



Attempt all questions before checking the answer key. Give qualitative explanations and labelled field/domain sketches where relevant.

A. Very short answers - 1 mark each

1. Why does cutting a bar magnet not produce an isolated magnetic pole?
2. Define magnetisation and give its SI unit.
3. Name one diamagnetic and one paramagnetic substance.
4. What happens to ferromagnetic behaviour above the Curie temperature?

B. Short answers / practice - 2 marks each

5. Draw magnetic field lines inside and outside a bar magnet. Explain why they form closed loops.
6. Describe how a current-carrying solenoid resembles a bar magnet.
7. Why is a diamagnetic sample pushed towards weaker regions of a non-uniform magnetic field?
8. Explain the difference between induced and permanent atomic magnetic dipoles.
9. Can isolated magnetic poles be obtained by breaking a magnet?
10. Is magnetic susceptibility negative for a diamagnet?
11. Can a diamagnetic substance be repelled by either magnetic pole?
12. Does a paramagnet generally retain strong magnetisation after removal of the field?
13. Why are magnetic field lines continuous through a bar magnet?
14. Explain why heating can weaken a permanent magnet.
15. Compare the orientation of atomic moments in an unmagnetised and magnetised ferromagnet.
16. Why is soft iron suitable for the core of an electromagnet?
17. What distinguishes a permanent magnet from an electromagnet?
18. Can a stationary magnetic dipole have torque but zero net force?
19. A magnet is cut into two equal lengths transverse to its axis. State the polarity of the new faces.

20. Classify bismuth, aluminium and iron by magnetic response.

21. Explain how a compass can map the field around a bar magnet.

22. Does a magnetic dipole align with or against the field in stable equilibrium?

C. Short answers - 3 marks each

23. Compare the directions of a bar magnet's field at distant axial and equatorial points. Illustrate both using a field sketch.
24. Distinguish diamagnetism, paramagnetism and ferromagnetism in terms of response to an applied field and relative permeability.
25. Explain why a compass near a strong bar magnet may not point north. What determines its equilibrium direction?
26. Describe the orientation of a freely suspended paramagnetic rod and a diamagnetic rod in a uniform magnetic field, and give reasons.

D. Long answers - 5 marks each

27. Explain ferromagnetism using domains. Describe changes in domain alignment during magnetisation, removal of field and heating above the Curie temperature.
28. Compare soft iron and hard steel as magnetic materials. Explain their suitability for electromagnets and permanent magnets respectively.
29. Discuss stable and unstable orientations of a magnetic dipole in a uniform field. Explain torque, net force and behaviour in a non-uniform field qualitatively.
30. An unknown material is weakly repelled by a magnet; another is weakly attracted and becomes less responsive on heating. Identify both and compare magnetic moments, susceptibility signs and temperature effects.

ANSWER KEY - Numerical / short answers

9) No; each piece remains a dipole. 10) Yes. 11) Yes, in a suitable non-uniform field. 12) No. 18) Yes, in a uniform field at a non-aligned angle. 20) Diamagnetic, paramagnetic and ferromagnetic respectively. 22) With the field.