A-LEVEL PHYSICS • EXERCISE SHEET

# 20.1 Concept of a magnetic field

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

## Objective

Build the skills to answer exam questions on the **magnetic field** —its sources and field lines.

**You must be able to:**

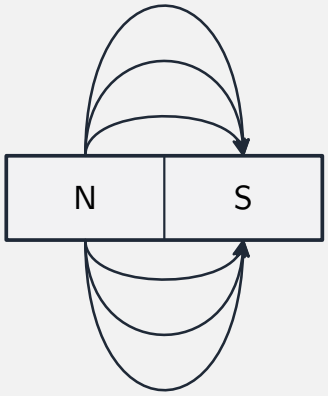
- state what produces a magnetic field
- represent a magnetic field with **field lines**

## 1 Worked examples

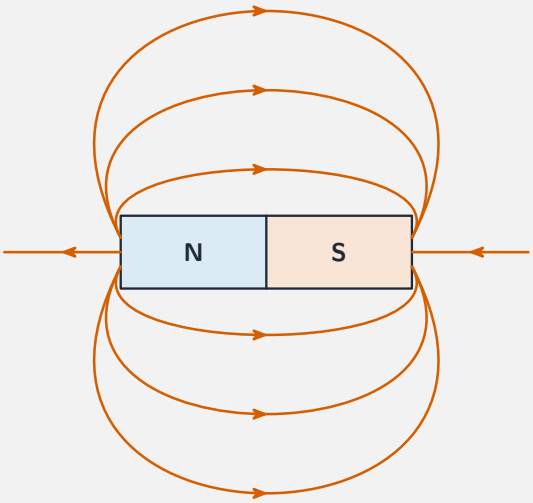
Study these first. Each one shows the method for a question type used later —follow the steps and you can do the Practice and Exam-style questions yourself.

### Magnetic fields

A **magnetic field** is a region where a moving charge or current feels a force. It is produced by **moving charges (currents)** or **permanent magnets**.



field lines run from **N** to **S** outside the magnet




*The field of a bar magnet*

- field lines run **N to S** outside a magnet (closed loops);
- they **never cross**; **closer lines → stronger field**.

## 2 Practice

Now apply the methods above.

**2.1** State **two** things that can produce a magnetic field. [1]

**2.2** State the direction of the field lines **outside** a bar magnet. [1]

**2.3** State what **closer** field lines indicate. [1]

## 3 Exam-style questions

**3.1** Magnetic field lines **outside** a bar magnet point from: [1]

- **A** S to N
- **B** N to S

- **C** N to N
- **D** nowhere

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**3.2** Sketch the magnetic field lines around a bar magnet. [2]

**3.3** State **two** ways a magnetic field can be produced. [2]

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## 4 Go further

You are now ready for the real exam questions on this subtopic. Open the **20.1 Concept of a magnetic field** past-paper sheet in the Library, or try this in **Practice mode**:

- 9702/44 J25 —Q6 (magnetic field and the motor effect)

The magnetic field also runs through the **20.2 Force on a current-carrying conductor** and **20.4 Magnetic fields due to currents** sheets, so practise those too.

## Solutions

**2.1 Moving charges (currents)** and **permanent magnets**.

**2.2** From **N to S**.

**2.3** A **stronger** magnetic field.

**3.1 B** —N to S.

**3.2** Curved lines from **N to S** outside the magnet; closer together near the **poles**.

**3.3** A **current** (moving charges) in a wire; a **permanent magnet**.