

20 Force on a current – Part 2

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 flux den- sity	磁通密度	_____
Fleming's hand rule	left- 左手定则	_____

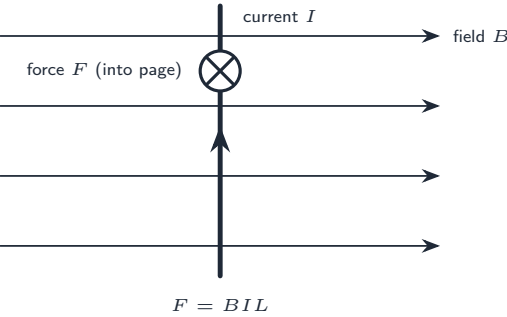
Recall

When a current flows across a magnetic field, the wire feels a force. This is how electric motors work.

New ideas

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

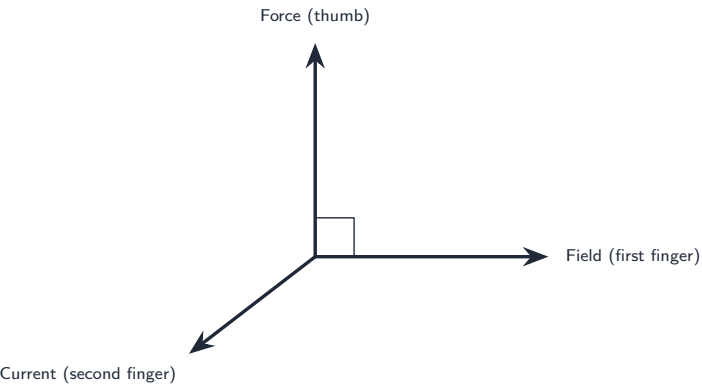
■ 1 The force on a wire



A wire of length L carrying current I across a field of **magnetic flux density** 磁通密度 B feels a force $F = BIL$ (when the wire is at right angles to the field).

Worked example. A wire 0.10 m long carries 3.0 A at right angles to a field $B = 0.20$ T: $F = BIL = 0.20 \times 3.0 \times 0.10 = 0.060$ N.

■ 2 Which way?



Fleming's left-hand rule 左手定则 gives the direction: thumb = Force, first finger = Field, second finger = Current — all at right angles.

Worked example. Field points right, current points away from you. Set your left hand so the first finger points right and the second finger points away — your thumb then points up, the direction of the force.

Watch out: $F = BIL$ holds only when the wire is at right angles to the field. If the wire lies *along* the field, the force is zero.

Practice

Try these in order.

20.1 Write the formula for the force on a current-carrying wire. [1]

20.2 In $F = BIL$, what does B stand for? [1]

20.3 A wire ($L = 0.5$ m, $I = 2$ A) is in a field $B = 0.3$ T at right angles. Find the force. [2]

20.4 In *Fleming's left-hand rule*, what does the thumb show? [1]

20.5 What does the first finger show? [1]

20.6 A wire carries a current *parallel* to the magnetic field, not across it. Explain what force it feels. [2]

20.7 Challenge. Explain how the force on a current-carrying wire is used to make a simple electric motor turn. [2]
