PHYSICS

BOOKS - FULL MARKS PHYSICS (TAMIL ENGLISH)

MAGNETISM AND MAGNETIC EFFECTS OF ELECTRIC CURRENT

In Text Solved Examples

1. The horizontal component and vertical components of Earth's maganetic field at a plase are 0.15 G and 0.26 G respectively. Calculate the angle of dip and resultant magnetic field.

Watch Video Solution

2. Let the magnetic moment of a bar magnet be $\overrightarrow{p_m}$ whose mangetic length is d = 2l and pole strenght is q_m. Compute the magnetic moment of the bar magnet when it is cut into two pieces.

(a) along its length (b) perpendicular to its length

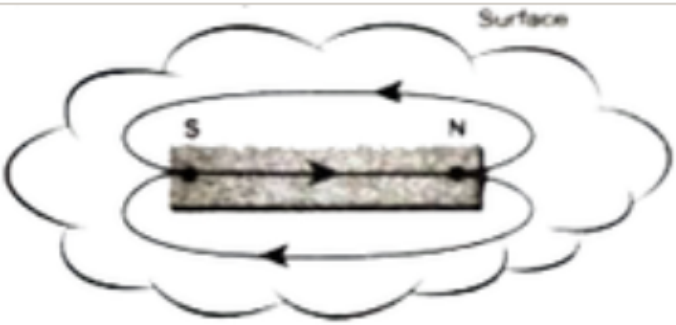
Watch Video Solution

3. Compute the magnetic length of a uniform bar magnet if the geometrical length of the magnet is 12 cm. Mark the

positions of magnetic pole points.

Watch Video Solution

4. Calculate the magnetic flux coming out from the surface containing magnetic dipole (say, a bar magnet) as shown in figure.



View Text Solution

5. The repulsive force between two magnetic poles in air is 9×10^{-3} N. if the two poles are equal in strength and are separated by a distance of 10 cm , calculate the pole strength of each pole .

Watch Video Solution

6. A short bar magnet has a magnetic moment of 0.5 J T^{-1}. Calculate magnitude and direction of the magnetic field produced by the bar magnet which is kept at a distance of 0.1 m from the centre of the bar magnet (a) axial line of the bar magnet and (b) normal bisector of the bar magnet.

Watch Video Solution

7. Show the time period of oscillation when a bar magnet is kept in a uniform magnetic field is T = $2\pi\sqrt{\frac{l}{p_m B}}$. In second, where I represents moment of inertia of the bar magnet, p_m is the magnetic moment and is the magnetic field.

Watch Video Solution

8. Consider a magnetic dipole which on switching ON external magnetic field orient only in two possible was i.e., one along the direction of the magnetic field (parallel to the field) and another anti-parallel to magnetic field. Compute the energy for the possible orientation . Sketch the graph.

Watch Video Solution

9. A coil of a tangent galvanometer of diametre 0.24 m has 100 turns. If the horizontal component of Earth's magnetic field is 25×10^{-6} T then, calculate the current which gives a deflection of 60° .

Watch Video Solution

10. Compute the intensity of magnetisation of the bar magnet whose mass, magnetic moment and density are 200 g. 2 A m^2 and 8 g cm^{-3},respectively.

Watch Video Solution

11. Using the relation $\vec{B} = \mu_0\left(\vec{H} + \vec{M}\right)$, show that $X_m = \mu_r - 1$.

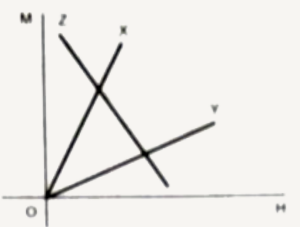
Watch Video Solution

12. Two materials X and Y are magnetised, whose intensity of magnetisation are 500 A m^{-1} and 2000 Am^{-1}, respectively. If the magnetising field is 1000 A `m. then which one among these materials can be easily magnetized ?

Watch Video Solution

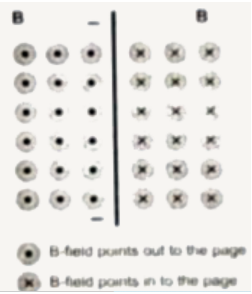
13. The following figure shows the variation of intensity of magnetisation with the applied magnetic field intensity for three magnetic materials X, Y and Z. Identify the materials X, Y

and Z.



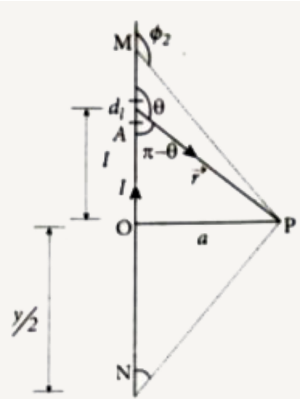
Watch Video Solution

14. The magnetic field shown in the figure is due to the current carrying wire, In which direction does the current flow in the wire ?



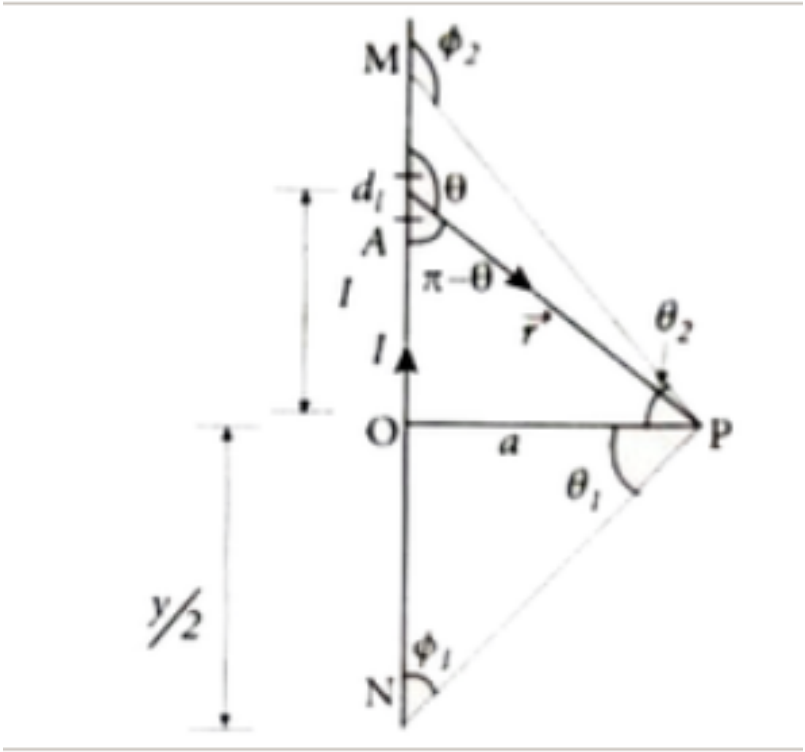
Watch Video Solution

15. Calculate the magnetic field at a point P which is perpendicular bisector to current carrying straight wire as shown in figure.



View Text Solution

16. Show that for a straight conductor , the magnetic field.



View Text Solution

17. What is the magnetic field at the centre of the loop shown in figure ?

View Text Solution

18. Compute the magnetic of the magnetic field of a long, straight wire carrying a current of 1 A at distance of 1m from it. Compare it with Earth's magnetic field .

Watch Video Solution

19. Calculate the magnetic field inside a solenold ,when

(a) The length of the solenoid becomes twice and fixed number of turns

(b) both the length of the solenoid and number of turns are double

(c) the number of turns becomes twice for the fixed length of the solenoid compare the results,

Watch Video Solution

20. A particle of charge q moves with velocity $\vec{v}$ along positive y - direction in a magnetic field $\vec{B}$. Compute the Lorentz force experienced by the particle (a) when magnetic field is along positive y-direction (b) when magnetic field points in positive z -direction (c) when magnetic field is in zy - plane and making an angle θ with velocity of the particle. Mark the direction of magnetic force in each case.

Watch Video Solution

21. Compute the work done and power delivered by the Lorentz force on the particle of charge q moving with velocity

$\vec{v}$. Calculate the angle between Lorentz force and velocity of the charged particle and also interpret the result.

Watch Video Solution

22. An electron moving perpendicular to a uniform magnetic field 0.500 T undergoes circular motion of radius 2.80 mm. What is the speed of electron ?

Watch Video Solution

23. A Proton moves in a iniform magnetic field of strength 0.500 T magnetic field is directed along the x-axis . At initial time, t = 0 s, the proton has velocity $\vec{v} = \left(1.95 \times 10^5 \hat{i} + 2.00 \times 10^5 \hat{k}\right) ms^{-1}$. Find

(a) At initial time, what is the acceleration of the proton

(b) is the path circular or helical , calculate the radius of helical trajectory and also calculate the pitch of the helix (Note: Pitch of the helix is the distance travelled along the helix axis per revolution).

Watch Video Solution

24. Two singly ionized isotopes of uranium $\frac{235}{92}U$ and $\frac{238}{92}$U (isotopes have same atomic number but different mass number) are sent with velocity 1.00 $\times 10^5 ms^{-1}$ into a magnetic field of strength 0.500 T normally . Compute the distance between the two isotopes after they complete a semi-circle. Also compute the time taken by each isotope to complete one semi-circular path. (given : masses of the isotopes :

View Text Solution

25. Let E be the electric field of magnitude 6.0 $\times 10^6 NC^{-1}$ and B be the magnetic field magnitude 0.83 T. Suppose an electron is accelerated with a potential of 200 V, will it show zero deflection ? If not, at what potential will it show zero deflection .

Watch Video Solution

26. Suppose a cyclotron is operated to accelerate protons with a magnetic field of strength 1 T. Calculate the frequency in which the electric field between two Dees could be reversed .

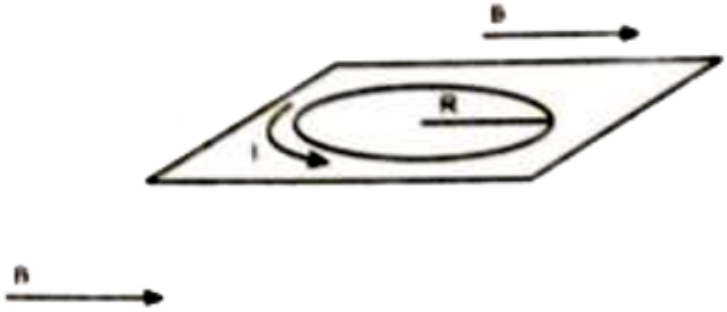
Watch Video Solution

27. A metallic rod of linear density is 0.25 kg m^{-1} is lylong horizontally on a smooth inclined plane which makes an angle of 45° with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of strength 0.25 T is acting on it in the vertical direction. Calculates the electric current flowing in the rod to keep it stationary .

Watch Video Solution

28. Consider a circular wire loop of radius R, mass kept at rest on a rough surface . Let 1 be the current flowing through the loop and $\overrightarrow{B}$ be the magnetic field acting along horizontal as shown in Figure. Estimate the current I that should be applied

so that one edge of the loop is lifted off the surface ?



Watch Video Solution

29. The coil of a moving coil galvanometer has 5 turns and each turn has an effective area of $2 \times 10^{-2} m^2$. It is suspended in a magnetic field whose strength is 4×10^{-2} Wb m^{-2} . If the torsional constant K of the suspension fibre is 4×10^{9} N m deg^{-1} .

(a) Find its current sensitivity in degree per micro - ampere

(b) Calculate the voltage sensitivity of the galvanometer for it

to havefull scale deflection of 50 divisions for 25 mV.

(c) Compute the resistance of the galvanometer .

Watch Video Solution

30. The resistance of moving coil galvanometer is made twice its original value in order to increase current sensitivity by 50% Will the voltage sensitivity change ? If so, by how much?

Watch Video Solution

Text Evaluation Solved

1. The magnetic field at the center O of the following current loop is ..... .

A. a) $\frac{\mu_0 I}{4r} \otimes$

B. b) $\frac{\mu_0 I}{4r} \odot$

C. c) $\frac{\mu_0 I}{2r} \otimes$

D. d) $\frac{\mu_0 I}{2r} \odot$

Answer: D

Watch Video Solution

2. An electron moves straight inside a charged parallel plate capacitor of uniform charge density σ . The time taken by the electron to cross the parallel plte capacitor when the plates of the capacitor are kept constant magnetic field of induction

$\vec{B}$ is ..... .

A. $\varepsilon_0 \frac{\mathrm{elB}}{\sigma}$

B. $\varepsilon_0 \frac{\mathrm{lB}}{\sigma l}$

C. $\varepsilon_0 \frac{\mathrm{lB}}{e\sigma}$

D. $\varepsilon_0 \frac{\mathrm{lB}}{\sigma}$

Answer: A::B

Watch Video Solution

3. The force experienced by a particle having mass m and charge q accelerated through a potential difference V when it is kept under perpendicular magnetic field $\vec{B}$ is ..... .

A. $\sqrt{\frac{2q^3BV}{m}}$

B. $\sqrt{\frac{q^3B^2V}{2m}}$

C. $\sqrt{\frac{2q^3B^2V}{m}}$

D. $\sqrt{\frac{2q^3B^V}{m^3}}$

Answer: B::C

Watch Video Solution

4. A circular coil of radius 5 cm and has 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is

A. 1.0 amp - m^2

B. 1.2 amp - m^2

C. 0.5 amp - m^2

D. 0.8 amp $-m^2$

Answer: A::B

Watch Video Solution

5. A thin insulated wire forms a plane spiral of $N = 100$ tight turns carrying a current I = 8 m A (milli ampere). The radii of inside and outside turns are equal to a = 50 mm and b = 100 mm, respectively. The magnetic induction at the center of the spiral is

A. 5 μ T

B. 7 μ T

C. 8 μ T

D. 10 μ T

Answer:

Watch Video Solution

6. Three wires of equal lengths are bent in the form of loops. One of the loops is circle, another is a semi-circle and the third one is a square . They are placed in a uniform magnetic field and same electric current is passed through them. Which of the following loop configuration will experience greater torque ?

A. circle

B. semi-circle

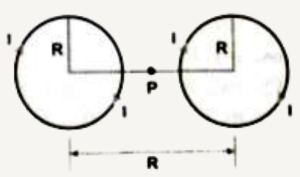
C. square

D. all of them

Answer: C

Watch Video Solution

7. Two identical coils, each with N turns and radius R are Placed coaxially at a distance R as shown in the figure. If I is the current passing through the loops in the same direction, then the magnetic field at a point P which is at exactly at $\frac{R}{2}$ distance between two coils is ..... .



A. a) $\frac{8N\mu_0 I}{\sqrt{5R}}$

B. b) $\frac{8N\mu_0 I}{\sqrt{5^{\frac{3}{2}}R}}$

C. c) $\frac{8N\mu_0 I}{5^{\frac{3}{2}}R}$

D. d) $\frac{4N\mu_0 I}{\sqrt{5R}}$

Answer: B::C

Watch Video Solution

8. A wire of length l carries a current I along the Y direction and mgnetic field is given by $\vec{B} = \frac{\beta}{\sqrt{3}}\left(\hat{i}+\hat{j}+\hat{k}\right)$ T. The magnitude of Lorentz force acting on the wire is ..... .

A. $\sqrt{\frac{2}{\sqrt{3}}}\beta$ll

B. $\sqrt{\frac{1}{\sqrt{3}}}\beta$ll

C. $\sqrt{2}\beta$ ll

D. $\sqrt{\frac{1}{2}}\beta$ ll

Answer: A::B::C

Watch Video Solution

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

A. M

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

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

D. $\frac{1}{2}$ M

Answer: C

Watch Video Solution

Watch Video Solution

10. A non-conducting charged ring of charge q. mass m and radius r is rotated with constant angular speed ω. Find the ratio of its magnetic moment with angular momentum is ..... .

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

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

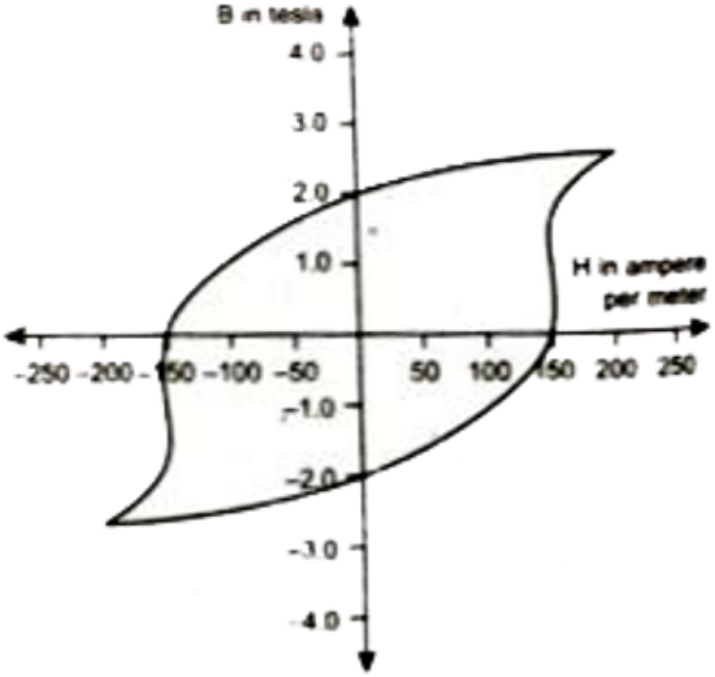
C. $\frac{q}{2m}$

D. $\frac{q}{4m}$

Answer: B

Watch Video Solution

11. The B_H curve for a ferromagnetic material is shown in the figure. The material is placed inside a long solenoid which contains 1000 turns/cm. the current that should be passed in the solenoid to demagnetize the ferromagnet completely is



A. 1.00 m A (milli ampere)

B. 1.25 mA

C. 1.50 mA

D. 1.75 mA

Answer: A::B

Watch Video Solution

12. Two short bar magnets have magnetic moments 1.20 Am^2 and 1.00 Am^2 respectively . They are kept on a horizontal table parallel to each other with their north poles pointing towards the south . They have a common magnetic equator and are separated by a distance of 20.0 cm.

The value of the resultant horizontal magnetic induction the mid point O of the line joining their centers is (Horizontal components of Earth's magnetic induction is $\left(3 \times 10^{-5} Wbm^{-2}\right)$ .....

A. $3.60 \times 10^{-5} Wbm^{-2}$

B. $3.5 \times 10^{-5} Wbm^{-2}$

C. $2.56 \times 10^{-4} Wbm^{-2}$

D. $2.2 \times 10^{-4} Wbm^{-2}$

Answer: A::B::D

Watch Video Solution

13. The vertical component of Earth's magnetic field at a place is equal to the horizontal component. What is the value of angle of dip at this place ?

A. 30°

B. 45°

C. 60°

D. 90°

Answer: D

Watch Video Solution

14. A flat dielectric disc disc of radius R carries an excess charge on its surface. The surface charge density is σ. The disc rotates about an axis perpendicular to its plane passing through the center with angular velocity ω.

Find the magnitude of the torque on the disc if it is placed in a uniform magnetic field whose strength is B which is directed perpendicular to the axis of rotation

A. $\frac{1}{4}\sigma\omega\pi$ B R

B. $\frac{1}{4}\sigma\omega\pi BR^2$

C. $\frac{1}{4}\sigma\omega\pi BR^3$

D. $\frac{1}{4}\sigma\omega\pi BR^4$

Answer: A::B::D

Watch Video Solution

15. A simple pendulum with charged bob is oscillating with time period T and let θ be the angular displacement. If the uniform magnetic field is switched ON in a direction perpendicular to the plane of oscillation then

A. time period will decrease but θ will remain constant

B. time period remain constant but θ decrease

C. both t and θ will remain the same

D. both T and θ will decrease

Answer: A::B::D

Watch Video Solution

Text Evaluation Solved Short Answer Questions

1. What is meant by magnetic induction ?

Watch Video Solution

2. Define magnetic flux.

Watch Video Solution

3. Define magnetic dipole moment.

Watch Video Solution

4. State Coulomb's inverse law.

Watch Video Solution

5. What is magnetic susceptibility ?

Watch Video Solution

6. State Biot-Savart's law.

Watch Video Solution

Watch Video Solution

7. What is magnetic permeability ?

Watch Video Solution

8. State Ampere's circuital law.

Watch Video Solution

9. Compare dia, para and ferromagnetism.

Watch Video Solution

10. What is elastic hysteresis?

Watch Video Solution

Text Evaluation Solved Long Answer Questions

1. Discuss Earth's magnetic field in detail.

Watch Video Solution

2. Deduce the relation for the magnetic induction at a point due to an infinitely long straight conductor carrying current.

Watch Video Solution

3. Obtain a relation for the magnetic induction at a point along the axis of a circular coil carrying current.

Watch Video Solution

4. Compute the torque experimenced by a magnetic needle in a uniform magnetic field.

Watch Video Solution

5. What is the magnetic field along the axis and equatorial line of a bar magnet ?

Watch Video Solution

6. What is the magnetic field along the axis and equatorial line of a bar magnet ?

Watch Video Solution

Watch Video Solution

7. Find the magnetic induction due to a long straight conductor using Ampere's circuital law.

Watch Video Solution

8. Discuss the working of cyclotron in detail.

Watch Video Solution

9. What is tangent law ? Discuss in detail.

Watch Video Solution

10. Explain the parinciple and working of a moving coil galvanometer .

Watch Video Solution

11. How can you convert a galvanometer into an voltmeter?

Watch Video Solution

12. Find the magnetic induction due to a long straight conductor using Ampere's circuital law.

Watch Video Solution

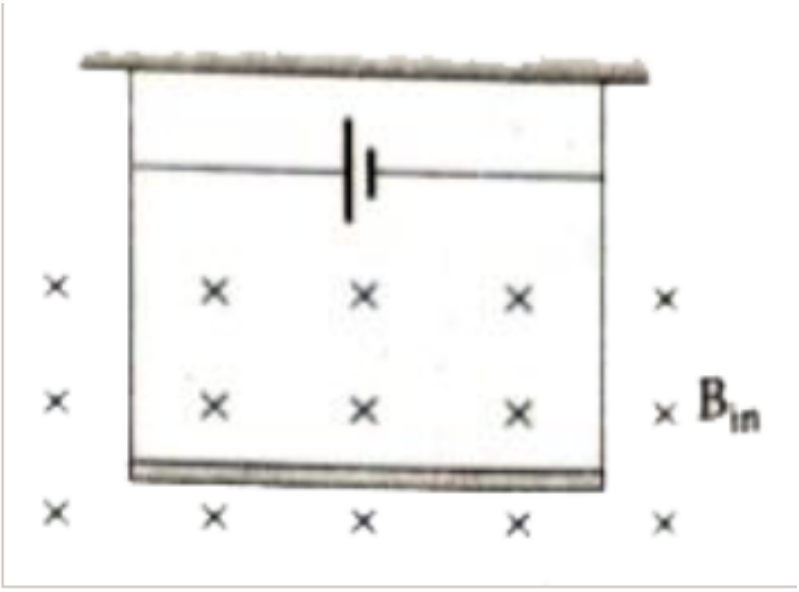
Text Evaluation Solved Numerical Problems

1. A bar magnet having a magnetic moment $\vec{M}$ is cut into four pieces i.e., first cut in two pieces along the axis of the magnet and each piece is further cut into two pieces. Compute the magnetic momment of each piece .

Watch Video Solution

2. A conductor of linear mass density 0.2 g m^{-1} suspended by two flexible wire as shown in figure . Suppose the tension in the supporting wires is zero when it is kept inside the magnetic field of 1 T whose direction is into the page. Compute the current inside the conductor and also the

direction of the current . Assume g = 10 ms^{-2} .



Watch Video Solution

3. A circular coil with cross - sectional area $0.1cm^2$ is kept in a uniform magnetic field of strength 0.2 T. If the current passing in the coil is 3 A and plane of the loop is perpendicular to the direction of magnetic field . Calculate

(a) total torque on the coil

(b) total force on the coil

(c) average force on each electron in the coil due to the magnetic field of the free electron density for the material of the wire is $10^{28} m^{-3}$.

Watch Video Solution

4. A bar magnet is placed in a uniform magnetic field whose strength is 0.8 T. Suppose the bar magnet orient an angle 30° with the external field experiences a torque of 0.2 Nm . Calculate :

(i) the magnetic moment of the magnet

(ii) the work done by an applied force in moving it form most stable configuration to the most unstable configuration and also compute the work done by the applied magnetic field in this case .

Watch Video Solution

5. A non - conducting sphere has mass of 100 g and radius 20 cm . A flat compact coil of wire with turns 5 is wrapped tightly around it with each turns concentric with the sphere. This sphere is placed on an inclined plane such that plane of coil is parallel to the inclined plane.

A uniform magnetic field of 0.5 T exists in the region in vertically upwards direction. Compute the current I required to rest the sphere in equilibrium.

$(\#\#SUR_PHY_XII_V01_C03_E04_{005}\_Q01\#\#)$

Watch Video Solution

6. Calculate the magnetic field at the center of a square loop which carries a current of 1.5 A , length of each loop is 50 cm .

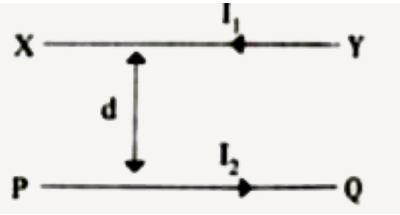
Watch Video Solution

7. Show that the magnetic field at any point on the axis of the solenoid having n turns per unit length is B = $\frac{1}{2}\mu_0 nI(\cos\theta_1 - \cos\theta_2)$.

Watch Video Solution

8. Let I_1 and I_2 be the steady currents passing through a long horizontal wire XY and PQ respectively. The wire PQ is fixed in horizontal plane and the wire XY be is allowed to move freely in a vertical plane. Let the wire XY is in equilibrium

at a height d over the parallel wire PQ as shown in figure.



Watch Video Solution

Additional Questions Solved

1. Source (s) of a mangnetic field is (are)

A. an isolated magnetic pole

B. a static electric charge

C. a moving electric charge

D. all of these

Answer: A::C

Watch Video Solution

2. Magnetic field lines

A. cannot intersect at all

B. intersect at infinity

C. intersect within the magnet

D. intersect at the neutral points

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

Watch Video Solution

3. A magnetic needle is kept in a non-uniform magnetic field. It experiences

A. a force and a torque

B. a force but not a torque

C. a turque but not a force

D. neither a force nor a forque

Answer: A::C::D

Watch Video Solution

4. The unit of pole strength (magnetic charge) is _____ .

A. A m^2

B. Am^{-1}

C. Am^{-2}

D. Am

Answer: A

Watch Video Solution

5. Earth's magnetic field always has horizontal component except at

A. equator

B. magnetic pole

C. latitude of 60°

D. a latitude of 50°

Answer: A::C

Watch Video Solution

6. The angle of dip at the magnetic equator is

A. 0°

B. 30°

C. 60°

D. 90°

Answer:

Watch Video Solution

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

A. 75°

B. 60°

C. 45°

D. 30°

Answer: C

Watch Video Solution

8. At magnetic poles the angle of dip is

A. 45°

B. 30°

C. 0°

D. 90°

Answer:

Watch Video Solution

9. The horizontal component of earth's magnetic field at a place is 3.6×10^{-5} T. if the angle of dip at this place is 60°, the vertical components of earth's field at this place is

A. 1.2×10^{-5} T

B. 2.4×10^{-5} T

C. 4×10^{-5} T

D. 6.2×10^{-5} T

Answer: A::B

Watch Video Solution

10. A bar magnet of magnetic moment M is cut into two parts of equal length. The magnetic moment of either part is

A. M

B. 2M

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

D. zero

Answer: B

Watch Video Solution

11. A magnetic needle suspended by a silk thread is vibrating in the earth's magnetic field. If the temperature of the needle is increases by 500° C , then

A. time period decreases

B. time period remains unchanged

C. time period increases

D. the needle stops vibrating

Answer: A::C::D

Watch Video Solution

12. Demagnetisation of a magnet can be done by

A. rough handling

B. magnetising in the opposite direction

C. heating

D. all the above

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

Watch Video Solution

13. All the magnetic materials lose their magnetic properties when

A. dipped in water

B. dipped in oil

C. brought near a piece of iron

D. strongly heated

Answer: A::D

Watch Video Solution

14. The relative permeability of a paramagnetic material is

A. greater than unity

B. less than unity

C. equal to unity

D. negative

Answer: A

Watch Video Solution

15. The relative permeability of a diamagnetic material is

A. greater than unity

B. less than unity

C. equal to unity

D. negative

Answer: A

Watch Video Solution

16. Which of the following is most suitable for the core of an electromagnet ?

A. air

B. soft iron

C. steel

D. Cu-Ni alloy

Answer:

Watch Video Solution

17. Soft iron is used in many parts of electrical machines for

A. low hysteresis loss and low permeability

B. low hysteresis loss and high permeability

C. high hysteresis loss and low permeability

D. high hysteresis loss and high permeability

Answer: A::B::D

Watch Video Solution

18. When a diamagnetic substance is brough near the north or the south pole of a bar magnet, it is

A. attracted by the poles

B. repelled by the poles

C. attracted by the north pole and repelled by the south pole

D. attracted by the south pole and repelled by the north pole

Answer: B::D

Watch Video Solution

19. At Curie point, a ferromagnetic material becomes

A. non magnetic

B. diamagnetic

C. paramagnetic

D. antiferromagnetic

Answer: A::C

Watch Video Solution

Watch Video Solution

20. Magnetic permeability is maximum for

A. diamagnetic substances

B. paramagnetic substances

C. ferromagnetic substances

D. all of these

Answer: A::B::C

Watch Video Solution

21. The material of a permanent magnet has

A. high retentivity, low coercivity

B. low retentivity, low coercivity

C. low retentivity , low coercivity

D. high retentivity, high coercivity

Answer: C

Watch Video Solution

22. Which one of the following is not made of soft iron ?

A. electromagnet

B. core of transformer

C. core of dynamo

D. magnet of loudspeaker

Answer: A::D

Watch Video Solution

23. A dip circle is at right angles to the magnetic meridian. The apparent dip is

A. 0°

B. 30°

C. 60°

D. 90°

Answer:

Watch Video Solution

24. A magnetic needle is placed in a uniform magnetic field. It experienece

A. a force and a torque

B. a force but not a torque

C. a torque but not a force

D. neither a force nor a furque

Answer: A::B::C

Watch Video Solution

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

A. 5501

B. 5500×10^{-7}

C. 5500×10^{7}

D. 5499

Answer: D

Watch Video Solution

26. The inherent property of all matter is

A. paramagnetism

B. diamagnetic

C. ferromagnetism

D. all the above

Answer: A::D

Watch Video Solution

27. A magnetic needle suspended freely

A. a) orients itself in a definite direction

B. b) remains in a direction

C. c) become itself in a definte direction

D. d) become extical with N-pole down

Answer: A::C::D

Watch Video Solution

28. The earth's magnetic field at a given point is 0.5 $\times 10^{-5} Wbm^2$. This field is to be annulled by magnetic induction at the center of circular conducing loop of radius 5 . The current required to be flown in the loop is nearly

A. 0.2 A

B. 0.4 A

C. 4 A

D. 40 A

Answer: A::D

Watch Video Solution

29. A frog can be leviated in a magnetic field produced by a current in a vertical soleniod placed below the frog. This is possible because the body of the frog is .....

A. paramagnetic

B. diamagnetic

C. ferromagnetic

D. antiferromagnetic

Answer: A::C

Watch Video Solution

30. The magnetic moment of a current carrying circular coil of radius r varies as

A. $\frac{1}{r^2}$

B. $\frac{l}{r}$

C. r

D. r^2

Answer: B

Watch Video Solution

31. For a paramagnetic material, the dependence of the magnetic susceptibility x on the absolute temperature T is given as

A. $x \propto r$

B. $X \propto \frac{l}{T^2}$

C. $x \propto \frac{l}{T}$

D. $x \propto T^2$

Answer:

Watch Video Solution

32. A charged paticle (charge q) is moving in a circle of radius R with uniform speed V . The associated magentic moment is given by

A. qVR^2

B. $\frac{qVR^2}{2}$

C. qVR

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

Answer: B

Watch Video Solution

33. Nickel shows ferromagnetic property at room temperature. If the temperature is increased beryond Curie temperatue,then it will show

A. antiferromagnetism

B. no magnetic property

C. diamagnetism

D. para magnetism

Answer: A::C

Watch Video Solution

34. A proton enters a magnetic field of flux density 1.5 Wb/m^2 with a spped of 2×10^7 m/s at angle of 30° with the field. The force on the proton will be

A. 0.24×10^{-12}N

B. 2.4×10^{-12}N

C. 24×10^{-12} N

D. 0.024×10^{-12} N

Answer: A::B::D

Watch Video Solution

35. A moving charge produces

A. an electric field only

B. a magnetic field only

C. both electric and magnetic fields

D. neither an electric nor a magnetic field

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

Watch Video Solution

36. A straight conductor carrying a current I, is split into a circular loop of radius r as shown in the figure. The fied at the centre O of the circle, in tesla is

A. $\frac{\mu_0 I}{2r}$

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

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

D. zero

Answer:

Watch Video Solution

37. In a moving coil galvanometer the current 'I' is related to the deflection θ as

A. I $\alpha\theta$

B. I $\alpha \tan\theta$

C. I $\alpha\theta^2$

D. I $\alpha\sqrt{\theta}$

Answer: A

Watch Video Solution

38. The magnetic moment of a current carrying circular coil of radius r varies as

A. $\frac{l}{r}$

B. $\frac{l}{r^{\frac{3}{2}}}$

C. $\frac{i}{r^3}$

D. $\frac{l}{r^2}$

Answer: C

Watch Video Solution

39. A moving charge is subjected to an external magnetic field. The change in the kinetic energy of the particle

A. increases with the increase in the field strength

B. decreases with the increase in the field strength

C. is always zero

D. depends upon whether the field is uniform or non-uniform

Answer: A

Watch Video Solution

40. Lorentz force is given by

A. q $(E + V \times B)$

B. $q(E - V \times B)$

C. q(E + V.B)

D. $q(E \times B \times V)$

Answer: B

Watch Video Solution

41. A circular loop has radius R and a current I flows through it. Another circular loop has radius 2R and a current 2I flows through it. Ratio of the magnetic fields at their centres is

A. $\frac{1}{4}$

B. 1

C. 2

D. 4

Answer: A

Watch Video Solution

42. The magnetic field inside a solenoid is

A. directly proportional to current

B. inversely proportional to current

C. directly proportional to its length

D. inversely proportional to the total number of turns

Answer: A::C::D

Watch Video Solution

43. A circular loop of area 0.01 m^2 and carrying a current of 10A is placed parallel to a magnetic field of intensity 0.1 T. The torque acting on the loop, in Nm is

A. 1.1

B. 0.8

C. 0.001

D. 0.01

Answer: A

Watch Video Solution

44. In a current carrying long solenoid the field produced does not depend upon

A. number of turns per unit length

B. current flowing

C. radius of the solenoid

D. all of the above

Answer: A::D

Watch Video Solution

45. When a charged particle enters a uniform magnetic field its kinetic energy

A. remains constant

B. increases

C. decreases

D. becomes zero

Answer: A::C

Watch Video Solution

Additional Questions Solved Iii Fill In The Blanks

1. At Curie point, a ferromagnetic material becomes ..... .

Watch Video Solution

2. Electromagnets are made of soft iron because soft iron has ..... .

Watch Video Solution

3. The word 'Magnetism' was derived from Iron are _____ .

Watch Video Solution

4. The chemical formula of magneties is ..... .

Watch Video Solution

5. The iron ore magnetite was found in the island of ..... .

Watch Video Solution

6. ..... Suggested that earth behaves as a giant bar magnet

Watch Video Solution

7. The field at the surface of the earth is approximately equal to ..... .

A. a) 1 tesla

B. b) 2 gauss

C. c) 10^4 tesla

D. d) 1 gauss

Answer: 10 T

Watch Video Solution

8. The natural magnets have ..... .

Watch Video Solution

9. Piecces of iron or steel that acquired magnetic properties when it is rubbed with a magnet are called ..... .

Watch Video Solution

10. Artificial magnet in the form of a rectangular or cylinderical bar is called ..... .

Watch Video Solution

11. In magnet, the magnetic attraction is maximum at the ..... Of the magnet

Watch Video Solution

12. The unit of pole strenghts is ..... .

Watch Video Solution

13. The unit of magnetic flu $\times$ density is .....

Watch Video Solution

14. The value of μ_0 Is equal to ..... .

Watch Video Solution

15. A unit pole e $\times$ periences a force of ..... .

Watch Video Solution

16. At netutral points the resultant magnetic field due to the magnet and earth is ..... .

Watch Video Solution

17. The circular scale of deflection magneto meter is divided into ..... Quadrants ?

Watch Video Solution

18. Each quadrant of the circular scale of deflection magnetometer is graduated from ..... .

Watch Video Solution

19. The sensitivity of the deflection magnet meter is more at ..... .

Watch Video Solution

20. The magnetic field used to magnetic a material is called the ..... .

Watch Video Solution

21. The unit of magnetic field is

Watch Video Solution

22. The magnetic moment per unit volume of the material is termed as ..... .

Watch Video Solution

23. The magnetic moment per unit volume of the material is termed as ..... .

Watch Video Solution

24. In diamagnetic materials the net magnetic moment of atoms is ..... .

Watch Video Solution

25. The susceptibility of diamagnetic materials has a ..... .

Value.

Watch Video Solution

26. The susceptibility (X_m) of bismuth is ..... .

Watch Video Solution

27. The relative permeability of a diamagnetic material is

Watch Video Solution

28. Ferromagnetic substances have ..... Magnetic moment.

Watch Video Solution

29. As the temperature increase , the value of susceptibility of the ferromagnetic substnce ..... .

Watch Video Solution

30. The phenomenon of lagging of magnetic induction behind the magnetising field is called ..... .

Watch Video Solution

31. The direction of the magnetic field in a current carrying conductor is given by .....

View Text Solution

32. The relative permeability (μ_r) for air is ..... .

Watch Video Solution

33. ..... Is used to measure electric current.

Watch Video Solution

34. Tangent galvanometer works on the priniciple of ..... .

Watch Video Solution

35. The tangent law is applied in .....

Watch Video Solution

Additional Questions Solved Iii Match The Following

1.

(i) H.C Oersted	(a) Cyclotron
(ii) William Gilbert	(b) Magnetic lorentz force
(iii) Lawrence	(c) Electromagnetis
(iv)Lorentz	(d)Earth powerful magnet

Watch Video Solution

2.

(i) Magnetic moment	$(a)\chi_m = \frac{C}{T}$
(ii) tangent Law	$(b)10^8$maxwell
(iii) Curie's Law	$(c)B = B_H \tan\theta$
(iv) I weber	$(d)P_m = q_m \overrightarrow{d}$

Watch Video Solution

3.

(i) Horizontal component B_H	$(a) l_g \propto \theta$
(ii) vertical component B_v	$(b) B_E \cos I$
(iii) Galvanometer to a ammeter	$(c) l_g \propto v$
(iv) Galvanometer to a voltmeter	$(d) B_e \sin l$

Watch Video Solution

4.

1.	Diamagnetic materials	(a)	Steel,Alnico
2.	Paramagnetic materials	(b)	Bi, Sb,Cu
3.	Ferromagnetic materials	(c)	Pt,Cr,Mn
4.	Permanent magnets	(d)	Fe, Ni, Co etc.,

Watch Video Solution

5.

(i) Artificial magnet	(a) tangent Galvanometer
(ii) Magnetic flux	(b) Desired shape
(iii) high energy accelerator	(c) Weber
(iv) Measurement of small current	(d) Cyclotron

Watch Video Solution

Watch Video Solution

Additional Questions Solved Assertion And Reason Questions

1. Assertion : The poles of magnet cannot be separated by breaking into two pieces.

Reason: The magnetic moment will be reduced to half when a magnet is broken into two equal pieces.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer:

Watch Video Solution

2. Assertion: When radius of circular loop carrying current is doubled, its magnetic moment becomes four times.

Reason : magnetic moment depends on area of the loop.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer:

Watch Video Solution

3. Assertion: the ferromagnetic substance do not obey Curie's Law.

Reason : At Curie point a ferromagnetic substance start behaving as a paramgnetic substance.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer:

Watch Video Solution

4. Assertion : Soft iron is used as transformer core.

Reason : Soft iron has narrow hysteresis loop.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer:

Watch Video Solution

5. Assertion : Cyclotron does not accelerate electron.

Reason : Mass of the electron is very small

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer:

Watch Video Solution

6. Assertion : Cyclotron is a device which is used to accelerate the positive ion.

Reason : Cyclotron frequency depends upon the velocity.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer:

Watch Video Solution

Additional Questions Solved 2 Mark Questions

1. Define magnetic declination (D).

Watch Video Solution

2. Define magnetic inclination (I).

Watch Video Solution

3. Define magnetic field.

Watch Video Solution

4. Define magnetic flux density.

Watch Video Solution

5. What is tangent law ? Discuss in detail.

Watch Video Solution

6. Define magnetic field.

Watch Video Solution

7. State Right hand thumb rule.

Watch Video Solution

8. Define Ampere :

Watch Video Solution

Additional Questions Solved 3 Mark Questions

1. Explain Curie's law of magnetism.

Watch Video Solution

2. State Maxwell's right hand cork screw rule ?

Watch Video Solution

3. Define Voltage sensitivity ?

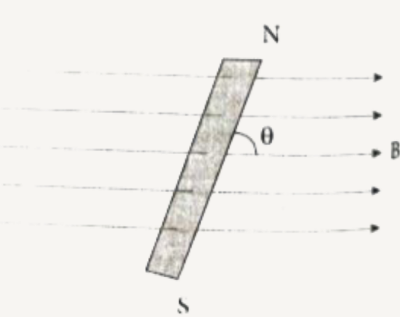
Watch Video Solution

4. Define Current sensitivity ?

Watch Video Solution

Additional Questions Solved 5 Mark Questions

1. Derive an expression for potenstial energy of bar magnet in a uniform magnetic field.



A bar magnet (magnetic dipole) in a uniform magnetic field

Watch Video Solution

2. Write down the appllication of Hysteresis loop.

Watch Video Solution

3. Write down the difference between soft and hard ferromagnetic materials .

Watch Video Solution

4. State Biot-Savart's law.

Watch Video Solution

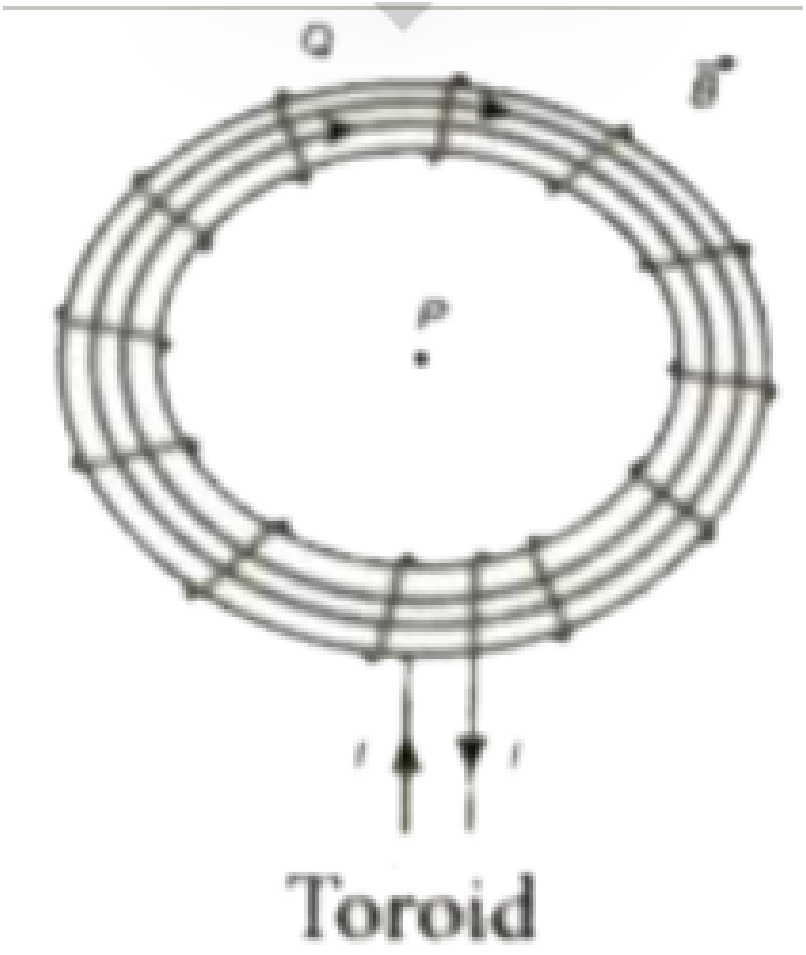
5. Tabulate the difference between Coulomb's law and Biot-Savort's law.

Watch Video Solution

6. Obtain an experssion for the magnetic dipole moment of a revolving electron.

Watch Video Solution

7. Apply Ampere's Circuital Law to find the magnetic field both inside and outside of a toroidal solenoid.



Watch Video Solution

8. Direction of magnetic force on a positive charge moving in a magnetic field is given by

Watch Video Solution

Additional Questions Solved Numerical Problems

1. The radius of the first orbit of hydrogen atom is 0.5 Å. The electron moves is an orbit with a uniform speed of 2.2 $\times 10^{6} ms^{-1}$. What is the magnetic field produced at the centre of the uncleus due to the mation of this electron ? Use $\mu_0 = 4\pi \times 10^{-7} Hm^{-1}$ and electric charge $= 1.6 \times 10^{-19}$ C

Watch Video Solution

2. A positive charge of 1.5 μC is moving with a speed of $2 \times 10^{-6} ms^{-1}$ along the postive X-axis. A magnetic field, $\overrightarrow{B} = \left(0.2\hat{j} + 0.4\hat{k}\right)$ tesla acts in space. Find the magnetic force acting on the charge.

Watch Video Solution

3. Copper has 8.0×10^{28} electrons per cuble meter carrying a current and lying at right angle to a magnetic field of strength 5×10^{-3} T. experiences a force of 8.0×10^{-2} N. Calculate the drift velocity of free electrons in the wire.

Watch Video Solution

4. An electron is moving at $10^6 ms^{-1}$ in a direction parallel to a current of 5A flowing through an infinitely long straight wire , separated by a perpendicular distance of 10 cm in air. Calculate the magnitude of the force experienced by the electron.

Watch Video Solution