PHYSICS

BOOKS - CHETANA PUBLICATION

Magnetic Fields due to Electric Current

Example

1. Explain the conclusion led by Oersted experiment.

Watch Video Solution

2. State the expression for the magnetic force acting on a electron moving with velocity $\bar{v}$ in a magnetic field $\overline{B}$.

Watch Video Solution

3. State the formula for Lorentz force acting on a charge in presence of electric as well as magnetic field.

Watch Video Solution

4. State the expression for magnetic force acting on a charge moving with velocity $\bar{v}$ in an uniform magnetic field $\overline{B}$. State the important features of this force?

Watch Video Solution

5. State the SI unit as well as non SI unit of magnetic field Define its SI units. Find its dimension.

Watch Video Solution

6. If the magnetic field is parallel to the positive y axis and the charged particle is moving along the positive x axis, then what would be the direction of Lorentz force be for:- an electron

Watch Video Solution

7. If the magnetic field is parallel to the positive y axis and the charged particle is moving along the positive x axis, then what would be the direction of Lorentz force be for:- a proton.

Watch Video Solution

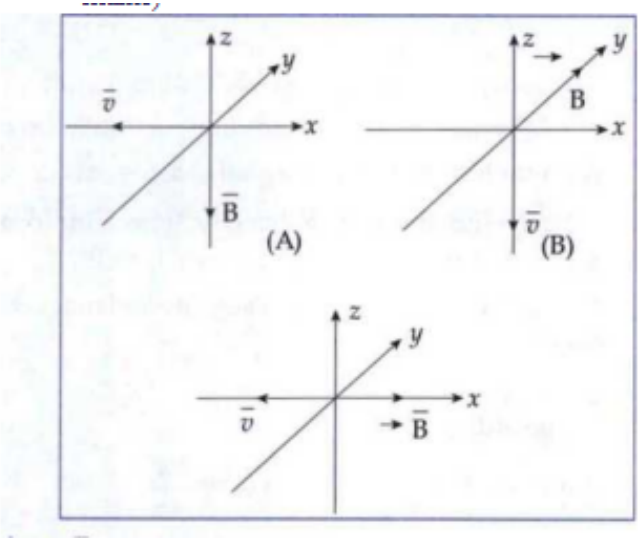
8. A charged particle moves with a velocity $3 \times 10^6 m/s$ at right angles to a uniform magnetic field of induction 0.005T. Find the

magnitude of the charge if the particle experience a force of $2 \times 10^{-2} N$.

Watch Video Solution

9. A charged particle travels with a velocity $\bar{v}$ through uniform magnetic field B as shown in the following figures. What is the direction of the magnetic force f_m due to magnetic field

on the particle?



Watch Video Solution

10. Explain why a charged particle in a particle accelerator the cyclotron describes circular motion. Derive cyclotron formula.

Watch Video Solution

11. What is cyclotron?

Watch Video Solution

12. Explain the function of electric field and magnetic field in a cyclotron?

Watch Video Solution

13. What are the factors on which the cyclotron frequency depends?

Watch Video Solution

14. What are the factors on which the maximum kinetic energy acquired by the particle in the cyclotron depends?

Watch Video Solution

15. Does the time spent by a charged particle inside a dee of a cyclotron depends upon its speed and the radius of its path? Why?

Watch Video Solution

16. Explain the construction and working of cyclotron.

Watch Video Solution

17. State the uses of cyclotron of particle accelerators

Watch Video Solution

18. Explain the working of the cyclotron and find the expression for the time period of revolution of the charged particle.

Watch Video Solution

19. Show that cyclotron frequency for charged particle is $\frac{qB}{2\pi m}$. What is resonance condition?

Watch Video Solution

20. Obtain an expression for K.E. of a positively charged particle.

Watch Video Solution

21. State the limitations of cyclotron.

Watch Video Solution

22. For proton acceleration, a cyclotron is used in which a magnetic field of $1.4Wb/m2$ is applied find the time period for reversing the electric field between the two Ds. Given that mass of the proton = $1.67x10^{-27}kg$, charged proton = $1.6 \times 10^{-19}C$

Watch Video Solution

23. An electron is moving with a speed of $3 \times 10^{7} m / s$ in a magnetic field of $6 \times 10^{-4} T$ perpendicular to its path. What will be the radius of the path? What will be the frequency and the energy in keV? Given: mass of electron = $9 \times 10^{-31} kg$, charge e = $1.6 \times 10^{-19} C$, lev = $1.6 \times 10^{-19} J$.

Watch Video Solution

24. An alpha particle (the nudeus of a helium atom) (with charge +2) is accelerated and moves in a vacuum tube with kinetic energy 10 MeV. It passes through a uniform magnetic field of 1.88T, and traces a circular path of radius 24.6cm. Obtain the mass of the alpha particle. [leV = $1.6 \times 10^{-19} J$, charge of electron = $1.6 \times 10^{-19} C$]

Watch Video Solution

25. In a cyclotron protons are to be accelerated. Radius of the D is 60 cm and its oscillator frequency is 10 Mhz. What will be the kinetic energy of the accelerated proton? Proton mass = $1.67 \times 10^{-27} kg$, e = $1.6 \times 10^{-19} C$ lev = $1.6 \times 10^{-19} J$

Watch Video Solution

26. Explain the helical motion of a charged particle is a magnetic field $\overline{B}$.

Watch Video Solution

27. Derive an expression for force experienced by a current carrying straight wire in a uniform magnetic field B. Discuss when will it be maximum and minimum.

Watch Video Solution

28. Explain how will the magnetic force acting on a arbitrary shaped wire be expressed.

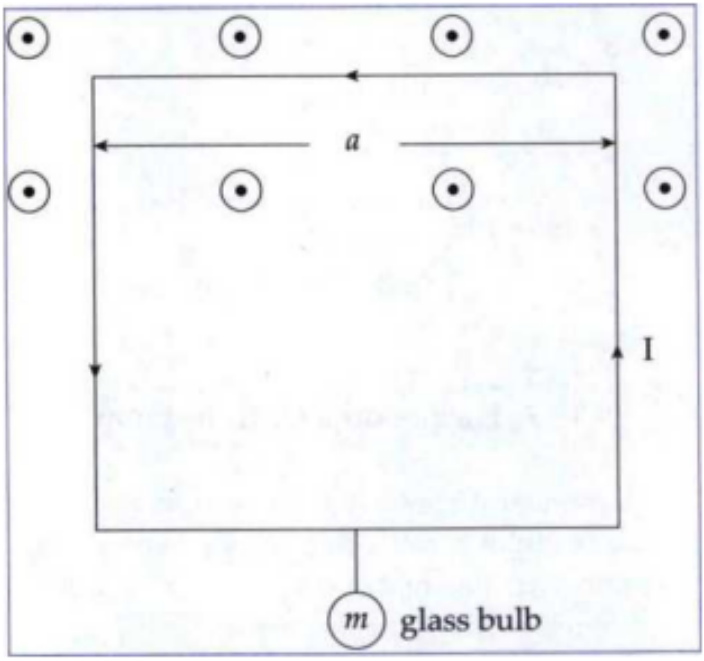
Watch Video Solution

29. What will be the force on a closed circuit on a magnetic field B ?

Watch Video Solution

30. Consider a square loop of wire loaded with a glass bulb of mass m hanging vertically, suspended in air with its one part in a uniform magnetic field B with its direction coming out of the plane of paper. Due to the current I

flowing through the loop, there is a magnetic force in upward direction calculate the current I in the loop for which the magnetic force would be exactly balanced by the force on mass m due to gravity.

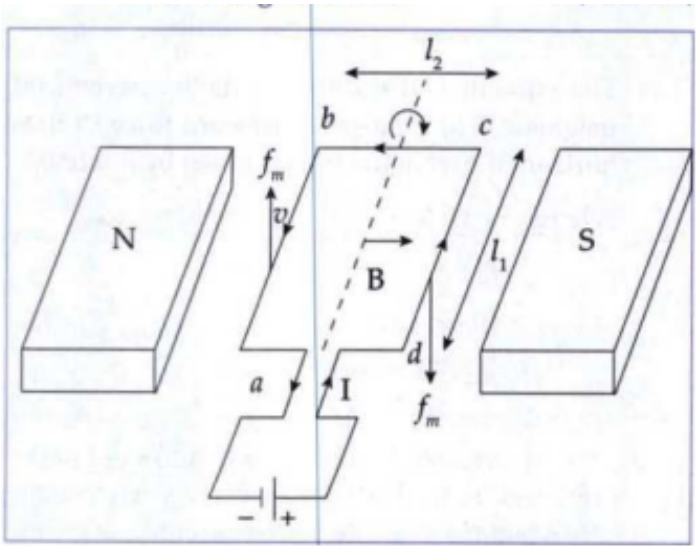


Watch Video Solution

31. A piece of straight wire has mass 20g and length lm. It is to be levitated using a current of 1A flowing through. A perpendicular magnetic field B in a horizontal direction is applied what must be the magnetic field B? take $g = 9.8m/s^2$

Watch Video Solution

32. Derive an expression for torque acting on a rectangular current loop carrying coil placed in a uniform magnetic field.



Watch Video Solution

33. A rectangular coil of 100 turns of length 40 cm and breadth 20 cm carrying a current of 10 A is placed making a angle of 60° with a magnetic field of 5T:- Calculate the magnitude of the counter torque, that must be applied to prevent the coil from turning.

Watch Video Solution

34. A rectangular coil of 100 turns of length 40 cm and breadth 20 cm carrying a current of 10

A is placed making a angle of 60° with a magnetic field of 5T:- Would the answer change of the rectangular coil is replaced by a planar coil of some irregular shape that encloses the same area? All other particular are also unaltered.

Watch Video Solution

35. With the help of neat labelled diagram, describe construction, theory and working of a moving coil galvanometer.

Watch Video Solution

36. Explain the construction and working of a moving coil galvanometer. Hence, show that a current flowing through it is directly proportional to the deflection.

Watch Video Solution

37. A moving coil galvanometer has been fitted with a rectangular coil having 50 turns and dimensions $5cmi \times 3cm$. The radial magnetic

field in which the coil is suspended is of $0.05wb/m^2$. The torsional constant of the spring is $1.5 \times 10^{-9} Nm/degree$. Obtain the current required to be passed through the galvanometer so as to produce a deflation of 30°.

Watch Video Solution

38. A rectangular coil of effective area $0.05m^2$ is suspended freely in a radial field of $0.01Wb/m^2$.If the torsional constant of

suspension fibre is $5 \times 10^{-9} N/m$ per degree, find the angle through which the coil rotates when a current of $300 \mu A$ is passed through it.

Watch Video Solution

39. Define magnetic dipole moment of a current carrying coil.

Watch Video Solution

40. A circular coil of conducting wire has 500 turns and an area $1.26 \times 10^{-4} m^2$ is enclosed by the coil. Calculate the magnetic moment of the coil if a current of $100 \mu A$ is passed through.

Watch Video Solution

41. Derive an expression for magnetic potential energy for a magnetic dipole freely suspended in a uniform magnetic field B.

Watch Video Solution

42. State when magnetic potential energy is maximum and minimum, also state which is the most $stab \leq /unstab \leq$ position.

Watch Video Solution

43. State and explain Biot-Savart's Law.

Watch Video Solution

44. State Biot-Savart's Law and write it in vector form.

Watch Video Solution

45. State the expression for magnetic field due to:- infinity long, straight wire,

Watch Video Solution

46. State the expression for magnetic field due to:- semi - infinite straight wire.

Watch Video Solution

47. Derive an expression for the magnetic field due to an infinitely long straight wire carrying current I.

Watch Video Solution

48. Calculate the value of magnetic field at a distance of 2 cm from a very long straight wire

carrying a current of 5A. Given $\mu_0 = 4\pi \times 10^{-7} Wb/Am$

Watch Video Solution

49. A very long straight wire carries a current 5.2A. What is the magnitude of the magnetic field at a distance 3.1 cm from the wire?

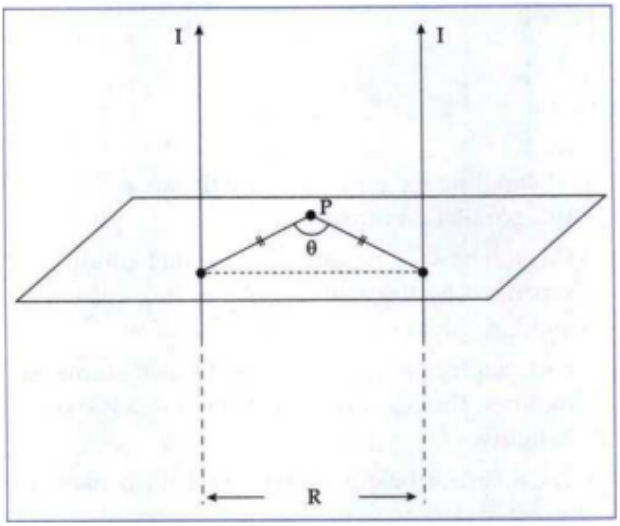
Watch Video Solution

50. Magnetic field at a distance 2.4 cm from a long straight wire is $16\mu T$. What must be current through the wire?

Watch Video Solution

51. Two long parallel wires going into the plane of the paper are separated by a distance R and carry a current I each in the same direction. Show that the magnitude of the magnetic field at a point P equidistance from

the wires and subtending angle θ from the plane containing the wires is $B = \frac{\mu_0}{\pi}\frac{I}{R}\sin 2\theta$ What is the direction of the magnetic field?



Watch Video Solution

52. Derive an expression for the force acting per unit length of the wire in case of two long parallel wires carrying currents.

Watch Video Solution

53. State the expression for force acting per unit length of each of the straight wire conducting current. Hence define SI unit of electric current.

Watch Video Solution

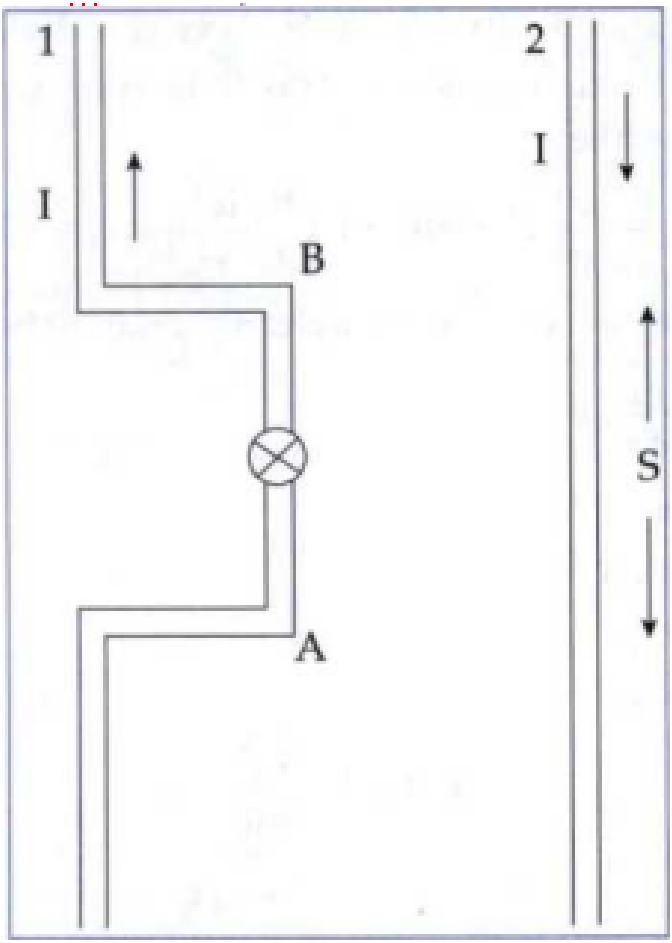
54. Current of equal magnitude flows through two long parallel wires having separation of 1.35 cm. If the force per unit length on each of the wires is $4.76 \times 10^{-2} N/m$,What must be the value of current?

Watch Video Solution

55. Two wires shown in the figure are connected in a series circuit and the same amount of current of 10A passes through

both, but in opposite directions seperation between the two wires is 8 mm. The length AB is S = 22 cm. Obtain the direction and magnetic field due to current in wire 2 on the section AB of wire 1. Also obtain the magnetic and direction of the force on wire 1.

$(\mu_0 = 4\pi \times 10^{-7} TmA^{-1})$.



Watch Video Solution

56. Derive an expression for the magnetic field produced by a current flowing through a circular arc of the wire.

Watch Video Solution

57. Find the value of magnetic field produced by a current flowing through a semi circular arc of wire.

Watch Video Solution

58. State the expression for the magnetic field at the centre of a full circle of a wire carrying a current I.

Watch Video Solution

59. Derive an expression for the magnetic field produced by a current flowing through a circular arc of the wire.

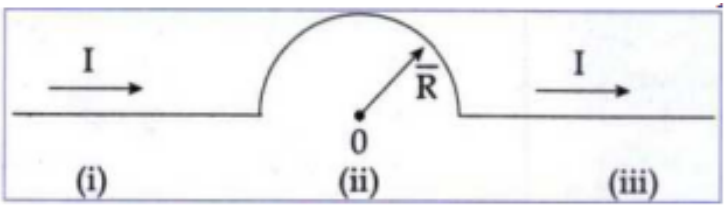
Watch Video Solution

60. State the expression for the magnetic field due to a circular are of wire carrying a current I. Hence find the magnetic field at the centre of circular coil and having n turns.

Watch Video Solution

61. A wire has 2 straight and one are as shown in the figure. Determine the direction and magnitude of the field produced at the center O of the semi circle by three sections

individually and the total.



Watch Video Solution

62. The magnetic field at the centre of a circular current carrying loop of radius 12.3 cm is $6.4 \times 10^{-6} T$. What will be the magnetic moment of the loop? $\left(\mu_0 = 4\pi \times 10^{-7} T m A^{-1}\right)$

Watch Video Solution

63. A circular coil of wire is made ϕ of 100 turns, each of radius 8 cm if a current of 0.4A passes through of, what will be the magnetic field at the centre of the coil

Watch Video Solution

64. A semicircular arc of radius 20 cm carries a current of 10 A calculates the magnitude of magnetic field at the centre of the arc.

Watch Video Solution

65. Two circular coils have radii in ratio $3:4$ and ratio of number of turns is $2:3$. The ratio of currents through coils is $1:4$ find the ratio of magnetic induction of their centre.

Watch Video Solution

66. The electron in a hydrogen atom circles around the positive nucleus with a speed of $2.18 \times 10^6 m/s$ in an orbit of radius

$5.3x10^{-11}m$. Calculate the:- equivalent current

Watch Video Solution

67. The electron in a hydrogen atom circles around the positive nucleus with a speed of $2.18 \times 10^{6} m/s$ in an orbit of radius $5.3x10^{-11}m$. Calculate the:- Magnetic field produced at the proton. Given e = $1.6 \times 10^{-19} c, \mu_0 = 471 \times 10^{-7} Wb/Am$

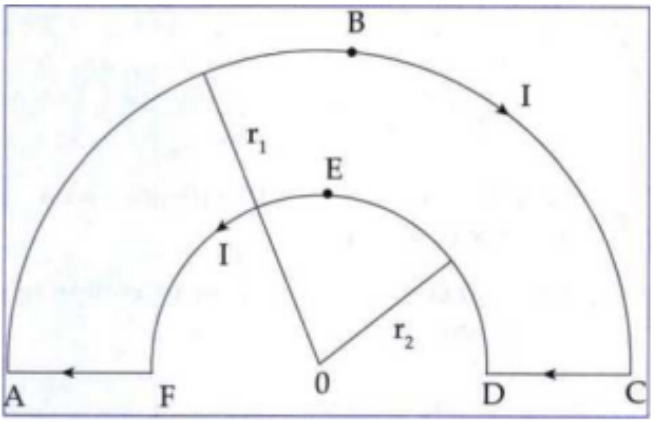
Watch Video Solution

68. Two identical coils each of radius r and having number of turns n are lying in perpendicular planes such that they have common centre. Find the magnetic field at the centre of the coils if they carry currents equal to I and $\sqrt{31}$ respectively.

Watch Video Solution

69. A wire loop is formed by joining two semicircular wires of radii r_1 and r_2 as shown

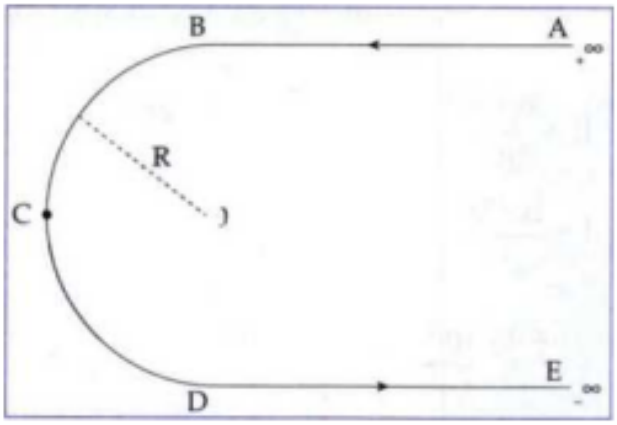
in the figure if the loop carries a current I_1 find the magnetic field at the centre O.



Watch Video Solution

70. An electric current I is flowing through an infinitely long conductor bent into the from as shown in the figure. Find the magnitude and

direction of magnetic field at the centre of the semi-circular part of the conductor.



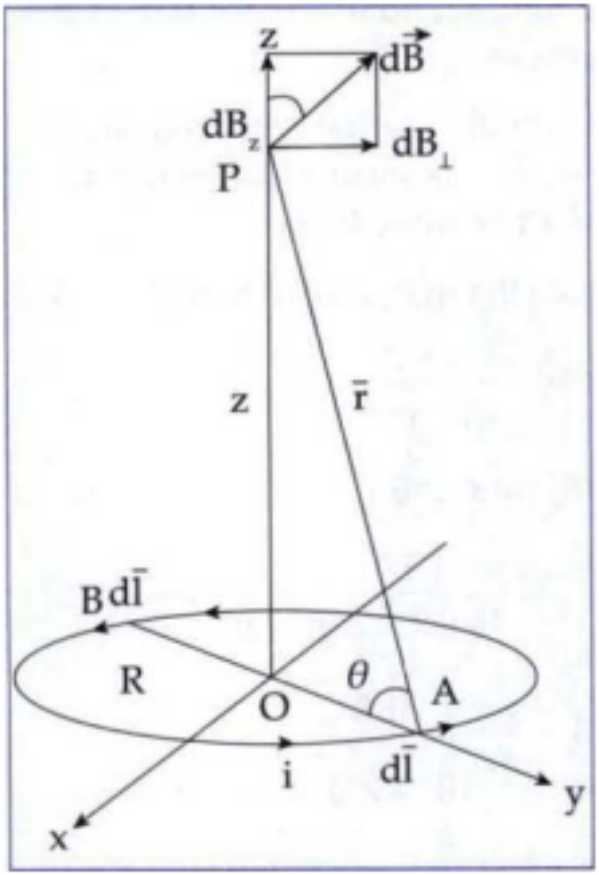
Watch Video Solution

71. A wire loop of the form shown the figure carries a current. Obtain the magnitude and

direction of the magnetic field at P.

Watch Video Solution

72. Find an expression for the axial magnetic field produced by current in a circular lopp?



Watch Video Solution

73. A circular loop of radius 9.7 cm carries a current 2.3A. Obtain the magnitude of the magnetic field:- centre of the loop .

Watch Video Solution

74. A circular loop of radius 9.7 cm carries a current 2.4A. Obtain the magnitude of the magnetic field:- at a distance of 9.7cm from the centre of the loop but on the axis. .

Watch Video Solution

75. Calculate the magnitude of the magnetic induction due to a circular coil of 400 turns and radius 0.05 cm, carrying a current of 5A, at a point on the axis of the coil at a distance of 0.1 m from the centre of the coil.

Watch Video Solution

76. Explain how a current loop acts as a magnetic dipole.

Watch Video Solution

77. State right hand thumbrole for a circular coil.

Watch Video Solution

78. State the expression for magnetic field at an axial point produced by current carrying loop. Hence find the expression for the magnetic field:- at the centre of a loop,

Watch Video Solution

79. State the expression for magnetic field at an axial point produced by current carrying loop. Hence find the expression for the magnetic field:- at the centre of a coil having N turns.

Watch Video Solution

80. From the expression of magnetic field at an axial point due to current carrying loop, find the expression for magnetic field at a

large distance from the loop along z axis. Is it analogous to electric field due to an elextric dipole?

Watch Video Solution

81. What is the fundamental difference between an electric dipole and magnetic dipole?

Watch Video Solution

82. Define magnetic dipole moment for a current carrying circular loop.

Watch Video Solution

83. Consider a closely wound 1000 turn coil having a radius of lm. If a current of 10A basses through the coil, what will be the magnitude of the magnetic field at the centre?

Watch Video Solution

84. A current of 10A passes through a coil having 5 turns and produces a magnetic field of magnitude. $5 \times 10^{-4} T$ at th e centre of the coil. Calculate the diameter of the coil.

Watch Video Solution

85. Using electrostatic analogue, obtain the magnetic field at a distance 'x' on the perpendicular bisector of a magnetic dipole μ for x » R, verify that $\overline{B} = \frac{\mu_0}{4\pi} \frac{\pi}{x^2}$

Watch Video Solution

86. State Ampere's Law.

Watch Video Solution

87. State and explain Ampere's law.

Watch Video Solution

88. Explain how the expression for magnetic field due to, straight conductor derived from

Biot Savart's law is in accordance with Ampere's circuital law.

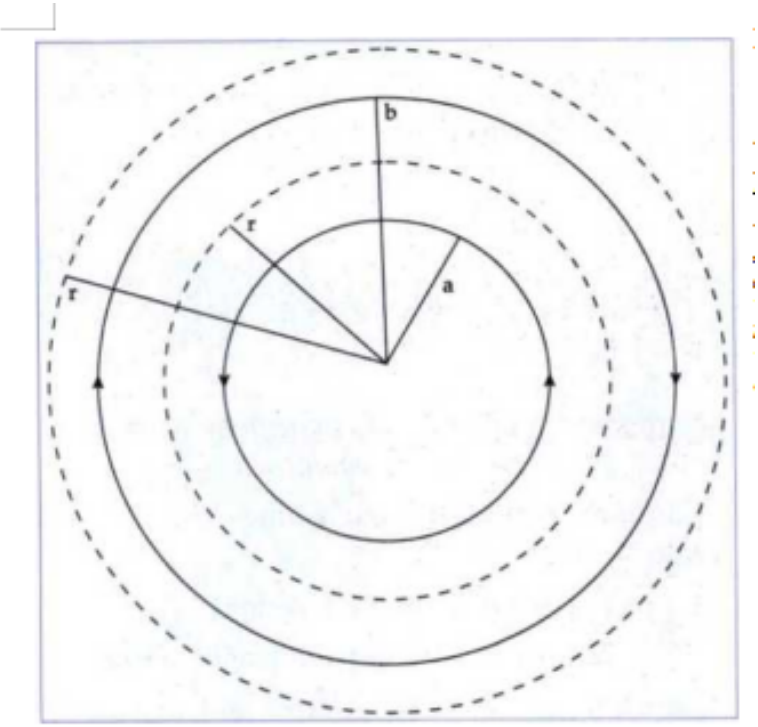
Watch Video Solution

89. A very long straight wire carries a current of 5A. The magnetic induction at 0.1m from the wire is $1 \times 10^{-5} wb/m^2$. What will be the magnetic induction at 0.5m from the wire of the current through the wire is increased to 20A?

Watch Video Solution

90. A coaxial cable consists of a central conducting core wire of radius, a and a coaxial cylinderical outer conductor of radius h (see figure). The two conductor carry an equal current I in opposite directions in and out of the plane of the paper what will be the magnitude of the magnetic field B for:- b < r?

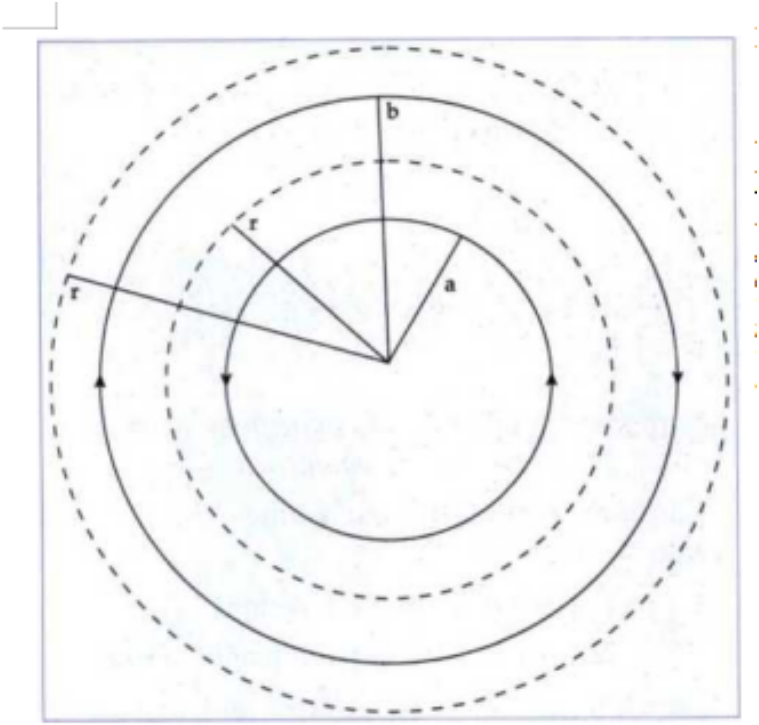
what will be its direction?



Watch Video Solution

91. A coaxial cable consists of a central conducting core wire of radius, a and a coaxial

cylinderical outer conductor of radius h (see figure). The two conductor carry an equal current I in opposite directions in and out of the plane of the paper what will be the magnitude of the magnetic field B for:- b < r? what will be its direction?



Watch Video Solution

92. Figure shows a cylinderical wire diameter a, carrying a current I. The current density which is in the direction of the central axis of the wire varies linearly with radias distance V from the axis according to the relation $J = J_0 r / a$. Obtain the magnetic field B inside the wire at a distance r' from its centre.

Watch Video Solution

93. In the above problem, what will be the magnetic field B inside the wire at a distance r from its centre. If the current density J is uniform across the cross section of the wire.

Watch Video Solution

94. What is a solenoid? Explain with a diagram Refer to the magnetic field produced by a current carrying solenoid.

Watch Video Solution

95. Find the expression for the magnetic field produced by a current carrying solenoid.

Watch Video Solution

96. What is a toroid? With neat labelled diagram, describe the magnetic field produced by current carrying toroid.

Watch Video Solution

97. A solenoid of length πm and 5 cm in diameter bas winding of 1000 turns and carries a current of 5A. Calculate the magnetic field at tits centre along the axis

Watch Video Solution

98. A solenoid 0.5 m long has a four layer winding of 300 turns each. What current must pass through it to produce a magnetic field of induction $2.1 \times 10^{-2} T$ at its centre?

Watch Video Solution

99. A solenoid 1 m long and 4 cm diameter possesses $10 tums / cm$. A current of 5A is flowing through it. Calculate the magnetic induction:- inside the solenoid

Watch Video Solution

100. A solenoid 1 m long and 4 cm diameter possesses $10 tums / cm$. A current of 5A is

flowing through it. Calculate the magnetic induction:- at one end on the axis of solenoid.

Watch Video Solution

101. A toroid of narrow radius of 10cm has 1000 turns of wire for a magnetic field of $5 \times 10^{-2} T$ along its axis. How much current is required to be passed through the wire?

Watch Video Solution

102. A toroid has a core (non - ferromagnetic) of inner radius 25 cm and outer radius 26 cm, around which 3500 turns of a wire are around. If the current in the wire is IIA, what is the magnetic field:- outside the toroid,

Watch Video Solution

103. A toroid has a core (non - ferromagnetic) of inner radius 25 cm and outer radius 26 cm, around which 3500 turns of a wire are around.

If the current in the wire is IIA, what is the magnetic field:- inside the core of the toroid

Watch Video Solution

104. A toroid has a core (non - ferromagnetic) of inner radius 25 cm and outer radius 26 cm, around which 3500 turns of a wire are around. If the current in the wire is IIA, what is the magnetic field:- in the empty space surrouned by the toroid?

Watch Video Solution

105. Define the SI unit of electrical current.

Watch Video Solution

106. A solenoid of length 25 cm has inner radius of 1 cm and is made up of 250 turns of copper wire. For a current of 3A in it, What will be the magnitude of the magnetic field inside the solenoid?

Watch Video Solution

Exercise

1. Find the magnetic induction at a distance of 5 cm from a long straight wire carrying a current of 5A

Watch Video Solution

2. A flat circular coil of 70 turns and radius 10 cm carriers a current I. If the magnetic field at the centre of the coil is $0.003 wb / m^2$, find the value of current.

Watch Video Solution

3. The number of turns in a circular coil of wire is 10 and average radius of each turn is 8 cm. A current of 5A is passed through the coil. Find the magnetic induction due to the current at a point at a distance of 6 cm on the axis of the coil from the centre.

Watch Video Solution

4. Through a coil of radius 3 cm and 25 turns, a current is passed so as to produce a magnetic induction of $10\pi \times 10^{-5} wb/m^2$, at a point distant 4 m from the centre of the coil on its axis. Find the current.

Watch Video Solution

5. A circular loop has radius 10 cm and it is carrying a current of 0.1A. Calculate magnetic dipole moment.

Watch Video Solution

6. A charged particle moves with velocity of $3 \times 10^6 m/s$ at right angle to a uniform field of magnetic field 0.005 T. Find the value of the charge on the particle if it experience a force of $2 \times 10^{-2} N$.

Watch Video Solution

7. A conductor of length 25 cm is placed:- parallel. It a charge of 1C passes through it in 5

second, calculate the force experienced by the conductor.

Watch Video Solution

8. A conductor of length 25 cm is placed:- perpendicular. It a charge of 1C passes through it in 5 second, calculate the force experienced by the conductor.

Watch Video Solution

9. A conductor of length 25 cm is placed:- inclined at an angle of 30° to a uniform magnetic field 2T. It a charge of 1C passes through it in 5 second, calculate the force experienced by the conductor.

Watch Video Solution

10. Find the force per unit length between the parallel wires kept 0.1m apart and carrying a

current of 2A and 3A respectively in the same direction. What is the nature of the force?

Watch Video Solution

11. A long straight wire carries a current of 35 A. What is the magnitude of the field (B) at a point 20 cm from the wire?

Watch Video Solution

12. A solenoid of length 100 cm having 150 turns carries a current of 3A. Find the magnitude of magnetic field:- in the interior of the solenoid,

Watch Video Solution

13. A solenoid of length 100 cm having 150 turns carries a current of 3A. Find the magnitude of magnetic field:- at one end of solenoid.

Watch Video Solution

14. A 50 m long solenoid has 500 turns and produces a magnetic field of $2.5 \times 10^{-4} T$ at its centre. Find the current in the solenoid.

Watch Video Solution

15. A rectangular coil of effective area $0.04 m^2$ is suspended freely in a radial magnetic field $1 \times 10^2 Wb/m^2$. When a current of 5 mA is passed through the coil, it deflects through

60°? Find the torsional constant of the suspension fibre.

Watch Video Solution

16. A proton is accelerated in a cyclotron in which the magnetic induction is $0.6Wb/m^2$. Find the cyclotron frequency. Given: Mass of proton = $1.673 \times 10^{-27} kg\, q = 1.6 \times 10^{-19} C$

Watch Video Solution

17. In a cyclotron, magnetic field of $3.5Wb/m^2$ is used to accelerate protons. What should be the time interval in which the electrics field between the dees be reversed? ($M_p = 1.67 \times 10^{-27} kg, q_p = 1.6 \times 10^{-19} C$)

Watch Video Solution

18. A rectangular coil of effective area $0.01m^2$ suspended freely in a radial magnetic field. The coil deflects through 30° when current of

$0.5 \times 10^{-3} A$ is passed through it. If torsional constant of suspension is $25 \times 10^{-9} Nm/rad$. Find 'B' magnetic induction.

Watch Video Solution

19. A 3 cm wire carrying a current of 10 A is placed inside be solenoid perpendicular to its axis. The magnetic field inside the solenoid is given to be 27 T. What is the magnetic force on the wire?

Watch Video Solution

20. A square coil of side 10 cm consists of 20 turns and carries a current of 12A. 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 0.8 T. What is the magnitude of torque experienced by the coil?

Watch Video Solution

21. Two concentric circular coils x and y of radius 16 cm and 10 cm respectively, lie in the same vertical plane containing the north to south direction coil x has 20 turns and carries current of 16A coil y has 25 turns and carries a current of 18A! The sense of the current in x is anticlockwise and clockwise in y for an observe looking at the coils facing west. Give The magnitude and direction of net magnetic field due to the coils at the centre.

Watch Video Solution

22. A cyclotron has dees of radius 47 cm and uses a maximum magnetic field of 1.77 T:- To what frequency should the oscillator be set of deuterons are to be accelerated?

Watch Video Solution

23. A cyclotron has dees of radius 47 cm and uses a maximum magnetic field of 1.77 T:- What is the maximum energy of deuteron in Mev that can be obtained?

Watch Video Solution

24. Deuterons are accelerated in a cyclotron that has dees of radius 50 cm and an oscillator frequency 10 MHz:- What is the magnetic field induction needed to accelerate the deuterons?

Watch Video Solution

25. Deuterons are accelerated in a cyclotron that has dees of radius 50 cm and an oscillator

frequency 10 MHz:- What is the maximum velocity of the deuterons emerging from the cyclotron?

Watch Video Solution

26. Ampere's law is analogous to

A. Kirchhoff's law in current electricity

B. Lenz's law

C. Gauss law in electrostatics

D. Faraday's law

Answer:

Watch Video Solution

27. Maximum force acts on a current carrying conductor in magnetic field, when angle between current and magnetic field is

A. 0

B. 45°

C. 90°

D. 60°

Answer:

Watch Video Solution

28. In a current carrying toroid, the field produced does not depend upon

A. number of turns per unit length

B. current flowing

C. radius of the solenoid

D. all of these.

Answer:

Watch Video Solution

29. The magnetic field inside a long solenoid is

A. non-uniform

B. zero

C. uniform

D. infinity

Answer:

Watch Video Solution

30. The magnetic field intensity due to a long solenoid at its end is

A. $2\mu_0 nI$

B. $\frac{\mu_0 nI}{2}$

C. $\sqrt{2\mu_0 nI}$

D. $(\mu_0 nI)$

Answer:

Watch Video Solution

31. According to Ampere's law, the line integral of the magnetic induction around a closed path is directly proportion to the enclosed

A. Magnetic flux

B. Charge

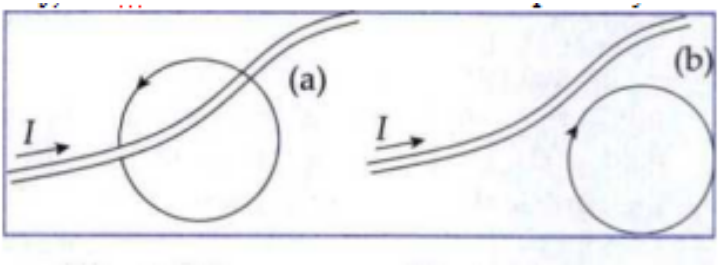
C. Magnetic energy

D. Current

Answer:

Watch Video Solution

32. Figure a, b show two Amperian loops associated with the conductors carrying current I in the sense shown. The $\oint \overline{B}$. dl in the cases a and b will be respectively.



A. $-\mu_0 I, 0$

B. $\mu_0 I, 0$

C. $0, \mu_0 I$

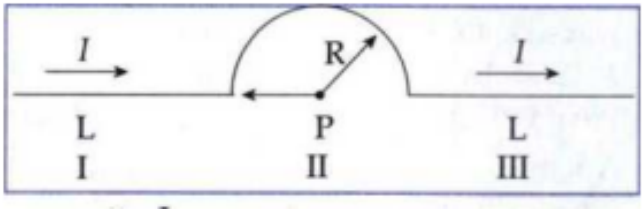
D. $0, \ -\mu_0 I$

Answer:

Watch Video Solution

33. A conductor has 3 segments two straight and of length L each and a semicircular with radius R. It carries a current I. What is the

magnetic field B at point P



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

B. $\frac{\mu_0}{4\pi}\frac{I}{R^2}$

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

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

Answer:

Watch Video Solution

34. A long solenoid carrying a current produces a magnetic field B along the axis. If the number of turns per cm is tripled and the current is halved, then the new value of the magnetic field will be

A. 1.5 B

B. 0.5 B

C. 2 B

D. 3 B

Answer:

Watch Video Solution

35. An electron (mass = $9 \times 10^{-5} kg$ charge = 1.610^{-510} ^ $-19C$) moving with a very high velocity of $10^6 m/s$ enters a magnetic field. If it describes a circle of radius 0.1 m, then the strength of magnetic field must be

A. $4.5 \times 10^{-5} T$

B. $1.4 \times 10^{-5} T$

C. $5.6 \times 10^{-5} T$

D. $2.6 \times 10^{-5} T$

Answer:

Watch Video Solution

36. In suspended coil type M.C.G, the coil is suspended in radial magnetic field by thin fibre of phosphor bronze because

A. it has high torsional constant

B. it has low torsional constant

C. it has negative torsional constant

D. it has adjustable torsional constant

Answer:

Watch Video Solution

37. A current of IA, flows along an infinitely long Staight thin walled tube. The magnetic induction at any point inside the tube is

A. infinity

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

C. $\frac{\mu_0 I}{2}$

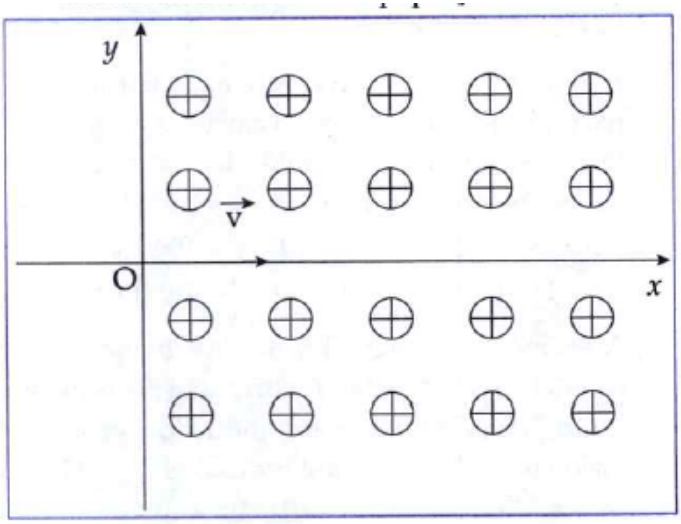
D. zero

Answer:

Watch Video Solution

38. A proton enters a perpendicular uniform magnetic field B at origin along the positive x axis with a velocity V as shown in the figure. Then it will follow the following path. [The

magnetic field is directed into the paper]



A. It will continue to move along positive x axis.

B. It will move along a curved path, bending towards x axis.

C. It will move along a curved path, bending toward negative y axis

D. It will move along a sinusoidal path along the positive x axis.

Answer:

Watch Video Solution

39. A conducting thick copper rod of length lm carries a current of 15 A and is located on the Earth's equator. There the magnetic flux lines

of the Earth's magnetic field are horizontal, with the field of $1.3 \times 10^{-4} T$, south to north. magnetic and direction of the force on the rod, when it is oriented so that current flows from west to east, are

A. $14 \times 10^{-4} N$, downward.

B. $20 \times 10^{-4} N$, downward.

C. $14 \times 10^{-4} N$, upward.

D. $20 \times 10^{-4} N$, upward.

Answer:

Watch Video Solution

40. A charged particle is in motion having initial velocity $\overline{V}$ when it enter into a region of uniform magnetic field perpendicular to V. Because of the magnetic force the kinetic energy of the particle wil

A. remain uncharged.

B. get reduced.

C. increase

D. be reduced to zero.

Answer:

Watch Video Solution

41. What is the magnetic field at a point 80 mm from a wire carrying current of 6A?

A. $0.15 \times 10^5 T$

B. $0.51 \times 10^{-5} T$

C. $0.15 \times 10^{-5} T$

D. $1.5 \times 10^{-5} T$

Answer:

Watch Video Solution

42. A moving coil galvanometer shows a deflection of 50° for a current of 0.3 mA. What current will produce a deflection of 40°?

A. 0.5 mA

B. 2 mA

C. 0.24 mA

D. 1.0 mA

Answer:

Watch Video Solution

43. In a cyclotron, the resonance condition is that the frequency of the reduction of charged particle is equal to

A. the frequency of the applied magnetic field

B. the frequency of the applied a.c. source

C. frequency of the applied magnetic field and the frequency of the applied a.c. source

D. none of these

Answer:

Watch Video Solution

44. The magnetic field at the centre of the current carrying coil

A. is directed normal to the plane of the paper

B. is directed parallel to the plane of paper

C. is zero

D. has none of the above characteristics

Answer:

Watch Video Solution

45. If 'R' is the radius of dees and B the magnitude of the magnetic field induction on which positive charges (q) mass (m) escape from the cyclotron, then their maximum speed $V_{\max}$ is

A. $\frac{qR}{Bm}$

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

C. $\frac{qBR}{m}$

D. $\frac{m}{qBr}$

Answer:

Watch Video Solution

46. A conductor of length '1' and carrying current "I" kept in uniform magnetic field "B" experiences a force.

A. in the direction of the magnetic field

B. in the direction opposite to the magnetic field

C. in the direction perpendicular to both field and its length

D. in the direction parallel to both field and its length

Answer:

 Watch Video Solution

47. The magnetic field at a distance r from a long wire carrying current is 0.6 tesla. The magnetic field at a distance 2r is

A. 0.6 tesla

B. 0.3 tesla

C. 1.2 tesla

D. 2.4 tesla

Answer:

Watch Video Solution

48. A cyclotron is a device which is generally used to

A. accelerate positive ions

B. accelerate negative ions

C. accelerate both positive and negative ions

D. keep the charged particle along a circular path of constant radius

Answer:

 Watch Video Solution

49. In a cyclotron, the applied magnetic field

A. increase only the speed of the charged particle

B. changes only the direction of the charged particle

C. changes the direction of the particle and increases the speed of the particle

D. neither increases the speed nor changes the direction

Answer:

Watch Video Solution

50. The electric field used in a cyclotron to accelerate charged particles is

A. static

B. alternative only

C. static as well as alternative

D. neither static nor alternative

Answer:

 Watch Video Solution

51. In cyclotron, time period of revolution inside the dees is

A. irrespective of the radius of the circle

B. increases with radius of the circle

C. decreases with radius of the circle

D. unpredictable

Answer:

Watch Video Solution

52. Maximum kinetic energy of the positive iron in the Cyclotron is

A. $\frac{q^2B^2R}{2m}$

B. $\frac{q^2BR}{2m}$

C. $\frac{qB^2R^2}{2m}$

D. $\frac{q^2B^2R^2}{2m}$

Answer:

Watch Video Solution

53. Cyclotron is a device by which

A. high frequency waves can be generated

B. heavy positively charged ions can be accelerated to high speeds

C. electrons can be accelerated

D. neutron can be accelerated

Answer:

Watch Video Solution

54. In side hollow dees of cyclotron, charge particles are under the influence of

A. electric field only

B. magnetic field only

C. both electric and magnetic field

D. neither electric or magnetic field

Answer:

Watch Video Solution

55. Charged particle in motion will produce

A. only electric field

B. only magnetic field

C. neither electrical nor magnetic

D. both electric and magnetic

Answer:

 Watch Video Solution

56. A solenoid is 2 m long and 3 cm in diameter. It has 1000 turns and carries a current of 5A. Magnetic field at the centre is

A. $3.14 \times 10^{-2} Wb/m^2$

B. $3.14 Wb/m^2$

C. $3.14 \times 10^{-3} Wb/m^2$

D. $3.14 \times 10^{-1} Wb/m^2$

Answer:

Watch Video Solution

57. A long horizontal overhead high tension wire, fixed in east-west direction carries a current 60A. What is the magnetic field at a point 3 m just below the power line? $\left[\mu_0 = 4\pi \times 10^{-7} SI$ units

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

B. $5 \times 10^{-6} T$

C. $2 \times 10^{-6} T$

D. $4 \times 10^{-6} T$

Answer:

Watch Video Solution

58. A solenoid of length 1.5 m and diameter 4 cm has 10 turns per meter. A current of 5A is passing through it. The magnetic induction at a point inside the solenoid along the axis is

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

B. $2\pi \times 10^{-5} T$

C. $3\pi \times 10^{-5} T$

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

Answer:

Watch Video Solution

59. A very long solenoid has 8400 winding and a length of 7m. If the field inside is $2\pi \times 10^{-3}T$, the current in the windings is about $[\mu_0 = 4\pi \times 10^{-7}Tm/A]$

A. 0.42 A

B. 0.83 A

C. 4.2 A

D. 8.3 A

Answer:

Watch Video Solution

60. A toroid with a circular cross-section has a current I in its winding. The total number of windings is N. The total current through an Amperian loop of radius r equal to the mean radius of the toroid is

A. ZERO

B. I

C. NI

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

Answer:

Watch Video Solution

61. Cyclotron can not accelerate

A. PROTON

B. NEUTRONS

C. $\alpha - partic \leq s$

D. DEUTERONS

Answer:

Watch Video Solution

62. If a particle of charge q is moving with a velocity v in a direction opposite to the magnetic field B, then the force acting on the particle is.

A. qvB

B. $-qvB$

C. 0

D. $qv\left(\frac{B}{2}\right)$

Answer:

Watch Video Solution

63. A conductor of length lm and carrying current of 1A is placed at an angle of 45° to

the magnetic field of 1G. The force acting on the conductor is

A. $\frac{1}{\sqrt{2}} \times 10^{-4} N$

B. `1/sqrt3xx10^-4N

C. `1/sqrt2xx10^-2N

D. `1/sqrt3xx10^-2N

Answer:

Watch Video Solution

64. The maximum force acting on a straight conductor of length 15 cm placed in a magnetic field $5 \times 10^{-5} N/Am$ is $3 \times 10^{-4} N$. Then current flowing through the conductor is

A. 4 mA

B. 40 mA

C. 400 mA

D. 40 mA

Answer:

Watch Video Solution

65. A force of $1.732 \times 10^{-2} N$ acts on a particle of charge moving with a velocity $\frac{1}{1000^{t} h}$ of the velocity of light in a magnetic field $2\sqrt{3} \times 10^{-5} T$ and perpendicular to the field then q is

A. $500 \mu C$

B. $5000 \mu C$

C. 500C

D. 5000C

Answer:

Watch Video Solution

66. The force acting on a particle of charge q moving in a uniform magnets field with velocity v is

A. parallel to both $\overrightarrow{v}$ and $\overrightarrow{B}$

B. perpendicular to both $\overrightarrow{v}$ and $\overrightarrow{B}$

C. parallel to r and perpendicular to $\vec{B}$

D. perpendicular to $\vec{v}$, and parallel to $\vec{B}$

Answer:

Watch Video Solution

67. In Bohr's model if hydrogen atom, the electron circulates around nucleus in a path of radius $0.5\overset{\circ}{A}$ at a frequency of $6.8 \times 10^{15} rev/s$. The magnetic field at the centre will be

A. 13.7 T

B. 1 T

C. 13.7 gauss

D. 13 gauss

Answer:

 Watch Video Solution

68. Two circular coils are made of two identical wires of same length. If the number of turns of

coil are 4 and 2 then the ratio of magnetic induction at centre will be

A. $4:1$

B. $1:4$

C. $1:2$

D. $2:1$

Answer:

Watch Video Solution

69. A circular coil having 50 turns each of radius 0.05 m carries a current of 1 A. The magnitude of magnetic induction at a point 0.2 m from its centre on its axis is

A. $5 \times 10^{-6} gauss$

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

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

D. $5 \times 10^{-6} Wb/m^2$

Answer:

Watch Video Solution

Watch Video Solution

70. The ratio of magnetic induction at a point along the axis of a circular coil of radius 'a' at a distance x to a point where x tends to zero is [x>>a]

A. $\frac{x^3}{a^3}$

B. $\frac{a^3}{x^3}$

C. $\frac{2a^3}{x^3}$

D. $\frac{2x^3}{a^2}$

Answer:

Watch Video Solution

71. A square coil of side 10 cm consists of 20 turns and carries 12 A. The coil is suspended vertically and the normal to the plane makes an angle of 30° with the direction of uniform magnetic field of 0.8T. The torque acting on the coil is

A. 0.69 Nm

B. 0.96 Nm

C. 0.096 Nm

D. 0.069 Nm

Answer:

Watch Video Solution

72. Two long and straight conductors, placed parallel to each other are separated by 10 cm, carrying current of 2A and 4 A respectively in

opposite direction. The force per unit length exerted by each conductor on the other

A. $16 \times 10^{-5} N/m$

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

C. $32 \times 10^{-5} N/m$

D. $3.2 \times 10^{-5} N/m$

Answer:

Watch Video Solution

73. The magnetic moment of a square coil having 5 turns, each side measuring 4 cm and carrying a current of unit ampere is

A. $20 \times 10^{-3} Am^2$

B. $8 \times 10^{-3} Am^2$

C. $8Am^2$

D. $16 \times 10^{-3} Am^2$

Answer:

Watch Video Solution

74. A long straight wire carries a current of 50 A. An electron moving at 10^7 m/s is 5 cm away from the wire. The force acting on electron if its velocity is directed towards the wire will be

A. $1.6 \times 10^{-16} N$

B. $3.2 \times 10^{-16} N$

C. $4.8 \times 10^{-16} N$

D. $1.8 \times 10^{-16} N$

Answer:

Watch Video Solution

75. The magnetic induction at a point on the axis of a circular current carrying coil at a distance equal to the radius of coil carrying a current of 0.5 A is

A. $\pi a\sqrt{2} \times 10^{-7} T$

B. $\frac{\pi a}{\sqrt{2}} \times 10^{-7} T$

C. $\frac{\pi}{2\left(\sqrt{2}\right) a \times 10^{-7} T}$

D. $\frac{\pi\sqrt{2}}{a} \times 10^{-7} T$

Answer:

Watch Video Solution

76. Choose the correct option:- Cyclotron cannot accelerate

A. Protons

B. Electrons

C. $\alpha - partic \leq s$

D. Deuterons

Answer:

 Watch Video Solution

77. Choose the correct option:- The magnetic field at a distance 'r' from long wire carrying a current is 0.8T. The magnetic field a distance 2r is

A. 0.6 T

B. 0.5 T

C. 0.4 T

D. 0.3 T

Answer:

Watch Video Solution

78. Choose the correct option:- Ampere's law is analogous to

A. Kirchhoff's law in current electricity.

B. Len's law

C. Faraday's Law

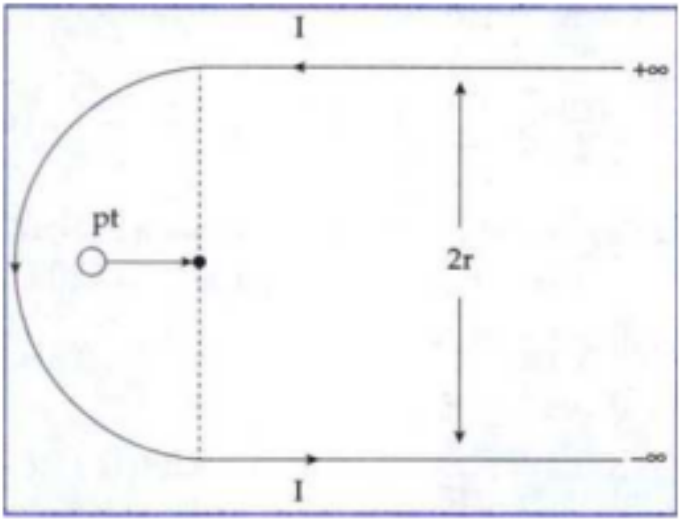
D. Gauss's law in electrostatics

Answer:

Watch Video Solution

79. Choose the correct option:- The magnetic field at point O is

4/1 r



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

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

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

D. $\frac{\mu_0}{4\pi}\frac{I}{R}(\pi - 2)$

Answer:

Watch Video Solution

80. What do you mean by resonance condition in cyclotron?

Watch Video Solution

81. State the principle of moving coil Galvanometer?

Watch Video Solution

82. What will be the force on a closed circuit on a magnetic field B ?

Watch Video Solution

83. Explain the helical motion of a charged particle is a magnetic field $\overline{B}$.

Watch Video Solution

84. Derive cyclotron formula.

Watch Video Solution

85. Define Magnetic dipole moment of a current carrying coil State its SI unit and dimension.

Watch Video Solution

86. Derive an expression for the magnetic field produced by a toroid using Ampere's law.

Watch Video Solution

87. Current of equal magnitude flows through two long parallel wires having separation of 1.35 cm. If the force per unit length on each of the wires is $4.76 \times 10^{-2} N/m$,What must be the value of current?

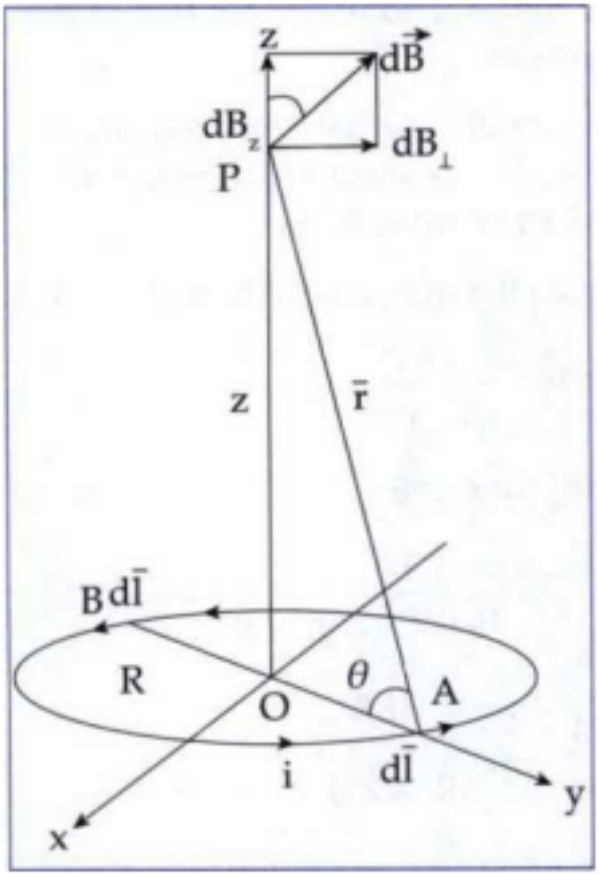
Watch Video Solution

88. A circular coil of wire is made ϕ of 100 turns, each of radius 8 cm if a current of 0.4A

passes through of, what will be the magnetic field at the centre of the coil

 Watch Video Solution

89. Find an expression for the axial magnetic field produced by current in a circular lopp?



Watch Video Solution

90. A semicircular arc of radius 10 cm carrying current of 20 A. Calculate the magnitude of magnetic field at the centre of arc. What will be the direction of magnetic field of current flows in anticlockwise direction?

Watch Video Solution

91. A conductor of length 25 cm is placed:- parallel. It a charge of 1C passes through it in 5

second, calculate the force experienced by the conductor.

Watch Video Solution

92. A conductor of length 25 cm is placed:- inclined at an angle of 60° with a uniform field $4 \times 10^{-3} T$ and carrying a current of 5 A calculate the force experienced by the conductor.

Watch Video Solution

93. Derive an expression for magnetic potential energy for a magnetic dipole freely suspended in a uniform magnetic field B.

Watch Video Solution

94. A charged paricle moving with a velocity of $2 \times 10^{7} m / s$ making an angle of 30° with a uniform field of $3.5 \times 10^{-4} T$ experiences a force of 0.07 N. find the charge.

Watch Video Solution

95. A solenoid of 150 cm length having 300 turns carries a current of 4A. Find the magnitude of the magnetic field inside the solenoid.

Watch Video Solution

96. What is Lorentz force equation?

Watch Video Solution