PHYSICS

BOOKS - KUMAR PRAKASHAN KENDRA PHYSICS (GUJRATI ENGLISH)

MOVING CHARGES AND MAGNETISM

Section A Question Answers

1. Give Oersted's observation.

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2. State scientists research about electricity and magnetism after Oersted's observation.

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3. Explain experiment which produced magnetic field due to straight long current carrying wire.

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4. Give convection for electric or magnetic field emerging out of the plane of the paper and going into the plane of paper.

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5. Explain electric field and its source as well as magnetic field and its source.

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6. Derived force on moving charge in uniform magnetic field with velocity $\overrightarrow{v}$.

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7. Give features of force on charge particle inside magnetic field.

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8. Give definition of magnetic field and give its unit.

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9. What is Lenz force ?

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10. Give expression for the force of a current carrying conductor in a magnetic field.

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11. Discuss the motion of a charged particle in a uniform magnetic field with initial velocity perpendicular to the magnetic field.

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12. Explain velocity of charge in combined electric and magnetic field in reference to velocity selector.

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13. What is cyclotron ? Discuss the principle of cyclotron.

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14. Explain construction of cyclotron with diagram.

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15. Explain working of cyclotron.

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16. Give uses of cyclotron.

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17. State and explain Biot-Savart law for the magnetic field produced by a current element. Give the direction of magnetic field

and define the unit of it.

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18. Give SI unit of magnetic field from Biot-Savart law.

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19. Discuss special cases of Biot-Savart law.

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20. Discuss similarities and differences of Biot Savart law with Coulomb's law.

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21. Give relation between vacuum permittivity, vacuum permeability and speed of light.

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22. Apply Biot-Savart law to find the magnetic field due to a circular current carrying loop at a point on the axis of the loop.

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23. Write equation of magnetic field due to circular current carrying loop at a point on the axis of the loop. Give its special cases.

Watch Video Solution

24. Show magnetic field lines for current carrying loop. Write rule for finding the direction of a magnetic field due to a circular current loop.

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25. Derive equation of missing term in Ampere circuital law. Write its definition and unit.

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26. Explain : "For some uses Ampere's circuital law $\oint \vec{B} \cdot \vec{dl} = \mu_0 I$ is easy".

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27. $BL = \mu_0 I_e$ is intresting by which consequences ?

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28. What is solenoid ? Give information of magnetic field by qualitative discussion.

Watch Video Solution

29. Derive equation of magnetic field inside a long straight solenoid.

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30. What is toroid ? Obtain formula for the magnitude of magnetic field due to current carrying toroid.

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31. Obtain equation for force between two parallel currents carrying wire.

Watch Video Solution

32. Derive an expression for the force per unit length between two infinitely long straight parallel current carrying wires. Hence, define one ampere (A).

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33. Define SI unit of electric charge in terms of Ampere.

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

Watch Video Solution

35. Derive an expression for the torque acting or a current carrying loop which subtends angle with uniform magnetic field.

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36. What is magnetic dipole moment for a coil ? Write its SI unit and dimensional formula.

Watch Video Solution

37. write equation the magnetic field due to current carrying loop as magnetic dipole on its axial point.

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38. Write the formula of magnetic field due to current carrying loop as magnetic dipole on its axial point and compare it electric field formula for electric dipole.

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39. Write formula of electric field and magnetic field due to electric dipole and current carrying loop respectively at bisector point of it.

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40. What is fundamental difference between electric dipole and magnetic dipole.

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41. Give two different properties of current carrying coil and state ampere's suggestion.

Watch Video Solution

42. Obtain an expression for orbital magnetic moment of an electron rotating about the nucleus in an atom and explain Gyromagnetic ratio.

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43. Define Bohr magneton using Bohr's first hypothesis.

Watch Video Solution

44. Explain orbital magnetic moment and spin magnetic moment.

Watch Video Solution

45. What is Galvanometer ? Give application of it.

Watch Video Solution

46. Explain construction and principle of moving coil galvanometer.

Watch Video Solution

47. Explain working of moving coil galvanometer and write its uses.

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48. Explain the difficulties occurred by using galvanometer directly as ammeter.

Watch Video Solution

49. What is shunt ? Explain its function in circuit.

Watch Video Solution

50. Explain the difficulties occurred by using galvanometer directly as ammeter.

Watch Video Solution

51. What is shunt? Obtain the formula for the shunt.

Watch Video Solution

52. What is current sensitivity of galvanometer ? How it can be increase ?

Watch Video Solution

53. What is shunt ? Explain its function in circuit.

Watch Video Solution

54. Give use of galvanometer as a voltmeter.

Watch Video Solution

55. What is voltage sensitivity ? write its equation.

Watch Video Solution

56. Explain : "Increasing the current sensitivity may not necessarily increase the voltage sensitivity".

Watch Video Solution

57. Give difference between Ammeter and Voltmeter.

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58. Why the resistance of ammeter should be as low as possible ?

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Section A Try Yourself

1. State Oersted's experiment.

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2. Fill the blank :

Static charge produces _____ field around it.

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3. Moving charge produces ____ field around it.

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4. Show arrangement of iron ore sprinkled around current carrying wire.

Watch Video Solution

5. Which convention we can use when currents and fields emerging out from surface ?

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6. What is source of magnetic field ?

Watch Video Solution

7. Write formula for moving charge q in magnetic field.

Watch Video Solution

8. Give definition of 1 T magnetic field.

Watch Video Solution

9. Any charge is moving parallel and antiparallel to magnetic field, then what is magnetic force on it ?

Watch Video Solution

10. Write Lorentz force equation.

Watch Video Solution

11. 1 T = _____ Guass.

Watch Video Solution

12. Write formula for current carrying wire placed in uniform magnetic field.

Watch Video Solution

13. What is trajectory (path) of charge particle entered in perpendicular magnetic field ?

Watch Video Solution

14. In uniform magnetic field during circular motion of charge particle, centripetal force is provided by _____.

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15. What would be the effect on radius of orbit of charged particle due to increase in momentum in cyclotron ?

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16. Write equation of Lorentz force.

Watch Video Solution

17. What is the behaviour of perpendicular electric field $\vec{E}$ and magnetic field $\vec{B}$?

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18. What is the use of mass spectrometer ?

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19. Give uses of cyclotron.

Watch Video Solution

20. What is cyclotron ? Discuss the principle of cyclotron.

Watch Video Solution

21. What do you mean by 'dees' which is used in cyclotron ?

Watch Video Solution

22. Write resonance condition for cyclotron.

Watch Video Solution

23. Which law is useful to determine relation between current and magnetic fields due to it.

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24. State and explain Biot-Savart law for the magnetic field produced by a current element. Give the direction of magnetic field and define the unit of it.

Watch Video Solution

25. How we can know direction of magnetic field using Biot-Savart law ?

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26. Write proportionality constant of Biot-Savart law with unit and value (magnitude).

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27. According to Biot-Savart law magnetic field _____ at point of axis of wire.

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28. Give similarity between Biot-Savart law and electrostatic law of Coulomb.

Watch Video Solution

29. Magnetic field vector component because of _____ and electric field scalar component because of _____ .

Watch Video Solution

30. Discuss similarities and differences of Biot Savart law with Coulomb's law.

Watch Video Solution

31. Write magnitude and dimensional formula of $\frac{1}{\sqrt{\mu_0 \in_0}}$.

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32. Give equation which relate $c, \mu_0, \in_0$.

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33. Write formula for magnetic field due to a circular current carrying loop having N turns and R radius at a point on the axis of the loop.

Watch Video Solution

34. Write formula for magnetic field at centre of ring.

Watch Video Solution

35. Write formula of magnetic field due to current carrying circular loop of radius R for $x > > R$.

Watch Video Solution

36. Write equation of magnetic field on axis from centre which have distance equal to radius.for current carrying loop

Watch Video Solution

37. Show magnetic field lines due to current carrying loop.

Watch Video Solution

38. Show magnetic field lines for current carrying loop. Write rule for finding the direction of a magnetic field due to a circular current loop.

Watch Video Solution

39. Ampere circuital law is associated with which law ?

Watch Video Solution

40. Ampere circuital define relation with _____

Watch Video Solution

41. Derive equation of missing term in Ampere circuital law. Write its definition and unit.

Watch Video Solution

42. What is Amperian loop ?

Watch Video Solution

43. Ampere's law is true for which type of current ?

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44. Give expression for the force of a current carrying conductor in a magnetic field.

Watch Video Solution

45. Write formula of the magnetic field at r perpendicular distance for finite current carrying wire.

Watch Video Solution

46. What is solenoid ?

Watch Video Solution

47. What is long solenoid ?

Watch Video Solution

48. What is magnetic field outside solenoid ?

Watch Video Solution

49. Write equation of magnetic field at inside point will of very long solenoid.

Watch Video Solution

50. What is toroid ? Obtain formula for the magnitude of magnetic field due to current carrying toroid.

Watch Video Solution

Watch Video Solution

51. Give formula for magnetic field due to toroid.

Watch Video Solution

52. Write magnetic force equation on current carrying element $I\vec{l}$ inside magnetic field $\vec{B}$.

Watch Video Solution

53. When current passing through two parallel wires force on them _____ while opposite current passes through same wire force between them _____.

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54. Derive an expression for the force per unit length between two infinitely long straight parallel current carrying wires. Hence, define one ampere (A).

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55. Define Ampere from two current carrying parallel wires.

Watch Video Solution

56. Define Coulomb from Ampere.

Watch Video Solution

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

Watch Video Solution

58. Write an equation for the torque acting on a current carrying loop which subtends angle θ with uniform magnetic field.

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59. Write the unit of magnetic dipole moment.

Watch Video Solution

60. Which rule can be use to determine direction of magnetic field due to current carrying loop.

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61. Write equation for magnetic dipole of current carrying circular loop at (i) at axis (ii) at plane of loop and at x distance from centre point of loop.

Watch Video Solution

62. Write equation for orbital magnetic moment for electron rotating about nucleus in an atom.

Watch Video Solution

63. What is gyromagnetic ratio ? Give magnitude of it?

Watch Video Solution

64. What is Bohr magneton ? Write its magnitude.

Watch Video Solution

65. Write equation for orbital magnetic moment for electron rotating about nucleus in an atom.

Watch Video Solution

66. What is intrinsic magnetic moment ?

Watch Video Solution

67. Write principle of moving coil galvanometer.

Watch Video Solution

68. Define function of small cylinder in construction of galvanometer.

Watch Video Solution

69. What is the function of spiral spring in construction of galvanometer ?

Watch Video Solution

70. Write equation of maximum torque in loop of galvanometer.

Watch Video Solution

71. Define torsional constant for spring.

Watch Video Solution

Watch Video Solution

72. Give unit of torsional constant.

Watch Video Solution

73. Give uses of galvanometer.

Watch Video Solution

74. What is use of Ammeter in circuit.

Watch Video Solution

75. What is shunt ? Explain its function in circuit.

Watch Video Solution

76. Give unit of shunt.

Watch Video Solution

77. What is possible value of shunt should be ?

Watch Video Solution

78. Why galvanometer did not show full scale deflection after connecting shunt.

Watch Video Solution

79. What is reason behind no damage in wire of coil of galvanometer after connecting shunt.

Watch Video Solution

80. How we can convert galvanometer to ammeter ?

Watch Video Solution

81. What is current sensitivity of galvanometer ? How it can be increase ?

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82. What is current sensitivity of galvanometer ? How it can be increase ?

Watch Video Solution

83. Possible value of resistance of ammeter is _____ and possible value of resistance of voltmeter is _____ .

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84. What is resistance of ideal ammeter.

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85. Write equation of resistance to increase n^{th} time capacity of voltmeter from capacity of galvanometer.

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86. What is voltage sensitivity ? write its equation.

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Watch Video Solution

87. Write equation for voltage sensitivity.

Watch Video Solution

88. By increasing current sensitivity, voltage sensitivity is also increase. This statement is true or false.

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89. What is the value of resistance to double the value of number of turns of coil for galvanometer ? Why?

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Section B Numerical From Textual Illustrations

1. A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. It is suspended in mid air by a uniform horizontal magnetic field B (figure). What is the magnitude of the magnetic field ?

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2. A straight wire of mass 150 g and length 2 m carries a current of 1.5 A. It is suspended in mid-air by a uniform horizontal magnetic field B (figure). What is the magnitude of the magnetic field ? $\left(g = 10ms^{-2}\right)$

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3. If the magnetic field is parallel to the positive Y-axis and the charged particle is moving along the positive X-axis as per figure,

which way would the Lorentz force be for (a) an electron (negative charge), (b) a proton (positive charge).

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4. If the magnetic field is parallel to the positive Y-axis and the charged particle is moving along the positive X-axis as per figure, which way would the Lorentz force be for (a) an electron (negative charge), (b) a proton (positive charge).

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5. What is the radius of the path of an electron (mass $9 \times 10^{-31} kg$ and charge $1.6 \times 10^{-19} C$) moving at a speed of $3 \times 10^{7} m/s$ in a magnetic field of $6 \times 10^{-4} T$ perpendicular to it? What is its frequency ? Calculate its energy in keV.

$\left(1eV = 1.6 \times 10^{-19} J\right)$

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6. What is the radius of the path of an electron (mass $9 \times 10^{-31} kg$ and charge $1.6 \times 10^{-19} C$) moving at a speed of $3 \times 10^{6} m/s$ in a magnetic field of 6T perpendicular to it? What is its frequency ? Calculate its energy in keV. $\left(1eV = 1.6 \times 10^{-19} J\right)$

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7. A cyclotron's oscillator frequency is 10 MHz. What should be the operating magnetic field for accelerating protons ? If the radius of its 'dees' is 60 cm, what is the kinetic energy (in MeV) of the proton beam produced by the accelerator.

$\left(e = 1.60 \times 10^{-19} C, m_p = 1.67 \times 10^{-27 kg}, 1MeV = 1.6 \times 10^{-13} J\right)$

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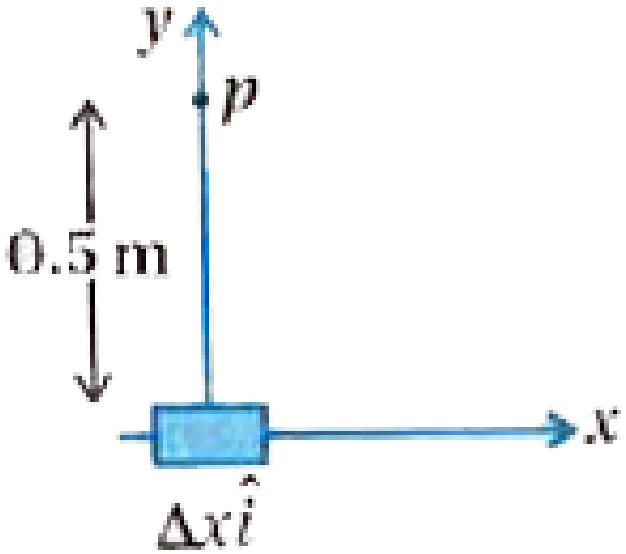
8. An element $\Delta l = \Delta x \hat{i}$ is placed at origin and carries a current I=10A. IF $\Delta x = 1cm$ magnetic field at point P is..... T.



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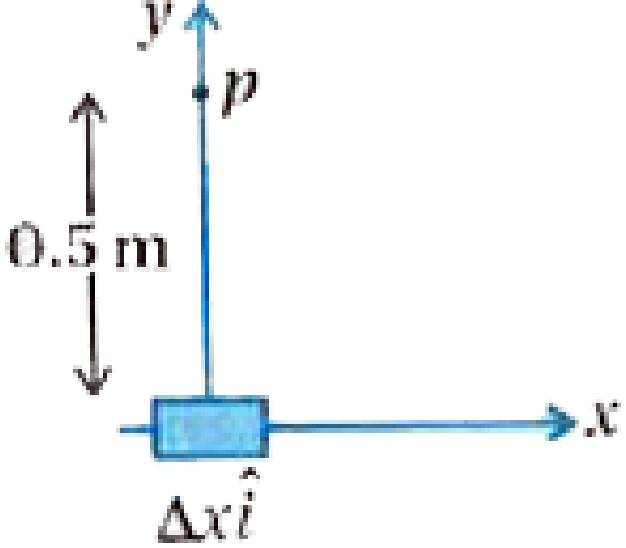
9. An element $\Delta l = \Delta x \hat{i}$ is placed at origin and carries a current I=10A. IF $\Delta x = 1cm$ magnetic field at point P is..... T.



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10. A straight wire carrying a current of 12 A is bent into a semicircular arc of radius 2.0 cm as shown in figure (a). Consider the magnetic field $\vec{B}$ at the centre of the arc.

(a) What is the magnetic field due to the straight segments ?

(b) In what way the contribution to $\vec{B}$ from the semicircle differs from that of a circular loop and in what way does it resemble ?

(c) Would your answer be different if the wire were bent into a

semicircular arc of the same radius but in the opposite way as shown in figure (b) ?

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11. Magnetic field produced at the centre of circular coil having radius 0.1 m and 2 turns is _____ if $\frac{1}{4\pi} A$ current passes through it.

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12. Consider a tightly wound 100 turn coil of radius 10 cm, carrying a current of 1 A. What is the magnitude of the magnetic field at the centre of the coil ?

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13. Consider a tightly wound 200 turn coil of radius 20 cm, carrying a current of 1A. What is the magnitude of the magnetic field at the centre of the coil ?

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14. An extremely long straight wire, with radius of cross-section a, carries current I. Then ratio of magnetic fields at distances $\frac{a}{2}$ and 2a from its axis would be _____ .

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15. A solenoid of length 3.14 cm has a radius of 1 cm and is made up of 500 turns. It carries a current of 5 A. What is the magnitude of the magnetic field inside the solenoid ?

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16. A solenoid of length 0.4 m has a radius of 1 cm and is made up of 500 turns. It carries a current of 10 A. What is the magnitude of the magnetic field inside the solenoid ?

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17. The horizontal component of the earth's magnetic field at a certain place is $4.0 \times 10^{-5} T$ and the direction of the field is from the geographic south to the geographic north. A very long straight conductor is carrying a steady current of 1A. What is the force per unit length on it when it is placed on a horizontal table and the direction of the current is east to west

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18. The horizontal component of the earth's magnetic field at a certain place is $2.5 \times 10^{-5} T$ and the direction of the field is from the geographic south to the geographic north. A very long straight conductor is carrying a steady current of 0.5 A. What is the force per unit length on it when it is placed on a horizontal table and the direction of the current is (a) east to west, (b) south to north?

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19. A 100 turn closely wound circular coil of radius 10 cm carries a current of 3.2 A. (a) What is the field at the centre of the coil? (b) What is the magnetic moment of this coil? The coil is placed in a vertical plane and is free to rotate about a horizontal axis which coincides with its diameter. A uniform magnetic field of 2T in the horizontal direction exists such that initially the axis of the coil is in the direction of the field. The coil rotates through an angle of 90° under the influence of the magnetic field. (c) What are the

magnitudes of the torques on the coil in the initial and final position? (d) What is the angular speed acquired by the coil when it has rotated by 90°? The moment of inertia of the coil is$0.1 kgm^2$.

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20. (a) A current-carrying circular 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). (b) A current-carrying circular loop is located in a uniform external magnetic field. If the loop is free to turn, what is its orientation of stable equilibrium? Show that in this orientation, the flux of the total field (external field + field produced by the loop) is maximum. (c) A loop of irregular shape carrying current is located in an external magnetic field. If the wire is flexible, why does it change to a circular shape?

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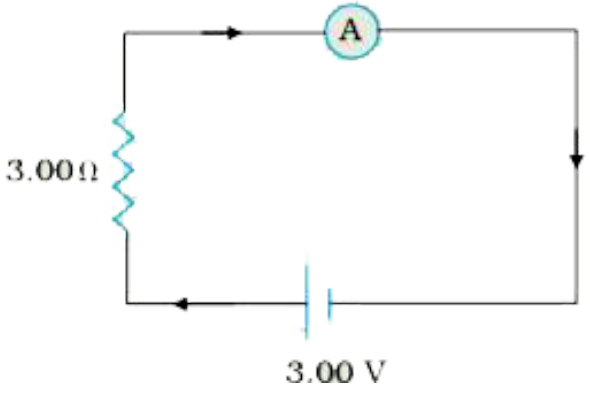
21. In the circuit the current is to be measured. What is the value of the current if the ammeter shown (a) is a galvanometer with a resistance $R_G = 60.00\Omega$, (b) is a galvanometer described in (a) but converted to an ammeter by a shunt resistance $r_s = 0.02\Omega$, (c) is an ideal ammeter with zero resistance?



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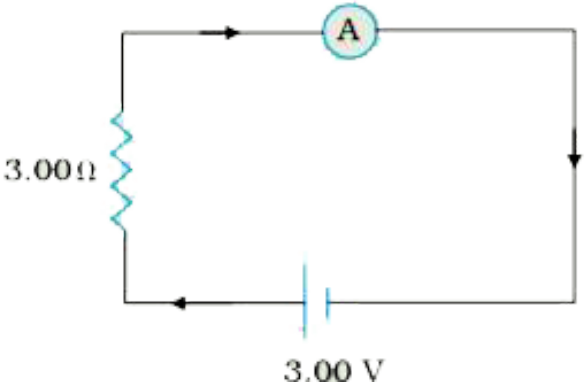
22. In the circuit the current is to be measured. What is the value of the current if the ammeter shown (a) is a galvanometer with a resistance $R_G = 60.00\Omega$, (b) is a galvanometer described in (a) but

converted to an ammeter by a shunt resistance $r_s = 0.02\Omega$, (c) is an ideal ammeter with zero resistance?



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Section B Numerical From Textual Exercise

1. A circular coil of wire consisting of 100 turns, each of radius 4.0 cm carries a current of 0.40 A. What is the magnitude of the magnetic field B at the centre of the coil ?

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

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3. A long straight wire in the horizontal plane carries a current of 50 A in north to south direction. Give the magnitude and direction of B at a point 2.5 m east of the wire

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4. A horizontal power line carries a current of 90A in east to west direction. What is the magnitude and direction of the magnetic field due to the current 1.5m below the line?

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5. 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?

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6. A 1.0 cm wire carrying a current of 30 A is placed inside a solenoid perpendicular to its axis. The magnetic field inside the solenoid is given to be 0.27 T. What is the magnetic force on the wire ?

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7. Two long and parallel straight wires A and B carrying currents of 10.0 A and 4.0 A in the same direction are separated by a distance of 4.0 cm. Estimate the force on a 10 cm section of wire A.

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8. A closely wound solenoid 80 cm long has 4 layers of windings of 500 turns each. The diameter of the solenoid is 1.7 cm. If the current carried is 8.0 A, estimate the magnitude of B inside the solenoid near its centre.

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9. 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?

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10. Two moving coil meters M_1 and M_2 have the following particulars :

$R_1 = 10\Omega, N_1 = 30$

$A_1 = 3.6 \times 10^{-3} m^2, B_1 = 0.25T$

$R_2 = 14\Omega, N_2 = 42$

$A_2 = 1.8 \times 10^{-3} m^2, B_2 = 0.50T$

(The spring constants are identical for the two meters). Determine the ratio of (a) current sensitivity and (b) voltage sensitivity of M_2 and M_1 .

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11. In a chamber, a uniform magnetic field of 6.5 G$\left(1G = 10^{-4}T\right)$ is maintained. An electron is shot into the field with a speed of $4.8x \times 10^6 ms^{-1}$ normal to the field. Explain why the path of the electron is a circle. Determine the radius of the circular orbit. $\left(e = 1.5x \times 10^{-19}C, m_e = 9.1x \times 10^{-31}kg\right)$

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12. Obtain the frequency of revolution of the electron in its circular orbit. Does the answer depend on the speed of the electron? Explain.

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13. (a) 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. (b) 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.)

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14. Two concentric circular coils X and Y of radii 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 a current of 16 A, coil Y has 25 turns and carries a current of 18 A. The sense of the current in X is anticlockwise, and clockwise in Y, for an observer looking at the coils facing west. Give the magnitude and direction of the net magnetic field due to the coils at their centre.

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15. A magnetic field of 100 G $\left(1G = 10^{-4}T\right)$ is required which is uniform in a region of linear dimension about 10 cm and area of cross-section about $10^{-3}m^2$. The maximum current-carrying capacity of a given coil of wire is 15 A and the number of turns per unit length that can be wound round a core is at most 1000 turns

m^{-1}. Suggest some appropriate design particulars of a solenoid for the required purpose. Assume the core is not ferromagnetic.

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16. For a circular coil of radius R and N turns carrying current. Prove that the magnitude of the magnetic field at a point on its axis at a distance X from its centre is given by $B = \frac{\mu_0 I R^2 N}{2(x^2 + R^2)^{3/2}}$

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17. 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 wound. If the current in the wire is 11 A, what is the magnetic field

(a) outside the toroid,

(b) inside the core of the toroid, and

(c) in the empty space surrounded by the toroid.

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18. A magnetic field that varies in magnitude from point to point but has a constant direction (east to west) is set up in a chamber. A charged particle enters the chamber and travels undeflected along a straight path with constant speed. What can you say about the initial velocity of the particle?

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19. An electron emitted by a heated cathode and accelerated through a potential difference of 2.0 kV, enters a region with uniform magnetic field of 0.15 T. Determine the trajectory of the electron if the field (a) is transverse to its initial velocity, (b) makes an angle of 30 with the initial velocity.

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20. A magnetic field set up using Helmholtz coils (described in Exercise 4.16) is uniform in a small region and has a magnitude of 0.75 T. In the same region, a uniform electrostatic field is maintained in a direction normal to the common axis of the coils. A narrow beam of (single species) charged particles all accelerated through 15 kV enters this region in a direction perpendicular to both the axis of the coils and the electrostatic field. If the beam remains undeflected when the electrostatic field is $9.0 \times 10^{-5} Vm^{-1}$, make a simple guess as to what the beam contains. Why is the answer not unique ?

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21. 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. (a) What magnetic field

should be set up normal to the conductor in order that the tension in the wires is zero? (b) 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.) $g = 9.8ms^{-2}$.

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

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23. A uniform magnetic field of 1.5 T exists in a cylindrical region of radius10.0 cm, its direction parallel to the axis along east to west. A wire carrying current of 7.0 A in the north to south direction passes

through this region. What is the magnitude and direction of the force on the wire if, (a) the wire intersects the axis, (b) the wire is turned from N-S to northeast-northwest direction, (c) the wire in the N-S direction is lowered from the axis by a distance of 6.0 cm?

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24. 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?

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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 (a) total torque on the coil, (b) total force on the coil, (c) 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 $10^{29}m^{-3}$.)

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26. 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?

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27. A galvanometer coil has a resistance of 12Ω and the metre shows full scale deflection for a current of 3 mA. How will you convert the metre into a voltmeter of range 0 to 18 V ?

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

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Section B Numerical From Darpan Based On Textbook

1. Electron is rotating in circular orbit with radius $5.2 \times 10^{-11} m$ and with linear speed $2 \times 10^{6} ms^{-1}$ in an hydrogen atom around

the proton. Find the magnetic field produced at the centre of the orbit.

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2. A charge Q is uniformly spread over a disc of radius R made from nonconducting material. This disc is rotated about its geometrical axis with frequency f. Find the magnetic field produced at the centre of the disc.

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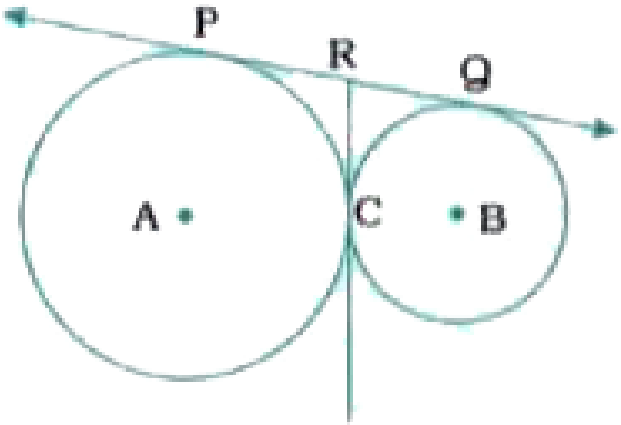
3. In the given figure, two circles with centres A and B touch each other at C bisects the common tangent at P and Q.



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4. A circular loop is prepared from a wire of uniform cross section. A battery is connected between any two points on its circumference. The magnetic induction at the centre of the loop is _____ .

Watch Video Solution

5. There are 21 marks (zero to 20) on the dial of a galvanometer, that is there are 20 divisions. On passing $10\mu A$ current through it, it shows a deflection of 1 division. Its resistance is 20Ω.

(a) How can it be converted into an ammeter which can measure 1 A current ?

(b) How can we change it into a voltmeter to measure a pd of 1 V ? Also find the effective resistance of both of the above mentioned meters.

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6. Distance between two very long parallel wires is 0.2 m. Electric currents of 4 A in one wire and 6 A in the other wire are passing in the same direction. Find the position of a point on the perpendicular line joining the two wires at which the magnetic field intensity is zero.

Watch Video Solution

7. A very long wire is held vertical in a direction perpendicular to the horizontal component of Earth's magnetic field. Find the value of current to be passed through this wire so that this resultant magnetic field at a point 10 cm away from this wire becomes zero. What will be the magnetic induction at a point 10 cm away from the wire on the opposite side of this point ?

Horizontal component of Earth's magnetic field $H = 0.36 \times 10^{-4} T$, $\mu_0 = 4\pi \times 10^{-7} Tm/A$.

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8. When a galvanometer with a shunt is joined in an electrical circuit 2% of the total current passes through the galvanometer.

Resistance of galvanometer is G. Find the value of shunt.

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9. Two particles of masses M_1 and M_2 and having the equal electric charge are accelerated through equal potential difference and then move inside a uniform magnetic field, normal to it. If the radii of their circular paths are R_1 and R_2 respectively, find the ratio of their masses.

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10. A proton and a deuteron having the same kinetic energies enter a region of uniform magnetic field perpendicularly, Deuteron's mass is twice that of proton. Calculate the ratio of the radii of their circular paths.

Watch Video Solution

11. Two rings X and Y are placed in such a way that their axes are along the X and the Y axes respectively and their centres are at the origin. Both the rings X and Y have the same radii of 3.14 cm. If the current through X and Y rings are 0.6 A and 0.8 A respectively, find the value of the resultant magnetic field at the origin.

$\left(\mu_0 = 4\pi \times 10^{-7} SI\right)$

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12. A very long straight wire carries a current of 5 A. An electron moves with a velocity of $10^6 ms^{-1}$ remaining parallel to the wire at a distance of 10 cm from wire in a direction opposite to that of electric current. Find the force on this electron. (Here the mass of electron is taken as constant)

$\left(e = -1.6 \times 10^{-19} C, \mu_0 = 4\pi \times 10^{-7} SI\right)$

Watch Video Solution

13. A current of 6 A passes through the wire shown in the figure. Find the magnitude of magnetic field at point C. The radius is 0.2 m. $\left(\mu_0 = 4\pi \times 10^{-7} TmA^{-1}\right)$

Watch Video Solution

Section C Multiple Choice Questions

1. Two charged particles traverse identical helical paths in a completely opposite sense in a uniform magnetic field $\vec{B} = B_0\hat{k}$.

A. They have equal z-components of momenta.

B. They must have equal charges.

C. They necessarily represent a particle, antiparticle pair.

D. The charge to mass ratio satisfy :

$$\left(\frac{e}{m}\right)_1 + \left(\frac{e}{m}\right)_2 = 0$$

Answer: D

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2. Biot-Savart law indicates that the moving electrons (velocity v) produce a magnetic field $\vec{B}$ such that

A. B is perpendicular of v

B. B is parallel to v

C. it obeys inverse cube law.

D. it is along the line joining the electron and point of observation.

Answer: A

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3. A current carrying circular loop of radius R is placed in the x-y plane with centre at the origin. Half of the loop with $x > 0$ is now bent so that it now lies in the y-z plane.

A. The magnitude of magnetic moment now diminishes.

B. The magnetic moment does not change.

C. The magnitude of B at $(0, 0, z), z > > R$ increases.

D. The magnitude of B at $(0, 0, z), z > > R$ is unchanged.

Answer: A

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4. An electron is projected with uniform velocity along the axis of a current carrying long solenoid. Which of the following is true ?

A. The electron will be accelerated along the axis.

B. The electron path will be circular about the axis.

C. The electron will experience a force at 45° to the axis and hence execute a helical path.

D. The electron will continue to move with uniform velocity along the axis of the solenoid.

Answer: D

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5. In a cyclotron, a charge particle,

A. undergoes acceleration all the time.

B. speeds up between the dees because of the magnetic field.

C. speeds up in a dee.

D. slows down within a dee and speeds up between dees.

Answer: A

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6. A circular current loop of magnetic moment M is in an arbitrary orientation in an external magnetic field $\vec{B}$. The work done to rotate the loop by 30° about an axis perpendicular to its plane is

A. MB

B. $\frac{\sqrt{3}}{2}MB$

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

D. zero

Answer: B::D

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7. The gyromagnetic ratio of an electron in an H-atom, according to Bohr model, is

A. independent of which orbit it is in.

B. negative

C. positive

D. increases with the quantum number n.

Answer: A::B

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8. Consider a wire carrying a steady current, I placed in a uniform magnetic field $\overrightarrow{B}$ perpendicular to its length. Consider the charges inside the wire. It is known that magnetic forces do no work. This implies that,

A. motion of charges inside the conductor is unaffected by $\overrightarrow{B}$ since they do not absorb energy.

B. some charges inside the wire move to the surface as a result of $\overrightarrow{B}$.

C. if the wire moves under the influence of $\overrightarrow{B}$, no work is done by the force.

D. if the wire moves under the influence of $\overrightarrow{B}$, no work is done by the magnetic force on the ions, assumed fixed within the wire.

Answer: B::D

Watch Video Solution

9. Two identical current carrying coaxial loops, carry current I in an opposite sense. A simple amperian loop passes through both of them once. Calling the loop as C,

A. $\oint_c \vec{B} \cdot \vec{dl} = \pm 2\mu_0 I$

B. the value of $\oint_c \vec{B} \cdot \vec{dl}$ is independent of sense of C.

C. there may be a point on C where $\vec{B}$ and $\vec{dl}$ are perpendicular.

D. $\vec{B}$ vanishes everywhere on C.

Answer: B::C

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10. A cubical region of space is filled with some uniform electric and magnetic fields. An electron enters the cube across one of its faces with velocity v and a positron enters via opposite face with velocity – v. At this instant,

A. the electric forces on both the particles cause identical accelerations.

B. the magnetic forces on both the particles cause equal accelerations.

C. both particles gain or loose energy at the same rate.

D. the motion of the Centre of Mass (CM) is determined by $\vec{B}$ alone.

Answer: B::C::D

Watch Video Solution

11. A charged particle would continue to move with a constant velocity in a region wherein,

A. $\vec{E} = 0, \vec{B} \neq 0$

B. $\vec{E} \neq 0, \vec{B} \neq 0$

C. $\vec{E} \neq 0, \vec{B} = 0$

D. $\vec{E} = 0, \vec{B} = 0$

Answer: A::B::D

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Section C Very Short Answer Type Questions

1. Verify that the cyclotron frequency $\omega = \frac{eB}{m}$ has the correct dimensions of $[T]^{-1}$.

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2. Show that a force that does no work must be a velocity dependent force.

Watch Video Solution

3. The magnetic force depends on v which depends on the inertial frame of reference. Does then the magnetic force differ from inertial frame to frame ? Is it reasonable that the net acceleration has a different value in different frames of reference ?

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4. Describe the motion of a charged particle in a cyclotron if the frequency of the radio frequency (rf) field were doubled.

Watch Video Solution

5. At what points on the curve $x^2 + y^2 - 2x - 4y + 1 = 0$, the tangents are parallel to the Y-axis ?

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Section C Short Answer Type Questions

1. A current carrying loop consists of 3 identical quarter circles of radius R, lying in the positive quadrants of the x-y, y-z and z-x planes with their centres at the origin, joined together. Find the direction and magnitude of B at the origin.

Watch Video Solution

2. A charged particle of charge e and mass m is moving in an electric field $\overrightarrow{E}$ and magnetic field $\overrightarrow{B}$. Construct dimensionless quantities and quantities of dimension $[T]^{-1}$.

Watch Video Solution

3. An electron enters with a velocity $\overrightarrow{v}, v_0\hat{i}$ into a cubical region (faces parallel to coordinate planes) in which there are uniform electric and magnetic fields. The orbit of the electron is found to spiral down inside the cube in plane parallel to the x-y plane. Suggest a configuration of fields E and B that can lead to it.

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4. Do magnetic forces obey Newton's third law. Verify for two current elements $\overrightarrow{dl_1} = dl\left(\hat{i}\right)$ located at the origin and

$\overrightarrow{dl_2} = dl\left(\hat{j}\right)$ located at (0, R, 0). Both carry current I.

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5. A multirange voltmeter can be constructed by using a galvanometer circuit as shown in figure. We want to construct a voltmeter that can measure 2 V, 20 V and 200 V using a galvanometer of resistance 10Ω and that produces maximum deflection for current of 1 mA. Find R_1, R_2 and R_3 that have to be used.

View Text Solution

6. The current flows from A to B in a straight wire as shown in figure and it is decreasing with time. The induced current in loop

placed near to it ___

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Section C Long Answer Type Questions

1. I amount of current is passed through a coil with N turns. Magnetic flux linked with the coil is .....

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2. A rectangular conducting loop consists of two wires on two opposite sides of length 1 joined together by rods of length d. The wires are each of the same material but with cross sections

differing by a factor of 2. The thicker wire has a resistance R and the rods are of low resistance, which in turn are connected to a constant voltage source V_0. The loop is placed in uniform a magnetic field $\vec{B}$ at 45° to its plane. Find the torque exerted by the magnetic field on the loop about an axis through the centres of rods.

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3. An electron and a positron are released from (0, 0, 0) and (0, 0, 1.5R) respectively, in a uniform magnetic field $\vec{B} = B_0\hat{i}$, each with an equal momentum of magnitude p = eBR. Under what conditions on the direction of momentum will the orbits be non-intersecting circles ?

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4. A uniform conducting wire of length 12a and resistance R is wound up as a current carrying coil in the shape of :

(i) an equilateral triangle of side a,

(ii) a square of sides a and,

(iii) a regular hexagon of sides a. The coil is connected to a voltage source V_0 . Find the magnetic moment of the coils in each case.

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5. Consider a circular current-carrying loop of radius R in the x-y plane with centre at origin. Consider the line integral $(L) = \left| \int_{-L}^{L} \vec{B} \cdot \vec{dl} \right|$ taken along z-axis.

(a) Show that (L) monotonically increases with L.

(b) Use an appropriate Amperian loop to show that $(\infty) = \mu_0 I$, where I is the current in the wire.

(c) Verify directly the above result.

(d) Suppose we replace the circular coil by a square coil of sides R carrying the same current I. What can you say about (L) and (∞)?

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6. A galvanometer coil has a resistance of 12Ω and the metre shows full scale deflection for a current of 3 mA. How will you convert the metre into a voltmeter of range 0 to 18 V ?

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

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Section D Multiple Choice Questions

1. Who had observed magnetic effect of electric current first ?

A. Oersted

B. Lorentz

C. Ampere

D. Bio-Savart

Answer: A

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2. If a stationary charged particle experience an electromagnetic force then _____ .

A. E = 0, B = 0

B. $E \neq 0, B = 0$ or $B \neq 0$

C. $E \neq 0, B \neq 0$

D. $\overrightarrow{E} \perp \overrightarrow{B}$

Answer: B

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3. A magnetic field can be produced by _____ .

A. A moving charge

B. A changing electric field

C. None of these

D. Both (A) and (B)

Answer: D

Watch Video Solution

4. Consider two straight parallel conductors A and B separated by a distance x and carrying individual current I_A and I_B respectively. If the two conductors attract each other, it indicates that _____ .

A. The two currents are parallel in direction

B. The two currents are antiparallel in direction

C. The magnetic lines of induction are parallel

D. The magnetic lines of induction are parallel to length of conductors

Answer: A

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5. The direction of magnetic lines of forces close to a straight conductor carrying current will be _____.

A. Along the length of the conductor

B. Radially outward

C. Circular in a plane perpendicular to the conductor

D. Helical

Answer: C

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6. A charged particle is moving with velocity $\vec{v}$ in a uniform magnetic field $\vec{B}$. The magnetic force acting on it will be maximum when _____ .

A. $\vec{v}$ and $\vec{B}$ are in same direction.

B. $\vec{v}$ and $\vec{B}$ are in opposite direction.

C. $\vec{v}$ and $\vec{B}$ are mutually perpendicular.

D. $\overrightarrow{v}$ and $\overrightarrow{B}$ make an angle of 45° with each other.

Answer: C

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7. A charged particle gains energy due to _____ .

A. electric field.

B. magnetic field.

C. both these fields.

D. none of these fields.

Answer: A

Watch Video Solution

8. Maximum magnetic force on electron moving with velocity $4 \times 10^4 m/s$ is _____ when it moves in magnetic field having intensity $5 \times 10^{-5} T$.

A. $1.6 \times 10^{-19} N$

B. $3.2 \times 10^{-19} N$

C. $1.6 \times 10^{-17} N$

D. $3.2 \times 10^{-17} N$

Answer: B

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9. Lorentz force acting on a charged particle is zero. If electric field is $5\frac{V}{m}$, then $\left|\left(\vec{B} \times \vec{V}\right)\right| =$ _____ .

A. zero

B. infinite

C. 5

D. none of these

Answer: C

Watch Video Solution

10. If proton moves with velocity $10\hat{i}ms^{-1}$ in magnetic field having magnitude $5\hat{j}$ T, magnetic force acting on it is _____ N.

A. 5×10^{-18}

B. 2×10^{-18}

C. 8×10^{-18}

D. 10×10^{-18}

Answer: C

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11. A strong magnetic field is applied on a stationary electron, then _____

A. The electron moves in the direction of the field.

B. The electron moves in an opposite direction.

C. The electron remains stationary.

D. The electron starts spinning.

Answer: C

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12. A proton is moving perpendicular to a uniform magnetic field of 2.5 tesla with 2MeV kinetic energy. The force on the proton is _____ .

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

B. $8 \times 10^{-11} N$

C. $3 \times 10^{-11} N$

D. $8 \times 10^{-12} N$

Answer: D

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13. A wire carrying a current i is placed in a uniform magnetic field in the form of the curve $y = a \sin\left(\frac{\pi x}{L}\right), 0 \leq x \leq 2L$. The force acting on the wire is

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

B. $iBL\pi$

C. $2iBL$

D. zero

Answer: C

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14. A small circular flexible loop of wire of radius r carries a current I. It is placed in a uniform magnetic field B. The tension in the loop will be doubled if _____ .

A. I is doubled

B. B is halved

C. r is doubled

D. Both B and I are doubled

Answer: A

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15. A particle having 2 C charge passes through magnetic field of $4\hat{k}T$ and some uniform electric field with velocity $25\hat{j}$. If the Lorentz force acting on it is $400\hat{i}N$, find the electric field in this region.

A. $200\hat{i}$

B. $200\hat{k}$

C. $100\hat{i}$

D. $10\hat{j}$

Answer: C

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16. The dimension formula of the magnetic field intensity B is _____ .

A. $ML^{-2}A^{-1}$

B. $MT^{-2}A^{-1}$

C. M^2TA^{-2}

D. $M^2LT^{-2}A^{-1}$

Answer: B

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17. Two straight parallel wires, both carrying 10 Ampere in the same direction attract each other with a force of $1 \times 10^{-3}N$. If both currents are doubled, what will be the force of attraction ?

A. $1 \times 10^{-3}N$

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

C. $4 \times 10^{-3}N$

D. $0.25 \times 10^{-3} N$

Answer: C

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18. Maximum kinetic energy of positive ion in cyclotron is _____

(Where r_0 = radius of cyclotron)

A. $\frac{q^2 B r_0}{2m}$

B. $\frac{qB^2 r_0}{2m}$

C. $\frac{q^2 B^2 r_0^2}{2m}$

D. $\frac{qBr_0}{2m}$

Answer: C

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19. Radius of circular path, followed by a charged particle is proportional to _____ .

A. charge of a particle

B. energy of a particle

C. momentum of a particle

D. magnetic field

Answer: C

Watch Video Solution

20. An electron moves perpendicular to uniform magnetic field B, on a circle of radius r. Now, if magnetic field is made half of its initial value, what would be new radius of circular path ?

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

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

C. 2r

D. 4r

Answer: C

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21. Cyclotron frequency does not depend on _____

A. mass

B. charge

C. magnetic field

D. momentum

Answer: D

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Watch Video Solution

22. Cyclotron frequency of electron when accelerated in 1 T magnetic field is _____ .

A. 28 MHz

B. 280 MHz

C. 2.8 GHz

D. 28 GHz

Answer: D

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23. Magnetic force exerted on charge moving in magnetic field is _____

A. in the direction of magnetic field.

B. in the opposite direction of magnetic field.

C. is perpendicular to both, velocity and field.

D. is parallel to both, velocity and field.

Answer: C

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24. When a charged particle enters perpendicular to uniform magnetic field, path followed by it is _____

A. linear

B. circular

C. helical

D. parabolic

Answer: B

Watch Video Solution

25. When α-particle and proton move perpendicular to uniform magnetic field with same speed then ratio of periodic times of their circular motion will be _____

A. $2:1$

B. $1:2$

C. $4:1$

D. $1:4$

Answer: A

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26. If radius of circular paths followed by one proton and one α-particle, in the plane, perpendicular to uniform magnetic field, are equal then ratio of their momenta is _____ .

A. $1:1$

B. $2:1$

C. $1:2$

D. $1:4$

Answer: C

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27. When a charged particle moves in a magnetic field its kinetic energy _____ .

A. remains constant

B. can increase

C. can decrease

D. can increase or decrease

Answer: A

Watch Video Solution

28. If the speed of a charged particle moving through a magnetic field is increased, then the radius of curvature of its trajectory will _____ .

A. decrease

B. increase

C. not change

D. become half

Answer: B

Watch Video Solution

29. Which of the following cannot be accelerated by cyclotron ?

A. α-particle

B. Proton

C. Deuteron

D. Neutron

Answer: D

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30. As Coulomb's law is important in static electricity, ____ law is important in magnetism.

A. Kirchhoff's

B. Ampere's

C. Faraday's

D. Bio-Savart's

Answer: D

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31. Ampere's circuital law is true for _____ .

A. symmetric electric fields

B. symmetric magnetic fields

C. steady currents

D. only those currents which are measured in ampere

Answer: C

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32. A telephone cable at a place has four long straight horizontal wires carrying a current of 1.0 A in the same direction east to west. The earth's magnetic field at the place is 0.39 G, and the angle of dip is 35^{o}. The magnetic declination is nearly zero. What are the resultant magnetic fields at points 4.0 cm below the cable ?

A. at P $\otimes$ and at Q $\odot$

B. at P $\odot$ and at Q $\otimes$

C. at P $\otimes$ and at Q $\otimes$

D. at P $\odot$ and at Q $\odot$

Answer: A

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33. The cartesian equation of the line passing through (4, 9, 8) and (3, - 2, 1) is ..

A. I_1, I_2 negative and I_3, I_4 positive

B. I_1, I_2 positive and I_3, I_4 negative

C. I_1, positive and I_2, I_3, I_4 negative

D. I_1, I_4, I_3 positive and I_2 negative

Answer: B

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34. A current of 1 ampere is passed through a straight wire of length 2.0 meters. What value of magnetic field at a point in air at a distance of 3 meters from either end of wire and on the axis of wire ?

A. $\frac{\mu_0}{2\pi}$

B. $\frac{\mu_0}{4\pi}$

C. $\frac{\mu_0}{8\pi}$

D. Zero

Answer: D

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35. Magnetic field at 10 cm from extremely long current carrying straight wire is $10^{-5} Wb/m^2$. Then current passing through this

wire is _____ .

A. 5A

B. 10A

C. 500A

D. 1000A

Answer: A

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36. Magnetic field at 10 cm from extremely long current carrying straight wire is $10^{-5} Wb/m^2$. Then current passing through this wire is _____ .

A. proportional to a

B. proportional to a^2

C. proportional to $\frac{1}{a}$

D. zero

Answer: D

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37. When a helium nucleus revolves in a circular orbit of radius 0.8 m,if it takes 2 sec to comlete one revolution. find magnetic field produced at the centre would be _____ T.

A. $10^{-18}\mu_0$

B. $5 \times 10^{-19}\mu_0$

C. $2 \times 10^{-19}\mu_0$

D. $10^{-19}\mu_0$

Answer: C

Watch Video Solution

38. Inside the solenoid, magnetic field lines in the middle part are _____

A. parallel to axis

B. perpendicular to axis

C. helical

D. circular

Answer: A

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39. SI unit of permeability is

A. $\frac{Am}{T}$

B. $\frac{Tm}{A}$

C. $\frac{T}{Am}$

D. $\frac{A}{Tm}$

Answer: B

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40. An extremely long straight wire, with radius of cross-section a, carries current I. Then ratio of magnetic fields at distances $\frac{a}{2}$ and 2a from its axis would be _____ .

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

B. 4

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

D. 1

Answer: D

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41. Ampere's law is the integral form of _____

A. Biot-Savart's law

B. Coulomb's law

C. Gauss's law

D. Maxwell's law

Answer: A

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42. The magnetic field at the centre of ring carrying electric current is ___ of area of the ring.

A. inversely proportional to square root

B. inversely proportional

C. directly proportional

D. directly proportional to square root

Answer: A

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43. Magnetic field produced at the centre of circular coil having radius 0.1 m and 2 turns is ____ if $\frac{1}{4\pi}A$ current passes through it.

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

B. $0.1 \times 10^{-6}T$

C. $1 \times 10^{-6}T$

D. $0.01 \times 10^{-6}T$

Answer: C

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44. A very long solenoid of length L has n layers. There are N turns in each layer. Diameter of the solenoid is D and it carries current I. The magnetic field at the centre of the solenoid is _____

A. directly proportional to D.

B. inversely proportional to D.

C. independent of D.

D. directly proportional to L.

Answer: C

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45. There are 50 turns per cm length in a very long solenoid. It carries a current of 2.5A. The magnetic field at its centre on the axis is _____ T.

A. $\frac{\mu_0 I}{4}(r_1 + r_2)$

B. $\frac{\mu_0 I}{4}(r_1 + r_2)$

C. $\frac{\mu_0 I}{4}\left(\frac{r_2 + r_1}{r_1 r_2}\right)$

D. $\frac{\mu_0 I}{4}\left(\frac{r_2 - r_1}{r_1 r_2}\right)$

Answer: C

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46. Magnetic field due to a ring having n turns at a distance x on its axis is proportional to (if r = radius of ring) _____ .

A. $\frac{r}{(x^2+r^2)}$

B. $\frac{r^2}{(x^2+r^2)^{\frac{3}{2}}}$

C. $\frac{nr^2}{(x^2+r^2)^{\frac{3}{2}}}$

D. $\frac{n^2r^2}{(x^2+r^2)^{\frac{3}{2}}}$

Answer: C

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47. A long solenoid carrying a current produces a magnetic field B along its axis. If the current is doubled and the number of turns per cm is halved, the new value of the magnetic field is _____ .

A. B

B. 2B

C. 4B

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

Answer: A

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48. At a distance of 10 cm from a long straight wire carrying current, the magnetic field is 0.04 T. At the distance of 40 cm, the magnetic field will be _____ .

A. 0.01 T

B. 0.02 T

C. 0.08 T

D. 0.16 T

Answer: A

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49. Length of solenoid is having 5000 turns is 40 cm. Magnetic field produced inside it is _____ T if 10 A electric current passes through it.

A. 0.0157

B. 0.0314

C. 0.0628

D. 0.1

Answer: A

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50. A long solenoid carring a current, produces a magnetic field B along its axis. If the current is doubled and the number of turns per cm is doubled. The new value of the magnetic field is

A. 2B

B. 4B

C. B

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

Answer: B

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51. A current of 6 A passes through the wire shown in the figure. Find the magnitude of magnetic field at point C. The radius is 0.2 m. $\left(\mu_0 = 4\pi \times 10^{-7} TmA^{-1}\right)$

A. 1.41×10^{-4}

B. 1.41×10^{-5}

C. zero

D. 1.41×10^{-3}

Answer: B

Watch Video Solution

52. The direction of magnetic lines of forces close to a straight conductor carrying current will be _____.

A. Along the length of the conductor

B. Radially outward

C. Circular in a plane perpendicular to the conductor

D. Helical

Answer: C

Watch Video Solution

53. Find the distance at which the magnetic field on axis as compared to the magnetic field at the centre of the coil carrying current I and radius R is $\frac{1}{8}$.

A. R

B. $\sqrt{2}R$

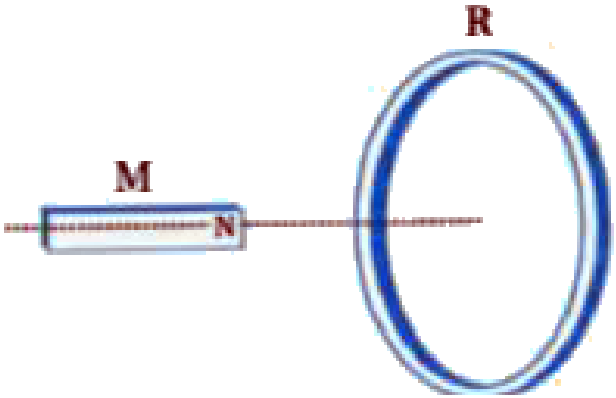
C. 2R

D. $\sqrt{3}R$

Answer: D

Watch Video Solution

54. As shown in fig. a conducting ring R is placed on the axis of a bar magnet M. The plane of R is perpendicular to the axis M can move along this axis _____



A. contract

B. expand

C. move towards positive X-direction

D. move towards negative X-direction

Answer: B

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55. Current passing through two parallel wires A and B are I_1 and I_2 respectively, If both the currents flow in the same direction, magnetic field near the midpoint of wire is 10 T. If direction of current I_2 is reversed magnetic field becomes 30T. $\frac{I_1}{I_2} =$ -----

A. 1

B. 2

C. 3

D. 4

Answer: B

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56. One straight wire carries 5 A. Angles made by line segments joining point P at 10 cm on perpendicular bisector and the two

ends of wire, with the wire are 60° each. Then magnetic field at this point will be _____ T.

A. $3\mu_0$

B. $3.98\mu_0$

C. $39.8\mu_0$

D. zero

Answer: B

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57. Two concentric rings are kept in the same plane. Number of turns in both the rings is 20. Their radii are 40 cm and 80 cm and they carry electric currents of 0.4 A and 0.6 A respectively, in mutually opposite directions. The magnitude of the magnetic field produced at their centre is _____ T.

A. $4\mu_0$

B. $2\mu_0$

C. μ_0

D. $2.5\mu_0$

Answer: C

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58. Shape of ideal toroid is ____

A. cylindrical

B. helical

C. spherical

D. circular

Answer: D

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59. Magnetic field inside the toroid is

A. radial

B. tangential

C. parallel to its winding

D. present only at its centre

Answer: B

Watch Video Solution

60. In ____ phenomenon, toroid is being used.

A. nuclear fission

B. nuclear radioactivity

C. nuclear fusion

D. nuclear disintegration

Answer: C

Watch Video Solution

61. Magnetic field at the centre of circular loop of radius R is B. Magnetic moment of this coil would be _____

A. $\frac{BR^3}{2\pi\mu_0}$

B. $\frac{2\pi BR^3}{\mu_0}$

C. $\frac{BR^2}{2\pi\mu_0}$

D. $\frac{2\pi BR^2}{\mu_0}$

Answer: B

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62. When electron revolves around nucleus in a circular orbit, its orbital magnetic moment is _____

A. $\vec{\mu}_l = \left(\frac{e}{2m_e}\right)\vec{l}$

B. $\vec{\mu}_l = -\left(\frac{e}{2m_e}\right)\vec{l}$

C. $\vec{\mu}_l = -\left(\frac{e}{2m_e}\right)\vec{r}\,v$

D. $\vec{\mu}_l = -\left(\frac{e}{2m_e}\right)m_e\vec{v}$

Answer: B

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63. Value of gyromagnetic ratio for an orbital electron is _____

A. $8.8 \times 10^{10} Ckg$

B. $8.8 \times 10^{10} C^{-1} kg$

C. $8.8 \times 10^{10} Ckg^{-1}$

D. $8.8 \times 10^{10} C^{-1} kg^{-1}$

Answer: C

Watch Video Solution

64. Which of the following atoms has permanent electric dipole moment zero ?

A. 

B. 

C. 

D. 

Answer: A

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65. A current carrying loop is placed in a uniform magnetic field. The torque acting on it does not depend upon _____ .

A. Shape of the loop

B. Area of the loop

C. Value of the current

D. Magnetic field

Answer: A

Watch Video Solution

66. A conducting wire of 2m length is used to form a circular loop. If it carries a current of 2A, its magnetic moment will be _____ Am^2.

A. π

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

C. 2π

D. 4π

Answer: B

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67. A rectrangular coil $20cm \times 20cm$ has 100 turns and carries a current of 1 A. It is placed in a uniform magnetic field B = 0.5T with the direction of magnetic field parallel to the plane of the coil. Find

the magnitude of the torque required to hold this coil in this position.

A. Zero

B. 200 Nm

C. 2 Nm

D. 10 Nm

Answer: C

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68. A current carring small loop behaves like a small magnet. If A be its area and M its magnetic moment, what will be the current in the loop ?

A. M/A

B. A/M

C. MA

D. A^2M

Answer: A

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69. Dipole moment of coil is $2\hat{i} + 3\hat{j} + 5\hat{k}$. If this coil is placed in uniform magnetic field having magnitude $3\hat{k}T$, torque acting on it is _____ Nm.

A. $\sqrt{35}$

B. $\sqrt{117}$

C. $\sqrt{25}$

D. $\sqrt{135}$

Answer: B

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70. A circular coil of radius 4 cm and of 20 turns carries a current of 3 Amperes. It is placed in a magnetic field at intensity of $0.5Wb/m^2$. What is the magnetic dipole moment of the coil ?

A. $0.15Am^2$

B. $0.3Am^2$

C. $0.45Am^2$

D. $0.6Am^2$

Answer: B

Watch Video Solution

71. An electron moves with a constant speed v along a circle of radius r. Its magnetic moment will be _____ . (e is the electron's charge.)

A. evr

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

C. $\pi r^2 ev$

D. $2\pi rev$

Answer: B

Watch Video Solution

72. A circular coil having N turns is made from a wire L meter long. If a current of I ampere is passed through this coil suspended in a uniform magnetic field of B tesla, find the maximum torque that can act on this coil.

A. $\frac{BIL^2}{2\pi N}$

B. zero

C. $\frac{BIL^2}{4\pi N}$

D. $\frac{BIL^2}{8\pi^2 N}$

Answer: C

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73. _____ can measure small current and small voltage both.

A. Ammeter

B. Voltmeter

C. Galvanometer

D. Potentiometer

Answer: C

Watch Video Solution

74. _____ has maximum resistance.

A. Ammeter

B. Voltmeter

C. Potentiometer

D. Galvanometer

Answer: B

Watch Video Solution

75. Why small soft iron cylinder is placed at the axis of the coil in galvanometer ?

A. to produced uniform radial magnetic field

B. for support of spring

C. to maintain electric potential difference

D. to produce tangential uniform magnetic field.

Answer: A

Watch Video Solution

76. What should be the resistance of an ideal ammeter ?

A. very less

B. very high

C. infinite

D. zero

Answer: D

Watch Video Solution

77. When series resistance is increased, range of voltmeter _____

A. decreases

B. increases

C. remains constant

D. none of above

Answer: B

Watch Video Solution

78. When shunt connected to galvanometer has the value equal to resistance of galvanometer, range of current meter would become _____

A. twice

B. thrice

C. four times

D. five times

Answer: A

Watch Video Solution

79. Which of following statements is wrong?

A. Resistance of a voltmeter is very high.

B. Resistance of an ammeter is very small.

C. Ammeter is always connected in parallel with a circuit element, current passing through which is to be measured.

D. Voltmeter is always connected in parallel with a circuit elements, voltage across which is to be measured.

Answer: C

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80. There are three voltmeters of same range with resistance $10,000\Omega, 8000\Omega \text{ and } 6000\Omega$, Which of these, can measure voltage most galvanometer. accurately ?

A. $10,000\Omega$

B. 8000Ω

C. 6000Ω

D. All of given

Answer: A

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81. In order to increase the sensitivity of a moving coil galvanometer, _____ should be decreased.

A. magnetic field B

B. torsional constant of a spring k

C. no. of turns in a coil N

D. none of above

Answer: B

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82. If range of an ammeter with resistance 5Ω is to be made double then _____

A. 5Ω resistance should be connected in parallel to it.

B. 5Ω resistance should be connected in series to it.

C. 2.5Ω resistance should be connected in parallel to it.

D. 10Ω resistance should be connected in parallel to it.

Answer: A

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83. _____ is known as current sensitivity of a galvanometer.

A. Current per unit angular deflection

B. Angular deflection per unit current

C. current for maximum deflection

D. None of above

Answer: B

Watch Video Solution

84. _____ is known as voltage sensitivity of galvanometer.

A. Voltage per unit angular deflection

B. Angular deflection per unit voltage

C. Voltage for maximum deflection

D. none of above

Answer: B

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85. Relation between voltage sensitivity (σ_v) and current sensitivity (σ_i) of a moving coil galvanometer is _____

A. $\frac{\sigma_i}{G} = \sigma_v$

B. $\frac{\sigma_v}{G} = \sigma_i$

C. $\frac{G}{\sigma_v} = \sigma_i$

D. $\frac{G}{\sigma_i} = \sigma_v$

Answer: A

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86. When 50Ω resistance is connected to one voltmeter, its range is obtained upto V volt. Now, instead of 50Ω, when 500Ω resistance is

connected to this voltmeter, its range is obtained upto 2 V volt. Find resistance of this voltmeter.

A. 100Ω

B. 200Ω

C. 300Ω

D. 400Ω

Answer: D

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87. When 3 mA and 5 mA currents are passed through two galvanometers P and Q, they give same deflection of 10 divisions. Hence

A. P is more sensitive than Q.

B. Q is more sensitive than P.

C. P and Q are both equally sensitive.

D. Sensitivity of Q is $\frac{5}{3}$ times sensitivity of P.

Answer: A

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88. 1A current is passed through a parallel combination of 8Ω resistance of galvanometer and 2Ω resistance of shunt. Then current passing through shunt is _____

A. 0.25 A

B. 0.8 A

C. 0.2 A

D. 0.5 A

Answer: B

Watch Video Solution

89. When 2.5Ω shunt is connected with 25Ω resistance of galvanometer, what fraction of total current I would pass through galvanometer?

A. $\frac{I_G}{I} = \frac{1}{11}$

B. $\frac{I_G}{I} = \frac{1}{10}$

C. $\frac{I_G}{I} = \frac{1}{9}$

D. $\frac{I_G}{I} = \frac{2}{11}$

Answer: A

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90. Give unit of torsional constant.

A. $\frac{Jrad}{m}$

B. $\frac{Nm}{rad}$

C. Nm

D. $\frac{Jm}{rad}$

Answer: B

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91. To turn galvanometer into ammeter, _____

A. greater resistance should be joined in series.

B. greater resistance should be joined in parallel.

C. smaller resistance should be joined in series.

D. smaller resistance should be joined in parallel.

Answer: D

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92. Resistance of galvanometer is G. If shunt required to make its range n times is S, n = _____ .

A. $\frac{G}{S}$

B. $1-\frac{G}{S}$

C. $1+\frac{G}{S}$

D. $\frac{S}{G}$

Answer: C

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93. Resistance of ammeter is $R\Omega$. What will be the required shunt to decrease the value of passing current from 60 A to 20 A ?

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

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

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

D. $\frac{R}{3}$

Answer: B

Watch Video Solution

94. The resistance of galvanomenter is G and its current capacity is I_g. To increase the current capacity by 'n' times, the required value of shunt is _____ .

A. $\frac{G}{n-1}$

B. $\frac{I_g \cdot G}{n-1}$

C. $\frac{nG}{n-1}$

D. $\frac{I_g \cdot G}{I - n \cdot I_g}$

Answer: A

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95. A galvanometer coil has a resistance of 12Ω and the metre shows full scale deflection for a current of 3 mA. How will you convert the metre into a voltmeter of range 0 to 18 V ?

A. 6012

B. 5980

C. 5985

D. 5988

Answer: D

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96. The current capacity of ammeter having 9Ω resistance is 1A. Now to make its capacity 10A. What shunt is required _____

A. 0.01Ω

B. 0.1Ω

C. 1Ω

D. 0.09Ω

Answer: C

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97. Range of voltmeter _____ with increase in series resistance.

A. decreases

B. increases

C. remains constant

D. none of these

Answer: B

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98. Resistance of ammeter made by combination of 20Ω galvanometer and 2Ω shunt is _____

A. 0.18Ω

B. 1.8Ω

C. 18Ω

D. 22Ω

Answer: B

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99. Wire used for shunt should be _____

A. long and thick

B. long and thin

C. short and thick

D. short and thin

Answer: C

Watch Video Solution

100. By connecting shunt of 12Ω resistance, the deflection of galvanometer decreases to 10 marks from 50 marks, then the resistance of galvanometer is _____

A. 24Ω

B. 12Ω

C. 6Ω

D. 48Ω

Answer: D

Watch Video Solution

101. Resistance of ammeter is $R\Omega$. What will be the required shunt to decrease the value of passing current from 60 A to 20 A ?

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

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

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

D. $\frac{R}{3}$

Answer: B

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102. One rectangular coil carrying current I, has N no. of identical turns, each with area A. When it is placed in uniform magnetic field, torque exerted on it is $\vec{\tau}$ = _____

A. $NI\left(\vec{A} \cdot \vec{B}\right)$

B. $NI\left(\vec{A} \times \vec{B}\right)$

C. $\frac{I}{N}\left(\vec{A} \cdot \vec{B}\right)$

D. $\frac{I}{N}\left(\vec{A} \times \vec{B}\right)$

Answer: B

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103. A conducting rod of mass 1 kg and length 1 m is suspended by two strings, so as to remain horizontal. If 2T horizontal magnetic field is applied perpendicular to the length of the rod then what amount of current should be passed through this rod to remove tension in two strings ? (Take g = $10ms^{-2}$)

A. 0.5A

B. 1.5A

C. 5A

D. 15A

Answer: C

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104. An electron of mass m and charge q is travelling with a speed v along a circular path of radius r at right angles to a uniform of magnetic field B. If speed of the electron is doubled and the magnetic field is halved, then resulting path would have a radius of ____ .

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

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

C. 2r

D. 4r

Answer: D

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105. An electron (mass = $9.0 \times 10^{-31} kg$ and charge = 1.6×10^{-19} coulomb) is moving in a circular orbit in a magnetic field of $1.0 \times 10^{-4} Wb/m^2$. Its period of revolution is _____ .

A. $3.5 \times 10^{-7} s$

B. $7.0 \times 10^{-7} s$

C. $1.05 \times 10^{-6} s$

D. $2.1 \times 10^{-6} s$

Answer: A

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106. An electron (mass = 9×10^{-31}kg, charge = $1.6 \times 10^{-19} C$) whose kinetic energy is 7.2×10^{-18}joule is moving in a circular

orbit in a magnetic field of $9 \times 10^{-5} Wb/m^2$. The radius of the orbit is ____ .

A. 1.25 cm

B. 2.5 cm

C. 12.5 cm

D. 25.0 cm

Answer: D

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107. A : Cyclotron does not accelerate electron.

R : Mass of the electron is very small.

A. Assertion is true, reason is true and reason is the correct explanation for assertion.

B. Assertion is true, reason is true but reason is not the correct explanation for assertion.

C. Assertion is true, reason is false.

D. Assertion is false, reason is true.

Answer: A

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108. A : Torque on the coil is the maximum, when coil is suspended in a radial magnetic field.

R : The torque tends to rotate the coil on its own axis.

A. Assertion is true, reason is true and reason is the correct explanation for assertion.

B. Assertion is true, reason is true but reason is not the correct explanation for assertion.

C. Assertion is true, reason is false.

D. Assertion is false, reason is true.

Answer: B

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Section D Mcqs Asked In Competitive Exams

1. Electric charge Q having mass M moves on a circular path of radius R with velocity $\vec{v}$, perpendicular to uniform magnetic field B. When a particle completes one revolution, work done by the field is _____

A. QvBR

B. $QvB(2\pi R)$

C. zero

D. $\frac{Mv^2}{R} \cdot 2\pi R$

Answer: C

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2. A uniform electric field and a uniform magnetic field are produced, pointing in the direction. If an electron is projected with its velocity pointing in the same direction _____

A. The electron will turn to its right.

B. The electron will turn to its left.

C. The electron velocity will increase in magnitude.

D. The electron velocity will decrease in magnitude.

Answer: D

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3. A charged particle is moving in a uniform magnetic field. Then _____ .

A. its momentum changes but kinetic energy does not change.

B. its momentum and kinetic energy both change.

C. neither the momentum nor kinetic energy changes.

D. kinetic energy changes but the momentum does not change.

Answer: A

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4. A proton, a deuteron ion and an α-particle of equal kinetic energy perform circular motion normal to a uniform magnetic field B. If the radii of their paths are r_p, r_d and r_α respectively then _____ [Here, $q_d = q_p, m_d = 2m_p$]

A. $r_\alpha = r_p < r_d$

B. $r_\alpha = r_d > r_p$

C. $r_\alpha > r_d > r_p$

D. $r_\alpha = r_d = r_p$

Answer: A

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5. The electric field of a plane electromagnetic wave is given by $\overrightarrow{E}(t) = E_0 \frac{\hat{i} + \hat{j}}{\sqrt{2}} \cos(\omega t + kz)$. At t = 0, a positively charged

particle is at the point $(x, y, z) = \left(0, 0, \frac{\pi}{k}\right)$. If its instantaneous velocity at t = 0 is $v_0\hat{k}$, the force acting on it due to the wave is

A. zero

B. antiparallel to $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$

C. parallel to $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$

D. parallel to $\hat{k}$

Answer: B

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6. When a proton of KE = 1.0 MeV moving towards North enters a magnetic field (directed along East), it accelerate with an acceleration, $a = 10^{12} m/s^2$. The magnitude of the magnetic field is

A. 0.71 mT

B. 7.1 mT

C. 71 mT

D. 710 mT

Answer: A

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7. In an ammeter 0.2% of main current passes through the galvonometer. If resistance of galvonometer is G, the resistance of ammeter will be _____

A. $\frac{1}{499}G$

B. $\frac{499}{500}G$

C. $\frac{1}{500}G$

D. $\frac{500}{499}G$

Answer: C

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8. A circuit contains an ammeter, a battery of 30 V and a resistance 40.8 ohm all connected in series. If the ammeter has a coil of resistance 480 ohm and a shunt of 20 ohm, the reading in the ammeter will be :

A. $1A$

B. 0.5A

C. 0.25A

D. 2A

Answer: B

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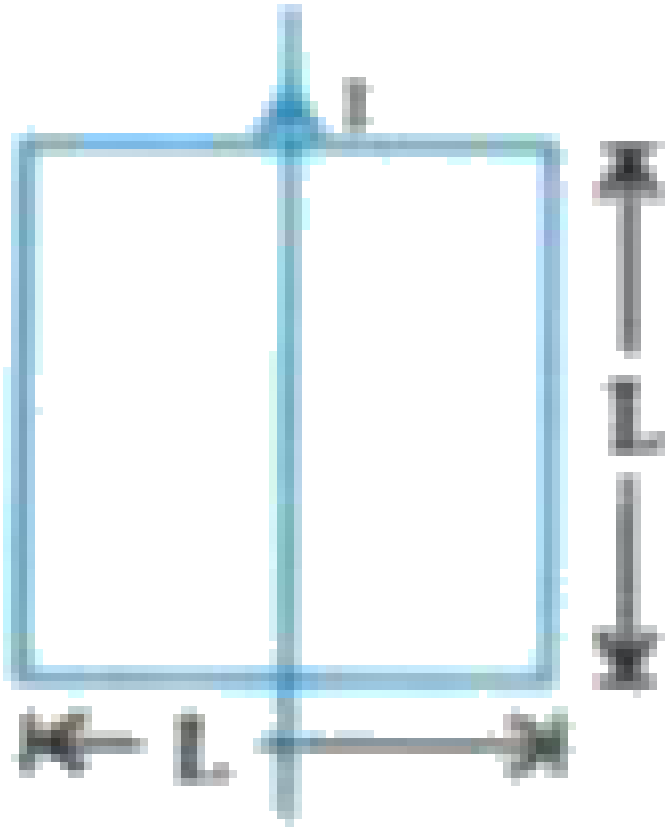
9. A square (each side of length L) wire loop is kept with a long straight wire carrying current I. The emf induced in the square loop is _____



A. $\frac{\mu_0 Ii}{2\pi}$

B. $\frac{2\mu_0 IiL}{3\pi}$

C. $\frac{\mu_0 IiL}{2\pi}$

D. $\frac{2\mu_0 Ii}{3\pi}$

Answer: D

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10. An electron is moving in a circular path under the influence of a transverse magnetic field of $3.57 \times 10^{-2} T$. If the value of $\frac{e}{m}$ is $1.76 \times 10^{11} \frac{C}{kg}$, the frequency of revolution of the electron is

A. 62.8 MHz

B. 6.28 MHz

C. 1 GHz

D. 100 MHz

Answer: C

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11. A uniform magnetic field of 0.3 T is established along the positive Z-direction. A rectangular loop in XY plane of sides 10 cm and 5 cm carries a current of I = 12 A as shown. The torque on the loop is _____

A. $+1.8 \times 10^{-2}\hat{j}Nm$

B. $-1.8 \times 10^{-2}\hat{j}Nm$

C. zero

D. $-1.8 \times 10^{-2}\hat{i}Nm$

Answer: C

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12. A metallic rod of mass per unit length $0.5kgm^{-1}$ is lying horizontally on a smooth inclined plane which makes an angle of 30° with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of induction 0.25 T is acting on it in the vertical direction. The current flowing in the rod to keep it stationary is.

A. 11.32 A

B. 7.14 A

C. 14.76 A

D. 5.98 A

Answer: A

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13. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V. The resistance of the galvanometer is

A. 500Ω

B. 40Ω

C. 250Ω

D. 25Ω

Answer: C

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14. Consider a tightly wound 200 turn coil of radius 20 cm, carrying a current of 1A. What is the magnitude of the magnetic field at the centre of the coil ?

A. 

B. 

C. 

D. 

Answer: D

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15. Ionized hydrogen atoms and α-particles with same momenta enters perpendicular to a constant magnetic field, B. The ratio of their radii of their paths $r_H : r_\alpha$ will be :

A. $1:4$

B. $2:1$

C. $1:2$

D. $4:1$

Answer: B

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16. The effective length of a magnet is 31.4 cm and its pole strength is 0.8 Am. The magnetic moment, if it is bent in the form of a semicircle is ____ Am^2.

A. 1.6

B. 0.16

C. 1.2

D. 0.12

Answer: B

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17. Equal currents are passing through two very long and straight parallel wires in the same direction. They will _____ .

A. repel each other

B. attract each other

C. lean towards each other

D. neither attract nor repel each other

Answer: B

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18. A galvanometer of resistance 50Ω is connecter to a battery of 8 V along with a resistance of 3950Ω in series. A full scale deflection on 30 div is obtained in the galvanometer. In order to reduce this deflection of 15 division, the resistance in series should be _____ Ω.

A. 7900

B. 2000

C. 1950

D. 7950

Answer: D

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19. Equal currents are passing through two very long and straight parallel wires in the same direction. They will _____ .

A. Normal to the plane of paper

B. Towards right of wire Q

C. Towards left of wire Q

D. In the direction of current passing through Q

Answer: B

Watch Video Solution

20. An alpha particle of mass m moves on a circular path of radius r in a plane inside and normal to uniform magnetic field B. The time taken by this particle to complete one revolution is _____

A. $\frac{4\pi eB}{m}$

B. $\frac{8\pi e^2 B}{m}$

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

D. $\frac{\pi m}{Be}$

Answer: D

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21. A long straight wire in the horizontal plane carries a current of 50 A in north to south direction. Give the magnitude and direction of B at a point 2.5 m east of the wire

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

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

C. $\frac{2}{3}\frac{\mu_0 I}{\pi r}$

D. $\frac{3}{8}\frac{\mu_0 I}{\pi r}$

Answer: C

Watch Video Solution

22. A proton is moving perpendicular to a uniform magnetic field of 2.5 tesla with 2MeV kinetic energy. The force on the proton is _____ .

A. 8×10^{-11}

B. 3×10^{-10}

C. 3×10^{-11}

D. 8×10^{-12}

Answer: A

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23. A particle of mass m and charge q is incident on xz plane with velocity v in a direction making angle θ with a uniform magnetic field applied along x-axis. The nature of motion performed by the particle is _____ .

A. helical

B. straight line

C. parabola

D. circular

Answer: A

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24. An electron having mass 9.1×10^{-31}kg, charge $1.6 \times 10^{-19}C$ and moving with the velocity of $10^{6}m/s$ enters a region where magnetic field exists. If it describes a circle of radius 0.2 m then the intensity of magnetic field must be _____ $\times 10^{-5}T$.

A. 14.4

B. 5.65

C. 2.84

D. 1.13

Answer: C

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25. Two parallel very long straight wires carrying current of 5A each are kept at a separation of 1 m. If the currents are in the same direction, the force per unit length between them is _____ N/m. $\left(\mu_0 = 4\pi \times 10^{-7} SI\right)$

A. 5×10^{-5}, attractive

B. 5×10^{-6}, attractive

C. 5×10^{-5}, repulsive

D. 5×10^{-6}, repulsive

Answer: B

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26. A very long straight wire of radius r carries current I. Intensity of magnetic field B at point lying at a perpendicular distance 'a' from the axis is α _____ . (where $a < r$)

A. a^2

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

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

D. a

Answer: D

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27. The dimensional formula of effective torsional constant of spring is _____ .

A. $M^1L^2T^{-3}$

B. $M^1L^2T^{-2}A^{-2}$

C. $M^1L^2T^{-2}$

D. $M^0L^0T^0$

Answer: C

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28. There are 50 turns per cm length in a very long solenoid. It carries a current of 2.5A. The magnetic field at its centre on the axis is _____ T.

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

B. $6\pi \times 10^{-3}$

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

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

Answer: A

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29. The gyromagnetic of an electron = _____ specific charge of an electron.

A. 1

B. 2

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

D. 4

Answer: C

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30. A straight wire of mass 200g and length 1.5m carries a current of 2A. To suspend it in a air by a uniform horizontal magnetic field, value of required magnetic field is.... T

A. 6.5

B. 0.45

C. 0.65

D. 4.5

Answer: C

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31. Unit of Bohr magneton is .....

A. Am

B. Cm^2

C. Am^{-2}

D. Am^2

Answer: D

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32. Current sensivity of galvanometer in inversely proportional to.....

A. number of turns

B. torsional constant

C. area

D. magnetic field

Answer: B

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33. Frequency of cyclotron is independent of .....

A. radius of its trajectory

B. charge of a particle

C. applied magnetic field

D. mass of a particle

Answer: A

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34. A circular coil of a wire containing 100 turns each of radius 2cm carries a current of 0.20A. The magnetic field at the centre of the coil is.....

A. $2\pi \times 10^{-4}$

B. $\pi \times 10^{-4}$

C. $3\pi \times 10^{-4}$

D. 10^{-4}

Answer: A

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