# PHYSICS

# BOOKS - MTG-WBJEE PHYSICS (HINGLISH)

# MAGNETIC EFFECT OF CURRENT

## Wb Jee Workout

**1.** Magnetic field intensity H at the centre of a circular loop of radius r carrying current I

e.m.u. is

A. $\frac{r}{I}$ oersted

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

C. $\frac{I}{2\pi r}$ oersted

D. $\frac{2\pi r}{I}$ oersted

**Answer: B**

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**2.** Which of the following relations represent Biot-Savart's law?

A. $d\vec{B} = \frac{\mu_0}{4\pi} I \frac{d\vec{l} \times \vec{r}}{r}$

B. $d\vec{B} = \frac{\mu_0}{4\pi} I \frac{d\vec{l} \times \vec{r}}{r^2}$

C. $d\vec{B} = \frac{\mu_0}{4\pi} I \frac{d\vec{l} \times \vec{r}}{r^3}$

D. $d\vec{B} = \frac{\mu_0}{4\pi} I \frac{d\vec{l} \times \vec{r}}{r^4}$

**Answer: C**

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**3.** An electron is moving with a velocity $\left(2\hat{i}+2\hat{j}\right)m/s$ is an electric field of intensity $\overrightarrow{E}=\hat{i}+2\hat{j}-8\hat{k}V/m$ and a magnetic field of $\overrightarrow{B}=\left(2\hat{j}+3\hat{k}\right)$ tesla. The magnitude of force on the electron is

A. $14.4\times10^{-19}N$

B. $9\times10^{-19}N$

C. $11.2\times10^{-19}N$

D. $6.4\times10^{-19}N$

**Answer: A**

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**4.** A straight wire of length 2m carries a current of 10A. If this wire is placed in a uniform magnetic field of 0.15T making an angle of $45^\circ$ with the magnetic field, the applied force on the wire will be

A. 1.5N

B. 3N

C. $3\sqrt{2}N$

D. $\frac{3}{\sqrt{2}}N$

**Answer: D**

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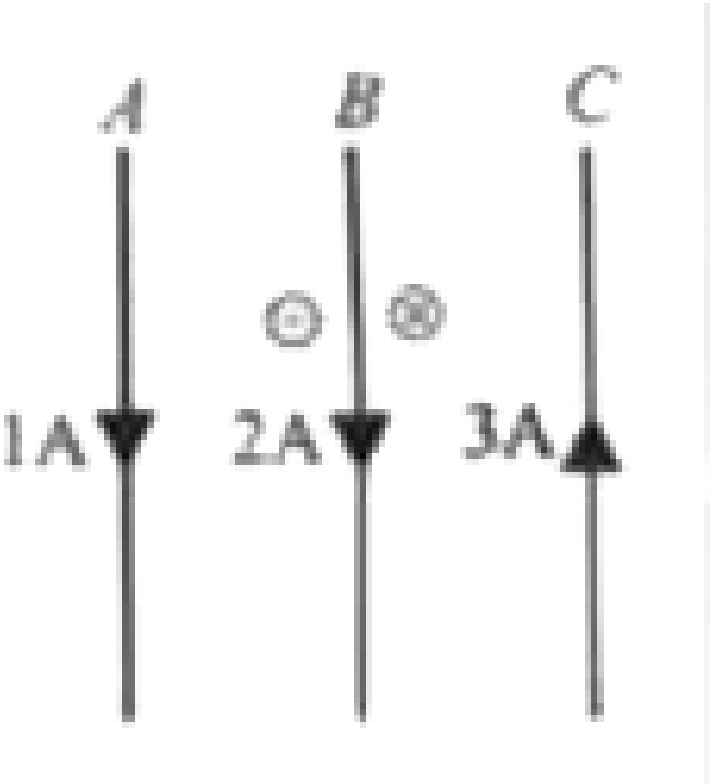
**5.** Three infinite straight wires A, B and C carry currents as shown in figure. The resultant

force on wire B is directed




A. towards A

B. towards C

C. zero

D. perpendicular to the plane of the page.

**Answer: A**

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**6.** Electron and proton of equal momentum enter a uniform magnetic field normal to the lines of force. If the radii of curvature of circular paths be $r_e$ and $r_p$ respectively, then

A. $\frac{r_e}{r_p} = \frac{1}{1}$

B. $\frac{r_e}{r_p} = \frac{m_p}{m_e}$

C. $\frac{r_e}{r_p} = \sqrt{m_p / m_e}$

D. $\frac{r_e}{r_p} = \sqrt{m_e / m_p}$

**Answer: A**

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

A. proportional to the distance from the wire

B. inversely proportional to the distance from wire

C. inversely proportional to the square of the distance from the wire

D. does not depend on distance

**Answer: B**

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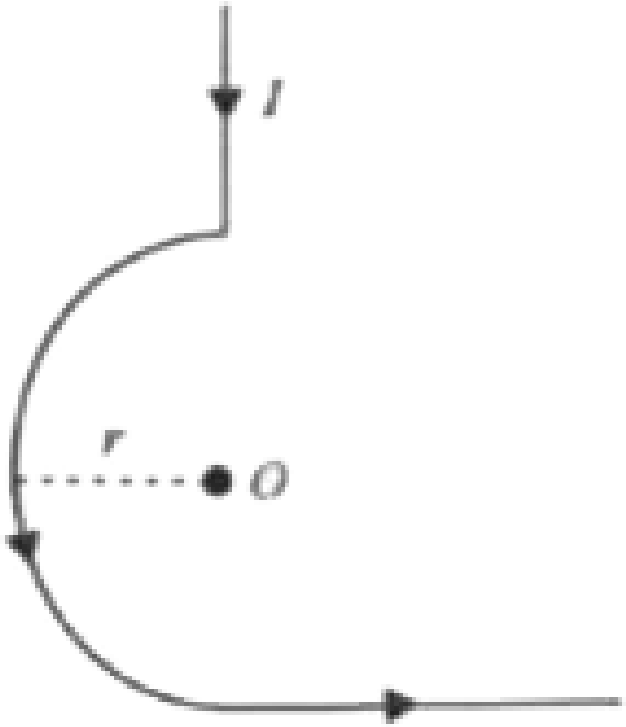
**8.** In the given figure what is the magnetic field induction at point O?




A. $\frac{\mu_0 I}{4\pi r}$

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

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

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

**Answer: C**

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**9.** A uniform magnetic field acts right angles to the direction of motion of electrones. As a result, the electron moves in acircular path of radius 2 cm. If the speed of electrons is

doubled, then the radius of the circular path will be

A. 2.0cm

B. 0.5cm

C. 4.0 cm

D. 1.0 cm

**Answer: C**

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**10.** A charge moving with velocity $v$ in $X$-direction is subjected to a field of magnetic induction in the negative $X$-direction. As a result, the charge will

A. remain unaffected

B. start moving in a circular path Y-Z plane

C. retard along X-axis

D. moving along a helical path around X-axis

**Answer: A**

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**11.** Two parallel wires in free spaces are $10cm$ apart and each carries a current of $10A$ in the same direction. The force one wire exerts on the other per metre of length is

A. $2 \times 10^{-4}N$, repulsive

B. $2 \times 10^{-7}N$, repulsive

C. $2 \times 10^{-4}N$, attractive

D. $2 \times 10^{-7} N$, attractive

**Answer: C**

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**12.** A charge having q/m equal to $10^8$ c/kg and with velocity $3 \times 10^5$ m/s enters into a uniform magnetic field B = 0.3 tesla at an angle $30^\circ$ with direction of field. Then radius of curvature will be:

A. 0.01cm

B. 0.5cm

C. 1cm

D. 2cm

**Answer: D**

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**13.** If a long hollow copper pipe carriers a direct current, the magnetic field associated with the current will be:

A. both inside and outside the pipe

B. outside the pipe only

C. inside the pipe only

D. neither inside nor outside the pipe.

**Answer: B**

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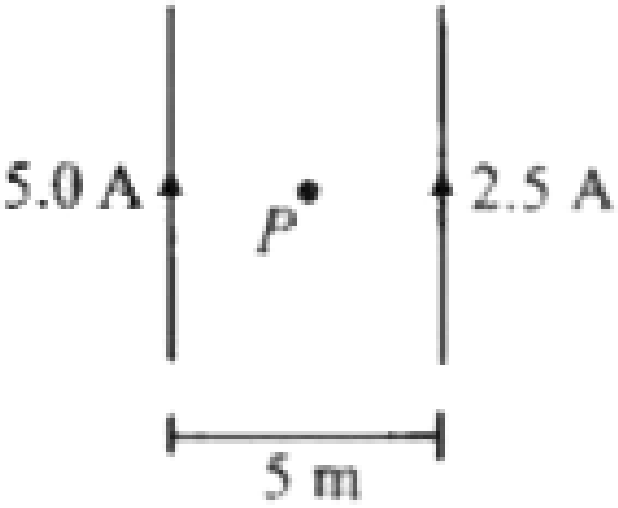
**14.** The magnetic field at centre , P will be




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

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

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

D. $4\mu_0\pi$

**Answer: C**

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**15.** Under the influence of a unifrom magnetic field a charged particle is moving on a circle of radius $R$ with Constnant speed $v$. The time period of the motion

A. depends on both R and v

B. is independent of both R and v

C. depends on R and not on v

D. depends on v and not on R.

**Answer: B**

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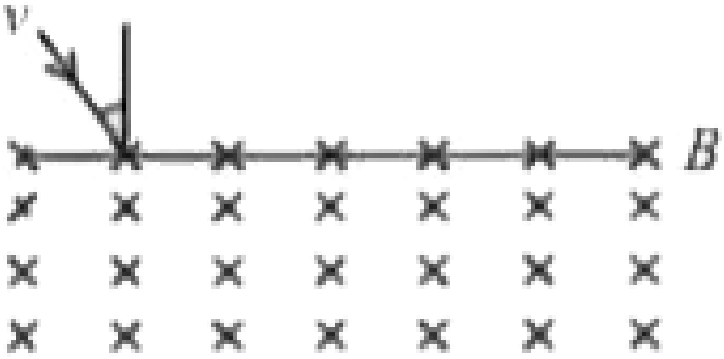
**16.** A charged particle of charge q and mass m enters a magnetic field as shown. Find radius of the circular path and the time spent inside

the field. Neglect gravity.




A. $\frac{R\pi\theta}{v}$

B. $\frac{R(\pi - 2\theta)}{v}$

C. $R\left(\frac{\pi + 2\theta}{v}\right)$

D. $\frac{2R\theta}{v}$

**Answer: B**

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**17.** Two identical charged particles enter a uniform magnetic field with same speed but at angles $30^\circ$ and $60^\circ$ with field Let a,b and c be the ratio of their time periods, radii and pitches of the helical paths than .

A. $abc = 1$

B. $abc > 1$

C. $abc < 1$

D. a= bc

**Answer: A**

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**18.** A conducting circular loop of radius r carries a constant current I. It is placed in a uniform magnetic field $\vec{B}$ such that $\vec{B}$ is perpendicular to the plane of the loop. The magnetic force acting on the loop is

A. $ir\vec{B}$

B. $2\pi ri\vec{B}$

C. zero

D. $\pi ri\overrightarrow{B}$

**Answer: C**

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**19.** Two very long, straight, 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

wires.Its instantaneous velocity $\vec{v}$ is perpendicular to this plane.The magnitude of the force due to the magnetic field acting on the charge at this instant is:

A. $\frac{\mu_0 I q v}{2\pi d}$

B. $\frac{\mu_0 I q v}{\pi d}$

C. $\frac{2\mu_0 I q v}{\pi d}$

D. 0

**Answer: D**

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**20.** A charged particle begins to move from the origin in a region which has a uniform magnetic field in the x-direction and a uniform electric field in the y-direction. Its speed is v when it reaches the point (x, y, z). Then, v will depend

A. only on x

B. only on y

C. on both x and y, but not z

D. on x, y and z

**Answer: B**

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**21.** A charged particle of mass $10^{-3}kg$ and charge $10^{-5}C$ enters a magnetic field of induction 1 T. If $g = 10ms^{-2}$, for what value of velocity will it pass straight through the field without deflection?

A. $10^{-3}ms^{-1}$

B. $10^{3}ms^{-1}$

C. $10^6 ms^{-1}$

D. $1 ms^{-1}$

**Answer: B**

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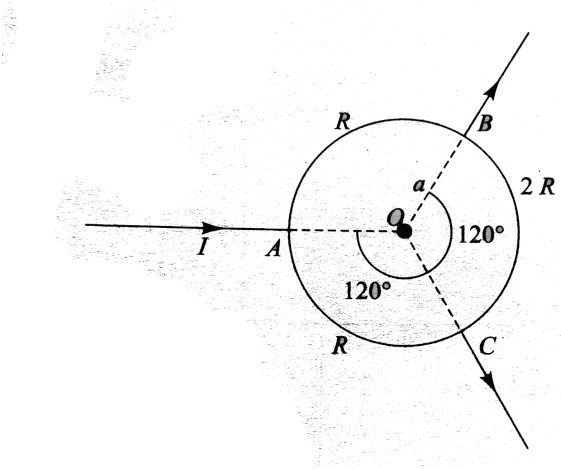
**22.** The resistances of three parts of a circular loop are as shown in Fig. The magnetic field at the centre O is (current enters at A and leaves

at B and C as shown)




A. $\frac{\mu_0 I}{6a}$

B. $\frac{\mu_0 I}{3a}$

C. $\frac{2}{3}\frac{\mu_0 I}{a}$

D. zero

**Answer: D**

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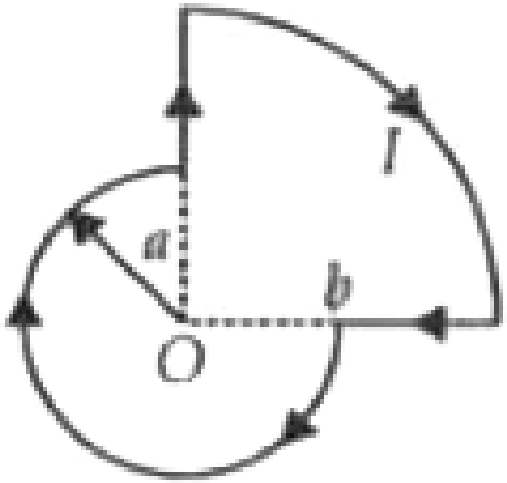
**23.** The magnetic induction at center O as shown in the figure is




A. $\frac{\mu_0 I}{2a} + \frac{\mu_0 I}{2b} \otimes$

B. $\frac{3\mu_0 I}{8a} + \frac{\mu_0 I}{8b} \otimes$

C. $\frac{3\mu_0 I}{8a} - \frac{\mu_0 I}{8b} \otimes$

D. $\frac{3\mu_0 I}{8a} + \frac{\mu_0 I}{8b} \odot$

**Answer: B**

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**24.** 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 ?

A. $250\mu T$

B. $150\mu T$

C. $125\mu T$

D. $75\mu T$

**Answer: A**

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**25.** A horizontal wire placed perpendicular to a magnetic field carries a current from left to right. The magnetic field is horizontal, directed

towards you. What is the direction of magnetic force on the wire?

A. north

B. south

C. east

D. west

**Answer: C**

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**26.** An electron of charge $-e$, mass m, enters a uniform magnetic field $\overrightarrow{B} = B\hat{i}$ with an initial velocity $\overrightarrow{v} = v_x\hat{i} + v_y\hat{j}$. What is the velocity of the electron after a time interval of t seconds?

A. $v_x\hat{i} + v_y\hat{j} + \frac{e}{m}v_yBt\hat{k}$

B. $v_x\hat{i} + v_y\hat{j} - \frac{e}{m}v_yBt\hat{k}$

C. $v_x\hat{i} + \left(v_y + \frac{e}{m}v_yBt\right)\hat{j}$

D. $\left(v_x + \frac{e}{m}v_yBt\right)\hat{i} + v_y\hat{j}$

**Answer: A**

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**27.** A conducting rod of 1 m length and 1 kg mass is suspended by two verticle wires through its ends. An external magnetic field of 2T is applied normal to the rod. Now the current to be passed through the rod so as to make the tension in the wire zero is

[Take $g = 10ms^{-2}$]

A. 0.5A

B. 15A

C. 5A

D. 1.5A

**Answer: C**

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**28.** A charged particle moves through a magnetic field perpendicular to its direction. Then

A. kinetic energy changes but the momentum is constant

B. the momentum changes but the kinetic energy is constant

C. both momentum and kinetic energy of the particle are not constant

D. both momentum and kinetic energy of the particle are constant

**Answer: B**

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**29.** A charged particle is moving in a magnetic field of strength B perpendicular to the direction of the field. If q and m denote the charge and mass of the particle respectively, then the frequency of rotation of the particle is

A. $\frac{qB}{2\pi m}$

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

C. $\frac{2\pi^2 m}{qB}$

D. $\frac{2\pi m}{qB}$

**Answer: A**

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**30.** Identify the correct statement from the following:

A. Cyclotron frequency is independent of charge of the particle

B. Kinetic energy of charged particle in cyclotron does not depend on its mass.

C. Cyclotron frequency does not depend on speed of charged particle

D. Kinetic energy of charged particle in cyclotron is independent of its charge.

**Answer: C**

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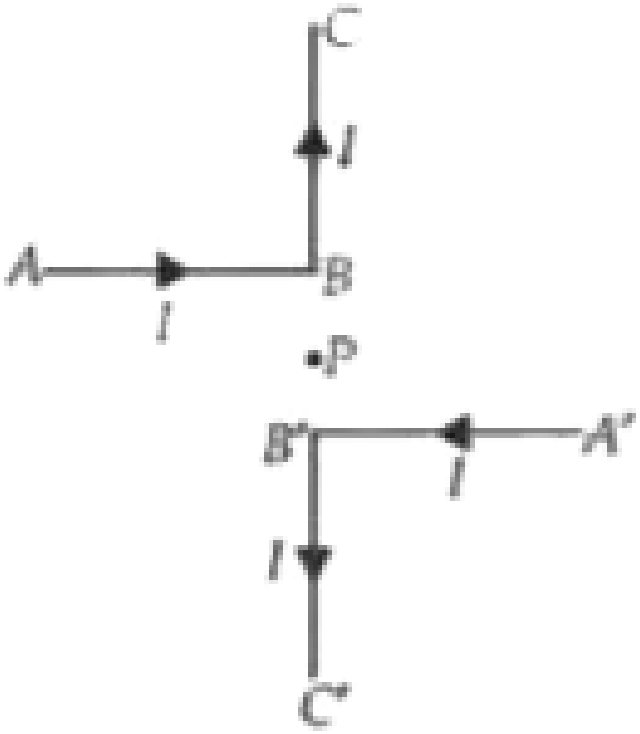
**31.** Current through ABC A'B'C' is I. What is the magnetic field at P? BP= PB' = r (Here C'B' PBC are collinear)




A. $B = \frac{1}{4\pi}\frac{2I}{r}$

B. $B = \frac{\mu_0}{4\pi}\left(\frac{2I}{r}\right)$

C. $B = \frac{\mu_0}{4\pi}\left(\frac{I}{r}\right)$

D. zero

**Answer: B**

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**32.** The magnetic field at the point of intersection of diagonals of a square wire loop of side L carrying a current I is

A. $\frac{\mu_0 I}{\pi L}$

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

C. $\frac{\sqrt{2}\mu_0 I}{\pi L}$

D. $\frac{2\sqrt{2}\mu_0 I}{\pi L}$

**Answer: D**

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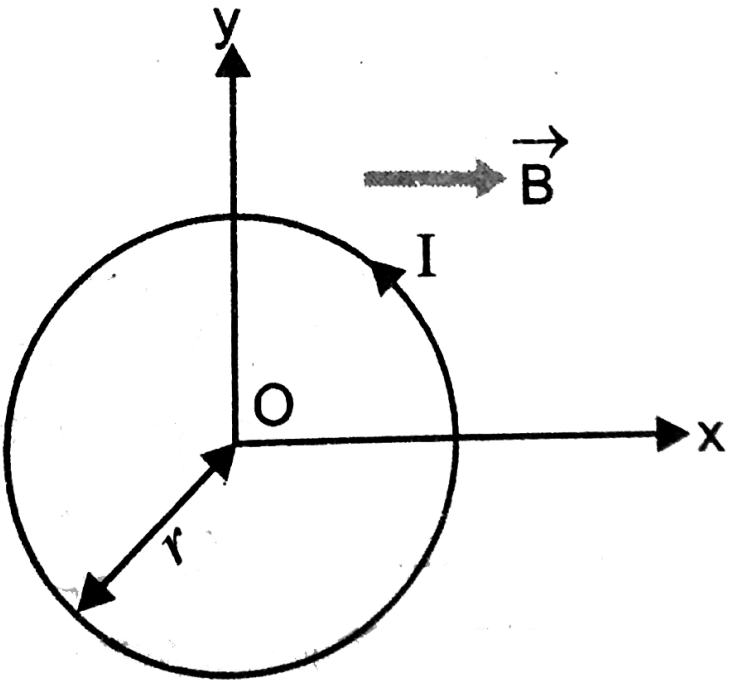
**33.** A circular loop of mass m and radius r in X-Y plane of a horizontal table as shown in figure. A uniform magnetic field B is applied

parallel to X-axis. The current I in the loop, so that its one edge just lifts from the table is




A. $mg/\pi r^2 B$

B. $mg/\pi r B$

C. $mg/2\pi r B$

D. $\pi rB/mg$

**Answer: C**

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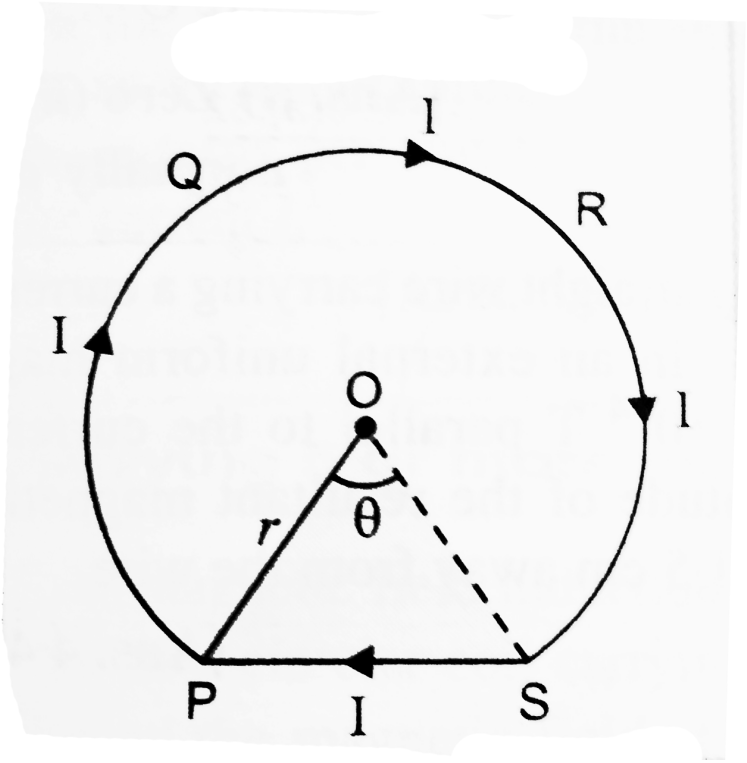
**34.** A current $I(=4A)$ flows along a thin wire PQRS shaped as shown in figure. The radius of the curved part of the wire is $10\cdot 0cm$. The angle $\theta = 90^\circ$. Find the magnitude of the

total magnetic field at the point O.




A. $28 \times 10^{-4} T$

B. $2.8 \times 10^{-7} T$

C. $28 \times 10^{-6} T$

D. $2.8 \times 10^{-6} T$

**Answer: C**

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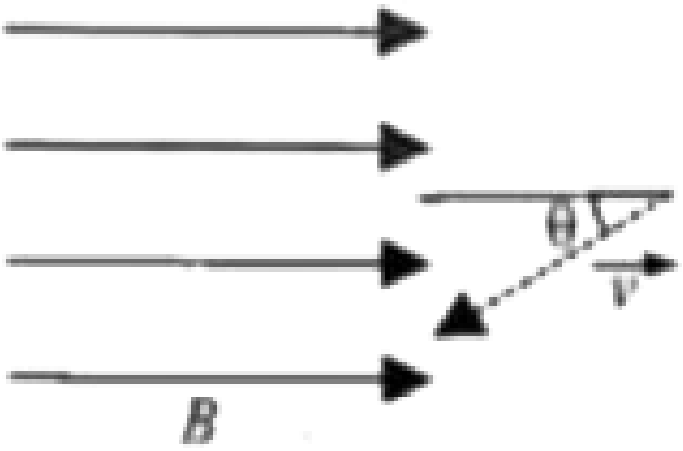
**35.** A positively charged particle is moving with a speed v in the region of uniform magnetic induction field B as shown in figure. Which of

the following statements is correct?




A. The force is Bqv $\sin\theta$ perpendicular to B and in the plane of page.

B. The force is Bqv $\cos\theta$ perpendicular to the plane of the page and directed towards reader

C. The force is Bqv $\sin\theta$ perpendicular to the plane of the page and directed towards the reader.

D. The force is Bqv $\sin\theta$ perpendicular to the plane of the page and directed away from the reader

**Answer: C**

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**36.** A coil in the shape of an equilateral triangle of side l is suspended between the pole pieces of a permanent magnet such that $\overrightarrow{B}$ is in the plane of the coil. If due to a current i in the triangle a torque $\tau$ acts on it, the side l of the triangle is

A. $\frac{2}{\sqrt{3}}\left(\frac{\tau}{Bi}\right)$

B. $2\left(\frac{\tau}{\sqrt{3}Bi}\right)^{1/2}$

C. $\frac{2}{\sqrt{3}}\left(\frac{\tau}{Bi}\right)^{1/2}$

D. $\frac{1}{\sqrt{3}}\frac{\tau}{Bi}$

**Answer: B**

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

A. 25keV

B. 50keV

C. 200keV

D. 100k eV

**Answer: D**

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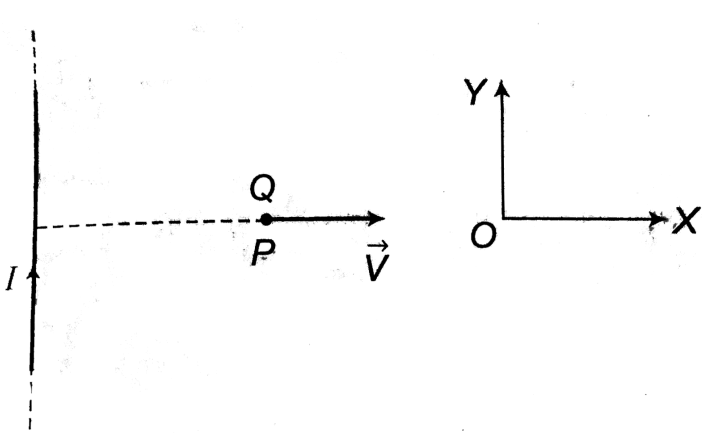
**38.** A very long straight wire carries a current I. At the instant when a charge $+Q$ at point $P$ has velocity $\vec{V}$, as shown, the force on the

charge is




A. along Oy

B. opposite to Oy

C. along Ox

D. opposite to Ox.

**Answer: A**

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**39.** A neutral atom of atomic mass number 100 which is stationary at the origin in gravity free space emits an $\alpha$-particle (A) in z-direction. The product ion is P. A uniform magnetic field exists in the x-direction. Disregard the electromagnetic interaction between A and P. If the angle of rotation of A after which A and P will meet for the first time is $\frac{n\pi}{25}$ radians, what is the value of n?

A. 8

B. 6

C. 4

D. 1

**Answer: B**

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**40.** A charged particle of specific charge (charge/mass) $\alpha$ released from origin at time $t = 0$ with velocity $\vec{v} = v_0\left(\hat{i} + \hat{j}\right)$ in uniform magnetic field $\vec{B} = B_0\hat{i}$.

Coordinates of the particle at time $t = \pi/(B_0\alpha)$ are

A. $\left(\frac{v_0}{2B_0\alpha}, \frac{\sqrt{2}v_0}{\alpha B_0}, \frac{-v_0}{B_0\alpha}\right)$

B. $\left(\frac{-v_0}{2B_0\alpha}, 0, 0\right)$

C. $\left(0, \frac{2v_0}{B_0\alpha}, \frac{v_0\pi}{2B_0\alpha}\right)$

D. $\left(\frac{v_0\pi}{B_0\alpha}, 0, \frac{-2v_0}{B_0\alpha}\right)$

**Answer: D**

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**41.** A particle of specific charge $\frac{q}{m} = \pi Ckg^{-1}$ is projected from the origin toward positive x-axis with a velocity of $10ms^{-1}$ in a uniform magnetic field $\overrightarrow{B} = -2\hat{k}T$. The velocity $\overrightarrow{v}$ of particle after time $t = \frac{1}{12}s$ will be (in $ms^{-1}$)

A. $5\left[\hat{i} + \sqrt{3}\hat{j}\right]$

B. $5\left[\sqrt{3}\hat{i} - \hat{j}\right]$

C. $5\left[3\hat{i} + \hat{j}\right]$

D. $5\left[\hat{i} + \hat{j}\right]$

**Answer: C**

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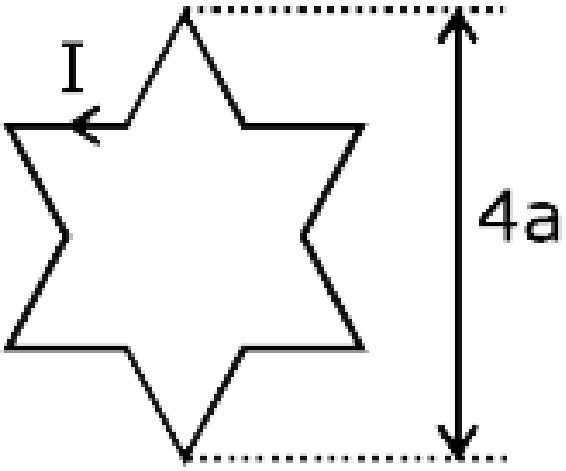
**42.** A symmetric star shaped conducting wire loop is carrying a steady state current I as shown in the figure. The distance between the diametrically opposite vertices of the star is 4a. The magnitude of the magnetic field at the

center of the loop is




A. $\frac{\mu_0 I}{4\pi a} 3\left[2-\sqrt{3}\right]$

B. $\frac{\mu_0 I}{4\pi a} 6\left[\sqrt{3}-1\right]$

C. $\frac{\mu_0 I}{4\pi a} 3\left[\sqrt{3}-I\right]$

D. $\frac{\mu_0 I}{4\pi a} 6\left[\sqrt{3}+1\right]$

**Answer: B**

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**43.** A solenoid of length $0.4m$ and having $500$ turns of wire carries a current of $3amp$ .Calculate the torque requred to hold a coil (having radius $0.02cm$ current $2A$ and turns $50$)in the middle of the solenoid with its axis perpendicular to the axis of the solenoid. $(\pi^2 = 10)$

A. 14.5

B. 10.3

C. 12.5

D. 16.3

**Answer: C**

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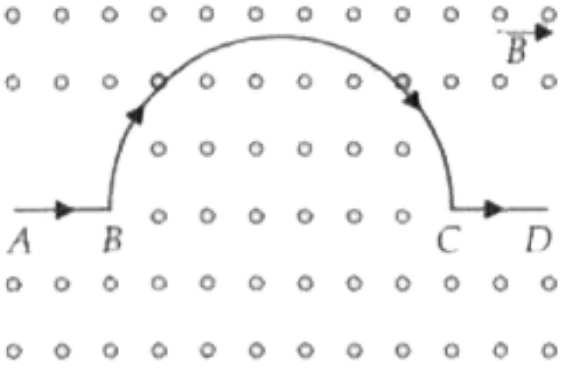
**44.** A wire ABCD is bent in the form shown here in the figure. Segments AB and CD are of length 1m each while the semicircular loop is

of radius 1m. A current of 5A flows from A towards the end D and the whole wire is placed in a magnetic field of 0.5 T direction out of the page. The force acting on the wire is




A. 40 N

B. 5 N

C. 10 N

D. 20 N

**Answer: C**

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**45.** The working principle of the mass spectrograph is that for a given combination of accelerating potential and magnetic field. The radius of curvature of the ion beam of charge q and mass m collected at different

positions on the collector will depend on the value of

A. $\sqrt{\frac{m}{2q}}$

B. $\frac{m}{q}$

C. $\sqrt{\frac{m}{q}}$

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

**Answer: C**

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**46.** A wire shaped to a regular hexagon of side x carries a current I ampere. Calculate the strength of the magnetic field at the centre of the hexagon.

A. $\frac{\sqrt{3}\mu_0 I}{\pi x}$

B. $\frac{3\mu_0 I}{\pi x}$

C. $\frac{\mu_0 I}{3\pi x}$

D. $\frac{\mu_0 I}{\sqrt{3}\pi x}$

**Answer: A**

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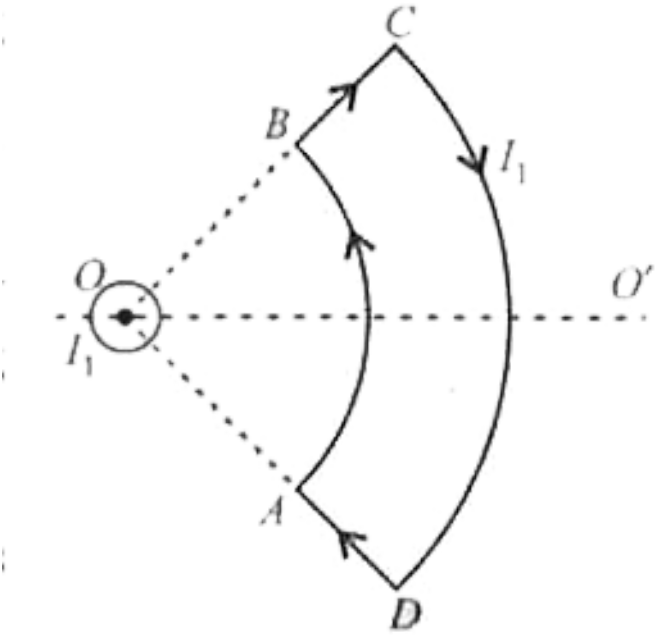
**47.** A long current carrying wire, carrying current $I_1$ such that $I_1$ is flowing out from the plants of paper is placed at O. A steady state current $I_2$ is flowing in the loop ABCD.



A. The net force is zero

B. The net torque is zero

C. As seen from O, the loop will rotate in clockwise along OO' axis

D. As seen from O, the loop will rotate in anticlockwise direction along OO' axis.

**Answer: A::C**

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**48.** The force $\vec{F}$ experienced by a particle of charge q moving with a velocity $\vec{v}$ in a magnetic field $\vec{B}$ is given by $\vec{F} = q\left(\vec{v} \times \vec{B}\right)$. Which pairs of vectors are at right angles to each other?

A. $\vec{F}$ and $\vec{v}$

B. $\vec{F}$ and $\vec{B}$

C. $\vec{B}$ and $\vec{v}$

D. $\vec{F}$ and $\left(\vec{v} \times \vec{B}\right)$

**Answer: A::B**

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**49.** Velocity and acceleration vectors of a charged particle moving in a magnetic field at some instant are $\vec{v} = 3\hat{i} + 4\hat{j}$ and $\vec{a} = 2\hat{i} + x\hat{j}$. Selcet the wrong alternative.

A. $x = -1.5$

B. x=3

C. Magnetic field is along z-direction

D. Kinetic energy of the particle is constant

**Answer: A::C**

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**50.** A charged particle is fired at an angle $\theta$ to a uniform magnetic field directed along the x-axis. During its motionalong a helical path, the particle will

A. never move parallel to the x-axis

B. move parallel to the x-axis once during every rotation for all values of $\theta$

C. move parallel to the x-axis at least once during every rotation if $\theta = 45^\circ$

D. never move perpendicular to the x-direction.

**Answer: A::D**

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**51.** A particle of mass m and charge Q moving with a velocity v enters a region on uniform

field of induction B Then its path in the region is s

A. its path in the region of the field is always circular

B. its path in the region of the field is circular if $\overrightarrow{v} . \overrightarrow{B} = 0$

C. its path in the region of the field is a straight line if $\overrightarrow{v} \times \overrightarrow{B} = 0$

D. distance travelled by the particle in time T does not depend on the angle

between $\overrightarrow{v}$ and $\overrightarrow{B}$.

**Answer: B::C::D**

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**52.** A charged particle of unit mass and unit charge moves with velocity $\overrightarrow{v} = \left(8\hat{i} + 6\hat{j}\right)ms^{-1}$ in magnetic field of $\overrightarrow{B} = 2\hat{k}T$. Choose the correct alternative (s).

A. The path of the particle may be

$$x^2 + y^2 - 4x - 21 = 0$$

B. The path of the particle may be

$$x^2 + y^2 = 25$$

C. The path of the particle may be

$$y^2 + z^2 = 25$$

D. The time period of the particle will be

3.14s

**Answer: A::B::D**

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**53.** If a charged particle kept at rest experiences an electromagnetic force,

A. the electric field must be there

B. the magnetic field must be there

C. the magnetic field may or may not be there

D. the electric field may or may not be there.

**Answer: A::C**

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**54.** Two circular coil of radii 5cm and 10cm carry equal currents of 2A. The coils have 50 and 100 turns, respectively, and are placed in such a way that their planes as well as their centers coincide. Magnitude of magnetic field at the common centre of coils is

A. $8\pi \times 10^{-4}T$ if current in the coils are in same sense.

B. $4\pi \times 10^{-4}T$ if current in the coils are in opposite sense

C. zero if current in the coils are in opposite sense

D. $8\pi \times 10^{-4}T$ if current in the coils are in opposite.

**Answer: A::C**

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**55.** Two coaxil solenoids 1 and 2 of the same length are set so that one is inside the other. The number of turns per unit length are $n_1$ and $n_2$. The current $i_1$ and $i_2$ are flowing in opposite directions. The magnetic field inside the inner coil is zero. This is possible when

A. $i_1 \neq i_2$ and $n_1 = n_2$

B. $i_1 = i_2$ and $n_1 \neq n_2$

C. $i_1 = i_2$ and $n_1 = n_2$

D. $i_1 n_1 = i_2 n_2$

**Answer: C::D**

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## Wb Jee Previous Years Questions

**1.** A current of 1A is flowing along positive x-axis through a straight wire of length 0.5m placed in a region of a magnetic field given by $\overrightarrow{B} = \left(2\hat{i} + 4\hat{j}\right)$T. The magnitude and the

direction of the force experienced by the wire respectively are

A. $\sqrt{18}N$, along positive z-axis

B. $\sqrt{20}N$, along positive x-axis

C. 2N , along positive z-axis

D. 4N, along positive y-axis

**Answer: C**

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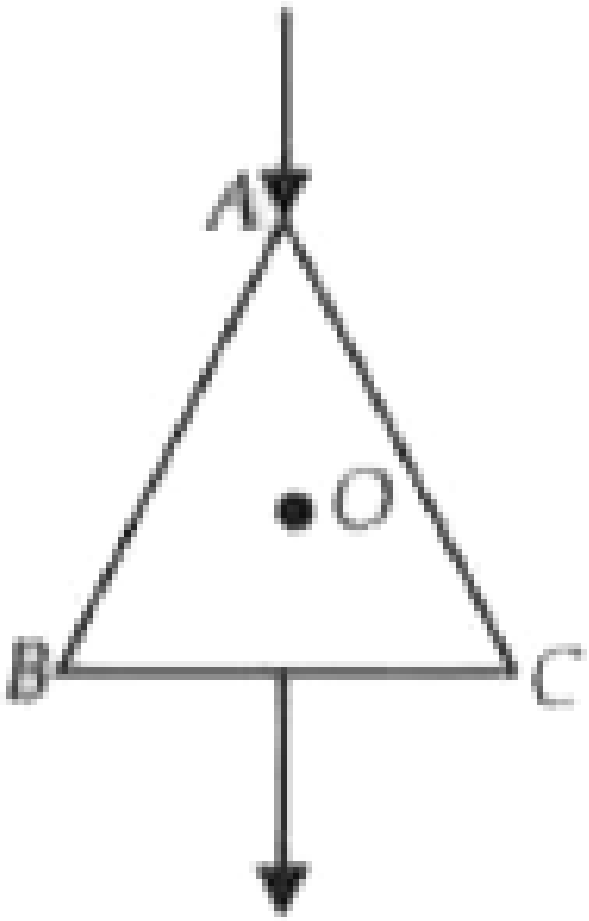
**2.** An equilateral triangle is made by uniform wires, AB, BC, CA. A current I enters at A and leaves from the mid point of BC. If the lengths of each side of the triangle is L, the magnetic

field B at the centroid O of the triangle is




A. $\frac{\mu_0}{4\pi}\left(\frac{4I}{L}\right)$

B. $\frac{\mu_0}{2\pi}\left(\frac{4I}{L}\right)$

C. $\frac{\mu_0}{4\pi}\left(\frac{2I}{L}\right)$

D. zero

**Answer: D**

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**3.** A galvanometer having internal resistance $10\Omega$ required $0.01$ A for a full scale deflection. To convert this galvanometer to a voltmeter of full scale deflection at 120 V, we need to connect a resistance of

A. $11990\Omega$ in series

B. $11990\Omega$ in parallel

C. $12010\Omega$ in series

D. $12010\Omega$ in parallel.

**Answer: A**

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**4.** A proton of mass m and charge q is moving in a plane with kinetic energy E. if there exists a uniform magnetic field B, perpendicular to

the plane motion. The proton will move in a circular path of radius

A. $\frac{2Em}{qB}$

B. $\frac{\sqrt{2Em}}{qB}$

C. $\frac{\sqrt{E}m}{2qB}$

D. $\sqrt{\frac{2E}{mB}}$

**Answer: B**

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**5.** Two particles X and Y having equal charges, after being accelerated through the same potential difference, enter a region of uniform magnetic field and describe circular paths of radii $R_1$ and $R_2$, respectively. The ratio of masses of X and Y is

A. $\sqrt{R_1 / R_2}$

B. $R_1 / R_2$

C. $(R_1 / R_2)^2$

D. $(R_2 / R_1)^2$

**Answer: C**

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**6.** An electron enters an electric field having intensity $\vec{E} = \left(3\hat{i} + 6\hat{j} + 2\hat{k}\right) Vm^{-1}$ and magnetic field having induction $\vec{B} = \left(2\hat{i} + 3\hat{j}\right)$ T with a velocity $\vec{V} = \left(2\hat{i} + 3\hat{j}\right) ms^{-1}$. The magnitude of the force acting on the electron is (Given $e = -1.6 \times 10^{-19} C$)

A. $2.02 \times 10^{18} N$

B. $5.16 \times 10^{-16} N$

C. $3.72 \times 10^{-17} N$

D. none of the above

**Answer:**

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**7.** The magnetic field due to current in a straight wire segment of length L at a point

on its perpendicular bisector at a distance $r(r > > L)$

A. decreases as $\frac{1}{r}$

B. decreases as $\frac{1}{r^2}$

C. decreases as $\frac{1}{r^3}$

D. approaches a finite limit as $r \to \infty$

**Answer: B**

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**8.** The magnets of two suspended coil galvanometer are of the same strength so that they produce identical uniform magnetic fields in the region of the coils. The coil of the first one is in the shape of a square of side a and that of the second one is circular of radius $\frac{a}{\sqrt{\pi}}$. When the same current is passed throught the coils, the ratio of the torque experienced by the first coil to that rxperienced by the second one is

A. $1:\frac{1}{\sqrt{\pi}}$

B. $1:1$

C. $\pi:1$

D. $1:\pi$

**Answer: B**

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**9.** A proton is moving with a uniform velocity of $10^6 m.\, s^{-1}$ along the Y-axis, under the joint action of a magnetic field along Z-axis and an electric field of magnitude $2 \times 10^4 V.\, m^{-1}$

along the negative X-axis. If the electric field is switched off, the proton starts moving in a circle. The radius of the circle is nearly (given: $\frac{e}{m}$ ratio for proton $\approx 10^8 C.\, kg^{-1}$)

A. 0.5m

B. 0.2m

C. 0.1m

D. 0.05m

**Answer: A**

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**10.** A proton of mass 'm' moving with a speed v ( $< < c$, velocity of light in vaccuum) completes a circular orbit in time 'T' in a uniform magnetic field. If the speed of the proton is increased to $\sqrt{2}v$, what will be time needed to complete the circular orbit?

A. $\sqrt{2}T$

B. T

C. $\frac{T}{\sqrt{2}}$

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

**Answer: B**

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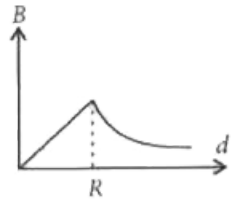
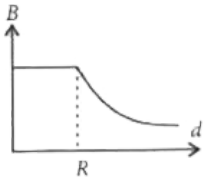
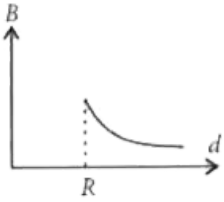
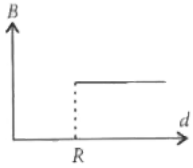
**11.** A uniform current is flowing along the length of an infinite, straight, thin, hollow cylinder of radius 'R'. The magnetic field 'B' produced at a perpendicular distance 'd' from the axis of the cylinder is plotted in a graph. Which of the following figure looks like the plot?

A. 


B. 


C. 


D. 


**Answer: C**

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**12.** A circular loop of radius 'r' of conducting wire connected with a Voltage source of zero internal resistance produces a magnetic field 'B' at its centre. If instead, a circular loop of radius '2r' made of same material, having the same cross section is connected to the same voltage source, what will be the magnetic field at its centre?

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

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

C. 2B

D. B

**Answer: B**

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**13.** To which of the following quantities, the radius of the circular path of a charged particle moving at right angles to a uniform magnetic field is directly proportional?

A. energy of the particle

B. magnetic field

C. charge of the particle

D. momentum of the particle

**Answer: D**

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**14.** An electric current I enters and leaves a uniform circular wire of radius a through diametrically opposite points. A charged paricle q moving along the axis of the circular

wire passes through its centre at speed v. The magnetic force acting on the particle when it passes through the centre has a magnitude

A. $qv\frac{\mu_0 i}{a}$

B. $qv\frac{\mu_0 i}{2a}$

C. $qv\frac{\mu_0 i}{2\pi a}$

D. zero

**Answer: D**

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**15.** A current 'I' is flowing along an infinite, straight wire, in the positive Z-direction and the same current is flowing along a similar parallel wire 5m apart, in the negative Z-direction. A point P is at a perpendicular distance 3m from the first wire and 4m from the second. What will be magnitude of the magnetic field $\overrightarrow{B}$ at P?

A. $\frac{5}{12}(\mu_{0I}$

B. $\frac{7}{24}(\mu_0 I)$

C. $\frac{5}{24}(\mu_0 I)$

D. $\frac{25}{288}(\mu_0 I)$

**Answer:**

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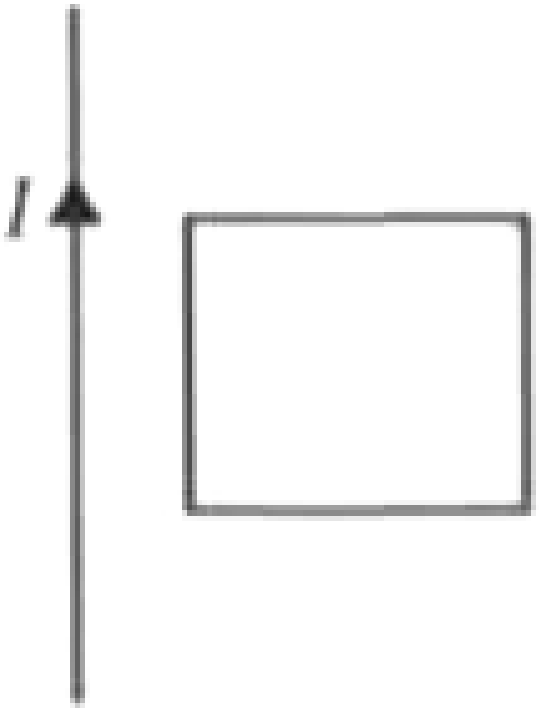
**16.** A square conducting loop is placed near an infinitely long current carrying wire with one edge parallel to the wire as shown in the figure. If the current in the straight wire is suddenly halved, which of the following

statements will be true? "The loop will.."




A. stay stationary

B. move towards the wire

C. move away from the wire

D. move parallel to the wire

**Answer: B**

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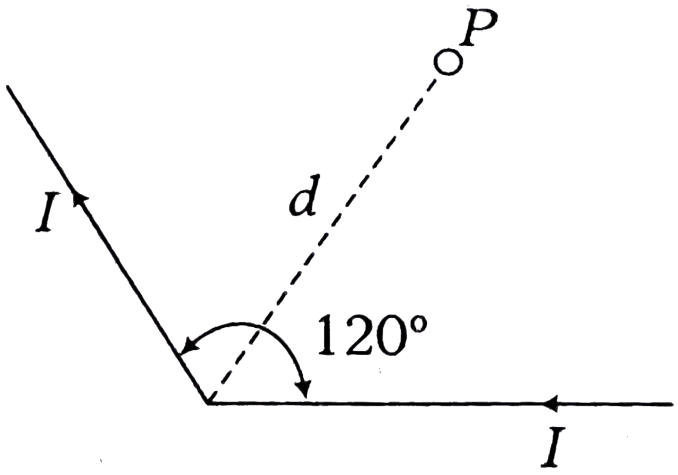
**17.** A long conducting wire carrying a current I is bent at $120^\circ$ ( see figure). The magnetic field B at a point P on the right bisector of bending angle at a distance d from the bend is

($\mu_0$ is the permeability of free space)




A. $\frac{3\mu_0 I}{2\pi d}$

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

C. $\frac{\mu_0 I}{\sqrt{3}\pi d}$

D. $\frac{\sqrt{3}\mu_0 I}{2\pi d}$

**Answer: D**

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**18.** A light charged particle is revolving in a circle of radius 'r' in electrostatic attraction of a static heavy particle with opposite charge. How does the magnetic field 'B' at the centre of the circle due to the moving charge depend on 'r' ?

A. $B \propto \frac{1}{r}$

B. $B \propto \frac{1}{r^2}$

C. $B \propto \frac{1}{r^{3/2}}$

D. $B \propto \frac{1}{r^{5/2}}$

**Answer: D**

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**19.** If E and B are the magnitudes of electric and magnetic field respectively in some region of space, then the possibilities for which a charged particle may move in that space with a uniform velocity of magnitude v are

A. E= vB

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

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

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

**Answer: A::C::D**

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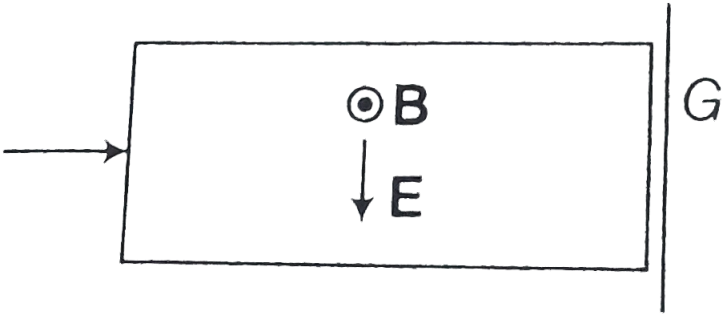
**20.** A stream of electron and protons are directed towards a narrow slit in a screen the intervening region has a uniform electric field E vertically downwards and a unifrom

magnetic field B out of the plane of the as shown then




A. electrons and protons with speed $\left|\frac{\vec{E}}{\vec{B}}\right|$ will pass through the slit

B. protons with speed $\left|\frac{\vec{E}}{\vec{B}}\right|$ will pass through the slite, electrons of the same speed will not

C. neither electrons nor protons will go through the slit irrespective of their speed.

D. electrons will always be deflected upwards irrespective of their speed.

**Answer: C::D**

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**21.** A coil carrying electric current is placed in uniform magnetic field

A. force is non-zero

B. force is zero

C. torque is zero

D. torque is non-zero

**Answer: A::D**

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**22.** Two long parallel wires separated by 0.1m carry currents of 1A and 2A respectively in opposite directions. A third current carrying wire parallel to both of them is placed in the same plane such that it feels no net magnetic force. It is placed at a distance of

A. 0.5m from the $1^{st}$ wire, towards the $2^{nd}$ wire

B. 0.2m from the $1^{st}$ wire, towards the $2(nd)$ wire

C. 0.1m from the $1^{st}$ wire, away from the $2^{nd}$ wire

D. 0.2 m from the $1^{st}$ wire, away from the $2^{nd}$ wire.

**Answer: C**

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