

12. Magnetic Fields and Electromagnetism

Starter Quiz · 课前小测

AP Physics C: Electricity and Magnetism

Name: _____ Score: _____

1. Outside a bar magnet, the field lines run:

- ☐ from S to N
- ☐ from N to S
- ☐ straight up
- ☐ in no particular direction

2. A magnetic field exerts a force on a charge only when the charge is:

- ☐ at rest
- ☐ moving
- ☐ positive
- ☐ very large

3. The magnetic field around a long straight wire forms:

- ☐ straight lines pointing away
- ☐ circles around the wire
- ☐ a uniform field
- ☐ no field at all

4. In Ampère's law, the field summed around a loop equals:

- ☐ the enclosed charge over ε_0
- ☐ μ_0 times the enclosed current
- ☐ zero always
- ☐ the total current in the universe

5. The SI unit of magnetic field strength is the _____.

6. A 3 C charge moves at 4 m/s across a 2 T field ($\theta = 90^\circ$). Find F (in N).

_____ N

7. The straight-wire field strength falls off with distance as:

- ☐ $1/r^2$
- ☐ $1/r$

☐ it stays constant

☐ $1/r^3$

8. A current outside an Amperian loop contributes nothing to the line integral of B.

☐ True ☐ False

9. A charge moving exactly along the field ($\theta = 0$) feels no magnetic force.

☐ True ☐ False

10. A current-carrying wire produces its own magnetic field.

☐ True ☐ False

AP Physics C: Electricity and Magnetism1. **from N to S**

Outside, field lines run from the north pole to the south pole.

2. **moving**

The magnetic force $F = qvB$ needs a nonzero velocity.

3. **circles around the wire**

Field lines circle the wire; $B = \mu_0 I / 2\pi r$.

4. μ_0 **times the enclosed current**

$$\oint \vec{B} \cdot d\vec{\ell} = \mu_0 I_{\text{enc}}.$$

5. **tesla**

Magnetic field B is measured in tesla (T).

6. **24 N**

$$F = qvB = 3 \times 4 \times 2 = 24 \text{ N}.$$

7. $1/r$

$$B = \mu_0 I / 2\pi r \text{ — a } 1/r \text{ falloff.}$$

8. **True**

Only the enclosed current counts; outside current cancels around the loop.

9. **True**

$$\sin 0 = 0, \text{ so } F = qvB \sin \theta = 0.$$

10. **True**

Oersted showed a current deflects a compass — it makes a field.