AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.7.2.2

# Fleming's left-hand rule (HT only)

## Past-paper questions

| | |
|---|---|
| Tier | **Higher** |
| Question groups | **5** |
| Available paper years | **2019–2023** |

## Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

**Name:** _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

### 6.7.2.2 Fleming's left-hand rule (HT only)

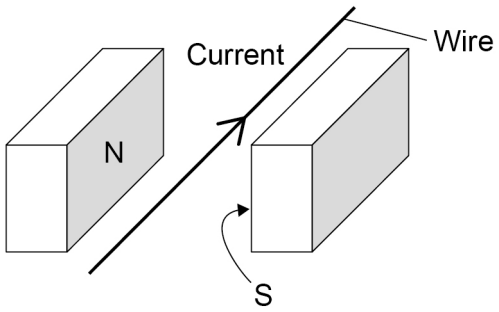
**Question 01**

June 2019 | 8464/P/2H | Original Q4

**0 4** **Figure 6** shows a wire in a magnetic field.

The direction of the current in the wire is shown.

**Figure 6**

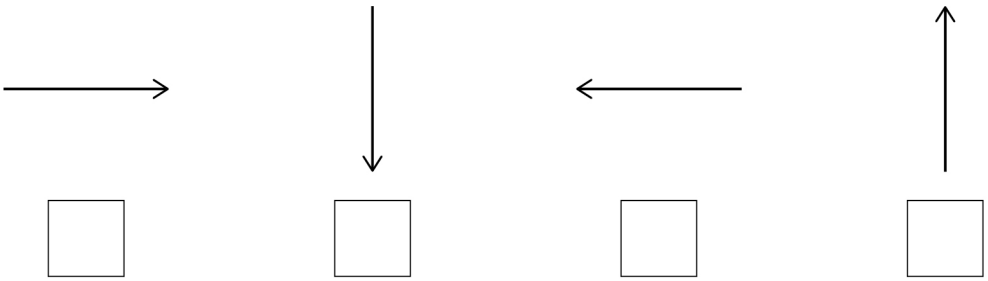



**0 4 . 1** There is a force on the wire due to the current in the magnetic field.

In which direction is the force on the wire?

**[1 mark]**

Tick (✓) **one** box.



**0 4 . 2** Give **two** ways that the direction of the force on the wire could be reversed.

**[2 marks]**

1 _____

2 _____

**Question 4 continues on the next page**

6.7.2.2 Fleming's left-hand rule (HT only)

Question 01 · continued



**0 4 . 3** The length of the wire in the magnetic field is 0.050 m

The force on the wire is 0.072 N

magnetic flux density = 360 mT

Calculate the current in the wire.

Use the Physics Equations Sheet.

**[4 marks]**

Current = _____ A

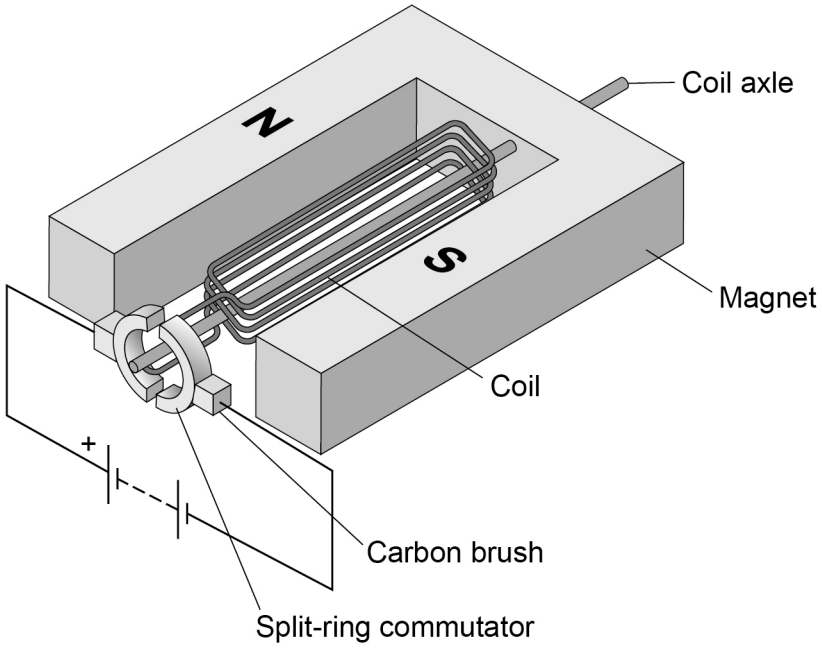
6.7.2.2 Fleming's left-hand rule (HT only)

Question 01 · continued



**0 4 . 4** **Figure 7** shows a simple motor.

**Figure 7**




Explain why the coil rotates when there is a current in the coil.

**[4 marks]**

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### 6.7.2.2 Fleming's left-hand rule (HT only)

**Question 02**

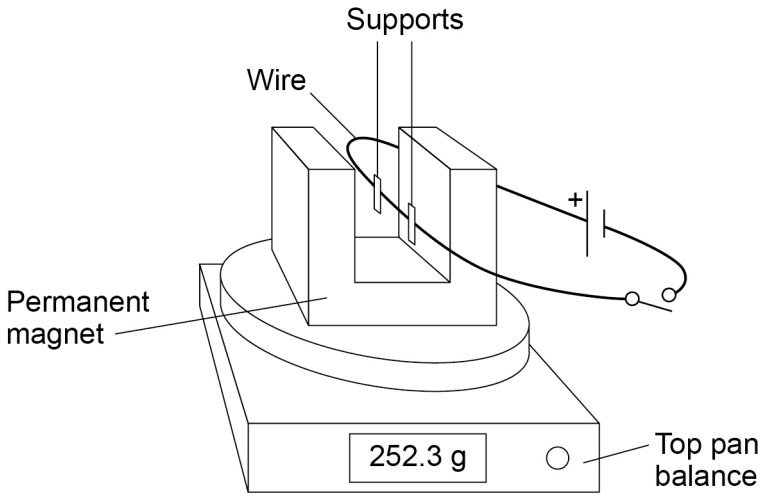
November 2020 | 8464/P/2H | Original Q7

**0 7** A student clamped a wire between the poles of a permanent magnet.

The student investigated how the force on the wire varied with the current in the wire.

**Figure 13** shows the equipment used.

**Figure 13**




The top pan balance was used to determine the force on the wire.

**0 7 . 1** When the switch was closed the reading on the top pan balance increased.

Explain why the increased reading showed that there was an upward force on the wire.

**[2 marks]**

6.7.2.2 Fleming's left-hand rule (HT only)

Question 02 · continued



**0 7 . 2** **Table 3** shows the readings on the top pan balance with the switch open and with the switch closed.

**Table 3**

| Switch | Mass in grams |
|---|---|
| Open | 252.3 |
| Closed | 254.8 |

Explain how the values in **Table 3** can be used to determine the size of the force on the wire.

**[2 marks]**

**Question 7 continues on the next page**

6.7.2.2 Fleming's left-hand rule (HT only)

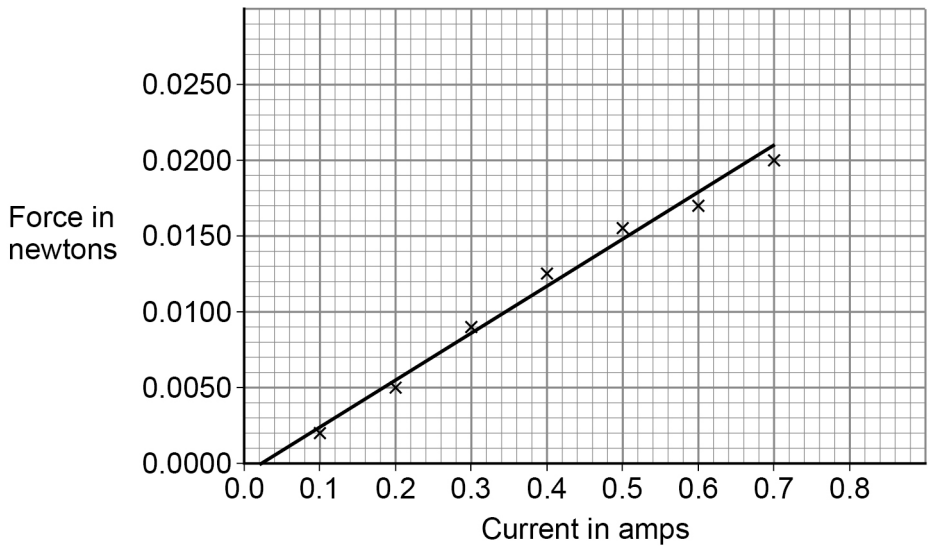
Question 02 · continued



**0 7 . 3** The student varied the current in the wire and calculated the force acting on the wire.

**Figure 14** shows the results.

**Figure 14**




The length of the wire in the magnetic field was 0.125 m

Determine the magnetic flux density.

**[4 marks]**

Magnetic flux density = _____ T

8

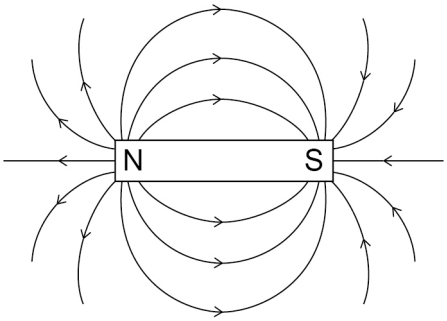
### 6.7.2.2 Fleming's left-hand rule (HT only)

**Question 03**

November 2021 | 8464/P/2H | Original Q4

**0 4** **Figure 4** shows the magnetic field pattern around a permanent magnet.

**Figure 4**




**0 4 . 1** Where is the magnetic field of the magnet the strongest?

**[1 mark]**

**0 4 . 2** How does **Figure 4** show that the strength of the magnetic field is not the same at all places?

**[1 mark]**

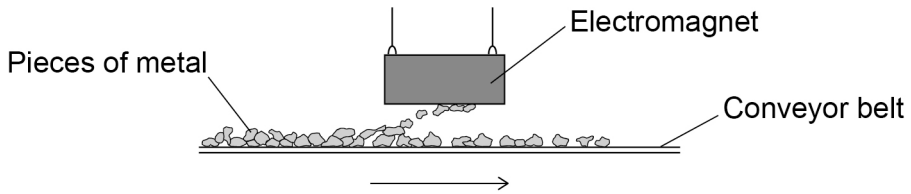
6.7.2.2 Fleming's left-hand rule (HT only)

Question 03 · continued



**Figure 5** shows an electromagnet being used to separate iron and steel from non-magnetic metals.

**Figure 5**




**0 4 . 3** Explain **one** reason why an electromagnet is used instead of a permanent magnet.

**[2 marks]**

**0 4 . 4** Pieces of iron and steel are attracted to the electromagnet.

Name **two** other metals that would be attracted to the electromagnet.

**[2 marks]**

1 _____

2 _____

**0 4 . 5** The design of the electromagnet **cannot** be changed.

Give **two** ways the force exerted by the electromagnet on a piece of iron or steel could be increased.

**[2 marks]**

1 _____

2 _____

### 6.7.2.2 Fleming's left-hand rule (HT only)

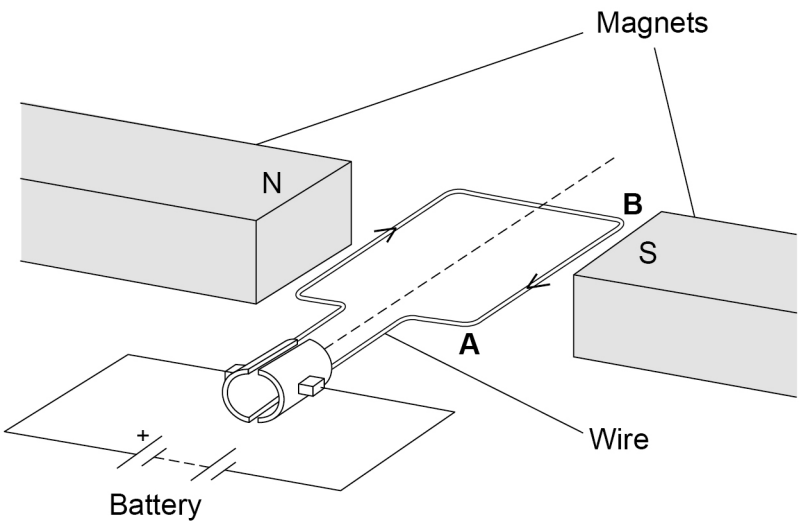
**Question 03 · continued**



The conveyor belt that moves the pieces of metal is driven by an electric motor.

**Figure 6** shows a simple electric motor.

**Figure 6**



6.7.2.2 Fleming's left-hand rule (HT only)

Question 03 · continued



**0 4 . 6** The length of the wire **AB** in the magnetic field is 120 mm.

There is a current of 4.0 A in the wire. The length of wire **AB** experiences a force of 0.36 N.

Calculate the magnetic flux density between the magnets.

Give the unit.

**[5 marks]**

Magnetic flux density = _____ Unit _____

**Question 4 continues on the next page**

6.7.2.2 Fleming's left-hand rule (HT only)

Question 03 · continued

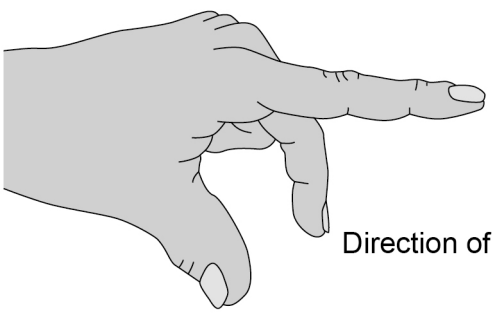


**0 4 . 7** Fleming's left-hand rule can be used to determine the direction of the force on wire **AB**.

Complete the labels on **Figure 7** to show Fleming's left-hand rule.

**[2 marks]**

**Figure 7**



Direction of _____

Direction of _____

Direction of _____

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### 6.7.2.2 Fleming's left-hand rule (HT only)

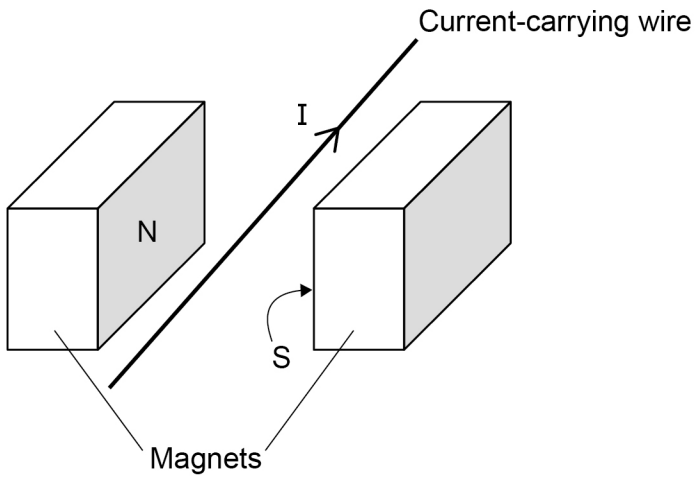
**Question 04**



**0 4** A teacher demonstrated the motor effect.

**Figure 5** shows the equipment used.

**Figure 5**




**0 4 . 1** Explain why there is a force on the wire when there is a current in the wire.

**[2 marks]**

**0 4 . 2** Explain how the direction of the force on the wire can be predicted.

**[3 marks]**

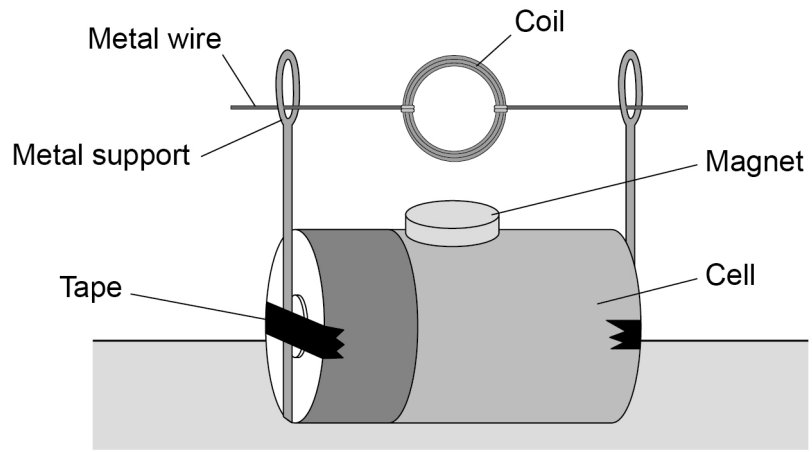
6.7.2.2 Fleming's left-hand rule (HT only)

Question 04 · continued



**0 4 . 3** **Figure 6** shows a simple electric motor.

**Figure 6**




Explain **one** way that the motor could be changed to increase the rate at which the coil rotates.

**[2 marks]**

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### 6.7.2.2 Fleming's left-hand rule (HT only)

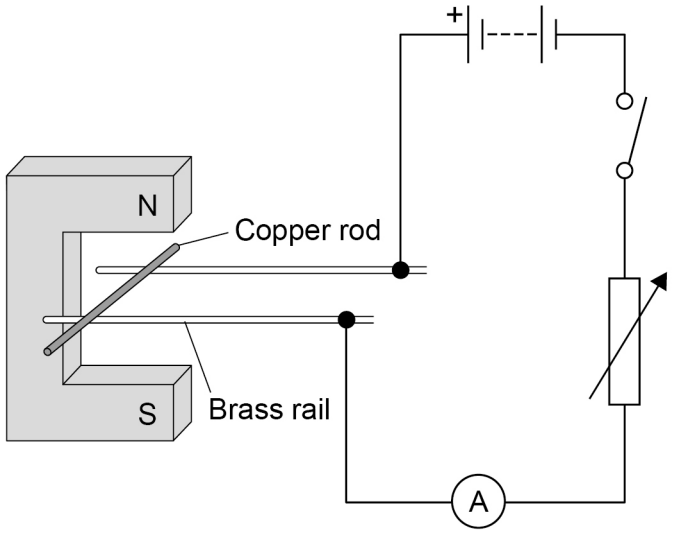
**Question 05**



**0 4** A teacher demonstrated the motor effect.

**Figure 5** shows the equipment used. The equipment includes a permanent magnet.

**Figure 5**




**0 4 . 1** The copper rod remains stationary while the switch is open.

Complete the sentence.

**[1 mark]**

The tendency for an object to remain stationary is

called _____ .

6.7.2.2 Fleming's left-hand rule (HT only)

Question 05 · continued

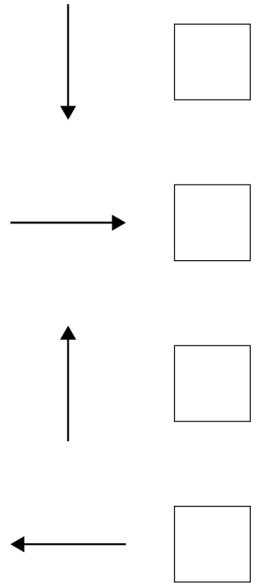


When the switch is closed the copper rod accelerates.

**0 4 . 2** In which direction will the copper rod accelerate?

**[1 mark]**

Tick (✓) **one** box.



**0 4 . 3** Explain **one** way the teacher could increase the acceleration of the copper rod.

**[2 marks]**

**Question 4 continues on the next page**

6.7.2.2 Fleming's left-hand rule (HT only)

Question 05 · continued



**0 4 . 4** The magnet used in the demonstration was a permanent magnet.

**Figure 6** shows an iron bar and a permanent magnet.

**Figure 6**




Iron bar

Permanent magnet

Describe how the permanent magnet could be used to test if the iron bar is also a permanent magnet.

**[2 marks]**

6.7.2.2 Fleming's left-hand rule (HT only)

Question 05 · continued



**0 4 . 5** **Figure 7** shows a magnetic compass used by walkers.

**Figure 7**




Explain how a magnetic compass provides evidence that the Earth has a magnetic field.

**[2 marks]**

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