EXERCISE-I

Biot-savart's Law and Ampere's Law

1. A current of 0.1 A circulates around a coil of 100 turns and having a radius equal to 5 cm. The magnetic field set up at the centre of the coil is

$(\mu_0 = 4\pi \times 10^{-7}\ weber / ampere - metre)$

(A) $4\pi \times 10^{-5}\ tesla$ (B) $8\pi \times 10^{-5}\ tesla$

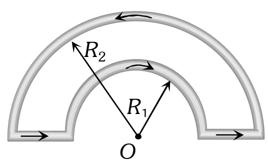
(C) $4 \times 10^{-5}\ tesla$ (D) $2 \times 10^{-5}\ tesla$

2. The magnetic field B with in the solenoid having n turns per metre length and carrying a current of i *ampere* is given by

(A) $\dfrac{\mu_0 ni}{e}$ (B) $\mu_0 ni$

(C) $4\pi\mu_0 ni$ (D) ni

3. The magnetic induction at the centre O in the figure shown is



(A) $\dfrac{\mu_0 i}{4}\left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$

(B) $\dfrac{\mu_0 i}{4}\left(\dfrac{1}{R_1} + \dfrac{1}{R_2}\right)$

(C) $\dfrac{\mu_0 i}{4}(R_1 - R_2)$

(D) $\dfrac{\mu_0 i}{4}(R_1 + R_2)$

4. Field inside a solenoid is

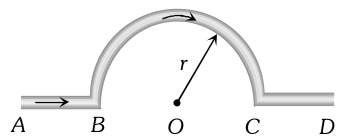
(A) Directly proportional to its length

(B) Directly proportional to current

(C) Inversely proportional to total number of turns

(D) Inversely proportional to current

5. In the figure, shown the magnetic induction at the centre of there arc due to the current in portion AB will be



(A) $\dfrac{\mu_0 i}{r}$

(B) $\dfrac{\mu_0 i}{2r}$

(C) $\dfrac{\mu_0 i}{4r}$

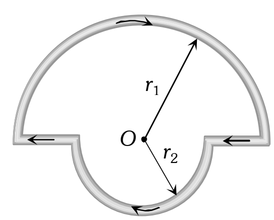
(D) Zero

6. In the above question, the magnetic induction at O due to the whole length of the conductor is

(A) $\dfrac{\mu_0 i}{r}$ (B) $\dfrac{\mu_0 i}{2r}$

(C) $\dfrac{\mu_0 i}{4r}$ (D) Zero

7. In the figure shown there are two semicircles of radii r_1 and r_2 in which a current i is flowing. The magnetic induction at the centre O will be



(A) $\dfrac{\mu_0 i}{r}(r_1 + r_2)$

(B) $\dfrac{\mu_0 i}{4}(r_1 - r_2)$

(C) $\dfrac{\mu_0 i}{4}\left(\dfrac{r_1 + r_2}{r_1 r_2}\right)$

(D) $\dfrac{\mu_0 i}{4}\left(\dfrac{r_2 - r_1}{r_1 r_2}\right)$

8. The magnetic moment of a current carrying loop is $2.1 \times 10^{-25}\ amp \times m^2$. The magnetic field at a point on its axis at a distance of $1\mathring{A}$ is

(A) $4.2 \times 10^{-2}\ weber / m^2$

(B) $4.2 \times 10^{-3}\ weber / m^2$

(C) $4.2 \times 10^{-4}\ weber / m^2$

(D) $4.2 \times 10^{-5}\ weber / m^2$

9. Two straight horizontal parallel wires are carrying the same current in the same direction, d is the distance between the wires. You are provided with a small freely suspended magnetic needle. At which of the following positions will the orientation of the needle be independent of the magnitude of the current in the wires

(A) At a distance $d/2$ from any of the wires

(B) At a distance $d/2$ from any of the wires in the horizontal plane

(C) Anywhere on the circumference of a vertical circle of radius d and centre halfway between the wires

(D) At points halfway between the wires in the horizontal plane

10. A particle carrying a charge equal to 100 times the charge on an electron is rotating per second in a circular path of radius 0.8 *metre*. The value of the magnetic field produced at the centre will be (μ_0 = permeability for vacuum)

(A) $\frac{10^{-7}}{\mu_0}$ (B) $10^{-17}\mu_0$

(C) $10^{-6}\mu_0$ (D) $10^{-7}\mu_0$

11. An arc of a circle of radius R subtends an angle $\frac{\pi}{2}$ at the centre. It carries a current i. The magnetic field at the centre will be

(A) $\frac{\mu_0 i}{2R}$ (B) $\frac{\mu_0 i}{8R}$

(C) $\frac{\mu_0 i}{4R}$ (D) $\frac{2\mu_0 i}{5R}$

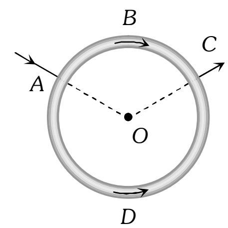
12. At a distance of 10 *cm* from a long straight wire carrying current, the magnetic field is 0.04 *T*. At the distance of 40 *cm*, the magnetic field will be

(A) 0.01 *T* (B) 0.02 *T*

(C) 0.08 *T* (D) 0.16 *T*

13. A uniform wire is bent in the form of a circle of radius R. A current I enters at A and leaves at C as shown in the figure :

If the length ABC is half of the length ADC, the magnetic field at the centre O will be



(A) Zero

(B) $\frac{\mu_0 I}{2R}$

(C) $\frac{\mu_0 I}{4R}$

(D) $\frac{\mu_0 I}{6R}$

14. The magnetic induction at any point due to a long straight wire carrying a current is

(A) Proportional to the distance from the wire

(B) Inversely proportional to the distance from wire

(C) Inversely proportional to the square of the distance from the wire

(D) Does not depend on distance

15. The expression for magnetic induction inside a solenoid of length L carrying a current I and having N number of turns is

(A) $\frac{\mu_0}{4\pi}\frac{N}{LI}$ (B) $\mu_0 NI$

(C) $\frac{\mu_0}{4\pi}NLI$ (D) $\mu_0 \frac{N}{L} I$

16. In a current carrying long solenoid, the field produced does not depend upon

(A) Number of turns per unit length

(B) Current flowing

(C) Radius of the solenoid

(D) All of the above three

17. The earth's magnetic induction at a certain point is $7\times10^{-5} Wb/m^2$. This is to be annulled by the magnetic induction at the centre of a circular conducting loop of radius 5 *cm*. The required current in the loop is

(A) 0.56 *A* (B) 5.6 *A*

(C) 0.28 *A* (D) 2.8 *A*

18. Magnetic field due to 0.1 *A* current flowing through a circular coil of radius 0.1 *m* and 1000 turns at the centre of the coil is

(A) $2\times10^{-1}T$ (B) $4.31\times10^{-2}T$

(C) $6.28\times10^{-4}T$ (D) $9.81\times10^{-4}T$

19. Magnetic field intensity at the centre of coil of 50 turns, radius 0.5 *m* and carrying a current of 2 *A* is

(A) $0.5\times10^{-5}T$ (B) $1.25\times10^{-4}T$

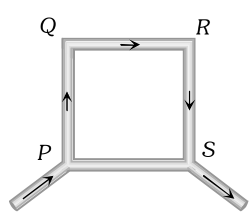
(C) $3\times10^{-5}T$ (D) $4\times10^{-5}T$

20. A circular coil '*A*' has a radius *R* and the current flowing through it is *I*. Another circular coil '*B*' has a radius 2*R* and if 2*I* is the current flowing through it, then the magnetic fields at the centre of the circular coil are in the ratio of ($i.e.\ B_A$ to B_B)

(A) 4 : 1 (B) 2 : 1

(C) 3 : 1 (D) 1 : 1

21. *PQRS* is a square loop made of uniform conducting wire the current enters the loop at *P* and leaves at *S*. Then the magnetic field will be



(A) Maximum at the centre of the loop

(B) Zero at the centre of loop

(C) Zero at all points inside the loop

(D) Zero at all points outside of the loop

22. Magnetic fields at two points on the axis of a circular coil at a distance of 0.05*m* and 0.2*m* from the centre are in the ratio 8 : 1. The radius of the coil is

(A) 1.0 *m* (B) 0.1 *m*

(C) 0.15 *m* (D) 0.2 *m*

23. An electric current passes through a long straight wire. At a distance 5 *cm* from the wire, The magnetic field is *B*. The field at 20 *cm* from the wire would be

(A) $\frac{B}{6}$ (B) $\frac{B}{4}$

(C) $\frac{B}{3}$ (D) $\frac{B}{2}$

24. A closely wound flat circular coil of 25 turns of wire has diameter of 10 *cm* and carries a current of 4 *ampere*. Determine the flux density at the centre of a coil

(A) $1.679\times10^{-5}\,tesla$ (B) $2.028\times10^{-4}\,tesla$

(C) $1.257\times10^{-3}\,tesla$ (D) $1.512\times10^{-6}\,tesla$

25. The dimension of the magnetic field intensity *B* is

(A) $MLT^{-2}A^{-1}$ (B) $MT^{-2}A^{-1}$

(C) ML^2TA^{-2} (D) $M^2LT^{-2}A^{-1}$

26. A current of 2 *amp*. flows in a long, straight wire of radius 2 *mm*. The intensity of magnetic field on the axis of the wire is

(A) $\left(\frac{\mu_o}{\pi}\right)\times10^3\ Tesla$ (B) $\left(\frac{\mu_o}{2\pi}\right)\times10^3\ Tesla$

(C) $\left(\frac{2\mu_o}{\pi}\right)\times10^3\ Tesla$ (D) Zero

27. The magnetic field at the centre of a circular coil of radius *r* carrying current *I* is B_1. The field at the centre of another coil of radius 2 *r* carrying same current *I* is B_2. The ratio $\frac{B_1}{B_2}$ is

(A) $\frac{1}{2}$ (B) 1

(C) 2 (D) 4

28. 1*A* current flows through an infinitely long straight wire. The magnetic field produced at a point 1 *metres* away from it is

(A) $2\times10^{-3}\,Tesla$ (B) $\frac{2}{10}Tesla$

(C) $2\times10^{-7}\,Tesla$ (D) $2\pi\times10^{-6}$ Tesla

29. Two infinitely long parallel wires carry equal current in same direction. The magnetic field at a mid-point in between the two wires is

(A) Twice the magnetic field produced due to each of the wires

(B) Half of the magnetic field produced due to each of the wires

(C) Square of the magnetic field produced due to each of the wires

(D) Zero

30. A wire in the form of a square of side 'a' carries a current i. Then the magnetic induction at the centre of the square wire is (Magnetic permeability of free space $= \mu_o$)

(A) $\frac{\mu_0 i}{2\pi a}$ (B) $\frac{\mu_0 i\sqrt{2}}{\pi a}$

(C) $\frac{2\sqrt{2}\mu_o i}{\pi a}$ (D) $\frac{\mu_0 i}{\sqrt{2}\pi a}$

31. A long straight wire carrying current of $30A$ is placed in an external uniform magnetic field of induction $4 \times 10^{-4} T$. The magnetic field is acting parallel to the direction of current. The magnitude of the resultant magnetic induction in *tesla* at a point 2.0 cm away from the wire is

(A) 10^{-4} (B) 3×10^{-4}

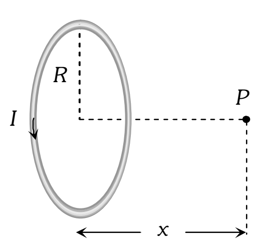
(C) 5×10^{-4} (D) 6×10^{-4}

32. The earth's magnetic field at a given point is $0.5 \times 10^{-5}\, Wb\text{-}m^{-2}$. This field is to be annulled by magnetic induction at the center of a circular conducting loop of radius $5.0 cm$. The current required to be flown in the loop is nearly

(A) $0.2\ A$ (B) $0.4A$

(C) $4A$ (D) $40A$

33. A coil having N turns carry a current I as shown in the figure. The magnetic field intensity at point P is



(A) $\frac{\mu_0 NIR^2}{2(R^2+x^2)^{3/2}}$

(B) $\frac{\mu_0 NI}{2R}$

(C) $\frac{\mu_0 NIR^2}{(R+x)^2}$

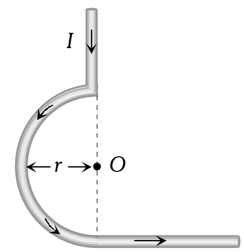
(D) Zero

34. Two similar coils are kept mutually perpendicular such that their centres coincide. At the centre, find the ratio of the magnetic field due to one coil and the resultant magnetic field by both coils, if the same current is flown

(A) $1: \sqrt{2}$ (B) $1 : 2$

(C) $2 : 1$ (D) $\sqrt{3} : 1$

35. In the figure, what is the magnetic field at the point O



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

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

(C) $\frac{\mu_0 I}{4r} + \frac{\mu_0 I}{4\pi r}$

(D) $\frac{\mu_0 I}{4r} - \frac{\mu_0 I}{4\pi r}$

36. The magnetic moment of a current (i) carrying circular coil of radius (r) and number of turns (n) varies as

(A) $1/r^2$ (B) $1/r$

(C) r (D) r^2

37. A current flows in a conductor from east to west. The direction of the magnetic field at a points above the conductor is .....

(A) Towards north (B) Towards south

(C) Towards east (D) Towards west

38. A long wire carries a steady current. It is bent into a circle of one turn and the magnetic field at the centre of the coil is B. It is then bent into a circular loop of n turns. The magnetic field at the centre of the coil will be

(A) nB (B) n^2B

(C) $2nB$ (D) $2n^2B$

39. The magnetic field due to a current carrying circular loop of radius 3 cm at a point on the axis at a distance of 4 cm from the centre is 54 μT. What will be its value at the centre of the loop

(A) 250 μT (B) 150 μT

(C) 125 μT (D) 75 μT

40. The magnetic induction at the centre of a current carrying circular of coil radius r, is

(A) Directly proportional to r

(B) Inversely proportional r

(C) Directly proportional to r^2

(D) Inversely proportional to r^2

Motion of Charged Particle In Magnetic Field

41. An electron is moving with a speed of $10^8\, m/\sec$ perpendicular to a uniform magnetic field of intensity B. Suddenly intensity of the magnetic field is reduced to $B/2$. The radius of the path becomes from the original value of r

(A) No change (B) Reduces to $r/2$

(C) Increases to $2r$ (D) Stops moving

42. A proton and an $\alpha-$particle enter a uniform magnetic field perpendicularly with the same speed. If proton takes 25 μ sec to make 5 revolutions, then the periodic time for the $\alpha-$particle would be

(A) 50 μ sec (B) 25 μ sec

(C) 10 μ sec (D) 5 μ sec

43. A proton (mass $=1.67\times10^{-27}\,kg$ and charge $=1.6\times10^{-19}\,C$) enters perpendicular to a magnetic field of intensity 2 $weber/m^2$ with a velocity $3.4\times10^7\,m/\sec$. The acceleration of the proton should be

(A) $6.5\times10^{15}\,m/\sec^2$ (B) $6.5\times10^{13}\,m/\sec^2$

(C) $6.5\times10^{11}\,m/\sec^2$ (D) $6.5\times10^{9}\,m/\sec^2$

44. An $\alpha-$particle travels in a circular path of radius 0.45 m in a magnetic field $B=1.2\,Wb/m^2$ with a speed of $2.6\times10^7\,m/\sec$. The period of revolution of the $\alpha-$particle is

(A) 1.1×10^{-5} sec (B) 1.1×10^{-6} sec

(C) 1.1×10^{-7} sec (D) 1.1×10^{-8} sec

45. A uniform magnetic field B is acting from south to north and is of magnitude 1.5 Wb/m^2. If a proton having mass $=1.7\times10^{-27}\,kg$ and charge $=1.6\times10^{-19}\,C$ moves in this field vertically downwards with energy 5 MeV, then the force acting on it will be

(A) $7.4\times10^{12}\,N$ (B) $7.4\times10^{-12}\,N$

(C) $7.4\times10^{19}\,N$ (D) $7.4\times10^{-19}\,N$

46. 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

47. A uniform magnetic field acts at right angles to the direction of motion of electrons. As a result, the electron moves in a circular path of radius 2 cm. If the speed of the electrons is doubled, then the radius of the circular path will be

(A) 2.0 cm (B) 0.5 cm

(C) 4.0 cm (D) 1.0 cm

48. A deutron of kinetic energy 50 keV is describing a circular orbit of radius 0.5 $metre$ in a plane perpendicular to magnetic field $\vec{B}$. The kinetic energy of the proton that describes a circular orbit of radius 0.5 $metre$ in the same plane with the same $\vec{B}$ is

(A) 25 keV (B) 50 keV

(C) 200 keV (D) 100 keV

49. If a proton is projected in a direction perpendicular to a uniform magnetic field with velocity v and an electron is projected along the lines of force, what will happen to proton and electron

(A) The electron will travel along a circle with constant speed and the proton will move along a straight line

(B) Proton will move in a circle with constant speed and there will be no effect on the motion of electron

(C) There will not be any effect on the motion of electron and proton

(D) The electron and proton both will follow the path of a parabola

50. An electron is travelling horizontally towards east. A magnetic field in vertically downward direction exerts a force on the electron along

(A) East (B) West

(C) North (D) South

51. An electron enters a magnetic field whose direction is perpendicular to the velocity of the electron. Then

(A) The speed of the electron will increase

(B) The speed of the electron will decrease

(C) The speed of the electron will remain the same

(D) The velocity of the electron will remain the same

52. An electron is moving in the north direction. It experiences a force in vertically upward direction. The magnetic field at the position of the electron is in the direction of

(A) East (B) West

(C) North (D) South

53. A current carrying long solenoid is placed on the ground with its axis vertical. A proton is falling along the axis of the solenoid with a velocity v. When the proton enters into the solenoid, it will

(A) Be deflected from its path

(B) Be accelerated along the same path

(C) Be decelerated along the same path

(D) Move along the same path with no change in velocity

54. A charged particle of mass m and charge q describes circular motion of radius r in a uniform magnetic field of strength B. The frequency of revolution is

(A) $\frac{Bq}{2\pi m}$ (B) $\frac{Bq}{2\pi rm}$

(C) $\frac{2\pi m}{Bq}$ (D) $\frac{Bm}{2\pi q}$

55. An electron is accelerated by a potential difference of 12000 *volts*. It then enters a uniform magnetic field of $10^{-3}\,T$ applied perpendicular to the path of electron. Find the radius of path. Given mass of electron $= 9\times10^{-31}\,kg$ and charge on electron $= 1.6\times10^{-19}\,C$

(A) 36.7 *m* (B) 36.7 *cm*

(C) 3.67 *m* (D) 3.67 *cm*

56. The charge on a particle Y is double the charge on particle X. These two particles X and Y after being accelerated through the same potential difference enter a region of uniform magnetic field and describe circular paths of radii R_1 and R_2 respectively. The ratio of the mass of X to that of Y is

(A) $\left(\frac{2R_1}{R_2}\right)^2$ (B) $\left(\frac{R_1}{2R_2}\right)^2$

(C) $\frac{R_1^2}{2R_2^2}$ (D) $\frac{2R_1}{R_2}$

57. A particle with $10^{-11}\,coulomb$ of charge and $10^{-7}\,kg$ mass is moving with a velocity of $10^8\,m/s$ along the y-axis. A uniform static magnetic field $B = 0.5\,Tesla$ is acting along the x-direction. The force on the particle is

(A) $5\times10^{-11}\,N$ along $\hat{i}$ (B) $5\times10^{3}\,N$ along $\hat{k}$

(C) $5\times10^{-11}\,N$ along $-\hat{j}$ (D) $5\times10^{-4}\,N$ along $-\hat{k}$

58. A particle of charge q and mass m moving with a velocity v along the x-axis enters the region $x > 0$ with uniform magnetic field B along the $\hat{k}$ direction. The particle will penetrate in this region in the x-direction upto a distance d equal to

(A) Zero (B) $\frac{mv}{qB}$

(C) $\frac{2mv}{qB}$ (D) Infinity

59. A charged particle is moving with velocity v in a magnetic field of induction B. The force on the particle will be maximum when
(A) v and B are in the same direction
(B) v and B are in opposite directions
(C) v and B are perpendicular
(D) v and B are at an angle of $45°$

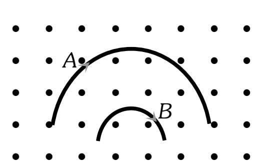
60. A charged particle enters a magnetic field H with its initial velocity making an angle of $45°$ with H. The path of the particle will be
(A) A straight line (B) A circle
(C) An ellipse (D) A helix

61. A homogeneous electric field E and a uniform magnetic field $\vec{B}$ are pointing in the same direction. A proton is projected with its velocity parallel to $\vec{E}$. It will
(A) Go on moving in the same direction with increasing velocity
(B) Go on moving in the same direction with constant velocity
(C) Turn to its right
(D) Turn to its left

62. The radius of circular path of an electron when subjected to a perpendicular magnetic field is
(A) $\frac{mv}{Be}$ (B) $\frac{me}{Be}$
(C) $\frac{mE}{Be}$ (D) $\frac{Be}{mv}$

63. Cyclotron is used to accelerate
(A) Electrons (B) Neutrons
(C) Positive ions (D) Negative ions

64. Two particles A and B of masses m_A and m_B respectively and having the same charge are moving in a plane. A uniform magnetic field exists perpendicular to this plane. The speeds of the particles are v_A and v_B respectively, and the trajectories are as shown in the figure. Then
(A) $m_A v_A < m_B v_B$
(B) $m_A v_A > m_B v_B$
(C) $m_A < m_B$ and $v_A < v_B$
(D) $m_A = m_B$ and $v_A = v_B$



65. A proton and an alpha particle are separately projected in a region where a uniform magnetic field exists. Their initial velocities are perpendicular to direction of magnetic field. If both the particles move around magnetic field in circles of equal radii, the ratio of momentum of proton to alpha particle $\left(\frac{P_p}{P_\alpha}\right)$ is
(A) 1 (B) $\frac{1}{2}$
(C) 2 (D) $\frac{1}{4}$

66. A particle of mass 0.6 g and having charge of 25 nC is moving horizontally with a uniform velocity $1.2 \times 10^4 ms^{-1}$ in a uniform magnetic field, then the value of the magnetic induction is $(g = 10 ms^{-2})$
(A) Zero (B) 10 T
(C) 20 T (D) 200 T

67. An α particle and a proton travel with same velocity in a magnetic field perpendicular to the direction of their velocities, find the ratio of the radii of their circular path
(A) 4 : 1 (B) 1 : 4
(C) 2 : 1 (D) 1 : 2

68. Motion of a moving electron is not affected by
(A) An electric field applied in the direction of motion
(B) Magnetic field applied in the direction of motion
(C) Electric field applied perpendicular to the direction of motion
(D) Magnetic field applied perpendicular to the direction of motion

69. When a charged particle enters a uniform magnetic field its kinetic energy
(A) Remains constant (B) Increases
(C) Decreases (D) Becomes zero

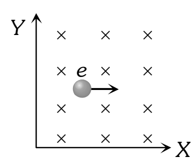
70. If cathode rays are projected at right angles to a magnetic field, their trajectory is
(A) Ellipse (B) Circle
(C) Parabola (D) None of these

71. An electron and a proton have equal kinetic energies. They enter in a magnetic field perpendicularly, Then
(A) Both will follow a circular path with same radius
(B) Both will follow a helical path
(C) Both will follow a parabolic path
(D) All the statements are false

72. Electrons move at right angles to a magnetic field of 1.5×10^{-2} *Tesla* with a speed of $6\times10^{7} m/s$. If the specific charge of the electron is 1.7×10^{11} *C/kg*. The radius of the circular path will be
(A) 2.9 *cm* (B) 3.9 *cm*
(C) 2.35 *cm* (D) 3 *cm*

73. The cyclotron frequency of an electron grating in a magnetic field of 1 *T* is approximately
(A) 28 *MHz* (B) 280 *MHz*
(C) 2.8 *GHz* (D) 28 *GHz*

74. In the given figure, the electron enters into the magnetic field. It deflects in ...... direction
(A) + *ve X* direction
(B) – *ve X* direction
(C) + *ve Y* direction
(D) – *ve Y* direction



75. A proton of energy 8 *eV* is moving in a circular path in a uniform magnetic field. The energy of an alpha particle moving in the same magnetic field and along the same path will be
(A) 4 *eV* (B) 2 *eV*
(C) 8 *eV* (D) 6 *eV*

76. An electron, a proton, a deuteron and an alpha particle, each having the same speed are in a region of constant magnetic field perpendicular to the direction of the velocities of the particles. The radius of the circular orbits of these particles are respectively R_e, R_p, R_d and R_α. It follows that
(A) $R_e = R_p$ (B) $R_p = R_d$
(C) $R_d = R_\alpha$ (D) $R_p = R_\alpha$

77. An electron moving with a uniform velocity along the positive *x*-direction enters a magnetic field directed along the positive *y*-direction. The force on the electron is directed along
(A) Positive *y*-direction
(B) Negative *y*-direction
(C) Positive *z*-direction
(D) Negative *z*-direction

78. An electron is projected along the axis of a circular conductor carrying some current. Electron will experience force
(A) Along the axis
(B) Perpendicular to the axis
(C) At an angle of 4^{o} with axis
(D) No force experienced

79. A very high magnetic field is applied to a stationary charge. Then the charge experiences
(A) A force in the direction of magnetic field
(B) A force perpendicular to the magnetic field
(C) A force in an arbitrary direction
(D) No force

80. A electron (q = 1.6 × 10^{-19} C) is moving at right angle to the uniform magnetic field 3.534 × 10^{-5} *T*. The time taken by the electron to complete a circular orbit is
(A) 2 μs (B) 4 μs
(C) 3 μs (D) 1 μs

Force and Torque on a Current Carrying Conductor

81. To make the field radial in a moving coil galvanometer
(A) The number of turns in the coil is increased
(B) Magnet is taken in the form of horse-shoe
(C) Poles are cylindrically cut
(D) Coil is wounded on aluminium frame

82. The deflection in a moving coil galvanometer is
(A) Directly proportional to the torsional constant
(B) Directly proportional to the number of turns in the coil
(C) Inversely proportional to the area of the coil
(D) Inversely proportional to the current flowing

83. A moving coil sensitive galvanometer gives at once much more deflection. To control its speed of deflection
(A) A high resistance is to be connected across its terminals
(B) A magnet should be placed near the coil
(C) A small copper wire should be connected across its terminals
(D) The body of galvanometer should be earthed

84. In a moving coil galvanometer, the deflection of the coil θ is related to the electrical current i by the relation
(A) $i \propto \tan\theta$ (B) $i \propto \theta$
(C) $i \propto \theta^2$ (D) $i \propto \sqrt{\theta}$

85. The unit of electric current "*ampere*" is the current which when flowing through each of two parallel wires spaced 1 m apart in vacuum and of infinite length will give rise to a force between them equal to
(A) $1 N/m$ (B) $2\times10^{-7} N/m$
(C) $1\times10^{-2} N/m$ (D) $4\pi\times10^{-7} N/m$

86. A moving coil galvanometer has N number of turns in a coil of effective area A, it carries a current I. The magnetic field B is radial. The torque acting on the coil is
(A) NA^2B^2I (B) $NABI^2$
(C) N^2ABI (D) $NABI$

87. A small coil of N turns has an effective area A and carries a current I. It is suspended in a horizontal magnetic field $\vec{B}$ such that its plane is perpendicular to $\vec{B}$. The work done in rotating it by $180°$ about the vertical axis is
(A) $NAIB$ (B) $2NAIB$
(C) $2\pi NAIB$ (D) $4\pi NAIB$

88. A small coil of N turns has area A and a current I flows through it. The magnetic dipole moment of this coil will be
(A) NI/A (B) NI^2A
(C) N^2AI (D) NIA

89. A current of 10 *ampere* is flowing in a wire of length 1.5 m. A force of 15 N acts on it when it is placed in a uniform magnetic field of 2 *tesla*. The angle between the magnetic field and the direction of the current is
(A) 30° (B) 45°
(C) 60° (D) 90°

90. A rectangular loop carrying a current i is placed in a uniform magnetic field B. The area enclosed by the loop is A. If there are n turns in the loop, the torque acting on the loop is given by
(A) $ni\vec{A}\times\vec{B}$ (B) $ni\vec{A}\cdot\vec{B}$
(C) $\frac{1}{n}(i\vec{A}\times\vec{B})$ (D) $\frac{1}{n}(i\vec{A}\cdot\vec{B})$

91. A rectangular coil $20\,cm\times20\,cm$ has 100 turns and carries a current of 1 A. It is placed in a uniform magnetic field B =0.5 T with the direction of magnetic field parallel to the plane of the coil. The magnitude of the torque required to hold this coil in this position is
(A) Zero (B) 200 N-m
(C) 2 N-m (D) 10 N-m

92. If a current is passed in a spring, it
(A) Gets compressed
(B) Gets expanded
(C) Oscillates
(D) Remains unchanged

93. A current carrying small loop behaves like a small magnet. If A be its area and M its magnetic moment, the current in the loop will be
(A) M/A (B) A/M
(C) MA (D) A^2M

94. In hydrogen atom, the electron is making $6.6\times10^{15}\ rev/\sec$ around the nucleus in an orbit of radius 0.528 Å. The magnetic moment $(A-m^2)$ will be

(A) 1×10^{-15} (B) 1×10^{-10}

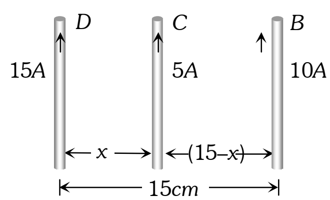
(C) 1×10^{-23} (D) 1×10^{-27}

95. A triangular loop of side l carries a current I. It is placed in a magnetic field B such that the plane of the loop is in the direction of B. The torque on the loop is

(A) Zero (B) IBl

(C) $\frac{\sqrt{3}}{2}Il^2B^2$ (D) $\frac{\sqrt{3}}{4}IBl^2$

96. Three long, straight and parallel wires carrying currents are arranged as shown in the figure. The wire C which carries a current of 5.0 *amp* is so placed that it experiences no force. The distance of wire C from wire D is then



(A) 9 *cm*

(B) 7 *cm*

(C) 5 *cm*

(D) 3 *cm*

97. A vertical wire carrying a current in the upward direction is placed in horizontal magnetic field directed towards north. The wire will experience a force directed towards

(A) North (B) South

(C) East (D) West

98. A coil carrying electric current is placed in uniform magnetic field, then

(A) Torque is formed

(B) E.M.f. is induced

(C) Both (A) and (B) are correct

(D) None of these

99. A circular loop carrying a current is replaced by an equivalent magnetic dipole. A point on the axis of the loop is

(A) An end-on position

(B) A broad side-on position

(C) Both (A) and (B)

(D) Neither (A) nor (B)

100. A power line lies along the east-west direction and carries a current of 10 *ampere*. The force per metre due to the earth's magnetic field of 10^{-4} *tesla* is

(A) $10^{-5}\ N$ (B) $10^{-4}\ N$

(C) $10^{-3}\ N$ (D) $10^{-2}\ N$

101. A long wire A carries a current of 10 *amp*. Another long wire B, Which is parallel to A and separated by 0.1m from A, carries a current of 5 *amp*, in the opposite direction to that in A. what is the magnitude and nature of the force experienced per unit length of B

$(\mu_0 = 4\pi\times10^{-7}\ weber/amp\text{-}m)$

(A) Repulsive force of $10^{-4}\ N/m$

(B) Attractive force of $10^{-4}\ N/m$

(C) Repulsive force of $2\pi\times10^{-5}\ N/m$

(D) Attractive force of $2\pi\times10^{-5}\ N/m$

102. A stream of electrons is projected horizontally to the right. A straight conductor carrying a current is supported parallel to electron stream and above it. If the current in the conductor is from left to right then what will be the effect on electron stream

(A) The electron stream will be pulled upward

(B) The electron stream will be pulled downward

(C) The electron stream will be retarted

(D) The electron beam will be speeded up towards the right

103. The relation between voltage sensitivity (σ_V) and current sensitivity (σ_i) of a moving coil galvanometer is (Resistance of Galvanometer = G)

(A) $\frac{\sigma_i}{G}=\sigma_V$ (B) $\frac{\sigma_V}{G}=\sigma_i$

(C) $\frac{G}{\sigma_V}=\sigma_i$ (D) $\frac{G}{\sigma_i}=\sigma_V$

104. What is shape of magnet in moving coil galvanometer to make the radial magnetic field

(A) Concave

(B) Horse shoe magnet

(C) Convex

(D) None of these

105. If a wire of length 1 *meter* placed in uniform magnetic field 1.5 *Tesla* at angle 30^o with magnetic field. The current in a wire 10 *amp.* Then force on a wire will be
(A) 7.5 N (B) 1.5 N
(C) 0.5 N (D) 2.5 N

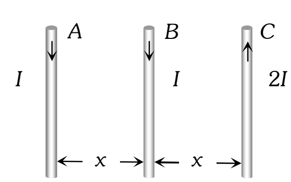
106. A current i flows in a circular coil of radius r. If the coil is placed in a uniform magnetic field B with its plane parallel to the field, magnitude of the torque that acts on the coil is
(A) Zero (B) $2\pi r i B$
(C) $\pi r^2 i B$ (D) $2\pi r^2 i B$

107. An arbitrary shaped closed coil is made of a wire of length L and a current I ampere is flowing in it. If the plane of the coil is perpendicular to magnetic field $\vec{B}$, the force on the coil is
(A) Zero (B) IBL
(C) $2IBL$ (D) $\frac{1}{2}IBL$

108. A circular coil having N turns is made from a wire of length L meter. If a current I ampere is passed through it and is placed in a magnetic field of B *Tesla*, the maximum torque on it is
(A) Directly proportional to N
(B) Inversely proportional to N
(C) Inversely proportional to N^2
(D) Independent of N

109. A small cylindrical soft iron piece is kept in a galvanometer so that
(A) A radial uniform magnetic field is produced
(B) A uniform magnetic field is produced
(C) There is a steady deflection of the coil
(D) All of these

110. *A, B* and *C* are parallel conductors of equal length carrying currents *I, I* and 2*I* respectively. Distance between *A* and *B* is *x*. Distance between *B* and *C* is also *x*. F_1 *is* the force exerted by *B* on *A* and F_2 is the force exerted by *B* on *A* choose the correct answer
(A) $F_1 = 2F_2$
(B) $F_2 = 2F_1$
(C) $F_1 = F_2$
(D) $F_1 = -F_2$



111. Two parallel wires of length 9 m each are separated by a distance 0.15 m. If they carry equal currents in the same direction and exerts a total force of 30×10^{-7} N on each other, then the value of current must be
(A) 2.5 *amp* (B) 3.5 *amp*
(C) 1.5 *amp* (D) 0.5 *amp*

112. Current i is carried in a wire of length L. If the wire is turned into a circular coil, the maximum magnitude of torque in a given magnetic field B will be
(A) $\frac{LiB^2}{2}$ (B) $\frac{Li^2B}{2}$
(C) $\frac{L^2iB}{4\pi}$ (D) $\frac{Li^2B}{4\pi}$

113. In ballistic galvanometer, the frame on which the coil is wound is non-metallic to
(A) Avoid the production of induced e.m.f.
(B) Avoid the production of eddy currents
(C) Increase the production of eddy currents
(D) Increase the production of induced e.m.f.

114. Two thin, long, parallel wires, separated by a distance 'd' carry a current of 'i' A in the same direction. They will
(A) Attract each other with a force of $\mu_0 i^2/(2\pi d^2)$
(B) Repel each other with a force of $\mu_0 i^2/(2\pi d^2)$
(C) Attract each other with a force of $\mu_0 i^2/(2\pi d)$
(D) Repel each other with a force of $\mu_0 i^2/(2\pi d)$

115. Three long, straight parallel wires carrying current, are arranged as shown in figure. The force experienced by a 25 cm length of wire C is
(A) 10^{-3} N
(B) 2.5×10^{-3} N
(C) Zero
(D) 1.5×10^{-3} N