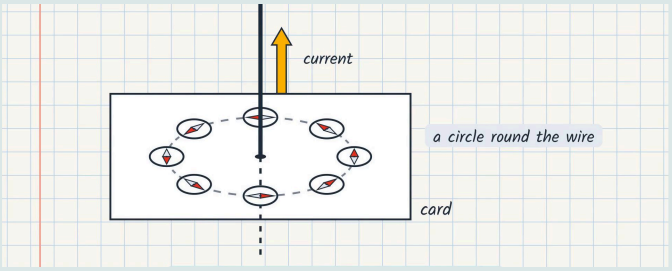
Electromagnetism

Wires, solenoids and electromagnets

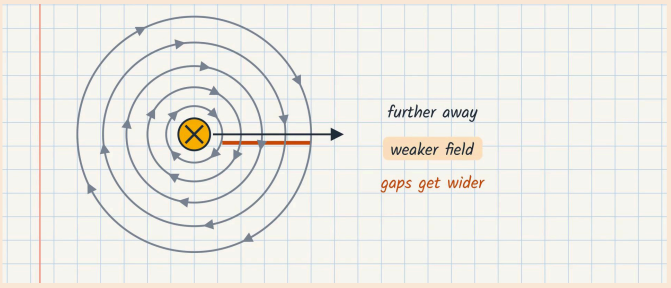
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Summary sheet

1 A current makes a field



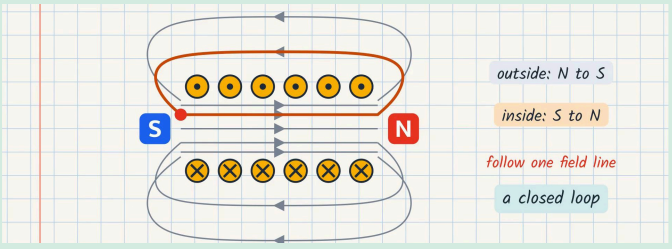
- A compass needle near a wire swings when the current is switched on, and swings back when it is switched off.
- Compasses round a wire passing through a card line up in a **circle**: a **current makes a magnetic field**.

2 The field around a wire



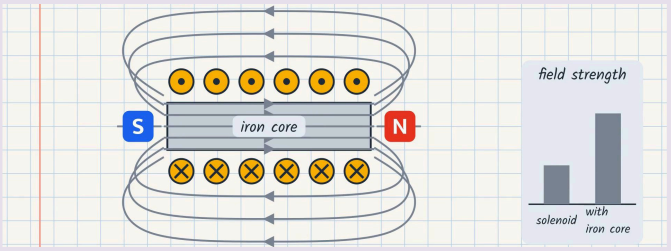
- The field lines are **circles centred on the wire**. Reverse the current and the field reverses.
- A **bigger current** makes a **stronger** field; the field is **weaker further from the wire**. Helper: right-hand grip (thumb along the current, fingers show the field).

3 The solenoid



- A **solenoid** is a coil of wire. The fields of every turn add up, so the field is much **stronger**; more turns make it stronger still.
- Inside: **strong and uniform** (straight, parallel, evenly spaced lines). Outside: the same shape as a **bar magnet**. Lines run S to N inside, making closed loops.

4 The electromagnet



- An **electromagnet** is a solenoid with an **iron core**. The core becomes an **induced magnet**, so the total field is much stronger.
- Switch off the current and the magnetism goes, so a scrapyard crane can drop a car.

Exam tip

Asked how to make an electromagnet stronger? Give a full answer: "Increase the current, or add more turns, or add an iron core, so the magnetic field is stronger."

Check yourself

- 1 What shape are the field lines around a straight wire?
- 2 Describe the field inside a solenoid.

Answers: 1. Circles centred on the wire 2. Strong and uniform