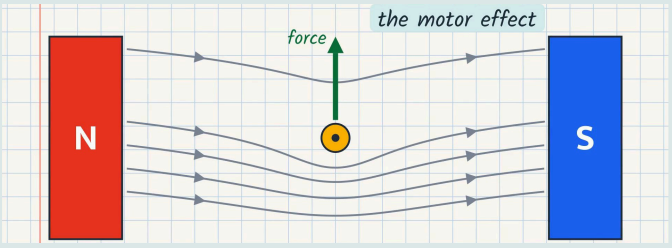
The motor effect

Fleming's left-hand rule and F = BIℓ

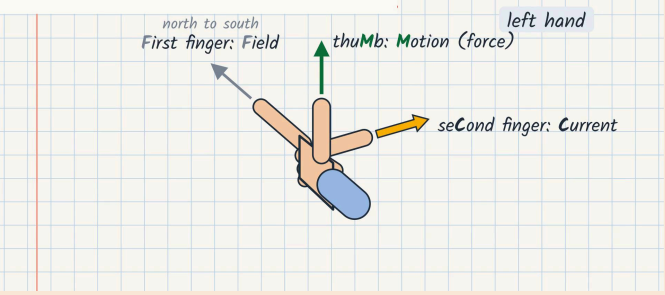
sansara academy
Summary sheet

1 The motor effect



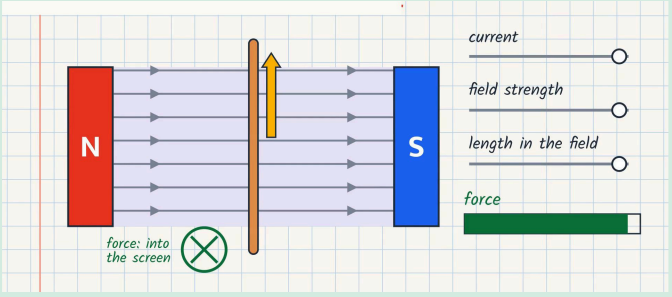
- A current makes its own magnetic field. It pushes on the magnet's field: the fields add on one side and cancel on the other.
- The **motor effect**: a current-carrying wire in a magnetic field feels a force (and the magnet feels an equal force the other way).

2 Fleming's left-hand rule



- Left hand, three fingers at right angles: **F**irst finger = **F**ield (N to S), se**C**ond finger = **C**urrent, thu**M**b = **M**otion (force).
- Reverse the current **or** the field and the force reverses. Cross = into the screen, dot = out of the screen.

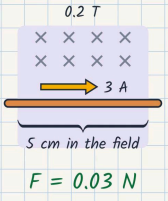
3 What changes the force



- A bigger **current**, a stronger **magnetic field** or a longer **length of wire** in the field gives a bigger force.
- The force is biggest when the wire is at right angles to the field, and zero when the wire runs along the field.

4 F = B I ℓ

Knowns	I = 3 A, B = 0.2 T, ℓ = 5 cm
Convert	ℓ = 5 cm = 0.05 m
Equation	F = B I ℓ
Substitute	F = 0.2 × 3 × 0.05
Answer	F = 0.03 N



- **F = B I ℓ** (wire at right angles to the field): force in N, magnetic flux density in T (tesla), current in A, length in m. On the equation sheet.
- Change the length into metres first; to find B, rearrange: B = F ÷ (I ℓ).

Exam tip

Asked how to make the wire move more? Finish the answer: "Increase the current, so the force on the wire increases."

Check yourself

1. What does your second finger show in Fleming's left-hand rule?
2. A 0.4 m wire carries 2 A in a 0.5 T field. What is the force?

Answers: 1. The current 2. F = 0.5 × 2 × 0.4 = 0.4 N