PHYSICS

BOOKS - MTG PHYSICS (ENGLISH)

MAGNETISM AND MATTER

The Bar Magnet

1. The primary origin(s) of magnetism lies in

A. atomic current and intrinsic spin of electrons-

B. polar and non polar nature of molecules.

C. pauli exclusion principle.

D. electronegative nature of materials.

Answer: A

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2. Magnetic moment for a solenoid and corresponding bar magnet is

A. equal for both

B. more for solenoid

C. more for bar magnet

D. none of these

Answer: A

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3. Which of the following is not correct about the magnetic field lines?

A. The magnetic field lines of a magnet form continuous closed loops

B. The tangent to the field line at a given point represents the direction of the net magnetic field B at that point.

C. The larger the number of field lines crossing per unit area, the stronger is the magnitude of the magnetic field B.

D. The magnetic field lines may intersect to each other in certain conditions.

Answer: D

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4. Which of the following is correct about magnetic monopole?

A. Magnetic monopole exists.

B. Magnetic monopole does not exist.

C. Magnetic monopole has constant value of monopole momentum.

D. The monopole momentum increase due to increase in its distance from the field.

Answer: B

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5. If B_E represents equatorial magnetic field and B_A represents axial magnetic field due to a bar magnet. Which of the following

relationships between B_E and B_A is correct ?

A. $B_E = 2B_A$

B. $B_A = 2B_E$

C. $B_E = 4B_A$

D. $B_A = 4B_E$

Answer: B

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6. A short bar magnet has a magnetic moment of $0 \cdot 48JT^{-1}$. Give the direction and magnitude of the magnetic field produced by the magnet at a distance of $10cm$ from the centre of the magnet on (i) the axis (ii) the equatorial line (normal bisector) of the magnet.

A. 0.48×10^{-4} T along N-S direction

B. 0.28×10^{-4} T along S-N direction

C. 0.28×10^{-4} T along N-S direction

D. 0.96×10^{-4} T along S-N direction

Answer: D

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7. A short bar magnet has a magnetic moment of 0.39 J T^{-1}. The magnitude and direction of the magnetic field produced by the magnet at a distance of 20 cm from the centre of the magnet on the equatorial line of the magnet is

A. 0.049 G, N-S direction

B. 4.95 G, S-N direction

C. 0.0195 G, S-N direction

D. 19.5 G, N-S direction

Answer: A

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8. The magnet induction at a point 1 Ã... away from a proton measured along its axis of spin is (magnetic moment of the proton is $1.4 \times 10^{-26} \mathrm{A\ m}^2$)

A. 0.28 mT

B. 28 mT

C. 0.028 mT

D. 2.8 mT

Answer: D

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9. The pole strength of 12 cm long bar magnet is 20 A m. The magnetic induction at a point 10 cm away from the centre of the magnet on its axial line is $\left[\frac{\mu_0}{4\pi} = 10^{-7}\mathrm{H\ m^{-1}}\right]$

A. 1.17×10^{-3} T

B. 2.20×10^{-3} T

C. 1.17×10^{-2} T

D. 2.20×10^{-2} T

Answer: A

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10. Two short bar magnets of magnetic moments m each are arranged at the opposite corners of a square of side d such that their centres coincide with thecorners and their axes are parallel. If the like poles are in the same direction, the magnetic induction at any of the other corners of the square is

A. $\frac{\mu_0}{4\pi}\frac{m}{d^3}$

B. $\frac{\mu_0}{4\pi}\frac{2m}{d^3}$

C. $\frac{\mu_0}{4\pi}\frac{m}{2d^3}$

D. $\frac{\mu_0}{4\pi}\frac{m^3}{2d^3}$

Answer: A

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11. Two identical magnetic dipoles of magnetic moments $2Am^2$ are placed at a separation of $2m$ with their axes perpendicular to each other in air. The resultant magnetic field at a mid point between the dipole is

A. $4\sqrt{5} \times 10^{-5}$ T

B. $2\sqrt{5} \times 10^{-5}$ T

C. $4\sqrt{5} \times 10^{-7}$ T

D. $2\sqrt{5} \times 10^{-7}$ T

Answer: D

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12. The magnitude of the equatorial magnetic field due to a bar magnet of length 2 cm at a distance of 1m from its mid-point is

(magnetic moment of the bar magnet is 0.60 A m)

A. 5.0×10^{-5} T

B. 6.0×10^{-8} T

C. 7.0×10^{-7} T

D. 8.0×10^{-8} T

Answer: B

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13. What is the magnitude of axial field due to a bar magnet of length 3 cm at a distance of 75 cm from its mid-point if its magnetic moment is 0.6 Am^2?

A. 0.013μ T

B. 0.113 μ T

C. 0.213 μ T

D. 0.313 μ T

Answer: C

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14. In Fg. 5.4 (b). The magnetic needle has magnetic moment $6.7 \times 10^{-2} Am^2$ and moment of inertia $= 7.5 \times 10^{-6} kgm^2$. It performs 10 complete oscillations is 6.70 s. what is the magnitude of the magnetic field?

A. 0.011 T

B. 0.021 T

C. 0.031 T

D. 0.041 T

Answer: B

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15. In Fg. 5.4 (b). The magnetic needle has magnetic moment $6.7 \times 10^{-2} Am^2$ and moment of inertia $= 7.5 \times 10^{-6} kgm^2$. It performs 10 complete oscillations is 6.70 s. what is the magnitude of the magnetic field?

A. 0.0016 T

B. 0.16 T

C. 1.6 T

D. 0.021 T

Answer: A

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16. A bar magnet of magnetic moment M and moment of inertia I (about centre, perpendicular to length) is cut into two equal pieces, perpendicular to length. Let T be the period of oscillation of the original magnet about an axis through the mid point, perpendicular to length, in a magnetic field $\vec{B}$. What would be the similar period T' for each piece?

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

B. $\frac{3T}{4}$

C. $\frac{5T}{2}$

D. T

Answer: A

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

A. 30 N m

B. $30\sqrt{30}$ N m

C. 60 N m

D. $60\sqrt{3}$ N m

Answer: A

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18. A circular coil of 16 turns and radius 10cm carrying a current of 0.75A rests with its plane normal to an external field of

magnitude $5 \cdot 0 \times 10^{-2} T$. The coil is free to turn about an axis in its plane perpendicular to the field direction. When the coil is turned slightly and released, it oscillates about its stable equilibrium with a frequency of $2 \cdot 0 s^{-1}$. What is the moment of inertia of the coil about its axis of rotation?

A. $1.13 \times 10^{-1} \mathrm{kg\ m^2}$

B. $1.13 \times 10^{-2} \mathrm{kg\ m^2}$

C. $1.113 \times 10^{-3} \mathrm{kg\ m^2}$

D. $1.13 \times 10^{-4} \mathrm{kg\ m^2}$

Answer: D

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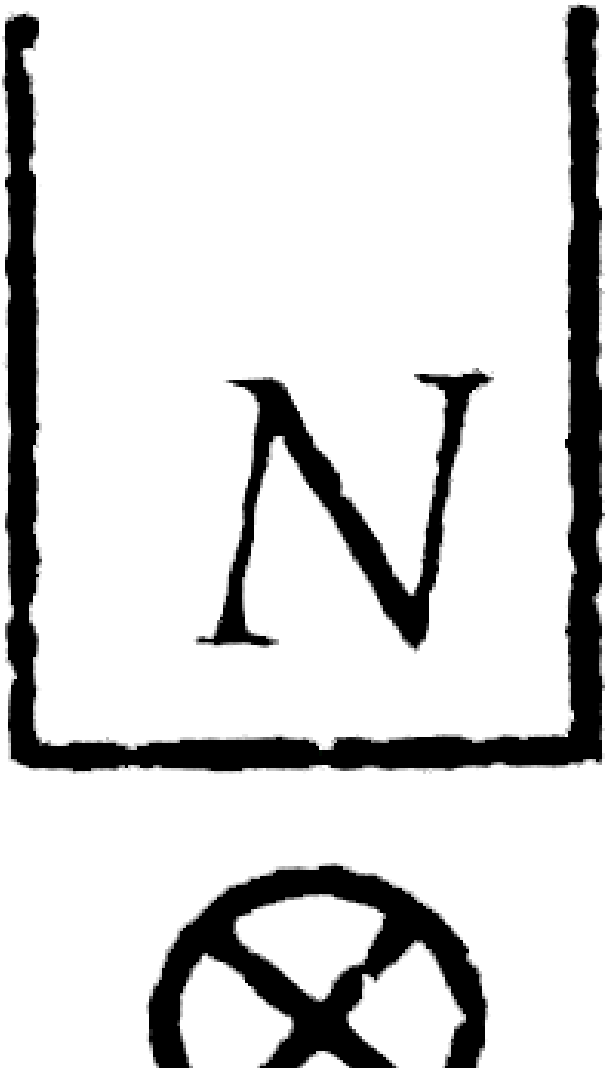
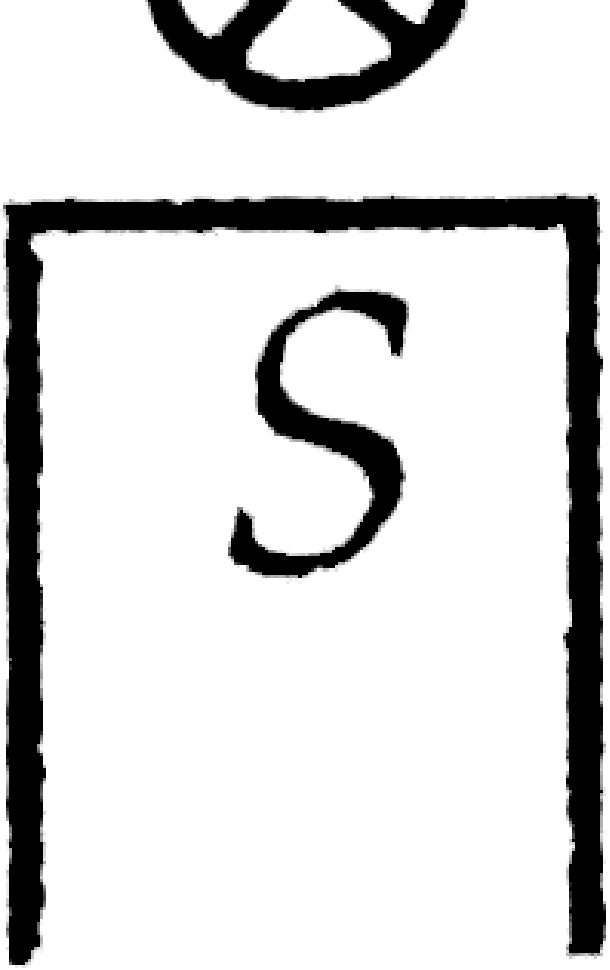
19. A wire is placed between the poles of twofixed bar magnets as shown in the figure. A small current in the wire is into the plane of the paper. The direction of the magnetic force on the wire is





A. ↑

B. ↓

C. →

D. $\leftarrow$

Answer: D

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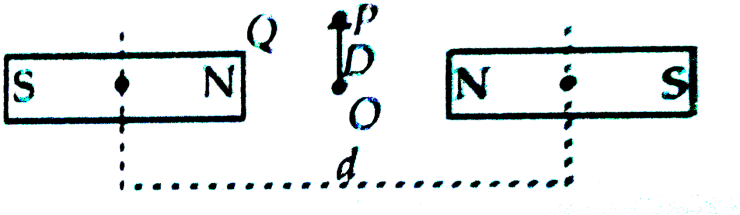
20. Two identical bar magnets are fixed with their centres at a distance d apart. A stationary charge Q is placed at P in between the gap of the two magnets at distance D from the centre O as shown in the figure. The force on the charge Q is



A. zero

B. directed along OP

C. directed along PO

D. directed perpendicular to the plane of paper

Answer: A

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21. A solenoid of cross-sectional area $2 \times 10^{-4} m^2$ and 900 turns has $0.6 Am^2$ magnetic moment. Then the current flowing through it is

A. 2.4A

B. 2.34mA

C. 3.33A

D. 3.33mA

Answer: C

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22. A closely wound solenoid of 750 turns and area of cross section of $5 \times 10^4 m^2$ carries a current of 3.0 A. Its associated magnetic moment is

A. $4.12 JT^{-1}$

B. $3.12 JT^{-1}$

C. $2.12 JT^{-1}$

D. $1.13 JT^{-1}$

Answer: D

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23. A closely wound solenoid of 1000 turns and area of cross section $1.4 \times 10^{-4} m^2$ carrying a current of 3 A is suspended through its centre allowing it to turn in a horizontal plane. The magnetic moment associated with this solenoid is

A. $0.22 JT^{-1}$

B. $0.32 JT^{-1}$

C. $0.42 JT^{-1}$

D. $0.52 JT^{-1}$

Answer: C

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24. A circular coil of 300 turns and diameter $14cm$ carries a current of $15A$. What is the magnitude of magnetic moment

linked with the loop?

A. $51.7JT^{-1}$

B. $69.2JT^{-1}$

C. $38.6JT^{-1}$

D. $19.5JT^{-1}$

Answer: B

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25. A closely wound solenoid of 3000 turns and area of cross section $2 \times 10^{-4}m^2$, carrying a current of 6 A is suspended through its centre allowing it to turn in a horizontal plane. The magnetic moment associated with this solenoid is

A. $1.2JT^{-1}$

B. $2.4JT^{-1}$

C. $3.0JT^{-1}$

D. $3.6JT^{-1}$

Answer: D

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26. The torque and magnetic potential energy of a magnetic dipole in most stable position ina uniform magnetic field $\overrightarrow{B}$ having magnetic moment $\overrightarrow{m}$ will be

A. $-mB, zero$

B. $mB, zero$

C. $zero, mB$

D. $zero, \ -mB$

Answer: D

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27. The work done in moving a dipole from its most stable to most unstable position in a 0.09 T uniform magnetic field is (dipole moment of this dipole = $0.5Am^2$)

A. 0.07J

B. 0.08J

C. 0.09J

D. 0.1J

Answer: C

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28. A circular coil of 25 turns and radius of 12 cm is placed in a uniform magnetic field of 0.5 T normal to the plane of coil. If the current in the coil is 5 A, then total torque experienced by the coil is

A. 1.5Nm

B. 2.5Nm

C. 3.5Nm

D. zero

Answer: D

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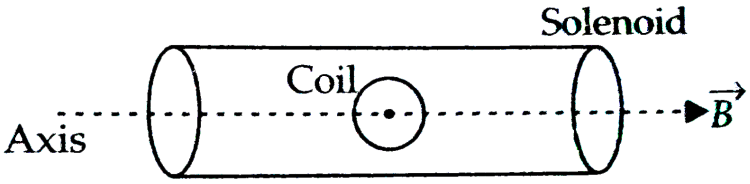
29. The torque required to hold a small circular coil of 10 turns, area $1mm^2$ and carrying a current of $\left(\frac{21}{44}\right)A$ in the middle of a

long solenoid of $10^3 \mathrm{turns}/\mathrm{m}$ carrying a current of 2.5A, with its axis perpendicular to the axis of the solenoid is



A. $1.5 \times 10^{-6} Nm$

B. $1.5 \times 10^{-8} Nm$

C. $1.5 \times 10^{6} Nm$

D. $1.5 \times 10^{8} Nm$

Answer: B

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30. A short bar magnet placed with its axis at 30° with a uniform external magnetic field of 0.35 T experiences a torque of

magnitude equal to $4.5 \times 10^{-2} Nm$. The magnitude of magnetic moment of the given magnet is

A. $0.26 JT^{-1}$

B. $2.6 JT^{-1}$

C. $0.26 JT^{-1}$

D. $0.026 JT^{-1}$

Answer: C

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31. If a solenoid is free to turn about the vertical direction, and a uniform horizontal magnetic field of $0 \cdot 25T$ is applied, what is the magnitude of the torque on the solenoid when its axis

makes an angle of 30° with the direction of the applied field? Magnetic moment is $0.6JT^{-1}$

A. 0.075Nm

B. 0.080Nm

C. 0.081Nm

D. 0.091Nm

Answer: C

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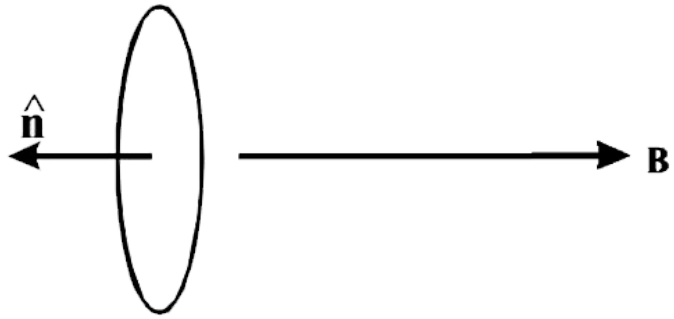
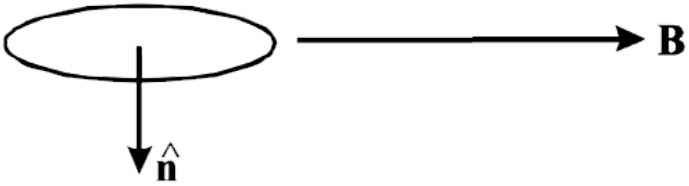
32. A current carrying loop is placed in a uniform magnetic field in four different orientations , I,ii,iii & iv arrange them in the decreasing order of potential Energy`

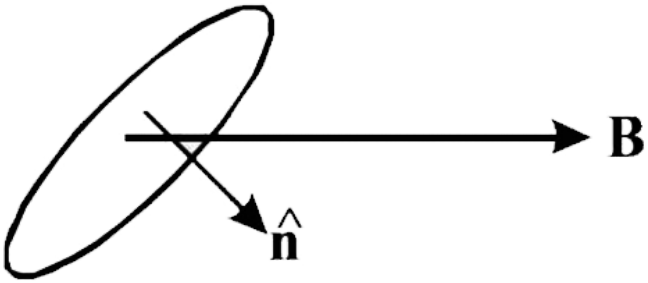
I.



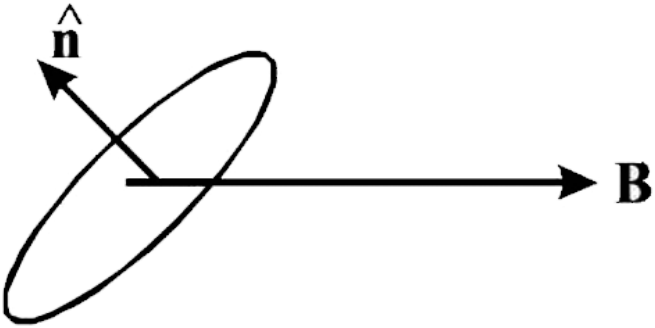
II.



III



IV



A. 4,2,3,1

B. 1,4,2,3

C. 4,3,2,1

D. 1,2,3,4

Answer: B

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33. A circular coil of 100turns radius 10cm, carries a current of 5A. It is suspended vertically in a uniform horizontal magnetic field of 0.5T and the field lines make an angle of 60° with the plane of the coil. The magnitude of the torque that must be applied on it to prevent it from turning is

A. 2.93Nm

B. 3.41Nm

C. 3.93Nm

D. 4.93Nm

Answer: C

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34. A dipole of magnetic moment $\vec{m} = 30\hat{j}Am^2$ is placed along the y-axis in a uniform magnetic field $\vec{B} = \left(2\hat{i} + 5\hat{j}\right)T$. The torque acting on it is

A. $-40\hat{k}Nm$

B. $-50\hat{k}Nm$

C. $-60\hat{k}Nm$

D. $-70\hat{k}Nm$

Answer: C

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35. A uniform horizontal magnetic field of $7.5 \times 10^{-2} T$ is set up at an angle of 30° with the axis of an solenoid and the magnetic moment associated with it is $1.28 JT^{-1}$. Then the torque on it is

A. $4.8 \times 10^{-2} Nm$

B. $1.6 \times 10^{-2} Nm$

C. $1.2 \times 10^{-2} Nm$

D. $4.8 \times 10^{-4} Nm$

Answer: A

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36. A magnetic dipole is under the influence of two magnetic fields. The angle between the field direction is 60° and one of

the fields has magnitude of $1.2 \times 10^{-2} T$. If the dipole comes to stable equilibrium at an angle of 30° with this Held, then the magnitude of the field is

A. $1.2 \times 10^{-4} T$

B. $2.4 \times 10^{-4} T$

C. $1.2 \times 10^{-2} T$

D. $2.4 \times 10^{-2} T$

Answer: C

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37. The magnetic moment of a short bar magnet placed with its magnetic axis at 30° to an external field of 900 G and experiences a torque of 0.02 N m is

A. $0.35Am^2$

B. $0.44Am^2$

C. $2.45Am^2$

D. $1.5Am^2$

Answer: B

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38. Which of the following is not showing the essential difference between electrostatic shielding by a conducting shell and magnetostatic shielding?

A. Electrostatic field lines can end on charges and conductors have free charges.

B. Magnetic field lines can end but conductors cannot end them.

C. Lines of magnetic field cannot end on any material and perfect shielding is not possible.

D. Shells of high permeability materials can be used to divert lines of magnetic field from the interior region.

Answer: B

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Magnetism And Gauss S Law

1. The net magnetic flux through any closed surface, kept in a magnetic field is

A. zero

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

C. $4\pi\mu_0$

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

Answer: A

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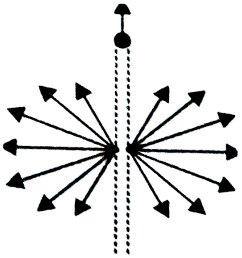
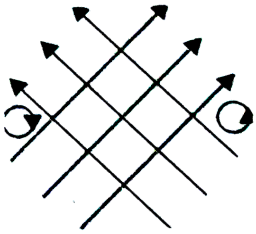
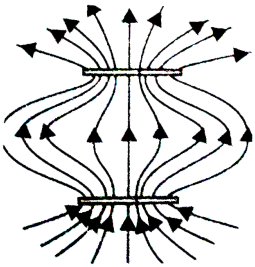
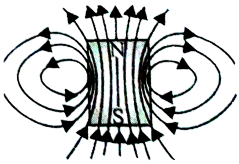
2. Point out the correct direction of magnetic field in the given figures.

A.



B. 

C. 

D. 

Answer: D

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The Earth S Magnetism

1. The earth behaves as a magnet with magnetic Held pointing approximately from the geographic

A. North to South

B. South to North

C. East to west

D. West to East

Answer: B

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2. The strength of the earth's magnetic field is

A. constant everywhere

B. zero everywhere

C. having very high value

D. vary from place to place on the earths surface

Answer: D

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3. Which of the following is responsible for the earth's magnetic field?

A. Convective currents in earth's core.

B. Diversive current in earth's core.

C. Rotational motion of earth.

D. Translational motion of earth.

Answer: A

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4. Which of the following is independent quantities is not used to specify the earth's magnetic field?

A. Magnetic declination (θ)

B. Magnetic field (δ)

C. Horizontal component of earth's field (B_H)

D. Vertical component of earth's field (B_V)

Answer: D

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5. If you made a map of magnetic field lines at Melbourne in Australia, then the magnetic field lines seem to be

A. go into the ground

B. come out of the ground

C. maintain a spiral path on the surface of earth

D. move on helical path above the surface of ground

Answer: B

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6. The horizontal and vertical components of earth's magnetic field at a place are 0.3G and 0.52G. The earth's magnetic field and the angle of dip are

A. $0.3g$ and $\delta = 30^\circ$

B. $0.4g$ and $\delta = 40^\circ$

C. $0.5g$ and $\delta = 50^\circ$

D. $0.6g$ and $\delta = 60^\circ$

Answer: D

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7. Let the magnetic field on earth be modeled by that of a point magnetic dipole at the centre of earth. The angle of dip at a point on the geographical equator is

A. always zero

B. positive, negative or zero

C. unbounded

D. always negative

Answer: B

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8. Consider the plane S formed by the dipole axis and the axis of earth. Let P be point on the magnetic equator and in S. Let Q be the point of intersection of the geographical and magnetic equators Obtain the declination and dip angles at P and Q.

A. $0^\circ, 11.3^\circ$

B. $11.3^\circ, 0^\circ$

C. $11.3^\circ, 11.3^\circ$

D. $0^\circ, 0^\circ$

Answer: B

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9. The dip angle at a location in southern India is about 18°. Then the dip angle in Britain will be

A. greater than 18°

B. lesser than 18°

C. equal to 18°

D. zero

Answer: A

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10. What is the angle of dip at a place where horizontal and vertical components of earth's field are equal?

A. 30°

B. 75°

C. 60°

D. 45°

Answer: D

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11. The vertical component of earth's magnetic field at a place is $\sqrt{3}$ times the horizontal component the value of angle of dip at this place is

A. 30°

B. 45°

C. 60°

D. 75°

Answer: C

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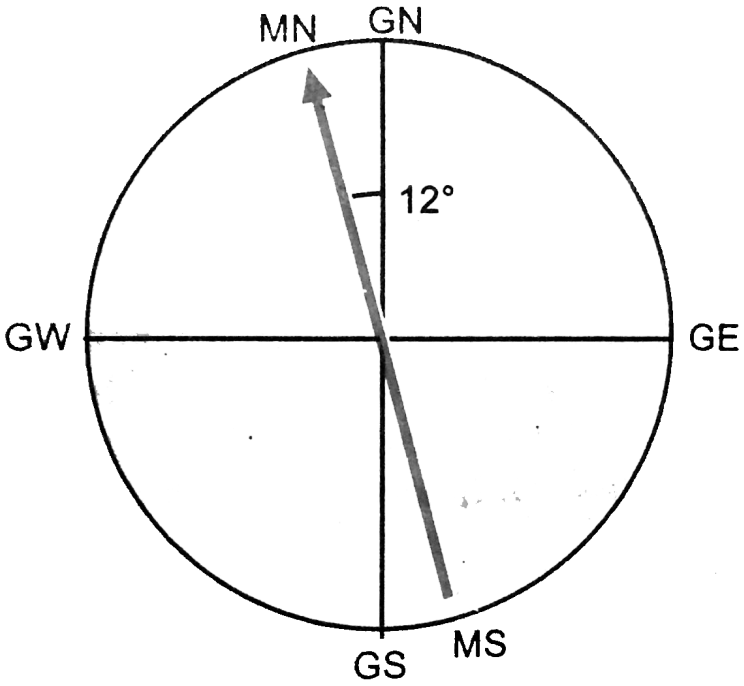
12. At a certain location in Africa, compass points 12° west of geographic north, figure. The north tip of magnetic needle of a dip circle placed in the plane of magnetic meridian points 60° above the horizontal. The horizontal component of earth's field is measured to be $0.16 gauss$. Specify the direction and

magnitude of the earth's field at the location.



A. 0.32G

B. 0.42G

C. 4.2G

D. 3.2G

Answer: A

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13. Assume the dipole model of earth's magnetic field B which is given by B_V= vertical component of magnetic field $= \frac{\mu_0}{4\pi}\frac{2M\cos\theta}{r^3}$, B_H=Horizontal component of magnetic field $= \frac{\mu_0}{4\pi}\frac{\sin\theta M}{r^3}$, $\theta = 90^\circ$-latitude as measured from magnetic equator.

Find loci of points for which dip angle is $\pm 45^\circ$.

A. $\tan^{-1}(3)$

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

C. $\tan^{-1}(0.5)$

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

Answer: B

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14. The angle of dip at the poles and the equator respectively are

A. $30^\circ, 60^\circ$

B. $0^\circ, 90^\circ$

C. $45^\circ, 90^\circ$

D. $90^\circ, 0^\circ$

Answer: D

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15. At a given place on earth's surface the horizontal component of earths magnetic field is $2 \times 10^{-5} T$ and resultant magnetic field is $4 \times 10^{-5} T$. The angles of dip at this place is

A. 30°

B. 60°

C. 90°

D. 44°

Answer: B

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16. The earth's field departs from its dipole shpae substantially at large distance (greater than about 3000 km). The responsible factor for this distortion is

A. motion of ions in earth's ionosphere

B. motion of ions in earth's atmosphere

C. motion of ions in earth's lithosphere

D. motion of ions in the space.

Answer: A

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17. In the magnetic meridian of a certain place, the horizontal component of the earth's magnetic field is $0 \cdot 26G$ and dip angle is 60°. What is the magnetic field of earth at this location?

A. 0.50G

B. 0.52G

C. 0.54G

D. 0.56G

Answer: A

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18. The earth's magnetic field at the equator is approximately $0 \cdot 4G$, Estimate the earth's dipole moment.

A. $1.05 \times 10^{23} Am^2$

B. $2.05 \times 10^{23} Am^2$

C. $1.05 \times 10^{21} Am^2$

D. $2.05 \times 10^{21} Am^2$

Answer: A

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19. A compass needle whose magnetic moment is $60 Am^2$ pointing geograhic north at a certain place, where the

horizontal component of earth's magnetic field is $40\mu Wbm^{-2}$ experiences a torque $1 \cdot 2 \times 10^{-3} Nm$. What is the declination of the place?

A. 20°

B. 45°

C. 60°

D. 30°

Answer: D

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Magnetisation And Magnetic Intensity

1. A magnetising field of $1500A/m$ produces a flux of $2 \cdot 4 \times 10^{-5}$ weber in a bar of iron of cross-sectional area $0 \cdot 5cm^2$. Calculate the permeability and susceptibility of the iron bar used.

A. 245

B. 250

C. 252

D. 255

Answer: D

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2. A solenoid has a core of a substance with relative permeability 600. What is the magnetic permeability of the given substance?

A. $20\pi \times 10^{-5} NA^{-2}$

B. $21\pi \times 10^{-5} NA^{-2}$

C. $22\pi \times 10^{-5} NA^{-2}$

D. $24\pi \times 10^{-5} NA^{-2}$

Answer: D

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3. A permanent magnet in the shape of a thin cylinder of length 50 cm has intensity of magnetisaton $10^6 Am^{-1}$. The magnetisation current is

A. $5 \times 10^5 A$

B. $6 \times 10^5 A$

C. $5 \times 10^4 A$

D. $6 \times 10^5 A$

Answer: A

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4. A domain in ferromagnetic iron in the form of cube shaving 5×10^{10} atoms. If the side length of this domain is 1.5μ and each atom has a dipole moment of $8 \times 10^{-24} Am^2$, then magnetisation of domain is

A. $11.8 \times 10^5 Am^{-1}$

B. $1.18 \times 10^5 Am^{-1}$

C. $11.8 \times 10^4 Am^{-1}$

D. $1.18 \times 10^5 Am^{-1}$

Answer: D

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5. A magnetising field of $2 \times 10^3 Am^{-1}$ produces a magnetic flux density of $8\pi T$ in an iron rod. The relative permeability of the rod will be

A. 10^2

B. 1

C. 10^4

D. 10^3

Answer: C

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6. A permanent magnet in the shape of a thin cylinder of length 10 cm has magnetisation $(M) = 10^6 Am^{-1}$. It's magnetization current I_m is

A. $10^5 A$

B. $10^6 A$

C. $10^7 A$

D. $10^8 A$

Answer: A

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7. A ring of mean radius 15 cm has 3500 turns of wire wound on a ferromagnetic core of relative permeability 800. The magnetic field in the core for a magnetising current of 1.2 A is

A. 2.48T

B. 3.48T

C. 4.48T

D. 5.48T

Answer: C

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8. A solenoid has a core of a material with relative permeability of 500. The windings of the solenoid are insulated from the core and carry a current of 2 A. If the number of turns is 1000 per meter, then magnetisation is

A. $7.78 \times 10^5 Am^{-1}$

B. $8.88 \times 10^5 Am^{-1}$

C. $9.98 \times 10^5 Am^{-1}$

D. $10.2 \times 10^5 Am^{-1}$

Answer: C

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9. A solenoid has core of a material with relative permeability 500 and its windings carry a current of 1 A. The number of turns of the solenoid is 500per meter. The magnetization of the material is nearly

A. $2.25 \times 10^3 Am^{-1}$

B. $2.25 \times 10^5 Am^{-1}$

C. $2.0 \times 10^3 Am^{-1}$

D. $2.0 \times 10^5 Am^{-1}$

Answer: B

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10. The relation connecting magnetic susceptibility χ_m and relative permeability μ_r, is

A. $\chi_m = \mu_r + 1$

B. $\chi_m = \mu_r - 1$

C. $\chi_m = \dfrac{1}{\mu_r}$

D. $\chi_m = 3(1 + \mu_r)$

Answer: B

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11. The relative permeability of iron is 6000. Its magnetic susceptibility is

A. 5999

B. 6001

C. 6000×10^{-7}

D. 6000×10^{7}

Answer: A

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Magnetic Properties Of Materials

1. Which of the following is not correct about relative magnetic permeability (μ_r)?

A. It is a dimensionless pure ratio.

B. For vacuum medium its value is one.

C. For ferromagnetic materials of $\mu > > 1$

D. For paramagnetic materials $\mu_r > 1$

Answer: D

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2. Point out the correct set of diamagnetic substances

A. aluminum, sodium calcium and oxygen

B. bismuth, copper, lead and silicon

C. cobalt, nickel, gadolinium and aluminum

D. silver, niobium, magnesium and calcium

Answer: B

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3. Which of the following is universal magnetic property

A. Ferromagnetis

B. Diamagnetism

C. Pararnagnetis

D. Anti-ferromagnetism

Answer: B

Watch Video Solution

4. Superconductors are:

A. most exotic diamagnetic materials

B. ferromagnetic material with low resistivity

C. Paramagnetic materials at high temperature

D. none of these

Answer: A

Watch Video Solution

5. Magnetic susceptibility of a diamagnetic substances

A. increases with increase in temperature

B. increases with decrease in temperature

C. remains constant with change in temperature

D. none of these

Answer: C

Watch Video Solution

6. If a magnetic material is having magnetic susceptibility $(\chi) = -1$ then the relative magnetic permeability (μ_r) and type of mangnetic material is

A. 0, diamagnetic

B. 2,ferromagnetic

C. 1,paramagnetic

D. -1, diamagnetic

Answer: A

Watch Video Solution

7. A ball of superconducting material is dipped in liquid nitrogen and placed near a bar magnet. In which direction will it move?

A. Away from bar magnet

B. Towards the bar magnet

C. Around the bar magnet

D. Remain constant

Answer: A

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8. The range of magnetic susceptibility and relative magnetic permeability for diamagnetic subtance are

A. $-1 \geq \chi > 0, 0 \leq \mu_r < 1$

B. $-1 \leq \chi > 0, 0 \geq \mu_r < 1$

C. $-1 \geq \chi > 1, 0 \leq \mu_r < 1$

D. $-1 \leq \chi \leq 0, 0 \leq \mu_r \leq 1$

Answer: D

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9. Out of given paramagnetic substance (Calcium, Chromium, Oxygen and Tungsten) which substance has maximum susceptibility

A. Calcium

B. Chromium

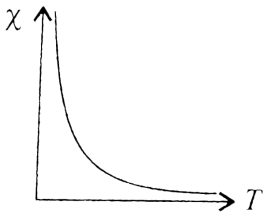
C. Oxygen

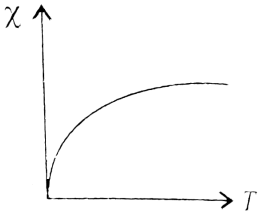
D. Tungsten

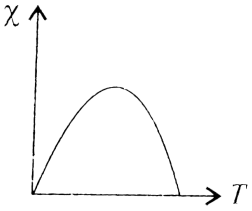
Answer: B

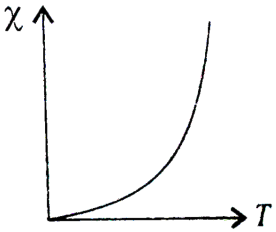
Watch Video Solution

10. Point out the best representation of relation between magnetic susceptibility (Chi) and temperature (T) for a paramagnetic material

A. 

B. 

C. 

D. 

Answer: A

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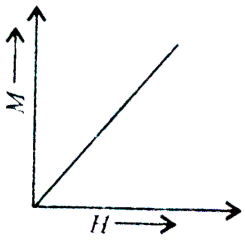
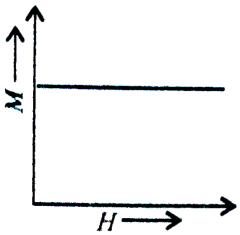
11. The correct M-H curve for a paramagnetic material at a constant temperature (T) is represented by

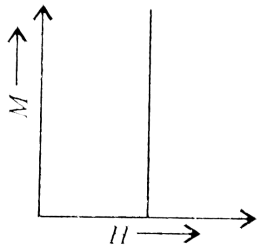
A.



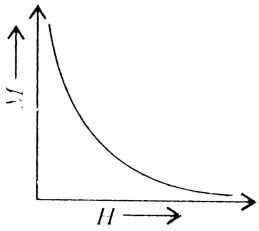
B.



C.



D.



Answer: A

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12. The magnetic susceptibility of a paramagnetic material at $-73^\circ C \text{is} 0.0075$, its value at $-173^\circ C$ will be

A. 0.045

B. 0.03

C. 0.015

D. 0.0075

Answer: C

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13. The magnetic susceptibility of a paramagnetic substance at $-173^\circ C$ is 1.5×10^{-2} then its value at $-73^\circ C$ will be?

A. 7.5×10^{-1}

B. 7.5×10^{-2}

C. 7.5×10^{-3}

D. 7.5×10^{-4}

Answer: C

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14. A paramagnetic liquid is taken in a U-tube and arranged so that one of its limbs is kept between pole pieces of the magnet. The liquid level in the limb

A. goes down

B. rise up

C. remains same

D. first goes down and then rise

Answer: B

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15. Mark the correct set of ferromagnetic substances

A. iron, cobalt and nickel

B. iron, copper and lead

C. silicon, bismuth and nickel

D. aluminum, sodium and copper.

Answer: A

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16. In an experiment it is found that the magnetic susceptibility of given substance is much more greater than one. The possible substance is

A. diamagnetic

B. paramagnetic

C. ferromagnetic

D. nonmagnetic

Answer: C

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17. Magnetic permeability is maximum for

A. ferromagnetic substances

B. diamagnetic substances

C. paramagnetic substances

D. all of these

Answer: A

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18. Which of following property shows the property of ferromagnetic substances?

A. The ferromagnetic property depends, on temperature.

B. The ferromagnetic property does not depend on temperature.

C. At high enough temperature ferromagnet becomes a diamagnet.

D. At low temperature ferromagnet becomes a paramagnet.

Answer: A

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19. Nickel shows ferromagnetic property at room temperature. If the temperature is increased beyond curie temperature, then it will show

A. anti ferromagnetism

B. no magnetic property

C. diamagnetism

D. paramagnetism

Answer: D

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20. The temperature of transition from ferromagnet property to paramagnetic property is called

A. Transition temperature

B. Critical temperature

C. Curie temperature

D. Triplet temperature.

Answer: C

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21. A domain in ferromagnetic iron is in the form of a ube of side length $2\mu m$ then the number of iron atoms in the domain are $\left(\text{Molecular mass of iron} = 55gmol^{-1} \text{ and density} = 7.92gcm^{-3}\right)$

A. $6.92 \times 10^{12}\text{atoms}$

B. $6.92 \times 10^{11}\text{atoms}$

C. $6.92 \times 10^{10}\text{atoms}$

D. $6.92 \times 10^{13}\text{atoms}$

Answer: B

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22. In question number 91, maximum value of magnetisation of the given domain is (Dipole moment of an iron atom $9.27 \times 10^{-24}Am^2$)

A. $8.0 \times 10^5 Am^{-1}$

B. $6.0 \times 10^4 Am^{-1}$

C. $8.0 \times 10^3 Am^{-1}$

D. $6.0 \times 10^3 Am^{-1}$

Answer: A

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23. Point out the wrong statement about the magnetic properties of soft iron and steel.

A. Retentivity of soft iron is more than retentivity of steel.

B. Coercivity of soft iron is less than coercivity of steel..

C. Area of B-H loop in soft iron is smaller than the area of B-H loop .for steel.

D. Area of B-H in soft iron is greater than the area of 8-H loop .for steel.

Answer: D

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24. The hysteresis cycle forhe material of a transformer core is

A. short and wide

B. tall and narrow

C. tall and wide

D. short and narrow

Answer: B

View Text Solution

25. The magnetising field required to be applied in opposite direction to reduce residual magnetism to zero is called

A. retentivity

B. coercivity

C. hysteresis

D. flux

Answer: B

View Text Solution

26. Which of the following material is used in making the core of a moving coil galvanometer?

A. Copper

B. Nickel

C. Iron

D. Both (a) and (b)

Answer: C

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Permanent Magnets And Electromagnets

1. Materials suitable for permanent magnet, must have which of the following properties?

A. High retantivity low coercivity and high permeability

B. Low retantivity low coercivity and low permeability

C. Low retantivity high coercivity and low permeability

D. High retantivity high coercivity and high permeability

Answer: D

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2. Permanent magnets are the substances having the property of

A. ferromagnetism at room temperature for long period of time.

B. paramagnetism at room temperature for a long period of time.

C. anti ferromagnetism at room temperature for a long period of time.

D. diamagnetism at room temperature for a long period of time.

Answer: A

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3. Core of electromagnets are made of ferromagnetic materials which have

A. low permeability and low retentivity

B. high permeability and high retentivity

C. high permeability and low retentivity

D. low permeability and high retentivity.

Answer: D

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4. Identify the mismatched pair.

Hard magnet	Alnico
Soft magnet	Soft iron
Bar magnet	Equivalent solenoid
Electromagnet	Loud speaker

A. Hard magnet Alnico

B. Soft magnet Soft iron

C. Bar magnet Equivalent solenoid

D. Electromagnet Loud speaker

Answer: A

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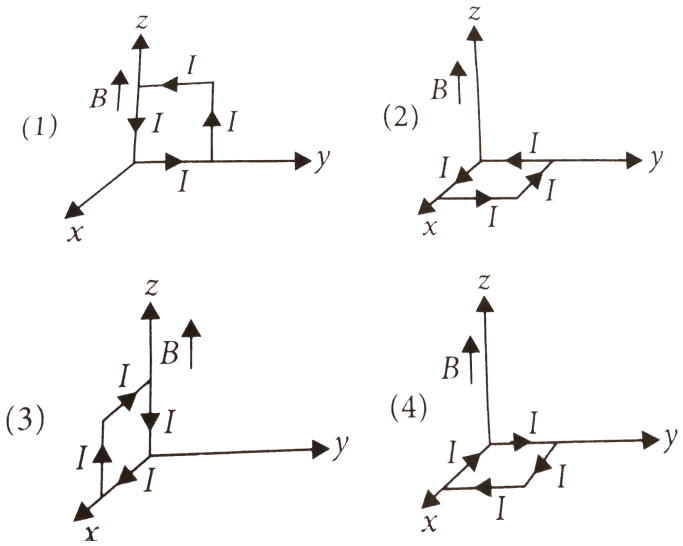
Higher Order Thinking Skills Hots

1. A rectangular loop of sides 10cm and 5cm carrying a current I of 12A is placed in different orienctations as shown in the figure



If there is a uniform magnetic field of 0.3 T in the positive z-direction, in which orientations the loop would be in (i) stable equilibrium and (ii) unstable equilibrium .

A. (2)and(4), respectively

B. (2)and(3), respectively

C. (1)and(2), respectively

D. (1)and(3), respectively

Answer: B

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2. A compass needle free to turn in a horizontal plane is placed at the centre of a circular coil of 30turns and radius 12cm. The coil is in a vertical plane malting an angle of 45° with the magnetic meridian when the current in the coil is 0.35A, the needle points west to east. Determine the horizontal component of earth's magnetic field at the location.

A. $3.9 \times 10^{-7}\text{tesla}$

B. $3.9 \times 10^{5}\text{tesla}$

C. $8.0 \times 10^{-5}\text{tesla}$

D. $7.0 \times 10^{-7}\text{tesla}$

Answer: A

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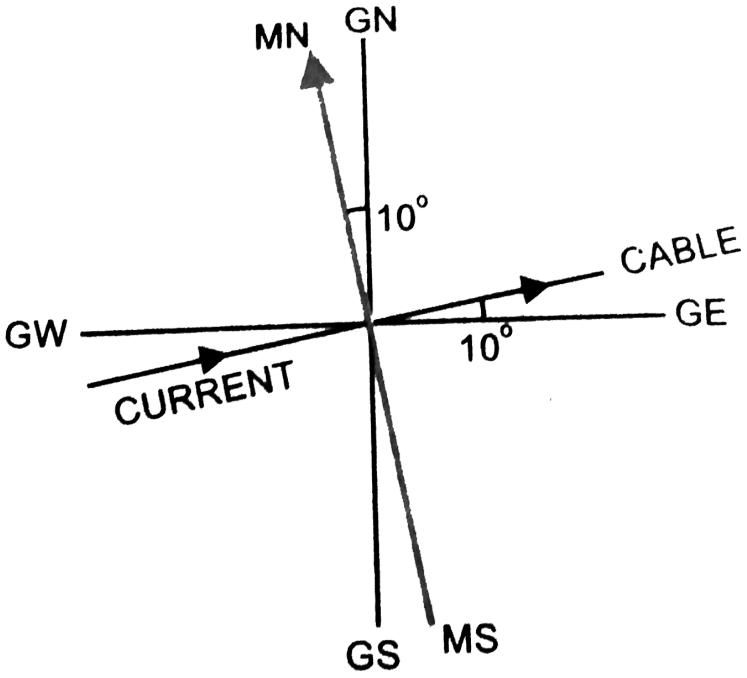
3. A long straight horizontal cable carries a current of $2.5amp$. In the direction 10° south of west to 10° north of east, figure. The magnetic meridian of the place happens to be 10° west of the geographic meridian. The earth's magnetic field at the location is $0.33G$ and the angle of dip is zero. Locate the line of neutral points (Ignore the thickness of the cable). [At neutral points, magnetic fied due to a current cable is equal and

opposite to the horizontal component of earth's magnetic field.]



A. 15.15mm

B. 30.15mm

C. 35.15mm

D. 40.15mm

Answer: A

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4. A telephonic cable at a place has four long straight horizontal wires carrying a current of $1.0amp.$ in the same direction east to west. The earth's magnetic field at the place is $0.39G$ and the angle of dip is 35°. The magnetic declination is almost zero. What are the resultant magnetic fields at points $4.0cm$ below and above the cable?

A. 0.25G

B. 0.50G

C. 1.25G

D. 2.50G

Answer: C

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5. There are two current carrying planar coils made each from identical wires of length L. C_1 is the circular (radius R) and C_2 is square (side a). They are so constructed that they have same frequency of oscillation when they are placed in the same uniform $\vec{B}$ and carry the same current i. Find a in terms of R.

A. a=R

B. a=2R

C. a=3R

D. 2a=5R

Answer: C

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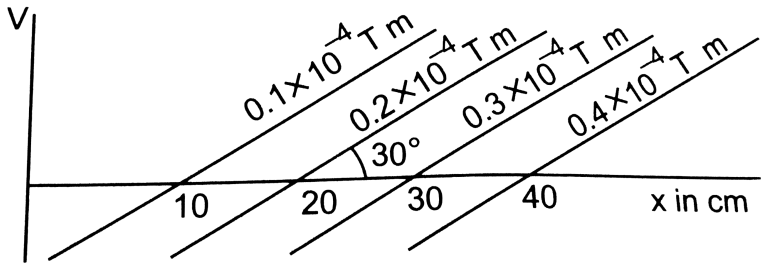
6. Figure shows some of the equipotential surfaces of the magnetic scalar potential. Find the magnetic field B at a point in the region.



A. $10^{-4}T$

B. $0.5 \times 10^{-4}T$

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

D. none of these

Answer: C

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7. A rod of ferromegnetic materical with dimensions $10cm \times 0.5cm \times 2cm$ is placed in a magnetising field of intensity $2 \times 10^5 A/m$. The magnetic moment produced due it is $6\ amop - m^2$. The value of magnetic induction will be------ $10^{-2}T$.

A. 0.358T

B. 0.54T

C. 6.28T

D. 2.519T

Answer: B

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8. The percentage increase in magnetic field B when the space within a current carrying toroid is filled with aluminum $(\chi = 2.1 \times 10^{-5})$ is

A. 0.002

B. $2 \times 10^{-3}\ \%$

C. $2 \times 10^{-2}\ \%$

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

Answer: C

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Exemplar Problems

1. A toroid of n turns, mean radius R and cross-sectional radius a carries current I. It is placed on a horizontal table taken as x-y plane. Its magnetic moment $\overrightarrow{M}$

A. is non-zero and points in the z-direction by symmetry

B. points along the axis of the toroid $\left(\overrightarrow{M} = m\hat{\phi}\right)$

C. is zero, otherwise there would be a field falling as $\frac{1}{r^3}$ at large distances outside the toroid

D. is pointing radially outwards.

Answer: A

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2. The magnetic field of Earth can be modelled by that of a point dipole placed at the centre of the Earth. The dipole axis makes an angle of $11 \cdot 3^{\circ}$ with the axis of Earth. At Mumbai, declination is nearly zero. Then,

A. the declination varies between $11.3^{\circ} W \text{to} 11.3^{\circ} W$

B. the least declination is 0°

C. the plane defined by dipole axis and the earth axis passes through Greenwich.

D. declination averaged over the earth must be always negative.

Answer: C

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3. In a permanent magnet at room temperature.

A. magnetic moment of each molecule is zero.

B. the individual molecules have non-zero magnetic moment which are all perfectly aligned.

C. domains are partially aligned.

D. domains are all perfectly aligned.

Answer: B

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4. Consider the two idealised systems (i) a parallel plate capacitor with large plates and small separation and (ii) a long solenoid of length $L > > R$ radius of cross-section In (i) E is ideally treated as a constant between plates and zero outside. In

(ii) magnetic field is constant the solenoid and zero outside. these idealised assumptions, however, contradict fundamental laws as below

A. case(i) contracdicts Gauss's law for electrostatic fields.

B. case(ii) contracdicts Gauss's law for electrostatic fields.

C. case (i) agrees with $\oint \vec{E} . \vec{dl} = 0$

D. case (i) agrees with $\oint \vec{H} . \vec{dl} = I_{en}$

Answer: B

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5. A paramagnetic sample shows a net magnetisation of $8Am^{-1}$ when placed in an external magnetic field of $0 \cdot 6T$ at a temperature of $4K$. When the same sample is placed in an

external magnetic field of $0 \cdot 2T$ at a temperature of $16K$, the magnetisation will be

A. $\frac{32}{3} Am^{-1}$

B. $\frac{2}{3} Am^{-1}$

C. $6Am^{-1}$

D. `2.4Am^(-1)

Answer: A

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Assertion And Reason

1. Assertion : When a bar magnet is freely suspended, it points in the north-south direction.

Reason : The earth behaves as a magnet with the magnetic field pointing approximately from the geographic south to north.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: D

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2. Assertion: Magnetic force between two short magnets, when they are co-axial follows inverse square law of distance.

Reason: The magnetic forces between two poles do not follow inverse square law of distance.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: C

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3. Assertion: Magnetic field strength at a point on axial line of a bar magnet is along South to North pole of magnet.

Reason: The magnetic field strength can never be along North to South pole of magnet.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

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4. Assertion : Gauss's law of magnetism is different from that for electrostatics.

Reason : Isolated magnetic poles are not known to exist.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

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5. Assertion : Earth's magnetic field does not affect the working of a moving coil galvanometer.

Reason: The earth's magnetic field is quite weak as compared to magnetic field produced in the moving coil galvanometer.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: C

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6. Assertion : The magnetic Held lines of the earth resemble that of a magnetic dipole located at the centre of the earth.

Reason : The axis of the dipole coincide with the axis of rotation of the earth.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: C

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7. Assertion In water, value of magnetic field decreases.

Reason: Water is a diamagnetic substance. When diamagnetic

material is placed in

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

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8. Assertion" When diamagnetic material is placed in a non-uniform magnetic Held, it tends to move from stronger to the

weaker part of the magnetic field.

Reason: Diamagnetic materials possess strong magnetism.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: C

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9. Assertion: Diamagnetism is universal, it is present in all materials

Reason: Field due to induced magnetic moment is opposite to the magnetising field.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

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10. Assertion : The ability of a material to permit the passage of magnetic lines of force through it is called magnetic

permeability.

Reason: For a perfect diamagnetic substance, permeability is always one.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: C

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11. Assertion: Paramagnetic substances get weakly attracted to a magnet.

Reason: They have tedency to from a region of strong magNetic field to weak magnetic Held.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: C

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12. Assertion : The product of magnetic susceptibility and absolute temperature for a paramagnetic substance is constant. Reason: Susceptibility is positive but very small for paramagnetic 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 and reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: B

Watch Video Solution

13. Assertion At high temperature, a ferromagnet becomes a paramagnet.

Reason: The ferromagnetic property depends on temperature.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

Watch Video Solution

14. Assertion: Substances which at room temperature retain their ferromagnetic property for a long period of time are called permanent magnets.

Reason: permanent magnet can be made by placing a ferramagnetic rod in a solenoid and passing current through it.

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

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

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: B

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15. 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 and reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

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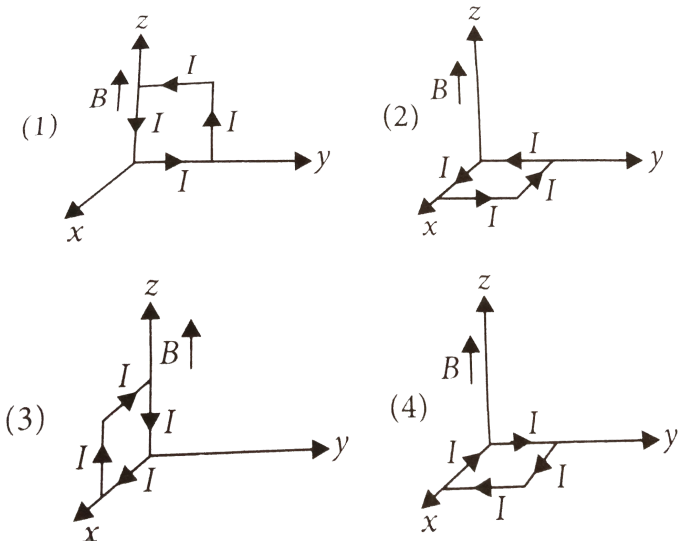
Higher Order Thinking Skills

1. A rectangular loop of sides 10cm and 5cm carrying a current I of 12A is placed in different orienctations as shown in the figure



If there is a uniform magnetic field of 0.3 T in the positive z-direction, in which orientations the loop would be in (i) stable equilibrium and (ii) unstable equilibrium .

A. (2)and(4), respectively

B. (2)and(3), respectively

C. (1)and(2), respectively

D. (1)and(3), respectively

Answer: B

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2. A compass needle free to turn in a horizontal plane is placed at the centre of a circular coil of 30turns and radius 12cm. The coil is in a vertical plane malting an angle of 45° with the magnetic meridian when the current in the coil is 0.35A, the needle points west to east. Determine the horizontal component of earth's magnetic field at the location.

A. $3.9 \times 10^{-7}\text{tesla}$

B. $3.9 \times 10^{5}\text{tesla}$

C. $8.0 \times 10^{-5}\text{tesla}$

D. $7.0 \times 10^{-7} \text{tesla}$

Answer: A

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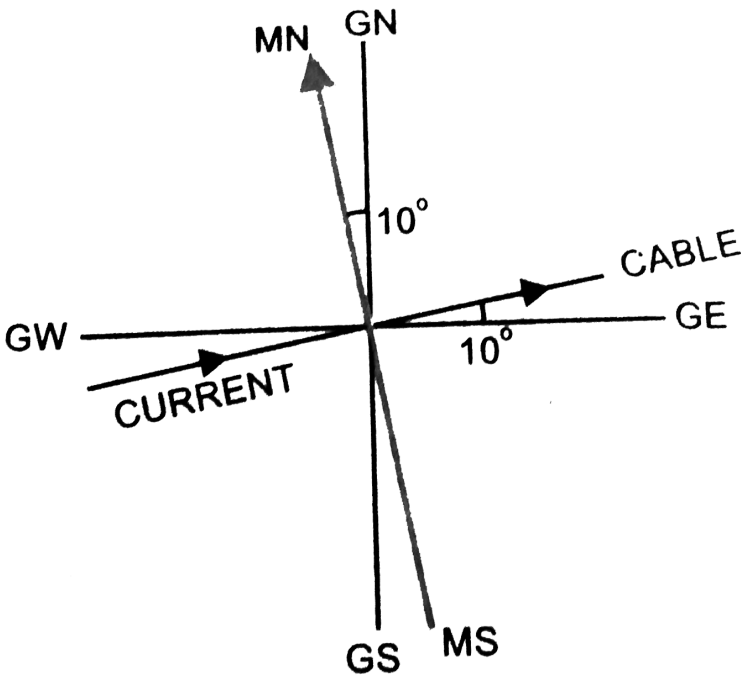
3. A long straight horizontal cable carries a current of $2.5 amp$. In the direction 10° south of west to 10° north of east, figure. The magnetic meridian of the place happens to be 10° west of the geographic meridian. The earth's magnetic field at the location is $0.33G$ and the angle of dip is zero. Locate the line of neutral points (Ignore the thickness of the cable). [At neutral points, magnetic fied due to a current cable is equal and

opposite to the horizontal component of earth's magnetic field.]



A. 15.15mm

B. 30.15mm

C. 35.15mm

D. 40.15mm

Answer: A

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4. A telephonic cable at a place has four long straight horizontal wires carrying a current of $1.0amp.$ in the same direction east to west. The earth's magnetic field at the place is $0.39G$ and the angle of dip is 35°. The magnetic declination is almost zero. What are the resultant magnetic fields at points $4.0cm$ below and above the cable?

A. 0.25G

B. 0.50G

C. 1.25G

D. 2.50G

Answer: C

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5. There are two current carrying planar coils made each from identical wires of length L. C_1 is the circular (radius R) and C_2 is square (side a). They are so constructed that they have same frequency of oscillation when they are placed in the same uniform $\vec{B}$ and carry the same current i. Find a in terms of R.

A. a=R

B. a=2R

C. a=3R

D. 2a=5R

Answer: C

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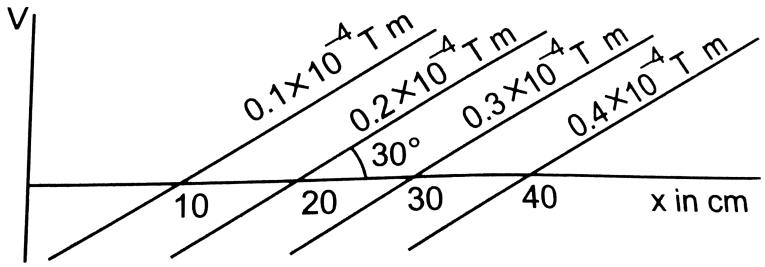
6. Figure shows some of the equipotential surfaces of the magnetic scalar potential. Find the magnetic field B at a point in the region.



A. $10^{-4}T$

B. $0.5 \times 10^{-4}T$

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

D. none of these

Answer: C

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7. A rod of ferromegnetic materical with dimensions $10cm \times 0.5cm \times 2cm$ is placed in a magnetising field of intensity $2 \times 10^5 A/m$. The magnetic moment produced due it is $6\ amop - m^2$. The value of magnetic induction will be------ $10^{-2}T$.

A. 0.358T

B. 0.54T

C. 6.28T

D. 2.519T

Answer: B

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8. The percentage increase in magnetic field B when the space within a current carrying toroid is filled with aluminum $(\chi = 2.1 \times 10^{-5})$ is

A. 0.002

B. $2 \times 10^{-3}\ \%$

C. $2 \times 10^{-2}\ \%$

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

Answer: C

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Ncert Exemplar

1. A toroid of n turns, mean radius R and cross-sectional radius a carries current I. It is placed on a horizontal table taken as x-y plane. Its magnetic moment $\overrightarrow{M}$

A. is non-zero and points in the z-direction by symmetry

B. points along the axis of the toroid $\left(\overrightarrow{M} = m\hat{\phi}\right)$

C. is zero, otherwise there would be a field falling as $\frac{1}{r^3}$ at large distances outside the toroid

D. is pointing radially outwards.

Answer: A

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2. The magnetic field of Earth can be modelled by that of a point dipole placed at the centre of the Earth. The dipole axis makes an angle of $11 \cdot 3^{\circ}$ with the axis of Earth. At Mumbai, declination is nearly zero. Then,

A. the declination varies between $11.3^{\circ} W \text{to} 11.3^{\circ} W$

B. the least declination is 0°

C. the plane defined by dipole axis and the earth axis passes through Greenwich.

D. declination averaged over the earth must be always negative.

Answer: C

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3. In a permanent magnet at room temperature.

A. magnetic moment of each molecule is zero.

B. the individual molecules have non-zero magnetic moment which are all perfectly aligned.

C. domains are partially aligned.

D. domains are all perfectly aligned.

Answer: B

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4. Consider the two idealised systems (i) a parallel plate capacitor with large plates and small separation and (ii) a long solenoid of length $L > > R$ radius of cross-section In (i) E is ideally treated as a constant between plates and zero outside. In

(ii) magnetic field is constant the solenoid and zero outside. these idealised assumptions, however, contradict fundamental laws as below

A. case(i) contracdicts Gauss's law for electrostatic fields.

B. case(ii) contracdicts Gauss's law for electrostatic fields.

C. case (i) agrees with $\oint \overrightarrow{E} . \overrightarrow{dl} = 0$

D. case (i) agrees with $\oint \overrightarrow{H} . \overrightarrow{dl} = I_{en}$

Answer: B

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5. A paramagnetic sample shows a net magnetisation of $8Am^{-1}$ when placed in an external magnetic field of $0 \cdot 6T$ at a temperature of $4K$. When the same sample is placed in an

external magnetic field of $0 \cdot 2T$ at a temperature of $16K$, the magnetisation will be

A. $\frac{32}{3} Am^{-1}$

B. $\frac{2}{3} Am^{-1}$

C. $6Am^{-1}$

D. `2.4Am^(-1)

Answer: A

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Others

1. The net magnetic flux through any closed surface, kept in a magnetic field is

A. zero

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

C. $4\pi\mu_0$

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

Answer: A

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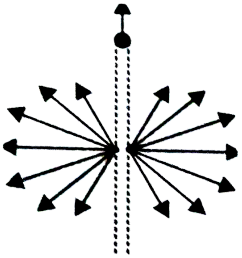
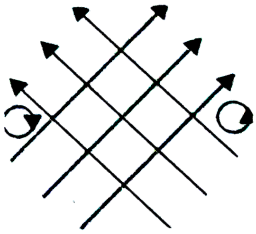
2. Point out the correct direction of magnetic field in the given figures.

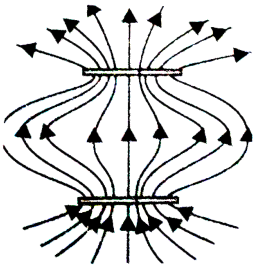
A.



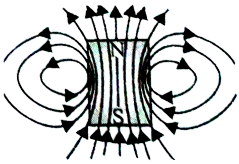
B.



C.



D.



Answer: D

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3. The earth behaves as a magnet with magnetic Held pointing approximately from the geographic

A. North to South

B. South to North

C. East to west

D. West to East

Answer: B

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4. The strength of the earth's magnetic field is

A. constant everywhere

B. zero everywhere

C. having very high value

D. vary from place to place on the earths surface

Answer: D

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5. Which of the following is responsible for the earth's magnetic field?

A. Convective currents in earth's core.

B. Diversive current in earth's core.

C. Rotational motion of earth.

D. Translational motion of earth.

Answer: A

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6. Which of the following is independent quantities is not used to specify the earth's magnetic field?

A. Magnetic declination (θ)

B. Magnetic field (δ)

C. Horizontal component of earth's field (B_H)

D. Vertical component of earth's field (B_V)

Answer: D

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7. If you made a map of magnetic field lines at Melbourne in Australia, then the magnetic field lines seem to be

A. go into the ground

B. come out of the ground

C. maintain a spiral path on the surface of earth

D. move on helical path above the surface of ground

Answer: B

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8. The horizontal and vertical components of earth's magnetic field at a place are 0.3G and 0.52G. The earth's magnetic field and the angle of dip are

A. $0.3g$ and $\delta = 30^\circ$

B. $0.4g$ and $\delta = 40^\circ$

C. $0.5g$ and $\delta = 50^\circ$

D. $0.6g$ and $\delta = 60^\circ$

Answer: D

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9. Let the magnetic field on earth be modeled by that of a point magnetic dipole at the centre of earth. The angle of dip at a point on the geographical equator is

A. always zero

B. positive, negative or zero

C. unbounded

D. always negative

Answer: B

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10. Consider the plane S formed by the dipole axis and the axis of earth. Let P be point on the magnetic equator and in S. Let Q be the point of intersection of the geographical and magnetic equators Obtain the declination and dip angles at P and Q.

A. $0^\circ, 11.3^\circ$

B. $11.3^\circ, 0^\circ$

C. $11.3^\circ, 11.3^\circ$

D. $0^\circ, 0^\circ$

Answer: B

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11. The dip angle at a location in southern India is about 18°. Then the dip angle in Britain will be

A. greater than 18°

B. lesser than 18°

C. equal to 18°

D. zero

Answer: A

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12. What is the angle of dip at a place where horizontal and vertical components of earth's field are equal?

A. 30°

B. 75°

C. 60°

D. 45°

Answer: D

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13. The vertical component of earth's magnetic field at a place is $\sqrt{3}$ times the horizontal component the value of angle of dip at this place is

A. 30°

B. 45°

C. 60°

D. 75°

Answer: C

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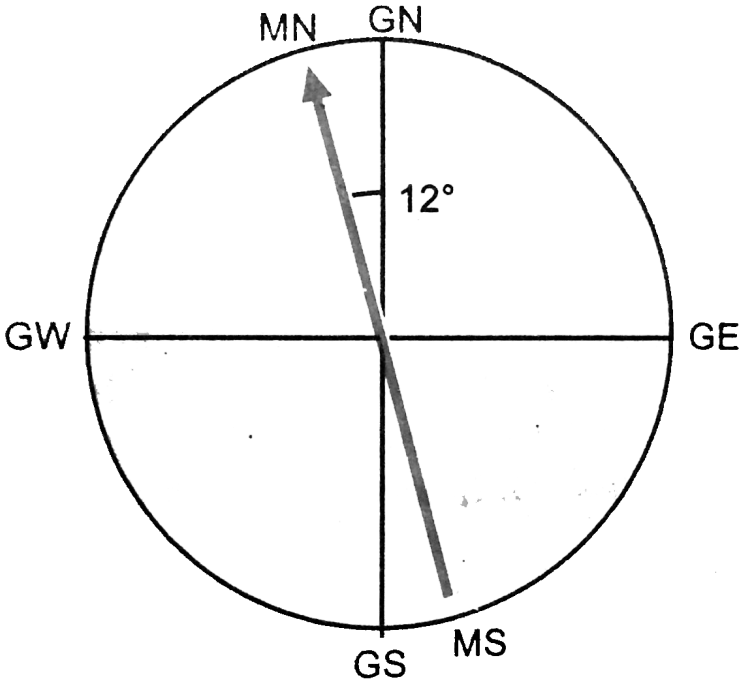
14. At a certain location in Africa, compass points 12° west of geographic north, figure. The north tip of magnetic needle of a dip circle placed in the plane of magnetic meridian points 60° above the horizontal. The horizontal component of earth's field is measured to be $0.16 gauss$. Specify the direction and magnitude of the earth's field at the location.



A. 0.32G

B. 0.42G

C. 4.2G

D. 3.2G

Answer: A

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15. Assume the dipole model of earth's magnetic field B which is given by B_V= vertical component of magnetic field $= \frac{\mu_0}{4\pi}\frac{2M\cos\theta}{r^3}$, B_H=Horizontal component of magnetic field $= \frac{\mu_0}{4\pi}\frac{\sin\theta M}{r^3}$, $\theta = 90^\circ$-latitude as measured from magnetic equator.

Find loci of points for which dip angle is $\pm 45^\circ$.

A. $\tan^{-1}(3)$

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

C. $\tan^{-1}(0.5)$

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

Answer: B

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16. The angle of dip at the poles and the equator respectively are

A. $30^\circ, 60^\circ$

B. $0^\circ, 90^\circ$

C. $45^\circ, 90^\circ$

D. $90^\circ, 0^\circ$

Answer: D

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17. At a given place on earth's surface the horizontal component of earths magnetic field is $2 \times 10^{-5} T$ and resultant magnetic field is $4 \times 10^{-5} T$. The angles of dip at this place is

A. 30°

B. 60°

C. 90°

D. 44°

Answer: B

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18. The earth's field departs from its dipole shpae substantially at large distance (greater than about 3000 km). The responsible factor for this distortion is

A. motion of ions in earth's ionosphere

B. motion of ions in earth's atmosphere

C. motion of ions in earth's lithosphere

D. motion of ions in the space.

Answer: A

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19. In the magnetic meridian of a certain place, the horizontal component of the earth's magnetic field is $0 \cdot 26G$ and dip angle is 60°. What is the magnetic field of earth at this location?

A. 0.50G

B. 0.52G

C. 0.54G

D. 0.56G

Answer: A

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20. The earth's magnetic field at the equator is approximately $0 \cdot 4G$, Estimate the earth's dipole moment.

A. $1.05 \times 10^{23} Am^2$

B. $2.05 \times 10^{23} Am^2$

C. $1.05 \times 10^{21} Am^2$

D. $2.05 \times 10^{21} Am^2$

Answer: A

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21. A compass needle whose magnetic moment is $60 Am^2$ pointing geograhic north at a certain place, where the horizontal component of earth's magnetic field is $40 \mu Wbm^{-2}$ experiences a torque $1 \cdot 2 \times 10^{-3} Nm$. What is the declination of the place?

A. 20°

B. 45°

C. 60°

D. 30°

Answer: D

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