1. A bar magnet is equivalent to **[KCET 2004]**

(a) Straight conductor carrying current (b) Toroid carrying current
(c) Circular coil carrying current (d) None of these

2. The magnetic lines of force inside a bar magnet **[AIEEE 2003]**

(a) Are form south-pole to north - pole of the magnet (b) Are form north – pole to south – pole of the magnet
(c) Do not exist (d) Depend upon the area of cross–section of the bar magnet

3. A small bar magnet has a magnetic moment 1.2 $A-m^2$. The magnetic field at a distance 0.1 m on its axis will be ($\mu_0 = 4\pi\times10^{-7} T.m/A$) **[MP PMT 2003]**

(a) $1.2\times10^{-4}T$ (b) $2.4\times10^{-4}T$ (c) $2.4\times10^{4}T$ (d) $1.2\times10^{2}T$

4. A bar magnet of magnetic moment *M* is placed in a magnetic field of induction *B*. The torque exerted on it is **[EAMCET (Engg.) 1995; CBSE 1999; BHU 2003]**

(a) $M.B$ (b) $-M.B$ (c) $M\times B$ (d) $-M\times B$

5. Two identical thin bar magnets each of length *l* and pole strength *m* are placed at right angle to each other with north pole of one touching south pole of the other. Magnetic moment of the system is **[MNR 1981; MP PMT 2002]**

(a) ml (b) 2ml (c) $\sqrt{2}$ml (d) $\frac{1}{2}$ml

6. A ring of radius *R*, made of an insulating material carries a charge *Q* uniformly distributed on it. If the ring rotates about the axis passing through its centre and normal to plane of the ring with constant angular speed ω, then the magnitude of the magnetic moment of the ring is **[MP PET 2001]**

(a) $Q\omega R^2$ (b) $\frac{1}{2}Q\omega R^2$ (c) $Q\omega^2 R$ (d) $\frac{1}{2}Q\omega^2 R$

7. If a bar magnet of magnetic moment *M* is freely suspended in a uniform magnetic field of strength *B*, the work done in rotating the magnet through an angle θ is **[MP PMT 1989, 96, 99; AFMC 1997; MNR 1998; MP PET 1984, 89, 2001; UPSEAT 2001]**

(a) $MB(1-\sin\theta)$ (b) $MB\sin\theta$ (c) $MB\cos\theta$ (d) $MB(1-\cos\theta)$

8. A magnet of magnetic moment *M* and pole strength *m* is divided in two equal parts, then magnetic moment of each part will be **[NCERT 1974; MP Board 1985; MP PMT 1988; CPMT 1988; KCET 1994; AFMC 1996; DPMT 1984; MP PET 1984, 2000]**

(a) *M* (b) *M*/2 (c) *M*/4 (d) 2*M*

9. Intensity of magnetization is given as **[UPSEAT 1999, 2000]**

(a) Magnetic moment per unit mass (b) Magnetic moment per unit volume
(c) Magnetic moment per unit atomic weight (d) None of the above

10. There is no couple acting when two bar magnets are placed coaxial separated by distance because **[EAMCET (Engg.) 2000]**

(a) There are no forces on the poles (b) The forces are parallel and their lines of action do not coincide
(c) The forces are perpendicular to each other (d) The forces act along the same line

11. A bar magnet when placed at an angle of 30^o to the direction of magnetic field induction of 5×10^{-2} *T*, experiences a moment couple 2.5×10^{-6} *N-m*. If the length of the magnet is 5 cm, its pole strength is **[EAMCET (Med.) 2000]**

(a) 2×10^2 A – m (b) 5×10^2 A – m (c) 2 A – m (d) 5 A – m

12. A magnet of magnetic moment $50\hat{i}$ $A-m^2$ is placed along the *x*-axis in a magnetic field $\vec{B} = (0.5\hat{i} + 3.0\hat{j})T$. The torque acting on the magnet is **[MP PMT 2000]**

(a) $175\hat{k}$ Nm (b) $150\hat{k}$ Nm (c) $75\hat{i}$ Nm (d) $25\sqrt{37}\hat{k}$ Nm

13. Which of the following statements in not correct about the magnetic field **[AIIMS 2000]**

(a) Magnetic lines of force do not cut each other
(b) Insides the magnet the lines go from north to south pole of the magnet
(c) The magnetic lines form a closed loop
(d) Tangents to the magnetic lines give the direction of the magnetic field.

14. A bar magnet of magnetic moment 3.0 A-m^2 is placed in a uniform magnetic induction field of $2\times10^{-5}T$. If each pole of the magnetic experiences a force of 6×10^{-4} *N*, the length of the magnet is **[EAMCET 2000]**

(a) 0.5 *m* (b) 0.3 *m* (c) 0.2 *m* (d) 0.1 *m*

15. A bar magnet is held perpendicular to a uniform magnetic field, If the couple acting on the magnet is to be halved by rotating it, then the angle by which it is to be rotated is **[CBSE PMT 2000]**

(a) 30° (b) 45° (c) 60° (d) 90°

16. If a magnet of length 10*cm* and pole strength 40 *A-m* is placed at an angle of 45° in an uniform induction field of intensity $2\times10^{-4}T,$ the couple acting on it is

(a) $0.5656\times10^{-4}N-m$ (b) $0.5656\times10^{-3}N-m$ (c) $0.656\times10^{-4}N-m$ (d) $0.656\times10^{-5}N-m$

17. The magnetic field strength at a point at a distance '*d*' from the centre on the axial line of a very short bar magnet of magnetic moment *M*, is *B*. The magnetic induction at a distance '2*d*' from centre, on the equatorial line of a magnet of magnetic moment 8 M, will be

[EAMCET (Engg.) 1999]

(a) 4 *B* (b) *B*/2 (c) *B*/4 (d) 2*B*

18. If two bar magnets of different magnetic lengths have equal moments than the pole strength is **[EAMCET (Med.) 1999]**

(a) Equal for both the magnets (b) Lesser for shorter magnet (c) More for longer magnet (d)

19. A bar magnet of pole strength 2 *amp-m* kept in magnetic field of induction 4×10^{-5} *Wb*/*m^2* such that that the axis of the magnet makes and angle of 30° with the direction of the field. The couple acting on the magnet is found to be 80×10^{-7} $N-m$. Then the distance between the poles of the magnet is **[EAMCET 1997]**

(a) 20 *m* (b) 2 *m* (c) 3 *cm* (d) 20 *cm*

20. The dipole moment of a short bar magnet is 1.25 *ampere – metre*^{2}. The magnetic field on its axis at a distance of 0.5*m* form the centre of the magnet is **[MP PAT 1996]**

(a) 1.0×10^{-4} *newton* /*amp-meter* (b) 4×10^{-2} *newton* /*amp-meter*

(c) 2×10^{-6} *newton* /*amp-meter* (d) 6.64×10^{-8} *newton* /*amp-meter*

21. The field due to a magnet at a distance *R* from the centre of the magnet is proportional to **[MP PET 1996]**

(a) R^2 (b) R^3 (c) $1/R^2$ (d) $1/R^3$

22. A bar magnet of magnetic moment $10^4\,J/T$ is free to rotate in a horizontal plane. The work done in rotating the magnet slowly from a direction parallel to a horizontal magnetic field of $4\times10^{-5}T$ to direction 60° from the field will be **[MP PET 1993, 95]**

(a) $0.2J$ (b) $2.0J$ (c) $4.18J$ (d) 2×10^2J

23. If a piece of metal was thought to be magnet, which one of the following observations would offer conclusive evidence **[KCET 1994]**

(a) It attracts a known magnet (b) It repels a known magnet

(c) Neither (a) nor (b) (d) It attracts a steel screw dirver

24. A bar magnet of length 10*cm* and having pole strength equal to 10^{-3} *A-m* is kept in a magnetic field (B) of $4\pi\times10^{-3}$tesla. It makes an angle of 30° with the direction of *B*. The torque acting on the magnet is **[MP PET 1993]**

(a) $2\pi\times10^{-7}Nm$ (b) $2\pi\times10^{-5}$ *Nm* (c) 0.5 *Nm* (d) 0.5×10^2Nm

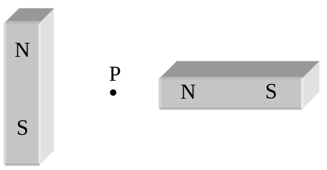
25. The magnetic field due to a short magnet at a point on its axis at distance *x cm* from the middle point of the magnet is 200 gauss. The magnetic field at a point on the neutral axis at a distance. *x cm* from the middle of the magnet is **[MP PMT 1985; CPMT 1971, 88]**

(a) 100 *Gauss* (b) 400 *Gauss* (c) 50 *Gauss* (d) 200 *Gauss*

26. Points *A* and *B* are situated along the extended axis of 2 *cm* long bar magnet at a distance *x* and 2*x cm* respectively. From the pole nearer to the points, the ratio of magnetic field at *A* and *B* will be **[EAMCET 1984; CPMT 1986]**

(a) 4 : 1 exactly (b) 4 : 1 approx (c) 8 : 1 exactly (d) 8 : 1 approx

27. Two equal bar magnets are kept as shown in the figure. The direction of resultant magnetic field, indicated by arrow head at the point *P* is (approximately)



(a) $\rightarrow$ (b) $\nearrow$ (c) $\searrow$ (d) $\uparrow$

28. Consider a magnetic dipole kept in the north –south direction. Let P_1, P_2, Q_1, Q_2 be four points at the same distance from the dipole towards north, south, east and west of the dipole respectively. The directions of the magnetic field due to the dipole are the same at

(a) P_1 and P_2 (b) P_1 and Q_2 (c) P_1 and Q_1 (d) P_2 and Q_2

29. A thin magnet of length *L* is bent into an arc of a semi- circle. The new length of the magnet is

(a) $\frac{L}{\pi}$ (b) $\frac{L}{2\pi}$ (c) $\frac{2L}{\pi}$ (d) $\frac{2L}{3\pi}$

30. The magnetic potential due to a magnetic dipole at a point on its axis distant 40 *cm* from its centre is found to be $2.4 \times 10^{-5}\ J/A-m,$ The magnetic moment of the dipole will be

(a) $28.6\ A-m^2$ (b) $32.2\ A-m^2$ (c) $38.4\ A-m^2$ (d) None of these

31. The cross – sectional areas of three magnets of equal length are A, 2A and 6A. The ratio of their magnetic moments will be

(a) 6 : 2 : 1 (b) 1 : 2 : 6 (c) 1 : 4 : 6 (d) 36 : 4 : 1

32. If a hole is made at the centre of a bar magnet, then its magnetic moment will

(a) Increase (b) Decrease (c) Not change (d) None of these

Advance Level

33. If the angular momentum of an electron of mass m is J then the magnitude of the magnetic moment will be **[MP PMT 2001]**

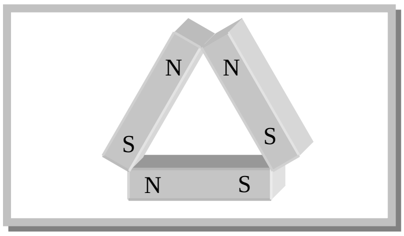
(a) $\frac{eJ}{m}$ (b) $\frac{eJ}{2m}$ (c) $2eJm$ (d) $\frac{2m}{eJ}$

34. Two small bar magnets are placed in a line with like poles facing each other at a certain distance *d* apart. If the length of each magnet is negligible as compared to *d* the force between them will be inversely proportional to **[CPMT 1971; NCERT 1971; MP PMT 1992]**

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

35. Three indentical bar magnets each of magnetic moment *M*, are placed in the form of an equilateral triangle with north pole of one touching the south pole of the other (figure). The net magnetic moment of the system is

(a) Zero
(b) $3M$
(c) $\frac{3M}{2}$
(d) $M\sqrt{3}$



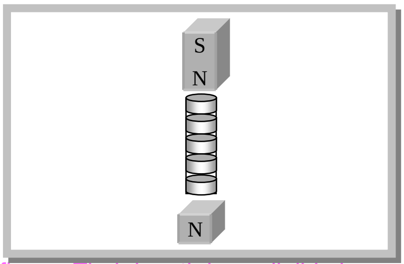
36. A bar magnet with its poles 25 *cm* apart and of pole strength 24.0 *A-m* rests with its centre on a frictionless pivot. A force *F* is applied on the magnet at a distance of 12 *cm* from the pivot so that it is held in equilibrium at an angle of 30° with respect to a magnetic field of induction 0.25 *T*. The value of force *F* is

(a) $5.62\ N$ (b) $2.56\ N$ (c) $6.52\ N$ (d) $6.25\ N$

37. Two short bar magnets with pole strengths of 900 *ab - amp×cm* and 100 *ab - amp×cm* are placed with their axes in the same vertical lines with similar poles facing each other. Each magnet has a length of 1 *cm*. When the separation between the nearer poles is 1 *cm*. The weight of the upper magnet is supported by the repulsive force between the magnets. If *g* is 1000 cm/sec^2, then the mass of the upper magnet is

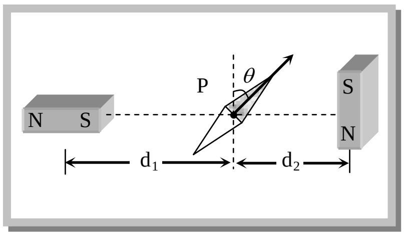
(a) 100 *g* (b) 55 *g* (c) 77.5 *g* (d) 45 *g*

38. A strong magnet of magnico alloy can hold a chain consisting of several cylinders made of soft iron (figure). If a similar magnet is brought up from below to this chain, what happens if the magnets are arranged with their line poles facing



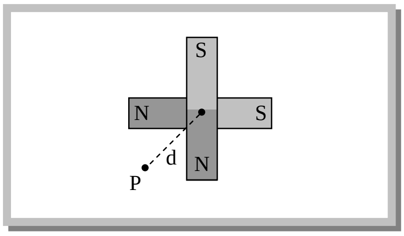
(a) Attached cylinders loosen grip
(b) The attached cylinder tighten the grip
(c) The cylinders fall one by one on to lower magnet.
(d) The cylinders loose contact for the upper magnet and remains suspended in between two magnets.

39. Two magnets A and B are identical and these are arranged as shown in the figure. Their length is negligible in comparison to the separation between them. A magnetic needle is placed between the magnets at point *P* which gets deflected through an angle θ under the influence of magnets. The ratio of distance d_1 and d_2 will be



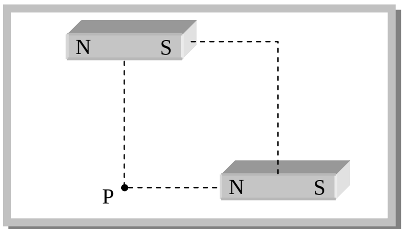
(a) $(2\tan\theta)^{1/3}$
(b) $(2\tan\theta)^{-1/3}$
(c) $(2\cot\theta)^{1/3}$
(d) $(2\cot\theta)^{-1/3}$

40. Two short magnets of equal dipole moments *M* are fastened perpendicularly at their centre (figure). The magnitude of the magnetic field at a distance d from the centre on the bisector of the right angle is



(a) $\frac{\mu_0}{4\pi}\frac{M}{d^3}$
(b) $\frac{\mu_0}{4\pi}\frac{M\sqrt{2}}{d^3}$
(c) $\frac{\mu_0}{4\pi}\frac{2\sqrt{2}M}{d^3}$
(d) $\frac{\mu_0}{4\pi}\frac{2M}{d^3}$

41. Two short magnets of magnetic moment 1000 Am^2 are placed as shown at the corners of a square of side 10 *cm*. The net magnetic induction at *P* is

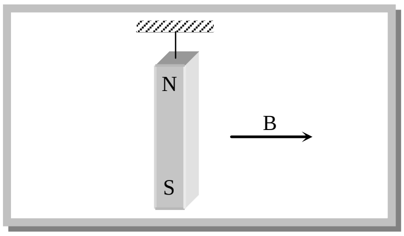


(a) 0.1 *T*
(b) 0.2 *T*
(c) 0.3 *T*
(d) 0.4 *T*

42. A long magnet is placed vertically with its S- pole resting on the table. A neutral point is obtained 10 cm form the pole due geographical north of it. If $B_H = 3.2\times10^{-5}$ *Tesla*, then the strength of the magnet is

(a) $16\ ab-amp\times cm$ (b) 32 $ab-amp\times cm$ (c) 64 $ab-amp\times cm$ (d) 8 $ab-amp\times cm$

43. A bar magnet hangs by a thread attached to the ceiling of a room. When a horizontal magnetic field directed to the right is established,

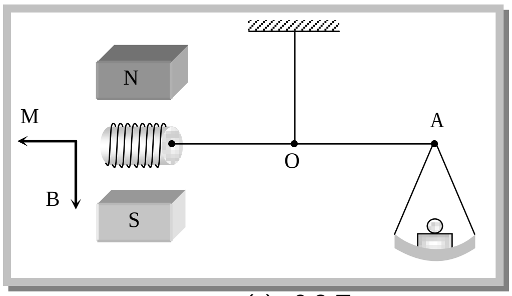


(a) Both the string and the magnet will deviate form the vertical
(b) The string will deviate from the vertical and the magnet will remain vertical
(c) The string will remain vertical and the magnet will deviate from the vertical
(d) Both will remain vertical plane of the outer ring

44. A paramagnetic gas consists of atoms each with a dipole moment of 1.5×10^{-23} *J/T*. Temperature of the gas is 27°*C* and its number density is 2× 10^{26} m^{-3}. What is the maximum magnetisation of the sample possible when placed in an external field

(a) $1\times10^3\,A/m$ (b) $2\times10^3\,A/m$ (c) $3\times10^3\,A/m$ (d) $4\times10^3\,A/m$

45. A small coil C with *N* = 200 turns is mounted on one end of a balance beam and introduced between the poles of an electromagnet as shown in figure. The cross sectional area of coil is A= 1.0 *cm*^{2}, length of arm OA of the balance beam is $l = 30\,cm.$ When there is no current in the coil the balance is in equilibrium. On passing a current *I* = 22 mA through the coil the equilibrium is restored by putting the additional counter weight of mass $\Delta m = 60\,mg$ on the balance pan. Find the magnetic induction at the spot where coil is located.



(a) 0.4*T* (b) 0.3 *T* (c) 0.2 *T* (d) 0.1 *T*

Earth's magnetism

Basic Level

46. At a place the angle of dip is 30°. If the horizontal component of earth's magnetic field is *H*, then the total field intensity will be given by

(a) $\frac{H}{2}$ (b) $\frac{2H}{\sqrt{3}}$ (c) $H\sqrt{2}$ (d) $H\sqrt{3}$

47. *I* is the total intensity of earth's magnetic field, *H* its horizontal component and *V* the vertical component then these are related as **[CPMT 2000; KCET (Engg./Med.) 2001]**

(a) $I = V^2 + H^2$ (b) $I = V + H$ (c) $I^2 = V + H$ (d) $I^2 = V^2 + H^2$

48. At the north pole of earth **[CPMT 2001]**

(a) *V*>>*H* (b) *V* = *H* = 0 (c) *V*<< *H* (d) $V \neq 0, H = 0$

49. At a certain place, the horizontal component B_0 and the vertical component V_0 of the earth's magnetic field are equal in magnitude. The total intensity at the place will be

(a) B_0 (b) B_0^2 (c) $2B_0$ (d) $\sqrt{2}B_0$

50. At a certain place, the horizontal component of earth's magnetic field is $\sqrt{3}$ times the vertical component. The angle of dip at this place is **[AFMC 1999, 2000; Pb. CET 2000]**

(a) 75° (b) 60° (c) 45° (d) 30°

51. The horizontal component of the earth's magnetic field is 3.6×10^{-5} *T* where the dip angle is 60°. The magnitude of the earth's magnetic field is **[UPSEAT 2000]**

(a) $3.6\times10^{-5}\,T$ (b) $7.2\times10^{-5}\,T$ (c) $2.1\times10^{-4}\,T$ (d) $2.8\times10^{-4}\,T$

52. The angle between the magnetic meridian and geographical meridian is called **[MNR 1990; MP PMT 2000]**

(a) Angle of dip (b) Angle of declination (c) Magnetic moment (d) Power of magnetic field

53. The null points are on the axial line of a bar magnet, when it is placed such that its south pole points

(a) South (b) East (c) North (d) West

54. At magnetic poles of earth, angle of dip is **[NCERT 1981; CPMT 1977, 91; MP PET 1997]**

(a) Zero (b) 45° (c) 90° (d) 180°

55. The angle of dip at the magnetic equator is

[MP PET 1984; MP PMT 1987; CBSE 1989, 90; MP Board 1980; CPMT 1977, 87, 90; Manipal MEE 1995]

(a) 0° (b) 45° (c) 30° (d) 90°

56. At a place, if the earth's horizontal and vertical components of magnetic fields are equal, then the angle of dip will be [MP Board 1974, 76, SCRA 1994]

(a) 30° (b) 90° (c) 45° (d) 0°

57. The lines joining the places of the same horizontal intensity are known as [MNR 1984]

(a) Isogonic lines (b) A clinic line (c) Isoclinic line (d) Isodynamic line

58. A mariner's compass is used

(a) To compare magnetic moments (b) For determination of *H*

(c) For determination of direction (d) For determination of dip at a place

59. A compass needle which is allowed to move in a horizontal plane is taken to a geomagnetic pole. It

(a) Will stay in north-south direction only (b) Will stay in east-west direction only

(c) Will become rigid showing no movement (d) Will stay in any position

60. A magnetic needle of magnetic moment 60 *amp-m*^{2} experiences a torque of 1.2×10^{-3} *N-m* directed in geographical north. If the horizontal intensity of earth's magnetic field at that place is 40μ*Wb*/*m*^{2}, then the angle of declination will be

(a) 30° (b) 45° (c) 60° (d) 90°

61. Two similar poles of strength 3 *mwb* and 27 *m wb* are separated by a distance of 24 *cm*. The neutral point from the smaller pole will be at

(a) 6 *cm* (b) 9 *cm* (c) 4 *cm* (d) 7 *cm*

62. A bar magnet 8 *cms* long is placed in the magnetic meridian with the *N* – pole pointing towards geographical north. Two neutral points separated by a distance of 6 *cms* are obtained on the equatorial axis of the magnet. If $B_H = 3.2\times10^{-5}$ *Tesla* then the pole strength of the magnet, is

(a) $5ab - amp \times cm$ (b) $10ab - amp \times cm$ (c) $2.5ab - amp \times cm$ (d) $20ab - amp \times cm$

Advance Level

63. The true value of angle of dip at place is 60°, the apparent dip in a plane inclined at an angle of 30° with magnetic meridian is [AIEEE 2002]

(a) $\tan^{-1}\frac{1}{2}$ (b) $\tan^{-1}(2)$ (c) $\tan^{-1}\left(\frac{2}{3}\right)$ (d) None of these

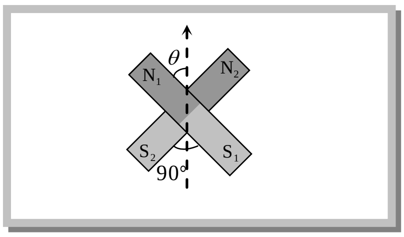
64. A dip needle arranged to move freely in the magnetic meridian dips by an angle θ. If the vertical plane in which the needle moves is rotated through an angle α to the magnetic meridian, then the needle will dip by an angle

(a) θ (b) α (c) More than θ (d) Less than θ

65. If ϕ_1 and ϕ_2 be the angles of dip in two vertical planes at right angles to each other and ϕ is the true angle of dip then

(a) $\cot^2\phi = \cot^2\phi_1 + \cot^2\phi_2$ (b) $\cot\phi = \cot^2\phi_1 + \cot^2\phi_2$ (c) $\cot\phi = \cot\phi_1 + \cot\phi_2$ (d) $\cot\phi = \cot\phi_1 / \cot\phi_2$

66. Two magnets of equal mass are joined at 90° to each other as shown in fig. Magnet N_1S_1 has a magnetic moment $\sqrt{3}$ times that of N_2S_2. The arrangement is pivoted so that it is free to rotate in horizontal plane. When in equilibrium, what angle should N_1S_1 make with magnetic meridian



(a) 75°

(b) 60°

(c) 30°

(d) 45°

Tangent law and magnetic instruments

Basic Level

67. The length of a magnet is large compared to its width and breadth. The time period of its oscillation in a vibration magnetometer is 2 *sec*. The magnet is cut along its length into three equal parts and these parts are then placed on each other with their like poles together. The time period of this combination will be **[AIEEE 2004]**

(a) $2\sqrt{3}$ *sec* (b) $\frac{2}{3}$ *sec* (c) 2 *sec* (d) $\frac{2}{\sqrt{3}}$ *sec*

68. In a tangent galvanometer a current of 0.1 *A* produces a deflection of 30°. The current required to produce a deflection of 60° is **[MP PET 2003]**

(a) 0.2 *A* (b) 0.3 *A* (c) 0.4 *A* (d) 0.5 *A*

69. A bar magnet is oscillating in earth's magnetic field with a period *T*. What happens to its period and motion if its mass is quadrupled **[CBSE PMT 1994; 2003]**

(a) Motion remains S.H.M. with the new period = 4*T*

(b) Motion remains S.H.M. with the new period = $\frac{T}{2}$

(c) Motion does not remain S.H.M. and period is approximately constant

(d) Motion remains S.H.M. with new period 2*T*

70. A thin rectangular magnet suspended freely has a period of oscillation equal to *T*. Now it is broken into two equal halves (each having half of the original length) and one piece is made to oscillate freely in the same field. If its period of oscillation if *T*, the ratio $\frac{T'}{T}$ is **[AIEEE 2003]**

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

71. Two bar magnets having same geometry with magnetic moments *M* and 2 *M*, are first placed in such a way that their similar poles are on same side then its time period of oscillation is T_1. Now the polarity of one of the magnet is reversed then time period of oscillation is T_2. Now **[CBSE 2002; MP PET 2003]**

(a) $T_1 < T_2$ (b) $T_1 = T_2$ (c) $T_1 > T_2$ (d) $T_2 = \infty$

72. Two similar magnets of magnetic moment M_1 and M_2 are taken and vibrated in a vibration magnetometer with their (i) like poles together (ii) unlike poles together. If the ratio of the time periods is 1/2, then the ratio of M_1 and M_2 is

(a) 0.5 (b) 2 (c) 5/3 (d) 1/3

73. The period of oscillations of a magnet is 2 sec. When it is remagnetised so that the pole strength is 4 times its period will be **[Kerala PMT 2002]**

(a) 4 sec (b) 2 sec (c) 1sec (d) 1/2 sec

74. When two magnetic moments are compared using equal distance method the deflections produced are 45° and 30°. If the length of mag

(a) 3 : 1 (b) 3 : 2 (c) $\sqrt{3}:1$ (d) $2\sqrt{3}:1$

75. The time period of oscillation of a bar magnet suspended horizontally along the magnetic meridian is T_0. If this magnet is replaced by another magnet of the same size and pole strength but with double the mass, the new time period will be **[SCRA 1994; JIPMER 2002]**

(a) $\frac{T_0}{2}$ (b) $\frac{T_0}{\sqrt{2}}$ (c) $\sqrt{2}\,T_0$ (d) 2 T_0

76. A bar magnet has a magnetic moment equal to $5\times10^{-5}\,W-m$. It is suspended in a magnetic field, which has a magnetic induction *B* equal to $8\pi\times10^{-4}$ Tesla. Magnet vibrates with a period of vibration equal to 15 sec. The moment of inertia of the magnet is

[CBSE PMT 2001]

(a) $22.5\times10^{7}\text{kg}-\text{m}^2$ (b) $11.25\times10^{-7}\text{kg}-\text{m}^2$ (c) $5.62\times10^{-7}\text{kg}-\text{m}^2$ (d) $7.16\times10^{-7}\text{kg}-\text{m}^2$

77. Which of the following statement is not the true **[KCET 2001]**

(a) While taking reading of tangent galvanometer, the plane of the coil must be set at right angles to that earth's magnetic meridian

(b) A short magnet is used in a tangent galvanometer since a long magnet would be heavy and may not easily move

(c) Measurements with the tangent galvanometer will be more accurate when the deflection is around 45°

(d) A tangent galvanometer can not be used in the polar region

78. Before using the tangent galvanometer, its coil is set in **[MP PMT 2001]**

(a) Magnetic meridien (b) Perpendicular to magnetic meridien

(c) At angle of 45° to magnetic meridien (d) It does not require any setting

79. The error in measuring the current with a tangent galvanometer is minimum when deflection is about **[MP PET 2001]**

(a) 0° (b) 30° (c) 45° (d) 60°

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

(a) $\frac{T}{2}$ (b) T (c) $\sqrt{2}\,T$ (d) $2T$

81. Two tangent galvanometers having coils of the same radius are connected in series. A current flowing in them produces deflections of 60^o and 45^o respectively. The ratio of the number of turns in the coils is **[MP PET 1995; MP PMT 1999]**

(a) $\frac{4}{3}$ (b) $\frac{(\sqrt{3}+1)}{1}$ (c) $\frac{(\sqrt{3}+1)}{(\sqrt{3}-1)}$ (d) $\frac{\sqrt{3}}{1}$

82. When the radius of the tangent galvanometer coil is decreased its sensitivity **[KCET 1999]**

(a) Increases (b) May increase or decrease (c) Decreases (d) Remain unaltered

83. A short magnetic needle is provided in a uniform magnetic field of strength 1*T*. When another magnetic field of strength $\sqrt{3}\text{T}$ is applied to the needle in a perpendicular direction, the needle deflects through an angle θ, where θ is **[KCET 1999]**

(a) 45^o (b) 90^o (c) 60^o (d) 30^o

84. A tangent galvanometer of reduction factor I *A* is placed with the plane of its coil parallel to the magnetic meridian. When a current of I *A* is passed through it, the deflection produced is

(a) 45^o (b) Zero (c) 30^o (d) 60^o

85. Magnets *A* and *B* are geometrically similar but the magnetic moment of *A* is twice that of *B*. If T_1 and T_2 be the time periods of the oscillation when their like poles and unlike poles are kept together respectively, then $\frac{T_1}{T_2}$ will be **[SCRA 1998]**

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) $\frac{1}{\sqrt{3}}$ (d) $\sqrt{3}$

86. Two magnets of same size and mass make respectively 10 and 15 oscillations per minute at certain place. The ratio of their magnetic moments is **[Bihar PET 1984; MP PMT 1988; MP PET 1988, 92; CPMT 1997]**

(a) 4 : 9 (b) 9 : 4 (c) 2 : 3 (d) 3 : 2

87. The time period of a freely suspended magnet is 4 seconds. If it is broken in length into two equal parts and one part is suspended in the same way, then its time period will we **[NCERT 1984; CPMT 1991; MP PMT 1994]**

(a) 4 seconds (b) 2 seconds (c) 0.5 second (d) 0.25 second

88. A bar magnet *A* of magnetic moment M_A is found is oscillate at a frequency twice that of magnet *B* of magnetic moment M_B when placed in a vibrating magnetometer. We may say that

(a) $M_A = 2M_B$ (b) $M_A = 8M_B$ (c) $M_A = 4M_B$ (d) $M_B = 8M_A$

89. A magnet of magnetic moment *M* oscillating freely in earth's horizontal magnetic field makes *n* oscillations per minute. If the magnetic moment is quadrupled and the earth's field is doubled, the number of oscillations made per minute would be **[MP PET1991]**

(a) $\frac{n}{2\sqrt{2}}$ (b) $\frac{n}{\sqrt{2}}$ (c) $2\sqrt{2}\,n$ (d) $\sqrt{2}\,n$

90. The period of oscilation of a magnet in vibration magnetometer is 2 sec. The period of oscillation of a magnet whose magnetic moment is four times that of the first magnet is **[MP PMT 1988; CPMT 1975, 77, 79, 89, 90]**

(a) 1 sec (b) 4 sec (c) 8 sec (d) 0.5 sec

91. The number of turns and radius of cross-section of the coil of a tangent galvanometer are doubled. The reduction factor *K* will be **[NCERT 1983]**

(a) *K* (b) 2*K* (c) 4*K* (d) $\frac{K}{4}$

92. A small magnet of magnetic moment 4 $A\text{-}m^2$ is placed on a deflection magnetometer in tan *B* position at a distance of 20 *cm* from the compass needle. At what distance from the compass needle should another small magnet of moment 0.5 $A\text{-}m^2$ be placed such that the deflection of the needle remains zero

(a) 5 *cm* (b) 10 *cm* (c) 15 *cm* (d) 20 *cm*

Advance Level

93. The materials suitable for making electromagnets should have **[AIEEE 2004]**

(a) High retentivity and low coercivity (b) Low retentivity and low coercivity

(c) High retentivity and high coercivity (d) Low retentivity and high coercivity

94. A vibration magnetometer consists of two identical bar magnets placed one over the other such that they are perpendicular and bisect each other. The time period of oscillation in a horizontal magnetic field is $2^{5/4}$ seconds. One of the magnets is removed and if the other magnet oscillates in the same field, then the time period in seconds is **[EAMCET 2003]**

(a) $2^{1/4}$ (b) $2^{1/2}$ (c) 2 (d) $2^{-1/4}$

95. The period of oscillations of a freely suspended bar magnet in the earth Horizontal field (*H*) is 4*sec*. When another magnet is brought near it, the period of oscillating is reduced to 2*sec*.The field of the second magnet is **[UPSEAT 2000]**

(a) $\sqrt{3}H$ (b) $2H$ (c) $3H$ (d) $4H$

96. In a deflection magnetometer experiment in tan *A* position, short-bar magnet placed at 18 *cm* from the centre of the compass needle produces a deflection of 30^o. If another magnet of same length but 16 times pole strength as that of first magnet is placed in tan *B* position at 36 *cm* the deflection will be

(a) 0^o (b) 30^o (c) 45^o (d) 60^o

97. A compass needle placed at a distance r from a short magnet in $\tan A$ position shows a deflection of 60°. If the distance is increased to $r(3)^{1/3}$, then the deflection of the compass needle is

(a) 30° (b) $60^o \times (3)^{1/3}$ (c) $60^o \times (3)^{2/3}$ (d) $60^o \times (3)^{3/3}$

98. A bar magnet suspended by a horse hair lies in the magnetic meridian when there is no twist in the hair. On turning the upper end of the hair through 150° from the meridian the magnet is deflected through 30° from the meridian. Then the angle through which the upper end of the hair has to be twisted to deflect the magnet through 90° from the meridian, is

(a) 450° (b) 360° (c) 330° (d) 150°

99. The magnetic needle of an oscillation magnetometer makes 10 oscillations per minute under the action of earth's magnetic field alone. When a bar magnet is placed at some distance along the axis of the needle it makes 14 oscillations per minute. If the bar magnet is turned so that its pole interchange their position, Then the new frequency of oscillation of the needle is

(a) 10 vibrations per minute (b) 14 vibrations per minute (c) 4 vibrations per minute (d) 2 vibrations per minute

100. Two magnets are suspended by a given wire one by one. In order to deflect the first magnet through 45°, the wire has to be twisted through 540° whereas with the second magnet the wire requires a twist of 360° for the same deflection. Then the ratio of magnetic moments of the two is

(a) $\frac{3}{2}$ (b) $\frac{4}{3}$ (c) $\frac{7}{6}$ (d) $\frac{11}{7}$

Magnetic materials

Basic Level

101. The material of permanent magnet has **[KCET 1994, 2003]**

(a) High retentivity, low coercivity (b) Low retentivity, high coercivity

(c) Low retentivity, low coercivity **(d) High retentivity, high coercivity**

102. When a diamagnetic substance is placed near a magnet then it is **[Similar to EAMCET 1995, 96; CBSE PMT 1999; AFMC 1999, 2003]**

(a) Attracted (b) Repelled (c) No effect (d) None of these

103. According to Curie's law, the magnetic susceptibility of a substance at an absolute temperature *T* is proportional to **[CBSE PMT 2003]**

(a) *T* (b) $\frac{1}{T^2}$ (c) T^2 (d) $\frac{1}{T}$

104. Which of the magnetic materials have negative susceptibly **[AMU 1994; AIEEE 2003]**

(a) Diamagnetic materials (b) Paramagnetic materials (c) Ferromagnetic materials (d) Ferromagnetic materials

105. A frog can be levitated in a magnetic field produced by a current in a vertical solenoid placed below the frog. This is possible because the body of the frog behave as

(a) Paramagnetic (b) Diamagnetic (c) Ferromagnetic (d) Anti-ferromagnetic

106. A superconductor exhibits perfect **[KCET 2003]**

(a) Ferromagnetism (b) Ferromagnetism (c) Diamagnetism (d) Paramagnetism

107. A small rod of bismuth is suspended freely between the poles of a strong electromagnet. It is found to arrange itself at right angles to the magnetic field. This observation establishes that bismuth is

(a) Diamagnetic (b) Paramagnetic (c) Ferromagnetic (d) Anti-ferromagnetic

108. A liquid is there in a *U* tube. A sudden magnetic field is produced perpendicular to one of its arms, liquid rises up, the magnetic character of liquid is **[UPSEAT 2002]**

(a) Diamagnetic (b) Paramagnetic (c) Both (d) None of these

109. Susceptibility of a material varies as $\chi = \frac{C}{T}$, where *C* is a constant and *T* is temperature at absolute state, then material must be **[BHU 2000; UPSEAT 2002]**

(a) Diamagnetic (b) Paramagnetic

(c) Ferromagnetic (d) Any of the above depending upon range of temperature

110. Which of the following statements is incorrect about hysterisis **[UPSEAT 2002]**

(a) This effect is common to all ferromagnetic substances

(b) The hysterisis loop area is proportional to the thermal energy developed per unit volume of the material

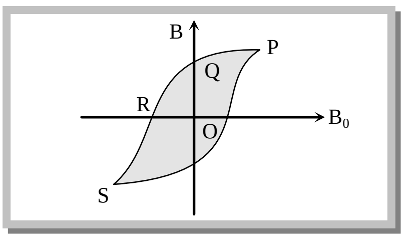
(c) The hysterisis loop area is independent of the thermal energy developed per unit volume of the material

(d) The shape of the hysterisis loop is characteristic of the material

111. Of dia, para and ferromagnetism, the universal property of all substances is **[CPMT 1995, 2002]**

(a) Diamagnetism (b) Paramagnetism (c) Ferromagnetism (d) All of the above

112. The figure illustrate how *B*, the flux density inside a sample of unmagnetised ferromagnetic material varies with B_0, the magnetic flux density in which the sample is kept. For the sample to be suitable for making a permanent magnet



(a) *OQ* should be large, *OR* should be small

(b) *OQ* and *OR* should both be large

(c) *OQ* should be small and *OR* should be large

(d) *OQ* and *OR* should both be small

113. Which of the following is true **[BHU 2001]**

(a) Diamagnetism is temperature dependent (b) Paramagnetism is temperature dependent

(c) Paramagnetism is temperature independent (d) None of these

114. The relative permeability is represented by μ_r and the susceptibility by χ for a magnetic substance. Then for a paramagnetic substance

[KCET 2001]

(a) $\mu_r > 1, \chi > 0$ (b) $\mu_r > 1, \chi < 0$ (c) $\mu_r < 1, \chi > 0$ (d) $\mu_r < 1, \chi < 0$

115. Identify the paramagnetic substance **[Kerala (Engg.) 2001]**

(a) Iron (b) Aluminium (c) Nickel (d) Hydrogen

116. Magnetic susceptibility of which material does not depend on the temperature **[CBSE PM/PD 2001]**

(a) Dia-magnetism (b) Paramagnetism (c) Ferro-magnetism (d) Ferrite

117. The magnetic material, which moves from stronger to weaker parts of a magnetic field is known as

(a) Diamagnetic (b) Paramagnetic (c) Ferromagnetic (d) Anti-ferromagnetic

118. The use of study of hysteresis curve for a given material is to estimate the **[CBSE PMT 2000]**

(a) Voltage loss (b) Hysteresis loss (c) Current loss (d) All of these

119. When a diamagnetic substances is inserted in a current carrying coil, the magnetic field is **[UPSEAT 2000]**

(a) Decreased

(b) Unchanged

(c) Increased

(d) Increased or decreased depending upon the relative volume of the substance

120. An example for diamagnetic substance is **[KCET 2000]**

(a) Iron (b) Copper (c) Aluminum (d) Nickel

121. If a diamagnetic substance is brought near north or south pole of a bar magnet, it is **[EAMCET (Engg.) 1995; CBSE PMT 1999]**

(a) Attracted by the poles (b) Repelled by the poles

(c) Repelled by the north pole and attracted by the south pole (d) Attracted by the north pole and repelled by the south pole

122. Substances in which the magnetic moment of a single atom is not zero, are known as **[AFMC 1999]**

(a) Diamagnetic (b) Ferromagnetic (c) Paramagnetic (d) Ferromagnetic

123. Which one of the following materials is ferromagnetic **[CPMT 1991; JIPMER 1997]**

(a) Gold (b) Nickel (c) Wood (d) Manganese

124. The major contribution of magnetism in substances is due to

(a) Orbital motion of electrons (b) Spin motion of electrons

(c) Equally due to orbital and spin motions of electrons (d) Hidden magnets

125. The softness of a magnetic substance is measured by

(a) Magnetic induction (b) Coercivity (c) Intensity of magnetisation (d) Density

126. Select the wrong statement

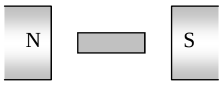
(a) In a diamagnetic substance the direction $\vec{I}$ is opposite to that of $\vec{H}$

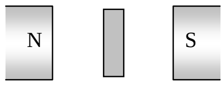
(b) In a paramagnetic substance the direction $\vec{I}$ is along $\vec{H}$

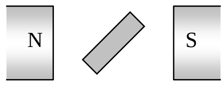
(c) In a ferromagnetic substance, the direction $\vec{I}$ is along $\vec{H}$

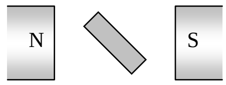
(d) In a diamagnetic substance, the direction $\vec{I}$ is along $\vec{H}$

127. A thin bar of diamagnetic substances is placed between two pole pieces. Which of the following represents the orientation of bar (represented by thick black)

(a) 

(b) 

(c) 

(d) 

Advance Level

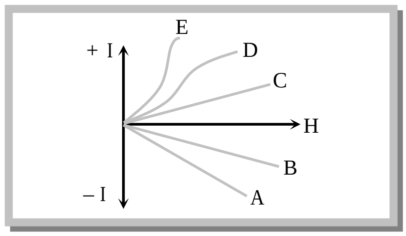
128. The variation of the intensity of magnetisation (I) with respect to the magnetising field H in a diamagnetic substance is described by the graph **[KCET 2002]**

(a) OA

(b) OB

(c) OC

(d) OD



129. Magnetic moment of Ne is **[RPMT 2000]**

(a) 0 (b) 1.27×10^{-24} *amp-m*^{2} (c) 3.4×10^{-24} *amp-m*^{2} (d) 5.6×10^{-24} *amp-m*^{2}

130. If a diamagnetic solution is poured into a U-tube and one arm of this U-tube placed between the poles of a strong magnet with the meniscus in a line with the field, then the level of the solution will

(a) Rise (b) Fall (c) Oscillate slowly (d) Remain as such

131. The number of atoms per unit volume in a sample of iron is 9×10^{28} atom/m^3. The magnetic moment of every iron atom is 1.5×10^{28} $A\text{-}m^2$. If all the dipoles are aligned in a domain due to ferromagnetic interaction, then the magnetization of an iron rod of length 10 *cm* and area of cross-section 1 cm^2 will be

(a) 1.8×10^6 *A/m* (b) 1.31×10^5 *A/m* (c) 1.35×10^5 *A/m* (d) 1.4×10^3 *A/m*