

12 Magnetic fields from currents – Part 2

Name: _____ Class: _____ Date: _____

Recall

In Part A a magnetic field pushed on a moving charge. Now the reverse link:

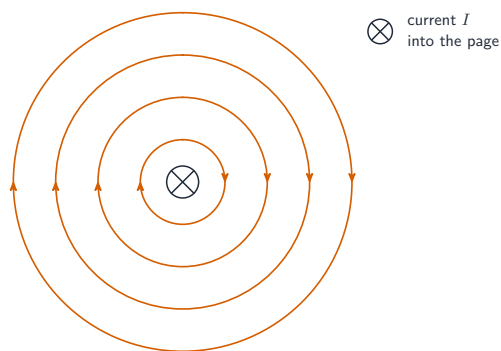
- A current does not just feel magnetic forces – it **creates** a magnetic field.
- This is how electromagnets work.

Each idea has a worked example before the Practice.

New ideas

■ 1 A current makes a field

A current in a straight wire creates a magnetic field that **circles around** the wire.



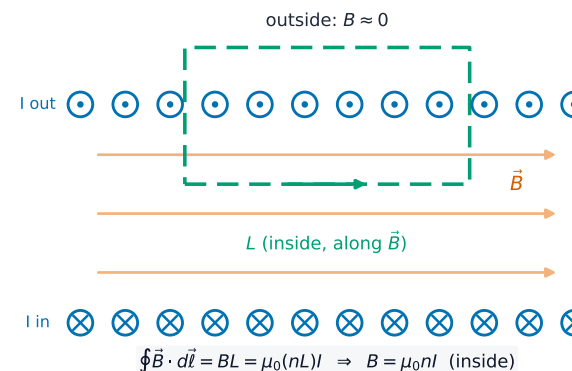
circular field lines (right-hand grip rule)

■ 2 Stronger with more current

The field is stronger with a bigger current and weaker further from the wire.

■ 3 Coils and solenoids

Winding the wire into a coil (a **solenoid**) makes the fields add up, giving a strong, uniform field inside – just like a bar magnet.



■ 4 Electromagnets

Because the field comes from the current, you can **switch it off** by cutting the current – the basis of electromagnets used in scrapyards and doorbells.

Watch out: the magnetic field circles **around** the wire, not along it. The field lines form closed loops around the current, so there is no “north end” of a straight wire.

Practice

Try these in order. The methods are all above.

2.1 State the shape of the magnetic field around a straight current-carrying wire. [2]

2.2 State two things that make the field around a wire stronger. [2]

2.3 State what a solenoid produces inside it. [2]

2.4 State one advantage of an electromagnet over a permanent magnet. [2]

2.5 Give one everyday device that uses an electromagnet. [1]
