AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.7.2.3

Electric motors (HT only)

Past-paper questions

Tier	**Higher**
Question groups	**3**
Available paper years	**2019–2022**

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.

6.7.2.3 Electric motors (HT only)

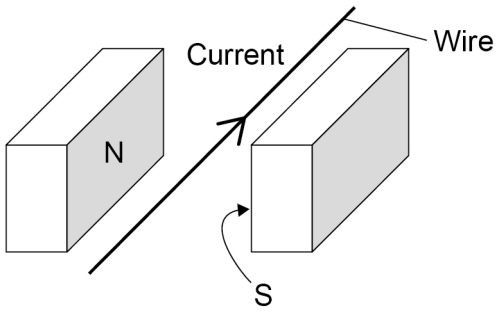
Question 01

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

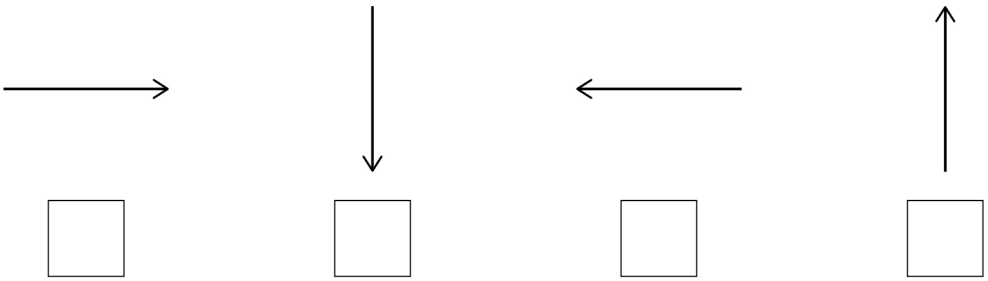


0 4 . 1 There is a force on the wire due to the current in the magnetic field.

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

6.7.2.3 Electric motors (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]

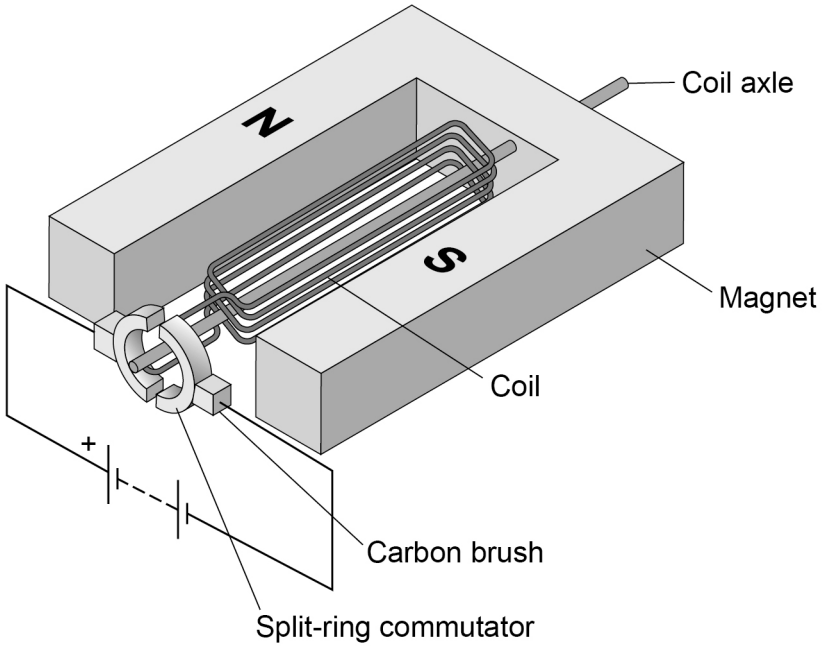
Current = _____ A

6.7.2.3 Electric motors (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]

11

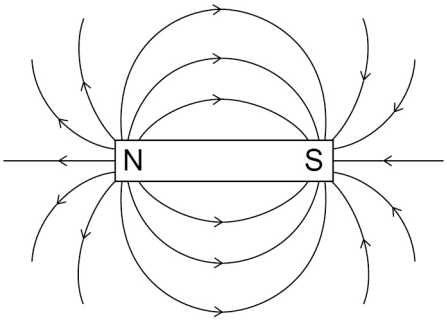
6.7.2.3 Electric motors (HT only)

Question 02

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?

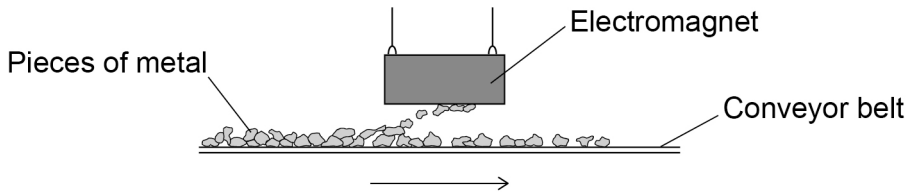
[1 mark]

6.7.2.3 Electric motors (HT only)

Question 02 · 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 _____

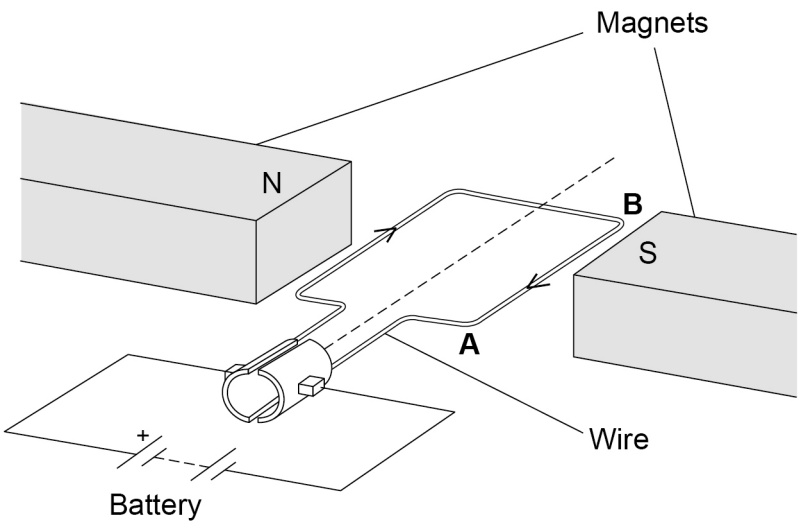
6.7.2.3 Electric motors (HT only)

Question 02 · 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



6.7.2.3 Electric motors (HT only)

Question 02 · 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

6.7.2.3 Electric motors (HT only)

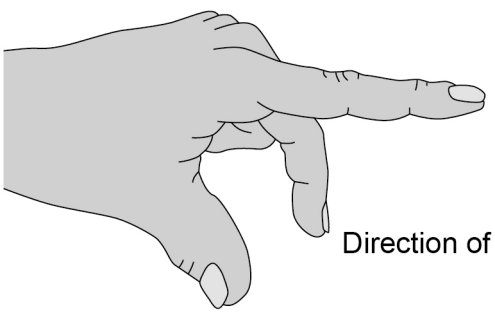
Question 02 · continued

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



15

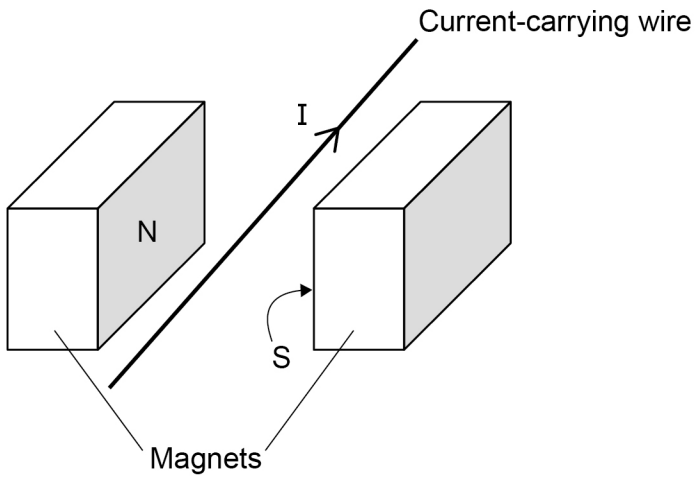
6.7.2.3 Electric motors (HT only)

Question 03

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.

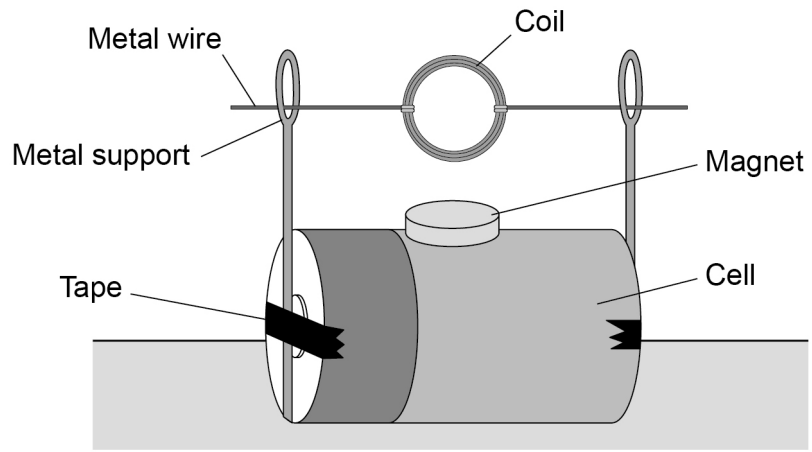
[3 marks]

6.7.2.3 Electric motors (HT only)

Question 03 · 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]

7