Physics

Board – CBSE	Class – 12th	Chapter – Magnetism and Matter

Q.1 The horizontal component of the earth's magnetic field at a place is B and angle of dip is 60°. What is the value of vertical component of earth's magnetic field at equator?

Q.2. What are permanent magnets? Give one example.

Q.3. Is the steady electric current the only source of magnetic field? Justify your answer.

Q.4. Relative permeability of a material, $\mu_r = 0.5$. Identify the nature of the magnetic material and write its relation to magnetic susceptibility.

Q.5. In what way is the behavior of a diamagnetic material different from that of a paramagnetic, when kept in an external magnetic field?

Q.6. At a place, the horizontal component of earth's magnetic field is B and angle of dip is 60°. What is the value of horizontal component of the earth's magnetic field at the equator?

Q.7. Define magnetic susceptibility of a material. Name two elements, one having positive susceptibility and the other having negative susceptibility. What does negative susceptibility signify?

Q.8. (i) Write two characteristics of a material used for making permanent magnets.
(ii) Why is core of an electromagnet made of ferromagnetic materials?

Q.9. Draw magnetic field lines when a

(i) diamagnetic,

(ii) paramagnetic substance is placed in an external magnetic field.

Which magnetic property distinguishes this behavior of the field lines due to the two substances?

Q.10. A magnetic needle free to rotate in a vertical plane parallel to the magnetic meridian has its north tip down at 60° with the horizontal. The horizontal component of the earth's magnetic field at the place is known to be 0.4 G. Determine the magnitude of the earth's magnetic field at the place.

Q.11. The susceptibility of a magnetic material is -2.6×10^{-5}. Identify the type of magnetic material and state its two properties.

Q.12. A circular coil of N turns and radius R carries a current I. It is unwound and rewound to make another coil of radius R/2, current. remaining the same. Calculate the ratio of the magnetic moments of the new coil and the original coil.

Q.13. A circular coil of N turns and diameter 'd' carries a current' I'. It is unwound and rewound to make another coil of diameter' 2 d ', current T remaining the same. Calculate the ratio of the magnetic

Q.14. (a) How does a diamagnetic material behave when it is cooled to very low temperatures?
(b) Why does a paramagnetic sample display greater magnetization when cooled? Explain.

Q.15. State two characteristic properties distinguishing the behavior of paramagnetic and diamagnetic materials.

Q.16. State two characteristic properties distinguishing the behavior of diamagnetic and ferromagnetic materials.

Q.17. Write two characteristic properties each to select materials suitable for
(i) permanent magnets and

(ii) electromagnets.

Q.18. A coil of 'N' turns and radius 'R' carries a current' I '. It is unwound and rewound to make a square coil of side 'a' having same number of turns (N). Keeping the current 'I' same, find the ratio of the magnetic moments of the square coil and the circular coil.

Q.19. Depict the behavior of magnetic field lines when
(i) a diamagnetic material and

(ii) a paramagnetic material is placed in an external magnetic field. Mention briefly the properties of these materials which explain this distinguishing behavior.

Q.20. Answer the following questions regarding earth's magnetism:
(a) A vector needs three quantities for its specification. Name the three independent quantities conventionally used to specify the earth's magnetic field.

(b) The angle of dip at a location in southern India is about 18°.
Would you expect a greater or smaller dip angle in Britain?

(c) If you made a map of magnetic field lines at Melbourne in Australia, would the lines seem to go into the ground or come out of the ground?

(d) In which direction would a compass free to move in the vertical plane point to, if located right on the geomagnetic north or south pole?

(e) The earth's field, it is claimed, roughly approximates the field due to a dipole of magnetic moment 8×10^{22} J T^{-1} located at its centre. Check the order of magnitude of this number in some way

(f) Geologists claim that besides the main magnetic N — S poles, there are several local poles on the earth's surface oriented in different directions. How is such a thing possible at all?

Q.21. A short bar magnet placed with its axis at 30° with a uniform external magnetic field of 0.25 T experiences a torque of magnitude equal to 4.5×10^{-2} J. What is the magnitude of magnetic moment of the magnet?

Q.22. A short bar magnet of magnetic moment m $= 0.32$ JT^{-1} is placed in a uniform magnetic field of 0.15 T. If the bar is free to rotate in the plane of the field, which orientation would correspond to its

(a) stable, and

(b) unstable equilibrium? What is the potential energy of the magnet in each case?

Q.23. A bar magnet of magnetic moment 1.5 J T^{-1} lies aligned with the direction of a uniform magnetic field of 0.22 T.

(a) What is the amount of work required by an external torque to turn the magnet so as to align its magnetic moment:

(i) normal to the field direction, (ii) opposite to the field direction?

(b) What is the torque on the magnet in cases (i) and (ii)?

Q.24. A circular coil of 16 turns and radius 10 cm carrying a current of 0.75 A rests with its plane normal to an external field of magnitude 5.0×10^{-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 2.0 s^{-1}. What is the moment of inertia of the coil about its axis of rotation?

Q.25. A short bar magnet placed in a horizontal plane has its axis aligned along the magnetic north-south direction. Null points are found on the axis of the magnet at 14 cm from the centre of the magnet. The earth's magnetic field at the place is 0.36G and the angle of dip is zero. What is the total magnetic field on the normal bisector of the magnet at the same distance as the null-point (i.e., 14 cm) from the centre of the

magnet? (At null points, field due to a magnet is equal and opposite to the horizontal component of earth's magnetic field.)

Q.26. If the bar magnet in exercise 5.13 is turned around by 180°, where will the new null points be located?