



Chapter 5 : Magnetism and Matter (50 Important MCQs)

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Notes

50 important MCQs from GSEB, CBSE, NEET and JEE exams · Answer key at the end

Section A — Multiple Choice Questions

Each question carries 1 mark. Choose the correct option.

Q.1 The dimensions of $\frac{B^2}{2\mu_0}$, where B is the magnetic field and μ_0 the permeability of vacuum, are

- (A) $[ML^{-1}T^{-2}]$ (B) $[ML^2T^{-2}]$ (C) $[ML^{-1}T^2]$ (D) $[ML^{-2}T^{-1}]$

Q.2 The unit of $\frac{B^2}{2\mu_0}$ is the unit of which quantity?

- (A) Energy (B) Energy density (C) Potential energy (D) Capacitance

Q.3 The magnetic moments of two closely wound circular coils A and B of radii $r_A = 10$ cm and $r_B = 20$ cm are equal if (N_A, I_A and N_B, I_B are the numbers of turns and currents of A and B)

- (A) $2N_AI_A = N_BI_B$ (B) $N_A = 2N_B$ (C) $N_AI_A = 4N_BI_B$ (D) $4N_AI_A = N_BI_B$

Q.4 Two charged particles A and B have charge q each and masses m_1 and m_2 . Both enter a transverse magnetic field B with the same velocity v, and their radii are r_1 and r_2 . The ratio $m_1 : m_2$ is

- (A) $\frac{r_2}{r_1}$ (B) $\left(\frac{r_1}{r_2}\right)^2$ (C) $\frac{r_1}{r_2}$ (D) $\left(\frac{r_2}{r_1}\right)^2$

Q.5 If the magnetic dipole moments of an atom of a diamagnetic, a paramagnetic and a ferromagnetic material are μ_d, μ_p and μ_f respectively, then

- (A) $\mu_d = 0$ and $\mu_p \neq 0$ (B) $\mu_p = 0$ and $\mu_f \neq 0$ (C) $\mu_d \neq 0$ and $\mu_p = 0$ (D) $\mu_d \neq 0$ and $\mu_f \neq 0$

Q.6 A bar magnet of length l and magnetic dipole moment m is bent into an arc that subtends an angle of 60° at its centre. The new magnetic dipole moment will be

- (A) m (B) $\frac{3}{\pi}m$ (C) $\frac{2}{\pi}m$ (D) $\frac{m}{2}$

Q.7 A rectangular coil of length 0.12 m and width 0.1 m with 50 turns hangs vertically in a uniform magnetic field of 0.2 T. The coil carries a current of 2 A. If the plane of the coil is inclined at 30° to the field, the torque needed to hold the coil in this position is ____ N m.

- (A) 0.24 (B) 0.12 (C) 0.15 (D) 0.2

Q.8 An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1} . The permeability of the material of the rod is ($\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$)

- (A) $8.0 \times 10^{-5} \text{ T m A}^{-1}$ (B) $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$ (C) $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$ (D) $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$

Q.9 An iron bar of length L has magnetic moment M . It is bent at the middle so that the two arms make an angle of 60° with each other. The magnetic moment of the new magnet is

- (A) $2M$ (B) $\frac{M}{\sqrt{3}}$ (C) M (D) $\frac{M}{2}$

Q.10 When a drop of liquid oxygen is placed between the poles of a strong magnet, it is held suspended between them. This is because oxygen is

- (A) diamagnetic (B) paramagnetic
(C) ferromagnetic (D) anti-ferromagnetic

Q.11 For an ideal diamagnetic substance (superconductor), the magnetic susceptibility is

- (A) -1 (B) 0 (C) $+1$ (D) ∞

Q.12 Which of the following materials has a negative value of magnetic susceptibility χ_m ?

- (A) Diamagnetic (B) Paramagnetic (C) Ferromagnetic (D) All of the above

Q.13 A magnetic needle is placed parallel to a uniform magnetic field. The work done to rotate it by 60° is $\sqrt{3} \text{ J}$. The torque required to keep it stationary in this new position is

- (A) $2\sqrt{3} \text{ J}$ (B) 3 J (C) $\sqrt{3} \text{ J}$ (D) $\frac{3}{2} \text{ J}$

Q.14 A substance placed in a non-uniform magnetic field experiences a weak force towards the strong field. The substance is

- (A) ferromagnetic (B) diamagnetic (C) paramagnetic (D) none of these

Q.15 At a certain place on the Earth's surface, the horizontal component of the Earth's magnetic field equals the vertical component. The angle of dip at that place is

- (A) 30° (B) 45° (C) 60° (D) 90°

Q.16 What is the magnitude of the equatorial field due to a bar magnet of length 5.0 cm at a distance of 75 cm from its mid-point? The magnetic moment of the bar magnet is 0.75 A m^2 .

- (A) $3.2 \times 10^{-7} \text{ T}$ (B) $6.4 \times 10^{-7} \text{ T}$ (C) $1.78 \times 10^{-7} \text{ T}$ (D) $3.56 \times 10^{-7} \text{ T}$

Q.17 A solenoid has a core of relative permeability 400. Its windings, insulated from the core, carry a current of 1 A . If there are 1000 turns per metre, the magnetic field B is ____ T. ($\mu_0 = 4\pi \times 10^{-7} \text{ SI}$)

- (A) $16\pi \times 10^{-2}$ (B) $16\pi \times 10^2$ (C) $1.6\pi \times 10^2$ (D) $0.16\pi \times 10^{-2}$

Q.18 A short bar magnet placed with its axis at 30° to a uniform external magnetic field of 0.25 T experiences a torque of $4.5 \times 10^{-2} \text{ J}$. The magnitude of its magnetic moment is

- (A) 3.6 J T^{-1} (B) 0.036 J T^{-1} (C) 0.36 J T^{-1} (D) 36 J T^{-1}

Q.19 A bar magnet of pole strength q_m and magnetic moment m is divided into two equal parts along its length (i.e. cut lengthwise, parallel to its axis). The new pole strength and magnetic moment of each part are respectively

- (A) $q_m, \frac{m}{2}$ (B) $\frac{q_m}{2}, m$ (C) $\frac{q_m}{2}, \frac{m}{2}$ (D) q_m, m

Q.20 A solenoid has a core of relative permeability 400. Its windings, insulated from the core, carry a current of 2 A . If there are 1000 turns per metre, the magnetic field inside the solenoid is ____ T.

- (A) 1.5 (B) 1.0 (C) 1.8 (D) 2.0

Q.21 A short bar magnet placed with its axis at 30° to a uniform external magnetic field of 0.5 T experiences a torque of 4.5×10^{-2} J. The magnitude of its magnetic moment is

- (A) $3.6 \times 10^2 \text{ J T}^{-1}$ (B) $36 \times 10^{-2} \text{ J T}^{-1}$ (C) $1.8 \times 10^2 \text{ J T}^{-1}$ (D) $18 \times 10^{-2} \text{ J T}^{-1}$

Q.22 A short bar magnet placed with its axis at 30° to a uniform external field of 0.15 T experiences a torque of 4.5×10^{-2} N m. The magnitude of its magnetic moment (in N m T^{-1}) is

- (A) 0.45 (B) 0.60 (C) 0.36 (D) 0.18

Q.23 For an electromagnet core, ferromagnetic materials should have ____ retentivity and ____ permeability.

- (A) high, high (B) high, low (C) low, high (D) low, low

Q.24 In the magnetic meridian of a certain place, the horizontal component of the Earth's magnetic field is 0.26 G and the total magnetic field is 0.52 G. The angle of dip is

- (A) 45° (B) 30° (C) 60° (D) 90°

Q.25 For a bar magnet of length l , the ratio of the equatorial field to the axial field at the same distance r ($r \gg l$) is

- (A) 0 (B) 2 (C) 0.5 (D) 1

Q.26 The unit of magnetisation (M) is

- (A) A m^{-2} (B) A m^{-1} (C) C m^{-1} (D) C m^{-2}

Q.27 In the magnetic meridian of a certain place, the horizontal component of the Earth's magnetic field is 0.20 G and the dip angle is 30° . The total magnetic field at this location is

- (A) 0.23 G (B) 0.32 G (C) 0.42 G (D) 0.82 G

Q.28 A square of side L metre lies in the x - y plane in a region where the magnetic field is $\vec{B} = B_0 (\hat{2i} + 4\hat{j} + 3\hat{k})$ T, where B_0 is constant. The magnitude of flux through the square is

- (A) $2B_0 L^2 \text{ Wb}$ (B) $3B_0 L^2 \text{ Wb}$ (C) $4B_0 L^2 \text{ Wb}$ (D) $\sqrt{29} B_0 L^2 \text{ Wb}$

Q.29 The core of an electromagnet should have ____ permeability and ____ retentivity.

- (A) low, high (B) low, low (C) high, low (D) high, high

Q.30 A magnetic needle has magnetic moment $6.7 \times 10^{-2} \text{ A m}^2$ and moment of inertia $7.5 \times 10^{-6} \text{ kg m}^2$. Its period of oscillation is 0.67 s. The magnetic field is

- (A) 0.01 T (B) 1.02 T (C) 6.7 T (D) none of these

Q.31 A closely wound solenoid of 1000 turns and area of cross-section $2 \times 10^{-4} \text{ m}^2$ carries a current of 5.0 A. Its magnetic moment is ____ A m^2 .

- (A) 1 (B) 3 (C) 2 (D) 4

Q.32 The magnetic needle of a magnetic compass is made of

- (A) aluminium (B) lodestone (C) copper (D) bismuth

Q.33 The phenomenon of perfect diamagnetism in superconductors is called the

- (A) Compton effect (B) Lorentz effect (C) Meissner effect (D) Curie effect

Q.34 The relative permittivity and relative permeability of a material are ϵ_r and μ_r . Which of the following values are allowed for a diamagnetic material?

- (A) $\epsilon_r = 1.5, \mu_r = 1.5$ (B) $\epsilon_r = 0.5, \mu_r = 1.5$ (C) $\epsilon_r = 1.5, \mu_r = 0.5$ (D) $\epsilon_r = 0.5, \mu_r = 0.5$

Q.35 A magnet is cut perpendicular to its axis into two pieces whose lengths are in the ratio 2 : 1. The ratio of their pole strengths is

- (A) 2 : 1 (B) 1 : 2 (C) 4 : 1 (D) 1 : 1

Q.36 When a magnet is placed in a 0.8 T magnetic field, the magnetic force on each of its two poles is 0.08 N. The pole strength of each pole is

- (A) 10 A m (B) 0.1 A m (C) 0.1 A m² (D) 10 A m²

Q.37 If p is the magnetic pole strength and $\vec{l}$ the vector from S-pole to N-pole (distance between the poles), the magnetic moment is

- (A) $\vec{m} = p\vec{l}$ (B) $\vec{m} = \frac{1}{2}p\vec{l}$ (C) $\vec{m} = 3p\vec{l}$ (D) $\vec{m} = 2p\vec{l}$

Q.38 Magnetic field lines

- (A) always intersect (B) always form closed loops
(C) are more crowded away from the magnet (D) cannot pass through vacuum

Q.39 The magnetic field produced by an electron in an atom or molecule is due to its

- (A) spin motion (B) orbital motion
(C) spin and orbital motion (D) none of these

Q.40 For a short magnet with magnetic dipole moment $\vec{m}$, its magnetic field at a distance d from its centre on its equator is

- (A) $-\frac{\mu_0 \vec{m}}{4\pi d^3}$ (B) $\frac{\mu_0 \vec{m}}{4\pi d^2}$ (C) $\frac{\mu_0 \vec{m}}{4\pi d^3}$ (D) $\frac{\mu_0 \vec{m}}{2\pi d^3}$

Q.41 At the equator of a magnet, the magnetic field due to the magnet is

- (A) in the direction of the magnetic moment (B) opposite to the direction of the magnetic moment
(C) towards the equator (D) in any direction

Q.42 The direction of the magnetic dipole moment of a magnet is

- (A) from north pole to south pole (B) from south pole to north pole
(C) possible in any direction (D) not decided

Q.43 The relation between the geometric length (l_g) and the magnetic length (l_m) of a bar magnet is

- (A) $l_m = \frac{5}{6}l_g$ (B) $2l_m = \frac{5}{6}l_g$ (C) $l_m = \frac{6}{5}l_g$ (D) $l_m = \frac{3}{5}l_g$

Q.44 The unit of pole strength of a magnet is equivalent to (Q = charge, v = velocity)

- (A) Qv (B) Q/v (C) v/Q (D) $1/(Qv)$

Q.45 The pole strength of a magnet is 5 A m and its magnetic length is 10 cm. Its magnetic dipole moment is

- (A) 0.5 A m² (B) 5 A m² (C) 50 A m² (D) 20 A m²

Q.46 The magnitude of the resultant force acting on a bar magnet placed in a uniform magnetic field is

- (A) mB (B) zero (C) $\sqrt{\pi} B$ (D) $\frac{mB}{2}$

Q.47 The force on the north pole of a magnet of pole strength 3200 A m due to the south pole (10 cm away) of a point bar magnet of pole strength 40 A m is ____ N.

- (A) -1.28 (B) 1.28 (C) 1.28×10^{-7} (D) 1.28×10^7

Q.48 A magnet of magnetic moment 0.1 A m² is placed in a uniform magnetic field of 0.36×10^{-4} T. The force on each pole is 1.44×10^{-4} N. The distance between the two poles is ____ cm.

- (A) 1.25 (B) 2.5 (C) 5.0 (D) 1.8

Q.49 A bar magnet of pole strength p is divided into 4 equal parts such that the length and breadth of each part are half of the original. The pole strength of each part will be

- (A) $p/4$ (B) $p/2$ (C) $p/8$ (D) $4p$

Q.50 Points A and B lie on the axis of a bar magnet of length 3 cm, at distances 24 cm and 48 cm respectively, on opposite sides of the centre. The ratio of the magnetic fields at these points is

- (A) 8 : 1 (B) 4 : 1 (C) 3 : 1 (D) $1 : 2\sqrt{2}$



Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	11	A	21	D	31	A	41	B
2	B	12	A	22	B	32	B	42	B
3	C	13	B	23	C	33	C	43	A
4	C	14	C	24	C	34	C	44	A
5	A	15	B	25	C	35	D	45	A
6	B	16	C	26	B	36	B	46	B
7	D	17	A	27	A	37	A	47	B
8	D	18	C	28	B	38	B	48	B
9	D	19	C	29	C	39	C	49	B
10	B	20	B	30	A	40	A	50	A

