



# PHYSICS

## BOOKS - MTG-WBJEE PHYSICS

### (HINGLISH)

## MAGNETICS

**Wb Jee Workout Category 1 Single Option  
Correct Type**

1. At a certain place, the horizontal component of earth's magnetic field is  $\sqrt{3}$  times the vertical component. The angle of dip at that place is

A.  $30^\circ$

B.  $60^\circ$

C.  $45^\circ$

D.  $90^\circ$

**Answer: A**



**View Text Solution**

2. The ratio of magnetic field and magnetic moment at the centre of a current carrying circular loop is  $x$ . When both the current and radius is doubled the ratio will be

A.  $\frac{x}{8}$

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

C.  $\frac{x}{2}$

D.  $2x$

**Answer: A**



**View Text Solution**

**3.** A ferromagnetic material is heated above its curie temperature. Which one is a correct statement ?

A. Ferromagnetic domains are perfectly arranged.

B. Ferromagnetic domains become random.

C. Ferromagnetic domains are not influenced.

D. Ferromagnetic material changes itself into diamagnetic.

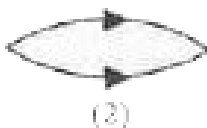
**Answer: A**



**View Text Solution**

4. Following figures (1) and (2) represent lines of force, Which of the following is correct

statement?



A. figure (1) represents magnetic lines of force

B. figure (2) represents magnetic lines of force

C. figure (1) represents electric lines of force

D. both figure (1) and figure (2) represent magnetic lines of force.

**Answer: C**



**View Text Solution**

5. Soft iron is used to manufacture electromagnets because their

A. magnetic saturation limit is high while retentivity and coercive force are small

B. retentivity is high but coercive force is small

C. retentivity is small but coercive force is high

D. area of hysteresis loop is large.

**Answer: B**



**View Text Solution**



6. If a diamagnetic substance is brought near North or South pole of a bar magnet, it is

- A. repelled by North pole and attracted by the South pole
- B. repelled by the poles
- C. attracted by the poles
- D. attracted by the North pole and repelled by the South pole.

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

7. Among which the magnetic susceptibility does not depend on the temperature?

- A. diamagnetism
- B. paramagnetism
- C. ferromagnetism
- D. ferrite

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

8. A charged particle (charge  $q$ ) is moving in a circle of radius  $R$  with uniform speed  $v$ . The associated magnetic moment  $\mu$  is given by

A.  $qvR^2$

B.  $qvR^2 / 2$

C.  $qvR$

D.  $qvR^2 / 2$

**Answer: D**



 [View Text Solution](#)

9. The value of angle of dip is zero at the magnetic equator because on it

- A.  $V$  and  $H$  are equal
- B. The values of  $V$  and  $H$  are zero
- C. The value of  $V$  is zero
- D. The value of  $H$  is zero.

**Answer: C**



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10. The relative permeability is represented by  $\mu_r$  and the susceptibility is denoted by  $\chi$  for a magnetic substance. Then for a paramagnetic substance

A.  $\mu_r < 1$  and  $\chi < 0$

B.  $\mu_r < 1$  and  $\chi > 0$

C.  $\mu_r > 1$  and  $\chi < 0$

D.  $\mu_r < 1$  and  $\chi < 0$

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



[View Text Solution](#)

11. The magnetism of magnet is due to

A. the spin motion of electrons

B. Earth

C. pressure of huge magnet inside the  
earth

D. cosmic rays.

**Answer: A::C**



12. The true value of dip at a place is  $60^\circ$ . The apparent dip in a plane inclined at an angle of  $30^\circ$  with magnetic meridian is

A.  $\tan^{-1}\left(\frac{1}{2}\right)$

B.  $\tan^{-1}(2)$

C.  $\tan^{-1}\left(\frac{2}{3}\right)$

D. None of these

**Answer: B**



[View Text Solution](#)

**13.** Magnetic meridian is a

A. Point

B. Horizontal plane

C. Vertical plane

D. Line along N - S.

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



[View Text Solution](#)



14. A superconductor exhibits perfect

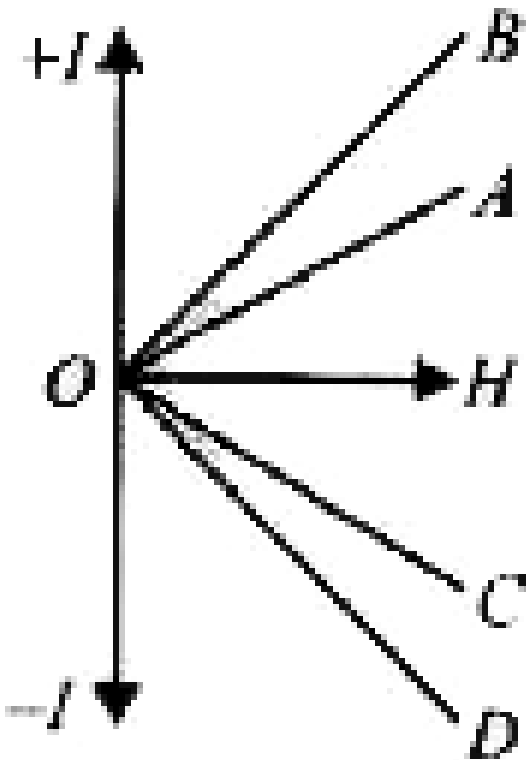
- A. Ferrimagnetism
- B. Ferromagnetism
- C. Paramagnetism
- D. Diamagnetism.

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



**View Text Solution**

15. The variation of intensity of magnetization ( $I$ ) with respect to the magnetising field ( $H$ ) in a diamagnetic substance is described by the graph



A. OD

B. OC

C. OB

D. OA

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



**View Text Solution**

**16.** The magnetic lines of force inside a bar magnet

A. are from south pole to north pole of the magnet

B. are from north pole to south pole of the magnet

C. do not exist

D. depend upon area of cross-section of the bar magnet.

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



**View Text Solution**

17. Isogonic lines on magnetic map will have

- A. Zero angle of dip
- B. Zero angle of declination
- C. Same angle of declination
- D. Same angle of dip.

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



**View Text Solution**

**18.** At which place, Earth's magnetism becomes horizontal.

- A. Magnetic pole
- B. Geographical pole
- C. Magnetic meridian
- D. Magnetic equator

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



**View Text Solution**

19. Relative permeability of iron is 5500. Its magnetic susceptibility is

A.  $5500 \times 10^7$

B. 5499

C. 5501

D.  $5500 \times 10^{-7}$

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



**View Text Solution**

20. Ascertain amount of current when flowing in a properly set tangent galvanometer, produces a deflection of  $45^\circ$ . If the current is reduced by a factor of  $\sqrt{3}$ , the deflection would

A. decrease by  $30^\circ$

B. increase by  $30^\circ$

C. decrease by  $15^\circ$

D. increase by  $15^\circ$

**Answer: C**





View Text Solution

21. The angle of dip at place is  $\delta$ . If dip is measured in a plane making an angle  $\theta$  with the magnetic meridian, the apparent angle of dip  $\delta_1$  will be equal to

A.  $\tan^{-1}(\tan \delta \sec \theta)$

B.  $\tan^{-1}(\tan \delta \sin \theta)$

C.  $\tan^{-1}(\tan \theta \cos \theta)$

D.  $\tan^{-1}(\tan \delta \cos \theta)$

**Answer: A**



**View Text Solution**

22. A thin magnetic wire of length and moment is bent at its midpoint at an angle of  $60^\circ$ . The new magnetic inoment after bending will be

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

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

C.  $\sqrt{2}M$

D. 2M

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



**View Text Solution**

**23.** The magnetic moment of paramagnetic material is

A. infinity

B. constant but now

C. unity

D. zero

**Answer: A::B::C**



**View Text Solution**

**24.** The pole strength of a bar magnet is 100 units. It is cut into two pieces along a line parallel to its equator in such a way that the length of one piece is half the length of the other. What will be the ratio of the pole strengths of the two pieces?

A. 1 : 1

B. 1 : 2

C. 1 : 3

D. 5 : 2

**Answer: A**



**View Text Solution**

**25.** A charge  $q$  is circulating with a constant speed  $v$  in a semicircular loop of wire of radius  $R$ . The magnetic moment of this loop is

A.  $qvR$

B.  $\frac{\pi Rqv}{2(\pi + 2)}$

C.  $\frac{qvR}{3}$

D.  $\frac{qv\pi R}{\pi + 2}$

**Answer: B**



[View Text Solution](#)

26. If the angular momentum of an electron is  $\vec{j}$  then the magnitude of the magnetic moment will be

A.  $eJ2m$

B.  $\frac{2m}{eJ}$

C.  $\frac{eJ}{2m}$

D.  $\frac{eJ}{m}$

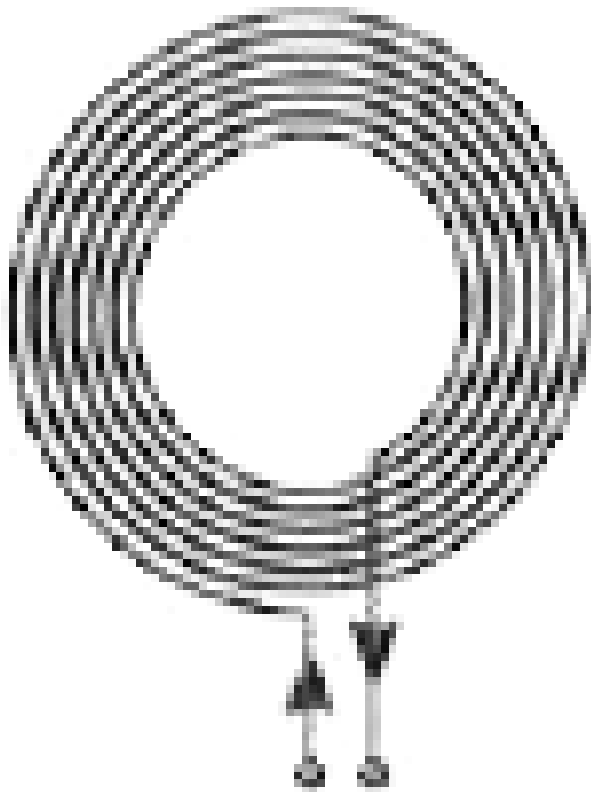
**Answer: C**



[View Text Solution](#)

**27.** A thin insulated wire forms a plane spiral of  $N = 100$  tight turns carrying a current  $I = 8$  mA. The radii of inside and outside turns are equal

to  $a = 50 \text{ mm}$  and  $b = 100 \text{ mm}$ . Find the magnetic moment of the spiral with a given current



A.  $15Am^2$



B.  $10Am^2$

C.  $30Am^2$

D.  $5Am^2$

**Answer: A**



**View Text Solution**

**28.** Consider a solid sphere of radius  $r$  and mass  $m$  which has a charge  $q$  distributed uniformly over its volume. The sphere is rotated about a diameter with an angular

speed  $\omega$ . The magnetic moment of the sphere is

A.  $\frac{1}{3}q\omega r^2$

B.  $\frac{1}{5}q\omega r^2$

C.  $\frac{1}{7}q\omega r^2$

D.  $\frac{1}{9}q\omega r^2$

**Answer: B**



**View Text Solution**

29. A rod of length  $l$  having uniformly distributed charge  $Q$  is rotated about one end with constant frequency ' $f$ '. Its magnetic moment is  $\frac{\pi f Q l^2}{n}$ . Then the value of  $n$  is

A. 7

B. 5

C. 9

D. 3

**Answer: D**



[View Text Solution](#)

**30.** A bar magnet having a magnetic moment of  $2.0 \times 10^{-4} \text{ J/T}$  is free to rotate in a horizontal plane. A horizontal magnetic field  $B = 5 \times 10^{-5} \text{ T}$  exists in the space. Then the work done in rotating the magnet slowly from a direction parallel to the field to a direction  $60^\circ$  from the field is

A. 0.1 J

B. 0.3 J

C. 0.5 J

D. 0.7 J

**Answer: C**



**View Text Solution**

**Wb Jee Workout Category 2 Single Option  
Correct Type**

**1.** A magnetic needle is placed in a uniform magnetic field and is aligned with the field.

The needle is now rotated by an angle of  $60^\circ$  and the work done is  $W$ . The torque on the magnetic needle at this position is

A.  $2\sqrt{3}W$

B.  $\sqrt{3}W$

C.  $\frac{\sqrt{3}}{2}W$

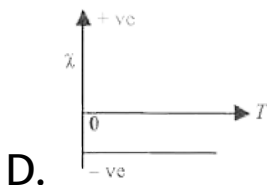
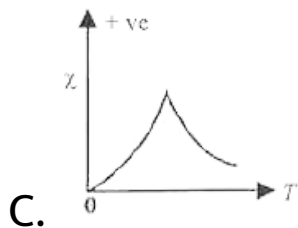
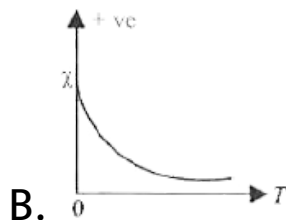
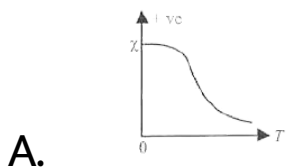
D.  $\frac{\sqrt{3}}{4}W$

**Answer: B**



**View Text Solution**

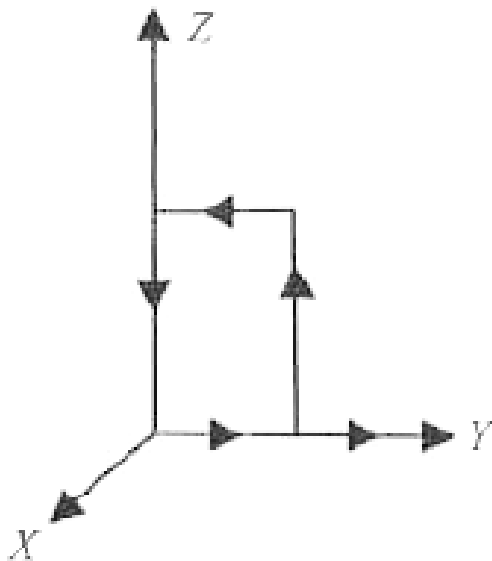
2. The variation of magnetic susceptibility ( $\chi$ ) with absolute temperature for antiferromagnetic material is given by



**Answer: C**

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3. A rectangular coil of area of cross-section is placed as shown. A magnetic field  $B$  is applied along  $Z$ -axis. The torque on the coil is





A. ABI along + Y-axis

B. ABI along - Y-axis

C. ABI along + X-axis

D. ABI along - X-axis

**Answer: A**



**View Text Solution**

4. If the magnetic dipole moment of an atom  
of diamagnetic material paramagnetic

material and ferromagnetic material are denoted by  $m_d$ ,  $m_p$  and  $m_f$  respectively then

A.  $m_d = 0$  and  $m_p \neq 0$

B.  $m_d \neq 0$  and  $m_p = 0$

C.  $m_p = 0$  and  $m_f \neq 0$

D.  $m_d \neq 0$  and  $m_f \neq 0$

**Answer: A**



**View Text Solution**

5. The time period of a thin bar magnet in Earth's magnetic field is  $T$ . If the magnet is cut into two equal parts perpendicular to its length, the time period of each part in the same field will be

A.  $T / 2$

B.  $T$

C.  $\sqrt{2}T$

D.  $2T$

**Answer: D**



[View Text Solution](#)

6. The value of workdone for rotating a magnet of magnetic moment  $M$  by an angle  $\theta$  in external magnetic field  $H$  is given by

A.  $MH \cos \theta$

B.  $2Mh \sin^2 \left( \frac{\theta}{2} \right)$

C.  $MH \sin \theta$

D.  $MH ( - 1 \sin^2 \theta )$

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



View Text Solution

7. At magnetic equator, total intensity of Earth's magnetic field is  $I_E$  and at poles it is  $I_p$ . They are related as

A.  $2I_P = I_E$

B.  $I_P = 2I_E$

C.  $\sqrt{3}I_P = I_E$

D.  $I_P = 2I_E$

**Answer: B**



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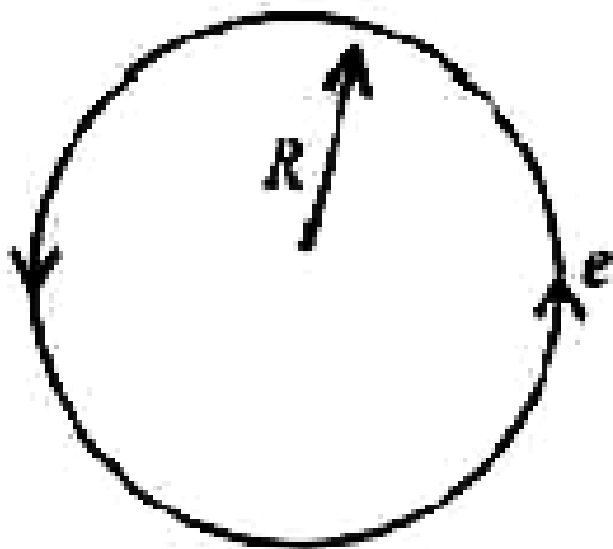
8. An electron is moving in an orbit of radius  $R$  with a time period  $T$  as shown in the figure.

The magnetic moment produced may be given

by

$|e|$  represents the magnitude of the electron

charge.



$$|\vec{A}| = \pi R^2$$

A.  $\vec{m} = \frac{2\pi|e|\vec{A}}{T}$

B.  $\vec{m} = -\frac{2\pi|e|\vec{A}}{T}$

C.  $\vec{m} = -\frac{|e|\vec{A}}{T}$

$$D. \vec{m} = - \frac{|e| \vec{A}}{T}$$

**Answer: B**

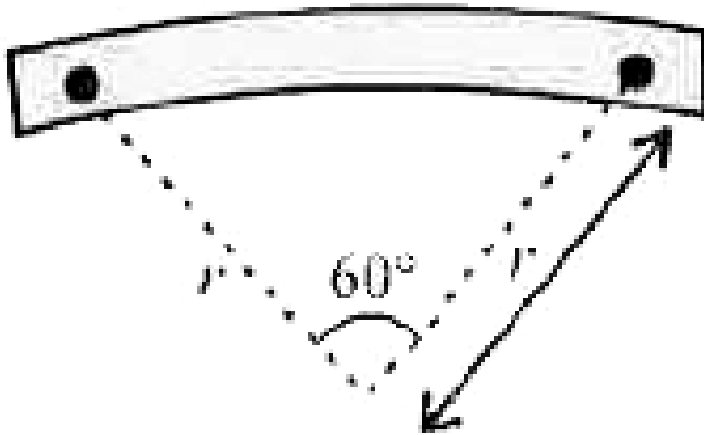


**View Text Solution**

9. A bar magnet of  $l$  length and magnetic dipole moment  $M$  is bent in the form of an arc as shown in the figure. The new magnetic



dipole moment will be



A.  $M$

B.  $\frac{3}{\pi}M$

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

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

**Answer: B**





10. A bar magnet has a pole strength of 15 A m and magnetic length 20 cm. What is the magnetic induction produced by it at a point at a distance of 30 cm from either pole?

$$\left( \frac{\mu_0}{4\pi} = 10^{-7} \text{Wb/A m} \right)$$

A.  $1.11 \times 10^{-5} \text{Wb/m}^2$

B.  $0.8 \times 10^{-4} \text{Wb/m}^2$

C.  $1.5 \times 10^{-5} \text{Wb/m}^2$

D.  $2.75 \times 10^{-5} \text{Wb/m}^2$

**Answer: A**



**View Text Solution**

**11.** The magnetic induction at a point P on the axis is equal to the magnetic induction at a point on the equator of a short magnetic dipole. What is the ratio of the distances of P and Q from the centre of the dipole?

A.  $2^{2/3}$

B.  $3^{1/2}$

C.  $2^{2/3}$

D.  $4^{1/3}$

**Answer: A**



**View Text Solution**

**12.** Two short bar magnets A and B of dipole moments  $0.15Am^2$  and  $1.2Am^2$  respectively are placed with their axes along the same line with their centres 0.15 m apart. The dipole moments due to A and B point in opposite

directions. What is the position of the point, between the two magnets, where the resultant induction is zero?

A. 10 cm from the centre of A

B. 12 cm from the centre of A

C. 5 cm from the centre of A

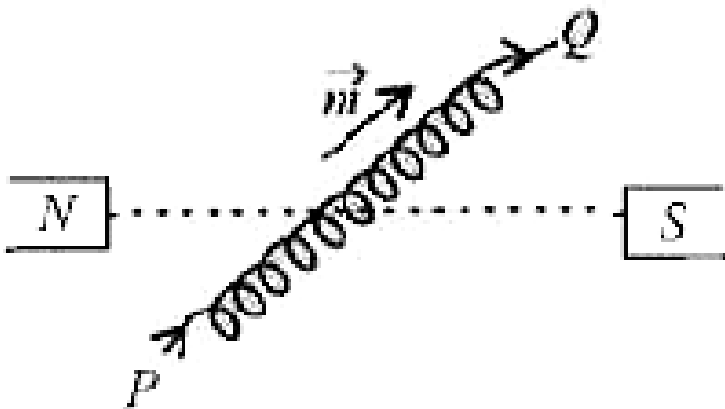
D. 8 cm from the centre of A

**Answer: C**



**View Text Solution**

**13.** A closely wound solenoid of 1000 turns and area of Cross-section  $2.0 \times 10^{-4}$  m<sup>2</sup> carries a current of 2.0 A. It is placed with its horizontal axis at  $30^\circ$  with the direction of a uniform horizontal magnetic field of 0.16 T as shown in the figure. What is the magnitude of the restoring torque produced by the field on the solenoid!



A. 0.016 Nm

B. 0.024 Nm

C. 0.032 Nm

D. 0.05 Nm

**Answer: C**



**View Text Solution**

**14.** A dip circle shows an apparent dip of  $60^\circ$  at a place Where the true dip is  $45^\circ$  . If the dip

circle is rotated through  $90^\circ$ , what apparent dip will it show?

A.  $40^\circ$

B.  $45^\circ$

C.  $51^\circ$

D.  $57^\circ$

**Answer: C**



**View Text Solution**



15. The coercivity of a small magnet where the ferromagnet gets demagnetised is  $3 \times 10^3 \text{ A/m}$ . The current required to be passed in a solenoid of length 10 cm and number of turns 100, so that the magnet gets demagnetised when placed inside the solenoid is

A. 30 mA

B. 60 mA

C. 3A

D. 6A

**Answer: C**



**View Text Solution**

**16.** The distance between the two ends of the wings of a metallic aeroplane is 5 m. It is moving horizontally with a velocity of  $360\text{km/hr}$ . The earth's magnetic field all around its motion is  $4 \times 10^{-4}$  tesla and the angle of dip is  $30^\circ$ . Then,

A. vertical component of earth's magnetic

field is  $2 \times 10^{-4} T$

B. vertical component of earth's magnetic

field is  $2 \times 10^{-2} T$

C. horizontal component of earth's

magnetic field is  $2 \times 10^3 T$

D. The aeroplane will cut the horizontal

component of Earth's magnetic field

only.

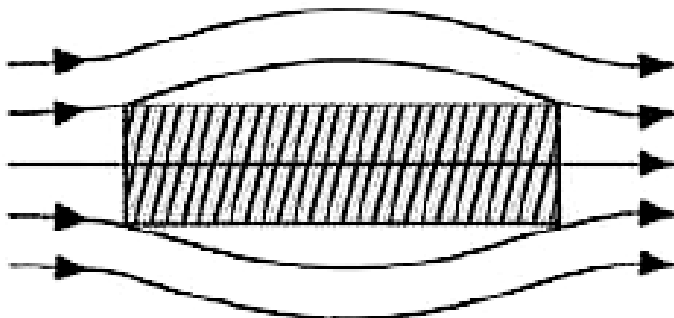
**Answer: A**



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## Wb Jee Workout Category 3 One Or More Than One Option

1. Consider the given statement with respect to the figure showing a bar of material placed in an external magnetic field and choose the correct statement(s).



A. The field lines are repelled or expelled and the field inside the material is reduced.

B. When placed in a non-uniform magnetic field, the bar magnet will tend to move from low to high field.

C. When placed in a non-uniform magnetic field, the bar will tend to move from high to low field.

D. Reduction in the field inside the material is slight being one part in  $10^5$ .

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



**View Text Solution**

2. Which of the following statement(s) is/are true about the magnetic susceptibility  $\chi_m$  of paramagnetic substance?

A. Value of  $X_m$  inversely proportional to the absolute temperature of the substance.

B.  $X_m$  is positive at all temperature.

C.  $X_m$  is negative at all temperature.

D.  $X_m$  does not depend on the temperature of the substance.

**Answer: A**



**View Text Solution**

3. Pick the correct options.

A. All electrons have magnetic moment.

B. All protons have magnetic moment.

C. All nuclei have magnetic moment.

D. All atoms have magnetic moment.

**Answer: A::B**



**View Text Solution**



4. When a ferromagnetic material goes through a hysteresis loop, the magnetic susceptibility

A. has a fixed value

B. may be zero

C. may be infinity

D. may be negative.

**Answer: B::D**



**View Text Solution**

5. Mark out the correct options.

A. Diamagnetism occurs in all materials.

B. Diamagnetism results from the partial alignment of permanent magnetic moment.

C. The magnetising field intensity  $H$  is always zero in free space.

D. The magnetic field of induced magnetic moment is opposite to the applied field.

**Answer: A::D**



**View Text Solution**

6. A toroid has a mean radius  $R$  equal to  $20/\pi \text{ cm}$ , and a total of 400 turns of wire carrying a current of 2.0 A. An aluminium ring at temperature 280 K inside the toroid provides the core. If the magnetisation  $I$  is  $4.8 \times 10^{-2} \text{ Am}^{-1}$ , then, choose the correct option(s).

A. Magnetic intensity in the core is

$$1000 \text{ Am}^{-1}$$

B. Susceptibility of the aluminium at

$$\text{temperature } 280 \text{ K is } 2.4 \times 10^{-5}.$$

C. If the temperature of the aluminium ring

is raised from 320 K, then the

$$\text{magnetization will be } 4.2 \times 10^{-2} \text{ Am}^{-1}.$$

D. Susceptibility of aluminium at

$$\text{temperature } 320 \text{ K is } 2.1 \times 10^{-5}$$

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



[View Text Solution](#)

7. A bar magnet has a pole strength of  $3.6 \text{ A m}$  and magnetic length  $8 \text{ in.}$  Then, choose the correct option(s).

A. Magnetic field at a point on the axis at a distance of  $6 \text{ cm}$  from the centre towards the north pole is  $8.6 \times 10^{-4} \text{ T.}$

B. Direction of field at an axial point towards the north pole will be towards

the magnet.

C. Magnetic field at a point on the

broadside-on position will be

$$7.7 \times 10^{-5} T$$

D. The magnetic field at a point in the

broadside-on position will be parallel to

the magnet.

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



**View Text Solution**

8. The earth's magnetic field at geomagnetic poles has a magnitude  $6.2 \times 10^{-5} T$ . The radius makes an angle of  $135^\circ$  with the axis of the earth's assumed magnetic dipole. Then, which of the following statement(s) is/are correct?

A. At a point where  $\theta = 135^\circ$ , magnetic field  $4.9 \times 10^{-5} T$ .

B. The tangent of the angle of the field with the vertical is given by  $\tan$

$$\alpha = -0.5.$$

C. Inclination angle (dip angle) made by

Earth's magnetic field will be  $63^\circ$  below

the horizontal.

D. None of these.

**Answer: A::B::C**



**View Text Solution**



9. A magnetic needle of length 10 cm, suspended at its middle point through a thread, stays at an angle of  $45^\circ$  with the horizontal. The horizontal component of the earth's magnetic field is  $18\mu T$ , Which of the following statement(s) *is / are* correct.

A. Vertical component of magnetic field,

$$B_V = 18\mu T.$$

B. Without the applied force the needle will

stay in the direction of the resultant

magnetic field of the earth.

C. When the force is applied the needle will stay in horizontal position.

D. A vertical Torque of  $F = 5.8 \times 10^{-5} N$ , should be applied we end so as to keep it in horizontal position when the pole strength of the needle is 1.6Am.

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



**View Text Solution**

# Wb Jee Previous Years Questions Category 1

## Single Option Correct Type

1. A bar magnet has a magnetic moment of  $200 \text{ Am}^2$ . The magnet is suspended in a magnetic field of  $0.30 \text{ NA}^{-1} \text{ m}^{-1}$ . The torque required to rotate the magnet from its equilibrium position through an angle of  $30^\circ$ , will be

A.  $30 \text{ N m}$

B.  $30\sqrt{3} \text{ Nm}$

C.  $60 \text{ N m}$

D.  $60\sqrt{3} \text{ Nm}$

**Answer: A**



**View Text Solution**

2. At two different places the angles of dip are respectively  $30^\circ$  and  $45^\circ$ . At these two places the ratio of horizontal component of earth's magnetic field is

A.  $\sqrt{3} : \sqrt{2}$

B.  $1 : \sqrt{2}$

C.  $1 : 2$

D.  $1 : \sqrt{3}$

**Answer: A**



**View Text Solution**

**3.** An electron in a circular orbit of radius 0.05 mm performs  $10^{16}$  revolutions per second. The

magnetic moment due to this rotation of electron is (in  $\text{Am}^2$ )

A.  $2.16 \times 10^{-23}$

B.  $3.21 \times 10^{-22}$

C.  $3.21 \times 10^{24}$

D.  $1.26 \times 10^{-23}$

**Answer: D**



**View Text Solution**

4. The intensity of magnetization of a bar magnet is  $5.0 \times 10^4 \text{ Am}^{-1}$ . The magnetic length and the area of cross-section of the magnet are 12 cm and  $1 \text{ cm}^2$  respectively. The magnitude of magnetic moment of this bar magnet is (in SI unit)

A. 0.6

B. 1.3

C. 1.24

D. 2.4

**Answer: A**



**View Text Solution**

## Wb Jee Previous Years Questions Category 2 Single Option Correct Type

1. A magnetic field  $B = 2t + 4t^2$  (where  $t =$  time) is applied perpendicular to the plane of a circular wire of radius and resistance  $R$ . If all the units are in SI the electric charge that



flows through the circular wire during  $t = 0$  s

to  $t = 2$  s is

A.  $\frac{6\pi r^2}{R}$

B.  $\frac{20\pi r^2}{R}$

C.  $\frac{48\pi r^2}{R}$

D.  $\frac{20\pi r^3}{R}$

**Answer: B**



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## Wb Jee Previous Years Questions Category 3 One Or More Than One Option

1. An electron of charge  $e$  and mass  $m$  is moving in a circular path of radius  $r$  with a uniform angular speed  $\omega$ . Then which of the following statements are correct?

- A. The equivalent current flowing in the circular path is proportional to  $r^2$ .
- B. The magnetic moment due to circular current loop is independent of  $m$ .

C. The magnetic moment due to circular current loop is equal to  $2e/m$  times the angular momentum of the electron:

D. The angular momentum of the particle is proportional to the areal velocity of electron.

**Answer: B::D**



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2. If  $X$  stands for the magnetic susceptibility of a substance.  $\mu$  for its magnetic permeability and to  $\mu_0$  the permeability of free space, then

A. for a paramagnetic substance

$$X > 0, \mu > \mu_0$$

B. for a diamagnetic substance :

$$X < 0, \mu < \mu_0$$

C. for a paramagnetic substance

$$X < 0, \mu < \mu_0$$

D. Tora      ferromagnetic      substance.

$$X < 1, \mu < \mu_0$$

**Answer: B::D**



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