

CLASS 12

PHYSICS

EXTRA QUESTIONS

Class 12 Physics Chapter 5 Magnetism and Matter – Extra Questions with Answers

From a bar magnet's magnetic moment to how diamagnetic, paramagnetic, and ferromagnetic materials respond differently to a field, Class 12 Physics Chapter 5 covers a lot of ground -- these questions revisit the key formulas and definitions.

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From a bar magnet's magnetic moment to how diamagnetic, paramagnetic, and ferromagnetic materials respond differently to a field, Class 12 Physics Chapter 5 covers a lot of ground — these questions revisit the key formulas and definitions.

Very Short Answer Questions (1 mark)

Q1. Write the formula for magnetic moment of a bar magnet.

Ans: $m = q_m \times 2l$.

Q2. What is the value of horizontal component of Earth's field at the magnetic poles?

Ans: Zero (field is fully vertical there).

Q3. Name one diamagnetic material.

Ans: Bismuth (or copper, water).

Q4. What happens to paramagnetic susceptibility as temperature increases?

Ans: It decreases (Curie's law, $\chi \propto 1/T$).

Q5. Write the formula for potential energy of a magnetic dipole in a field.

Ans: $U = -mB \cos\theta$.

Short Answer Questions (2–3 marks)

Q6. A bar magnet has magnetic moment $5 \text{ A}\cdot\text{m}^2$. Find the field on its axial line at 0.2m (take $r \gg l$).

Ans: $B = (\mu_0/4\pi)(2m/r^3) = 10^{-7} \times 2(5)/(0.2)^3 = 10^{-7} \times 10/0.008 = 1.25 \times 10^{-6} \text{ T}$.

Q7. A dipole of moment $2 \text{ A}\cdot\text{m}^2$ is placed in a field of 0.5T at 30° . Find the torque.

Ans: $\tau = mB \sin\theta = 2(0.5)\sin 30^\circ = 1(0.5) = 0.5 \text{ N}\cdot\text{m}$.

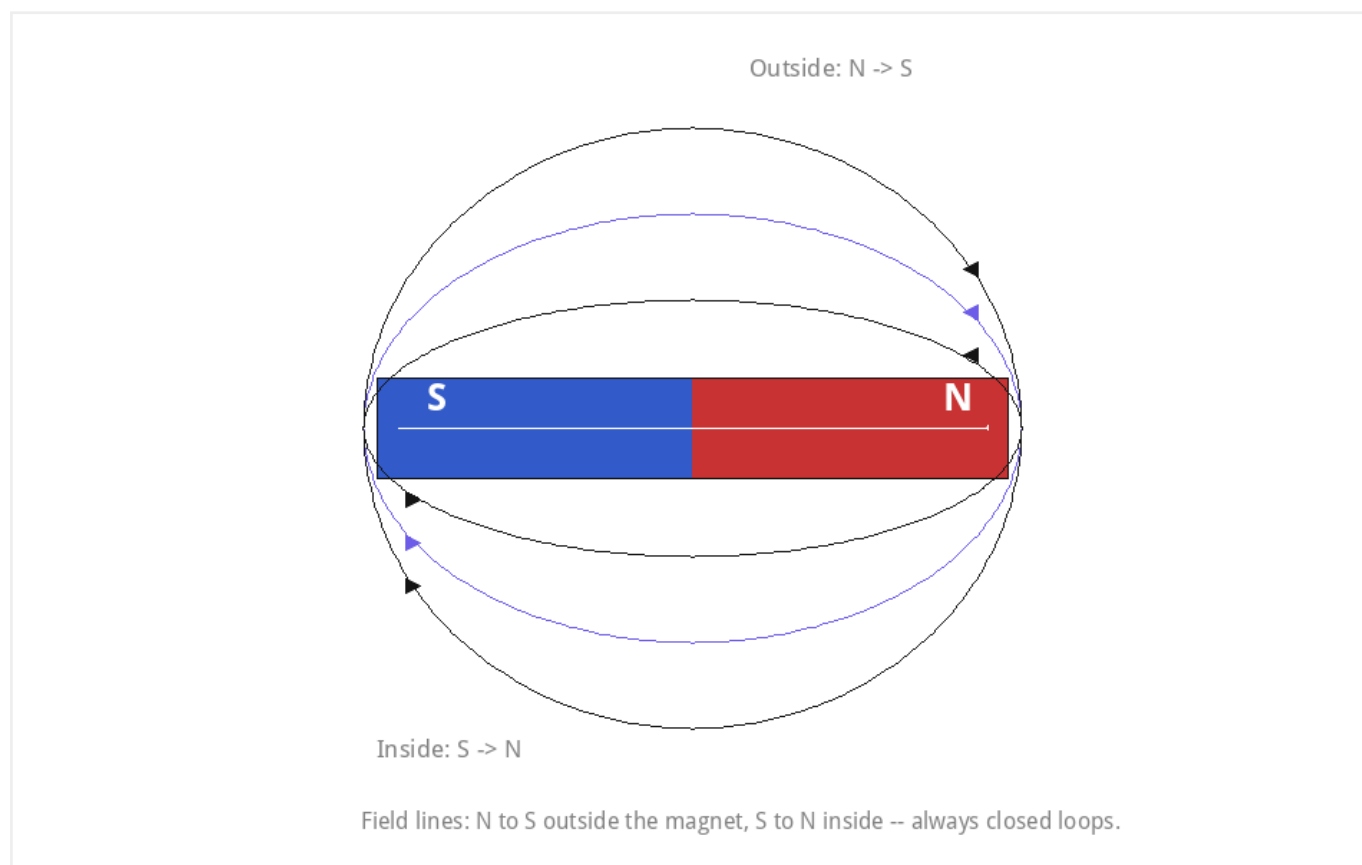
Q8. Distinguish diamagnetic and ferromagnetic materials in terms of susceptibility.

Ans: Diamagnetic: small negative χ (independent of field, weakly repelled). Ferromagnetic: large positive χ (strongly attracted, retains magnetisation, exhibits hysteresis).

Higher-Order Thinking / Application Questions

Q9. Explain why the magnetic field lines inside a bar magnet run from the south pole to the north pole, while outside they run from north to south, and relate this to why field lines form closed loops.

Ans: Magnetic field lines, by definition and by Gauss's law for magnetism ($\nabla \cdot \mathbf{B} = 0$, no magnetic monopoles), must always form closed loops — they can never simply begin or end at a pole the way electric field lines do at a charge. Outside the bar magnet, the field lines emerge from the north pole, curve around, and enter the south pole, matching what we observe with iron filings. Since these lines cannot simply terminate at the south pole (that would violate the closed-loop requirement), they must continue through the interior of the magnet, and by symmetry/continuity, this internal path runs from the south pole back to the north pole, completing the loop. This is exactly analogous to the field of a solenoid, which is why a bar magnet is treated as 'equivalent' to a solenoid: both produce this same closed-loop field pattern, with the equivalence becoming an especially good approximation for a uniformly magnetized bar.



Q10. A compass needle at a certain place shows a dip of 60° and the horizontal component of Earth's field there is 0.3 Gauss. Find the total magnetic field of the Earth at that place, and explain what a dip of 90° would physically mean.

Ans: The horizontal component relates to the total field via $B_H = B \cos(\text{dip})$. Rearranging:
 $B = B_H / \cos(\text{dip}) = 0.3 / \cos(60^\circ) = 0.3 / 0.5 = 0.6$ Gauss. This is the total magnitude of Earth's magnetic field at that location. A dip of 90° would mean the magnetic field is pointing straight down (or up), entirely vertical, with zero horizontal component ($B_H = B \cos 90^\circ = 0$) — this occurs at the magnetic poles, where a magnetic compass needle would try to point straight down into the Earth rather than showing any horizontal direction, making an ordinary compass useless for direction-finding there. This is exactly why the horizontal component (relevant for compass navigation) vanishes at the poles, consistent with the answer to Q2 above.

Class 12 Physics Chapter 5 – Solutions and Notes

For complete step-by-step answers and a quick summary, check the [Class 12 Physics Chapter 5 Solutions](#) and [Class 12 Physics Chapter 5 Revision Notes](#).

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