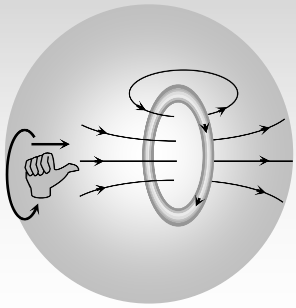
Assignment

(Basic & Advance Level Questions)



Assignment

Biot-Savart's Law

Basic Level

1. 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 **[AIEEE 20**

(a) $2n\ B$ (b) $n^2\ B$ (c) $n\ B$ (d) $2\ n^2\ B$.

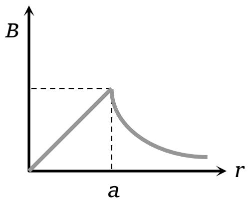
2. The magnetic field due to a current carrying circular loop of radius 3 *cm* at a point on the axis at a distance of 4 *cm* from the centre is $54\ \mu T$. What will be its value at the centre of the loop **[AIEEE 2004]**

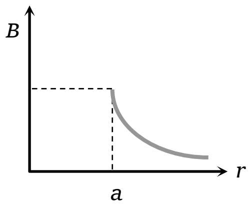
(a) $125\ \mu T$ (b) $150\ \mu T$ (c) $250\ \mu T$ (d) $75\ \mu T$

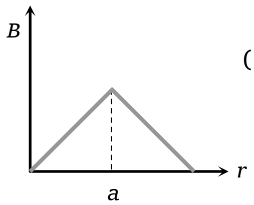
3. A circular coil of radius R carries an electric current. The magnetic field due the coil at a point on the axis of the coil located at a distance r from the centre of the coil, such that $r >> R$, varies as **[EAMCET 1987; AIIMS 2004]**

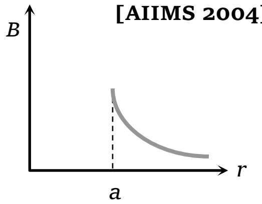
(a) $1/r$ (b) $1/r^{3/2}$ (c) $1/r^2$ (d) $1/r^3$

4. The magnetic field due to a straight conductor of uniform cross section of radius a and carrying a steady current is represented by **[AIIMS 2004]**

(a) 

(b) 

(c) 

(d) 

5. A current flows in a conductor from east to west. The direction of the magnetic field at a point above the conductor is **[KCET 2004]**

(a) Towards west (b) Towards east (c) Towards south (d) Towards north

6. The earth's magnetic field at a given point is $0.5\times10^{-5}\ Wb\ m^{-2}$. This field is to be annulled by magnetic induction at the centre of a circular conducting loop of radius 5.0 *cm*. The current required to be flown in the loop is nearly **[DCE 2001; AIIMS 2003]**

(a) 0.2 *A* (b) 0.4 *A* (c) 4 *A* (d) 40 *A*

7. Which is a vector quantity **[AFMC 2003]**

(a) Flux density (b) Magnetic flux (c) Intensity of magnetic flux (d) Magnetic potential

8. A long straight wire carrying of 30*A* 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 $(\mu_0 = 4\pi\times10^{-7}\,H/m$ **[KCET 2003]**

(a) 10^{-4} (b) 3×10^{-4} (c) 5×10^{-4} (d) 6×10^{-4}

9. Two similar coils are kept mutually perpendicular such that the centre coincide. At the centre, find the ratio of the magnetic field due to one coil the resultant magnetic field. By both coils, if the same current is flown **[BHU 2003]**

(a) $1:\sqrt{2}$ (b) 1 : 2 (c) 2 : 1 (d) $\sqrt{3}:1$

10. A wire in the form of a circular loop of one turn carrying a current produces a magnetic field *B* at the centre. If the same wire is looped into a coil of two turns and carries the same current, the new value of magnetic induction at the centre is

[AIIMS 1980; MP PMT 1995, 99; Haryana CEET 1998; KCET 2003]

(a) 5 *B* (b) 3 *B* (c) 2 *B* (d) 4 *B*

11. A circular loop of radius *R*, carrying current *i*, lies in *XY*-plane with its centre at origin. The total magnetic flux through *X-Y* plane is

[UPSEAT 2003]

(a) Directly proportional to *R* (b) Directly proportional to *i* (c) Inversely proportional to *i* (d) Zero

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

[MP PET 2003]

(a) $\frac{\mu_0 i}{2R}$ (b) $\frac{\mu_0 i}{8R}$ (c) $\frac{\mu_0 i}{4R}$ (d) $\frac{2\mu_0 i}{5R}$

13. The vector form of Biot-Savart law for a current carrying element is **[CBSE PMT 1996; MP PET 2000; MP PMT 2002]**

(a) $d\vec{B} = \frac{\mu_0}{4\pi}\frac{idl\sin\phi}{r^2}$ (b) $d\vec{B} = \frac{\mu_0}{4\pi}\frac{\vec{i}\,dl\times\hat{r}}{r^2}$ (c) $d\vec{B} = \frac{\mu_0}{4\pi}\frac{\vec{i}\,dl\times\hat{r}}{r^3}$ (d) $d\vec{B} = \frac{\mu_0}{4\pi}\frac{\vec{i}\,dl\times\vec{r}}{r^2}$

14. Two long straight wires are set parallel to each other. Each carries a current in the same direction and the separation between them is 2*r*. The intensity of the magnetic field midway between them is **[Kerala (Engg.) 2002]**

(a) $\mu_0 i/r$ (b) $4\mu_0 i/r$ (c) Zero (d) $\mu_0 i/4r$

15. A magnetic field can be produced by **[AIEEE 2002]**

(a) A moving charge (b) A changing electric field (c) None of these (d) Both of these

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

[AFMC 1999; CBSE PMT 1999; BHU 2002]

(a) $0.5\times10^{-5}\,T$ (b) $1.25\times10^{-4}\,T$ (c) $3\times10^{-5}\,T$ (d) $4\times10^{-5}\,T$

17. A long straight wire carries a current of π *amp*. The magnetic field due to it will be $5\times10^{-5}\,Weber/m^2$ at what distance from the wire

[μ_0 = permeability of air] **[MP PMT 2002]**

(a) $10^4\,\mu_0$ *metre* (b) $\frac{10^4}{\mu_0}$ *metre* (c) $10^6\,\mu_0$ *metre* (d) $\frac{10^6}{\mu_0}$ *metre*

18. On connecting a battery to the two corners of a diagonal of a square conductor frame of side *a*, the magnitude of the magnetic field at the centre will be **[CPMT 1998; MP PET 2002]**

(a) Zero (b) $\frac{\mu_0}{\pi a}$ (c) $\frac{2\mu_0}{\pi a}$ (d) $\frac{4\mu_0 i}{\pi a}$

19. 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 **[AIIMS 2001]**

(a) 1.679×10^{-5} *Tesla* (b) 2.028×10^{-4} *Tesla* (c) 1.257×10^{-3} *Tesla* (d) 1.512×10^{-6} *Tesla*

20. A current of 2 *amp*, flows in a long, straight wire of radius 2 *mm*. The intensity of magnetic field at the axis of the wire is **[MP PET 2001]**

(a) $\left(\frac{\mu_0}{\pi}\right)\times10^3$ *Tesla* (b) $\left(\frac{\mu_0}{2\pi}\right)\times10^3$ *Tesla* (c) $\left(\frac{2\mu_0}{\pi}\right)\times10^3$ *Tesla* (d) Zero

21. 1*A* current flows through an infinitely long straight wire. The magnetic field produced at a point 1 *metres* away from it is **[MP PMT 2001]**

(a) 2×10^{-3} *Tesla* (b) $\frac{2}{10}$ *Tesla* (c) 2×10^{-7} *Tesla* (d) $2\pi\times10^{-6}$ *Tesla*

22. A circular loop has a radius of 5 *cm* and it is carrying a current of 0.1 *amp*. It magnetic moment is **[MP PMT 2000]**

(a) 1.32×10^{-4} *amp - m*^{2} (b) 2.62×10^{-4} *amp - m*^{2} (c) 5.25×10^{-4} *amp - m*^{2} (d) 7.85×10^{-4} *amp - m*^{2}

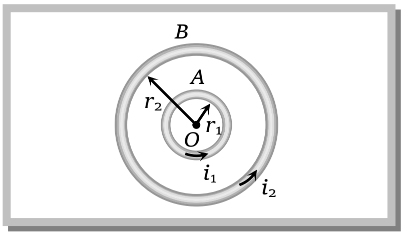
23. Which of the following gives the value of magnetic field according to 'Biot-Savart's law' **[RPMT 1989; BHU 2000]**

(a) $\frac{i\Delta l\sin\theta}{r^2}$ (b) $\frac{\mu_0}{4\pi}\frac{i\Delta l\sin\theta}{r}$ (c) $\frac{\mu_0}{4\pi}\frac{i\Delta l\sin\theta}{r^2}$ (d) $\frac{\mu_0}{4\pi}\cdot i\Delta l\sin\theta$

24. A circular loop of radius 0.0157 *m* carries a current of 2.0 *amp*. The magnetic field at the centre of the loop is $(\mu_0 = 4\pi\times10^{-7}\ weber/amp-m)$ **[MP PET 2000]**

(a) 1.57×10^{-5} *weber* / m^2 (b) 8.0×10^{-5} *weber* / m^2 (c) 2.5×10^{-5} *weber* / m^2 (d) 3.14×10^{-5} *weber* / m^2

25. *A* and *B* are two concentric circular conductors of centre *O* and carrying currents i_1 and i_2 as shown in the figure. The ratio of their radii is 1 : 2 and ratio of the flux densities at *O* due to *A* and *B* is 1 : 3. The value of i_1/i_2 will be **[KCET 2000]**



(a) 1/6

(b) 1/4

(c) 1/2

(d) 1/3

26. A long straight wire carries an electric current of 2*A*. The magnetic induction at a perpendicular distance of 5*m* from the wire is

[EAMCET (Med.) 2000]

(a) $4\times10^{-8}T$ (b) $8\times10^{-8}T$ (c) $12\times10^{-8}T$ (d) $16\times10^{-8}T$

27. The magnetic field in a straight current carrying conductor wire is

(a) Upward to downward (b) Downward to upward (c) All around (d) In a circular path

28. A current carrying wire in the neighbourhood produces **[AFMC 1999]**

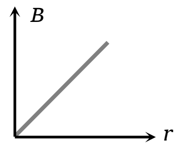
(a) No field (b) Electric field only (c) Magnetic field only (d) Electric and magnetic fields

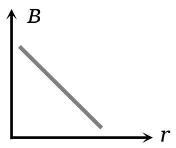
29. The magnetic induction in air at a point 1 *cm* away from a long wire that carries a current of 1*A*, will be **[BHU 1999]**

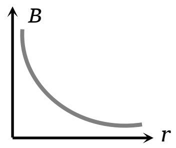
(a) $1\times10^{-5}\,T$ (b) $2\times10^{-5}\,T$ (c) $3\times10^{-5}\,T$ (d) $4\times10^{-5}\,T$

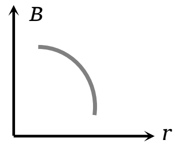
30. Which of the following graphs shows the variation of magnetic induction B with distance r from a long wire carrying current

[NCERT 1984; MNR 1998; MP PMT 1999]

(a) 

(b) 

(c) 

(d) 

31. 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

[CBSE PMT 1999]

(a) $2\times10^{-1}\,T$ (b) $4.31\times10^{-2}\,T$ (c) $6.28\times10^{-4}\,T$ (d) $9.81\times10^{-4}\,T$

32. A straight wire of diameter 0.5 *mm* carrying a current of 1*A is* replaced by another wire of 1 *mm* diameter carrying the same current. The strength of magnetic field far away is

(a) Twice the earlier value (b) Half of the earlier value (c) Quarter of its earlier value (d) Unchanged

33. A straight wire of length (π^2) *metre* is carrying a current of 2*A* and the magnetic field due to it is measured at a point distant 1 *cm* from it. If the wire is to be bent into a circle and is to carry the same current as before, the ratio of the magnetic field at its centre to that obtained in the first case would be **[Haryana CEE 1998]**

(a) 50 : 1 (b) 1 : 50 (c) 100 : 1 (d) 1 : 100

34. Two straight long conductors *AOB* and *COD* are perpendicular to each other and carry currents i_1 and i_2. The magnitude of the magnetic induction at a point *P* at a distance *a* from the point *O* in a direction perpendicular to the plane *ACBD* is

[MP PMT 1994]

(a) $\frac{\mu_0}{2\pi a}(i_1+i_2)$ (b) $\frac{\mu_0}{2\pi a}(i_1-i_2)$ (c) $\frac{\mu_0}{2\pi a}(i_1^2+i_2^2)^{1/2}$ (d) $\frac{\mu_0}{2\pi a}\frac{i_1 i_2}{(i_1+i_2)}$

35. Two concentric circular coils of ten turns each are situated in the same plane. Their radii are 20 and 40 *cm* and they carry respectively 0.2 and 0.3 *ampere* current in opposite direction. The magnetic field in *weber*/m^2 at the centre is **[CPMT 1994; MP PMT 1994]**

(a) $\frac{35}{4}\mu_0$ (b) $\frac{\mu_0}{80}$ (c) $\frac{7}{80}\mu_0$ (d) $\frac{5}{4}\mu_0$

36. 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) **[CBSE PMT 1993]**

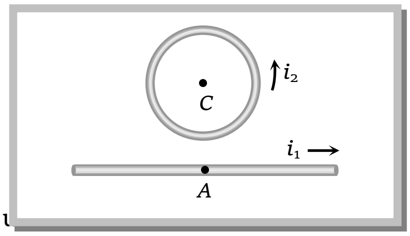
(a) 4 : 1 (b) 2 : 1 (c) 3 : 1 (d) 1 : 1

37. A straight section *PQ* of a circuit lies along the *X*-axis from $X=-\frac{a}{2}$ to $X=\frac{a}{2}$ and carries a steady current *i*. The magnetic field due to the section *PQ* at a point *X* = + *a* will be **[MP PMT 1987]**

(a) Proportional to *a* (b) Proportional to a^2 (c) Proportional to $\frac{1}{a}$ (d) Equal to zero

38. A straight wire and a circular loop both carrying currents are in the same vertical plane. There is no contact between the two at the point A. If B_1 and B_2 are magnetic fields due to i_1 and i_2 respectively at the point C, the centre of the loop, then the total field at C is

[CPMT 1987]



(a) Zero

(b) $(B_1 - B_2)$ or $(B_2 - B_1)$

(c) $(B_1 + B_2)$ perpendicular to the plane of the loop towards us

(d) $(B_1 + B_2)$ perpendicular to the plane of the loop away from u

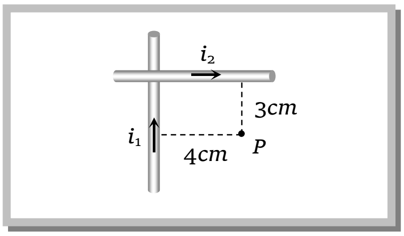
39. Two mutually perpendicular wires are placed along X-axis and Y-axis. They carry currents i_1 and i_2 respectively. The locus of the points for zero magnetic induction in the magnetic field produced by them is

(a) $y = (i_1 / i_2)x$ (b) $y = (i_1 i_2)x$ (c) $y = (i_2 / i_1)x$ (d) $y = x/(i_1 i_2)$

40. The field normal to the plane of a coil of n turns and radius r which carries a current i is measured on the axis of the coil at a small distance h from the centre of the coil. This is smaller than the field at the centre by the fraction

(a) $\frac{3}{2}\frac{h^2}{r^2}$ (b) $\frac{2}{3}\frac{h^2}{r^2}$ (c) $\frac{3}{2}\frac{r^2}{h^2}$ (d) $\frac{2}{3}\frac{r^2}{h^2}$

41. Two infinitely long insulated wires are kept perpendicular to each other. They carry currents $i_1 = 2\,A$. and $i_2 = 1.5\,A$. Find the direction and magnitude of magnetic field produced at P



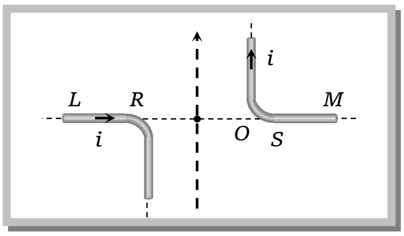
(a) $\sqrt{2} \times 10^{-5} \frac{N}{A \times m}, \otimes$

(b) $2 \times 10^{-5} \frac{N}{A \times m}, \odot$

(c) $10^{-5} \frac{N}{A \times m}, \otimes$

(d) $10^{-5} \frac{N}{A \times m}, \odot$

42. A pair of stationary and infinitely long bent wires are placed in the XY plane as shown in the figure. The wire carrying a current of 1.0 *ampere* each as shown. The segments L and M are along X- axis, the segments P and Q are parallel to Y- axis such that $OS = OR = 0.02m$. The direction and magnitude of magnetic induction at the origin is



(a) $10^{-4} \frac{Wb}{m^2}$

(b) $10^{-5} \frac{Wb}{m^2}$

(c) $2 \times 10^{-4} \frac{Wb}{m^2}$

(d) $2 \times 10^{-5} \frac{Wb}{m^2}$

43. Two similar coils of radius R and number of turns N are lying concentrically with their planes at right angles to each other. The currents flowing in them are i and $i\sqrt{3}$ respectively. The resultant magnetic induction at the centre will be (in Wb/m^2)

(a) $\frac{\mu_0 Ni}{2R}$ (b) $\frac{\mu_0 Ni}{R}$ (c) $\sqrt{3}\mu_0 \frac{Ni}{2R}$ (d) $\sqrt{5} \frac{\mu_0 Ni}{2R}$

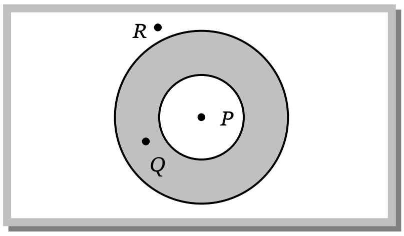
44. Two concentric coil carry the same current in opposite directions. The diameter of the outer coil in twice as compared to the inner coil. If at its centre, the smaller coil produces a magnetic field of $2T$, then the magnetic field at the common centre is

(a) $4T$ (b) $3\ T$ (c) $2T$ (d) $1\ T$

45. If the ratio of magnetic fields at two points in a definite direction due to current carrying straight conductor is 3/4, then the ratio of the distances of these points from the conductor will be

(a) $2/\sqrt{3}$ (b) $4/3$ (c) $\sqrt{3/4}$ (d) $\sqrt{3/2}$

46. Current is flowing through a conducting hollow pipe whose area of cross-section is shown in the figure. Magnetic induction will be zero at



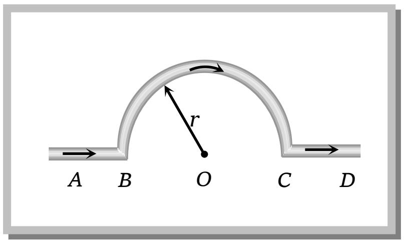
(a) Points P, Q and R

(b) Point R but not at P and Q

(c) Point Q but not at P and R

(d) Point P but not at Q and R

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



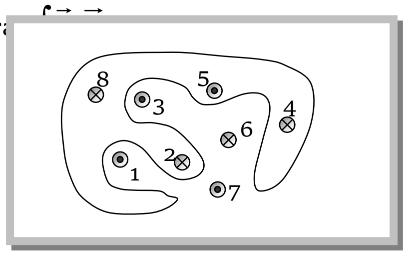
(a) $\frac{\mu_0 i}{r}$

(b) $\frac{\mu_0 i}{2r}$

(c) $\frac{\mu_0 i}{4r}$

(d) Zero

48. Eight wires cut the page perpendicularly at the points shown. Each wire carries current i_0. Odd currents are out of the page and even currents into the page. The line integra[l $\oint \vec{B} \cdot d\vec{l}$ ...]



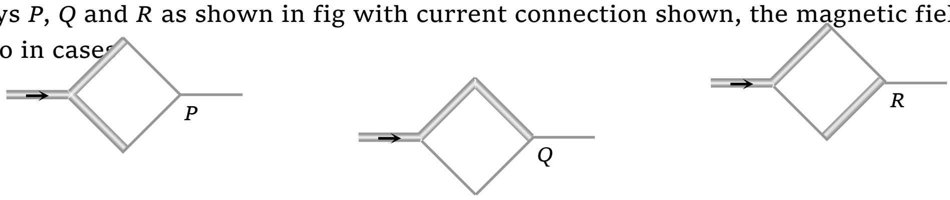
(a) $\mu_0 i_0$

(b) $2\mu_0 i_0$

(c) 0

(d) $3\mu_0 i_0$

49. Two thick wires and two thin wires, all of the same materials and same length form a square in the three different ways P, Q and R as shown in fig with current connection shown, the magnetic field at the centre of the square is zero in cases



(a) In P only (b) In P and Q only (c) In Q and R only (d) P and R only

Advance Level

50. A metallic loop is placed in a magnetic field. If a current is passed through it, then **[UPSEAT 2003]**

(a) The ring will feel a force of attraction
(b) The ring will feel a force of repulsion
(c) Will move to and from about its centre of gravity
(d) None of these

51. A long straight wire along the z-axis carries a current i in the negative z direction. The magnetic vector field $\vec{B}$ at a point having coordinates (x, y) in the $z = 0$ plane is **[IIT-JEE (Screening) 2002]**

(a) $\frac{\mu_0 i}{2\pi}\frac{(y\hat{i}-x\hat{j})}{(x^2+y^2)}$
(b) $\frac{\mu_0 i}{2\pi}\frac{(x\hat{i}+y\hat{j})}{(x^2+y^2)}$
(c) $\frac{\mu_0 i}{2\pi}\frac{(x\hat{j}-y\hat{i})}{(x^2+y^2)}$
(d) $\frac{\mu_0 i}{2\pi}\frac{(x\hat{i}-y\hat{j})}{(x^2+y^2)}$

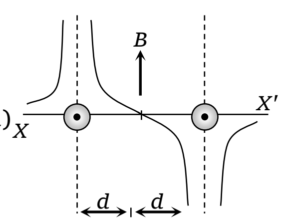
52. Magnetic fields at two points on the axis of a circular coil at a distance of 0.05 m and 0.2m from the centre are in the ratio 8 : 1. The radius of the coil is

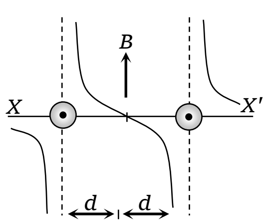
(a) 1.0 m
(b) 0.1 m
(c) 0.15 m
(d) 0.2 m

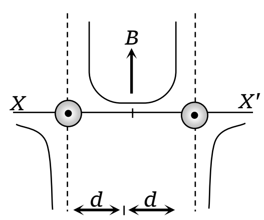
53. Two concentric coplanar circular loops of radii r_1 and r_2 carry currents of respectively i_1 and i_2 in opposite directions (one clock-wise and other anticlockwise). The magnetic induction at the centre of the loops is half due to i_1 alone at the centre. If $r_2 = 2r_1$, the value of i_2 / i_1 is **[MP PET 2000]**

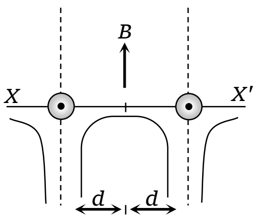
(a) 2
(b) 1/2
(c) 1/4
(d) 1

54. Two long parallel wires are at a distance 2d apart. They carry steady equal currents flowing out of the plane of the paper, as shown. The variation of the magnetic field B along the line XX' is given by **[IIT-JEE (Screening) 2000]**

(a) 

(b) 

(c) 

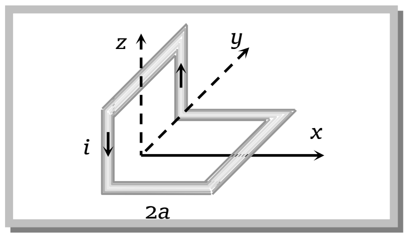
(d) 

55. Two long parallel wires P and Q are held perpendicular to the plane of paper with distance of 5m between them. If P and Q carry current of 2.5 *amp*. and 5 *amp*. respectively in the same direction, then the magnetic field at a point half-way between the wires is

[CBSE PMT 2000]

(a) $\mu_0 / 17$
(b) $\sqrt{3}\mu_0 / 2\pi$
(c) $\mu_0 / 2\pi$
(d) $3\mu_0 / 2\pi$

56. A non-planar loop of conducting wire carrying a current i is placed as shown in the figure. Each of the straight sections of the loop is of length 2a. The magnetic field due to this loop at the point P (a, 0, a) points in the direction **[IIT-JEE (Screening) 2000]**



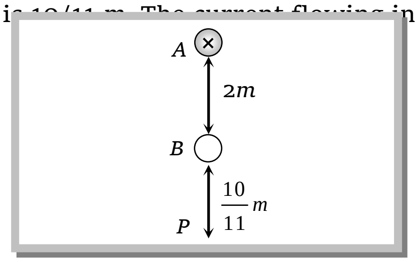
(a) $\frac{1}{\sqrt{2}}(-\hat{j}+\hat{k})$

(b) $\frac{1}{\sqrt{3}}(-\hat{j}+\hat{k}+\hat{i})$

(c) $\frac{1}{\sqrt{3}}(\hat{i}+\hat{j}+\hat{k})$

(d) $\frac{1}{\sqrt{2}}(\hat{i}+\hat{k})$

57. Two long straight parallel wires are 2 *metres* apart, perpendicular to the plane of the paper. The wire A carries a current of 9.6 A directed into the plane of the paper. The wire B carries a current such that the magnetic field at the point P is zero. The distance of point P from the wire B is 10/11 m. The current flowing in the wire B is



(a) 3A inward

(b) 3A outward

(c) 1.5A inward

(d) 1.5A outward

58. A coaxial cable consists of a inner solid conductor and an outer hollow conductor. The two conductors carry equal and opposite currents. If B_1 is the magnetic field in the space between the conductors and B_2 outside the cable, then

(a) $B_1 = 0, B_2 = 0$ (b) $B_1 = 0, B_2 \neq 0$ (c) $B_1 \neq 0, B_2 = 0$ (d) $B_1 \neq 0, B_2 \neq 0$

59. A current of 10*A* is established in a long wire along positive *Z*-axis. Find the magnetic field *B* at the point (1*m*, 0, 0)

(a) 1 μT along the *y*-axis (b) 2 μT along the *y*-axis (c) 1 μT along the axis (d) 2 μT along the *x*-axis

60. 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 potential difference across them so that the magnetic induction at their centre may be same

(a) $V_Q = 2V_P$ (b) $V_Q = 3V_P$ (c) $V_Q = 4V_P$ (d) $V_Q = 1/4 V_P$

61. Two parallel long wires carry currents i_1 and i_2 with $i_1 > i_2$. When the currents are in the same direction, the magnetic field midway between the wires is 15 μT. When the direction of i_2 is reversed, it becomes 40 μT. the ratio i_1 / i_2 is

(a) 3 : 4 (b) 11 : 7 (c) 7 : 11 (d) 11 : 15

62. A circular loop is kept in that vertical plane which contains the north-south direction. It carries a current that is towards north at the topmost point. Let *A* be a point on the axis of the circle to the east of it and *B* a point on this axis to the west of it. The magnetic field due to the loop

(a) Is towards east at *A* and towards west at *B* (b) Is towards west at *A* and towards east at *B*

(c) Is towards east at both *A* and *B* (d) Is towards west at both *A* and *B*

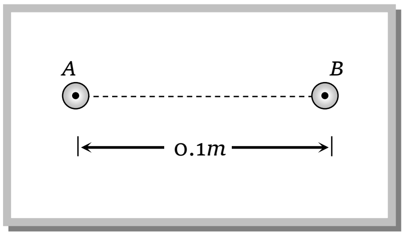
63. Two straight infinitely long and thin parallel wires are spaced 0.1 *m* apart and carry a current of 10 *A* each. The magnetic field at a point distant 0.1 *m* from both wires when currents are in the same direction

(a) $2\sqrt{3} \times 10^{-5}\ T$

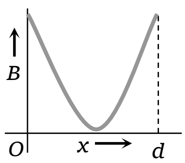
(b) $2 \times 10^{-5}\ T$

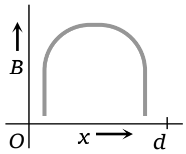
(c) $4 \times 10^{-5}\ T$

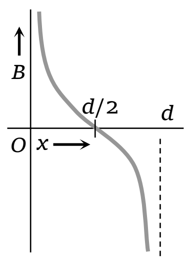
(d) Zero

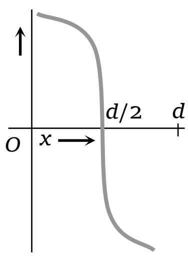


64. Two parallel beams of protons and electrons, carrying equal currents are fixed at a separation *d*. The protons and electrons move in opposite directions. *P* is a point on a line joining the beams, at a distance *x* from any one beam. The magnetic field at *P* is *B*. If *B* is plotted against *x*, which of the following best represents the resulting curve

(a) 

(b) 

(c) 

(d) 

65. A current *i* is flowing in a straight conductor of length *L*. The magnetic induction at a point distant $\frac{L}{4}$ from its centre will be

(a) $\frac{4\mu_0 i}{\sqrt{5}\pi L}$ (b) $\frac{\mu_0 i}{2\pi L}$ (c) $\frac{\mu_0 i}{\sqrt{2}L}$ (d) Zero

66. The magnetic field midway between two parallel current carrying wires, carrying currents i and $2i$ is B. If the current in the wire with current i is switched off, the magnetic field will become

(a) $B/3$ (b) $2B$ (c) $B/2$ (d) $B/4$

67. A long vertical wire carries a current of 10 *amperes* flowing upwards through it at a place where the horizontal component of the earth's magnetic induction is 0.3 *Gauss*. Then the total magnetic induction at a point 5 *cm* from the wire due magnetic north of the wire is

(a) 0.7 *Gauss* (b) 0.5 *Gauss* (c) 0.1 *Gauss* (d) 0.4 *Gauss*

68. The magnetic field on the axis of a current carrying circular coil of radius a at a distance $2a$ from its centre will be

(a) $\frac{\mu_0 i}{2}$ (b) $\frac{\mu_0 i}{10\sqrt{5}a}$ (c) $\frac{\mu_0 i}{4a}$ (d) $\mu_0 i$

69. If a current is flowing in anticlockwise direction through a coil placed in X-Y plane, then the direction of magnetic field at the centre of the coil will be

(a) In X-direction

(b) In Y-direction

(c) Upward and perpendicular to the X-Y plane

(d) Downward and perpendicular to the X-Y plane.

70. The radius of a circular coil is R. The distance on the axis from the centre of the coil where the intensity of magnetic field is $\frac{1}{2\sqrt{2}}$ times that at the centre, will be

(a) $x = 2R$ (b) $x = 3R/2$ (c) $x = R$ (d) $x = R/2$

71. A coil carrying a heavy current and having large number of turns is mounted in a *N-S* vertical plane. A current flows in the clockwise direction. A small magnetic needle at its centre will have its north pole in

(a) East-north direction (b) West-north direction (c) East-south direction (d) West-south direction

72. One *coulomb* charge is attached at one end of a non-conducting rod of length 0.6*m*. This rod is rotated with an angular velocity of $10^4\pi$ *rad/s* in a vertical plane about a horizontal axis passing through the other end of the rod. The magnetic field (in *Tesla*) at a distance of 0.8*m* from the centre of the path on the axis of rotation will be

(a) 1.13×10^{-3} (b) 2.26×10^{-3} (c) 0.113×10^{-3} (d) 1.13×10^{-4}

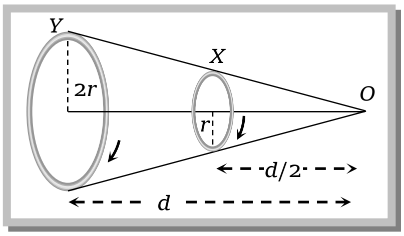
73. The flux density obtained at the centre of a circular coil of radius R which carries a current 'i' is B_0. At a distance pR from the centre on the axis, the flux density will be

(a) $\frac{B_0}{(-p+1)\sqrt{p+1}}$ (b) $\frac{B_0}{(p^2+1)\sqrt{p^2-1}}$ (c) $\frac{B_0}{(p^2+1)\sqrt{p^2+1}}$ (d) $\frac{B_0}{(P-1)\sqrt{p-1}}$

74. Same current i is flowing in three infinitely long wires along positive x, y and z directions. The magnetic field at a point (0, 0, − a) would be

(a) $\frac{\mu_0 i}{2\pi a}(\hat{j}-\hat{i})$ (b) $\frac{\mu_0 i}{2\pi a}(\hat{i}+\hat{j})$ (c) $\frac{\mu_0 i}{2\pi a}(\hat{i}-\hat{j})$ (d) $\frac{\mu_0 i}{2\pi a}(\hat{i}+\hat{j}+\hat{k})$

75. Two circular coils X and Y, having equal number of turns, carry equal currents in the same sense and subtend same solid angle at point O. If the smaller coil, X is midway between O and Y, then if we represent the magnetic induction due to bigger coil Y at O as B_Y and that due to smaller coil X at O as B_X , then



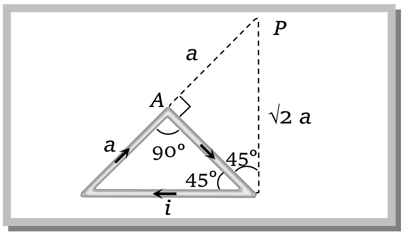
(a) $\frac{B_Y}{B_X}=1$

(b) $\frac{B_Y}{B_X}=2$

(c) $\frac{B_Y}{B_X}=\frac{1}{2}$

(d) $\frac{B_Y}{B_X}=\frac{1}{4}$

76. A piece of wire is bent into an isosceles is right angled triangle, whose shorter side is 'a' if the wire carries a current 'i' calculate the magnetic induction B at the point P



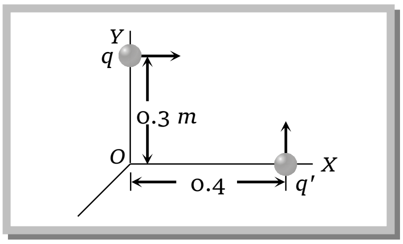
(a) $\frac{\mu_0 i}{4\sqrt{2}\pi a}\left(1-\frac{1}{\sqrt{2}}\right)\odot$

(b) $\frac{\mu_0 i}{4\sqrt{2}\pi a}\left(1+\frac{1}{\sqrt{2}}\right)\otimes$

(c) $\frac{\mu_0 i}{2\sqrt{2}\pi a}\left(1-\frac{1}{\sqrt{2}}\right)\odot$

(d) $\frac{\mu_0 i}{2\sqrt{2}\pi a}\left(1+\frac{1}{\sqrt{2}}\right)\otimes$

77. Two point charges $q=6\mu C$ and $q'=-2\mu C$ are moving in a frame of reference shown in the figure with velocities $6\times10^5\hat{i}(m/s)$ and $8\times10^5\hat{j}(m/s)$ respectively. The magnetic field in *Tesla* at the origin O will be



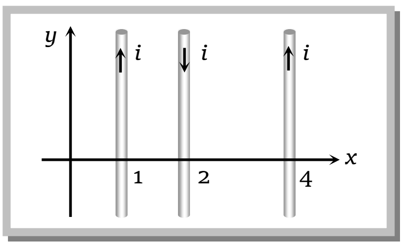
(a) $6.4\times10^{-5}(-\hat{k})$

(b) $5\times10^{-6}(-\hat{k})$

(c) $5\times10^{-6}(\hat{k})$

(d) $6.4\times10^{-5}(\hat{k})$

78. Equal currents $i=1A$ are flowing through the wires parallel to y-axis located at $x=+1m, x=+2m, x=+4m$ *etc*. but in opposite directions as shown. The magnetic field at origin (in *Tesla*) would be



(a) $-1.33\times10^{-7}\hat{k}$

(b) $1.33\times10^{-7}\hat{k}$

(c) $2.67\times10^{-7}\hat{k}$

(d) $-2.67\times10^{-7}\hat{k}$

79. Two parallel wires carrying equal currents in opposite directions are placed at $x=\pm a$ parallel to y-axis with $z=0$. Magnetic field at origin O is B_1 and at $P(2a,0,0)$ is B_2 . Then the ratio B_1/B_2 is

(a) – 3 (b) $-\frac{1}{2}$ (c) $-\frac{1}{3}$ (d) 2

80. Magnetic field at the centre of a circular coil of radius *R* and carrying a current *i* is (*c* = speed of light)

(a) $\frac{\mu_0 i}{2R}$ (b) $\frac{i}{2c^2\varepsilon_0 R}$ (c) $\frac{\mu_0 i}{2\pi R}$ (d) $\frac{ic^2}{2\varepsilon_0 R}$

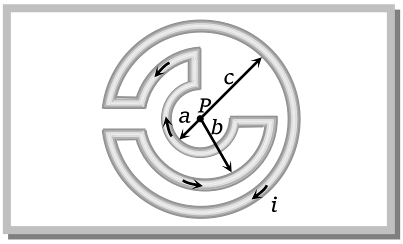
81. For $c = 2a$ and $a < b < c$, the magnetic field at point *P* will be zero

(a) $a = b$

(b) $a = \frac{3}{5}b$

(c) $a = \frac{5}{3}b$

(d) $a = \frac{1}{3}b$



Ampere's Law

Basic Level

82. A long solenoid carrying a current produces a magnetic field *B* along its axis. If the current is doubled and the number of turns per *cm* is halved, the new value of the magnetic field is **[CBSE 2003]**

(a) *B* (b) 2*B* (c) 4*B* (d) *B*/2

83. A long solenoid has 200 turns per *cm* and carries a current of 2.5 *amp*. The magnetic field at its centre is **[MP PET 2000]**

$[\mu_0 = 4\pi \times 10^{-7} weber / m^2]$

(a) $3.14 \times 10^{-2} Wb/m^2$ (b) $6.28 \times 10^{-2} Wb/m^2$ (c) $9.42 \times 10^{-2} Wb/m^2$ (d) $12.56 \times 10^{-2} Wb/m^2$

84. A long solenoid of length *L* has a mean diameter *D*. it has *n* layers of windings of *N* turns each. If it carries a current *I*, the magnetic field at its centre will be **[MP PMT 2000]**

(a) Proportional to *D* (b) Inversely proportional to *D* (c) Independent of *D* (d)

85. If a long hollow copper pipe carries a current, the produced magnetic field will be **[AFMC 1999; CPMT 2000]**

(a) Inside the pipe only (b) Outside the pipe only

(c) Both inside and outside the pipe only (d) Neither inside nor outside the pipe only

86. In a current carrying long solenoid, the field produced does not depend upon **[MP PET 1999]**

(a) Number of turns per unit length (b) Current flowing

(c) Radius of the solenoid (d) All of the above

87. A long copper tube of inner radius *R* carries a current *i*, the magnetic field *B* inside the tube is **[MP PMT 1995]**

(a) $\frac{\mu_0 i}{2\pi R}$ (b) $\frac{\mu_0 i}{4\pi R}$ (c) $\frac{\mu_0 i}{2R}$ (d) Zero

88. A long solenoid has 800 *turns per metre* length of solenoid. A current of 1.6 *A* flows through it. The magnetic induction at the end of the solenoid on its axis is

(a) 16×10^{-4} *Tesla* (b) 8×10^{-4} *Tesla* (c) 32×10^{-4} *Tesla* (d) 4×10^{-4} *Tesla*

89. A solenoid 1.5 *meter* and 4.0 *cm* in diameter possesses 10 turns/ *cm*. A current of 5.0 *A* is flowing through it. Calculate the magnetic induction

(i) Inside and (ii) At one end on the axis of solenoid respectively

(a) $2\pi \times 10^{-3}$ *T*, $\pi \times 10^{-3}$ *T* (b) $\pi \times 10^{-3}$ *T*, $2\pi \times 10^{-3}$ *T* (c) $2\pi \times 10^{-3}$ *T*, $2\pi \times 10^{-3}$ *T* (d) $\pi \times 10^{-3}$ *T*, $\pi \times 10^{-3}$ *T*

90. A current of $\frac{1}{4\pi}$ *A* is flowing through a toroid. It has 1000 number of turn per meter then value of magnetic field (in wb/m^2) along its axis is

(a) 10^{-2} (b) 10^{-3} (c) 10^{-4} (d) 10^{-7}

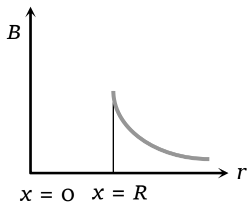
91. Mean radius of a toroid is 10 *cm* and number of turns are 500. If current flowing through it is 0.1 *A* then value of magnetic induction (in *Tesla*) for toroid

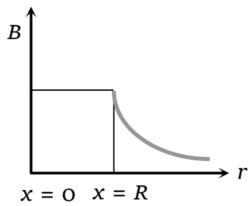
(a) 10^{-2} (b) 10^{-5} (c) 10^{-3} (d) 10^{-4}

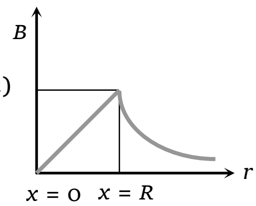
92. Which formula does not show the *Ampere's* circuital law

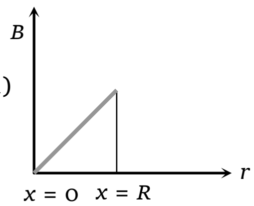
(a) $\oint \vec{B}.\vec{dl} = \mu_0 \Sigma i$ (b) $\frac{W}{m} = \mu_0 \Sigma i$ (c) $\oint \vec{H}.\vec{dl} = \Sigma i$ (d) $\oint \vec{H}.\vec{dl} = \mu_0 \Sigma i$

93. A long thin hollow metallic cylinder of radius '*R*' has a current *i ampere*. The magnetic induction '*B*'-away from the axis at a distance *r* from the axis varies as shown in

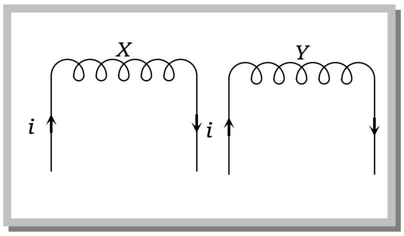
(a)


(b)


(c)


(d)


94. In the given figure, the coils *X* and *Y* have same number of turns and length. Each has a flux density *B* in the middle and a flux density $\frac{B}{2}$ at the ends when carrying the same current *i*. When the coils are joined together to form a long coil of twice the length of *X* or *Y* and the current *i* is sent through the coil, the flux density in the middle is given by



(a) 0

(b) $\frac{B}{2}$

(c) 2*B*

(d) *B*

Advance Level

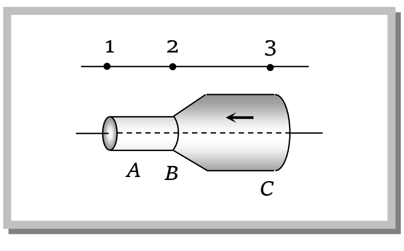
95. The magnetic induction at the centre of a solenoid is *B*. If the length of solenoid is reduced to half and the same wire is wound over it in two layers, then the new magnetic induction will be

(a) *B* (b) 2*B* (c) $\frac{B}{2}$ (d) 4*B*

96. The length of a solenoid is 0.1 *m* and its diameter is very small. A wire is wound over it in two layers. the numbers of turns in the inner layer is 50 and that on the outer layer is 40 The strength of current flowing in two layers in the same direction is 3 *A*. The magnetic induction in the middle of the solenoid will be

(a) 3.4×10^{-3} *Tesla* (b) 3.4×10^{-3} *Gauss* (c) 3.4×10^{3} *Tesla* (d) 3.4×10^{3} *Gauss*

97. A long, straight, hollow conductor (tube) carrying a current has two sections *A* and *C* of unequal cross-sections joined by a conical section *B*. 1, 2 and 3 are points on a line parallel to the axis of the conductor. The magnetic fields at 1, 2 and 3 have magnitudes B_1, B_2 and B_3



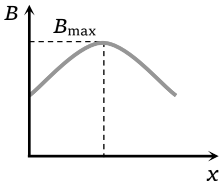
(a) $B_1 = B_2 = B_3$

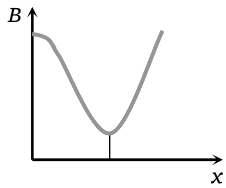
(b) $B_1 = B_2 \neq B_3$

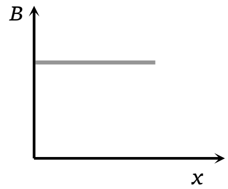
(c) $B_1 < B_2 < B_3$

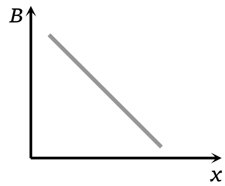
(d) B_2 cannot be found useless the dimensions of the section B are known

98. The correct curve between the magnetic induction (B) along the axis of a long solenoid due to current flow i in it and distance x from one end is

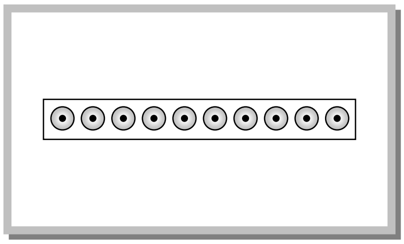
(a) 

(b) 

(c) 

(d) 

99. A large metal sheet carries an electric current along its surface. Current per unit length is λ. Magnetic field near the metal sheet is



(a) $\frac{\lambda\mu_0}{2}$

(b) $\frac{\lambda\mu_0}{2\pi}$

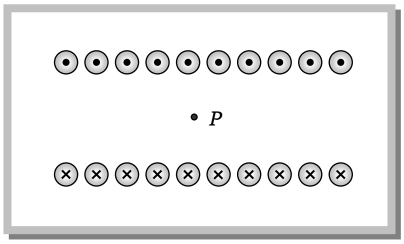
(c) $\lambda\mu_0$

(d) $\frac{\mu_0}{2\lambda\pi}$

100. A cylendrical conductor of radius 'R' carries a current 'i'. The value of magnetic field at a point which is $\frac{R}{4}$ distance inside from the surface is 10 T. Find the value of magnetic field at point which is $4R$ distance outside from the surface

(a) $\frac{4}{3}T$ (b) $\frac{8}{3}T$ (c) $\frac{40}{3}T$ (d) $\frac{80}{3}T$

101. Two large, parallel metal sheets carry currents in opposite directions as shown. The density of current is J. The magnetic field at a point mid-way between the sheets is



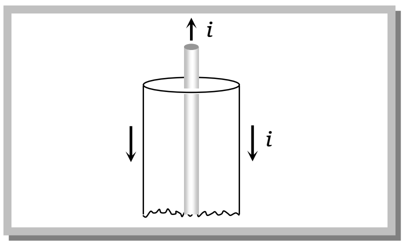
(a) 0

(b) $\mu_0 J$

(c) $\frac{1}{2}\mu_0 J$

(d) $2\mu_0 J$

102. A current i flows upwards along the inner conductor of a coaxial cable and returns down along the external shell. The magnetic field at a distance r inside the cable is



(a) Zero

(b) $\frac{\mu_0 i}{\pi r^2}$

(c) $\frac{\mu_0 i}{4\pi r}$

(d) $\frac{\mu_0 i}{2\pi r}$

Motion of Charge In Magnetic Field

Basic Level

103. A proton and an α-particle, moving with the same velocity, enter into a uniform magnetic field, acting normal to the plane of their motion. The ratio of the radii of the circular paths described by the proton and α-particle is **[AIIMS 2004]**

(a) 1 : 2 (b) 1 : 4 (c) 1 : 16 (d) 4 : 1

104. 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 work done by the field when the particle completes one full circle is **[AIEEE 2003]**

(a) $BQv\ 2\pi R$ (b) $\left(\frac{Mv^2}{R}\right)2\pi R$ (c) Zero (d) $BQ\,2\pi\ R$

105. An electron is travelling along the x-direction. It encounters a magnetic field in the y-direction. Its subsequent motion will be

[AIIMS 2003]

(a) Straight line along the x-direction (b) A circle in the xz-plane

(c) A circle in the yz-plane (d) A circle in the xy-plane

106. An electron having charge 1.6×10^{-19} C and mass 9×10^{-31} kg is moving with 4×10^{6} ms^{-1} speed in a magnetic field 2×10^{-1} *Tesla* in a circular orbit. The force acting on electron and the radius of the circular orbit will be

(a) $12.8\times10^{-13}\ N,\ 1.1\times10^{-4}\ m$ (b) $1.28\times10^{-13}\ N,\ 1.1\times10^{-3}\ m$

(c) $1.28\times10^{-14}\ N,\ 1.1\times10^{-4}\ m$ (d) $1.28\times10^{-13}\ N,\ 1.1\times10^{-4}\ m$

107. Two ions having masses in the ratio 1 : 1 and charges 1 : 2 are projected into uniform magnetic field perpendicular to the field with speeds in the ratio 2 : 3. The ratio of the radii of circular paths along which the two particles move is **[EAMCET 2003]**

(a) 4 : 3 (b) 2 : 3 (c) 3 : 1 (d) 1 : 4

108. A charged particle is at rest in the region where magnetic field and electric field are parallel. The particle will move in a

[IIT-JEE 1999; UPSEAT 2003]

(a) Straight line (b) Circle (c) Ellipse (d) None of these

109. 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

110. A charge $'q'$ moves in a region where electric field and magnetic field both exist, then force on it is

(a) $q\,(\vec{v}\times\vec{B})$ (b) $q\,\vec{E}+q(\vec{B}\times\vec{v})$ (c) $q\,\vec{B}+q(\vec{E}\times\vec{v})$ (d) $q\vec{E}+q(\vec{v}\times\vec{B})$

111. At a specific instant emission of radioactive compound is deflected in a magnetic field. The compound can emit

(i) Electrons (ii) Protons (iii) He^{2+} (iv)

The emission at the instant can be

(a) i, ii, iii (b) i, ii, iii, iv (c) iv (d) ii, iii

112. Which particles will have minimum frequency of revolution when projected with the same velocity perpendicular to a magnetic field

[Orissa CEE 2002]

(a) Li^+ (b) Electron (c) Proton (d) He^+

113. Mixed He^+ and O^{2+} ions (mass of He^+ = 4 *amu* and that of O^{2+} = 16 *amu*) beam passes a region of constant perpendicular magnetic field. If kinetic energy of all the ions is same then

(a) He^+ ions will be deflected more than those of O^{2+} (b) He^+ ions will be deflected less than those of O^{2+}

(c) All the ions will be deflected equally (d) No ions will be deflected

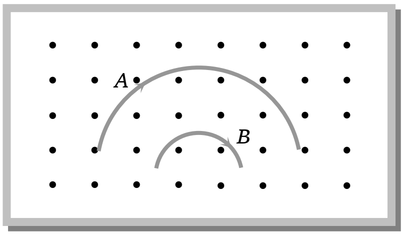
114. If cathode rays are projected at right angles to a magnetic field, their trajectory is **[JIPMER 2002]**

(a) Ellipse (b) Circle (c) Parabola (d) None of these

115. When a charged particle enters in uniform magnetic field. Its kinetic energy **[MP PMT 2001; MP PET 2002]**

(a) Remains constant (b) Increases (c) Decreases (d) Becomes zero

116. 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 $v_A = v_B$

117. 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*

118. A straight conductor carries a current of 5A. An electron travelling with a speed of $5 \times 10^6\ ms^{-1}$ parallel to the wire at a distance of 0.1 *m* from the conductor, experiences a force of

(a) $8 \times 10^{-20}\ N$ (b) $3.2 \times 10^{-19}\ N$ (c) $8 \times 10^{-18}\ N$ (d) $1.6 \times 10^{-19}\ N$

119. Cyclotron frequency does not depend upon **[BHU 2001]**

(a) Radius (b) Velocity (c) Magnetic induction (d) None of these

120. Cyclotron is used to accelerate **[CPMT 1993; AIIMS 2001]**

(a) Electrons (b) Neutrons (c) Positive ions (d) Negative ions

121. A proton moving with a velocity $3 \times 10^5\ ms^{-1}$ enters a magnetic field of 0.3 *Tesla* at an angle of 30° with the field. The radius of curvature of the path will be (*e/m* for proton = 10^8 *C/kg*)

(a) 0.5 *cm* (b) 0.02 *cm* (c) 1.25 *cm* (d) 2 *cm*

122. A proton moving with a velocity, $2.5 \times 10^7\ m/s$, enters a magnetic field of intensity 2.5 *T* making an angle 30° with the magnetic field. The force on the proton is

(a) $3 \times 10^{-12}\ N$ (b) $5 \times 10^{-12}\ N$ (c) $6 \times 10^{-12}\ N$ (d) $9 \times 10^{-12}\ N$

123. An electron (charge *q* coulomb) enters a magnetic field of *H weber/m²* with a velocity of *v m/s* in the same direction as that of the field. The force on the electron is

(a) *Hqv Newtons* in the direction of the magnetic field

(b) *Hqv* dynes in the direction of the magnetic field

(c) *Hqv Newtons* at right angles to the direction of the magnetic field

(d) Zero

124. A charge of 1 C is moving in a magnetic field of 0.5 *Tesla* with a velocity of 10 *m/sec*. Force experienced is **[RPMT 2000]**

(a) 5 *N* (b) 10 *N* (c) 0.5 *N* (d) 0 *N*

125. An electron moving towards the east enters a magnetic field directed towards the north. The force on the electron will be directed

[MP PET 2000]

(a) Vertically upward (b) Vertically downward (c) Towards the west (d) Towards the south

126. An electron (mass $=9.0\times10^{-31}$ *kg* and charge $=1.6\times10^{-19}$ *Coulomb*) is moving in a circular orbit in a magnetic field of 1.0×10^{-4} *weber* $/m^2$. Its period of revolution is **[MP PET 2000; Similar to RPET 2000]**

(a) 3.5×10^{-7} *second* (b) 7.0×10^{-7} *second* (c) 1.05×10^{-6} *second* (d) 2.1×10^{-6} *second*

127. A charge q is moving in a magnetic field then the magnetic force does not depend upon

(a) Charge (b) Mass (c) Velocity (d) Magnetic field

128. A charged particle moves in uniform magnetic field. The velocity of the particle at some instant makes an acute angle with the magnetic field. The path of the particle will be

(a) A straight line (b) A circle

(c) A helix with uniform pitch (d) A helix with non-uniform pitch

129. Cathode rays and canal rays produced in a certain discharge tube are deflected in the same direction, if

(a) A magnetic field is applied normally (b) An electric field is applied normally

(c) An electric field is applied tangentially (d) A magnetic field is applied tangentially

130. 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 $=1.6\times10^{-19}C$ **[MP PET 1997]**

(a) 36.7 *m* (b) 36.7 *cm* (c) 3.67 *m* (d) 3.67 *cm*

131. 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 **[MP PMT 1997]**

(a) Zero (b) $\frac{mv}{qB}$ (c) $\frac{2mv}{qB}$ (d) Infinity

132. A proton, a deuteron and an α – particle having the same kinetic energy are moving in circular trajectories in a constant magnetic field. If r_p, r_d and r_α denote respectively the radii of the trajectories of these particles, then

(a) $r_\alpha = r_p < r_d$ (b) $r_\alpha > r_d > r_p$ (c) $r_\alpha = r_d > r_p$ (d) $r_p = r_d = r_\alpha$

133. Two particles *X* and *Y* having equal charges, after being accelerated through the same potential difference, enter a region of uniform magnetic field and describes circular path of radius R_1 and R_2 respectively. The ratio of mass of *X* to that of *Y* is

[IIT 1988; CBSE 1995]

(a) $\left(\frac{R_1}{R_2}\right)^{1/2}$ (b) $\frac{R_2}{R_1}$ (c) $\left(\frac{R_1}{R_2}\right)^2$ (d) $\frac{R_1}{R_2}$

134. A proton and an electron both moving with the same velocity v enter into a region of magnetic field directed perpendicular to the velocity of the particles. They will now move in circular orbits such that

(a) Their time periods will be same (b) The time period for proton will be higher

(c) The time period for electron will be higher (d) Their orbital radii will be same

135. If electron velocity is $2\hat{i}+3\hat{j}$ and it is subjected to magnetic field of $4\hat{k}$, then its **[CPMT 1995]**

(a) Speed will change (b) Path will change (c) Both (a) and (b) (d) None of the above

136. An ion of specific charge $5\times10^{7} C/kg$ enters in transverse magnetic field of intensity 4×10^{-2} *Tesla* with velocity of $2\times10^{5} m/\sec$. Radius of its circular path will be

(a) 5 *cm* (b) 15 *cm* (c) 10 *cm* (d) 30 *cm*

137. If a particle of charge 10^{-12} *coulomb* moving along the $\hat{x}$-direction with a velocity $10^{5} m/s$ experiences a force of 10^{-10} *Newton* in $\hat{y}$-direction due to magnetic field, then the minimum magnetic field is

(a) 6.25×10^{3} *Tesla* in $\hat{z}$-direction (b) 10^{-15} *Tesla* in $\hat{z}$-direction

(c) 6.25×10^{-3} *Tesla* in $\hat{z}$-direction (d) 10^{-3} *Tesla* in $\hat{z}$-direction

138. A deutron of kinetic energy 50 *keV* is describing a circular orbit of radius 0.5 *metre* in a plane perpendicular to magnetic field *B*. The kinetic energy of the proton that describes a circular orbit of radius 0.5 *metre* in the same plane with the same *B* is **[CBSE 1991]**

(a) 25 *keV* (b) 50 *keV* (c) 200 *keV* (d) 100 *keV*

139. A proton with velocity $\vec{v}$ enters a region of uniform magnetic induction $\vec{B}$, with $\vec{v}$ perpendicular to $\vec{B}$ and describes a circle of radius *R*. If an α – particle enters this region with the same velocity $\vec{v}$, it describes a circle of radius **[IIT-JEE 1990]**

(a) $R/2$ (b) $\sqrt{2}\ R$ (c) 2 *R* (d) 4 *R*

140. A $2MeV$ proton is moving perpendicular to a uniform magnetic field of 2.5 *Tesla*. The force on the proton is **[CPMT 198**

(a) $2.5\times10^{-10} N$ (b) $7.6\times10^{-11} N$ (c) $2.5\times10^{-11} N$ (d) $7.8\times10^{-12} N$

141. A beam of protons enters a uniform magnetic field of 0.3 *Tesla* with a velocity of $4\times10^{5}\ m/\sec$ at an angle of 60° to the field. The radius of the helical path taken by the beam is

(a) 6 *mm* (b) 12 *mm* (c) 18 *mm* (d) 24 *mm*

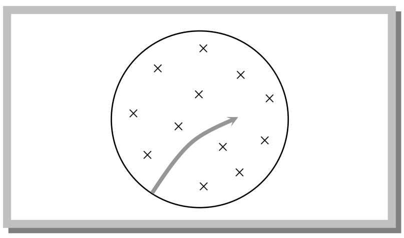
142. A proton, a deuteron and an α-particle enter a uniform magnetic field normally and the radii of their circular paths are same. The ratio of their kinetic energies is

(a) 2 : 1 : 1 (b) 1 : 1 : 2 (c) 2 : 2 : 1 (d) 2 : 1 : 2

143. A cyclotron in which the flux density is 1.57 *T* is employed to accelerate protons. How rapidly should the electric field between the dees be reversed

(a) 4.8×10^{8} *cycles* / sec (b) 2.5×10^{7} *cycles* / sec (c) 4.8×10^{6} *cycles* / sec (d) 8.4×10^{8} *cycles* / sec

144. There is a magnetic field acting in a plane perpendicular to this sheet of paper, downward into the paper as shown in the figure. Particles in vacuum move in the plane of the paper from left to right. The path indicated by the arrow could be travelled by



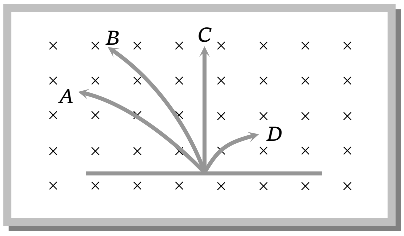
(a) Proton

(b) Neutron

(c) Electron

(d) Alpha particle

145. A neutron, a proton, an electron and an α-particle enter a region of uniform magnetic field with equal velocities. The magnetic field is perpendicular directed into the paper. The tracks of particles are labelled in fig. The electron follows track



(a) *A*

(b) *B*

(c) *C*

(d) *D*

146. A charged particle moves through a magnetic field in a direction perpendicular to it. Then the

(a) Direction of the particle remains unchanged (b) Acceleration remains unchanged

(c) Velocity remains unchanged (d) Speed of the particle remains unchanged

147. A particle with a specific charge *s* is fired with a speed *v* towards a wall at a distance *d*, perpendicular to the wall. What minimum magnetic field must exist in this region for the particle not to hit the wall

(a) v/sd (b) $2v/sd$ (c) $v/2sd$ (d) $v/4sd$

148. A beam of protons is moving horizontally towards you. As it approaches, it passes through a magnetic field directed downward. The beam deflects

(a) To your left side (b) To your right side (c) Does not deflect (d) Nothing can be said

149. A charged particle is whirled in a horizontal circle by attaching it to a string fixed at one point. If a magnetic field is switched on in the vertical direction, the tension in the string

(a) Will increase (b) Will decrease (c) Will remain the same (d) May increase or decrease

150. A charged particle entering a magnetic field from outside in a direction perpendicular to the field

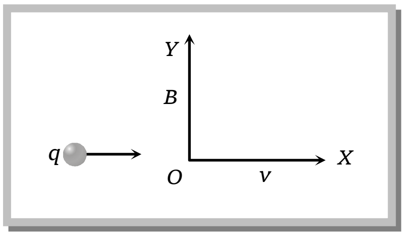
(a) Can never complete one rotation inside the field

(b) May or may not complete one rotation in the field depending on its angle of entry into the field

(c) Will always complete exactly half of a rotation before leaving the field

(d) May follow a helical path depending on its angle of entry into the field

151. If a positively charged particle is moving as shown in the figure, then it will get deflected due to magnetic field towards



(a) + *x*-direction

(b) + *y*-direction

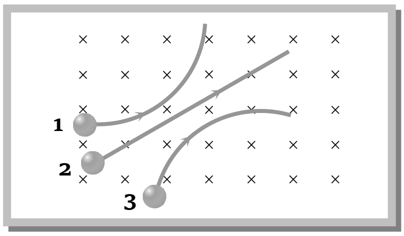
(c) – *x*-direction

(d) + *z*-direction

152. A charged particle, having charge q_1 accelerated through a potential difference V enter a perpendicular magnetic field in which it experiences a force F. If V is increased to $5V$, the particle will experience a force

(a) F (b) $5F$ (c) $\frac{F}{5}$ (d) $\sqrt{5}F$

153. Particles 1, 2 and 3 are moving perpendicular to a uniform magnetic field, then particle



(a) 1 is positively charged and particle 3 is negatively charged

(b) 1 is negatively charged and particle 3 is positively charged

(c) 1 is negatively charged and particle 2 is neutral

(d) 1 and 3 are positively charged and particle 2 is neutral

154. A proton and an α -particle enter a uniform magnetic field perpendicular with the same speed. If proton takes 20μ seconds to make 5 revolutions, then the periodic time for the α -particle would be

(a) $5\mu\,\text{sec}$ (b) $8\mu\,\text{sec}$ (c) $10\mu\,\text{sec}$ (d) $16\mu\,\text{sec}$

155. Doubly ionised oxygen atoms (O^{2-}) and singly-ionised lithium atoms (Li^{+}) are traveling with the same speed, perpendicular to a uniform magnetic field. The relative atomic masses of oxygen ad lithium are 16 and 7 respectively. The ratio $\frac{\text{radius of } O^{2-} \text{orbit}}{\text{radius of } Li^{+} \text{orbit}}$ is

(a) 16 : 7 (b) 8 : 7 (c) 7 : 8 (d) 7 : 16

Advance Level

156. An electron moving with a speed u along the positive x-axis at $y = 0$ enters a region of uniform magnetic field $\vec{B} = -B_o\hat{k}$ which exists to the right of y-axis. The electron exits from the region after some time with the speed v at ordinate y, then

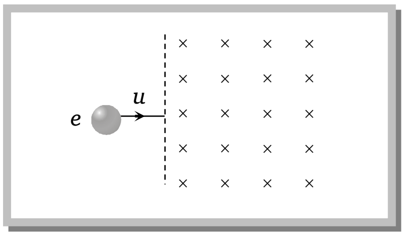
[IIT-JEE (Screening 2004]

(a) $v > u, y < 0$

(b) $v = u, y > 0$

(c) $v > u, y > 0$

(d) $v = u, y < 0$



157. For a positively charged particle moving in a x-y plane initially along the x-axis, there is a sudden change in its path due to the presence of electric and/or magnetic fields beyond P. The curved path is shown in the x-y plane and is found to be non-circular.

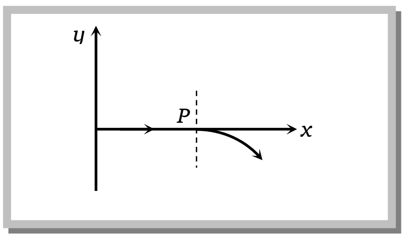
Which one of the following combinations is possible **[IIT-JEE (Screening) 2003]**

(a) $\vec{E} = 0;\ \vec{B} = b\hat{i} + c\hat{k}$

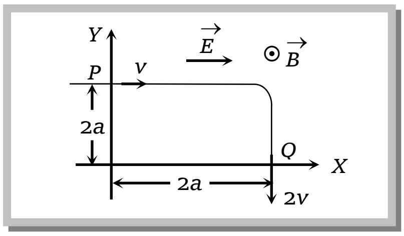
(b) $\vec{E} = a\hat{i}; B = c\hat{k} + a\hat{i}$

(c) $\vec{E} = 0;\ \vec{B} = c\hat{j} + b\hat{k}$

(d) $\vec{E} = a\hat{i};\ \vec{B} = c\hat{k} + b\hat{j}$



158. A particle of charge $+q$ and mass m moving under the influence of a uniform electric field $E\hat{i}$ and a uniform magnetic field $B\hat{k}$ follows trajectory from P to Q as shown in figure. The velocities at P and Q are $v\hat{i}$ and $-2v\hat{j}$ respectively. Which of the following statement (s) is/are correct.



(a) Rate of work done by electric field at P is zero

(b) Rate of work done by both the field at Q is zero

(c) $E = \frac{3}{4}\frac{mv^2}{qa}$

(d) Rate of work done by electric field at P is $\frac{3}{4}\frac{mv^3}{a}$

159. A homogeneous electric field $\vec{E}$ 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

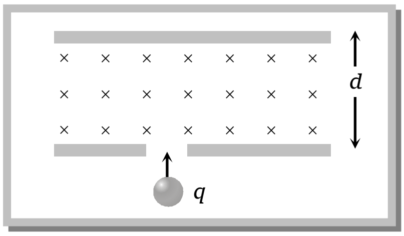
(a) Go on moving in the same direction with increasing velocity

(b) Go on moving in the same direction with constant velocity

(c) Turn to its right

(d) Turn to its left

160. As shown in the figure, a uniform magnetic field B is applied between two identical plates. There is a hole in one plate. If a particle of charge q, *mass* m and energy E enters this magnetic field through this hole, then the particle will not collide with the upper plate provide



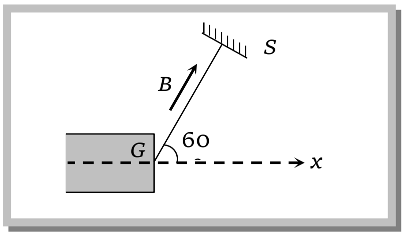
(a) $B > \frac{2mE}{qd}$

(b) $B > \frac{\sqrt{2mE}}{qd}$

(c) $B < \frac{2mE}{qd}$

(d) $B < \frac{\sqrt{2mE}}{qd}$

161. An e^- gun G emits electrons of energy 2 *KeV* travelling in the positive x-direction. The e^- are required to hit the spots S. Where $GS = 0.1\ m$, and the line GS makes an angle 60° with the axis, as shown in the figure. A uniform magnetic field parallel to GS exists in the region outside the electron gun. The minimum value of B needed to make the electrons hit S **[IIT-JEE 1993]**



(a) $4.73 \times 10^{-3}\ T$

(b) $3.74 \times 10^{-3}\ T$

(c) $7.43 \times 10^{-3}\ T$

(d) $6.37 \times 10^{3}\ T$

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

(a) 90^o (b) $\sin^{-1}(2/3)$ (c) 30^o (d) 180^o

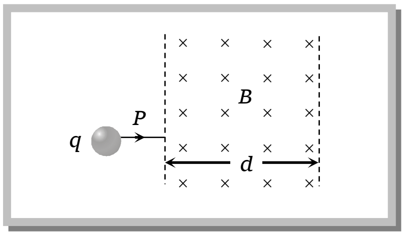
163. A particle with charge q, moving with a momentum p, enters a uniform magnetic field normally. The magnetic field has magnitude B and is confined to a region of width d, where $d < \frac{p}{Bq}$, The particle is deflected by an angle θ in crossing the field

(a) $\sin\theta = \frac{Bqd}{p}$

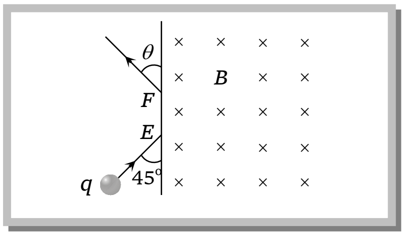
(b) $\sin\theta = \frac{p}{Bqd}$

(c) $\sin\theta = \frac{Bp}{qd}$

(d) $\sin\theta = \frac{pd}{Bq}$



164. A particle of mass $m = 1.6 \times 10^{-27}$ *kg* and charge $q = 1.6 \times 10^{-19}$ *C* enters a region of uniform magnetic field of strength 1 *Tesla* along the direction shown in the figure. The speed of the particle is 10^7 *m/s*. The magnetic field is directed inwards normal to the plane of paper. The particle leaves the region of the field at the point *F*. The distance *EF* will be



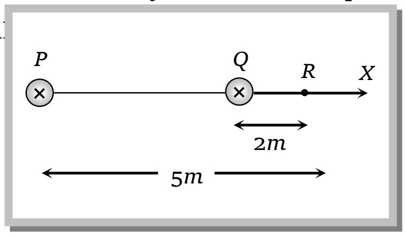
(a) 1.41 *m*

(b) 0.56 *m*

(c) 0.28 *m*

(d) 0.14 *m*

165. In the adjoining diagram, *P* and *Q* are parallel wires carrying currents of 2.5 *A* and *i* respectively directed at right angles to the plane of paper inwards. An electron moving with velocity $4 \times 10^5\, m/s$ in positive *x* - direction experiences a force of $3.2 \times 10^{-20}\, N$ at point R. The value of *i* wil



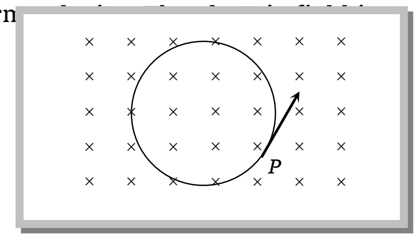
(a) 1*A*

(b) 2*A*

(c) 3*A*

(d) 4*A*

166. A particle having a charge of $10.0\,\mu C$ and mass $1\,\mu g$ moves in a circle of radius 10 *cm* under the influence of a magnetic field of induction $0.1T$. When the particle is at a point P, a uniform electric field is switched on so that the particle starts moving along the tangent with a uniforn



(a) 0.1 *V/m*

(b) 1.0 *V/m*

(c) 10.0 *V/m*

(d) 100 *V/m*

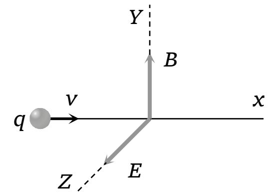
167. A particle of charge per unit mass α is released from origin with a velocity $\vec{v} = v_0\hat{i}$ in a uniform magnetic field $\vec{B} = -B_0\hat{k}$. If the particle passes through (0, *y*, 0), then *y* is equal to

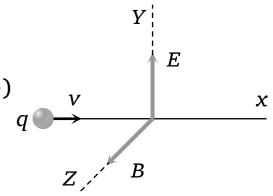
(a) $-\frac{2v_0}{B_0\alpha}$ (b) $\frac{v_0}{B_0\alpha}$ (c) $\frac{2v_0}{B_0\alpha}$ (d) $-\frac{v_0}{B_0\alpha}$

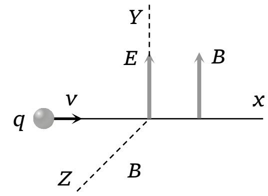
168. A charged particle enters a uniform magnetic field with velocity vector at an angle of 45° with the magnetic field. The pitch of the helical path followed by the particle is *p*. The radius of the helix will be

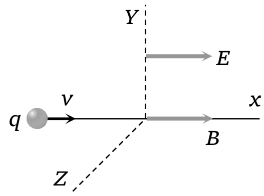
(a) $\frac{p}{\sqrt{2}\pi}$ (b) $\sqrt{2}p$ (c) $\frac{p}{2\pi}$ (d) $\frac{\sqrt{2}p}{\pi}$

169. A particle of charge q and mass m is moving along the x-axis with a velocity v and enters a region of electric field E and magnetic field B as shown in figure below for which figure the net force on the charge may be zero

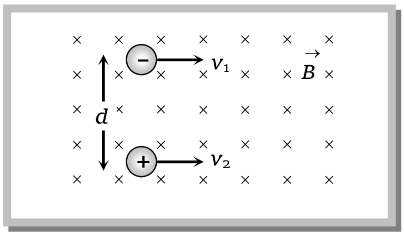
(a) 

(b) 

(c) 

(d) 

170. Two identical particles having the same mass m and charges $+q$ and $-q$ separated by a distance d enter in a uniform magnetic field B directed perpendicular to paper inwards with speeds v_1 and v_2 as shown in figure. The particles will not collide if



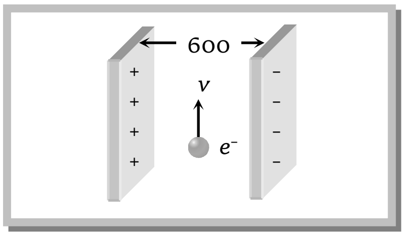
(a) $d > \frac{m}{Bq}(v_1 + v_2)$

(b) $d < \frac{m}{Bq}(v_1 + v_2)$

(c) $d > \frac{2m}{Bq}(v_1 + v_2)$

(d) $v_1 = v_2$

171. A potential difference of 600 V is applied across the plates of a parallel plate capacitor. The separation between the plates is 3 mm. An electron projected vertically parallel to the plates, with velocity of 2×10^6 m/s, moves undeflected between the plates. Find the magnitude and direction of the magnetic field in the region between the capacitor plates



(a) 0.1 T, into the page

(b) 0.1 T, out of the page

(c) 0.2 T, into the page

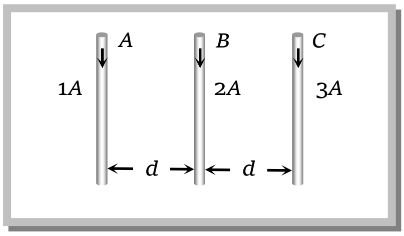
(d) 0.2 T, out of the page

Magnetic Force on a current Carrying wire

Basic Level

172. Three long straight wires A, B and C are carrying currents as shown ion figure. Then the resultant force on B is directed...

[KCET 2004]



(a) Perpendicular to the plane of paper and inward

(b) Perpendicular to the plane of paper and outward

(c) Towards C

(d) Towards A

173. Two long conductors, separated by a distance d carry current i_1 and i_2 in the same direction. They exert a force F on each other. Now the current in one of them is increased to two times and its direction is reversed. The distance is also increased to 3d. The new value of the force between them is **[AIEEE 2004]**

(a) $-\frac{2F}{3}$ (b) $\frac{F}{3}$ (c) $-2F$ (d) $-\frac{F}{3}$

174. Two parallel beams of positrons moving in the same direction will **[AIIMS 2004]**

(a) Repel each other (b) Will not interact with each other

(c) Attract each other (d) Be deflected normal to the plane containing the two beams

175. When two wires have current in same direction then force is

(a) Attractive (b) Repulsive (c) Both (d) Can't be determined

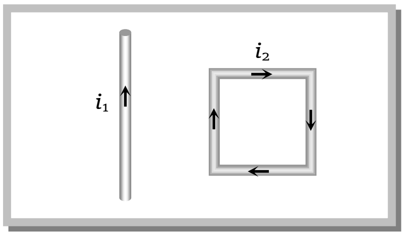
176. The current is flowing in opposite directions under magnetic field in two long parallel wires then

(a) Both the wires will attract each other (b) Both the wires will repell each other

(c) Both the wires will move perpendicular to each other (d) None of these

177. A rectangular loop carrying a current i_1 is situated near a long straight wire carrying a steady current i_2. The wire is parallel to one of the sides of the loop and is in the plane of the loop as shown in the figure. Then the current loop will

[IIT-JEE 1985; MP PET 1995; MP PMT 1995, 99; AFMC 2003; AIIMS 2003]



(a) Move away from the wire

(b) Move towards the wire

(c) Remain stationary

(d) Rotate about an axis parallel to the wire

178. Two parallel conductors *A* and *B* of equal lengths carry currents *i* and 10 *i*, respectively, in the same direction. Then

[MP PET 2003]

(a) *A* and *B* will repel each other with same force (b) *A* and *B* will attract each other with same force

(c) *A* will attract each *B*, but *B* will repel *A* (d) *A* and *B* will attract each other with different forces

179. Two thin and parallel wires are placed at a distance *b* and *i* current is flowing through each of the wires. The magnitude of the force exerted on the unit length of wire due to another wire will be

[IIT-JEE 1986; CPMT 1991; RPMT 1997; MP PET 1996, 2003; MP PMT 1996, 99; UPSEAT 2003]

(a) $\mu_0 i^2 / b^2$ (b) $\mu_0 i^2 / 2\pi b$ (c) $\mu_0 i / 2\pi b$ (d) $\mu_0 i / 2\pi b^2$

180. 1.2 *amp* current is flowing in a wire of 0.3 *m* length, It is placed perpendicular to the magnetic field (identical to 2*T*). The force acting on the wire will be

(a) 1*N* (b) 0.72 *N* (c) 0 (d) 2*N*

181. If a current is passed through a spring then the spring will

(a) Expand (b) Compress (c) Remains same (d) None of these

182. Two identical circular loops of metal wire are lying on a table. Loop *A* carries a current which increases with time. In response, the loop *B*

(a) Is attracted by the loop *A* (b) Is repelled by the loop *A* (c) Remains stationary (d)

183. Two long straight parallel conductors separated by a distance of 0.5 *m* carry currents of 5*A* and 8*A* in the same direction. The force per unit length experienced by each other is

(a) $1.6 \times 10^{-5}\,N$ (attractive) (b) $1.6 \times 10^{-5}\,N$ (repulsive)

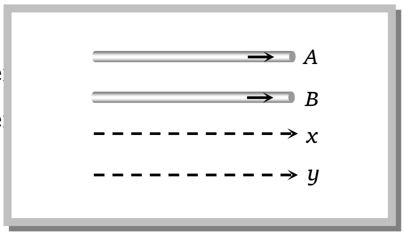
(c) $16 \times 10^{-5} N$ (attractive) (d) $16 \times 10^{-5} N$ (repulsive)

184. One ampere is that current flowing in two infinite long parallel wires placed at a distance on one meter produces between them a force of

(a) 1 N/m (b) 2×10^{7} N/m (c) 2×10^{-7} N/m (d) 3×10^{-7} N/m

185. A and B are two conductors carrying a current i in the same direction. x and y are two electron beams moving in the same direction

[KCET 2002]



(a) There will be repulsion between A and B, attraction betwee

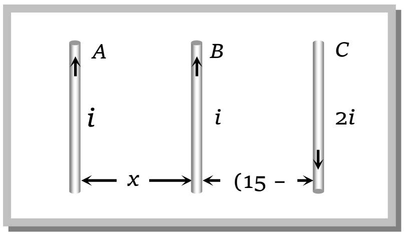
(b) There will be attraction between A and B, repulsion betwee

(c) There will be repulsion between A and B and also x and y

(d) There will be attraction between A and B and also x and y

186. A, B and C are parallel conductors of equal length carrying currents i, i and $2i$ 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. F_2 is the force exerted by C on A. Choose the correct answer

[Kerala (Engg.) 2001]



(a) $F_1 = 2F_2$

(b) $F_2 = 2F_1$

(c) $F_1 = F_2$

(d) $F_1 = -F_2$

187. If a wire of length 1 *metre* placed in uniform magnetic field 1.5 *Tesla* at angle 30° 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

188. An arbitrary shaped closed coil is made of a wire of a 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) $\frac{1}{2}iBL$

189. Two long parallel copper wires carry currents of 5A each in opposite directions. If the wires are separated by a distance of 0.5 m, then the force between the two wires is

(a) $10^{-5} N$, attractive (b) $10^{-5} N$, repulsive (c) 2×10^{-5}, attractive (d) 2×10^{-5}, repulsive

190. 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

[Roorkee 2000]

(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

191. Force per unit length acting at one end of each of the two parallel wires, carrying current i each, kept distance r apart is

[Haryana CEET 2000]

(a) $\frac{\mu_0}{4\pi}\frac{i^2}{r}$ (b) $\frac{\mu_0}{4\pi}\frac{2i^2}{r}$ (c) $\frac{\mu_0}{4\pi}\frac{(2i)^2}{r}$ (d) $\frac{\mu_0}{4\pi}\frac{i^2}{4r}$

192. If two streams of protons move parallel to each other in the same direction, then they

(a) Do not exert any force on each other (b) Repel each other
(c) Attract each other (d) Get rotated to be perpendicular to each other

193. A conducting circular loop of radius r carries a current i. It is placed in a uniform magnetic field $\overrightarrow{B_0}$ such that $\overrightarrow{B_0}$ is perpendicular to the plane of the loop. The magnetic force acting on the loop is

(a) irB_0 (b) $2\pi irB_0$ (c) Zero (d) πirB_0

194. Two very long, straight and parallel wires carry steady 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 the magnetic field acting in the charge at this instant is **[IIT-JEE 1998]**

(a) $\frac{\mu_0 iqv}{2\pi d}$ (b) $\frac{\mu_0 iqv}{\pi d}$ (c) $\frac{2\mu_0 iqv}{\pi d}$ (d) 0

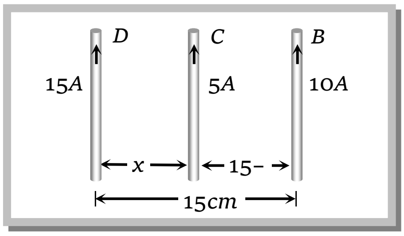
195. A straight wire of length 0.5 *metre* and carrying a current of 1.2 *ampere* placed in a uniform magnetic field of induction 2 *Tesla*. The magnetic field is perpendicular to the length of the wire. The force on the wire is

(a) 2.4 *N* (b) 1.2 *N* (c) 3.0 *N* (d) 2.0 *N*

196. A current of 5 *ampere* is flowing in a wire of length 1.5 *metres*. A force of 7.5 *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^o (b) 45^o (c) 60^o (d) 90^o

197. 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 **[AMU 1995]**



(a) 9 *cm*

(b) 7 *cm*

(c) 5 *cm*

(d) 3 *cm*

198. Through two parallel wires *A* and *B*, 10 and 2 *ampere* of currents are passed respectively in opposite direction. If the wire *A* is infinitely long and the length of the wire *B* is 2 *m*, the force on the conductor *B*, which is situated at 10 *cm* distance from *A* will be

[CPMT 1988; MP PMT 1994]

(a) $8\times10^{-5}\,N$ (b) $4\times10^{-7}\,N$ (c) $4\times10^{-5}\,N$ (d) $4\pi\times10^{-7}\,N$

199. Two straight parallel wires, both carrying 10 *ampere* in the same direction attract each other with a force of $1\times10^{-3}\,N$. If both currents are doubled, The force of attraction will be

(a) $1\times10^{-3}\,N$ (b) $2\times10^{-3}\,N$ (c) $4\times10^{-3}\,N$ (d) $0.25\times10^{-3}\,N$

200. Two long wires are hanging freely. They are joined first in parallel and then in series and then are connected with a battery. In both cases, which type of force acts between the two wires

(a) Attraction force when in parallel and repulsion force when in series

(b) Repulsion force when in parallel and attraction force when in series

(c) Repulsion force in both cases

(d) Attraction force in both cases

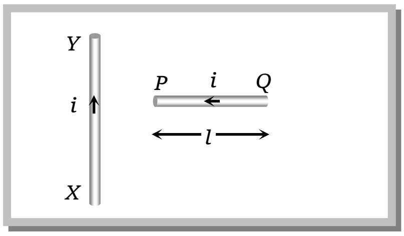
201. A power line lies along the East-West direction and carries a current of 10 *ampere*. The force per *metre* due to the earth's magnetic field of 10^{-4} *Tesla* is

(a) $10^{-5}\,N$ (b) $10^{-4}\,N$ (c) $10^{-3}\,N$ (d) $10^{-2}\,N$

202. Two circular coils mounted parallel to each other on the same axis carry steady currents. If an observer between the coils reports that one coil is carrying a clockwise current i_1, while the other is carrying a counter clockwise current i_2, between the two coils, then there is

(a) A steady repulsive force (b) Zero force (c) A repulsive force (d)

203. A conductor *PQ*, carrying a current *i* is placed perpendicular to a long conductor *xy* carrying a current *i*. The direction of force on *PQ* will be



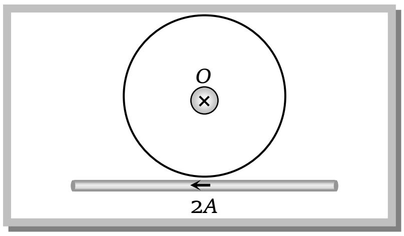
(a) Towards right

(b) Towards left

(c) Upwards

(d) Downwards

204. A long vertical straight conductor (not shown) is placed at *O* in figure, carries an inward current of 5*A*. A small straight wire *X* of length 0.03 *m* is placed along the tangent to the circle of centre *O* and radius 0.1*m* as shown. If *X* carries a current of 2*A*, The force on *X* in *N* is



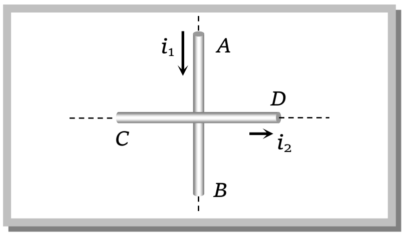
(a) 9×10^{-7}

(b) 6×10^{-7}

(c) Zero

(d) 3×10^{-7}

205. Two long wires *AB* and *CD* carry currents i_1 and i_2 in the directions shown



(a) Force on wire *AB* is towards left

(b) Force on wire *AB* is towards right

(c) Torque on wire *AB* is clockwise

(d) Torque on wire *AB* is anticlockwise

206. A triangular loop of side l caries 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) $\frac{\sqrt{3}}{2}iB^2l^2$ (d) $\frac{\sqrt{3}}{4}iBl^2$

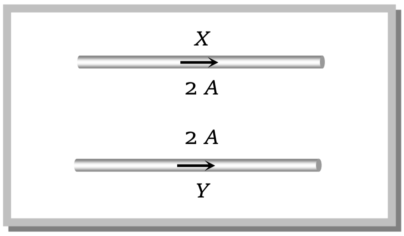
207. The force between two parallel conductors, each of length $50m$ and distant $20cm$ apart, is 1 *N*. If the current in one conductor is double that in another one, then their values will respectively be

(a) 100 *A* and 200 *A* (b) 50 *A* and 400 *A* (c) 10 *A* and 30 *A* (d) 5 *A* and 25 *A*

208. Two parallel conductors are suspended horizontally by light strings of length 75 *cm*. The mass of each conductor is 40 *gm/metre*. When current is not passed through them, the distance between them is 0.5 *cm* but when same amount of current is passed through them, the distance between them becomes 1.5 *cm*. The current and its direction will be

(a) 10 A in same direction (b) 10 A in opposite direction (c) 14 A in same direction (d)

209. In the figure X and Y are two long straight conductors each carrying a current of $2A$. The force on each conductor is F. When the current in each is changed to $1A$ and reversed in direction, the force on each is now



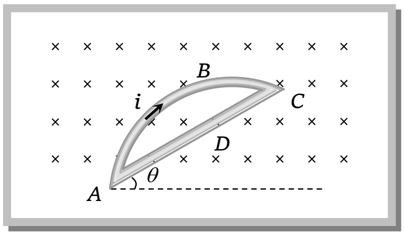
(a) $F/4$ and unchanged direction

(b) $F/2$ and reversed direction

(c) $F/2$ and unchanged direction

(d) $F/4$ and reversed direction

210. A circular wire ABC and a straight conductor ADC are carrying current i and are kept in the magnetic field B then considering points A and C



(a) Force as per ABC is more than ADC

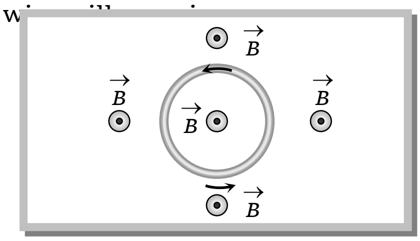
(b) Force as per ABC is less than ADC

(c) Force as per ABC is equal to that as per ADC

(d) Any of (a) or (b) or (c)

Advance Level

211. An elastic circular wire of length l carries an current i. It is placed in a uniform magnetic field $\vec{B}$ (out of paper) such that its plane is perpendicular to the direction of $\vec{B}$. The w



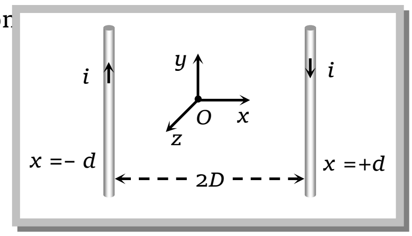
(a) No force

(b) A stretching force

(c) A compressive force

(d) A torque

212. In the given diagram, two long parallel wires carry equal currents in opposite directions. Point O is situated midway between the wires and the xy-plane contains the two wires and the positive z-axis comes normally out of the plane of paper. The magnetic field B at O is non-zero alon



(a) x, y and z-axis

(b) x-axis

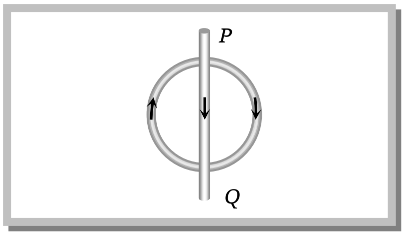
(c) y-axis

(d) z-axis

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

(a) 40 A (b) 5 A (c) 20 A (d) 2A

214. A circular coil of wire carries a current. *PQ* is part of a very long wire carrying a current and passing close to the circular coil. If the directions of the currents are those as shown, what is the direction of the force acting on *PQ*



(a) Parallel to *PQ*, towards *P*

(b) Parallel to *PQ*, towards *Q*

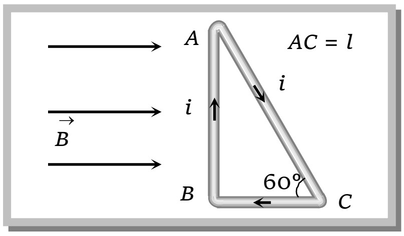
(c) At right angles to *PQ*, to the right

(d) At right angles to *PQ* to the left

215. The magnetic field existing in a region is given by $\vec{B} = B_0\left(1+\frac{x}{l}\right)\hat{k}$, A square loop of edge l and carrying a current i, is placed with its edges parallel to the *X-Y* axes. Find the magnitude of the net magnetic force experienced by the loop

(a) $\frac{1}{2} i B_0 l$ (b) Zero (c) $iB_0 l$ (d) $2iB_0 l$

216. The magnitude and direction of magnetic force on the side *AC* in the given figure will be



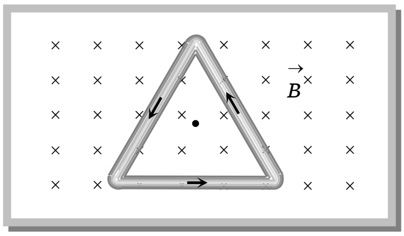
(a) $\frac{\sqrt{3}}{2}$ *Bil* at right angles to plane of paper upwards

(b) Zero

(c) $\frac{1}{2}$ *Bil* perpendicular to plane of paper downwards

(d) $\frac{1}{2}$ *Bil* perpendicular to plane of paper upwards

217. A wire is bent in the form of an equilateral triangle of side 1*m* and carries a current of 2*A*. It is placed in a magnetic field of induction 2.0 *T* directed into the plane of paper. The direction and magnitude of magnetic force acting on each side of the triangle will be



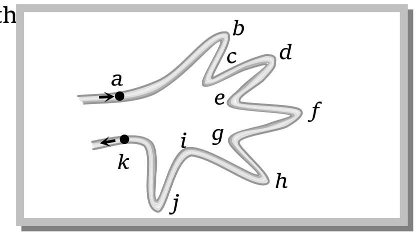
(a) 2*N*, normal to the side inwards

(b) 2*N*, normal to the side outwards

(c) 4*N*, normal to the side inwards

(d) 4*N*, normal to the side outwards

218. An irregular loop of conducting wire is lying on a frictionless table as shown in the figure. The wire is clamped at points *a* and *k*, when a current *i* is passed through it, then th



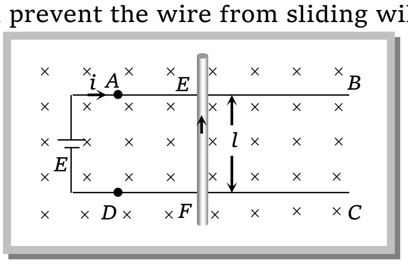
(a) Become parallel in two parts

(b) Collapse more

(c) Form a circular loop

(d) None of these

219. *AB* and *CD* are low rails on which a metallic conductor *EF* of mass m and length *l* can slide. The rails are connected to a source of *e.m.f. E* which drives a current *i* in the circuit. The coefficient of friction between the rails and the conductor is μ. The minimum value of μ which can prevent the wire from sliding will be



(a) $\frac{Bl}{img}$

(b) $\frac{img}{Bl}$

(c) $\frac{mg}{Bil}$

(d) $\frac{Bil}{mg}$

220. A fixed horizontal wire carries a current of 200 A. a other wire having a mass per unit length $10^{-2} kg/m$ is placed below the first wire at a distance of 2 cm and parallel to it. How much current must be passed through the second wire if it floats in air without any support? What should be the direction of current in it

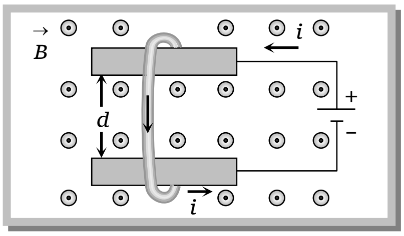
(a) 25A (direction of current is same to first wire)

(b) 25A (direction of current is opposite to first wire)

(c) 49 A (direction of current is same to first wire)

(d) 49 A (direction of current is opposite to first wire)

221. A metal wire of mass m slides without friction on two horizontal rails spaced at a distance d apart as shown in the figure. The rails are situated in a uniform magnetic field B, directed vertically upward, and a battery is sending a current i through them. Find the velocity (speed and direction) of the wire as a function of time. assuming it to be at rest initially



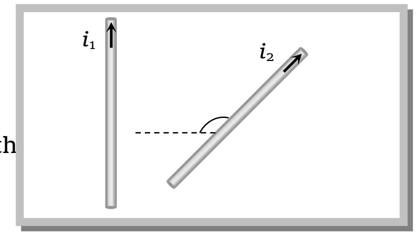
(a) $\frac{Bid}{m}t$, towards right hand side

(b) $\frac{Bid}{m}t$, towards left hand side

(c) $\frac{Bid}{2m}t$, towards right hand side

(d) $\frac{Bid}{2m}t$, towards left hand side

222. Currents are passed through two free, straight conductors arranged at right angles as shown in the figure. Then



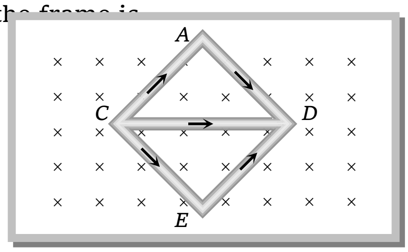
(a) Nothing will happen to the conductors

(b) They will turn, set themselves parallel and then repel

(c) They will turn set themselves parallel and then attract each oth

(d) They will turn, set themselves parallel and then oscillate

223. Same current i = 2A is flowing in a wire frame as shown in figure. The frame is a combination of two equilateral triangles ACD and CDE of side 1m. It is placed in uniform magnetic field B = 4T acting perpendicular to the plane of frame. The magnitude of magnetic force acting on the frame is



(a) 24 N

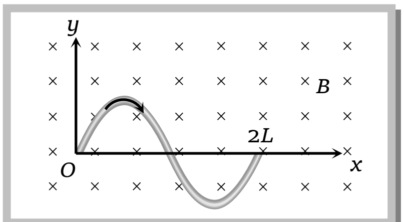
(b) Zero

(c) 16 N

(d) 8 N

224. A wire carrying a current i is placed in a uniform magnetic field in the form of the curve $y = a\sin\left(\frac{\pi x}{L}\right) 0 \le x \le 2L$.

The force acting on the wire is



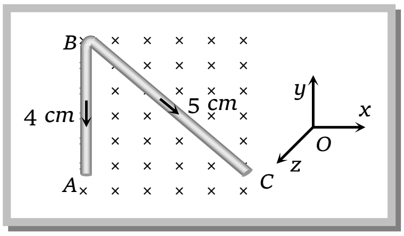
(a) $\frac{iBL}{\pi}$

(b) $iBL\pi$

(c) $2iBL$

(d) Zero

225. A uniform conducting wire *ABC* has a mass of 10*g*. A current of 2*A* flows through it. The wire is kept in a uniform magnetic field $B = 2T$. The acceleration of the wire will be



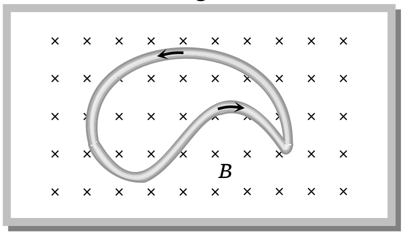
(a) Zero

(b) $12\ ms^{-2}$ along y -axis

(c) $1.2\times10^{-3} ms^{-2}$ along y-axis

(d) $0.6\times10^{-3} ms^{-2}$ along y - axis

226. A semi-circular wire of radius R is connected to a wire bent in the form of a sine curve to form a closed loop as shown in the figure. If the loop carries a current i and is placed in a uniform magnetic field B, then the total force acting on the sine curve is



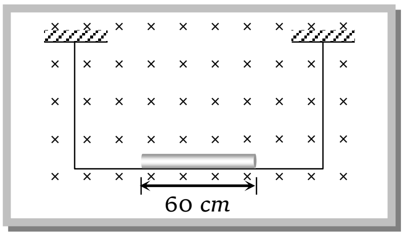
(a) 2*BiR* (downward)

(b) 2 *BiR* (upward)

(c) *BiR* (upward)

(d) Zero

227. A 60 *cm* long wire (mass 10 *gm*) is hanged by two flexible wire in a magnetic field of 0.40 $wb/meter^2$. Find the magnitude and direction of the current required to be flown to neutralize the tension of the hanging wires. (take g = 10 m/s^2)



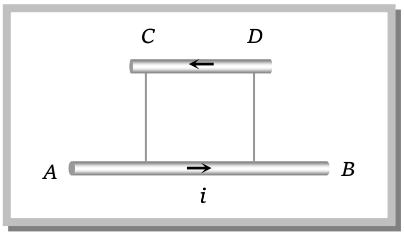
(a) 0.416 *A* from left to right

(b) 0.416 *A* from right to left

(c) 0.802 *A* from left to right

(d) 0.802 *A* from right to left

228. A long horizontal wire *AB* rest on a table. Another wire *CD* above *AB* is free to slide on two vertical metal guide *C* and *D* as shown in figure. A current i = 50 *A* is passed through the system. The height *h* to which *CD* will rise (if the mass per unit length of the wire *CD* is λ = 0.05 $g\ cm^{-1}$)



(a) 0.51 *cm*

(b) 0.51 *m*

(c) 1.02 *cm*

(d) 0.102 *m*

Magnetic moment and Torque

Basic Level

229. 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

230. 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 $\vec{B}$ *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

231. The relation between voltage sensitivity (σ_V) and current sensitivity (σ_i) of a moving coil galvanometer is

(a) $\frac{\sigma_i}{G} = \sigma_v$ (b) $\frac{\sigma_v}{G} = \sigma_i$ (c) $\frac{G}{\sigma_v} = \sigma_i$ (d) $\frac{G}{\sigma_i} = \sigma_v$

232. A small cylinderical 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 the above

233. Two galvanometers A and B require 3mA and 5mA respectively to produce the same deflection of 10 division then **[Kerala**

(a) A is more sensitive than B
(b) B is more sensitive than A
(c) A and B are equally sensitive
(d) Sensitiveness of B is twice that of A

234. A circular loop has a radius of 5 *cm* and it is carrying a current of 0.1 *amp*. It magnetic moment is **[MP PMT 2000]**

(a) $1.32 \times 10^{-4} amp.-m^2$ (b) $2.62 \times 10^{-4} amp.-m^2$ (c) $5.25 \times 10^{-4} amp.-m^2$ (d) $7.85 \times 10^{-4} amp.-m^2$

235. Magnetic dipole moment of a rectangular loop is **[RPET 2000]**

(a) Inversely proportional to current in loop
(b) Inversely proportional to area of loop
(c) Parallel to plane of loop and proportional to area of loop
(d) Perpendicular to plane of loop and proportional to area of loop

236. The magnetic moment of a circular coil carrying current is **[MP PET 2000]**

(a) Directly proportional to the length of the wire in the coil
(b) Inversely proportional to the length of the wire in the coil
(c) Directly proportional to the square of the length of the wire in the coil
(d) Inversely proportional to the square of the length of the wire in the coil

237. Due to the flow of current in a circular loop of radius R, the magnetic induction produced at the centre of the loop is B. the magnetic moment of the loop is (μ_0 = permeability constant)

(a) $BR^3 / 2\pi\mu_0$ (b) $2\pi BR^3 / \mu_0$ (c) $BR^2 / 2\pi\mu_0$ (d) $2\pi BR^2 / \mu_0$

238. A current loop of area 0.01 m^2 and carrying a current of 10 *amperes* is held perpendicular to a magnetic field of intensity of 0.1 *Tesla*. The torque (in Nm) acting of the loop is

(a) 0 (b) 0.001 (c) 0.01 (d) 1.1

239. A straight wire carrying current i is turned into a circular loop. If the magnitude of magnitude of magnetic moment associated with it in M.K.S. unit is M, the length of wire will be

(a) $\frac{4\pi}{M}$ (b) $\sqrt{\frac{4\pi M}{i}}$ (c) $\sqrt{\frac{4\pi i}{M}}$ (d) $\frac{M\pi}{41}$

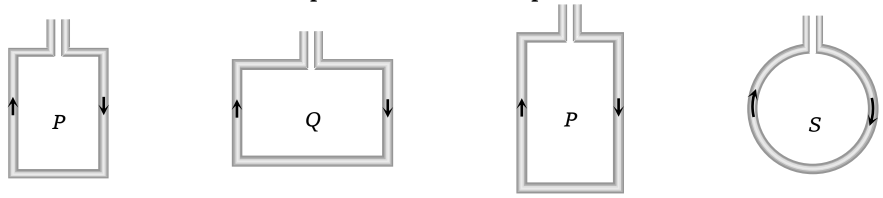
240. The current sensitivity of a moving coil galvanometer can be increased by

(a) Increasing the magnetic field of the permanent magnet
(b) Increasing the area of the deflecting coil
(c) Increasing the number of turns in the coil
(d) All of these

241. The coil of a moving coil galvanometer is wound over a metal frame in order to (1075)

(a) Reduce hysteresis
(b) Provide electromagnetic damping
(c) Increase the moment of inertia
(d) Increase the sensitivity

242. Four wire loops each of length 2.0 *meters* are bent into four loops P, Q, R and S and then suspended in a uniform magnetic field. Same current is passed in each loop. Which statement is correct



(a) Couple on loop P will be the highest (b) Couple on loop Q will be the highest

(c) Couple on loop R will be the highest (d) Couple on loop S will be highest

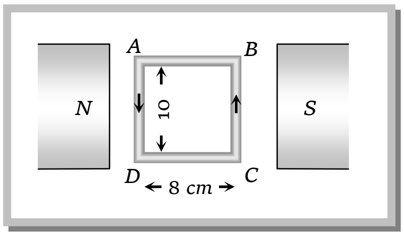
243. A rectangular coil 20 $cm \times$ 20 cm has 100 *turns* and carries a current of 1 A. It is placed in a uniform magnetic field B = 0.5 T with the direction of magnetic field parallel to the plane of the coil. The magnitude of the torque required to hold this coil in this position is

[MP PMT 1997]

(a) Zero (b) 200 N-m (c) 2 N-m (d) 10 N-m

244. A 100 turns coil shown in figure carries a current of 2 *amp* in a magnetic field $B = 0.2 Wb/m^2$. The torque acting on the coil is (879)

AB = 8 cm, AD = 10 cm **[MP PET 1997]**



(a) 0.32 Nm tending to rotate the side AD out of the page

(b) 0.32 Nm tending to rotate the side AD into the page

(c) 0.0032 Nm tending to rotate the side AD out of the page

(d) 0.0032 Nm tending to rotate the side AD into the page

245. To make the field radial in a moving coil galvanometer **[MP PET 1993]**

(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 wound on aluminium frame

246. A circular coil of magnetic moment M placed in a magnetic field B will be in equilibrium when plane of the coil is **[CBSE PMT 1992]**

(a) Parallel to B (b) Is perpendicular to B (c) At 45° with B (d) At 60° with B

247. A wire of length l in formed into a circular loop of one turn only and is suspended in a magnetic field B. When a current i is passed through the loop, the torque experienced by it is

(a) $\left(\frac{1}{4\pi}\right)8il$ (b) $\left(\frac{1}{4\pi}\right)l^2 iB$ (c) $\left(\frac{1}{4\pi}\right)B^2 il$ (d) $\left(\frac{1}{4\pi}\right)Bi^2 l$

248. A length l of a wire is bent form a circular coil of some turns. A current i is then established in the coil and it is placed in a uniform magnetic field B. The maximum torque that acts on the coil is

(a) iBl^2 (b) $4\pi iBl^2$ (c) $\frac{iBl^2}{4\pi}$ (d) Zero

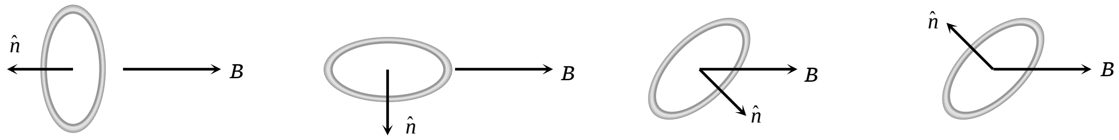
249. The restoring couple in the moving coil galvanometer is due to

(a) Current in the coil (b) Magnetic field of the magnet

(c) Material of the coil (d) Twist produced in the suspension wire

Advance Level

250. A current carrying loop is placed in a uniform magnetic field in four different orientations, I, II, III and IV, arrange them in the decreasing order of potential energy **[IIT-JEE (Screening) 2003]**



I II III IV

(a) I > III > II > IV (b) I > II > III > IV (c) I > IV > II > III (d) III > IV > I > II

251. In hydrogen atom, the electron is making $6.6 \times 10^{15} rev/\sec$ around the nucleus in an orbit of radius 0.528 $\AA$. The magnetic moment $(A - m^2)$ will be **[MP PET 1999]**

(a) 1×10^{-15} (b) 1×10^{-10} (c) 1×10^{-23} (d) 1×10^{-27}

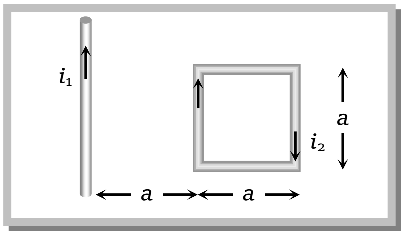
252. Magnetic field at the centre of a circular loop of area A is B. Then magnetic moment of the loop will

(a) $\frac{BA^2}{\mu_0 \pi}$ (b) $\frac{BA}{\mu_0}\sqrt{A}$ (c) $\frac{BA\sqrt{A}}{\mu_0 \pi}$ (d) $\frac{2BA}{\mu_0}\sqrt{\frac{A}{\pi}}$

253. A non-conducting disc of radius R is rotating about an axis passing through its centre and perpendicular to its plane with an angular velocity ω. Charge q is uniformly distributed over its surface. The magnetic moment of the disc is

(a) $\frac{1}{4} q\omega R^2$ (b) $\frac{1}{2} q\omega R$ (c) $q\omega R$ (d) $\frac{1}{2} q\omega R^2$

254. A current carrying square loop is placed near an infinitely long current carrying wire as shown in figure. The torque acting on the loop is



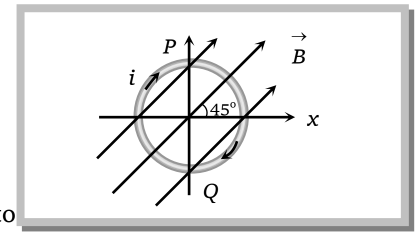
(a) $\frac{\mu_0}{2\pi}\left(\frac{i_1 i_2 a}{2}\right)$

(b) $\frac{\mu_0 i_1 i_2 a}{2\pi}$

(c) $\frac{\mu_0 i_1 i_2 a}{2\pi}\ln(2)$

(d) Zero

255. A constant current i is flowing through a circular coil placed in a uniform magnetic field $\vec{B}$ as shown in figure. Choose the correct alternative



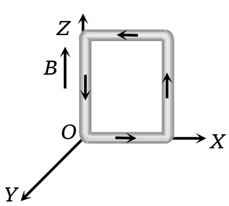
(a) The loop is in stable equilibrium

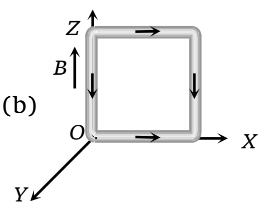
(b) The loop is in unstable equilibrium

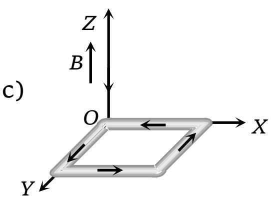
(c) The torque acting on the loop is maximum possible

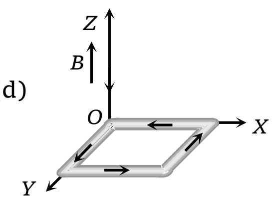
(d) The torque acting on the loop is $\frac{1}{\sqrt{2}}$ times the maximum to

256. In the following figures which one corresponds to the unstable equilibrium position

(a) 

(b) 

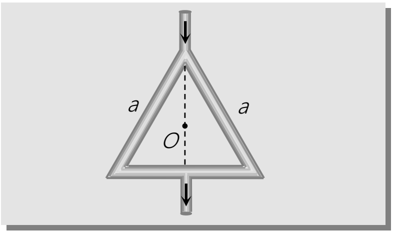
(c) 

(d) 

Practice Networks (Find magnetic field at O)

Basic Level

1.



(a) $\frac{\mu_0}{4\pi}\cdot\frac{\sqrt{3}\,i}{2a}$

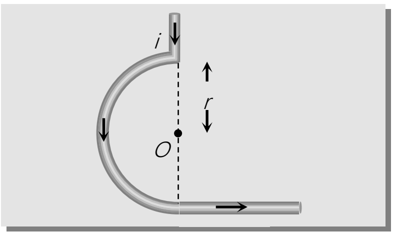
(b) $\frac{\mu_0}{4\pi}\cdot\frac{3\sqrt{3}\,i}{2a}$

(c) $\frac{\mu_0}{4\pi}\cdot\frac{i}{a}$

(d) Zero

Solution

2.



(a) $\frac{\mu_0}{4\pi}\cdot\frac{\pi i}{r}\odot$

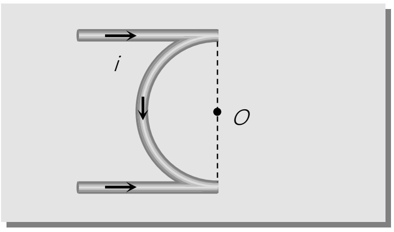
(b) $\frac{\mu_0}{4\pi}\cdot\frac{(\pi+1)i}{r}\odot$

(c) $\frac{\mu_0}{4\pi}\cdot\frac{(\pi+1)i}{r}\otimes$

(d) Zero

Solution

3.



(a) $\frac{\mu_0 i}{4r}\odot$

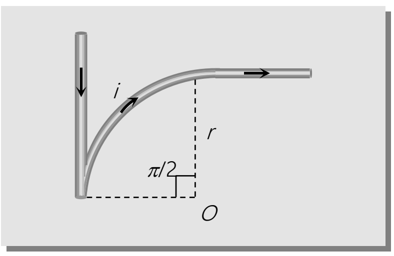
(b) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}(\pi+2)\otimes$

(c) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}(\pi-2)\odot$

(d) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}(4\pi+2)\otimes$

Solution

4.



(a) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}(\pi+2)\otimes$

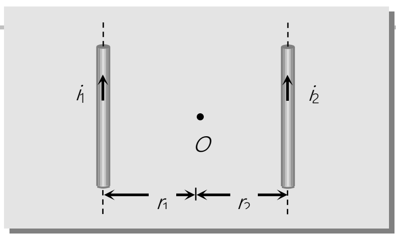
(b) $\frac{\mu_0}{4\pi}\cdot\frac{\pi i}{r}\otimes$

(c) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}(\pi-2)\odot$

(d) Zero

Solution

5.



Solution

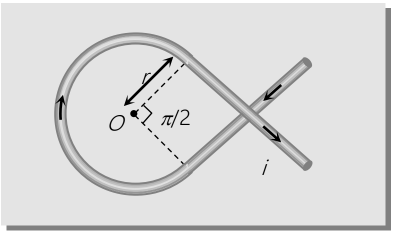
(a) $\frac{\mu_0 i}{2\pi}\left(\frac{i_1}{r_1}-\frac{i_2}{r_2}\right)\otimes$

(b) $\frac{\mu_0 i}{2\pi}\left(\frac{i_1}{r_1}-\frac{i_2}{r_2}\right)\odot$

(c) $\frac{\mu_0 i}{2\pi}\left(\frac{i_1}{r_1}+\frac{i_2}{r_2}\right)\otimes$

(d) Zero

6.



(a) $\frac{3\mu_0 i}{8r}\otimes$

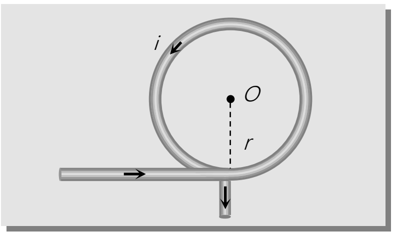
(b) $\frac{3\mu_0 i}{8r}\odot$

(c) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}\left(\frac{3\pi}{2}+2\right)\otimes$

(d) $\frac{\mu_0}{4\pi}\frac{i}{r}\left(\frac{3\pi}{2}+2\right)\odot$

Solution

7.



(a) $\frac{\mu_0 i}{2r}\left(1+\frac{\phi}{2\pi}\right)\otimes$

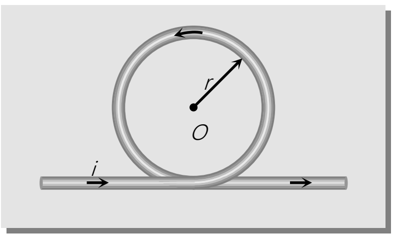
(b) $\frac{\mu_0}{2r}\left(1+\frac{1}{2\pi}\right)\odot$

(c) $\frac{\mu_0 i}{2r}\otimes$

(d) $\frac{\mu_0 i}{2r}\odot$

Solution

8.



(a) $\frac{\mu_0 i}{2r}\left(1+\frac{1}{\pi}\right)\odot$

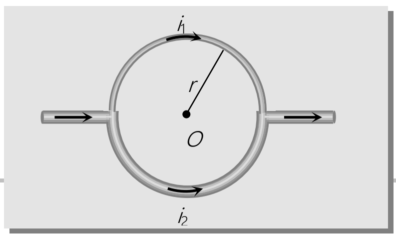
(b) Zero

(c) $\frac{\mu_0 i}{2r}\left(1-\frac{1}{\pi}\right)\otimes$

(d) $\frac{\mu_0 i}{2r}\odot$

Solution

9. Radius of the wire of upper semi-circle is half that of lower semi-circle



(a) $\frac{3\mu_0 i}{5r}\odot$

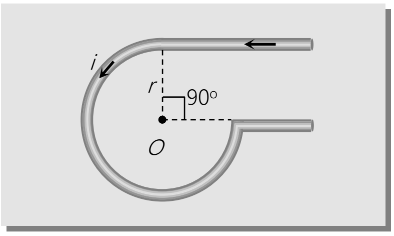
(b) $\frac{3\mu_0 i}{20r}\odot$

Solution

(c) $\frac{3\mu_0 i}{20r} \otimes$

(d) Zero

10.



(a) $\frac{\mu_0 i}{4\pi r}\left(\frac{3\pi}{2}+1\right) \otimes$

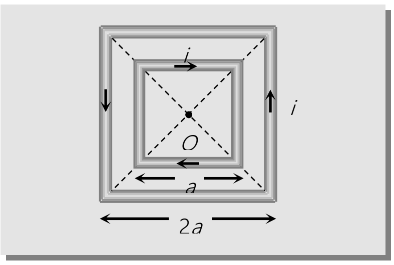
(b) $\frac{\mu_0 i}{4\pi r}\left(\frac{3\pi}{2}-1\right) \odot$

(c) $\frac{\mu_0 i}{4\pi}\left(\frac{\pi}{2}+1\right) \otimes$

(d) $\frac{\mu_0 i}{4\pi r}\left(\frac{\pi}{2}-1\right) \odot$

Solution

11.



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

(b) $\frac{\sqrt{2}\mu_0 i}{\pi a} \odot$

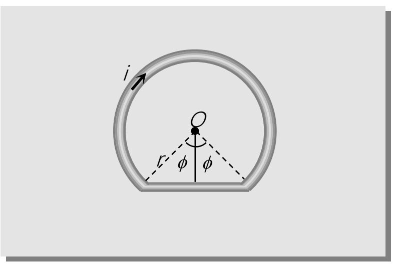
(c) Zero

(d) $\frac{8\sqrt{2}\mu_0 i}{4\pi a} \otimes$

Solution

Advance Level

12.



(a) $\frac{\mu_0 i}{2\pi r}[\pi - \phi + \tan\phi]$

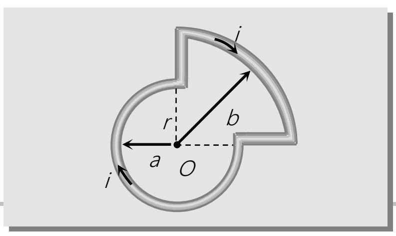
(b) $\frac{\mu_0 i}{2\pi r}$

(c) 0

(d) $\frac{\mu_0 i}{\pi r}[\pi - \phi + \tan\phi]$

Solution

13.



(a) $\frac{\mu_0}{4\pi}\cdot\frac{\pi i}{2}\left(\frac{3}{a}+\frac{1}{b}\right) \otimes$

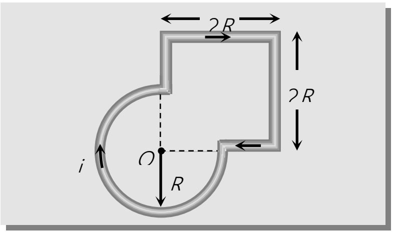
(b) $\frac{\mu_0}{4\pi}\cdot\frac{\pi i}{2}\left(\frac{3}{a}-\frac{1}{b}\right) \odot$

(c) $\frac{\mu_0}{4\pi}\cdot\frac{\pi i}{2}\left(\frac{3}{a}-\frac{1}{b}\right) \otimes$

Solution

(d) $\frac{\mu_0}{4\pi}\cdot\frac{\pi i}{2}\left(\frac{3}{a}+\frac{1}{b}\right)\odot$

14.



(a) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}\left(\frac{1}{\sqrt{2}}-\frac{3\pi}{2}\right)\odot$

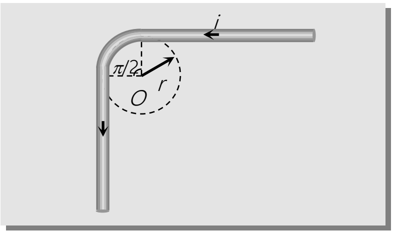
(b) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}\left(\frac{1}{\sqrt{2}}+\frac{3\pi}{2}\right)\odot$

(c) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}\left(\frac{1}{\sqrt{2}}+\frac{3\pi}{2}\right)\otimes$

(d) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}\left(\frac{1}{\sqrt{2}}-\frac{3\pi}{2}\right)\otimes$

Solution

15.



(a) $\frac{\mu_0 i}{2r}\left(\frac{4+\pi}{4\pi}\right)\otimes$

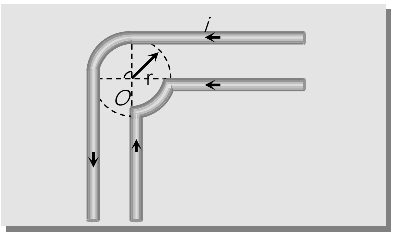
(b) $\frac{\mu_0 i}{2r}\left(\frac{4+\pi}{4\pi}\right)\odot$

(c) $\frac{\mu_0 i}{4\pi}(\pi+4)\otimes$

(d) Zero

Solution

16.



(a) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}\left(2+\frac{\pi}{2}\right)\otimes$

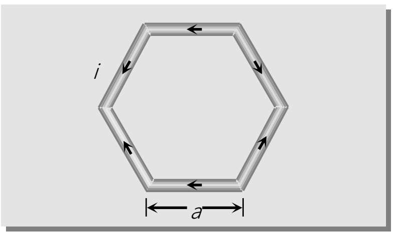
(b) $\frac{\mu_0}{4\pi}\cdot\frac{2i}{r}\otimes$

(c) $\frac{\mu_0}{4\pi}\cdot\frac{2i}{r}\odot$

(d) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}\left(2+\frac{\pi}{2}\right)\odot$

Solution

17.



(a) $\frac{\mu_0 i}{\pi a}\otimes$

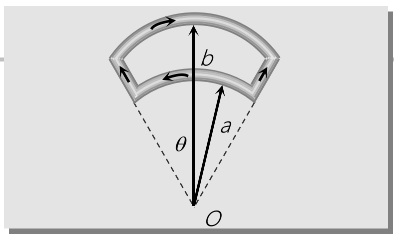
(b) $\frac{\sqrt{3}\mu_0 i}{\pi a}\otimes$

(c) $\frac{\sqrt{3}\mu_0 i}{\pi a}\odot$

(d) Zero

Solution

18.



(a) $\frac{\mu_0 i\theta}{4\pi}\left(\frac{1}{a}-\frac{1}{b}\right)\odot$

Solution

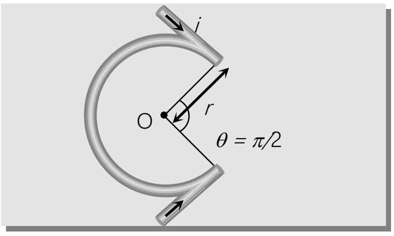
Solution

(b) $\frac{\mu_0 i\theta}{4\pi}\left(\frac{1}{a}+\frac{1}{b}\right)\odot$

(c) $\frac{\mu_0 i\theta}{2\pi}\left(\frac{1}{a}-\frac{1}{b}\right)\otimes$

(d) $\frac{\mu_0 i\theta}{2\pi}\left(\frac{1}{a}+\frac{1}{b}\right)\otimes$

19.



(a) $\frac{\mu_0}{4\pi}.\frac{i}{r}\left(\frac{3\pi}{2}-2\right)\odot$

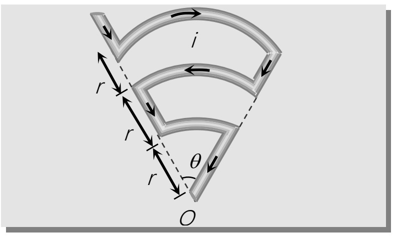
(b) $\frac{\mu_0}{4\pi}.\frac{i}{r}\left(\frac{3\pi}{2}+2\right)\odot$

(c) $\frac{\mu_0}{4\pi}.\frac{i}{r}\left(\frac{3\pi}{2}\right)\otimes$

(d) $\frac{\mu_0}{4\pi}.\frac{i}{r}\left(\frac{3\pi}{2}\right)\odot$

Solution

20.



(a) $\frac{5\mu_0 i\theta}{24\pi r}$

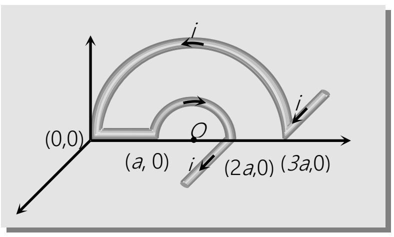
(b) $\frac{\mu_0 i\theta}{24\pi r}$

(c) $\frac{11\mu_0 i\theta}{24\pi r}$

(d) Zero

Solution

21.



(a) $\frac{2\mu_0 i}{3\pi a}\sqrt{4-\pi^2}$

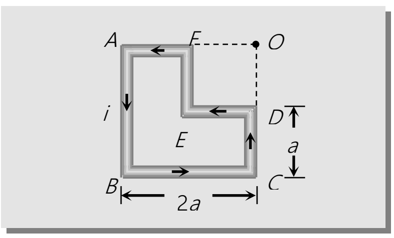
(b) $\frac{2\mu_0 i}{3\pi a}\sqrt{4+\pi^2}$

(c) $\frac{2\mu_0 i}{3\pi a^2}\sqrt{4+\pi^2}$

(d) $\frac{2\mu_0 i}{3\pi a}\sqrt{(4-\pi^2)}$

Solution

22.



(a) $\frac{\mu_0 i}{4\pi a}$

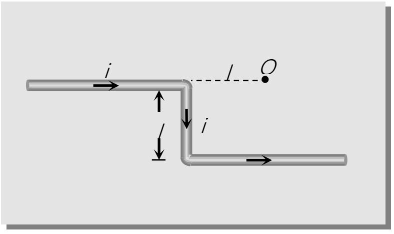
(b) $\frac{-\sqrt{2}\mu_0 i}{8\pi a}$

(c) $\frac{-8}{\sqrt{2}}\cdot\frac{\mu_0 i}{\pi a}$

(d) $\frac{2}{8}\frac{\mu_0 i}{\pi a}$

Solution

23.



(a) $\frac{\mu_0 i}{4\pi l}\left(2+\frac{1}{\sqrt{2}}\right)\otimes$

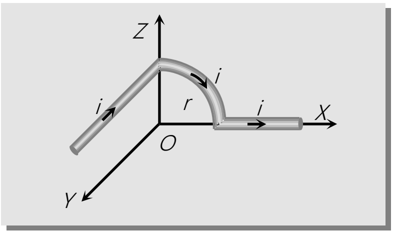
(b) $\frac{\mu_0}{4\pi l}\left(2+\frac{1}{\sqrt{2}}\right)\odot$

(c) Zero

(d) $\frac{\mu_0 i}{4\pi l}(\sqrt{2}-2)\otimes$

Solution

24.



(a) $\frac{\mu_0 i}{4\pi}\cdot\frac{i}{r}\sqrt{\left(1+\frac{\pi^2}{4}\right)}$

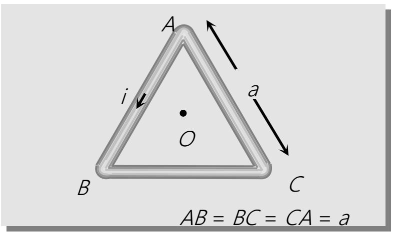
(b) $\frac{\mu_0}{4\pi}\cdot\frac{i}{r}\sqrt{\left(1-\frac{\pi^2}{4}\right)}$

(c) $\frac{\mu_0}{4\pi}\cdot\frac{\pi i}{2r}$

(d) None of these

Solution

25.



(a) $\frac{\mu_0}{4\pi}\cdot\frac{18i}{a}\otimes$

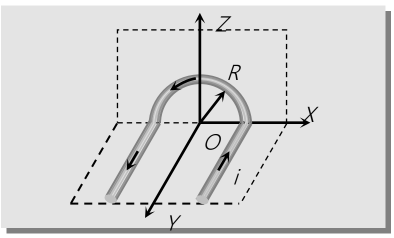
(b) $\frac{\mu_0}{4\pi}\cdot\frac{18i}{a}\odot$

(c) $\frac{\mu_0}{4\pi}\cdot\frac{6i}{a}\otimes$

(d) $\frac{\mu_0}{4\pi}\cdot\frac{6i}{a}\odot$

Solution

26.



(a) $\frac{\mu_0}{4\pi}\cdot\frac{i}{R}(\pi+2)$

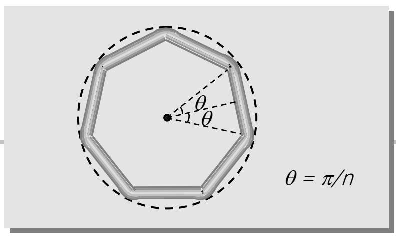
(b) $\frac{\mu_0}{4\pi}\cdot\frac{i}{R}(\pi-2)$

(c) $\frac{\mu_0}{4\pi}\cdot\frac{i}{R}\sqrt{(4+\pi^2)}$

(d) Zero

Solution

27. In the following figure a wire bent in the form of a regular polygon of *n* sides is in scribed in a circule of radius *a*



(a) $\frac{\mu_0 i}{2\pi a}\tan\frac{\pi}{n}$

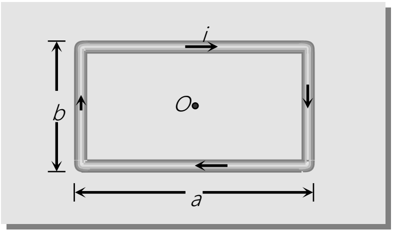
(b) $\frac{\mu_0 n i}{2\pi a}\tan\frac{\pi}{n}$

Solution

(c) $\frac{2}{\pi}\frac{ni}{a}\mu_0 \tan\frac{\pi}{n}$

(d) $\frac{ni}{2a}\mu_0 \tan\frac{\pi}{n}$

28.



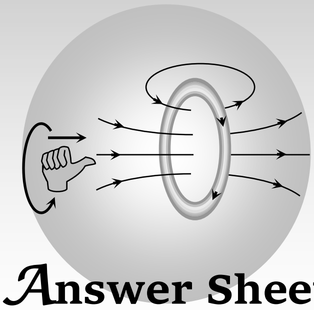
(a) $\frac{\mu_0 i(a+b)}{2\pi\sqrt{a^2+b^2}}$

(b) $\frac{\mu_0 iab}{2\pi\sqrt{a^2+b^2}}$

(c) $\frac{\mu_0 i(a-b)}{2\pi\sqrt{a^2+b^2}}$

(d) $\frac{\mu_0 i\sqrt{a^2+b^2}}{\pi ab}$

Solution



Answer Sheet

Assignment (Basic & Advance Level)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
b	c	d	a	d	b	c	c	a	d	d	b	b	c	d	b	a	a	c	d
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
c	d	c	b	a	a	d	c	b	c	c	d	b	c	d	d	d	c	a	a
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
a	b	b	d	b	d	d	b	d	d	a	b	d	b	c	d	b	c	b	c
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
d	d	a	c	a	b	b	b	c	c	b	a	c	a	c	a	b	b	a	b
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
b	a	b	c	b	c	d	b	a	c	d	d	a	d	b	a	a	a	a	b
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
b	d	a	c	b	d	a	a	d	d	a	a	c	b	a	b. c	c	c	b	c
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
a	b	d	a	b	a	b	c	a	b	b	a	c	b	b	c	d	d	c	d
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
b	d	b	c	d	d	a	b	d	a	d	d	a	b	b	d	b	b,c,d	a	b
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
a	d	a	d	d	c	c	c	b	c	a	c	a	a	a	b	b	b	b	b
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
b	b	a	c	b	d	a	a	b	b	b	b	c	d	b	a	a	a	c	a
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
c	d	d	c	d	a	a	d	a	c	b	d	c	d	c	a	c	c	d	c
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
b	c	a	c	b	b	a	c	d	a	a	d	a	d	d	c	b	a	b	d
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256				
b	d	c	a	c	b	b	c	d	c	c	d	a	d	c	d				

Assignment (Practice Networks)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
d	b	a	b	a	c	b	a	b	a	d	a	a	c	b	c	b	a	a	a
21	22	23	24	25	26	27	28												
b	a	b	a	a	c	b	d												