palanar loop. Explain.



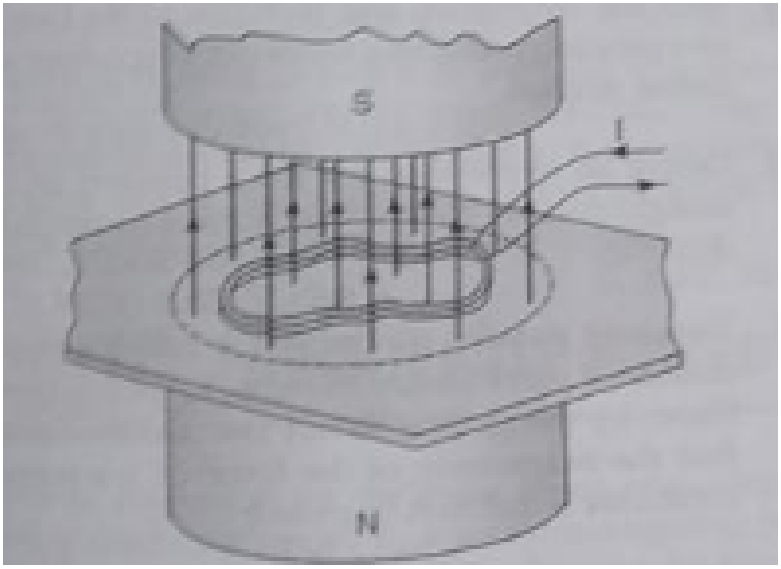
Watch Video Solution

148. A rubber band is covered with a conducting and current passed through it in the direction as shown in the figure. What happens, when it is placed in the magnetic field $\overrightarrow{B}$ shown in the figure



Watch Video Solution

149. A rubber band is covered with a conducting and current passed through it in the direction as shown in the figure. What happens, if the current is reversed in the rubber band



Watch Video Solution

150. A galvanometer having 30 divisions has a current sensitivity of $20\mu A$ per division. It has a resistance of 25Ω. How will you convert it into an ammeter measureing upto IA? How will you convert this ammeter into a voltmeter reading upto 1V?

Watch Video Solution

151. A galvanometer having a coil resistance of 100 omega gives a full scale deflection , when a

current of 1 mA is passed through it. The value of the resistance, which can convert this galvanometer into ammeter giving a full scale deflection for a current of 10A.

Watch Video Solution

Exercise

1. When is the force experienced by a current carrying conductor placed in a magnetic field, the largest?

Watch Video Solution

2. Find the force acting on a current carrying conductor placed in an uniform magnetic field.

Watch Video Solution

3. When is the force experienced by a current carrying conductor placed in a magnetic field, the largest?

Watch Video Solution

4. When is the force experienced by a current carrying conductor placed in a magnetic field, the largest?

Watch Video Solution

5. Derive an expression for the torque acting on a rectangular current carrying loop suspended in a uniform magnetic field.

Watch Video Solution

6. Write the expression for the magnitude of force per unit length between two infinitely long parallel straight conductors.

Watch Video Solution

7. Two parallel wires carrying currents in the same direction attract each other because of:

Watch Video Solution

8. Define an ampere in terms of the force between current carrying conductors.

Watch Video Solution

9. WHat is the direction of force between two parallel conductors carrying current in same direction

Watch Video Solution

10. Two long straight parallel conductors 'a' and 'b', carrying steady currents Ia and Ib are separated by a distance d. Write the magnitude and direction of the magnetic field produced by the conductor 'a' at the points along the conductor 'b'.If the currents are flowing in the same direction, what is the nature and magnitude of the force between the two conductors ? $F_{BA} = \frac{\mu_0 I_A I_B L}{2\pi d}$

Watch Video Solution

11. Prove that the parallel conductors of infinite length, carry current in the same direction, attravt each other. Deduce the expressions for the force per unit length experienced by each conductor.

Watch Video Solution

12. WHat is the direction of force between two parallel conductors carrying current in same direction

Watch Video Solution

13. Write the expression for the magnitude of force per unit length between two infinitely long parallel straight conductors.

Watch Video Solution

14. WHat is the direction of force between two parallel conductors carrying current in opposite direction?

Watch Video Solution

15. Derive an expression for the torque acting on a rectangular current carrying loop suspended in a uniform magnetic field.

Watch Video Solution

16. Derive an expression for the torque acting on a rectangular current carrying loop suspended in a uniform magnetic field.

Watch Video Solution

17. Derive an expression for the torque acting on a rectangular current carrying loop suspended in a uniform magnetic field.

Watch Video Solution

18. A rectangular loop of metallic wire is of length a and breadth b and carries a current I. Find the magnitude of magnetic field at the centre O of the loop.

Watch Video Solution

19. Derive an expression for the torque acting on a rectangular current carrying loop suspended in a uniform magnetic field.

Watch Video Solution

20. Derive an expression for the torque acting on a rectangular current carrying loop suspended in a uniform magnetic field.

Watch Video Solution

21. Draw the labelled diagram of a moving coil galvanometer. State the principle on which it works.

Watch Video Solution

22. State the principle of moving coil galvanometer?

Watch Video Solution

23. State the principle of moving coil galvanometer?

Watch Video Solution

24. How can a galvanometer be converted into an ammeter?

Watch Video Solution

25. How can a galvanometer be converted into an ammeter?

Watch Video Solution

26. How can a galvanometer be converted into an ammeter?

Watch Video Solution

27. How can a galvanometer be converted into an ammeter?

Watch Video Solution

28. How can a galvanometer be converted into an ammeter?

Watch Video Solution

29. How will you convert galvanometer into an ammeter? Why is an ammeter always connected in series?

Watch Video Solution

30. Explain how a Galvanometer can be converted into Voltmeter.

Watch Video Solution

31. What is the basic difference in converting a galvanometer into an ammeter and voltmeter.

Watch Video Solution

32. What is the basic difference in converting a galvanometer into an ammeter and voltmeter.

Watch Video Solution

33. A moving coil galvanometer, having a resistance G, produces full scale deflection when a current Ig flows through it. This galvanometer can be converted into

(i) An ammeter of range 0 to $I_0\left(I_0 > I_g\right)$by connecting a shunt resistance R_A to it and

(ii) Into a voltmeter of range 0 to $V(V = GI_0)$ by connecting a series resistanceR_V to it. T

Watch Video Solution

34. Explain the use of a starter for operating a d.c. motor.

Watch Video Solution

35. What is the use of a starter?

Watch Video Solution

36. Derive the expression for the torque acting on a current carrying loop placed in a magnetic field.

Watch Video Solution

37. Under what conditions, force experienced by a current carrying straight conductor placed in a magnetic field is zero

Watch Video Solution

38. The direction of force experienced by a current carrying conductor placed in a magnetic field is given by

Watch Video Solution

39. Write the expression for the magnitude of force per unit length between two infinitely long parallel straight conductors.

Watch Video Solution

40. Write expression for the force between two short parallel wires carrying a current, when they are much separate?

Watch Video Solution

41. Define SI unit of current.

Watch Video Solution

42. Two parallel wires carrying currents in the same direction attract each other because of:

Watch Video Solution

43. Draw the labelled diagram of a moving coil galvanometer. State the principle on which it works.

Watch Video Solution

44. With the help of diagram explain the principle, construction and theory of a moving coil galvanometer. What is the function of iron core in moving coil galvanometer?

Watch Video Solution

45. With the help of diagram explain the principle, construction and theory of a moving coil galvanometer. What is the function of iron core in moving coil galvanometer?

Watch Video Solution

46. With the help of diagram explain the principle, construction and theory of a moving coil galvanometer. What is the function of iron core in moving coil galvanometer?

Watch Video Solution

47. With the help of diagram explain the principle, construction and theory of a moving coil galvanometer. What is the function of iron core in moving coil galvanometer?

Watch Video Solution

48. With the help of diagram explain the principle, construction and theory of a moving

coil galvanometer. What is the function of iron core in moving coil galvanometer?

Watch Video Solution

49. With the help of diagram explain the principle, construction and theory of a moving coil galvanometer. What is the function of iron core in moving coil galvanometer?

Watch Video Solution

50. Draw the labelled diagram of a moving coil galvanometer. State the principle on which it works.

Watch Video Solution

51. State the principle of moving coil galvanometer?

Watch Video Solution

52. what is a dead beat galvanometer?

Watch Video Solution

53. State the principle, construction and working of a moving coil galvanometer with the help of diagram. Write the factors on which its current senstivity depends?

Watch Video Solution

54. What do you mean by current sensitivity of a moving coil galvanometer? On what factors does it depend?

Watch Video Solution

55. With the help of diagram explain the principle, construction and theory of a moving coil galvanometer. What is the function of iron core in moving coil galvanometer?

Watch Video Solution

56. What isi the importance of radial magnetic field in moving coil galvanometer?

Watch Video Solution

57. What is the nature of magnetic field in a moving coil galvanometer?

Watch Video Solution

58. Explain how a Galvanometer can be converted into Voltmeter.

Watch Video Solution

59. Explain how a Galvanometer can be converted into Voltmeter.

Watch Video Solution

60. How can a galvanometer be converted into an ammeter?

Watch Video Solution

61. How can a galvanometer be converted into an ammeter?

Watch Video Solution

62. Explain how a Galvanometer can be converted into Voltmeter.

Watch Video Solution

63. Explain the construction , principle and working of a D.C. motor. Find the expression for its efficiency.

Watch Video Solution

64. Draw a neat diagram of a d.c. motor and explain its working, what is the function of split ring in the motor?

Watch Video Solution

65. Draw a labelled diagram of a d.c. motor. State its principle and explain its working.

Watch Video Solution

66. A straight conductor carries a current of 1.5 A and is 2 m long, is placed in a uniform magnetic field of 0.15 T. Find the force on it, when it is inclined at an angle at 30°

Watch Video Solution

67. A straight conductor carries a current of 1.5 A and is 2 m long. is placed in a uniform magnetic field of 0.15 T Find the force on it, when it is perpendicular.

Watch Video Solution

68. A straight conductor carries a current of 1.5 A and is 2 m long. Find the force on it, when it is parallel to a uniform field of $2 \times 10^{-2} T$

Watch Video Solution

69. What is the magnitude of magnetic force per unit length on a wire carrying a current of 8 A and making an angle of 30° with the direction of a uniform magnetic field of 0.15 T?

Watch Video Solution

70. What is the force on a wire of length 4.0 cm placed inside a solenoid near its centre, making an angle 30° with its axis? The wire carries a current of 12 A and the magnetic field due to the solenoid has a magntiude of 0.25 T.

Watch Video Solution

71. A current of 10 A flows through each of two parallel long wires. The wires are 5 cm apart. Calculate the force acting per unit length of each wire. Use the standard value of constant required.

Watch Video Solution

72. Calculate the force per unit length between two parallel long straight wires 2 cm

apart in air, each carrying a current of 4 ampere.

Watch Video Solution

73. A currentof 5.0 A is flowing in eah of the two parallel conductors of infinite length separated by certain distance apart in vacuum in the same directions. Each conductor expereinces a force of $2 \times 10^{-4} Nm^{-1}$ due to the other. Find the separation between the two conductors.

Watch Video Solution

74. A current of 5.0 A flows through each of two parallel long wires. The wires are 2.5 cm apart. Calculate the force acitng per unti length of each wire. Use standard value of constant required. What will be the direction of force, if both curents flow in the same direction?

Watch Video Solution

75. Two long straight conducors are placed parallel at a distance of 2 cm form each other. When one of them caries a current of 60 A, the force on 1 m length of the other is 1,200 dyne. Calculate current in the other.

 Watch Video Solution

76. Two straight wires A and B of lenghts 10 m and 12 m carrying currents of 4.0 A and 6.0 A respectivity in opposite directions lie parallel

to each other at a distance of 3.0 cm. Estimate the force on a 15cm section of the wire B near its centre.

Watch Video Solution

77. A wire AB is carrying a steady current of 12A and is lying on the table. Another wire CD carrying 5A is held directly above AB at a height of 1mm. Find the mass per unit length of the wire CD so that it remains suspended at its position when left free. Give the direction

of the current flowing in CD with respect to that in AB. [Take the value of $g = 10ms^{-2}$]

Watch Video Solution

78. What torque acts ona 40 turn coil of $100cm^2$ area carrying a current of 10 ampere held with its axis at right angle to magnetic field of flux density 0.2 tesla and plane of the coil parallel to the field?

Watch Video Solution

79. A square coil of side 10 cm consists of 20 turns and carries a current of 12 A. The coil is suspended vertically and the normal to the plane of the coil makes an angle of 30° with the direction of a uniform horizontal magnetic field of magnitude 0.80 T. What is the magnitude of torque experienced by the coil?

Watch Video Solution

80. Calculate the torque on a 50 turn circular coil of radius 10 cm, when placed with its plane

at 60° with a magnetic field of 3.1×10^{-5}T . The current through the coil is 2 A.

Watch Video Solution

81. A circular coil of 100 turns radius 10cm, carries a current of 5A. It is suspended vertically in a uniform horizontal magnetic field of 0.5T and the field lines make an angle of 60° with the plane of the coil. The magnitude of the torque that must be applied on it to prevent it from turning.

Watch Video Solution

82. A circular coil of 30 turns and radius 8.0 cm carrying a current of 6.0 A is suspended vertically in a uniform horizontal magnetic field of magnitude 1.0 T. The field lines make an angle of 60° with the normal of the coil. Calculate the magnitude of the counter torque that must be applied to prevent the coil from turning.

Watch Video Solution

83. A circular coil of 25 turns and radius of 12 cm is placed in a uniform magnetic field of 0.5 T normal to the plane of coil. If the current in the coil is 5 A, then total torque experienced by the coil.

Watch Video Solution

84. A moving coil meter has the followig particulars. The number of turns n = 24, area of coil, A = $2.0 \times 10^{-3} m^2$ magnetic field strength, B = 0.20 T and resistane of the coil, R

= 14 ohm Indicate a simple way to increase in current sensitivity of the meter by 25%

Watch Video Solution

85. A moving coil meter has the followig particulars. The number of turns n = 24, area of coil, A = $2.0 \times 10^{-3} m^2$ magnetic field strength, B = 0.20 T and resistane of the coil, R = 14 ohm Indicate a simple way to increase in current sensitivity of the meter by 25%

Watch Video Solution

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

Watch Video Solution

87. In an exercise to increase current sensitivity by 25% , its resistane is also

increased by 50%. How will the voltage sensitivity of the galvanometer be affected?

Watch Video Solution

88. A galvanometer of resistance 15Ω gives full scale difflection for a current of 2 mA. Calculate shunt resistance required to convert it into an ammeter of range $0.5A$.

Watch Video Solution

89. A resistance of 900 ohm is connected in series with a galvanometer of resistance 100 ohm. A potential difference of 1 V produces a deflection of 100 division in the galvanometer. Find the figure of merit of galvanometer.

Watch Video Solution

90. How will you convert a 1.0 mA full scale deflection meter of resistance 100 ohm into an ammeter to read upto 1.0 A?

Watch Video Solution

91. Resistance of a galvanometer is 25 ohm it can carry a current of 0.5 mA. How can it be used to measure a current of 0.5 A.

Watch Video Solution

92. It is intended to measure a maximum urrent of 25A with an ammeter of range 2.5 A and resistance of 0.9 ohm. How can it be done?

Watch Video Solution

93. A galanometer has a resistance of 10 ohm. It gives maximum deflection for a current of 50 mA. Find the shunt resistance required to convert it into ammeter of range 2.5 A. What is the resistance of ammeter so constructed?

Watch Video Solution

94. The coil of a galvanometer has a resistance 100 ohm . It gives full scale deflection for a current of $5 \times 10^{-4} A$. How will you convert it into a voltmeter of 5 V range?

Watch Video Solution

95. A galvanometer of resistance 80 ohm gives full scale deflection for a current of 4 mA. How will you convert it into a voltmeter of range 0.5 V?

Watch Video Solution

96. How will you convert a 1.0 mA full scale deflection meter of resistance 100 ohm into an ammeter to read upto 1.0 A?

Watch Video Solution

97. A galvanometer with a coil of resistance 12.0 ohm shows full scale deflectio for a current of 2.5 mA. How will you convert the meter int an ammeter of range 0 to 7.5 A

Watch Video Solution

98. A galvanometer with a coil of resistance 12.0 ohm shows full scale deflectio for a current of 2.5 mA. How will you convert the meter into a voltmeter of range 0 to 10.0V?

Watch Video Solution

99. A voltemeter reads up to 3 V. It resistance is 200 ohm. It is to be used to measure a

potential difference, which may be as large as 60 V. What measures you would take to protect the voltmeter?

Watch Video Solution

100. A battery of e.m.f. 3 volt and internal resistance r is conneted inseries with a resistance of 55 ohm through an ammeter of resistance 1 ohm. The ammeter reads 50 mA. Draw the circuit diagram and calculate the value of r.

Watch Video Solution

101. A battery of emf 2 volts and internal resistance 0.1 ohm is being charged with a current of 5 amps. What is the potential difference between the two terminal of the battery?

Watch Video Solution

102. Two resistane coils of 100 ohm and 200 ohm respectively are connected in series

across 100 V. A moing coil voltmeter of 200 ohm is connected across 200ohm coil. What will it read?

Watch Video Solution

103. A battery of e.m.f 12 V supplies a current through a oil of resistance 48 ohm. The internal resistance of the battery is 1.2 ohms. A voltmeter of resistance 72 oohm is sued to measure the potential difference across the coil. What value would it show?

Watch Video Solution

104. A galvanometer coils is 2 cm square and contains 100 turns. Its period is 20 s and its moment of inertia is $2gcm^2$. The field of the magnet is 0.2 T. Determine the current sensitivity of the galvanometer?

Watch Video Solution

105. A galvanometer has a sensitivity of 60 divisions A^{-1}. When a shunt is used, its

sensitivity becomes 10 divisions A^{-1}. What is the value of shunt used, if the resistance of galvanometer is 20 ohm.

Watch Video Solution