

20 The magnetic field – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
magnetic field	磁场	_____
Field lines	场线	_____
solenoid	螺线管	_____

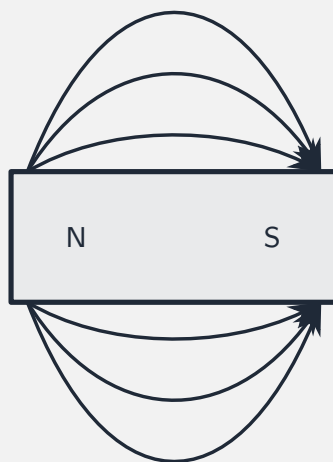
Recall

A **magnetic field** 磁场 is a region where a moving charge or a current feels a force. It is made by magnets or by currents.

New ideas

Read these first. Each idea has a short worked example. Then do the Practice.

■ 1 A bar magnet



lines run from N to S

Field lines 场线 run from N to S outside a magnet (and form closed loops). Closer lines mean a stronger field.

Worked example. Place small compasses around a bar magnet. Each needle lines up with the field, pointing along the lines from the N pole round to the S pole —so the compasses trace out the field pattern.

■ 2 A solenoid



uniform field inside

A **solenoid** 螺线管 (a coil) makes a nearly uniform field inside, like a stretched bar magnet. An iron core makes it much stronger.

Worked example. Switch a current through a solenoid and it behaves like a bar magnet with a N and a S end. Reverse the current and the two poles swap over.

Watch out: field lines run from N to S *outside* the magnet (and S to N *inside*), and they never cross.

Practice

Try these in order.

20.1 What is a *magnetic field*? [1]

20.2 Which way do field lines run outside a magnet? [1]

20.3 What does closer spacing of field lines mean? [1]

20.4 What is the field like *inside* a solenoid? [1]

20.5 What does adding an iron core do to the field? [1]

20.6 Explain how a solenoid can make an electromagnet that switches on and off, and give one advantage of this over a bar magnet. [2]

20.7 Challenge. A compass is held next to a straight wire. When the current is switched on, the compass needle moves. Explain what this shows about an electric current. [2]
