Magnetism and Matter

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. A bar magnet of magnetic moment 2 A m^2 makes 150° with a uniform field of 6×10^{-2} T. The torque on it is:

(a) 6×10^{-4} N m **(b)** 0.12 N m **(c)** 0 N m **(d)** 0.06 N m

2. The magnetic field 20 cm from the centre of a short bar magnet of moment 9 A m^2, on its axis, is: ($\mu_0 = 4\pi \times 10^{-7}$ T m/A)

(a) 1.125×10^{-4} T **(b)** 2.25×10^{-6} T **(c)** 2.25×10^{-4} T **(d)** 4.5×10^{-3} T

3. A magnet of moment 2 A m^2 makes 90° with a field of 2×10^{-2} T. Its potential energy is:

(a) 0.04 J **(b)** −0.02 J **(c)** −0.04 J **(d)** 0 J

4. The work needed to turn a magnet of moment 8 A m^2 from 0° to 180° with a field of 6×10^{-2} T is:

(a) 0.96 J **(b)** 1.92 J **(c)** −0.96 J **(d)** 0.48 J

5. The magnetic field lines of a bar magnet:

(a) stop at the surface **(b)** form closed loops
(c) start at N and end at S only **(d)** cross each other at the poles

6. A material has susceptibility $\chi = -6 \times 10^{-4}$. Its relative permeability and type are:

(a) 0.9994, diamagnetic **(b)** -6×10^{-4}, ferromagnetic
(c) 0.9994, paramagnetic **(d)** 1.0006, diamagnetic

7. Water is:

(a) non-magnetic in every field **(b)** paramagnetic
(c) diamagnetic **(d)** ferromagnetic

8. Assertion (A): A material with susceptibility -6×10^{-5} is paramagnetic.
Reason (R): Diamagnetic materials have a small negative susceptibility.

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. A coil of 226 turns and area 26 cm^2 carries 1 A. Find its magnetic moment and the largest torque on it in a field of 9×10^{-2} T.

10. A short bar magnet has moment 8 A m^2. Find the field 5 cm from its centre (a) on its axis, (b) on its equatorial line. ($\mu_0 = 4\pi \times 10^{-7}$ T m/A)

11. A magnet of moment 7 A m^2 lies in a field of 9×10^{-2} T. Find the work done in turning it from 0° to 120° with the field.

12. A magnet of moment 7 A m^2 is in a field of 9×10^{-2} T. Find its potential energy when it points along the field and when it points against it. Which position is stable?

13. A solenoid of 629 turns, radius 5 cm, carries 4 A. Find its magnetic moment.

14. A bar magnet of volume 85 cm^3 has magnetic moment 8 A m^2. Find its magnetisation.

15. A core of relative permeability 1800 sits in a magnetising field H = 100 A/m. Find the magnetic field B in the core. ($\mu_0 = 4\pi \times 10^{-7}$ T m/A)

16. A magnet of moment 4 A m^2 is in a field of 3×10^{-2} T. Find the torque on it at 30° and at 90° to the field.

Section C — Word problems — 4 × 4 = 16 marks

17. A short bar magnet of moment 1 A m^2 lies along the x-axis with its centre at the origin. Find the field at (20 cm, 0) and at (0, 20 cm), and the ratio of the two. ($\mu_0 = 4\pi \times 10^{-7}$ T m/A)

18. A magnet of moment 9 A m^2 is in a field of 2×10^{-2} T. Find the work done to turn it (a) from along the field to 90°, (b) from along the field to against it. Also find the torque at 90°.

19. A solenoid of 834 turns and radius 4 cm carries 5 A. It is free to turn in a horizontal field of 8×10^{-2} T. Find its magnetic moment and the torque on it when its axis makes 30° with the field.

20. An iron core has relative permeability 1100 and is placed in a magnetising field of 800 A/m. Find its susceptibility, its magnetisation and the magnetic field in it. ($\mu_0 = 4\pi \times 10^{-7}$ T m/A)

Want another sheet on this chapter? In the Ambiful Worksheets app every sheet is new, with its answer key, and your child never gets the same question twice.

Scan the code to get the free app, or open **worksheets.ambiful.com/get**

Answer key

Magnetism and Matter · AW-12P-MAM-2026-V1 · For parents — fold back or tear off before handing the sheet to your child.

Q	Answer	Working
1	**(d) 0.06 N m**	$\tau = mB \sin\theta$
2	**(c) 2.25×10^{-4} T**	$B = (\mu_0/4\pi) \times 2m/r^3$
3	**(d) 0 J**	$U = -mB\cos\theta$
4	**(a) 0.96 J**	$W = mB(\cos\theta_1 - \cos\theta_2)$
5	**(b) form closed loops**	—
6	**(a) 0.9994, diamagnetic**	$\mu r = 1 + \chi$
7	**(c) diamagnetic**	small negative χ
8	**(d) A is false, but R is true.**	A is false: a small negative susceptibility marks a diamagnetic material. R is true.
9	**0.5876 A m^2; 0.052884 N m**	$m = NIA$; $\tau max = mB$
10	**(a) 0.0128 T; (b) 6.4×10^{-3} T**	axis: $2m/r^3 \times 10^{-7}$; equator: $m/r^3 \times 10^{-7}$
11	**0.945 J**	$W = mB(\cos 0° - \cos 120°)$
12	**along: −0.63 J (stable); against: 0.63 J (unstable)**	$U = -mB\cos\theta$
13	**6.29π A m^2**	$m = NIA = 629 \times 4 \times \pi(5 \times 10^{-2})^2$
14	**9.41×10^4 A/m**	$M = m/V = 8 \div (85 \times 10^{-6})$
15	**$7.2\pi \times 10^{-2}$ T**	$B = \mu_0 \mu r H$
16	**0.06 N m; 0.12 N m**	$\tau = mB \sin\theta$
17	**2.5×10^{-5} T along the axis; 1.25×10^{-5} T, opposite to the moment; ratio 2 : 1**	$B(axis) = 2m/r^3 \times 10^{-7}$, $B(equator) = m/r^3 \times 10^{-7}$
18	**(a) 0.18 J; (b) 0.36 J; torque 0.18 N m**	$W = mB(\cos\theta_1 - \cos\theta_2)$
19	**m = 6.672π A m^2; τ = $2.6688\pi \times 10^{-1}$ N m**	$m = NI\pi r^2$; $\tau = mB\sin\theta$
20	**χ = 1099; M = 8.792×10^5 A/m; B = $3.52\pi \times 10^{-1}$ T**	$\chi = \mu r - 1$; $M = \chi H$; $B = \mu_0 \mu r H$

Ambiful Worksheets · worksheets.ambiful.com · Not affiliated with CBSE / NCERT AW-12P-MAM-2026-V1 · Page 4