AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.7.1.2

Magnetic fields

Past-paper questions

Tier	**Foundation**
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

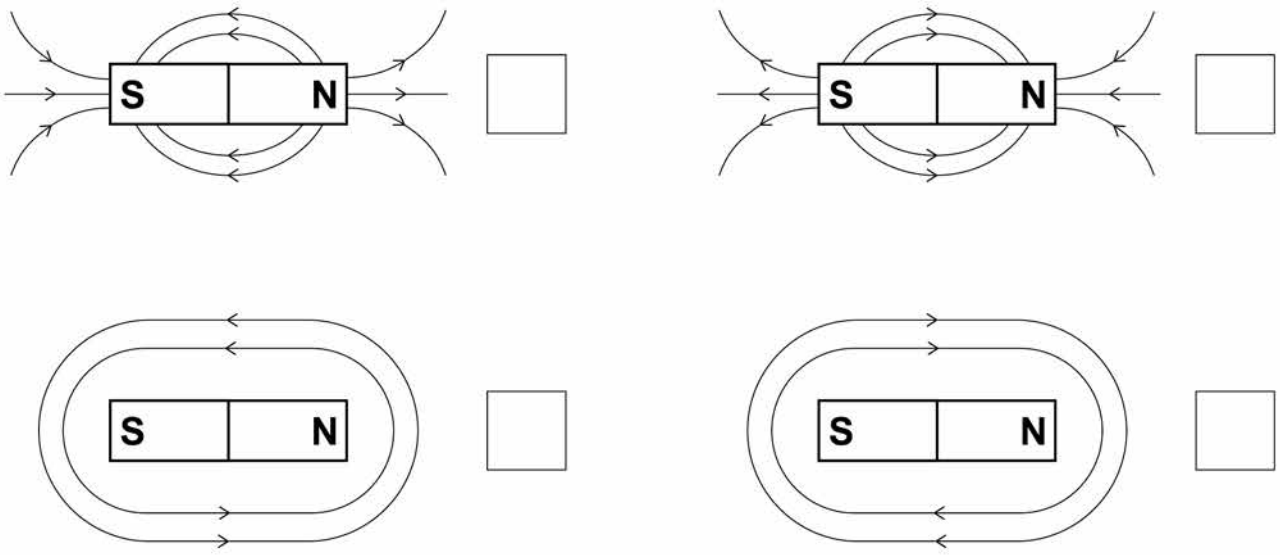
June 2018 | 8464/P/2F | Original Q8

0 8 A magnet produces a magnetic field.

0 8 . 1 Which diagram shows the magnetic field pattern around a bar magnet?

[1 mark]

Tick **one** box.



0 8 . 2 **Figure 13** shows three metal blocks.

The blocks are not labelled.

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

Figure 13



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

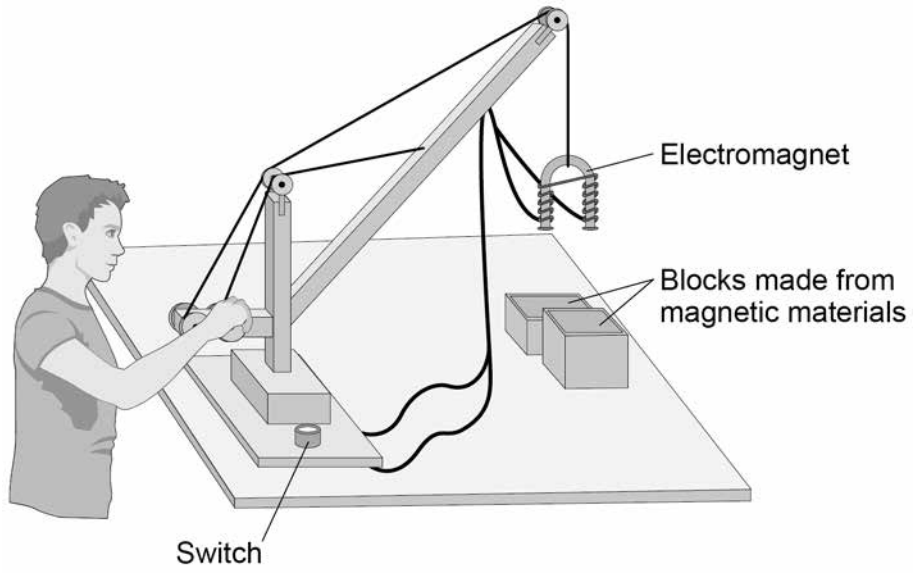
[3 marks]

6.7.1.2 Magnetic fields

Question 01 · continued

0 8 . 3 **Figure 14** shows a toy crane.

Figure 14



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]

6.7.1.2 Magnetic fields

Question 02

June 2019 | 8464/P/2F | Original Q1

0 1 Magnetic force is a non-contact force.

0 1 . 1 Which **two** of these are also non-contact forces?

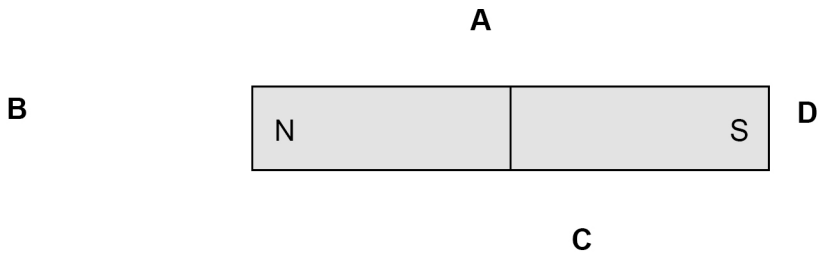
[2 marks]

Tick (✓) **two** boxes.

- Air resistance ☐
- Electrostatic ☐
- Friction ☐
- Gravitational ☐
- Tension ☐

0 1 . 2 **Figure 1** shows a bar magnet.

Figure 1



Which letter shows the position where the magnetic field around the bar magnet is strongest?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

6.7.1.2 Magnetic fields

Question 02 · continued

0 1 . 3 When two magnets are brought close to each other they exert a force on each other.

Describe how two bar magnets can be used to demonstrate a force of attraction and a force of repulsion.

[2 marks]

Force of attraction _____

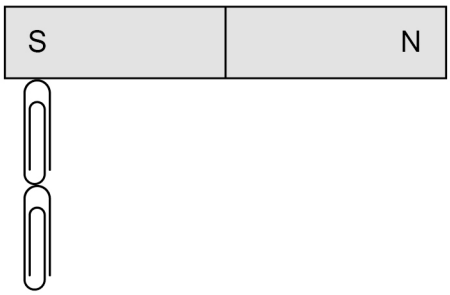
_____

Force of repulsion _____

_____

Figure 2 shows some paper clips that are attracted to a permanent magnet.

Figure 2



0 1 . 4 The paperclips become magnetised when they are close to the permanent magnet.

What is the name of this type of magnetism?

[1 mark]

Tick (✓) **one** box.

Forced magnetism ☐

Induced magnetism ☐

Strong magnetism ☐

0 1 . 5 Label the north and south poles of the two magnetised paper clips in **Figure 2**.

[2 marks]

8

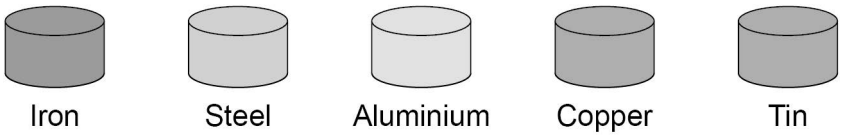
6.7.1.2 Magnetic fields

Question 03

November 2020 | 8464/P/2F | Original Q6

0 6 **Figure 9** shows five different metal samples.

Figure 9



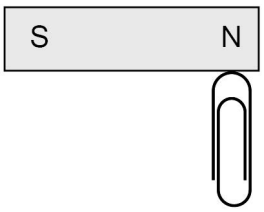
0 6 . 1 A student placed a magnet close to each metal sample.

Describe what happened.

[2 marks]

Figure 10 shows a paper clip being attracted to a permanent magnet.

Figure 10



0 6 . 2 The paper clip in **Figure 10** 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 6 . 3 Write down the equation that links gravitational field strength (*g*), mass (*m*) and weight (*W*).

[1 mark]

0 6 . 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

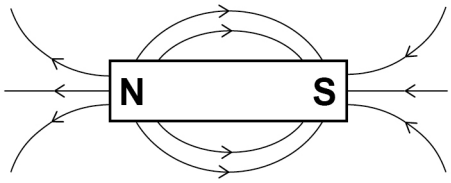
November 2021 | 8464/P/2F | Original Q2

0 2 Magnets attract some metals.

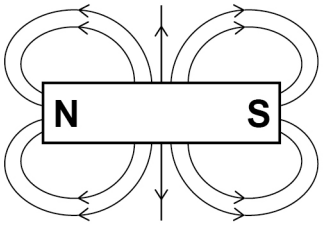
0 2 . 1 Which diagram shows the correct magnetic field pattern for a bar magnet?

[1 mark]

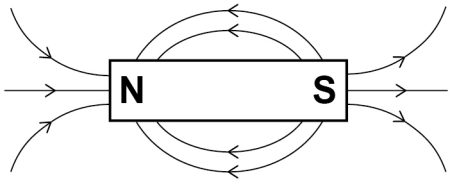
Tick (✓) **one** box.



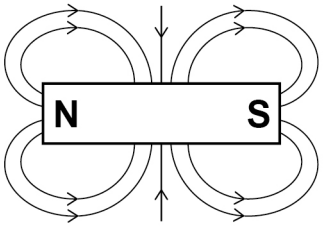
☐



☐



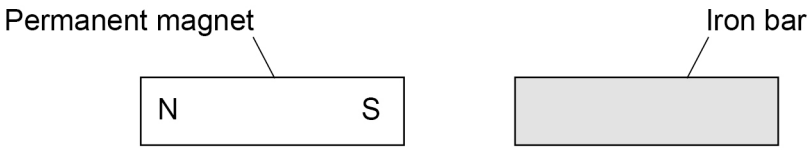
☐



☐

Figure 3 shows an iron bar near a permanent magnet.

Figure 3



The iron bar becomes an induced magnet.

0 2 . 2 Label the poles on the iron bar.

[1 mark]

0 2 . 3 The magnet is turned around so that the north pole is closest to the iron bar.

Which statement about the iron bar is true?

[1 mark]

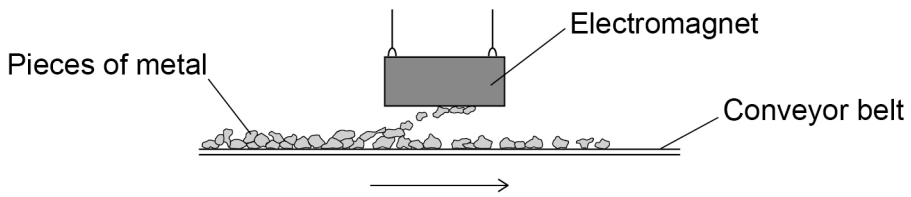
Tick (✓) **one** box.

- The iron bar does not experience a magnetic force. ☐
- The iron bar experiences a magnetic force of attraction. ☐
- The iron bar experiences a magnetic force of repulsion. ☐

Question 2 continues on the next page

Figure 4 shows an electromagnet being used to separate pieces of different types of metal on a conveyor belt.

Figure 4



0 2 . 4 Which **two** of the following types of metal would be attracted to the electromagnet?

[2 marks]

Tick (✓) **two** boxes.

- Aluminium ☐
- Copper ☐
- Magnesium ☐
- Nickel ☐
- Steel ☐

0 2 . 5 What is an advantage of using an electromagnet instead of a permanent magnet to separate the types of metal?

[1 mark]

Tick (✓) **one** box.

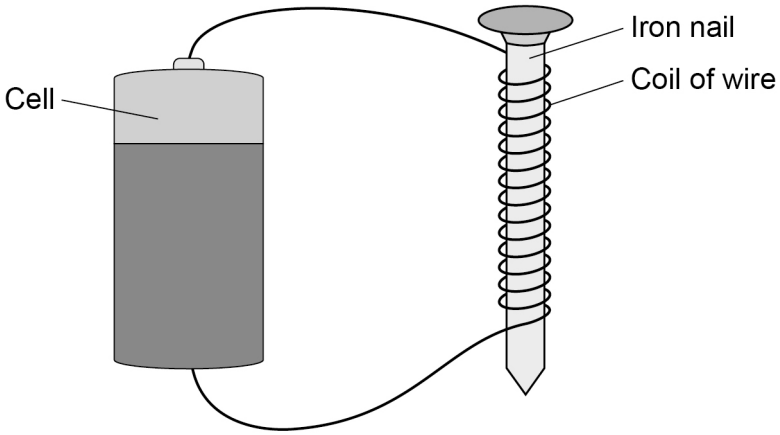
- An electromagnet attracts more types of metal than a permanent magnet. ☐
- An electromagnet can be switched on and off. ☐
- An electromagnet transfers less energy than a permanent magnet. ☐

6.7.1.2 Magnetic fields

Question 04 · continued

Figure 5 shows a simple electromagnet.

Figure 5



0 2 . 6 What is the purpose of the iron nail inside the coil of wire?

[1 mark]

Tick (✓) **one** box.

The iron nail makes the magnetic field stronger. ☐

The iron nail reduces the magnetic field to zero. ☐

The iron nail reverses the magnetic field. ☐

0 2 . 7 Which of the following would increase the strength of the electromagnet?

[1 mark]

Tick (✓) **one** box.

Use a greater current. ☐

Use a shorter nail. ☐

Use a thinner wire. ☐

8

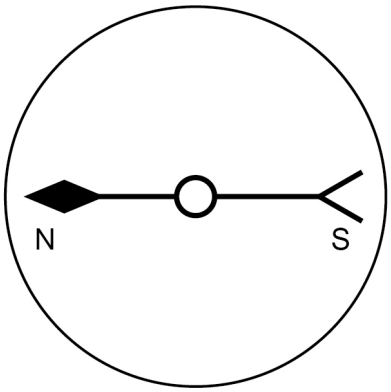
6.7.1.2 Magnetic fields

Question 05

June 2022 | 8464/P/2F | Original Q4

0 4 **Figure 5** shows a compass.

Figure 5



0 4 . 1 Why does the compass always point in the same direction when it is **not** near a magnet?

[1 mark]

Tick (✓) **one** box.

- The compass is not magnetic. ☐
- The Earth has a magnetic field. ☐
- There is no force acting on the compass. ☐

0 4 . 2 What material could the needle of the compass be made from?

[1 mark]

Tick (✓) **one** box.

- Aluminium ☐
- Copper ☐
- Plastic ☐
- Steel ☐

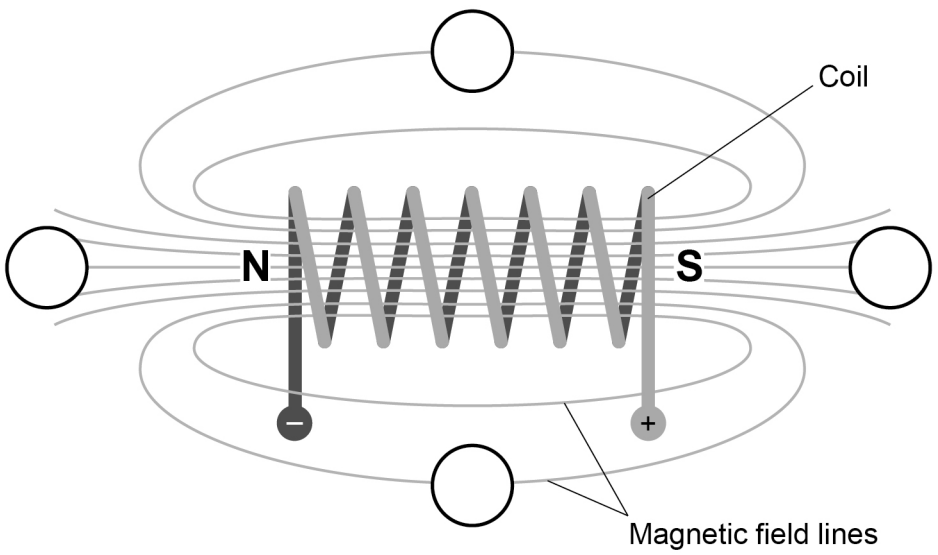
Question 05 · continued

Figure 6 shows a coil of wire.

There is a current in the coil.

The circles show the position of four compasses.

Figure 6



0 4 . 3 Which statement describes the magnetic field around the coil?

[1 mark]

Tick (✓) **one** box.

The field has the same strength at all points. ☐

The field is stronger further away from the coil. ☐

The field is strongest at the ends of the coil. ☐

0 4 . 4 Draw **one** arrow in **each** circle on **Figure 6** to show the direction of the magnetic field at that point.

[2 marks]

6.7.1.2 Magnetic fields

Question 05 · continued

0 4 . 5 Give **two** ways the magnetic field around the coil could be made stronger.

[2 marks]

1 _____

_____

2 _____

_____

7

Turn over for the next question

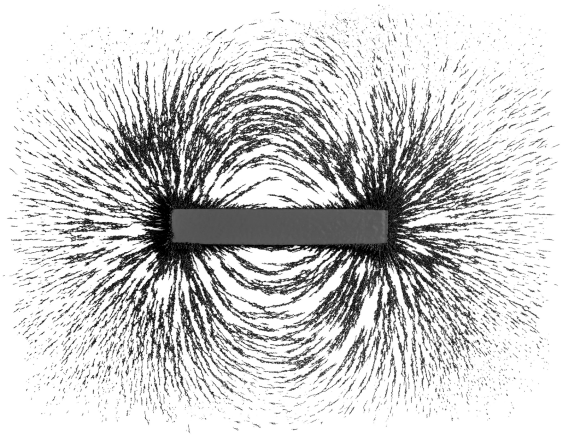
6.7.1.2 Magnetic fields

Question 06

June 2023 | 8464/P/2F | Original Q3

0 3 **Figure 4** shows iron filings sprinkled around a bar magnet.

Figure 4



0 3 . 1 Why are the iron filings attracted to the bar magnet?

[1 mark]

Tick (✓) **one** box.

Iron is a metal. ☐

Iron is charged. ☐

Iron is heavy. ☐

Iron is magnetic. ☐

Question 3 continues on the next page

6.7.1.2 Magnetic fields

Question 06 · continued

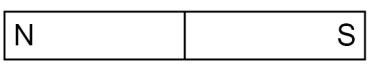
0 3 . 2 **Figure 5** shows a bar magnet.

Draw magnetic field lines to show the magnetic field pattern around the bar magnet.

You should add arrows to the field lines to show the direction of the magnetic field.

[2 marks]

Figure 5



0 3 . 3 **Figure 6** shows two bar magnets.

Figure 6



The magnets attract each other.

What conclusion can be made about the two poles marked **X** and **Y**?

[1 mark]

Tick (✓) **one** box.

They are both north poles. ☐

They are both south poles. ☐

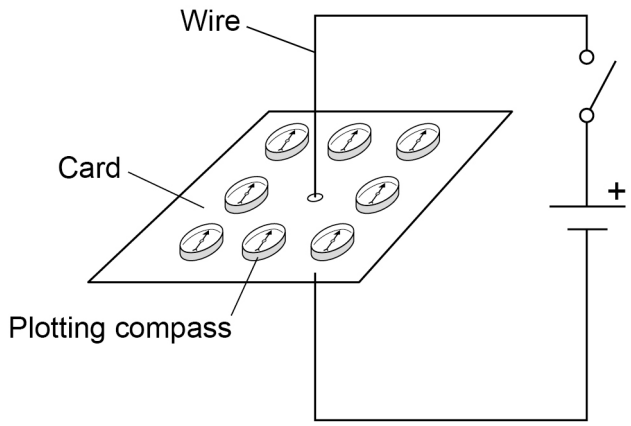
They are opposite poles. ☐

6.7.1.2 Magnetic fields

Question 06 · continued

Figure 7 shows some plotting compasses around a wire. There is no current in the wire.

Figure 7



0 3 . 4 Why do the plotting compasses all point in the same direction?

[1 mark]

0 3 . 5 When the switch is closed there is a current in the wire.

The current creates a magnetic field.

What shape are the magnetic field lines around the wire?

[1 mark]

Tick (✓) **one** box.

- Circular ☐
- Rectangular ☐
- Square ☐
- Triangular ☐

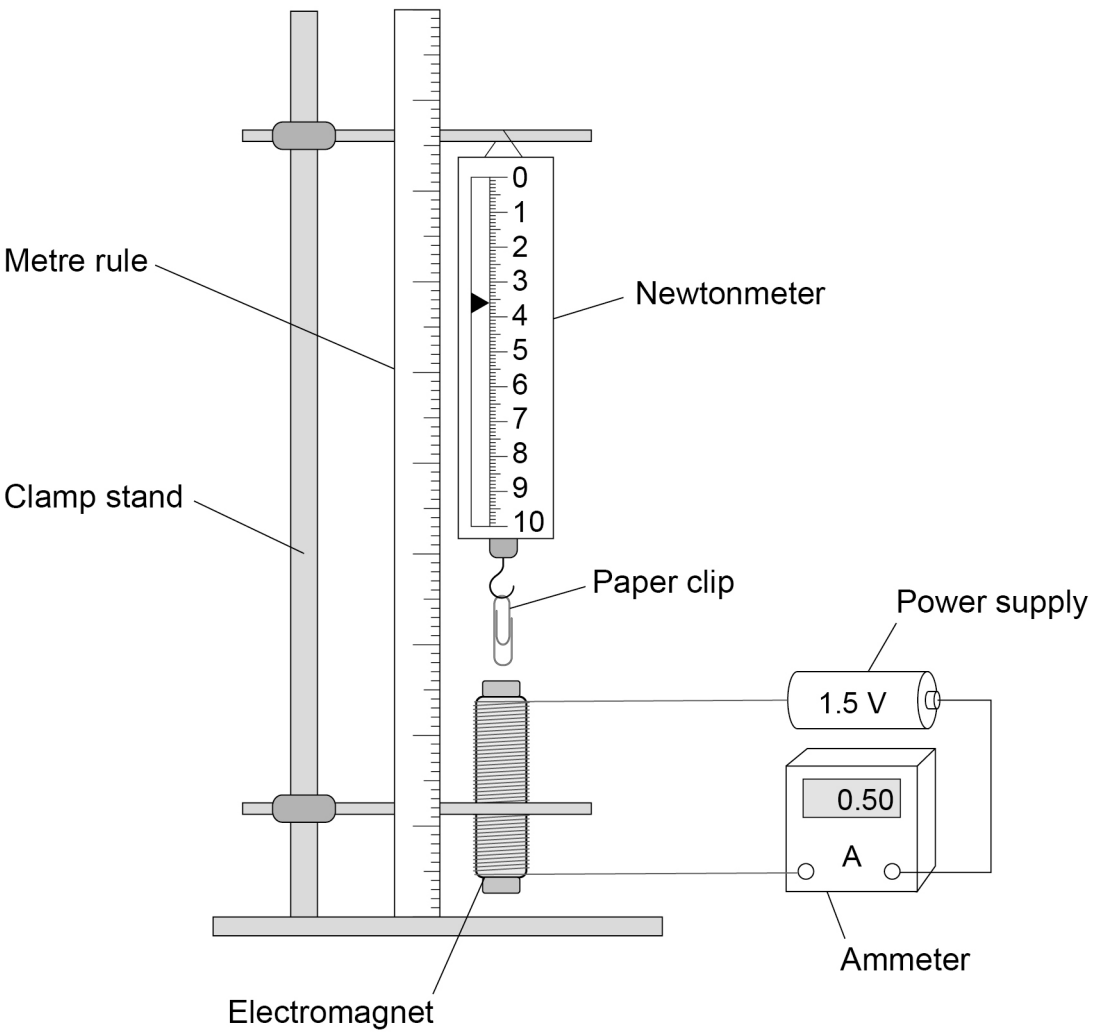
Question 06 · continued

A student investigated the force exerted by an electromagnet on a paper clip.

The student varied the distance between the paper clip and the electromagnet.

Figure 8 shows the equipment used.

Figure 8



The student recorded the reading on the newtonmeter for several different distances.

6.7.1.2 Magnetic fields

Question 06 · continued

0 3 . 6 The current in the electromagnet was the same for each distance.

Complete the sentence.

Choose the answer from the box.

[1 mark]

a control	**the dependent**	**the independent**

In the investigation, the current was _____ variable.

0 3 . 7 What is the size of the downward force on the paper clip in **Figure 8**?

[1 mark]

Force = _____ N

0 3 . 8 The distance between the paper clip and the electromagnet is **increased**.

What happens to the size of the downward force?

[1 mark]

_____

9

6.7.1.2 Magnetic fields

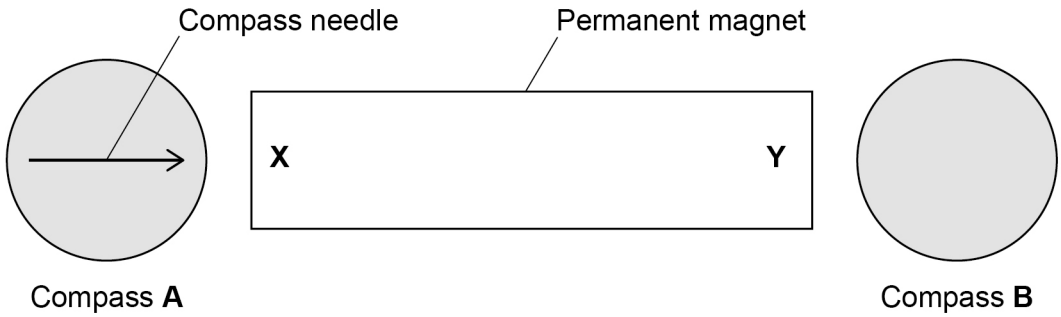
Question 07

June 2024 | 8464/P/2F | Original Q4

0 4 **Figure 8** shows a permanent magnet and two magnetic compasses.

The poles of the magnet are labelled **X** and **Y**.

Figure 8



0 4 . 1 The direction of the compass needle in compass **A** is shown.

Give the names of the poles labelled **X** and **Y** in **Figure 8**.

[2 marks]

X _____

Y _____

0 4 . 2 Draw an arrow on compass **B** in **Figure 8** to show the direction of the magnetic field at that position.

[1 mark]

Question 07 · continued

Figure 9 shows security tags on some clothes in a shop.

Security tags can be detected if clothes are taken out of the shop with tags still attached.

Figure 9



The tags are attached to the clothes by pins made from a magnetic material.

A shop assistant can use a magnet to remove the pins.

0 4 . 3 Which of the following are magnetic materials?

[2 marks]

Tick (✓) **two** boxes.

- Aluminium ☐
- Copper ☐
- Iron ☐
- Lead ☐
- Nickel ☐
- Tin ☐

6.7.1.2 Magnetic fields

Question 07 · continued

0 4 . 4 Which of the following describes the force between a magnetic material and a magnet?

[1 mark]

Tick (✓) **one** box.

The force is always attractive. ☐

The force is always repulsive. ☐

The force can be either attractive or repulsive. ☐

0 4 . 5 The shop assistant removes a security tag and drops the tag into a collecting bin.

As it falls, the tag accelerates at 9.8 m/s^2.

The mass of the tag is 0.030 kg.

Calculate the resultant force acting on the tag.

Use the equation:

resultant force = mass × acceleration

[2 marks]

Resultant force = _____ N

8

6.7.1.2 Magnetic fields

Question 08

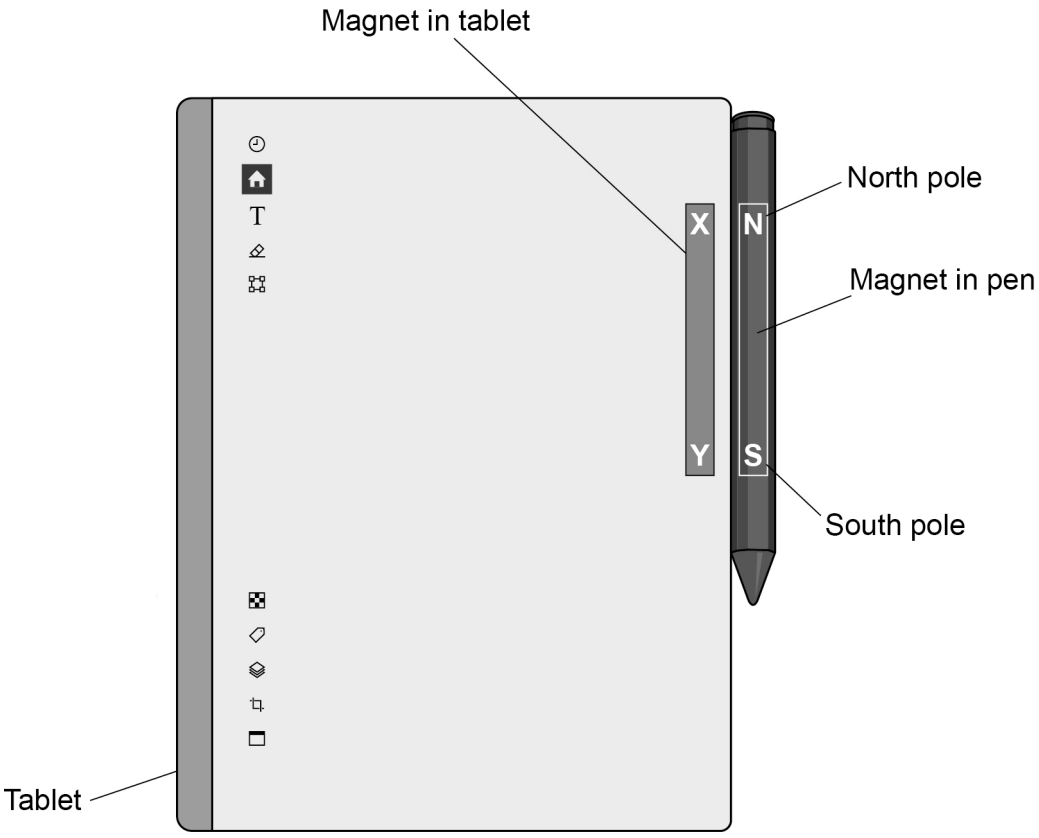
June 2025 | 8464/P/2F | Original Q4

0 4 A student uses a special pen to write notes on an electronic tablet.

There is a bar magnet inside the pen and a bar magnet inside the tablet.

Figure 9 shows the pen and tablet being held together by the magnets.

Figure 9



6.7.1.2 Magnetic fields

Question 08 · continued

0 4 . 1 The bar magnets in the tablet and pen attract each other.

What name is given to pole **X** and to pole **Y** in **Figure 9**?

Give the reason for your answer.

[2 marks]

Pole **X** _____

Pole **Y** _____

Reason _____

_____

Question 4 continues on the next page

Question 08 · continued

A student investigated the maximum distance from where the pen moves back to the tablet.

This is the method used.

1. Place the edge of the tablet at 0 cm on a ruler.

2. Place the pen 0.5 cm away from the tablet.

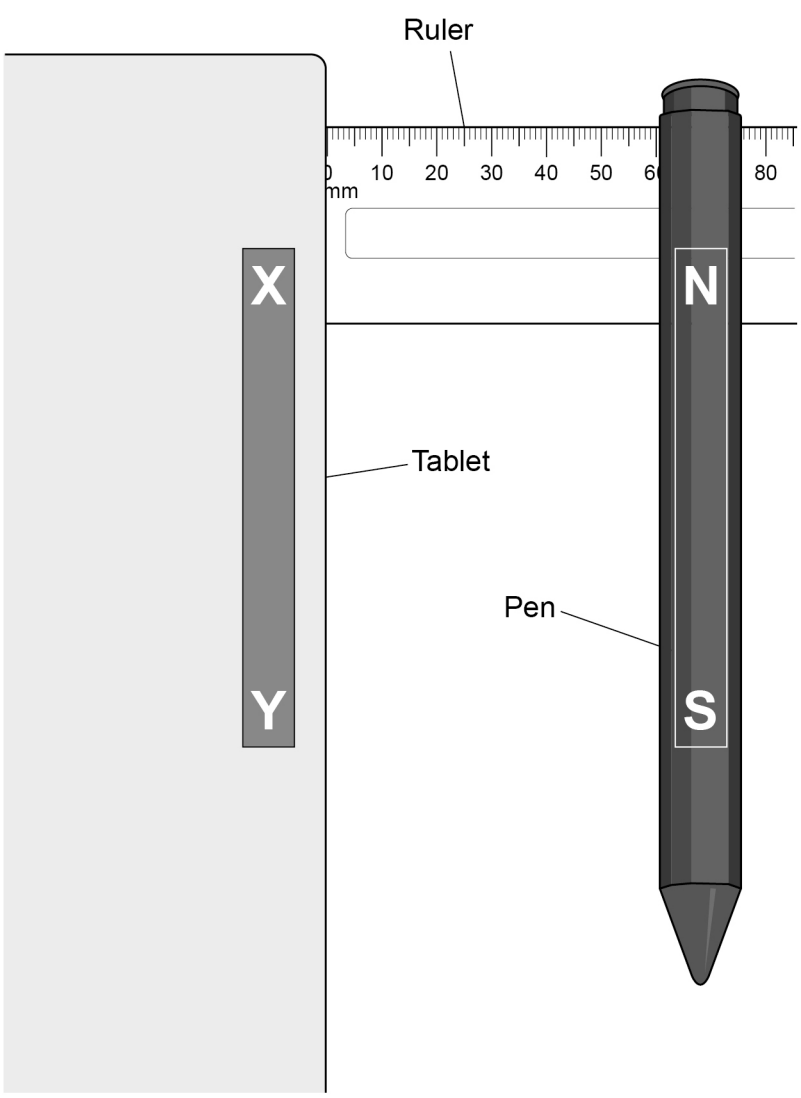
3. Release the pen.

4. If the pen moves to the tablet, repeat steps 2, 3 and 4 using a greater distance.

5. Record the greatest distance from where the pen moves back to the tablet.

Figure 10 shows the apparatus.

Figure 10



Question 08 · continued

The student repeated the investigation.

The distances recorded by the student were:

4.0 cm 3.5 cm 4.0 cm 3.5 cm 4.5 cm

0 4 . 2 What was the range of distances recorded by the student?

[1 mark]

Range = from _____ to _____ cm

0 4 . 3 Calculate the mean of the distances recorded by the student.

[2 marks]

_____

_____

_____

Mean distance = _____ cm

0 4 . 4 Complete the sentence.

Choose the answer from the box.

[1 mark]

random errors	**systematic errors**	**zero errors**

Repeating and calculating a mean reduces the effect

of _____.

6.7.1.2 Magnetic fields

Question 08 · continued

0 4 . 5 Describe how the size of the magnetic force on the pen changed as the pen was moved away from the tablet.

[1 mark]

0 4 . 6 What material could the magnet in the pen be made of?

[1 mark]

Tick (✓) **one** box.

- Aluminium ☐
- Copper ☐
- Steel ☐
- Zinc ☐

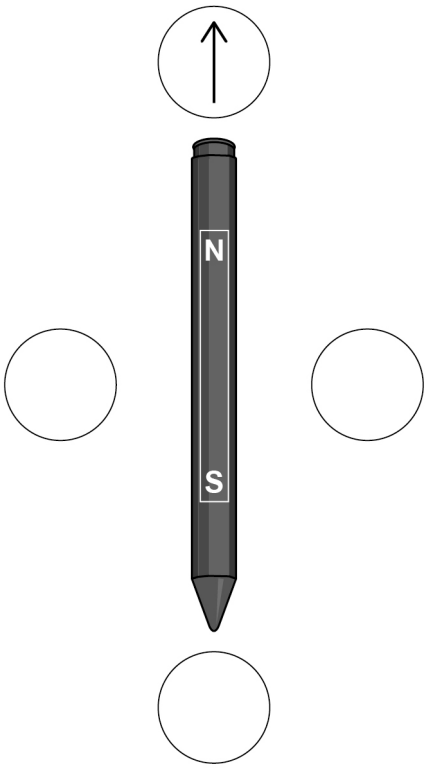
6.7.1.2 Magnetic fields

Question 08 · continued

0 4 . 7 The student used four plotting compasses to show the magnetic field pattern around the pen.

Figure 11 shows the pen and the outline of the plotting compasses.

Figure 11



Draw one arrow inside **each** compass on **Figure 11** to show which direction the compass needle points.

One arrow has been drawn for you.

[2 marks]

10