# QUESTIONS FROM COMPETITIVE EXAMS

## 4.1 Introduction

**(MHT-CET 2019)**

1. According to Oersted experiment, WRONG statement is that
   a) current carrying conductor does not produce magnetic field around it
   b) the direction of magnetic field can be obtained by using right hand rule
   c) current carrying conductor produces magnetic field around it
   d) the strength of magnetic field depends upon the current flowing through the conductor

## 4.2 Magnetic Force

**(MHT-CET 2008)**

2. Which of the following while in motion cannot be deflected by magnetic field ?
   a) Protons  b) Cathode rays  c) Alpha particles  d) Neutrons

## 4.3 Cyclotron

**(MHT-CET 2010)**

3. Two particles of masses $m_a$ and $m_b$ enter in a magnetic field and perpendicular to field. They travel along circular paths of radiis $r_a$ and $r_b$ respectively such that $r_a > r_b$. Then which of the following eq$^n$. is true ?
   a) $m_a v_a > m_b v_b$  b) $m_a > m_b$ and $v_a > v_b$
   c) $m_a = m_b$ and $v_a > v_b$  d) $m_b v_b > m_a v_a$

**(MHT-CET 2014)**

4. In cyclotron, for a given magnet, radius of the semicircle traced by positive ion is directly proportional to (v = velocity of positive ion)
   a) $v^{-2}$  b) $v^{-1}$  c) v  d) $v^2$

**(MH-CET 2016)**

5. Two particles X and Y having equal charges after being accelerated through same potential difference enter a region of uniform magnetic field and describe circular paths of radii '$r_1$' and '$r_2$' respectively. The ratio of the mass of X to that of Y is
   a) $\frac{r_1}{r_2}$  b) $\sqrt{\frac{r_1}{r_2}}$  c) $\left[\frac{r_2}{r_1}\right]^2$  d) $\left[\frac{r_1}{r_2}\right]^2$

**(MH-CET 2018)**

6. An alternating electric field of frequency '$V$' is applied across the dees (radius R) of a cyclotron to accelerate protons (mass m). The operating magnetic field 'B' used and K.E. of the proton beam produced by it are respectively (e = charge on proton)
   a) $\frac{2\pi mv}{e}, 2\pi^2 mV^2R^2$  b) $\frac{2\pi^2 mv}{e^2}, 4\pi^2 mV^2R^2$
   c) $\frac{\pi mv}{e}, \pi^2 mV^2R^2$  d) $\frac{2\pi^2 m^2v^2}{e}, 2\pi^2 m^2V^2R^2$

(MHT-CET 2020)

7. A charged particle is moving in a uniform magnetic field in a circular path of radius 'R'. When the energy of the particle becomes three times the original, the new radius will be

a) R  b) 3 R  c) $\frac{R}{3}$  d) $\sqrt{3}$ R

(MHT-CET 2021)

8. Two concentric coplanar circular loops of radii '$r_1$' and '$r_2$' respectively carry currents '$i_1$' and '$i_2$' in opposite directions (one clockwise and other anticlockwise). The magnetic induction at the centre of the loops is half that due to '$i_1$' alone at the centre. If $r_2 = 2r_1$, the value of $\frac{i_2}{i_1}$

a) $\frac{1}{4}$  b) 1  c) 2  d) $\frac{1}{2}$

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9. An electron of charge 'e' and mass 'm' is accelerated through a potential difference of 'V' volt. It enters a transverse uniform magnetic field 'B' and describes circular path. The radius of the circular path is

a) $\frac{1}{B}\sqrt{\frac{mv}{e}}$  b) $\frac{1}{B}\sqrt{\frac{2mv}{e}}$

c) $\sqrt{\frac{mv}{eB}}$  d) $\frac{mv}{eB}$

## 4.4 Helical Motion

(MHT-CET 2018)

10. A negatively charged particle projected towards east is deflected towards north by a magnetic field. The field may be

a) towards west  b) towards south  c) upwards  d) downwards

## 4.5 Moving Coil Galvanometer

(MHT-CET 2005)

11. Three moving coil galvanometers A, B and C are made of coils of three different materials having torsional constants $1.8 \times 10^{-8}$, $2.8 \times 10^{-8}$ and $3.8 \times 10^{-8}$ respectively. If the three galvanometers are identical in all other respects, then which galvanometer has maximum sensitivity ?

a) A  b) B

c) C  d) constant in each case

(MH-CET 2015)

12. Sensitivity of a moving coil galvanometer can be increased by

a) decreasing the number of turns of coil

b) increasing the number of turns of coil

c) decreasing the area of the coil

d) by using a weak magnet

Sensitivity of moving coil galvanometer is 's'. If a shunt of $\left(\frac{1}{8}\right)^{th}$ of the resistance of galvanometer is connected to moving coil galvanometer, its sensitivity becomes

a) $\frac{s}{3}$ b) $\frac{s}{6}$ c) $\frac{s}{9}$ d) $\frac{s}{12}$

(MHT-CET 2019)

In moving coil galvanometer, strong horse shoe magnet of concave shaped pole pieces is used to

a) increase space for rotation of coil

b) produce magnetic field which is parallel to plane of coil at any position

c) reduce weight of galvanometer

d) make magnetic induction weak at the centre

(MHT-CET 2020)

Two galvanometers '$G_1$' and '$G_2$' require 2 mA and 3 mA currents respectively to produce the same deflection. Then

a) $G_1$ is less sensitive than $G_2$ b) $G_1$ and $G_2$ are equally sensitive

c) sensitivity of $G_2$ is $\frac{3}{2}$ times that of $G_1$ d) $G_1$ is more sensitive than $G_2$

## 4.6 Biot-Savart's Law (Laplace's Law)

(MHT-CET 2007)

The magnetic field at the centre of the MCG is 0.25 T. The coil has an area of 0.2 $m^2$ and has 28 turns. If the sensitivity of the MCG is to be increased by 25%, the number of turns of the coil should be ... Assume all other things remaining constant.

a) 30 b) 32 c) 35 d) 38

(MHT-CET 2009)

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

a) n B b) $n^2$ B c) 2 n B d) 2 $n^2$ B

(MHT-CET 2011)

Two coils are made of same material such that radius of one coil is twice of the other and magnetic field is same at the centres. Then ratio of potential differences applied across $1^{st}$ to second coil is

a) 2 times b) same c) 4 times d) 3 times

(MHT-CET 2014)

Magnetic induction produced at the centre of a circular loop carrying current is 'B'. The magnetic moment of the loop of radius 'R' is ($\mu_0$ = permeability of free space)

a) $\frac{BR^3}{3\pi \mu_0}$ b) $\frac{2\pi BR^3}{\mu_0}$ c) $\frac{BR^2}{2\pi \mu_0}$ d) $\frac{2\pi BR^2}{\mu_0}$

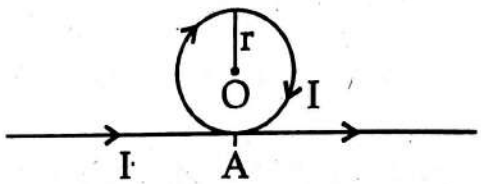
(MH-CET 2018)

20. A circular coil carrying current 'I' has radius 'R' and magnetic field at the centre is 'B'. At what distance from the centre along the axis of the same coil, the magnetic field will be $\frac{B}{8}$?

a) $R\sqrt{2}$ b) $R\sqrt{3}$ c) 2R d) 3R

(MHT-CET 2019)

21. Figure shows the circular coil carrying current 'I' kept very close but not touching at a point 'A' on a straight conductor carrying the same current 'I'. The magnitude of magnetic induction at the centre of the circular coil will be




a) zero b) $\frac{\mu_0 I}{2r}\left(1-\frac{1}{\pi}\right)$ c) $\frac{\mu_0 I}{2r}\left(1+\frac{1}{\pi}\right)$ d) $\frac{\mu_0 I}{2\pi r}$

(MHT-CET 2020)

22. Two parallel wires of equal lengths are separated by a distance of 3 m from each other. The current flowing through first and second wires is 3 A and 4.5 A respectively in opposite directions. The resultant magnetic field at mid-point of separation between the wires is

a) $\frac{7\mu_0}{2\pi}$ b) $\frac{5\mu_0}{2\pi}$ c) $\frac{3\mu_0}{2\pi}$ d) $\frac{\mu_0}{2\pi}$

## 4.7 Torque on a Current Loop in Magnetic Field

(MHT-CET 2013)

23. A current loop in a magnetic field
a) experiences a torque whether the field is uniform or non-uniform in all orientations
b) can be in equilibrium in one orientation
c) can be equilibrium in two orientations, both the equilibrium states are unstable
d) can be in equilibrium in two orientations, one stable while the other is unstable

## 4.8 Magnetic Dipole Moment

(MHT-CET 2001)

24. Magnetic dipole moment $\vec{M}$ of the coil, placed in uniform magnetic field of induction $\vec{B}$, does not depend on
a) number of turns of coil b) current through coil
c) area of the cross section d) magnetic field of induction

(MHT-CET 2021)

25. A wire of length 'L' is bent to form a circular coil of number of turns n placed in a magnetic field of induction 'B' and a current 'I' is passed through it. Maximum torque acting on the coil will be

a) $\frac{BIL^2}{4\pi n}$ b) $\frac{BIL^2}{4\pi n^2}$ c) $\frac{BIL^2}{2\pi n}$ d) zero

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6. Two wires of same length are made to form a circle and a square. They carry same current. The ratio of the magnetic moment of circle to that of square is

a) $2 : \pi$ b) $4 : \pi$ c) $\pi : 4$ d) $\pi^2 : 2$

## 4.9 Force Between Two Infinitely Long Current Carrying Parallel Conductors

(MHT-CET 2020)

7. Two long and straight conductors, placed parallel to each other are separated by 20 cm, carrying currents of 3 A and 5 A respectively in opposite directions. The force per unit length exerted by each conductor on the other is

a) $1.5 \times 10^{-5} \frac{N}{m}$, attractive b) $1.5 \times 10^{-5} \frac{N}{m}$, repulsive

c) $3 \times 10^{-5} \frac{N}{m}$, repulsive d) $3 \times 10^{-5} \frac{N}{m}$, attractive

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8. Two long parallel wires separated by distance 'd' carry currents $I_1$ and $I_2$ in the same direction. They exert a force F on each other. Now the current in one of the wires is increased to three times and its direction is made opposite. The distance between the wires is doubled. The magnitude of force between them is

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

## 4.10 Ampere's Law and Its Applications

(MHT-CET 2010)

29. Toroid is

a) ring shaped closed solenoid b) rectangular shaped solenoid

c) ring shaped open solenoid d) square shaped solenoid

(MHT-CET 2012)

30. The magnetic field inside a solenoid is

a) directly proportional to its length

b) inversely proportional to the total number of turns

c) inversely proportional to the current

d) directly proportional to the current

(MH-CET 2017)

31. The magnetic flux near the axis and inside an air core solenoid of length 60 cm carrying current 'I' is $1.57 \times 10^{-6}$ Wb. Its magnetic moment will be (cross-sectional area of a solenoid is very small as compared to its length, $\mu_0 = 4\pi \times 10^{-7}$ SI unit) :

a) 0.25 Am b) 0.50 Am c) 0.75 Am d) 1 Am

(MHT-CET 2019)

32. The magnetic induction at a point near end of a current carrying solenoid is (I = current, n = number of turns per unit length, $\mu_0$ = permeability)

a) $\frac{1}{2}\mu_0 nI$ b) $\frac{1}{4}\mu_0 nI$ c) $2 \pi_0 nI$ d) $\pi_0 nI$