PHYSICS

BOOKS - R G PUBLICATION

MOVING CHARGES AND MAGNETISM

Exercise

1. Write down the Biot-Savart's Law in vector form.

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2. Write the expresion for Lorentz force acting on a charged particle.

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3. Why is the Cyclotron not used to accelerate electrons?

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4. Define mobility of a charge carrier.

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5. What is Current Sensitivity of a galvanometer?

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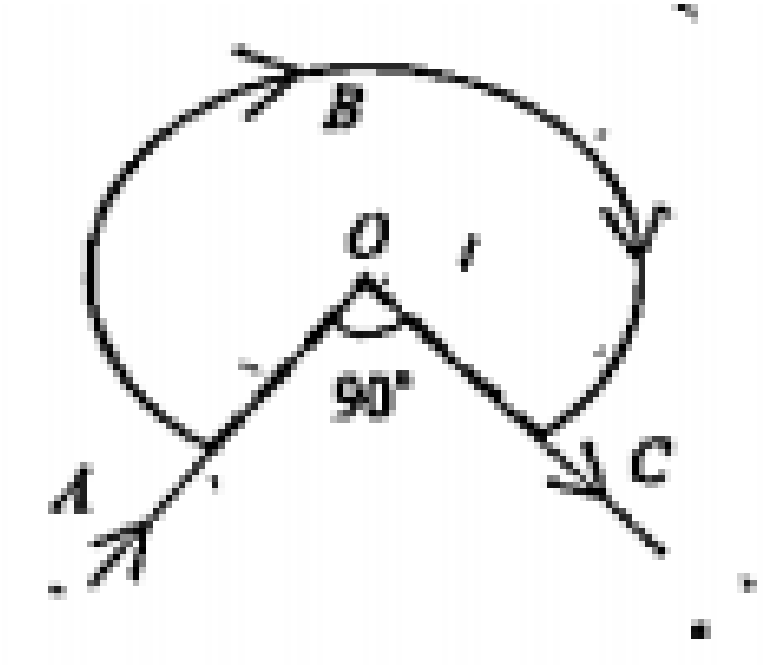
6. The wire shown in the figure carries a current of 10A. What is the magnitude of

magnetic field induction at the centre O? Give the radius of the bend coil is 3 cm.



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7. An α particle is moving in a magnetic field of $\left(3\hat{i}+2\hat{j}\right)$ tesla with in velocity of $5\times10^{5}\hat{i}ms^{-1}$. What will be the magnetic force acting on the particle?

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8. Find an expression for the magnetic field at points on the axis of a circular current loop.

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9. A rectangular coil carrying current is placed in a uniform magnetic field in such a way that normal to the coil makes an angle θ with the direction of magnetic flux density. Find the magnitude of torque acting on the coil Define magnetic moment of a current loop.

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10. A charge particle enters a magnetic field with velocity v in a direction perpendicular to

the field. Find the expression for the redius of the circular path of the particle.

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11. Show that the angular frequency of a charged particle moving in a circular path in a magnetic field is independent of its velocity.

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12. Find the following expression for the magnetic moment of an electron moving in a circular path

$$\mu_c = \frac{c}{2m_c}1$$

Wherel is the angular momentum of the electron about the nucleus, e and m_c are its charge and mass.

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13. Using Ampere's circuital law, find the magnetic flux density at the centre of a long solenoid carrying current.

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14. Write the working of a moving coil galvenometer.

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15. A coil of area A, number of turns N and resistance R is rotating in a radial magnetic field B with an angular speed w. What is the maximum power consumed by the coil?

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16. In an orbit of radius R, an electron is moving round a proton with unifrom circular velocity. Derive the guyromagnetic ratio of

electron of Charge (-e) and mass (m_e) . What is Bohr magneton?

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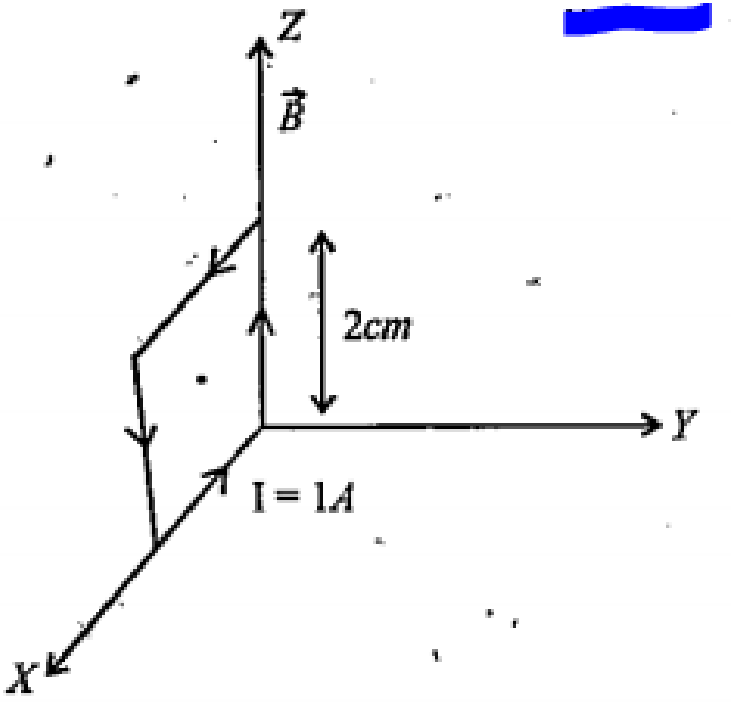
17. Find the magnitude and direction of the torque acting on the square loop as shown in the diagram where B = 1.5 T along positive Z-

axis.



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18. A uniform magnetic field of 2T is produced in a Cylinderical of free space having radius 5

cm. A conductor carrying a current $500mA$ passes through the region intersecting the axis normally. What is the magnitude of the force acitng on the conductor?

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19. A conductor of mass m and length l is placed on a table along east-west direction. Suddenly a certain amount of charge is passed throughit and it is found to jump to a height h. What was the. amount of charge passed?

The i horizontal magnetic induction of earth is B. Acceleration due to gravity is g.

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20. Two parallel Co-axial Coils of equal radius R and- numbers of turn N carrying equal currents I in same direction.are separated by a distance | R. Show that the magnetic field intensity B on the axis around the mid point between the coils is uniform over a very small

distance as compared to R and is given by-

$$B = \left(\frac{4}{5}\right)^{\frac{3}{2}} \frac{\mu_0 IN}{R}$$

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21. There exists a non uniform magnetci fiedl in free space. A charged particle of mass m and velocity v enters the field and comes out after a certain time. Comment with reason about the Kinetic energy of the particle after coming out of the field.

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22. Derive the expression for the magnetic force acting on a current carrying straight conductor placed in a uniform magnetic field and express it in vector form.

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23. 

In the above diagram, a particle of mass"m" and charge(-q) initially moving along X-axis with velocity "v". The length of the plave system is "L" and uniform electric filed between the plates is "E". What is the vertical deflext of the particle at the far edge of the plate?

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24. A charged particle of mass m and charge q is projected with velocity ν making in angle θ with the direction of a uniform magnetic field of induction B. Find the expression for-

Time period of revolution

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25. A charged particle of mass m and charge q is projected with velocity ν making in angle θ with the direction of a uniform magnetic field

of induction B. Find the expression for-

Pitch of the helical path followed by the particle.

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26. Two long straight thin conductors carrying currents I_1 and I_2 respectively along the same direction are placed parallel to each other in air. Derive an expression for the force per unit length acting on any one of the conductors and hence define one ampere current.

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27. Explain the concept of electric field. Express electric flux through a surface in terms of electric field cylindrical surface with its axis parallel to uniform electric field is zero,

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28. Using Biot-Savart Law find the magnetic field intesity due to current carrying loop at an external point on the axis that passes

perpendiculary to the plane of the loop through the centre. What is the field intensity at the centre?

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29. How can you convert a galvanometer into an ammeter ? Explain with diagrams.

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30. How can you convert a galvanometer into a Voltmeter ? Explain with diagrams.

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31. What is the basci principle of a moving coil galvanometer? Derive an expression for current flowing through the galvanometer in terms of steady angular deflection of its coil. Define voltage. Sensitivity of the galvanometer.

What is a convenient way to increase its sensitivity?

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32. What is magnetic field?

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33. What do you understand by Lorentz force.

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34. Write the value of earth's magnetic field.

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35. Write the expression for the motion of a charge moving in a magnetic field.

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36. What is the principle employed in a mass spectrometer?

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37. What is cyclotron frequency?

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38. What is a solenoid and a toroid?

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39. What is the magnetic field at a point placed outside of a long solenoid carrying current I.

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40. A loop of irregular shape carrying , current is located in an external magnetic field. If the wire is flexible, it change to a circular shape. Why?

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41. What is Bohr magneton?

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42. What is a shunt? What is its use?

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43. What is the value of absolute premeability of free space?Give its unit?

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44. Name the force which is experienced by moving charged particle in the magnetic field.

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45. When a charged particle moves in a magnetci field does the kinetic energy always remains constant?

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46. What is the resistance of ideal ammeter.

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47. An ammeter and a milliameter are converted from the same galvanometer. Out of two which current measuring instrument has smaller resistance?

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48. What is cyclotron frequency?

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49. If the distance between two parallel current carrying wire is doubled. What is the force between them?

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50. Why are pole pices of galvanometer made concave?

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51. Write down the Biot-Savart's Law in vector form.

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52. A circular coil of radius 'r' carrying current I is equivalent to a magentic dipole. What is the magnetic moment of the di-pole?

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53. What is the direction of magnetic dipole moment?

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54. State Ampere's circuital law.

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55. What is toroid?

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56. How does magnetic induction inside a solenoid change due to a change in number of turns of the solenoid?

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57. What is the ratio of electric and magnetic force between two moving charges.

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58. Write the Oersted's investigation on deflection of a magnetic compass needle when placed nearby a long straight current carrying conductor.

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59. Deduce the expression for magnetic force on a current carrying conductor.

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60. What is a cyclotron?

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61. Write the various fields of uses of a cyclotron.

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62. Illustrate the Biot-Savart law.

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63. State Ampere's circuital law.

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64. "Parallel currents attracts, and antiparallel currents repel" Discuss.

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65. Write the working of a moving coil galvenometer.

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66. Convert a moving coil galvanometer into a voltmeter.

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67. Convert a moving coil galvanometer into a ammeter.

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68. State Ampere's circuital law.

Watch Video Solution

69. Explain the main function of electric and magnetic fields in a cyclotron.

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70. What is voltmeter? How galvanometer converted to a voltmeter?

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71. A current of 10A flows through each of two parellel long wires. The wies are 5cm apart. Calculate the force acting per unit length of each wire.

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72. Electron moving at right angle to a uniform magnetic field complete a circular orbit of 10^{-2}m radius in $10^{-10}s$. What is the magnitude of magnetic field.

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73. An electron of energy 150ev describe a circular path in a magnetic field of 1 T. Calculate the radius of circle.

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74. Write the limitation of cyclotron.

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75. What do you understand by Lorentz force.

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76. What is voltmeter? How galvanometer converted to a voltmeter?

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77. Two long parallel wire hanging freely. If they are connected in a battery series. What

would be the effect of their position.

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78. Two long parallel wire hanging freely. If they are connected in a battery series. What would be the effect of their position.

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79. Explain the action of a shunt.

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80. What is the radius of the path of an electron moving at a speed of $10^{7} m/s$ in a magnetic field of 2×10^{-4}T perpendicular to it? Also find out its frequency and energy.

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81. Find out the operating magnetic field for accelerating protons of a cyclotron, if the cyclotron's oscillator frequency is 1×10^{6}Hz.

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82. Find out the operating magnetic field for accelerating protons of a cyclotron, if the cyclotron's oscillator frequency is 1×10^6Hz.

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83. What are the similarties / dissimilarities between Biot-Savart law for magnetic field and Coulomb's law for electrostataic field.

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84. Deduce the expression of Biot-Savart's law of a finite conductor carrying current I.

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85. Find an expression for the magnetic field at points on the axis of a circular current loop.

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86. What is the magnetic field at a point placed outside of a long solenoid carrying current I.

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87. Deduce the expression for torque on a rectangular current loop in a uniform magnetic field.

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88. Deduce the expression for the magnetic dipole moment of a revolving electron.

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89. A circular coil of wire consisting of 80 turns, each of radius 50 mm carries a current of 0.25 A. What is the magnetic field at the centre of the coil?

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90. A galvanometer coil has a resistance of 10Ω and the meter shows full scale deflection for a current of 2.5 mA. How will you convery the metre into an ammeter of range 0 to 4A.

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91. An electron is moving with a velocity $\left(3\hat{i}+3\hat{j}\right)ms^{-1}$ in an electric field $3\hat{i}+6\hat{j}+2\hat{k}$ and a magnetic field $2\hat{j}+3\hat{k}$. Calculate the magnitude of the force.

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92. Write the working principle of cyclotron.

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93. Describe the working principle of solenoid with the help of Amper's circuital law.

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94. A square coil of side 10cm consist of 20 turns and carries a current 10A. The coil is suspended vertically and normally and makes angle 30° with horizontal direction of uniform magnetic field 80T. What is the magnitude of torque experienced by the coil.

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95. Deduce the expression for torque on a rectangular current loop in a uniform

magnetic field.

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96. A 25Ω galvanometer is shunted by 2.5Ω wire. What part of total current flows through the galvanometer?

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97. The deflection in a galvanometer falls from 50 division to 10 division when a shunt of 15Ω

is used. Calculate the galvanometer resistance.

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98. A electron and proton possesing equal momentum and injected to a region at right angle to a uniform magnetic field. Calculate the ratio of this radius while moving inside the magnetic field.

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99. Write the working of a moving coil galvenometer.

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100. An oil drop of 10^{-6}m radius carring a charge 4 times that of an election and remain suspended between two charged parellel plate .01m apart. Find the potential difference between the plates.

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