AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.7.1.2

Magnetic fields

Past-paper questions

Tier	**Higher**
Question groups	**8**
Available paper years	**2018–2025**

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.

6.7.1.2 Magnetic fields

Question 01

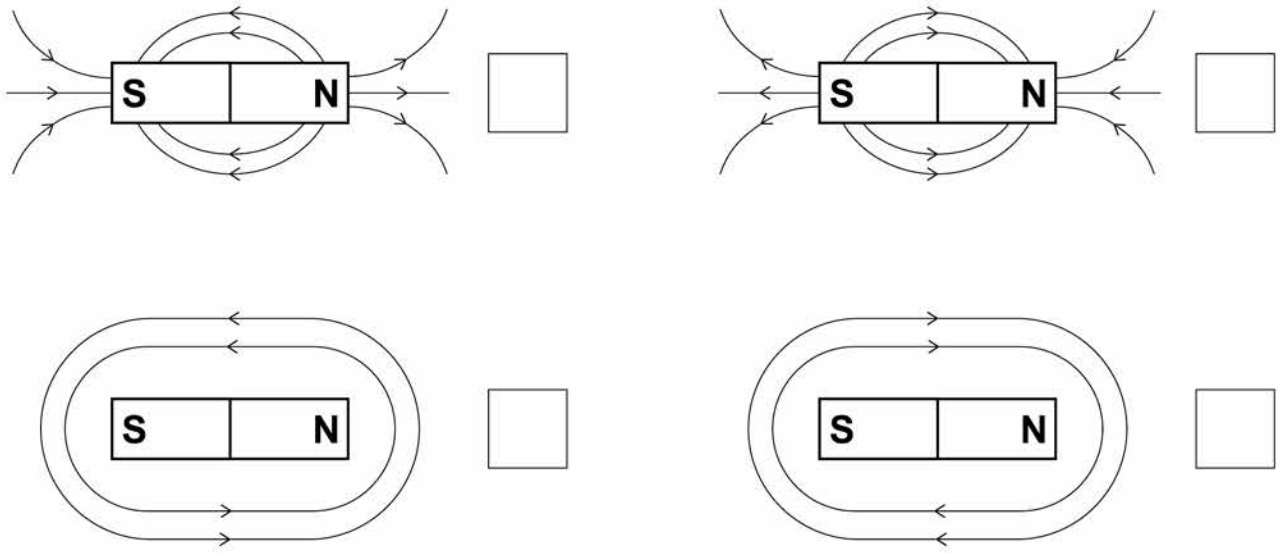
June 2018 | 8464/P/2H | Original Q2

0 2 A magnet produces a magnetic field.

0 2 . 1 Which diagram shows the magnetic field pattern around a bar magnet?

[1 mark]

Tick **one** box.



0 2 . 2 **Figure 3** shows three metal blocks.

The blocks are not labelled.

One block is a permanent magnet, one is iron and one is aluminium.

Figure 3



Describe how another permanent magnet can be used to identify the blocks.

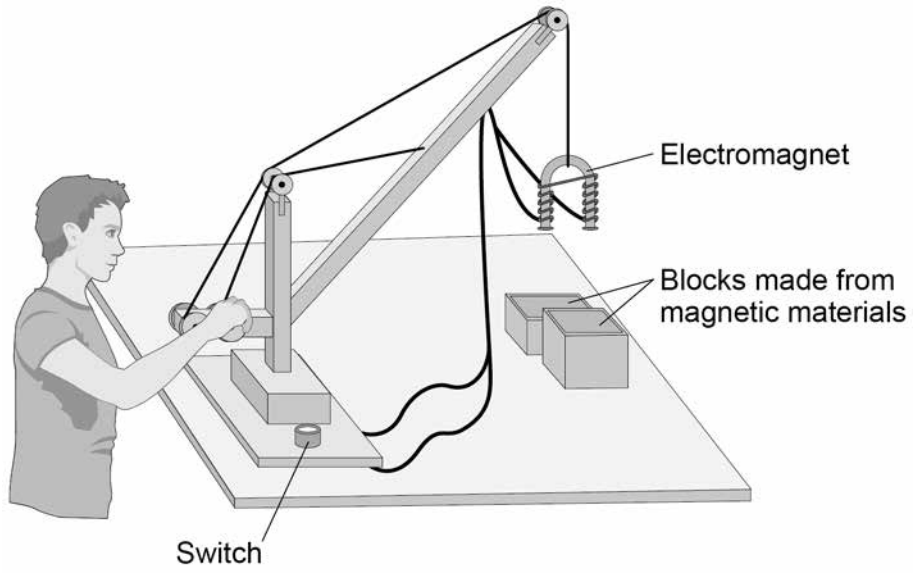
[3 marks]

6.7.1.2 Magnetic fields

Question 01 · continued

0 2 . 3 **Figure 4** shows a toy crane.

Figure 4



The toy crane uses an electromagnet to pick up and move the blocks.

Explain how this electromagnet is able to pick up and move the blocks.

[6 marks]

10

6.7.1.2 Magnetic fields

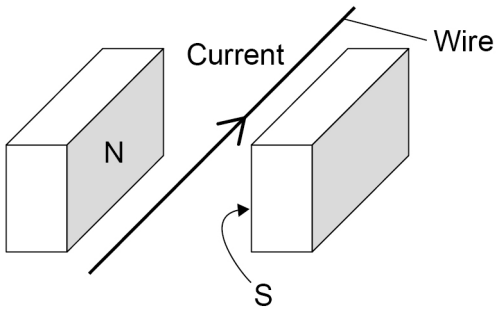
Question 02

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

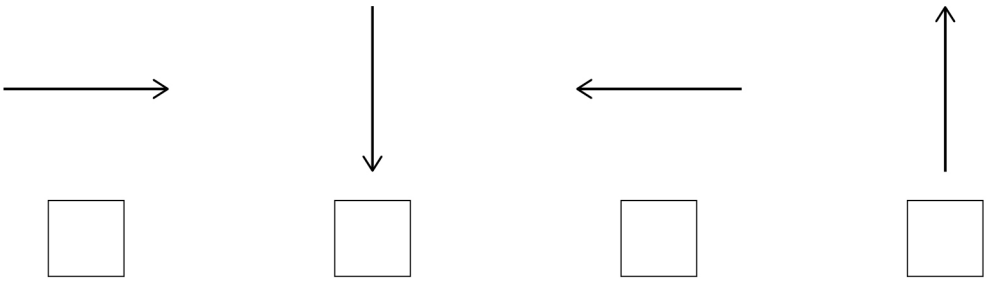


0 4 . 1 There is a force on the wire due to the current in the magnetic field.

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

6.7.1.2 Magnetic fields

Question 02 · 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]

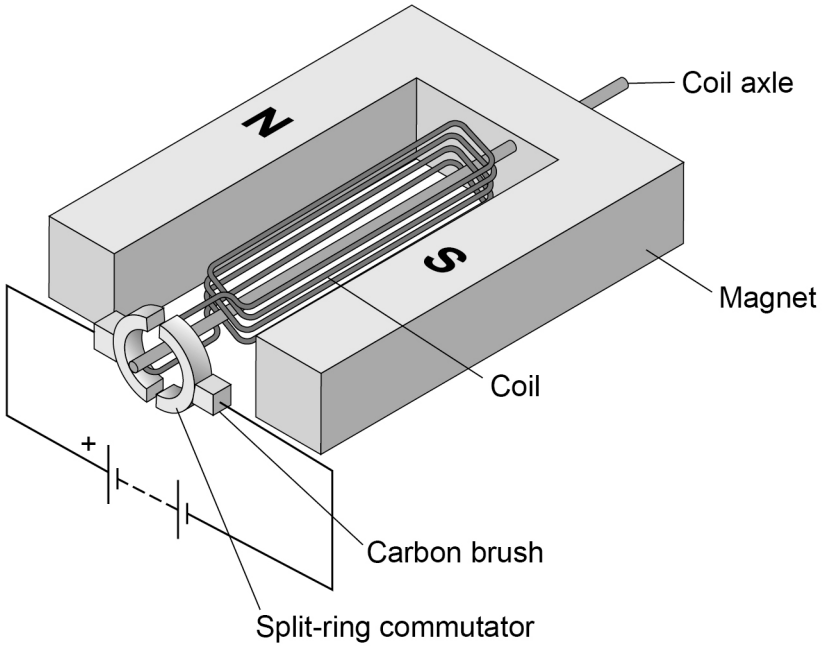
Current = _____ A

6.7.1.2 Magnetic fields

Question 02 · 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

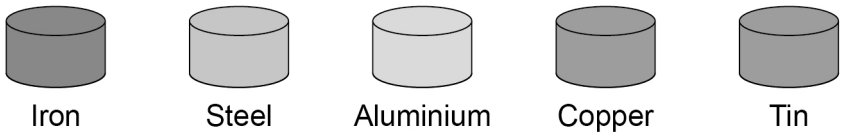
6.7.1.2 Magnetic fields

Question 03

November 2020 | 8464/P/2H | Original Q1

0 1 **Figure 1** shows five different metal samples.

Figure 1



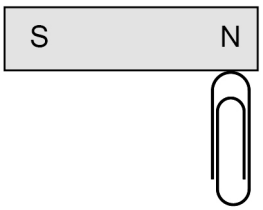
0 1 . 1 A student placed a magnet close to each metal sample.

Describe what happened.

[2 marks]

Figure 2 shows a paper clip being attracted to a permanent magnet.

Figure 2



0 1 . 2 The paper clip in **Figure 2** is not a permanent magnet.

Explain what would happen if the paper clip was removed and brought close to the south pole of the permanent magnet.

[2 marks]

6.7.1.2 Magnetic fields

Question 03 · continued

0 1 . 3 Write down the equation that links gravitational field strength (*g*), mass (*m*) and weight (*W*).

[1 mark]

0 1 . 4 The student added more paperclips to one end of the magnet.

The maximum number of paperclips the magnet could hold was 20

Each paper clip had a mass of 1.0 g

gravitational field strength = 9.8 N/kg

Calculate the maximum force the magnet can exert.

[3 marks]

Force = _____ N

8

6.7.1.2 Magnetic fields

Question 04

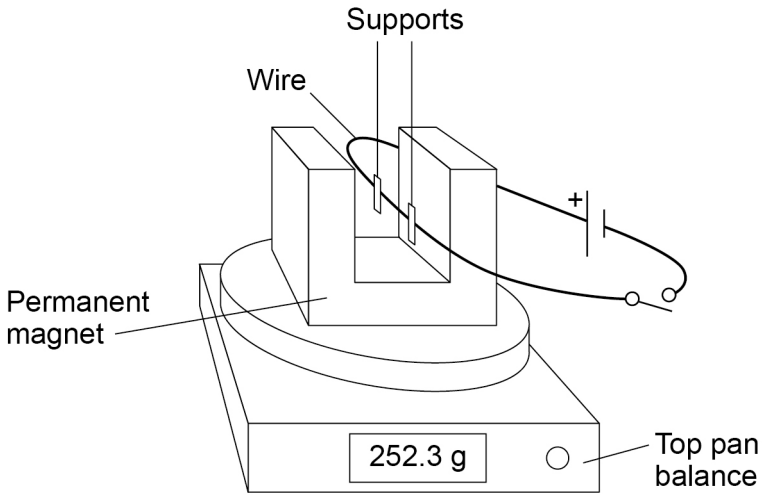
November 2020 | 8464/P/2H | Original Q7

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]

Question 04 · 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

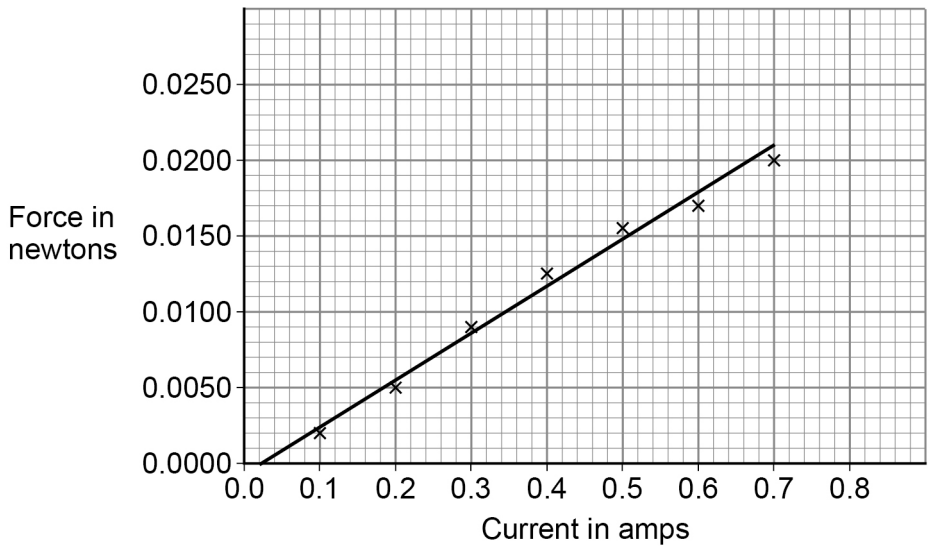
6.7.1.2 Magnetic fields

Question 04 · 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

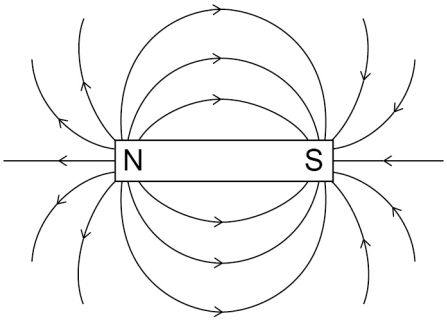
6.7.1.2 Magnetic fields

Question 05

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]

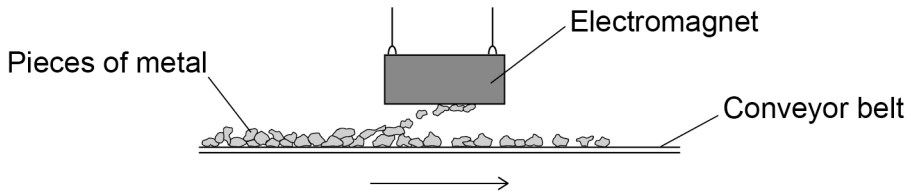
0 4 . 2 How does **Figure 4** show that the strength of the magnetic field is not the same at all places?

[1 mark]

Question 05 · 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 _____

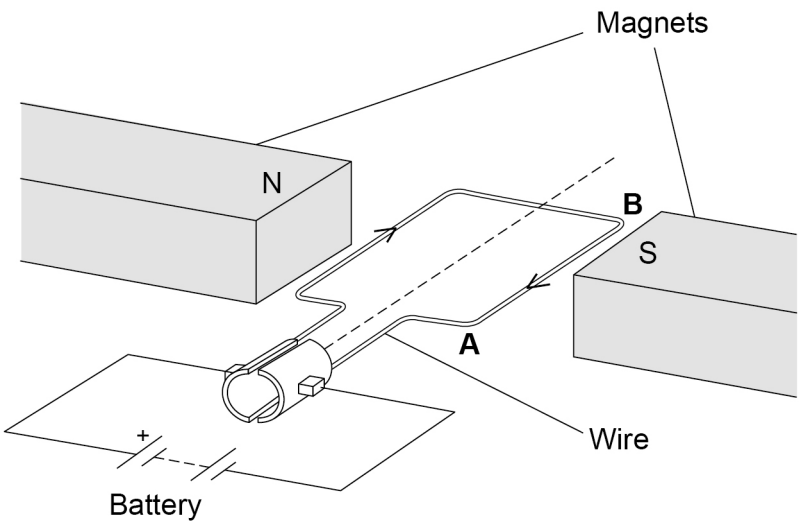
2 _____

Question 05 · 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



6.7.1.2 Magnetic fields

Question 05 · 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

6.7.1.2 Magnetic fields

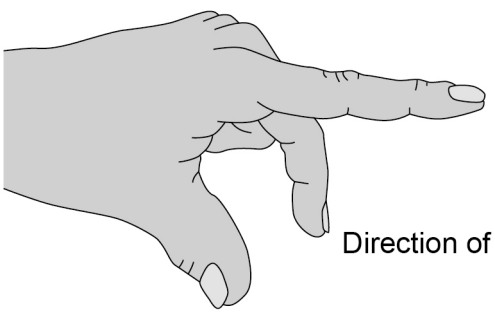
Question 05 · continued

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 _____

15

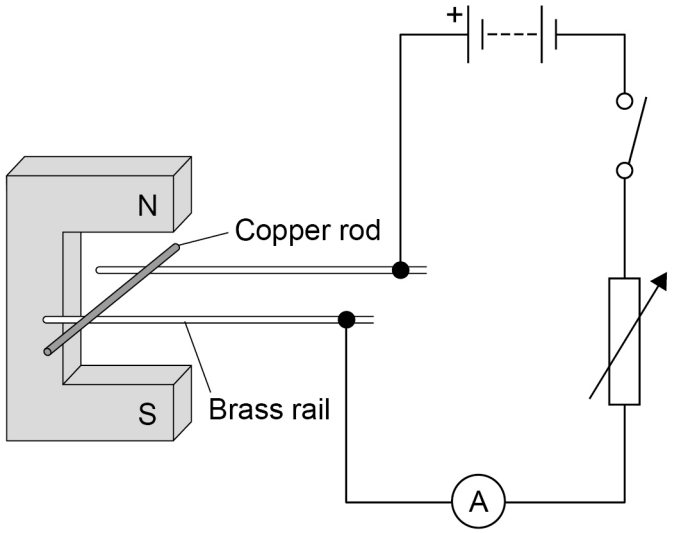
6.7.1.2 Magnetic fields

Question 06

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 _____ .

6.7.1.2 Magnetic fields

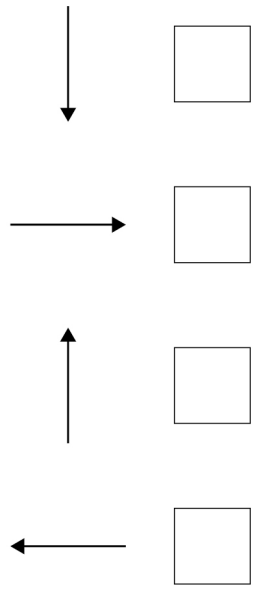
Question 06 · continued

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

Question 06 · 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]

6.7.1.2 Magnetic fields

Question 06 · 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]

8

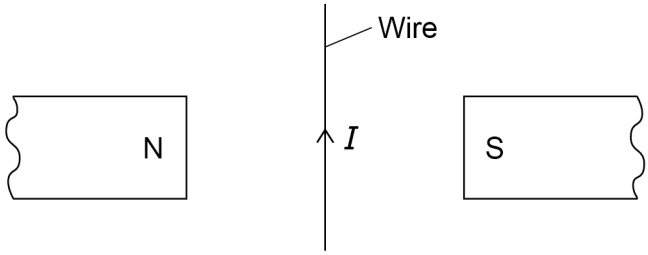
6.7.1.2 Magnetic fields

Question 07

0 4 **Figure 6** shows two magnets and a wire.

There is a current in the wire.

Figure 6



0 4 . 1 A force acts on the wire in **Figure 6**.

What is the direction of the force on the wire?

[1 mark]

Tick (✓) **one** box.

Into the page ☐

Out of the page ☐

To the left ☐

To the right ☐

6.7.1.2 Magnetic fields

Question 07 · continued

0 4 . 2 The length of the wire in the magnetic field between the magnets is 80 mm.

The current in the wire is 4.6 A.

The force on the wire is 0.092 N.

Calculate the magnetic flux density between the magnets.

Use the Physics Equations Sheet.

Give the unit.

[4 marks]

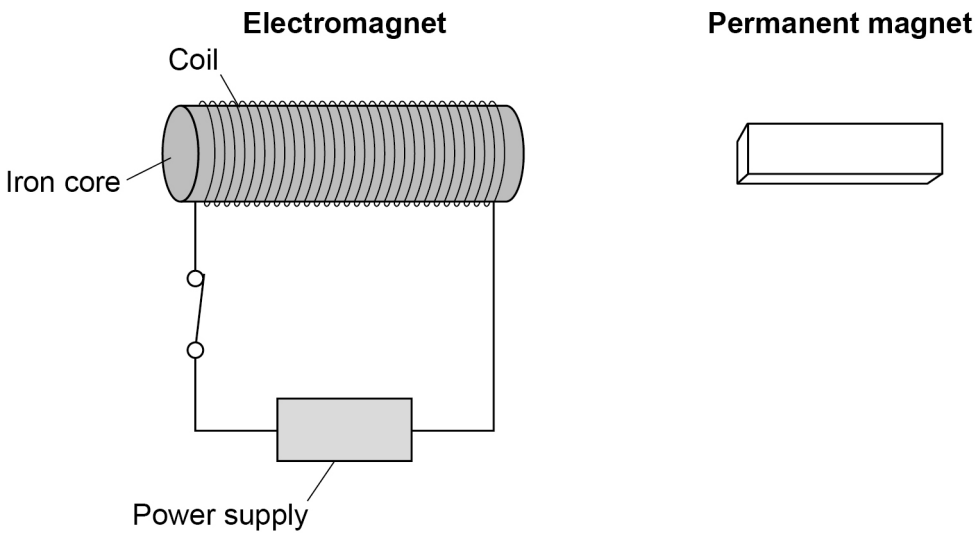
Magnetic flux density = _____ Unit _____

Question 4 continues on the next page

Question 07 · continued

Figure 7 shows an electromagnet close to a permanent magnet.

Figure 7



0 4 . 3 The electromagnet exerts a force on the permanent magnet.

The permanent magnet exerts an equal and opposite force on the electromagnet.

Which law is this an example of?

[1 mark]

Tick (✓) **one** box.

Newton's first law ☐

Newton's second law ☐

Newton's third law ☐

6.7.1.2 Magnetic fields

Question 07 · continued

0 4 . 4 Give **two** changes to the electromagnet that would increase the force exerted on the permanent magnet.

[2 marks]

1 _____

_____

2 _____

_____

0 4 . 5 Give **two** changes to the electromagnet that would reverse the direction of the force exerted on the permanent magnet.

[2 marks]

1 _____

_____

2 _____

_____

10

6.7.1.2 Magnetic fields

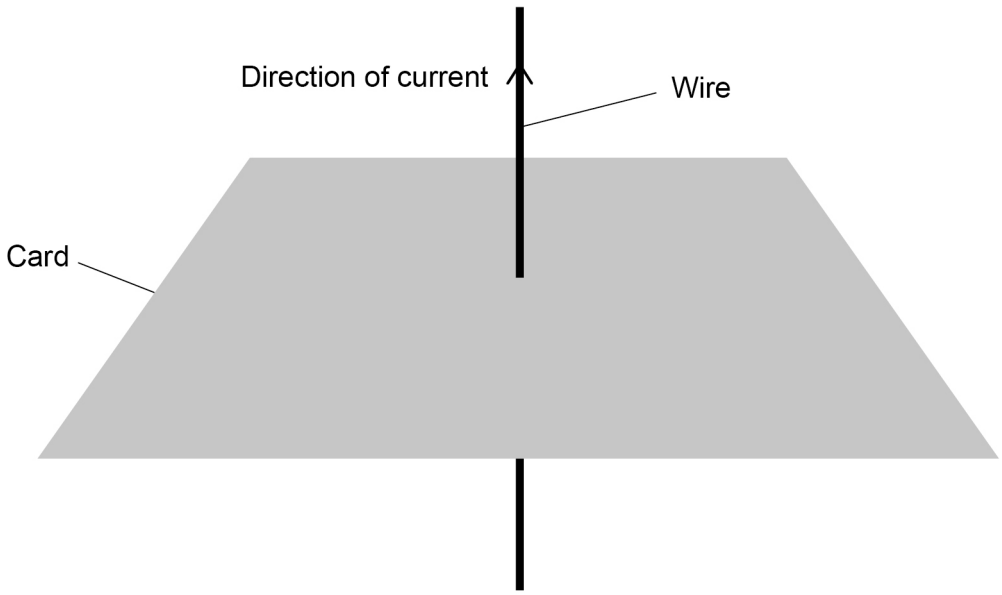
Question 08

0 4 When there is a current in a wire, there is a magnetic field around the wire.

0 4 . 1 **Figure 5** shows a wire passing through a piece of card.

There is a current in the wire.

Figure 5



Draw **two** magnetic field lines on the card in **Figure 5** to show the magnetic field pattern around the wire.

[2 marks]

6.7.1.2 Magnetic fields

Question 08 · continued

0 4 . 2 A student positioned a straight wire in the magnetic field between two magnets.

The wire was perpendicular to the magnetic field.

There was a current of 0.56 A in the wire.

The magnetic force on the wire was 2.1 mN.

The length of wire in the magnetic field was 0.050 m.

Calculate the magnetic flux density of the magnetic field between the magnets.

Use the Physics Equations Sheet.

Give the unit.

[5 marks]

Magnetic flux density = _____ Unit _____

Question 4 continues on the next page

Question 08 · continued

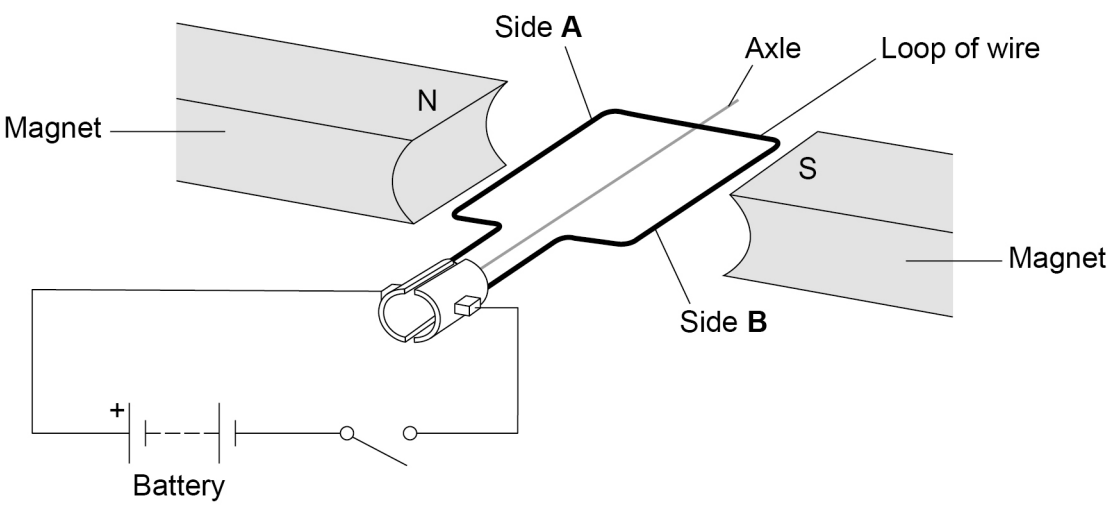
0 4 . 3 The student replaced the straight wire with a loop of wire.

The loop of wire was on an axle so that the loop could rotate.

The student connected the loop of wire to a battery and a switch.

Figure 6 shows the apparatus.

Figure 6



6.7.1.2 Magnetic fields

Question 08 · continued

When the switch is closed, magnetic forces on the loop make the loop begin to rotate.

Explain how.

You should refer to side **A** and side **B** of the loop of wire in **Figure 6**.

[5 marks]

Extra space

12