What is a Magnetic Field?

Worksheet

A magnetic field, B, describes the strength and direction of magnetic influence at a point, measured in tesla (T). Around a long straight wire, B = I / (2r).

B = @frac{@mu_0 I}{2@pi r}

Questions

1. What is the unit of magnetic field strength?

A) Newton
B) Tesla
C) Weber
D) Ohm

2. As distance from a current-carrying wire doubles, the magnetic field

A) doubles
B) stays the same
C) halves
D) quadruples

3. What determines the direction of a magnetic field around a wire?

A) Wire color
B) The right-hand rule
C) Wire length
D) Wire material only

4. What produces a magnetic field?

A) Any electric charge, moving or not
B) Only permanent magnets
C) Moving electric charges (currents) and magnets
D) Only static electricity

5. A long straight wire carries 5 A. Find the magnetic field at 0.02 m from the wire.

6. A wire carries 10 A. Find the magnetic field 0.1 m away.

7. A wire carries 15 A. Find the magnetic field 0.03 m away.

8. Define: What creates a magnetic field?

9. Define: What is the unit of magnetic field strength?

10. Define: What happens to field strength as distance from a wire increases?

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Answer Key

1. B) Tesla - Magnetic field strength is measured in tesla (T).
2. C) halves - B is inversely proportional to r, so doubling r halves B.
3. B) The right-hand rule - The right-hand rule gives the field's circular direction around the current.
4. C) Moving electric charges (currents) and magnets - Magnetic fields come from moving charges (currents) and from magnets.
5. B = I / (2r) B = (210 5) / 0.02 B = 0.00005 T = 50 T
6. B = (210 10) / 0.1 B = 0.00002 T = 20 T
7. B = (210 15) / 0.03 B = 0.0001 T = 100 T
8. Moving electric charges - including current in a wire - and permanent magnets.
9. The tesla (T); smaller fields are often given in microtesla (T).
10. It decreases - field strength is inversely proportional to distance (B 1/r).

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