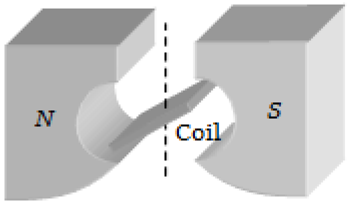
1.
The figure below shows the north and south poles of a permanent magnet in which n turn coil of area of cross-section A is resting, such that for a current i passed through the coil, the plane of the coil makes an angle θ with respect to the direction of magnetic field B. If the plane of the magnetic field and the coil are horizontal and vertical respectively, the torque on the coil will be



(a) $\tau = niAB\cos\theta$

(b) $\tau = niAB\sin\theta$

(c) $\tau = \text{niAB}$

(d) None of the above, since the magnetic field is radial

2.
Two short magnets with their axes horizontal to the magnetic meridian are placed with their centres 40 *cm* east and 50 *cm* west of magnetic needle. If the needle remains undeflected, the ratio of their magnetic moments is

(a) 4:5

(b) 16:25

(c) 64:125

(D) 2:$\sqrt{5}$

3.
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

(a) d

(b) d^2

(c) $\frac{1}{d^2}$

(d) d^4

4.
A magnet of magnetic moment *M* is situated with its axis along the direction of a magnetic field of strength B. The work done in rotating it by an angle of 180^{o} will be

(a) -MB (b) +MB

(c) 0 (d) +2MB

5.
A long magnetic needle of length $2L$, magnetic moment M and pole strength m units is broken into two pieces at the middle. The magnetic moment and pole strength of each piece will be

(a) $\frac{M}{2}, \frac{m}{2}$

(b) $M, \frac{m}{2}$

(c) $\frac{M}{2}, m$

(d) M, m

6.
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

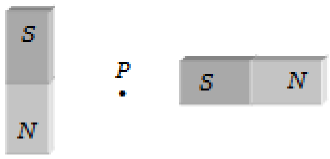
(a) ml

(b) 2mnl

(c) $\sqrt{2}ml$

(d) $\frac{1}{2}ml$

7.
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)

(b) 

(c) 

(d) 

8.

Two similar bar magnets P and Q, each of magnetic moment M, are taken. If P is cut along its axial line and Q is cut along its equatorial line, all the four pieces obtained have

(a) Equal pole strength (b) Magnetic moment M/4

(c) Magnetic moment M/2 (d) Magnetic moment M

9.

Two lines of force due to a bar magnet

(a) Intersect at the neutral point

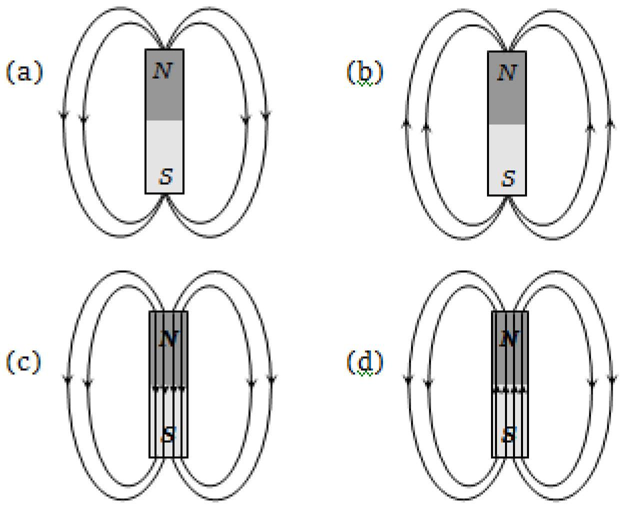
(b) Intersect near the poles of the magnet

(c) Intersect on the equatorial axis of the magnet

(d) Do not intersect at all

10.

The magnetic field lines due to a bar magnet are correctly shown in



11.

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) $\sqrt{2}B_0$

12.

Two bar magnets with magnetic moments 2 M and M are fastened together at right angles to each other at their centres to form a crossed system, which can rotate freely about a vertical axis through the centre. The crossed system sets in earth's magnetic field with magnet having magnetic moment $2M$ making an angle θ with the magnetic meridian such that

(a) $\theta = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$ (b) $\theta = \tan^{-1}\left(\sqrt{3}\right)$

(c) $\theta = \tan^{-1}\left(\frac{1}{2}\right)$ (d) $\theta = \tan^{-1}\left(\frac{3}{4}\right)$

13.

The angle of dip at a certain place is 30°. If the horizontal component of the earth's magnetic field is H, the intensity of the total magnetic field is

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

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

14.

The number of turns and radius of cross-section of the coil of a tangent galvanometer are doubled. The reduction factor K will be
(a) K (b) 2K
(c) 4K (d) K/4

15.

Two tangent galvanometers having coils of the same radius are connected in series. A current flowing in them produces deflections of 60° and 45° respectively. The ratio of the number of turns in the coils is

(a) 4/3 (b) $\frac{\sqrt{3}+1}{1}$

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

16.

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

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

(c) $\sqrt{2}T_0$ (d) $2T_0$

17.

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 is T', then ratio T'/T is

(a) 1/4

(b) $1/2\sqrt{2}$

(c) 1/2

(D) 2

18.

Two identical short bar magnets, each having magnetic moment M, are placed a distance of 2d apart with axes perpendicular to each other in a horizontal plane. The magnetic induction at a point midway between them is

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

(c) $\left(\frac{2\mu_0}{4\pi}\right)\frac{M}{d^3}$ (d) $\frac{\mu_0}{4\pi}\left(\sqrt{5}\right)\frac{M}{d^3}$

19.

If the angular momentum of an electron is $\overrightarrow{J}$ then the magnitude of the magnetic moment will be

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

(c) $eJ\,2m$ (d) $\frac{2m}{eJ}$

20.

A superconductor exhibits perfect
(a) Ferrimagnetism (b) Ferromagnetism
(c) Paramagnetism (d) Diamagnetism

21.

Among the following properties describing diamagnetism identify the property that is wrongly stated

(a) Diamagnetic material do not have permanent magnetic moment

(b) Diamagnetism is explained in terms of electromagnetic induction

(c) Diamagnetic materials have a small positive susceptibility

(d) The magnetic moment of individual electrons neutralize each other

22.

The true value of angle of dip at a place is 60^o, the apparent dip in a plane inclined at an angle of 30^o with magnetic meridian is

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

(b)$\tan^{-1}(2)$

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

(d)None of these

23.

A bar magnet has coercivity $4 \times 10^3\ Am^{-1}$. It is desired to demagnetise it by inserting it inside a solenoid 12 cm long and having 60 turns. The current that should be sent through the solenoid is

(a) 2 A (b) 4 A

(c) 6 A (d) 8 A

24.

If $\theta_1\ and\ \theta_2$ be the apparent angles of dip observed in two vertical planes at right angles to each other, then the true angle of dip θ is given by

(a) $cot^2\theta = cot^2\theta_1 + cot^2\theta_2$

(b) $\tan^2\theta = \tan^2\theta_1 - \tan^2\theta_2$

(c) $cot^2\theta = cot^2\theta_1 - \tan^2\theta_2$

(d) $\tan^2\theta = \tan^2\theta_1 - \tan^2\theta_2$

25.

A bar magnet is hung by a thin cotton thread in a uniform horizontal magnetic field and is in equilibrium state. The energy required to rotate it by 60° is W. Now the torque required to keep the magnet in this new position is

(a) $\frac{W}{\sqrt{3}}$ (b) $\sqrt{3}W$

(c) $\frac{\sqrt{3}W}{2}$ (d) $\frac{2W}{\sqrt{3}}$

26.

The magnetic susceptibility is negative for

(a) paramagnetic material only

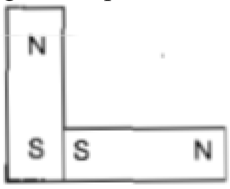
(b) ferromagnetic material only

(c) paramagnetic and ferromagnetic materials

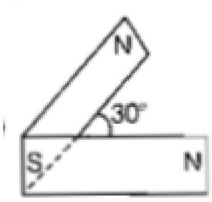
(d) diamagnetic material only

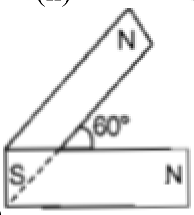
27.

Following figures show the arrangement of bar magnet in different configurations. Each magnet has magnetic dipole moment m. Which configuration has highest net magnetic dipole moment?

(i) 

(ii) 

(iii) 

(iv) 

(a) (i)

(b) (ii)

(c) (iii)

(d) (iv)

28.

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

(a) will become rigid showing no movement

(b) will stay in any position

(c) will stay in north-south direction only

(d) will stay in east-west direction only

29.

A magnetic needle suspended parallel to a magnetic field requires $\sqrt{3}$ J of work to turn it through 60°. The torque needed to maintain the needle in this position will be

(a) $2\sqrt{3}$J (b) 3 J

(c) $\sqrt{3}$ J (d) $\frac{3}{2}$ J

30.

There are four light-weight-rod samples *A, B, C, D* separately suspended by threads. A bar magnet is slowly brought near each sample and the following observations are noted

(i) *A* is feebly repelled

(ii) *B* is feebly attracted

(iii) *C* is strongly attracted

(iv) *D* remains unaffected

Which one of the following is true?

(a) *C* is of a diamagnetic material

(b) *D* is of a ferromagnetic material

(c) *A* is of a non-magnetic material

(d) *B* is of a paramagnetic material

31.

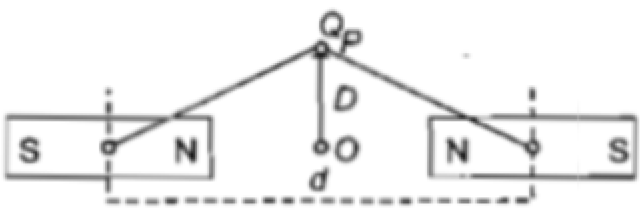
A short bar magnet of magnetic moment $0.4\ \mathrm{JT^{-1}}$ is placed in a uniform magnetic field of $0.16\ \mathrm{T}$. The magnet is stable equilibrium when the potential energy is

(a) -0.64 J (b) zero

(c) -0.082 J (d) -0.064 J

32.

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 a 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 the paper

33.

If a diamagnetic substance is brought near the north or the south pole of a bar magnet, it is

(a) repelled by both the poles

(b) repelled by the north pole and attracted by the south pole

(c) attracted by the north pole and repelled by the south pole

(d) attracted by both the poles

34.

A bar magnet having a magnetic moment of $2 \times 10^4\ JT^{-1}$ is free to rotate in a horizontal plane. A horizontal magnetic field $B = 6 \times 10^{-4} T$ exists in the space. The work done in taking the magnet slowly from a direction parallel to the field to a direction 60° from the field is

(a) 0.6 J (b) 12 J

(c) 6 J (d) 2 J

35.

Two bar magnets having the same geometry with magnetic moments M and 2M are first placed in such a way that their similar poles are on the same side then its time period of oscillation is T_1 . Now the polarity of one of the magnets is reversed ,then the time period of oscillation is T_2, so

1. $T_1 < T_2$
2. $T_1 = T_2$
3. $T_1 > T_2$
4. $T_2 = \infty$

36.

Diamagnetic material in a magnetic field moves

1. from stronger to the weaker parts of the field.
2. from weaker to the stronger parts of the field.
3. perpendicular to the field.
4. in none of the above directions.

37.

If the magnetic dipole moment of an atom of diamagnetic material, paramagnetic material and ferromagnetic material area denoted by μ_d, μ_p and μ_f, respectively, then

1. $\mu_p = 0$ and $\mu_f \neq 0$
2. $\mu_d \neq 0$ and $\mu_p = 0$
3. $\mu_d \neq 0$ and $\mu_f \neq 0$
4. $\mu_d = 0$ and $\mu_p \neq 0$

38.

Above Curie temperature

1. a ferromagnetic substance becomes paramagnetic.
2. a paramagnetic substance becomes diamagnetic.
3. a diamagnetic substance becomes paramagnetic.
4. a paramagnetic substance becomes ferromagnetic.

39.

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

1. anti-ferromagnetism.
2. no magnetic property.
3. diamagnetism.
4. paramagnetism.

40.

If a diamagnetic substance is brought near the north or the south pole of a bar magnet, it is

1. repelled by the north pole and attracted by the south pole.
2. attracted by the north pole and repelled by the south pole.
3. attracted by both the poles.
4. repelled by both the poles.

41.

A bar magnet having a magnetic moment of 2×10^4 JT^{-1} is free to rotate in a horizontal plane. A horizontal magnetic field $B = 6 \times 10^{-4}$ T exists in the space. The work done in taking the magnet slowly from a direction parallel to the field to a direction 60^o from the field is -

1. 12J
2. 6J
3. 2J
4. 0.6J

42.

Electromagnets are made of soft iron because soft iron has

1. high retentivity and low coercive force.
2. low retentivity and high coercive force.
3. high retentivity and high coercive force.
4. low retentivity and low coercive force.

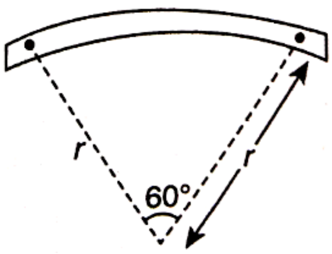
43.

The magnet moment of a diamagnetic atom is

1. 1
2. between zero and one
3. equal to zero
4. much greater than one

44.

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



1. M
2. $\frac{3}{\pi}M$
3. $\frac{2}{\pi}M$
4. $\frac{\text{M}}{2}$

45.

A proton and an alpha particle both enter a region of uniform magnetic field B, moving at right angles to the field B. If the radius of circular orbits for both the particles is equal and the kinetic energy acquired by proton is 1 MeV, the energy acquired by the alpha particle will be

1. 1 MeV
2. 4 MeV
3. 0.5 MeV
4. 1.5 MeV

Fill OMR Sheet