

Magnetism

Set - I

This document contains 100 multiple-choice questions on Magnetism and Matter and moving charges and magnetism, designed for NEET/EAMCET preparation. Each question has four options (a, b, c, d), with one correct answer. The answer key is provided at the end of the document.

Questions

- Which of the following statements is true for a diamagnetic material?
 - It is attracted to a magnet.
 - It has a positive magnetic susceptibility.
 - It has no unpaired electrons.
 - It loses its magnetism at high temperatures.
- The magnetic field lines due to a bar magnet:
 - Are closed loops.
 - Start from the north pole and end at the south pole.
 - Start from the south pole and end at the north pole.
 - Are straight lines.
- A bar magnet has a magnetic moment of 10 A m^2 . It is placed in a magnetic field of 0.5 T such that the angle between the magnetic moment and the field is 30° . The torque experienced by the magnet is:
 - 2.5 N m
 - $2.5 \text{ A m}^2 \text{ T}$
 - 2.5 J
 - 0 N m
- The magnetic susceptibility of a paramagnetic material is:
 - Small and positive
 - Large and positive
 - Negative
 - Zero
- In a ferromagnetic material, the magnetic domains are:
 - Randomly oriented in the absence of an external magnetic field.
 - Aligned in the direction of the external magnetic field.
 - Permanently aligned even in the absence of an external magnetic field.
 - Oriented perpendicular to the external magnetic field.
- The angle of dip at a place is 60° . The horizontal component of the earth's magnetic field is 0.2 G . The total magnetic field strength at that place is:
 - 0.4 G
 - 0.2 G
 - 0.346 G
 - 0.1 G
- The magnetic field strength H inside a long solenoid carrying current I with n turns per unit length is:
 - nI
 - $\mu_0 nI$
 - B , where B is the magnetic flux density
 - B/μ_0 , where B is the magnetic flux density inside the solenoid
- In the hysteresis curve for a ferromagnetic material, the area of the loop represents:
 - The energy dissipated per unit volume per cycle.
 - The magnetic susceptibility.
 - The coercivity.
 - The retentivity.
- Which of the following is a characteristic of a soft magnetic material?
 - High coercivity
 - Low permeability
 - High retentivity

- d) Low hysteresis loss
10. The magnetic field due to a magnetic dipole at a point along its axial line is:
- $\frac{\mu_0}{4\pi} \cdot \frac{2m}{r^3}$
 - $\frac{\mu_0}{4\pi} \cdot \frac{m}{r^2}$
 - $\frac{\mu_0}{4\pi} \cdot \frac{m}{r^3}$
 - $\frac{\mu_0}{4\pi} \cdot \frac{m}{r}$
11. The declination at a place is the angle between:
- The vertical component and the total magnetic field
 - The horizontal component and the geographic north-south direction
 - The total magnetic field and the geographic north-south direction
 - The horizontal component and the magnetic meridian
12. A bar magnet with magnetic moment 5 A m^2 is placed in a magnetic field of 0.2 T at an angle of 60° between the magnetic moment and the field. The potential energy of the magnet is:
- -1 J
 - -0.5 J
 - -0.866 J
 - -1.2 J
13. The relative permeability of a material is 0.99 . The material is:
- Diamagnetic
 - Paramagnetic
 - Ferromagnetic
 - Ferrimagnetic
14. Curie's law states that for a paramagnetic material, the magnetic susceptibility is:
- Directly proportional to temperature
 - Inversely proportional to temperature
 - Independent of temperature
 - Proportional to the square of temperature
15. The magnetic flux density B in a material is related to the magnetic field strength H by:
- $B = H$
 - $B = \mu_0 H$
 - $B = \mu H$, where μ is the permeability of the material
 - $B = H/\mu_0$
16. The SI unit of magnetic moment is:
- Ampere meter²
 - Newton meter
 - Tesla meter
 - Weber
17. Which of the following is not a ferromagnetic material?
- Iron
 - Cobalt
 - Nickel
 - Aluminium
18. The Earth's magnetic field is approximately that of a bar magnet placed at the center of the Earth with its north pole towards the geographic:
- North pole
 - South pole
 - East
 - West
19. The magnetic moment of an atom is due to:
- Only the spin of electrons
 - Only the orbital motion of electrons
 - Both spin and orbital motion of electrons
 - The motion of protons in the nucleus
20. In a paramagnetic material, the magnetic dipoles:
- Are permanently aligned
 - Align with the external magnetic field
 - Are randomly oriented
 - Oppose the external magnetic field
21. A magnetic needle oscillates in the Earth's horizontal magnetic field with a time period of 2 s . If the horizontal component of the Earth's magnetic field is $0.3 \times 10^{-4} \text{ T}$, the moment of inertia of the needle is $5 \times 10^{-6} \text{ kg m}^2$. The magnetic moment of the needle is:
- 0.0296 A m^2
 - 0.0592 A m^2
 - 0.0148 A m^2
 - 0.1184 A m^2
22. Which property distinguishes a ferromagnetic material from a paramagnetic material?

- a) High susceptibility
 - b) Permanent magnetization after removal of external field
 - c) Negative susceptibility
 - d) Alignment opposite to the external field
23. A short bar magnet produces a magnetic field of 0.1 T at a point 10 cm along its axial line. The magnetic moment of the magnet is:
- a) 0.5 A m^2
 - b) 0.25 A m^2
 - c) 1.0 A m^2
 - d) 0.125 A m^2
24. The magnetic susceptibility of a material becomes zero when:
- a) It is diamagnetic
 - b) It is ferromagnetic at Curie temperature
 - c) It is paramagnetic at absolute zero
 - d) It is placed in a vacuum
25. A solenoid of length 0.5 m has 500 turns and carries a current of 2 A. The magnetic field inside the solenoid is:
- a) $4 \times 10^{-3} \text{ T}$
 - b) $2.51 \times 10^{-3} \text{ T}$
 - c) $5 \times 10^{-3} \text{ T}$
 - d) $1.26 \times 10^{-3} \text{ T}$
26. The coercivity of a material indicates:
- a) The ability to retain magnetism
 - b) The field required to reduce magnetization to zero
 - c) The maximum magnetic field it can withstand
 - d) The susceptibility of the material
27. A magnetic dipole of moment 2 A m^2 is placed perpendicular to a uniform magnetic field of 0.4 T. The work done to rotate it to align with the field is:
- a) 0.8 J
 - b) 1.6 J
 - c) 0.4 J
 - d) 0 J
28. At the magnetic equator, the angle of dip is:
- a) 90°
 - b) 45°
 - c) 0°
 - d) 60°
29. A bar magnet is cut into two equal halves perpendicular to its length. The magnetic moment of each half becomes:
- a) Half of the original
 - b) Same as the original
 - c) Double the original
 - d) Zero
30. A current loop of area 0.01 m^2 carrying 5 A is placed in a magnetic field of 2 T such that the plane of the loop is perpendicular to the field. The torque on the loop is:
- a) 0.1 N m
 - b) 0.05 N m
 - c) 0.2 N m
 - d) 0 N m
31. The magnetization of a material is defined as:
- a) Magnetic moment per unit volume
 - b) Magnetic field strength per unit area
 - c) Magnetic flux density
 - d) Magnetic susceptibility per unit volume
32. A proton moves with a velocity of $2 \times 10^6 \text{ m/s}$ perpendicular to a magnetic field of 0.5 T. The magnetic force on the proton is:
- a) $1.6 \times 10^{-13} \text{ N}$
 - b) $3.2 \times 10^{-13} \text{ N}$
 - c) $1.6 \times 10^{-14} \text{ N}$
 - d) $8 \times 10^{-13} \text{ N}$
33. The relative permeability of a ferromagnetic material is:
- a) Slightly greater than 1
 - b) Much greater than 1
 - c) Less than 1
 - d) Equal to 1
34. Two identical bar magnets are placed end-to-end with like poles together. The resultant magnetic moment of the system is:
- a) Zero
 - b) Equal to one magnet
 - c) Double that of one magnet
 - d) Half that of one magnet
35. The vertical component of the Earth's magnetic field at a place is $0.4 \times 10^{-4} \text{ T}$, and the angle of dip is 30° . The total magnetic field is:
- a) $0.8 \times 10^{-4} \text{ T}$

- b) $0.462 \times 10^{-4} \text{ T}$
 c) $0.4 \times 10^{-4} \text{ T}$
 d) $0.346 \times 10^{-4} \text{ T}$
36. The retentivity of a material refers to:
- The maximum magnetization achieved
 - The residual magnetism after removing the field
 - The field required to demagnetize it
 - The susceptibility at saturation
37. A magnetic dipole experiences a torque of 0.2 N m in a field of 0.5 T when placed at 90° to the field. Its magnetic moment is:
- 0.4 A m^2
 - 0.2 A m^2
 - 0.1 A m^2
 - 0.8 A m^2
38. Which of the following materials exhibits hysteresis?
- Diamagnetic
 - Paramagnetic
 - Ferromagnetic
 - All of the above
39. A circular coil of radius 0.05 m with 100 turns carries a current of 1 A . The magnetic moment of the coil is:
- 0.785 A m^2
 - 1.57 A m^2
 - 0.392 A m^2
 - 3.14 A m^2
40. The magnetic field at a point on the equatorial line of a bar magnet is $2 \times 10^{-5} \text{ T}$. If the magnet's magnetic moment is 0.1 A m^2 , the distance of the point from the magnet is:
- 0.1 m
 - 0.171 m
 - 0.05 m
 - 0.2 m
41. A magnetic needle in a uniform magnetic field of 0.2 T oscillates with a time period of 1 s . If its moment of inertia is $2 \times 10^{-5} \text{ kg m}^2$, the magnetic moment of the needle is:
- 0.0789 A m^2
 - 0.0395 A m^2
 - 0.1578 A m^2
 - 0.0197 A m^2
42. The magnetic field at a point due to a short bar magnet is $4 \times 10^{-6} \text{ T}$ along its equatorial line at a distance of 0.2 m . The magnetic moment of the magnet is:
- 0.064 A m^2
 - 0.032 A m^2
 - 0.128 A m^2
 - 0.016 A m^2
43. Which of the following is true about the magnetization of a paramagnetic material?
- It decreases with increasing temperature
 - It increases with decreasing magnetic field
 - It is independent of temperature
 - It becomes zero at Curie temperature
44. A bar magnet of magnetic moment 8 A m^2 is placed in a magnetic field of 0.25 T at an angle of 45° . The torque acting on it is:
- 1.414 N m
 - 2 N m
 - 1 N m
 - 2.828 N m
45. The susceptibility of a diamagnetic material is:
- Small and positive
 - Large and positive
 - Small and negative
 - Zero
46. A solenoid with 200 turns per meter carries a current of 3 A . The magnetic field strength (H) inside the solenoid is:
- 600 A/m
 - 300 A/m
 - 900 A/m
 - 1200 A/m
47. The potential energy of a magnetic dipole of 4 A m^2 aligned at 60° with a magnetic field of 0.5 T is:
- -1 J
 - -2 J
 - -1.732 J
 - -0.866 J
48. The angle of dip at the magnetic poles is:
- 0°
 - 45°

- c) 90°
d) 30°
49. A circular coil of 50 turns and radius 0.02 m carries a current of 2 A. The magnetic field at the center of the coil is:
- a) 3.14×10^{-3} T
b) 6.28×10^{-3} T
c) 1.57×10^{-3} T
d) 12.56×10^{-3} T
50. The primary source of the Earth's magnetic field is believed to be:
- a) Permanent magnets in the crust
b) Electric currents in the molten outer core
c) Solar wind interactions
d) Rotation of the Earth's solid core
51. A bar magnet of length 0.1 m has a pole strength of 20 A m. Its magnetic moment is:
- a) 2 A m^2
b) 1 A m^2
c) 4 A m^2
d) 0.5 A m^2
52. The hysteresis loss in a ferromagnetic material depends on:
- a) The frequency of the applied field
b) The coercivity only
c) The susceptibility only
d) The temperature only
53. A magnetic dipole of moment 3 A m^2 is rotated from parallel to perpendicular orientation in a field of 0.6 T. The work done is:
- a) 1.8 J
b) 0.9 J
c) 3.6 J
d) 0 J
54. The magnetic field inside a material with relative permeability 1000 and magnetic field strength 500 A/m is:
- a) 0.628 T
b) 0.314 T
c) 0.157 T
d) 0.942 T
55. The magnetic moment of an electron orbiting in a circular path of radius 5.29×10^{-11} m with a speed of 2.19×10^6 m/s is:
- a) $9.27 \times 10^{-24} \text{ A m}^2$
b) $4.64 \times 10^{-24} \text{ A m}^2$
c) $1.85 \times 10^{-23} \text{ A m}^2$
d) $2.32 \times 10^{-24} \text{ A m}^2$
56. In a hysteresis loop, the point where the magnetization becomes zero is called:
- a) Retentivity
b) Coercivity
c) Saturation
d) Susceptibility
57. A square loop of side 0.1 m carrying 4 A is placed in a magnetic field of 0.8 T perpendicular to its plane. The torque on the loop is:
- a) 0.032 N m
b) 0.064 N m
c) 0.016 N m
d) 0.128 N m
58. The magnetic field at a point 0.1 m along the axial line of a bar magnet is twice that at a point on its equatorial line at the same distance. The magnetic field on the equatorial line is 1×10^{-5} T. The magnet's magnetic moment is:
- a) 0.02 A m^2
b) 0.01 A m^2
c) 0.04 A m^2
d) 0.005 A m^2
59. Which of the following phenomena is evidence of Earth's magnetic field reversals?
- a) Variation in declination
b) Magnetization of oceanic crust rocks
c) Changes in dip angle
d) Increase in hysteresis loss
60. A magnetic needle is placed in a field where $B_H = 0.4 \times 10^{-4}$ T and $B_V = 0.3 \times 10^{-4}$ T. The angle of dip is:
- a) 36.87°
b) 53.13°
c) 45°
d) 60°
61. A magnetic needle oscillates with a time period of 4 s in Earth's horizontal magnetic field of 0.25×10^{-4} T. If its moment of inertia is $8 \times 10^{-5} \text{ kg m}^2$, the magnetic moment of the needle is:
- a) 0.0197 A m^2

- b) 0.0395 A m^2
 c) 0.0790 A m^2
 d) 0.0099 A m^2
62. The magnetic field at a point 0.05 m along the axial line of a bar magnet is $8 \times 10^{-5} \text{ T}$. The magnetic moment of the magnet is:
 a) 0.01 A m^2
 b) 0.005 A m^2
 c) 0.02 A m^2
 d) 0.0025 A m^2
63. The Curie temperature of a ferromagnetic material is the temperature above which it becomes:
 a) Diamagnetic
 b) Paramagnetic
 c) Non-magnetic
 d) Ferromagnetic
64. A magnetic dipole of moment 6 A m^2 is placed in a magnetic field of 0.3 T at an angle of 30° . The torque experienced by the dipole is:
 a) 0.9 N m
 b) 1.8 N m
 c) 0.45 N m
 d) 1.2 N m
65. The magnetic susceptibility of a ferromagnetic material is:
 a) Small and positive
 b) Very large and positive
 c) Small and negative
 d) Zero
66. A solenoid of length 1 m has 1000 turns and carries a current of 1.5 A . The magnetic flux density inside the solenoid is:
 a) $1.885 \times 10^{-3} \text{ T}$
 b) $3.77 \times 10^{-3} \text{ T}$
 c) $0.942 \times 10^{-3} \text{ T}$
 d) $2.51 \times 10^{-3} \text{ T}$
67. The potential energy of a magnetic dipole of 5 A m^2 placed perpendicular to a magnetic field of 0.4 T is:
 a) 0 J
 b) -2 J
 c) 2 J
 d) -1 J
68. The horizontal component of the Earth's magnetic field at a place is $0.36 \times 10^{-4} \text{ T}$, and the total field is $0.6 \times 10^{-4} \text{ T}$. The angle of dip is:
 a) 36.87°
 b) 53.13°
 c) 45°
 d) 60°
69. A circular coil of radius 0.1 m with 20 turns carries a current of 3 A . The magnetic moment of the coil is:
 a) 1.885 A m^2
 b) 0.942 A m^2
 c) 3.77 A m^2
 d) 0.628 A m^2
70. The primary reason paramagnetic materials are weakly attracted to magnetic fields is:
 a) Presence of permanent dipoles
 b) Alignment of atomic dipoles with the field
 c) Opposition of atomic dipoles to the field
 d) High retentivity
71. A bar magnet produces a magnetic field of $1 \times 10^{-4} \text{ T}$ at a point 0.2 m on its equatorial line. The magnetic moment of the magnet is:
 a) 0.08 A m^2
 b) 0.04 A m^2
 c) 0.16 A m^2
 d) 0.02 A m^2
72. The coercivity of a soft iron sample is typically:
 a) High
 b) Low
 c) Zero
 d) Equal to its retentivity
73. A magnetic dipole of moment 10 A m^2 is rotated from 0° to 60° in a field of 0.5 T . The work done is:
 a) 2.5 J
 b) 5 J
 c) 1.25 J
 d) 0 J
74. The magnetic field inside a material with relative permeability 500 and magnetic field strength 200 A/m is:

- a) 0.1256 T
 - b) 0.0628 T
 - c) 0.2512 T
 - d) 0.0314 T
75. A rectangular loop of area 0.02 m^2 carrying 5 A is placed in a magnetic field of 1 T with its plane at 30° to the field. The torque on the loop is:
- a) 0.05 N m
 - b) 0.0866 N m
 - c) 0.1 N m
 - d) 0.0433 N m
76. The retentivity of a ferromagnetic material is highest when:
- a) It is fully magnetized
 - b) The external field is removed
 - c) The material is demagnetized
 - d) The coercivity is zero
77. A proton enters a magnetic field of 0.2 T with a speed of $5 \times 10^5 \text{ m/s}$ at 60° to the field. The magnetic force on the proton is:
- a) $8 \times 10^{-14} \text{ N}$
 - b) $6.93 \times 10^{-14} \text{ N}$
 - c) $4 \times 10^{-14} \text{ N}$
 - d) $1.6 \times 10^{-13} \text{ N}$
78. A bar magnet is cut into two equal halves along its length. The magnetic moment of each half is:
- a) Same as the original
 - b) Half of the original
 - c) Double the original
 - d) Zero
79. A coil of 100 turns and radius 0.05 m carries a current of 2 A. The magnetic field at a point 0.1 m along its axis is:
- a) $1.256 \times 10^{-4} \text{ T}$
 - b) $6.28 \times 10^{-5} \text{ T}$
 - c) $3.14 \times 10^{-5} \text{ T}$
 - d) $2.51 \times 10^{-4} \text{ T}$
80. The magnetic field lines inside a bar magnet run:
- a) From north to south
 - b) From south to north
 - c) In closed loops
 - d) Perpendicular to the magnet's axis
81. A magnetic needle oscillates in a uniform magnetic field of 0.1 T with a time period of 2 s. If its moment of inertia is $1 \times 10^{-5} \text{ kg m}^2$, the magnetic moment of the needle is:
- a) 0.00987 A m^2
 - b) 0.01974 A m^2
 - c) 0.03948 A m^2
 - d) 0.00494 A m^2
82. A bar magnet produces a magnetic field of $2 \times 10^{-5} \text{ T}$ at a point 0.3 m along its axial line. The magnetic moment of the magnet is:
- a) 0.081 A m^2
 - b) 0.162 A m^2
 - c) 0.027 A m^2
 - d) 0.054 A m^2
83. The magnetic susceptibility of a material decreases with temperature in:
- a) Diamagnetic materials
 - b) Paramagnetic materials
 - c) Ferromagnetic materials below Curie temperature
 - d) All magnetic materials
84. A magnetic dipole of moment 12 A m^2 is placed at 60° to a magnetic field of 0.2 T. The torque on the dipole is:
- a) 2.078 N m
 - b) 1.2 N m
 - c) 2.4 N m
 - d) 1.039 N m
85. The relative permeability of a diamagnetic material is:
- a) Slightly less than 1
 - b) Much greater than 1
 - c) Exactly 1
 - d) Slightly greater than 1
86. A solenoid of 400 turns per meter carries a current of 2.5 A. The magnetic field strength inside the solenoid is:
- a) 1000 A/m
 - b) 800 A/m
 - c) 1200 A/m
 - d) 600 A/m
87. The potential energy of a magnetic dipole of 8 A m^2 aligned parallel to a magnetic field of 0.25 T is:

- a) -2 J
 b) 0 J
 c) 2 J
 d) -1 J
88. The total magnetic field at a place is $0.5 \times 10^{-4}\text{ T}$, and the vertical component is $0.3 \times 10^{-4}\text{ T}$. The angle of dip is:
 a) 36.87°
 b) 53.13°
 c) 60°
 d) 45°
89. A circular coil of 150 turns and radius 0.03 m carries a current of 4 A . The magnetic field at the center is:
 a) $2.513 \times 10^{-3}\text{ T}$
 b) $5.026 \times 10^{-3}\text{ T}$
 c) $1.257 \times 10^{-3}\text{ T}$
 d) $7.539 \times 10^{-3}\text{ T}$
90. The hysteresis loop of a ferromagnetic material is wider when:
 a) Coercivity is low
 b) Retentivity is low
 c) Energy loss is high
 d) Susceptibility is high
91. A bar magnet of length 0.2 m has a magnetic moment of 4 A m^2 . The pole strength of the magnet is:
 a) 20 A m
 b) 10 A m
 c) 40 A m
 d) 5 A m
92. The magnetic field at a point on the equatorial line of a bar magnet is $5 \times 10^{-6}\text{ T}$ at a distance of 0.4 m . The magnetic moment is:
 a) 0.32 A m^2
 b) 0.16 A m^2
 c) 0.08 A m^2
 d) 0.64 A m^2
93. A magnetic dipole of 15 A m^2 is rotated from 30° to 90° in a field of 0.4 T . The work done is:
 a) 5.196 J
 b) 2.598 J
 c) 6 J
 d) 3 J
94. The magnetic field inside a material with relative permeability 2000 and magnetic field strength 100 A/m is:
 a) 0.2512 T
 b) 0.1256 T
 c) 0.5024 T
 d) 0.0628 T
95. A square loop of side 0.05 m carrying 6 A is placed in a magnetic field of 0.5 T perpendicular to its plane. The torque is:
 a) 0.0075 N m
 b) 0.015 N m
 c) 0.03 N m
 d) 0.06 N m
96. The magnetic moment of a current loop depends on:
 a) Current and area only
 b) Magnetic field strength
 c) Permeability of the medium
 d) Temperature of the loop
97. An electron moves at $3 \times 10^6\text{ m/s}$ perpendicular to a magnetic field of 0.3 T . The magnetic force on the electron is:
 a) $1.44 \times 10^{-13}\text{ N}$
 b) $2.88 \times 10^{-13}\text{ N}$
 c) $7.2 \times 10^{-14}\text{ N}$
 d) $4.8 \times 10^{-13}\text{ N}$
98. The magnetic field at a point 0.2 m along the axis of a circular coil of 50 turns, radius 0.05 m , and current 2 A is:
 a) $3.14 \times 10^{-5}\text{ T}$
 b) $1.57 \times 10^{-5}\text{ T}$
 c) $6.28 \times 10^{-5}\text{ T}$
 d) $2.51 \times 10^{-5}\text{ T}$
99. The magnetic field lines of a bar magnet:
 a) Originate from the south pole
 b) Are denser at the equator
 c) Are denser near the poles
 d) Do not intersect
100. A ferromagnetic material loses its magnetism completely when heated to:
 a) Melting point
 b) Curie temperature
 c) Absolute zero
 d) Critical temperature

Answer Key

1. c	11. b	21. b	31. a	41. b	51. a	61. c	71. a	81. b	91. a
2. a	12. b	22. b	32. a	42. a	52. a	62. a	72. b	82. a	92. a
3. a	13. a	23. a	33. b	43. a	53. a	63. b	73. a	83. b	93. b
4. a	14. b	24. b	34. a	44. a	54. a	64. a	74. c	84. a	94. a
5. a	15. c	25. b	35. b	45. c	55. a	65. b	75. b	85. a	95. b
6. a	16. a	26. b	36. b	46. a	56. b	66. a	76. b	86. a	96. a
7. a	17. d	27. a	37. a	47. a	57. b	67. a	77. b	87. a	97. a
8. a	18. b	28. c	38. c	48. c	58. a	68. b	78. b	88. c	98. a
9. d	19. c	29. a	39. a	49. b	59. b	69. a	79. b	89. b	99. c
10. a	20. b	30. a	40. b	50. b	60. a	70. b	80. b	90. a	100. b