

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 density	磁通密度	_____
Fleming's left-hand rule	左手定则	_____

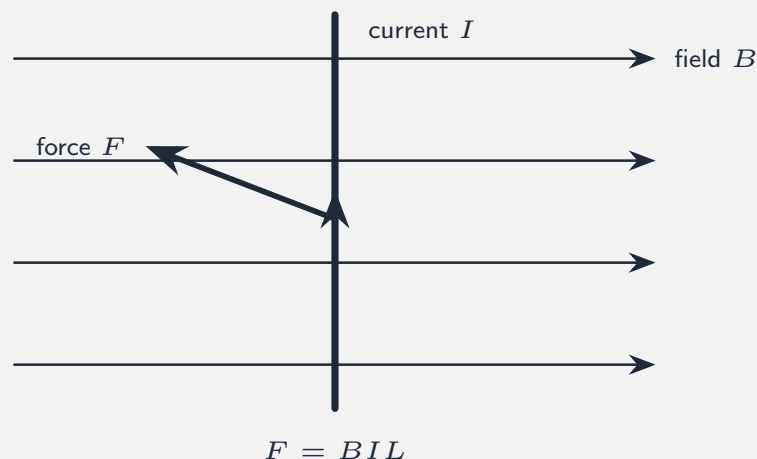
Recall

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.

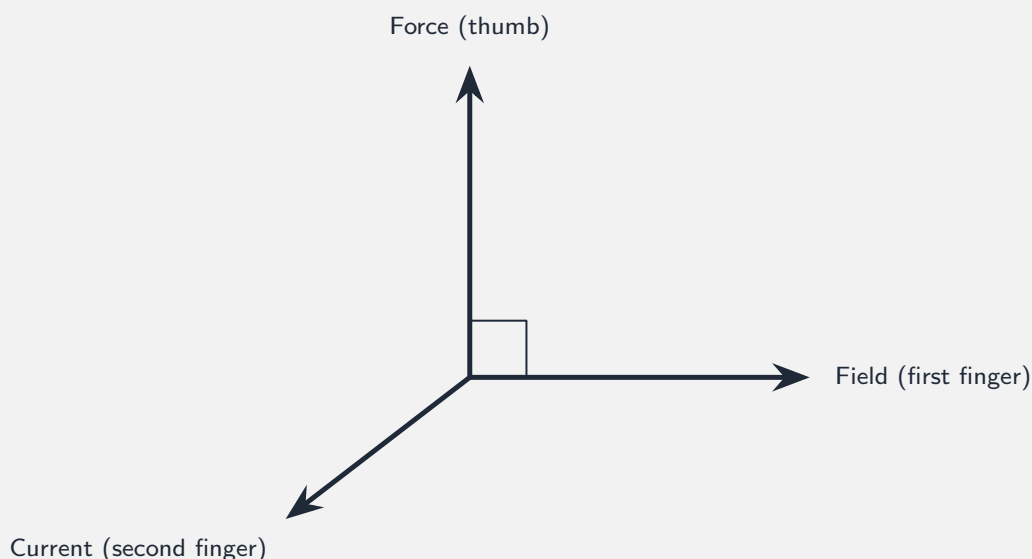
■ 1 The force on a wire



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]
