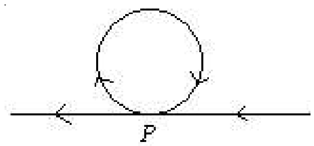
44 The magnetic field at the centre of the coil in the figure shown below is (the wires crossing at P are insulated from each other)



(1) $\frac{\mu_0}{4\pi}\frac{2I}{r}(1+\pi)$ (2) $\frac{\mu_0}{4\pi}\frac{2I}{r}(\pi-1)$

(3) $\frac{\mu_0}{4\pi}\frac{2I}{r}(\pi^2+1)$ (4) $\frac{\mu_0}{4\pi}\frac{2\pi I}{r}$

45 A square wire of each side l carries a current I. The magnetic field at the midpoint of the square is

(1) $4\sqrt{2}\frac{\mu_0}{4\pi}\frac{I}{l}$ (2) $8\sqrt{2}\frac{\mu_0}{4\pi}\frac{I}{l}$

(3) $16\sqrt{2}\frac{\mu_0}{4\pi}\frac{I}{l}$ (4) $32\sqrt{2}\frac{\mu_0}{4\pi}\frac{I}{l}$

46. A uniform wire of resistance 12 Ω is bent in the form of a square. A cell of emf 6V having negligible internal resistance connected across the diagonal of the square. The magnetic induction at its centre is (in tesla).

(1) 0 (2) 10^{-7}

(3) 5 x 10^{-7} (4) $\frac{\mu_0}{4\pi}\times 5\times 10^{-7}$

47. The magnetic induction at the centre due to motion of elecron in first Bohr orbit is B. The magnetic field due to the motion of electron in second Bohr orbit at the centre will be.

(1) B/64 (2) B/32 (3) B/16 (4) B/4

48. An electron in a circular orbit of radius 0.5 A^0 makes $7x10^{15}$ revolutions in each second. This electron orbit is equivalent to a magnetic shell of moment ... Am

(1) 88 x 10^{-25} (2) 8.89 x 10^{-25}
(3) 44 x 10^{-25} (4) $4.4x10^{-25}$

49. Two identical coils carry equal currents have a common centre and their planes are at right angles to each other. The ratio of the magnitude of the resultant magnetic field at the centre and the field due to one coil is

(1) 2 : 1 (2) 1 : 2 (3) $\sqrt{2}$:1 (4) 1: $\sqrt{2}$

50. In Bohr's model of hydrogen atom, the electron circulates round the nucleus in a path of radius 5 x 10^{-11}m at a frequency of $6.8x10^{15}$ revolutions per second. The value of magnetic induction at the centre of the orbit is

(1) 12.27 T (2) 10.8 T (3) 13.2 T (4) 14.6T

FORCE ON A MOVING CHARGE IN A MAGNETIC FIELD

51 An α -particle describes a circular path of radius r in a magnetic field B. The radius of the circular path described by the proton of same energy in the same magnetic field is

(1) r/2 (2) r (3) $\sqrt{2}\, r$ (4) 2r

52. An electron travelling with a velocity $\overline{V}$ =10^7 i m/s enter a magnetic field of induction $\overline{B} = \overline{2j}$. The force on electron is

(1) $1.6x10^{-12}\,\overline{j}$ N (2) $3.2x10^{-12}\,\overline{k}$ N
(3) $6.4x10^{-12}\,\overline{k}$ N (4) $-3.2x10^{-12}\,\overline{k}$ N

53. A beam of ions with a velocity of $2x10^5$ m/s. enters normally into a uniform magnetic field of $4x10^{-2}$ tesla. If the specific charge of the ion is $5x10^7$ C/kg, the radius of the circular path described is.

(1) 0.10 m (2) 0.16m (3) 0.20m (4) 0.25m

54. A charge q describes a circular orbit of radius r, with a speed of μ. The magnetic induction at the centre is

(1) $\frac{\mu_0 qv}{4\pi r}$ (2) $\frac{\mu_0 r}{4\pi qr}$ (3) $\frac{\mu_0 qv}{4\pi r^2}$ (4) $\frac{\mu_0 qv}{2\pi r^2}$

55. An electron is revolving around a proton in a circular orbit of diameter 1A^0. If it produces a magnetic field of 14 weber/m^2 at the proton, then its angular velocity is

(1) $2x10^{16}$rad/sec (2) $4.4x10^{16}$ rad/sec
(3) 10^{16} rad/sec (4) $3x10^{16}$ rad/sec

56. Two particles having same momentum enter at right angles into same magnetic field and travel in circular paths of radius r_1, and r_2. The ratio of their charges is

(1). r_1/r_2 (2). $(r_1/r_2)^{1/2}$ (3). $(r_1/r_2)^2$ (4). r_2/r_1

57. Two particles having same charge and KE enter at right angles into the same magnetic field and travel in circular paths of radii 2 cm and 3 cm respectively. The ratio of their masses is.

(1) 2 : 3 (2) 3 : 2 (3) 4 : 9 (4) 9 : 4

58. A proton of energy 2 MeV is moving perpendicular to uniform magnetic field of 2.5 T. The force on the proton is

(Mp = 1.6 x 10^{-27} Kg and q_p = e = $1.6x10^{-19}$C)

(1) 2.5 x 10^{-16}N (2) 8 x 10^{-11}N
(3) 2.5 x 10^{-11} N (4) 8 x 10^{-12} N

59. An electron is shot in steady electric and magnetic field such that its velocity is V. Electric field E and magnetic field B are mutually perpendicular. The

magnitude of E is 1 volt/cm and that of B is 2 tesla. Now it happens that the Lorentz (Magnetic) force cancels with the electro static force on the electron , then the velocity of the electron is

(1) 50 ms^{-1} (2) 2 cms^{-1}
(3) 0.5 cms^{-1} (4) 200ms^{-1}

60. An electron is projected with a velocity $3x10^{10}$ ms^{-1} at right angle to a uniform magnetic field of induction 0.2 T. The radius of the orbit that the electron revolves is
(Charge of e = $1.6x10^{-19}$, m_e = $9.1x10^{-31}$kg)
(1) 0.68 m (2) 0.42 m (3) 0.24m (4) 0.84 m

FORCE ON A CONDUCTOR CARRYING CURRENT PLACED IN A MAGNETIC FIELD

61. A horizontal wire carries 200 amp current below which another wire of linear density $20x10^{-3}$ kgm^{-1}. carrying a current is kept at 2 cm distance. If the wire kept below hangs in air. The current in this wire is
(1) 100A (2) 9.8 A (3) 98A (4) 48A

62. A current of 5 amp flows downwards in a long straight vertical conductor and the earth's horizontal flux density is 2 x 10^{-7} T then the neutral point is
(1) due north 10m from the wire
(2) due east 10m from the wire
(3) due east 5m from the wire
(4) due west 5m from the wire.

63. Two infinitely long straight conductors which are held parallel to each other at a distance 0.4m carry currents 20A and 10A in the same direction. The magnetic induction at a point midway between them is
(1) 10^{-5}T (2) $3x10^{-5}$T (3) $2x10^{-5}$T (4) 10^{-6}T

64. A horizontal wire of length 0.05m carries a current of 5A. If the mass of the wire is 10mg, the minimum magnetic field required to support the weight of the wire is (g=10m/s^2)
(1) $4x10^{-4}$ T (2) $25x10^{-4}$T
(3) $4x10^{-1}$ T (4) $25x10^{-1}$T

65. A wire carrying current of 10A supports a wire of 10cm long and weighing 1 gm vertically above it at a distance of 1 cm. The current that is passing through the wire is
(1) 490A (2) 205A (3) 408A (4) 316A

66. Two long parallel wires are separated by a distance of 2 m. They carry a current of 1A each in opposite direction. The magnetic induction at the midpoint of a straight line connecting these two wires is
(1) zero (2) $2x10^{-7}$ T
(3) $4x10^{-5}$T (4) $4x10^{-7}$T

67. A long straight wire carries a current of 10 A. An electron travels with a velocity of 5 x 10^6 m/sec parallel to the wire 0.1 m from it, and in a direction oposite to the current. What force does the magnetic field of current exert on the electron?
(1) $1.6x10^{-19}$ N (2) 3.2 x 10^{-17} N
(3) $1.6x10^{-17}$ N (4) $3.2x10^{-19}$N

MCG, AMMETER, VOLTMETER

68. A moving coil galvanometer A has 200 turns and resistance 100 Ω. Another meter B has 100 turns and resistance 40 Ω. All the other quantities are same in both the cases. The current sensistivity of
(1) B is double as that of A (2) A is 2.5 times of B
(3) A is 5 times of B (4) B is 5 times of A.

69. A moving coil galvanometer A has 100 turns and resistance 10 Ω. Another galvanometer B has 50 turns and 5 Ω. The other quantities are same in both the cases. Then the voltage sensitivity of
(1) A is greater than that of B
(2) B is greater than that of A
(3) A and B is Same (4) cannot be compared.

70. A rectangular coil 3x3 cm consisting of 100 turns caries 0.1 A. If it produces a deflection 10^0, in a field of induction 0.1T, the couple per unit twist is
(1) $9x10^{-2}$ N-m/Degree (2) $9x10^{-5}$ N-m/Degree
(3) $9x10^{-5}$ N-m/rad (4) 0.9 N-m/Degree

71. A galvanometer requires 10 μ A for one division of its scale. It is to be used to measure a current of 1 amp to the full scale deflection. The scale has 100 divisions. The value of shunt if the resistance of the galvanometer is 999 Ω
(1) 2 Ω (2) 3 Ω (3) 1 Ω (4) 4 Ω

72. The scale of a galvanometer, of resistance 50 Ω contains 25 divisions. On passing a current of $4x10^{-4}$A, it gives a deflection of one division. The resistance that must be added to it so that it may become a voltmeter of range 2.5V is.
1) 100 Ω 2) 200 Ω 3) 2000 Ω 4) 190 Ω

73. The sensitiveness of a voltmeter of 1000 Ω is millivolt/div. When a resistance of 99,000 Ω is connected in series, its sensitiveness becomes
(1) lvolt / div (2) 10v/div
(3) 1.1 volt / div (4) 0.1 volt / div

74. The resistance of a galvanomenter is 199 Ω. The sensitiveness is $2x10^{-4}$ A perdivision. The scale contains 100 divisions. In order to convert it into an ammeter to read upto 4 A, the shunt resistance is
(1) 0.5 Ω (2) 1 Ω (3) 2 Ω (4) 3.5 Ω

75. A galvanometer has a current range of 0 to 1 mA and voltage range 50 mV. The shunt required to convert this into an ammeter range 0.1A is

(1) $\frac{50}{99}\Omega$ (2) $\frac{42}{182}\Omega$ (3) $\frac{50}{989}\Omega$ (4) $\frac{50}{229}\Omega$

76. The resistance of a galvanometer is 18000 Ω its range is 200 volts. A bulb of resistance 2000 Ω is connected to the main of 200 V. By mistake, this voltmeter is connected in series with the bulb. What reading does it indicate?

1) 160 V 2) 180 V 3) 200 V 4) 220 V

KEY

01) 3 02) 2 03) 3 04) 1 05) 2 06) 1 07) 2
08) 2 09) 3 10) 2 11) 1 12) 3 13) 3 14) 2
15) 4 16) 2 17) 3 18) 2 19) 2 20) 2 21) 2
22) 3 23) 2 24) 4 25) 4 26) 1 27) 2 28) 3
29) 2 30) 3 31) 2 32) 3 33) 4 34) 4 35) 1
36) 2 37) 2 38) 4 39) 3 40) 3 41) 1 42) 3
43) 2 44) 1 45)2 46) 1 47) 2 48) 1 49) 3
50) 3 51) 2 52) 2 53) 1 54) 3 55) 2 56) 4
57) 3 58) 4 59) 1 60) 4 61) 3 62) 3 63) 1
64) 1 65) 1 66) 4 67) 3 68) 1 69) 3 70) 2
71) 3 72) 2 73) 4 74) 2 75) 1 76) 2

HINTS

1. $n = \frac{1}{2}$

2. $B = B_1 - B_2 = \frac{\mu_0 I}{2\pi r} - \frac{\mu_0 I}{2r}$

3. $B = B_1 + B_2$

4. Due to each arm of the square,

$a = \frac{l}{2}$

$B = \frac{\mu_0 I}{4\pi a}(\sin\theta_1 + \sin\theta_2)$

5. Field at the center due to opposite arms are equal in magnitude and opposite in direction. Hence cancel each other

6. $B = \frac{\mu_0 ne}{2r}$ *and* $n \propto \frac{1}{r^{3/2}}$ P

7. M= n I A

8. $B_R = B\sqrt{2}\ \sin ce\ B_1 = B_2 = B\ and\ \theta = 90^0$

10. $KE = \frac{q^2 r^2 B^2}{2m} = cons\tan t$

11. $\overline{F} = q(\overline{V}\times\overline{B})\ and\ \overline{i}\times\overline{j} = \overline{k}$

13 & 14. $BqV = mr\omega^2$

19. $r = \frac{mv}{qB}$

21. $\frac{\mu_0 I}{2\pi r} = B_H$

22. $B_R = B_1 - B_2 = \frac{\mu_0}{2\pi r}[I_1 - I_2]$

23 & 24. $\frac{\mu_0 I_1 I_2 l}{2\pi r} = mg$

25. $B_R = B_1 + B_2 = \frac{\mu_0}{2\pi r}[I_1 + I_2]$

26. $B = \frac{\mu_0 I}{2\pi r}\ and\ F = eVB(\sin ce\theta = 90^0)$

27. $\frac{\theta}{I_g} = \frac{nBA}{C}$

28. $\frac{\theta}{V_g} = \frac{nBA}{CG}$ 29. $I = \left(\frac{nBA}{C}\right)\theta$

32. $R = \frac{V}{I_g} - G$

34 & 35. $S = \frac{I_g G}{I - I_g}$

36. $V \propto R(\sin ce\ I\ is\ cons\tan t)$

$\frac{V_1}{V_2} = \frac{R_1}{R_2}; V_1 + V_2 = 200 volt$

(since connected in series)

LEVEL -III

1. AB is a straight wire of length 2 m and carries a current of 1 A from A to B. C is a point equidistant from A and B. Given that AC = BC = $\sqrt{2}$ m, the magnetic induction at C is

1) 1.41×10^{-7} tesla 2) 1.78×10^{-6} tesla
3) 2.82×10^{-7} tesla 4) 1.41×10^{-6} tesla

2. Two coplanar concentric circular coils have radii “r” and “2r”. Both have the same number of turns ‘n’. The smaller coil carries a clock wise current “i”, while the larger coil carries an anticlock current “2i”. The magnetic field induction at the centre is

1) $3\mu_o in/4r$ 2) zero
3) $\mu_o in/4r$ 4) $\mu_o in/2r$

3. A wire of length 'L' is bent in to an arc of a circle and found to subtend and angle of 'θ' radians at the center. If a current of 'i' is passed through it, the magnetic induction at the center of the circle is

1) $\frac{\mu_o i \theta^2}{2\pi L}$ 2) $\frac{\mu_o i \theta^2}{4\pi L}$ 3) $\frac{\mu_o i \theta}{4\pi L}$ 4) $\frac{\mu_o i \theta}{2\pi L}$

4. Two circular coils of wires made of wire of same gauge have the same number of turns and have radii 20 cm and 40 cm. They are connected in parallel to a battery. The ratio of the magnetic inductions are the centers of the coils is

1) 1 : 2 2) 2 : 1 3) 1 : 4 4) 4 : 1

5. A galvanometer of resistance 5 Ω is connected in series with a resistance of 102 Ω to a battery of negligible internal resistance. The deflection is noted. If the 102 Ω resistance is replaced by 2 Ω resistance, the value of shunt resistance to be connected to the galvanometer to maintain the same deflection is

1) 1 Ω 2) 0.1 Ω 3) 0.01 Ω 4) 10 Ω

6. Two particles of different masses m_1 and m_2, different charges Q_1 and Q_2, are accelerated through the same potential difference and then enter a uniform magnetic field in a direction perpendicular to the field. If they trace circular paths of same radius, then the ratio of their masses (m_1/m_2) must be

1) Q_2 / Q_1 2) Q_1 / Q_2
3) $(Q_1 / Q_2)^{1/2}$ 4) $(Q_2 / Q_1)^{1/2}$

7. The area of a coil is 500 cm^2 and the number of turns in it is 2000. It is kept perpendicular to a magnetic filed of induction 4×10^{-5} Weber /m^2. The coil is rotated through 180° in 0.1 second. If the resistance of the total circuit is 20 ohm, then the value of the induced charge flowing in the circuit will be

1) 1×10^{-4} coulomb 2) 2×10^{-4} coulomb
3) 3×10^{-4} coulomb 4) 4×10^{-4} coulomb

8. Three long straight conductors are arranged parallel to each other in the same plane and carry currents of 1 A, 2 A and 3 A all in the same direction. The distance between the first two conductors is "x" and the distance between the second and third conductors is "y". If the middle conductor is in equilibrium, the ratio x : y is

1) 1 : 3 2) 3 : 1 3) 1 : √3 4) √3 : 1

9. A circular coil of 100 turns and effective diameter 20cm carries a current of 0.5 A. It is to be turned in a magnetic field of B = 2.0 T from a position in which the normal to the plane of the coil makes an angle θ equals to zero to one in which θ equals to 180°. The work required in this process is

1) π J 2) 2 π J 3) 4 π J 4) 8 π J

10. A metallic wire is folded to form a square loop of side a. It carries a current i and is kept perpendicular to a uniform magnetic field of induction B. If the shape of the loop is changed to a circle, the amount of workdone in doing so is

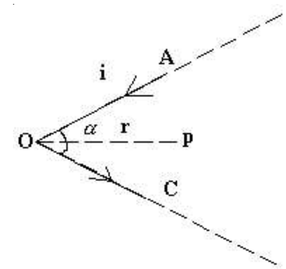
1) $iBa^2(\pi+2)$ 2) $iBa^2(\pi-2)$

3) $iBa^2\left(\frac{4}{\pi}-1\right)$ 4) $iBa^2\left(1-\frac{4}{\pi}\right)$

11. A charged particle enters a magnetic field at right angles to the field. The field exists for a length equal to 1.5 times the radius of circlar path of particle. The particle will be deviated from its path by

1) 90° 2) $\sin^{-1}\left(\frac{2}{3}\right)$ 3) 30° 4) 180°

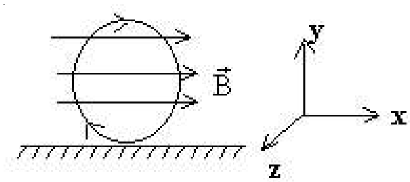
12. Two wires AO and OC carry currents i as shown in figure. One end of both the wires extends to infinity $\angle AOC = \alpha$, the magnitude of magnetic field at a point P on the bisector of the two wires at a distance r from O is



1) $\frac{\mu_o i}{2\pi r}\cot\left(\frac{\alpha}{2}\right)$ 2) $\frac{\mu_o i}{4\pi r}\cot\left(\frac{\alpha}{2}\right)$

3) $\frac{\mu_o i}{2\pi r}\frac{\left(1+\cos\frac{\alpha}{2}\right)}{\sin\left(\frac{\alpha}{2}\right)}$ 4) $\frac{\mu_o i}{4\pi r}\sin\left(\frac{\alpha}{2}\right)$

13. A conducting ring of mass 2kg and radius 0.5m is placed on a smooth horizontal plane. The ring carries a current i = 4A. A horizontal magnetic field B = 10T is switched on at t = 0 as shown in figure. The initial angular acceleration is

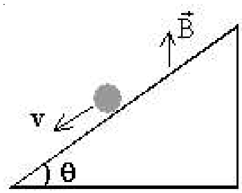


1) 40π rad / s^2 2) 20π rad / s^2
3) 5π rad / s^2 4) 15π rad / s^2

14. The ratio of magnetic field at the centre of a current carrying coil to its magnetic moment is x. If the current and radius both are doubled, the new ratio will become

1) 2x 2) 4x 3) $\frac{x}{4}$ 4) $\frac{x}{8}$

15. A conducting rod of length l and mass m is moving down a smooth inclined plane of inclination θ with constant velocity V. A current i is flowing in the conductor in a direction perpendicular to paper inwards. The magnitude of field $\vec{B}$ is



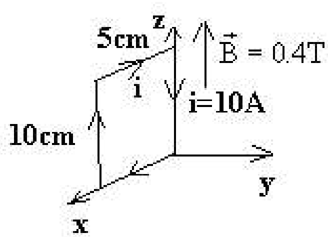
1) $\frac{mg}{il}.\sin\theta$ 2) $\frac{mg}{il}.\tan\theta$

3) $\frac{mg\cos\theta}{il}$ 4) $\frac{mg}{il\sin\theta}$

16. A copper wire of diameter 1.6mm carries a current i. The maximum magnetic field due to this wire is 5×10^{-3}T. The value of i is

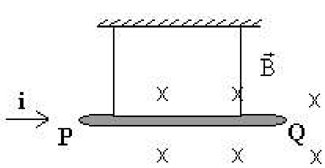
1) 40A 2) 5A 3) 20A 4) 2A

17. The torque acting on the loop is



1) 2×10^{-2} N-m along –x - axis
2) 2×10^{-2} N-m along +x - axis
3) 2×10^{-2} N-m along +y - axis
4) 2×10^{-2} N-m along –y - axis

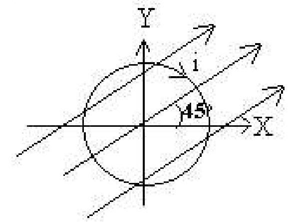
18. PQ is a uniform rod of length l and mass m carrying current i and is suspended in uniform magnetic field of induction $\vec{B}$ acting inward as shown in figure. The tension in each string is



1) mg – Bil 2) mg + Bil

3) $\frac{mg - Bil}{2}$ 4) $\frac{mg + Bil}{2}$

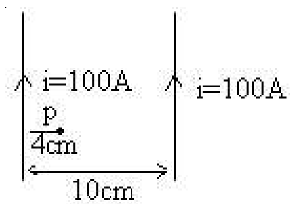
19. A circular loop of radius 20cm is placed in a uniform magnetic field $\vec{B} = 2T$ in X-Y plane. the loop carries a current 1A in the direction shown in figure. The magnitude of torque acting on the loop is nearly



1) 0.25 N-m 2) $\frac{0.25}{\sqrt{2}}$ N-m

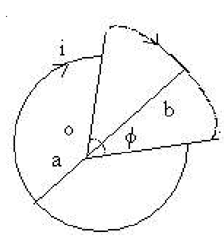
3) 0.75 N-m 4) $\frac{0.75}{\sqrt{2}}$ N-m

20. Two long wires are placed parallel to each other 10cm apart as shown in fig. The magnetic field at piont P is



1) $5/6 \times 10^{-3}$ T directed perpendicular into the paper
2) $1/3 \times 10^{-3}$ T directed perpendicular out of the paper
3) $5/6 \times 10^{-3}$ T directed perpendicular out of the paper
4) $1/6 \times 10^{-3}$ T directed perpendicular into the paper

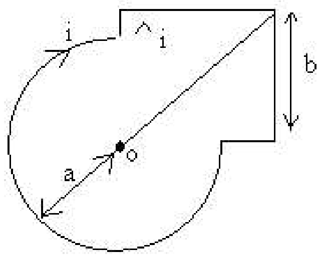
21. The magnetic induction field at O is



1) $\frac{\mu_o i}{4\pi}\left[\frac{2\pi-\phi}{a}+\frac{\phi}{b}\right]$ 2) $\frac{\mu_o i}{2\pi}\left[\frac{1}{a}+\frac{1}{b}\right]$

3) $\frac{\mu_o i}{4\pi}\left[\frac{2\pi-\phi}{a}-\frac{\phi}{b}\right]$ 4) zero

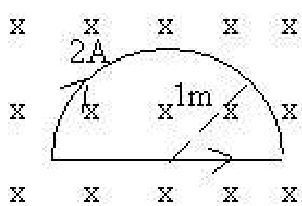
22. The magnetic induction at O due to a current in conductor shaped as shown in fig. is



1) $\frac{\mu_o i}{4\pi}\left[\frac{3\pi}{2a}+\frac{\sqrt{2}}{b}\right]$ 2) $\frac{\mu_o i}{4\pi}\left[\frac{3\pi}{4a}-\frac{\sqrt{2}}{b}\right]$

3) $\frac{\mu_o i}{2\pi}\left[\frac{3\pi}{4a}+\frac{1}{\sqrt{2}b}\right]$ 4) $\frac{\mu_o i}{4\pi}\left[\frac{1}{a}+\frac{1}{b}\right]$

23. In the figure shown a semi-circular wire loop is placed in uniform field of 1 T. The plane of the loop is perpendicular to the field. The magnetic force on the loop is



1) 2N 2) 4N 3) 8N 4) zero

24. A copper wire of cross sectional area $3mm^2$ carrying a current of 4A has 10^{29} free electrons/m^3. If this wire is now placed in a field of induction 0.15 T perpendicular to wire. The force on each electron is
1) 20×10^{-25}N 2) 37.5×10^{-25}N
3) 10×10^{-25}N 4) 41.7×10^{-25}N

25. A straight wire of length 30cm and mass 60 mg lies in a direction 30^0 east of north. The current must be passed through the wire so that it may float in air ($g=10m/s^2$, $B_H = 0.8$ Gauss) is
1) 50A 2) 25A 3) 75A 4) 100A

26. A charged particle of charge 5mc and mass 5gm is moving with a constant speed 5 m/s. in a uniform magnetic field on a curve $x^2+y^2=25$. Where x and y are in meter. The value of magnetic filed will be
1) 1 Tesla 2) 1 T along z-axis
3) 5 KT along the x-axis
4) 1 KT along any line in the x-y plane

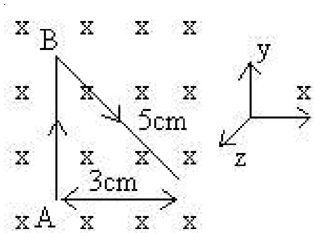
27. A square frame of side l carries a current produces a field B at its centre. The same current is passed through a circular loop having same perimeter as the square. The field at its centre is B', the ratio of $\frac{B}{B'}$ is

1) $\frac{8\sqrt{2}}{\pi^2}$ 2) $\frac{8}{\pi^2}$ 3) $\frac{\sqrt{2}}{\pi^2}$ 4) $\frac{\pi^2}{8\sqrt{2}}$

28. A charged particle is projected in a magnetic field $\vec{B}=\left(3\hat{i}+4\hat{j}\right)\times10^{-2}T$. the acceleration is found to be $\vec{a}=\left(x\hat{i}+2\hat{j}\right)m/s^2$. The value of x is
1) –8/3 m/s^2 2) 8/3 m/s^2
3) –4/3 m/s^2 4) 4/3 m/s^2

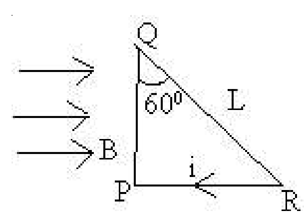
29. The force of attraction per unit length between two long conductors each carrying a current of 5A when they are placed 10cm apart and one conductor makes an angle of 60^0 with the other is
1) 5×10^{-5}N/m 2) 2.5×10^{-5}N/m
3) 7.5×10^{-5}N/m 4) $2.5\sqrt{3} \times 10^{-5}$N/m

30. A uniform wire ABC has a mass of 10gm. A current of 2A flows through it. The wire is kept in a uniform magnetic field of 2T. The acceleration of the wire will be



1) zero
2) 12 m/s^2 along y-direction
3) 36 m/s^2 along x-direction
4) 12 m/s^2 along y-direction

31. From the circuit shown in figure the direction and magnitude of the force on PQR is



1) zero 2) ilB out of the page
3) 1/2 ilB into of the page 4) ilB into of the page

32. A circular coil connected to a cell of e.m.f E produced a magnetic field. The coil is unwound, stretched to double its length, rewound in to a coil of 1/3 of the original radius and connected to a cell of e.m.f E^1 to produce the same field at the centre. Then E^1 is

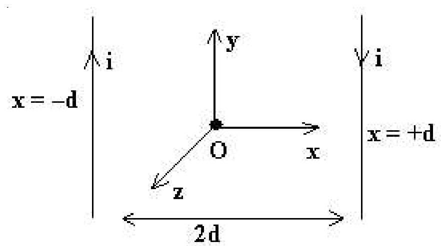
1) $E/2$ 2) $2E/9$ 3) $9E/4$ 4) $E/6$

33. Two circular coils P and Q are made from similar wires, but radius of Q is twice that of P. What should be the value of p.d across them so that the magnetic induction at their centre may be same

1) $V_q = 2V_P$ 2) $V_q = 3V_P$

3) $V_q = 4V_P$ 4) $V_q = 1/4V_P$

34. In the given diagram, two long parallel wires carry equal currents in opposite direction. The magnetic field B at O (origin) is non-zero along

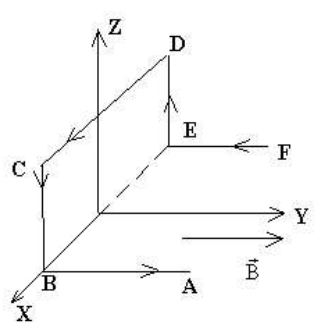


1) x, y and z-axis 2) x-axis
3) y-axis 4) z-axis

35. Two parallel long wires carry currents i_1 and i_2 ($i_1 > i_2$). When the currents are in the same direction, the magnetic induction at a point midway between the wires is 10mT. If the direction of i_2 is reversed, the induction becomes 30mT. The ratio of $\frac{i_1}{i_2}$ is

1) 4 2) 3 3) 2 4) 1

36. A wire ABCDEF (with each sideof length L) bent as shown in figure and carrying a current I is placed in a uniform magnetic field ($\vec{B}$) parallel to +y-axis. The force experienced by this wire is



1) BiL along z-axis 2) BIL along –z axis
3) BiL along +x-axis 4) BiL along –x-axis

37. A wire of length l is carrying a current i is in uniform magnetic field B perpendicular to wire. Torque due to magnetic field about its one end is

1) $\frac{il^2B}{3}$ 2) il^2B 3) $\frac{il^2B}{2}$ 4) $2il^2B$

38. A particle with a specific charge S is fired with a speed V towards a wall at a distace d, perpendicular to the wall. The minimum magnetic field must exist in this region for the paticle not to hit the wall is

1) $\frac{V}{sd}$ 2) $\frac{2V}{sd}$ 3) $\frac{V}{2sd}$ 4) $\frac{V}{4sd}$

39. A wire of length L is shaped into a circle and then bent in such a way that the two semi-circles are perpendicular. The magnetic moment of the system when current I flows through the system is

1) $\frac{\sqrt{2}iL^2}{8\pi}$ 2) $\frac{\sqrt{3}iL^2}{4\pi}$ 3) $\frac{iL^2}{4\pi}$ 4) $\frac{iL^2}{2\pi}$

KEY

1) 1	2) 2	3) 2	4) 4	5) 2	6) 2	7) 4
8) 1	9) 2	10)4	11)4	12)3	13)1	14)4
15)2	16)3	17)1	18)3	19)1	20)4	21)1
22)1	23)3	24)1	25)1	26).2	27)1	28)1
29)2	30)2	31)1	32)2	33)3	34)4	35)3
36)1	37)3	38).2	39)1			

HINTS

1. Workdone = change in potential energy
2. If the length of the field is more than the radius then the particle deviates by 180^0
4. $MB \sin\theta = I\alpha$
6. $mg \sin\theta = Bil \cos\theta$
7. $B = \mu_0 I / 2\pi r$
8. $\vec{\tau} = \vec{M} \times \vec{B}$
9. $2T = mg - Bil$
10. $\vec{\tau} = \vec{M} \times \vec{B}$
11. $B = \frac{\mu_0 I}{2\pi}\left[\frac{1}{r_1} - \frac{1}{r_2}\right]$
14. $F = BI(2r) + BI(2r)$
15. $F = q\left(\frac{I}{Ane}\right)B$
19. $\vec{F} = q\left(\vec{V} \times \vec{B}\right)$
29. $d \geq 2r$

QUESTIONS FROM PREVIOUS EAMCET EXAMS

SECTION I - ENGINEERING

1. 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 = μ_0)
(2001)

1) $\frac{\mu_0 i}{2\pi a}$ 2) $\frac{\mu_0 i\sqrt{2}}{\pi a}$ 3) $\frac{2\sqrt{2}\mu_0 i}{\pi a}$ 4) $\frac{\mu_0 i}{\sqrt{2}\pi a}$

2. A particle of mass 0.6 g and having charge of 25 nC is moving horizontally with a uniform velocity $1.2\text{x}10^4$ m/s in a uniform magnetic field, then the value of the magnetic induction is (2001).
1) zero 2) 10T 3) 20T 4) 200T

3. An electron moves with a speed 2 x 10^5 m/s along the positive x-direction in the presence of a magnetic induction $\overline{B} = (\bar{i} + 4\bar{j} - 3\bar{k})T$. The magnitude of the force experienced by the electron in newton is (charge on the electron = $1.6\text{x}10^{-19}$C)
1) $1.18\text{x}10^{-13}$ 2) $1.28\text{x}10^{-13}$
3) $1.6\text{x}10^{-13}$ 4) $1.72\text{x}10^{-13}$

4. Two long parallel copper wires carry currents of 5A each in the opposite direction . If the wires are seperated by a distance of 0.5 m, then the force between the two wires is (2000)
1) 10^{-5} N attractive 2) 10^{-5} N repulsive
3) $2\text{x}10^{-6}$ N attractive 4) $2\text{x}10^{-5}$ N repulsive.

5. An ammeter and a voltmeter of resistance R are connected in series to an electric cell of negligible internal resistance. Their readings are A and V respectively. If another resistance R is connected in parallel with the voltmeter , then (2000)
1) Both A and V increases
2) Both A and V decreases
3) A decreases but V increases
4) A increases but V decreases.

6. When two infinitely long parallel wires separated by a distance of 1m, each carry a current of 3 ampere, the force in newton/metre length experienced by each will be,
(given $\mu_0 = 4\pi \times 10^{-7}$ S.I. Units). (1999)
1) $2\text{x}10^{-7}$ 2) 3 x 10^{-7} 3) 6x 10^{-7} 4) 18 x 10^{-7}

7. If a long hollow copper wire carries a current, then the magnetic field produced will be (1998).
1) Inside the pipe only
2) Outside the pipe only
3) Neither inside nor outside the pipe.
4) Both inside and outside the pipe.

8. A galvanometer has a resistance of 500 Ω and a current of 0.01 amp will cause full scale deflection. To convert this into an ammeter with full scale deflection for 5A, we have to connect approximately a resistance of
1) 1 Ω in Series 2) 1 Ω in parallel
3) 2 Ω in Series 4) 2 Ω in parallel.

9. A current carrying wire produces in the neighbour hood. (1998)
1) Electric and magnetic fields
2) Electric field only
3) Magnetic field only. 4) No field.

10. Which of the following statements is wrong? (1997)
1) Ammeter is connected in series and maximum current flows through it.
2) Voltmeter is connected in parallel and potential is maximum.
3) Ammeter is connected in series and current through it is negligible
4) Voltmeter is connected in parrallel and current through it is negligible.

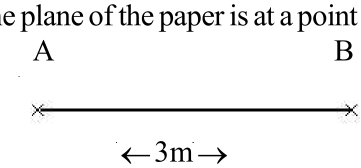
11. An electric current passes through a long straight wire. At a distance 5 cm from the wire, the magnetic field is B. The Field at 20 cm from the wire would be. (1996)
1) 2B 2) B/4 3) B/2 4) B

12. Two circular coils are made of two identical wires of the same length, if the number of turns of the two coils are 4 and 2, then the ratio of the magnetic inductions at the centre will be (1996)
1) 4:1 2) 2:1 3) 1:2 4) 1:1

13. An ammeter whose resistance is 180 Ω gives full scale deflection when curent is 2mA. The shunt required to convert into an ammeter reading 20 mA (in ohm) (1995)
1) 18 2) 20 3) 0.1 4) 10

14. The magnetic induction at a point distance ‘X’ from the centre, on the axis of a circular current carrying coil is inversely proportional to (if X>> radius of coil)
1) X 2) X^2 3) X^3 d. $X^{3/2}$

15. A and B are sections of two long parallel wires placed perpendicular to the plane of the paper. They carry current of 5 amp and 10 amp respectively in the directions indicated in the figure. If the separaton between them is 3m, the zero of the magnetic field in the plane of the paper is at a point (1992)



1) 3m to the left of A 2) 3 m to the right of B
3) 2m to the right of A 4) 2m to the left of B

16. Two long straight parallel wires separated by a distance, carrying equal currents exert a force F per unit length on each other. If the distance of separation is doubled, and the current in each is halved, the force per unit length, between them will be (1990)
1) F 2) F/2 3) F/4 4) F/8

17) A galvanometer having a resistance of 50Ω gives a full scale deflection for a current of 0.005 A. The length in meter of a resistance wire of area of cross section $2.97\times10^{-3}cm^{-2}$ that can be used to convert the galvanometer into an ammeter which can be read a maximum of 5A current is [specific resistance of the wire = $5\times10^{-7}\Omega-m$]
(EAMCET-2003)
1)9 2) 6 3) 3 4) 1.5

18) A long straight wire carrying a current of 30A is placed in an external uniform magnetic field of induction $4\times10^{-4}T$. 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
$[\mu_0 = 4\pi\times10^{-7}Hm^{-1}]$ (EAMCET-2003)
1) 10^{-4} 2) 3×10^{-4} 3) 5×10^{-4} 4) 6×10^{-4}

19) The scale of a galvanometer of resistance 100 ohms contains 25 divisions. It gives a deflection of one division on passing a current of 4×10^{-4} amperes. The resistance in ohms to be added to it, so that it may become a voltmeter of range 2.5 volts is (EAMCET-2003)
1)100 2)150 3)250 4)300

20) The electric current in a circular coil of two turns produced a magnetic induction of 0.2 T at its centre. The coil is unwound and is rewound into a circular coil of four turns. The magnetic induction at the centre of the coil now is, in tesla (if same current flows in the coil) (EAMCET-2003)
1)0.2 2) 0.4 3) 0.6 4) 0.8

21) Magnetic induction at the centre of a circular loop of area π square meter is 0.1 tesla. The magnetic moment of the loop is (μ_0 is permeability of air)
(EAMCET-2004)
1) $\frac{0.1\pi}{\mu_0}$ 2) $\frac{0.2\pi}{\mu_0}$ 3) $\frac{0.3\pi}{\mu_0}$ 4) $\frac{0.4\pi}{\mu_0}$

22) A wire of lenght 'l' is bent into a circular coil of one turn of radius R_1. Another wire of the same materi al and same area of cross section and same length is bent into a circular coil of two turns of radius R_2. When the same current flows through the two coils, the ratio of magnetic induction at the centres of the two coils is (EAMCET-2004)
1) 1:2 2)1:1 3) 1:4 4) 3:1

23) A circular coil of radius 2R is carrying current i. The ratio of magnetic fields at the centre of the coil and at a point at a distance 6R from the centre of the coil on the axis of the coil is
(EAMCET-2004)
1) 10 2) $10\sqrt{10}$ 3) $20\sqrt{10}$ 4) $20\sqrt{5}$

24) An electrical meter of internal resistance 20Ω gives a full scale deflection when one milliampere current flows through it. The maximum current, that can be measured by using three resistors of resistance 12Ω each, in milliamperes is
(EAMCET-2004)
1) 10 2) 8 3) 6 4) 4

25) Magnetic field induction at the center of a circular coil of radius 5cm and carrying a current 0.9 A is (in S.I. units) (ϵ_0 = absolute permittivity of air in S.I. units: velocity of light = $3\times10^8 ms^{-1}$)
(EAMCET-2005E)
1) $\frac{1}{\epsilon_0 10^{16}}$ 2) $\frac{10^{16}}{\epsilon_0}$ 3) $\frac{\epsilon_0}{10^{16}}$ 4) $10^{16}\epsilon_0$

26) A particle of mass 1×10^{-26} kg and charge 1.6×10^{-19} C travelling with a velocity $1.28\times10^6 ms^{-1}$ along the positive X-axis enters a region in which a uniform electric field $\vec{E} = -102.4\times10^3 k\ NC^{-1}$ and magnetic field $B = 8\times10^{-2} jWbm^{-2}$, the direction of motion of the particles is: (EAMCET-2005E)
1)along the positive X-axis
2) along the negative X-axis
3) at 45^0 to the positive X-axis
4) at 135^0 to the positive X-axis

KEY

1) 3	2)3	3)3	4)2	5)4
6)4	7)2	8)2	9) 3	10)3
11)2	12)1	13)2	14)3	15)4
16)4	17)3	18)3	19)2	20)4
21)2	22)3	23)2	24)3	25)1
26)1				

SECTION II - MEDICAL

1. The range of a voltmeter of resistance 300 Ω is 5V. The resistance to be connected to convert it as an ammeter of range 5A is (2001).
1) 1 Ω in series 2) 1 Ω in parallel
3) 0.1 Ω in series 4) 0.1 Ω in parallel.

2. A long straight wire carries an electric current of 2A. The magnetic induction at a perpendicular distance of 5 m from the wire is
($\mu_0 = 4\pi$ x 10^{-7} Hm^{-1}) (2000)
1) 4 x 10^{-8} T 2) 8 x 10^{-8} T
3) 12 x 10^{-8} T 4) 16x10^{-8}T

3. A galvanometer of 25 Ω resistance can read a maximum current of 6 mA. It can be used as a voltmeter to measure maximum 6V by connecting a resistance to galvanometer. Identify the correct choice in the given answers (2000)
1) 1025 Ω in series 2) 1025 Ω in parallel
3) 975 Ω in series 4) 975 Ω in parallel.

4. A doubly ionised He^{+2} atom travels at right angles to a magnetic field of induction 0.4T at a velocity of $10^5 ms^{-1}$ describing a circle of radius r. A proton travelling with same speed in same direction in the same field will describe a circle of radius (1999)
1) r/4 2) r/2 3) r 4) 2r

5. A charge of 10^{-6}C is describing a circular path of radius 1 cm making 5 revolutions per second. The magnetic induction at the centre of the circle is (1998)
1) π x 10^{-10}T 2) π x 10^{-9} T
3) (π/2) x10^{-10}T 4) (π/2) x 10^{-9}T.

6. Two long straight wires of length l lie parallel to one another and carry currents opposite to one another of magnitudes i_1 and i_2 respectively, The force experienced by each of the straight wires is (r is the distance of their separation) (1998)
1) repulsive and equal to ($\mu_0/2\pi$).l.(i_1i_2/r)
2) attractive and equal to ($\mu_0/2\pi$).($i_1i_2l^2$/r)
3) repulsive and equal to ($\mu_0/2\pi$).($i_1i_2l^2$/r)
4) attractive and equal to ($\mu_0/2\pi$).(i_1i_2l/r)

7. A galvanometer has a coil of resistance 50 Ω and shows full deflection for 100 μA. The resistance to be added to the galvanometer to work as an ammeter of range 10 mA is (1998)
1) 0.5 Ω in series 2) 0.5 Ω in parallel
3) 50 Ω in series 4) 50 Ω in parallel.

8. A galvanometer with a shunt in parallel is used in series in a circuit. Then it is called (1996)
1) Ammeter 2) Voltmeter
3) Ohmmeter 4) Multimeter

9. The resistance of an ideal voltmeter is (1995)
1) Zero 2) infinity 3) 1000 Ω 4) 10000 Ω

10. There is 10 units of charge at the centre of a circle of radius 10m. The workdone in moving one unit of charge around the circle once is,
1) Zero 2) 10 units 3) 100 units 4) 1unit

11. The magnetic induction at the centre of a current carrying circular coil of radius 10 cm is $5\sqrt{5}$ times the magnetic induction at a point on its axis. The distance of the point from the centre of the coil in cm is (2002)
1) 5 2) 10 3) 20 4) 25

12) A current carrying circular coil, suspended freely in a uniform external magnetic field orients to a position of stable equilibrium.In this state:(EAMCET-2005M)
1)The plane of the coil is normal to the external magnetic field
2)The plane of the coil is parallel to the external magnetic field
3)Flux through the coil is minimum
4) Torque on the coil is maximum

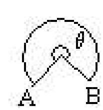
13) A proton is projected with a velocity $10^7 ms^{-1}$, at right angles to a uniform magnetic field of induction 100 mT. The time (in seconds) taken by the proton to traverse 90^0 arc is :
(Mass of proton = 1.65×10^{-27} kg and charge of proton = $1.6\times10^{-19} C$) EAMCET-2005M
1) 0.81×10^{-7} 2) 1.62×10^{-7}
3) 2.43×10^{-7} 4) 3.24×10^{-7}

KEY

1) 2	2) 2	3) 3	4) 2	5) 1
6) 1	7) 2	8) 1	9) 2	10) 1
11) 3	12)1	13)2		

QUESTIONS FROM OTHER COMPETITIVE EXAMS

1. A current of 'i' amp flows in a loop having circular arc of radius 'r' subtending an angle θ as shown in the figure. The magnetic field at the centre of the circle is (AFMC 2000)



1) $\mu_0 i\theta/4\pi r$ 2) $(\mu_0 i/4r) \sin\theta$

3) $(2\mu_0 i/2r) \sin\theta$ 4) $(\mu_0 i/4\pi r) \sin\theta$

2. If a current is passed in a spring it (PMTMP 1998)
1) gets compressed 2) gets expanded
3) oscillates 4) remains unchanged

3. A charged particle is moving with velocity 'V' in a magnetic field of induction B. The force on the particle will be maximum when (PMTMP 1998)
1) V and B are in the same direction
2) V and B are in Opposite direction
3) V and B are perpendicular
4) V and B are at an angle of 45^0

4. A current carrying small loop behaves like a small magnet. If A be its area, M its magnetic moment, the current in the loop will be (P.M.T.M.P 1998)
1) M/A 2) A/M 3) MA 4) A^2M

5. A particle of charge q, mass m and velocity V moves in a circular path inside the dees of a cyclotron. If the magnetic field exerted on the particle is B, the radius R is given by
(J.E.E. 1998 ORISS1)
1) $\frac{QVB}{M}$ 2) $\frac{QV}{M}$ 3) $\frac{MV}{QB}$ 4) $\frac{BV}{QM}$

6. Two particles each of mass m and charge q are attached to the two ends of a light rigid rod of length 2R. The rod is rotated at constant angular speed about a perpendicular axis passing through its centre. The ratio of the magnitudes of the magnetic moment of the system and its angular momentum about the centre of the rod is (IIT 1998)
1) $\frac{q}{2m}$ 2) $\frac{q}{m}$ 3) $\frac{2q}{m}$ 4) $\frac{q}{\pi m}$

7. Two very long, straight, parallel wires carry currents I and -I respectively. The distance between the wires is d. At a certain instant of time, a point charge q is at a point equidistant from the two wires, in the plane of the wires. Its instantaneous velocity v is perpendicular to this plane. The magnitude of the force due to magnetic field acting on the charge at this instant is (I.I.T 1998)
1) $\frac{\mu_0 Iqv}{2\pi d}$ 2) $\frac{\mu_0 Iqv}{\pi d}$ 3) $\frac{2\mu_0 Iqv}{\pi d}$ 4) zero

8. When the radius of the tangent galvanometer coil is decreased, its sensitiveness (C.E.T Karnataka 1999)
1) increases 2) may increase or decrease
3) decreases 4) remains unaltered

9. With a resistance R connected in series with a galvanometer of resistance 100 ohm, it acts as a voltmeter of range $0 \longrightarrow V$. To double the range a resistance of 1000 ohm is to be connected in series with R. Then the value of R in ohm is (C.E.T Karnataka 1999)
1) 1100 2) 800 3) 900 4) 1000

10. If only 2% of the main current is to be passed through a galvanometer of resistance G, then the resistance of the shunt will be (P.M.T.M.P 1998)
1) $\frac{G}{50}$ 2) $\frac{G}{49}$ 3) 50G 4) 49 G

11. A galvanometer having a resistance of 80 ohm is shunted by a wire of resistance 2 ohm. If the total current is two ampere, the part of it passing through the shunt is (Pre Medical, Dental 1998)
1) 0.25amp 2) 1.95 amp
3) 0.2amp 4) 0.5amp

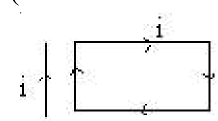
12. A voltmeter has range $0 \longrightarrow V$ with a series resistance R. With a series resistance 2R, the range is $0 \longrightarrow V'$. The correct relation between v and v' is (C.E.T. Karnataka 1998)
1) $v^1=2v$ 2) $v^1>2v$ 3) $v^1<2v$ 4) $v^1>>2v$

13. A galvanometer has a resistance G and a current i_g flowing in it produces full scale deflection. S_1 is the value of shunt, which converts it into an ammeter of range $0 \longrightarrow I$ and S_2 is the value of shunt for the range 0-2I the ratio $\frac{S_1}{S_2}$ is (C.E.T. Kanrnataka 1998)
1) $\frac{S_1}{S_2} = \left[\frac{2I - ig}{I - ig}\right]$ 2) $S_1/S_2 = 1/2\,[(I-ig)/(2I-ig)]$
3) 2 4) 1

14. A tangent galvanometer of reduction factor IA is placed with plane of its coil perpendicular to the magnetic meridian when a current of IA is passed through it. The deflection produced is
(C.E.T. KARNATAKA 1998)
1) 45^0 2) Zero 3) 30^0 4) 60^0

15. A particle of charge q and mass m moving with a velocity v along X-axis enters the region at x = 0 with uniform magnetic field B along the +Z direction. The particle will penetrate in this region in the x-direction up to a distance d equal to (P.M.I 1997 M.P.)
1) Zero 2) $\frac{mv}{BQ}$ 3) $\frac{2mv}{BQ}$ 4) Infinity

16. A rectangular loop carrying current is placed near a long straight fixed wire, that carries a strong current as shown in the figure. The directions of current are shown by arrowheads. The loop will experience (P.M.T. 1997 A.M.U)



1) no force 2) a torque but no force
3) force towards the wire
4) force away from the wire

17. A conductor in the form of a right angle ABC with AB=3cm and BC=4cm carries a current of 10 amp. There is a uniform magnetic field of 5T perpendicular to the plane of the conductor. The force on the conductor will be (PMT 1997 M.P)
1) 1.5 N 2) 2. N 3) 2.5 N 4) 3.5 N

18. The coil of a galvanometer consists of 100 turns and effective area 1cm^2. The restoring couple is 10^{-8} N-m/rad. The Magnetic field between the pole pieces is 5 tesla the current sensitivity of the galvanometer will be. (P.M.T. 1997 M.P)
1) $5x10^4$ radian per micro ampere
2) $5x10^{-6}$ radian per micro ampere
3) $2x10^{-7}$ radian per micro ampere
4) 5 radian per micro ampere

19. The resistance of a galvanometer is 2.5 ohm and it requires 50 mA for full scale deflection. The value of shunt required to convert it into an ammeter of 5A range is nearly (M.E.E. 1997 B.H.V.)
1) $2.5x10^{-2}$ ohm 2) $1.25X10^{-3}$ ohm
3) 0.05 ohm 4) 2.5 ohm

20. When 3 ampere current is passed in a tangent galavanometer, there is a deflection of 30^0 in it. The deflection obtained when $3\sqrt{3}$ ampere current is passed is (P.M.T. 1997 M.P.)
1) 30^0 2) 45^0 3) 60^0 4) 75^0

21. A steady curent 'i' is flowing through a conductor of uniform cross-section. Any segment of the conductor has (P.E.T.M.P. 1996)
1) zero charge 2) only positive charge
3) only negative charge
4) charge proportional to current

22. When a charged particle moves in a uniform magnetic field (C.E.T. 1996 Punjab)
1) it gains energy from the field
2) it loses energy to the field
3) it neither gains nor changes energy and momentum
4) momentum changes but not energy

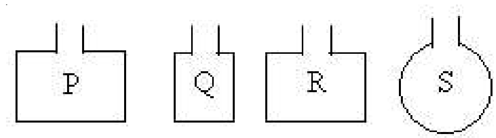
23. The sensitiveness of a moving coil galvanometer can be increased by decreasing (PMTM.P 1996)
1) The number of turns in the coil
2) The area of coil 3) The magnetic field
4)The couple per unit twist of the suspension

24. If electron velocity is 2i+4jand it is subjected to magnetic field of 4k, then its (C.M.P.T. 1995)
1) speed will change 2) path will change
3) both 1and 2 4) none of the above

25. An electron having energy 10 eV is circulating in a path having a magnetic field of 10^{-4}T. The speed of the electron will be (C.M.M.T. 1995)
1) $1.9X(10^6)\ ms^{-1}$ 2) $3.8\ X(10^6)\ ms^{-1}$
3) $1.9\ X(10^{12})\ ms^{-1}$ 4) $3.8\ X(10^{12})\ ms^{-1}$

26. A Particle having charge 100 times that of an electron is revolving in a circular path of radius 0.8m with one rotation per second.The magnetic field produced at the centre is (C.P.M.T.1995)
1) $10^{-7}/\mu_0$ 2)$10^{-17}\ \mu_0$ 3)$10^{-6}\ \mu_0$ 4)$10^{-15}/\mu_0$

27. Four wires each of length 2m are bent into four loops p,q,r and s and then suspended into a uniform magnetic field Same current is passed in each loop. The correct statement is
(P.E.T.M.P. 1995)



1) couple on loop P will be highest
2) couple on loop Q will be highest
3) couple on loop R will be highest
4) couple on loop S will be highest

28. A wire of length 'l' metre carrying a current of 'i' ampere is bent in the form of a circle Its magnetic moment will be (P.E.T.M.P. 1995)
1) $\frac{iL}{4\pi}$ 2) $\frac{iL^2}{4\pi}$ 3) $\frac{i^2L^2}{4\pi}$ 4) $\frac{i^2L}{4\pi}$

29. A current of one ampere is passed through a straight wire of length 2 metres. The magnetic field at a point in air at a distance of 3m from one end of the wire but lying on the axis of the wire will be (P.E.T.M.P. 1995)
1) $\mu_0/2\pi$ 2) $\mu_0/4\pi$ 3) $\mu_0/8\pi$ 4)Zero

30. A battery is connected between two points A and B on the circumference of a uniform conducting ring of radius r and resitance R. One of the arcs AB subtends an angle θ at the centre. The value of the magnetic induction at the centre due to the current in the ring
(I.I.T.1995)
1) proportional to 2 $(180^0-\theta)$
2) Inversely proportional to r
3) zero only if $\theta=180^0$
4) zero for all values of θ

31. A proton moving with a velocity V is acted upon by electric field E and magnetic field B. The proton will move undeflected if (P.M.I. M.P. 1995)
1) E is perpendicular to B
2) E is parallel toV and perpendicular to B
3) E and B both are parallel to V
4) E,. V and B are mutually perpendicular and $V=\frac{E}{B}$

32. Two concentric coils of 10 turns each are situated in the same plane. Their radii are 20 cm and 40 cm and they carry respectively 0.2 and 0.3 amp current in opposite directions. The magnetic field in wbm^{-2} at the centre is (C.M.P.T 1994)

1) $\frac{35}{4}\mu_0$ 2) $\mu_0/80$ 3) 7 $\mu_0/80$ 4)5 $\mu_0/4$

33. 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 (PMT MP 1994)

1) $ni(\overline{A}\times\overline{B})$ 2) $ni(\overline{A}.\overline{B})$

3) $\left(\frac{i\overline{A}\times\overline{B}}{n}\right)$ 24) $\left(\frac{i\overline{A}.\overline{B}}{n}\right)$

34. A small coil of N turns has an area A and a curent 'i' flows through it. The magnetic dipole moment of the coil will be (P.M.T.M.P. 1994)

1) i NA 2) i^2 NA 3) i N^2A 4) iN/A

35. Two straight long conductors AOB and COD are perpendicular to each other and carry currents i_1 and i_2. The magnitude of magnetic induction at a point P at a distance a from the point O in the direction perpendicular to the plane ABCD is (P.M.T.M.P. 1994)

1) ($\mu_0/2\pi$ a) ($i_1 + i_2$) 2) ($\mu_0/2\pi$ a) ($i_1 - i_2$)

3) ($\mu_0/2\pi$ a) $(i_1^2 + i_2^2)^{1/2}$

4)($\mu_0/2\pi$ a) [$i_1 i_2/(i_1+i_2)$]

36. An electron moves with a constant speed v along a circle of radius r. The magnetic moment will be (e is the electron charge) (P.M.T.M.P. 1994)

1) evr 2) $\frac{evr}{2}$ 3) $\pi r^2 ev$ 4) 2π rev

37. A circular coil 'A' has a radius 'R' and the current flowing through it is I. Another circular coil 'B' has a radius 2R and the current flowing through it is 2I, then the magnetic fields at the centre of the circular coils are in the ratio of (i.e. B_1 to B_2) (Pre Medical / Dental 1993)

1) 4:1 2)2:1 3) 3:1 4)1:1

38. Voltmeters V_1 and V_2 are connected in series across a D.C. line. V_1 reads 80 volt and has a per volt resistance of 200 ohm V_2 has a total resistance of 32 kilo ohm. The line voltage is (C.E.E. 1992)

1) 120 Volt 2) 160 Volt 3)220 Volt 4) 240 Volt.

39. 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 (Premedical/ Dental 1991)

1) 25 keV 2) 50 keV 3) 200 keV 4)100 keV.

40. A micro ammeter has a resistance of 100 Ω and a full scale range of 50 μ A. It can be used as a voltmeter or as a higher range ammeter provided a resistance is added to it. Pick the current range and resistance combinations. (C.P.M.T. 1998, I.I.T. 1991)

1) 50 Volt range with 10 KΩ resitance in series
2) 10 Volt range with 200KΩ resistance in series
3) 5 mA range with 1 Ω resistance in parallel
4)10 mA range with 1 Ω resistance in parallel

41. A galvanometer of resistance 25 ohm is connected to a battery of 2 V along with a resistance in series. When the value of this resistance is 3000 Ω a full scale deflection of 30 units is obtained in the galvanometer. In order to reduce this deflection to 20 units, the resistance in series will be (C.P.M.T. 1991).

1) 4513 ohm 2) 5413 ohm
3) 2000 ohm 4) 6000 ohm.

42. A small current loop has a magnetic field B_1 at a point on the axis and B_2 at a point at the same distance in its plane. Then numerically. (A.P. 1994)

1) $B_1 = B_2$ 2)B_1=2B_2 3) B_2=2B_1 4)$B_2=\frac{B_1}{\sqrt{2}}$

43. Lorentz force can be calculated by using the formula. (P.E.T.M.P. 1994)

1) $\vec{F}=Q(\vec{E}+\vec{V}x\vec{B})$ 2) $\vec{F}=Q(\vec{E}-\vec{V}x\vec{B})$

3) $\vec{F}=Q(\vec{E}+\vec{V}.\vec{B})$ 4) $\vec{F}=Q(\vec{E}-\vec{V}.\vec{B})$

44. If a particle of charge 10^{-12} C moving along the x-axis with a velocity 10^5 m/s. experiences a force of 10^{-10} N in y-direction due to magnetic field, then the minimum magnetic field is. (P.M.T.M.P 1994)

1) 6.25 x 10^3 tesla in Z direction
2) 10^{-15} tesla in Z direction
3) 6.25 x 10^{-3} tesla in Z direction
4) 10^{-3} tesla in Z direction

45. The magnetic induction at a point P which is 4 cm distant from a long current carrying wire is 10^{-3} tesla. The field of induction at a distance 12 cm from the same current would be (Pre Medical / Dental 1990)

1) 3.33x10^{-4} tesla 2) 1.11x 10^{-4} tesla
3) 3 x 10^{-2} tesla 4) 9 x 10^{-2} tesla

46. A moving coil voltmeter is generally used to measure the potential difference across a conductor of resistance 'r' carrying a current i. The resistance of voltmeter is R. For more correct measurement of potential difference (A.P. 1994)

1) R = r 2) R>>r 3) R << r 4) R = 0

47. A Proton and an alpha particle enter into a uniform magnetic field with the same velocity. The period of rotation of the alpha particle will be (M.P.P.M.T. 1990)

1) Four times that of proton
2) Two times that of proton
3) Three times that of proton
4) Same as that of proton

48. A helium nucleus makes a full rotation in a circle of radius 0.8 metre in two seconds. The value of the magnetic field B at the centre of the circle will be (C.P.M.P.T. 1988)

1) $10^{-19} / \mu_0$ 2) $10^{-19}\ \mu_0$
3) $2 \times 10^{-19}\ \mu_0$ 4) $2 \times 10^{-19} / \mu_0$

49. An electron having a charge e moves with a velocity 'v' in X-direction. An electric field acts on it in y-direction. The force on the electron acts in (M.P.P.M.T 1988)

1) positive direction of y-axis
2) negative direction of y-axis
3) positive direction of z-axis
4) negative direction of z-axis

50. Currents of 10 A , 2 A are passed through two parallel wires A and B respectively in opposite directions. If the wire A is infinetely long and the length of the wire B is 2 metre, the force on the conductor B, which is situated at 10cm distance from A will be (P.M.T. 1998)

1) 8×10^{-5} newton 2) 5×10^{-5} newton
3) $8\pi \times 10^{-7}$ newton d. $4\pi \times 10^{-7}$ newton

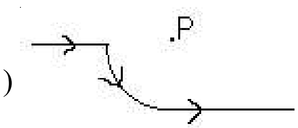
51. Two particles X and Y having equal charges, after being accelerated through the same potential differences enter a region of uniform magnetic field and describe circular paths of radii R_1 and R_2 respectively. The ratio of the mass of X to that of Y is (I.I.T. 1988,P.M.T. 1991. 1998)

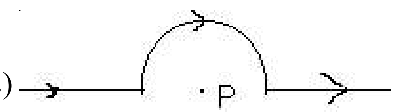
1) $(R_1/R_2)^{1/2}$ 2) (R_2/R_1)
3) $(R_1/R_2)^2$ 4) (R_1/R_2)

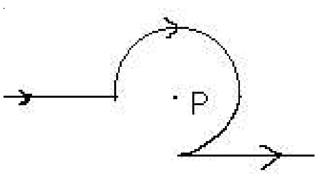
52. A 2MeV proton is moving perpendicular to a uniform magnetic field of 2.5 tesla. The force on the proton is (C.P.M.T. 1989)

1) 2.5×10^{-10} newton 2) 8×10^{-11} newton
3) 2.5×10^{-11} newton 4) 8×10^{-12} newton

53. The magnetic field at the centre of a circular coil of radius r is π times that due to a long straight wire at a distance r from it, for equal currents. Figure shows three cases; In all cases the circular path has radius r and straight ones are infinitely long. For same current the B field at the centre P in cases 1,2,3 has the ratio (C.P.M.T. 1989)

1) 

2) 

3) 

1) $-\left(\frac{\pi}{4}+\frac{1}{2}\right) : (\pi/2) : ((3\pi/4) - 1/2)$
2) $((-\pi/2)+1) : ((\pi/2)+1) : ((3\pi/4) + 1/2)$
3) $-\pi/2 : \pi/2 : 3\pi/4$
4) $((-\pi/2)-1) : ((\pi/2)-(1/4)) : ((3\pi/4) + 1/2)$

54. A straight section PQ of a circuit is along the x-axis from x= -a/2 to x = a/2 and carries a steady current i. The magnetic field due to the section PQ at a point x=+a is (M.P.P.M.T 1987)

1) Proportional to a s2) proportional to a^2
3) proportional to 1/a
4) equal to zero

55. A galvanometer of resistance 100 ohm gives full scale deflection with 5 mill ampere current. To convert it into a 5 volt range voltmeter, the value of resistance connected in series is (M.P. 1986)

1) 900 ohm 2) 9999 ohm
3) 10000 ohm 4) 1 mega ohm

56) A particle of mass 'M' and charge 'Q' moving with velocity $\vec{V}$ describes a circular path of radius 'R' when subjected to a uniform transverse magnetic field of induction 'B'. The workdone by the field when the particle completes one full circle is AIEEE-2003

1) $\left(\frac{MV^2}{R}\right)2\pi R$ 2) zero

3) $BQ2\pi R$ 4) $BQV2\pi R$

57) An ammeter reads upto 1 ampere. Its internal resistance is 0.81 ohm. To increase the range to 10A the value of the required shunt is (AIEEE-2004)

1) 0.03Ω 2) 0.3Ω 3) 0.9Ω 4) 0.09Ω

58) A particle of charge 16×10^{-18} coulomb moving with velocity 10m/s along the x-axis enters a region where a magnetic field of induction B is along the y-axis, and an electric field of magnitude $10Vm^{-1}$ is along the negative Z-axis. If the charged particle continues moving along the X-axis, the magnitude of B is (AIEEE-2003)

1) $10^3 Wb/m^2$ 2) $10^5 Wb/m^2$

3) $10^6 Wb/m^2$ 4) $10^{-3} Wb/m^2$

59) The magnetic field due to current carrying loop of radius 3cm at a point on the axis at a distance of 4 cm form the centre is $54\mu T$. What will be its value at the cente of the loop? (AIEEE-2004)

1) $250\mu T$ 2) $150\mu T$ 3) $125\mu T$ 4) $75\mu T$

60) A long wire carries a steady current. It is bent into a circle of one turn and the magnetic field at the cente of the coil is B. It is then bent ito a circular loop of n turns. The magnetic field at the centre of the coil will be (AIEEE-2004)

1) nB 2) n^2B^2 3) n^2B 4) $2n^2B$

61) A current 'i' ampere flows along an infinitely long straight thin walled tube , then the magnetic induction at any point inside the tube is (AIEEE-2004)

1) infinite 2) zero

3) $\frac{\mu_0}{4\pi}.\frac{2i}{r}tesla$ 4) $\frac{2i}{r}tesla$

62) Alternating current cannot be measured by D.C. ammeter because (AIEEE-2004)

1)A.C. cannot pass through D.C. ammeter

2) A.C. changes direction

3) average value of current for complete cycle is zero

4) D.C> ammeter will get damaged

KEY

1)1	2)1	3) 3	4)1	5)3
6)1	7)4	8)1	9)3	10)2
11)2	12)3	13)1	14)2	15)3
16)3	17)3	18)4	19)1	20)2
21)1	22)4	23)4	24) 2	25) 1
26) 2	27) 4	28) 2	29) 4	30) 4
31) 4	32) 4	33) 1	34) 3	35) 2
36) 4	37) 4	38) 4	39) 3	40) 3
41) 2	42) 1	43) 4	44) 1	45) 2
46) 2	47) 3	48) 2	49) 2	50) 1
51) 3	52) 4	53) 1	54) 4	55) 1
56) 2	57) 4	58) 1	59) 1	60) 3
61) 2	62) 3			