

# 12.1 Magnetic Fields

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 8 marks

KEY WORDS magnetic field 磁场

## Objective

Build the skills to answer exam questions on **magnetic fields**.

You must be able to:

- describe a **magnetic field** 磁场  $\vec{B}$  as a vector field from magnets and moving charges
- draw magnetic field lines, noting they form **closed loops** with no isolated poles
- use a compass or the right-hand rule to find the field direction around a magnet

## 1 Worked examples

Study these first. Each one shows the method for a question type used later.

### ■ The magnetic field

$\vec{B}$  is a vector field, measured in tesla (T), produced by magnets and by moving charges (currents).

### ■ Field lines

Magnetic field lines form **closed loops**, leaving the north pole and entering the south. There are **no isolated poles** (no magnetic monopoles).

### ■ Finding the direction

A compass needle lines up with the field; the right-hand rule gives the field around a current.

## 2 Practice

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

2.2 State whether magnetic field lines are open or closed. [1]

2.3 State why isolated magnetic poles (monopoles) are never found. [1]

## 3 Exam-style questions

3.1 Magnetic field lines [1]

- |   |   |
|---|---|
| A | B |
| C | D |
- A start and end on charges
  - B form closed loops
  - C are always straight
  - D do not exist

3.2 A magnetic field can be produced by [1]

- |   |   |
|---|---|
| A | B |
| C | D |
- A a stationary charge
  - B a moving charge
  - C a neutral atom at rest
  - D none of these

3.3 A bar magnet is cut in half.

(a) State what each half becomes. [1]

(b) Explain your answer in terms of magnetic poles. [2]