AQA GCSE Physics | 8463

SPECIFICATION POINT 4.7.1.1

Poles of a magnet

Past-paper questions

Tier	**Foundation**
Question groups	**7**
Available paper years	**2008–2025**

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.

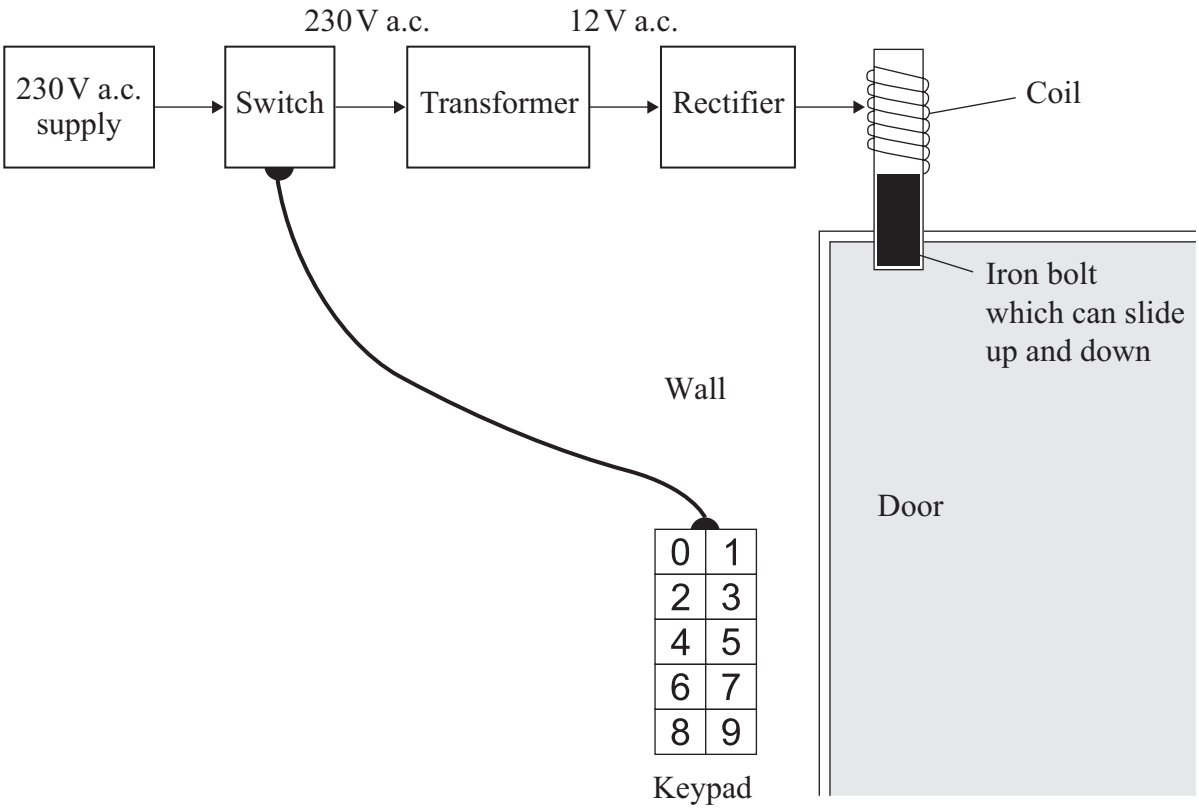
4.7.1.1 Poles of a magnet

Question 01

June 2008 | PHY3F | Original Q2 | Legacy

2 The diagram shows the design for a remotely controlled door bolt.

When the correct numbers are entered into the keypad the transformer switches on. Then the door can be opened.



2 (a) What kind of transformer is shown in the diagram?

.....

(1 mark)

2 (b) What does the abbreviation a.c. stand for?

.....

(1 mark)

4.7.1.1 Poles of a magnet

Question 01 · continued

for mark

2 (c) Complete the sentences using the correct words from the box.

attracts	**downwards**	**magnet**	**reflects**	**repels**
sideways	**switch**	**transformer**	**upwards**	

(i) When a current flows in the coil, the coil becomes a ..... .

(ii) The coil ..... the iron bolt which moves ..... .

(3 marks)

5

Turn over for the next question

4.7.1.1 Poles of a magnet

Question 02

June 2018 | 8463/2F | Original Q4

0 4 **Figure 3** shows two paper clips hanging from a bar magnet.

Figure 3



The paper clips have become magnetised.

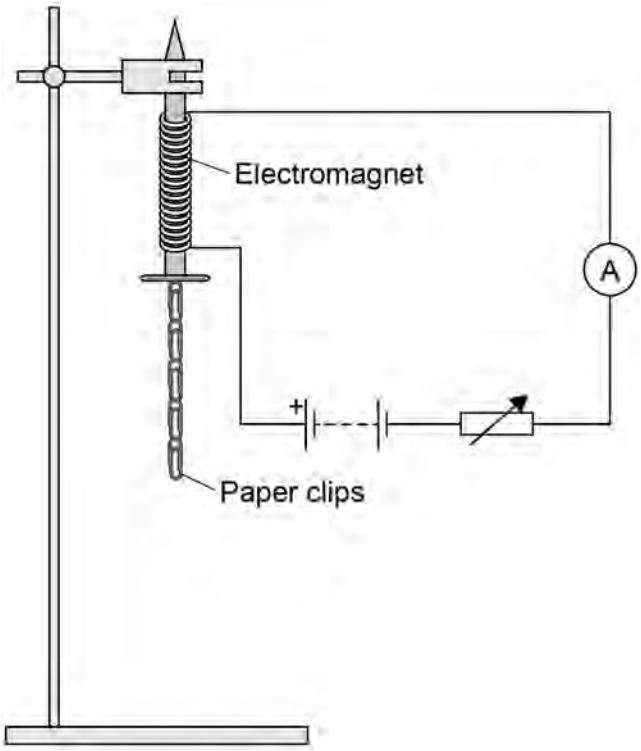
0 4 . 1 Label the north and south poles of both paper clips.

[1 mark]

A student investigated how the number of turns of wire on an electromagnet affects the strength of the electromagnet.

Figure 4 shows the equipment used by the student. Throughout the investigation the student kept the current through the wire constant.

Figure 4



4.7.1.1 Poles of a magnet

Question 02 · continued

0 4 . 2 The student measured the strength of the electromagnet by counting the number of paper clips the electromagnet could hold.

Explain why it was important that the paper clips were all the same size.

[2 marks]

Table 2 shows the student's results.

Table 2

Number of turns of wire on the electromagnet	Number of paper clips held
10	3
20	6
30	9
40	12

0 4 . 3 Describe the pattern shown in **Table 2**.

[2 marks]

Question 4 continues on the next page

4.7.1.1 Poles of a magnet

Question 02 · continued

0 4 . 4 The student then used 50 turns of wire on the electromagnet.

The electromagnet picked up 18 paper clips. This was more paper clips than the student had expected.

Which **one** is the most likely cause of this result?

Tick **one** box.

[1 mark]

The paper clips used with 50 turns were larger than the others. ☐

There were less than 50 turns of wire on the electromagnet. ☐

Some of the paper clips were already magnetised. ☐

0 4 . 5 The student repeated the measurement for 50 turns of wire three more times.

This gave her the following set of results.

18 16 14 15

Explain what the student should now do with the **four** results for 50 turns of wire.

[3 marks]

4.7.1.1 Poles of a magnet

Question 02 · continued

0 4 . 6 The student wrote the hypothesis:

'Increasing the current through the wire will make the electromagnet stronger.'

Describe how the student should change the investigation to test this hypothesis.

[3 marks]

12

4.7.1.1 Poles of a magnet

Question 03

0 3 . 1 **Figure 5** shows a bar magnet.

Each circle represents a compass.

Figure 5



Draw an arrow inside each circle to show the direction that each compass would point.

[1 mark]

0 3 . 2 **Figure 6** shows part of a coat.

The coat has two magnets hidden inside the material.

Figure 7 shows how the magnets are used to fasten the coat.

Figure 6

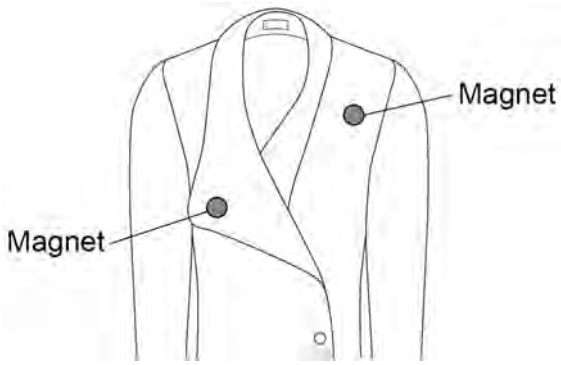


Figure 7



Explain why the magnets inside the coat must **not** have two south poles facing each other.

[2 marks]

4.7.1.1 Poles of a magnet

Question 03 · continued

A coil of wire is connected to a battery.

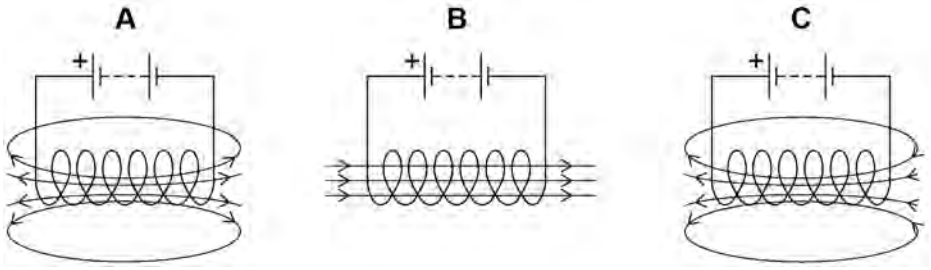
The current in the coil produces a magnetic field.

0 3 . 3 Which diagram in **Figure 8** shows the magnetic field produced by the current in the coil?

[1 mark]

Tick (✓) **one** box.

Figure 8



A ☐ B ☐ C ☐

0 3 . 4 A solid rod is placed inside the coil.

Which type of rod would make the magnetic field of the coil stronger?

[1 mark]

Tick (✓) **one** box.

Glass rod ☐

Plastic rod ☐

Steel rod ☐

Wooden rod ☐

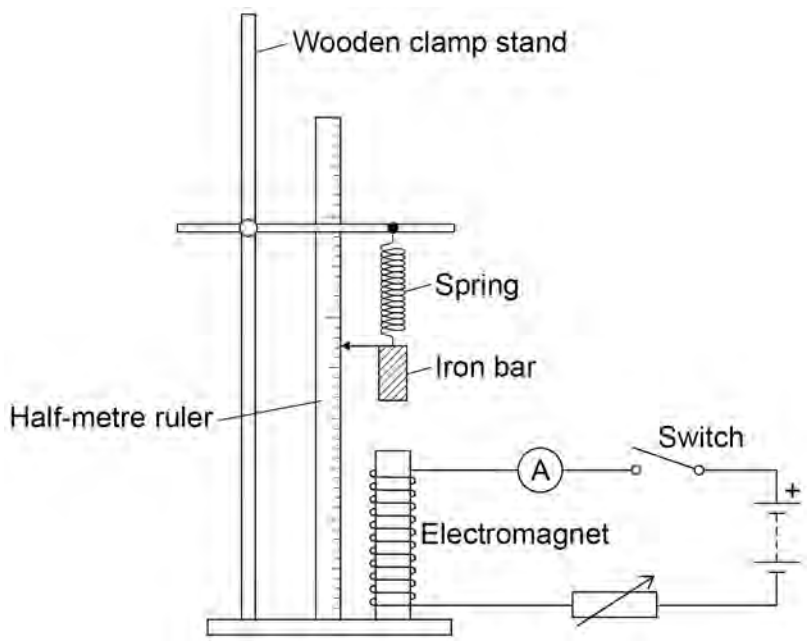
4.7.1.1 Poles of a magnet

Question 03 · continued

A student investigated how the strength of an electromagnet varies with the current in the coil of the electromagnet.

Figure 9 shows the equipment the student used.

Figure 9



0 3 . 5 Why does the spring get longer when the electromagnet is switched on?

[1 mark]

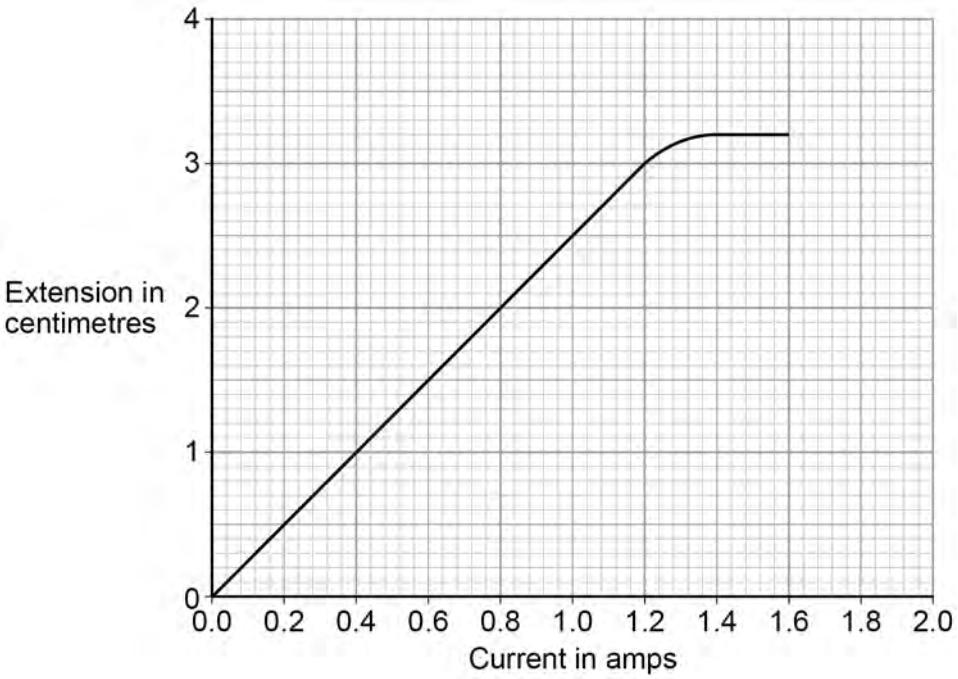
4.7.1.1 Poles of a magnet

Question 03 · continued

The student measured how much further the spring extended with different values of current in the coil.

Figure 10 shows the results.

Figure 10



0 3 . 6 The current in the coil is increased from 0.6 A to 1.2 A

Determine the increase in the extension of the spring.

[1 mark]

Increase in the extension = _____ cm

0 3 . 7 Calculate the increase in the force on the spring when the current in the coil increased from 0.6 A to 1.2 A

Spring constant = 0.18 N/cm

Use the equation:

force = spring constant × extension

[2 marks]

Increase in the force = _____ N

4.7.1.1 Poles of a magnet

Question 03 · continued

0 3 . 8 Describe what happened to the strength of the electromagnet as the current in the coil increased from 1.2 A to 1.6 A

[2 marks]

11

4.7.1.1 Poles of a magnet

Question 04

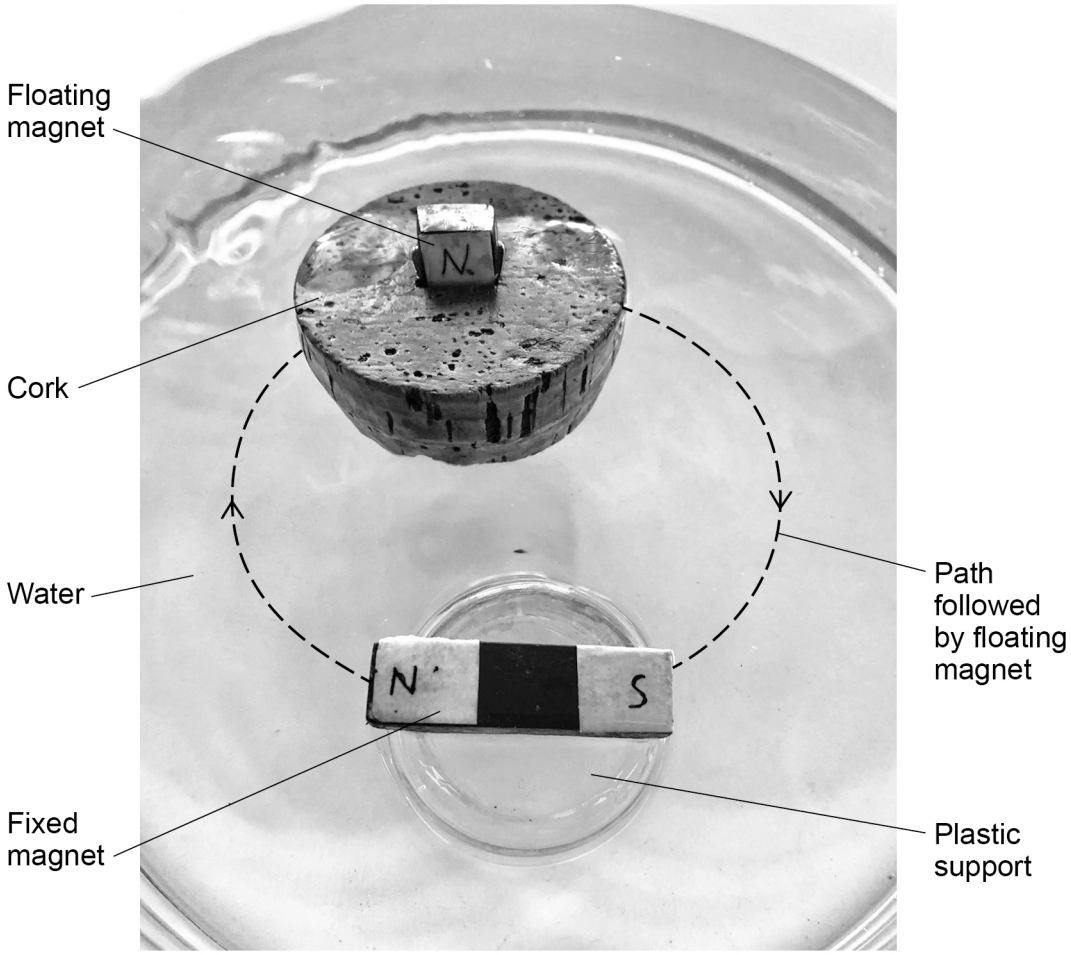
November 2020 | 8463/2F | Original Q5

0 5 A student placed a magnet on top of a plastic support in a bowl of water. This magnet was fixed in position and above the surface of the water.

The student put a second magnet into a piece of cork so that the magnet floated on the water. Only the north pole of the floating magnet was above the surface of the water.

Figure 6 shows the arrangement of the magnets.

Figure 6



0 5 . 1 The floating magnet was placed near to the north pole of the fixed magnet. The floating magnet then moved along the path shown in **Figure 6**.

Explain why.

[2 marks]

4.7.1.1 Poles of a magnet

Question 04 · continued

0 5 . 2 The student replaced the floating magnet with a piece of iron.

What happened to the piece of iron?

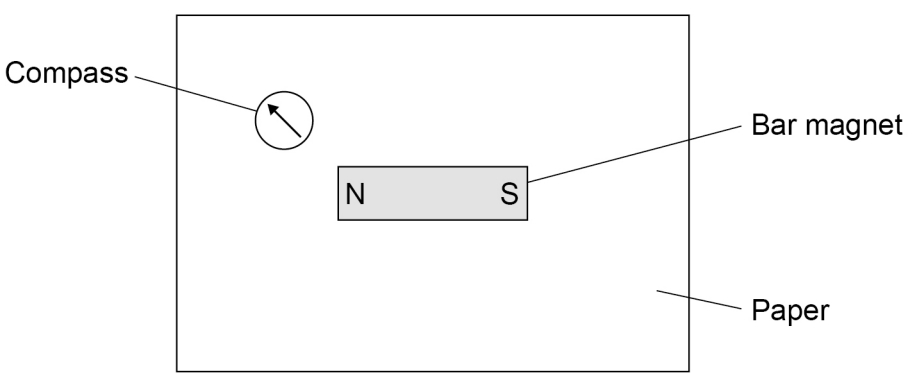
[1 mark]

0 5 . 3 Describe how to use a compass to plot the magnetic field pattern around a bar magnet.

Use **Figure 7** to help you.

[4 marks]

Figure 7

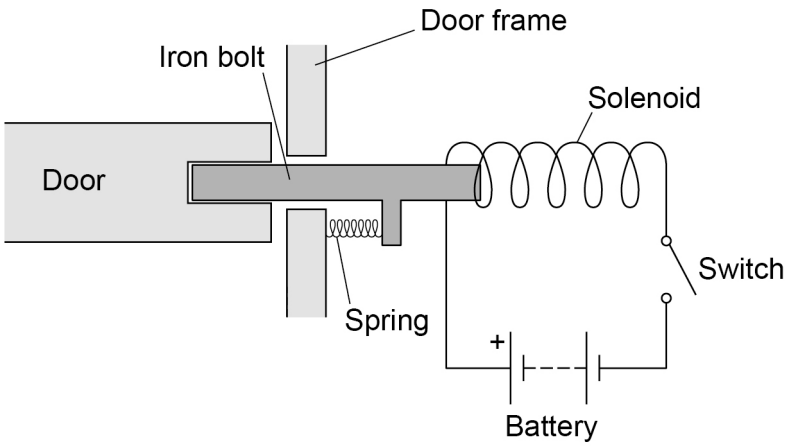


4.7.1.1 Poles of a magnet

Question 04 · continued

Figure 8 shows a diagram of an electromagnetic lock used to secure a door.

Figure 8



0 5 . 4 **Figure 9** shows an incomplete sequence of how the door unlocks.

Figure 9



Write **one** letter in each box to show the correct sequence.

[2 marks]

A The iron bolt moves.

B A magnetic field is created around the solenoid.

C There is a current in the circuit.

Question 5 continues on the next page

4.7.1.1 Poles of a magnet

Question 04 · continued

0 5 . 5 The electromagnetic lock contains a spring.

When the door is unlocked the extension of the spring is 0.040 m.

spring constant = 200 N/m

Calculate the elastic potential energy of the spring when the door is unlocked.

Use the equation:

$$\text{elastic potential energy} = 0.5 \times \text{spring constant} \times (\text{extension})^2$$

[2 marks]

Elastic potential energy = _____ J

11

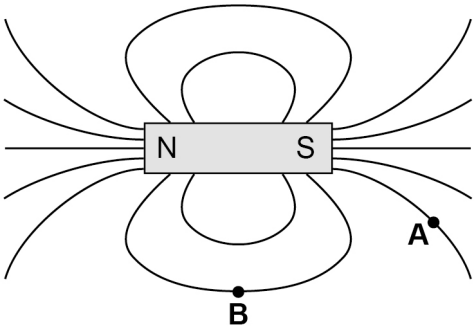
4.7.1.1 Poles of a magnet

Question 05

November 2021 | 8463/2F | Original Q7

0 7 **Figure 16** shows the magnetic field pattern around a bar magnet.

Figure 16



0 7 . 1 Draw an arrow at point **A** and point **B** to show the direction of the magnetic field at each point.

[1 mark]

0 7 . 2 A bar magnet produces its own magnetic field.

Complete the sentence.

Choose the answer from the box.

[1 mark]

an electromagnet	**an induced magnet**	**a permanent magnet**

A bar magnet is an example of _____ .

4.7.1.1 Poles of a magnet

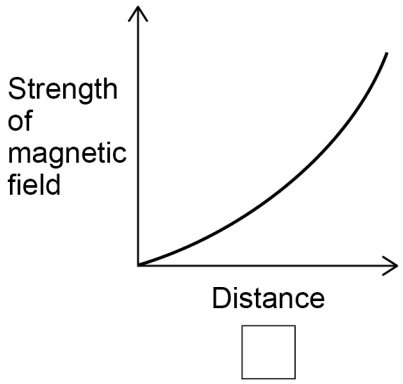
Question 05 · continued

0 7 . 3 Which graph shows how the strength of the magnetic field varies with distance from the bar magnet?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.



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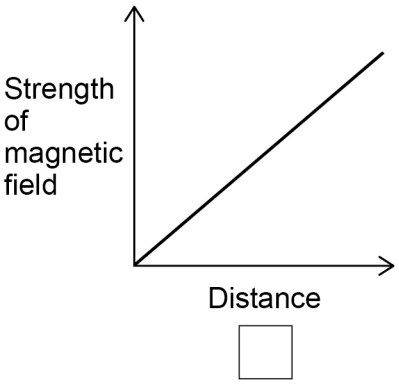

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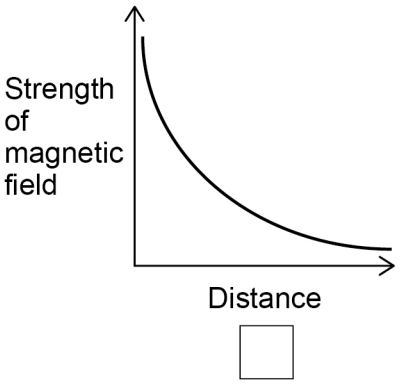


☐

Reason _____

_____

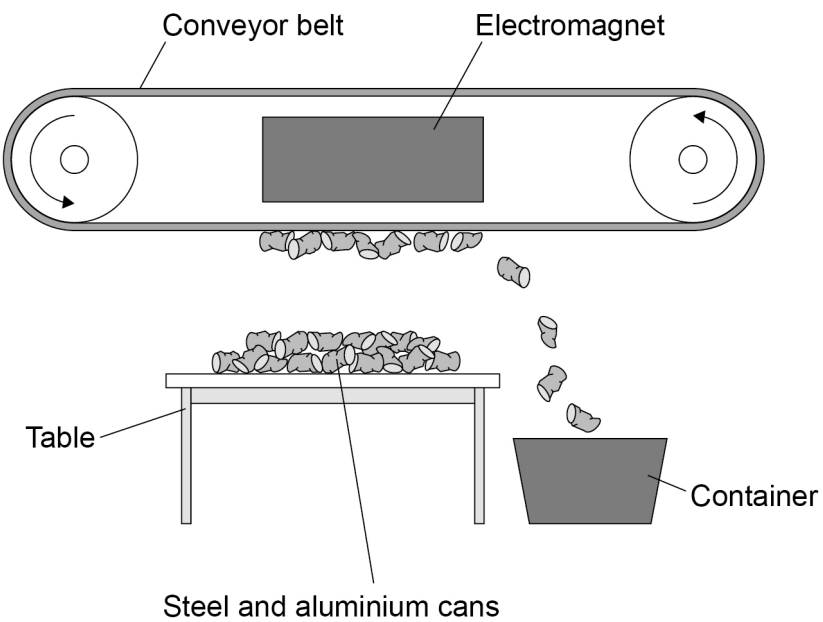
Question 7 continues on the next page

4.7.1.1 Poles of a magnet

Question 05 · continued

Figure 17 shows an electromagnet being used to separate aluminium cans from steel cans.

Figure 17



0 7 . 4 Explain how the electromagnet and conveyor belt are used to separate the steel cans from the aluminium cans.

[2 marks]

4.7.1.1 Poles of a magnet

Question 05 · continued

0 7 . 5 At the top of the table the strength of the magnetic field is only just enough to pick the cans up.

Describe **two** ways to increase the strength of magnetic field at the top of the table.

[2 marks]

1 _____

_____

2 _____

_____

0 7 . 6 Write down the equation which links distance travelled (*s*), speed (*v*) and time (*t*).

[1 mark]

_____

0 7 . 7 The conveyor belt moves a can at a speed of 1.7 m/s.

Calculate the time taken to move the can 3.3 m at this speed.

Give your answer to 2 significant figures.

[4 marks]

_____

_____

_____

_____

_____

Time taken (2 significant figures) = _____ s

13

4.7.1.1 Poles of a magnet

Question 06

June 2022 | 8463/2F | Original Q1

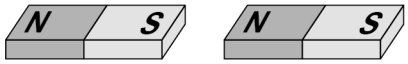
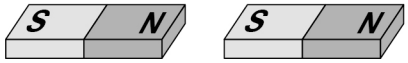
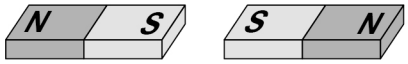
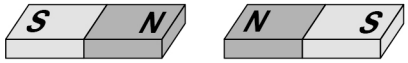
0 1 When two magnets are close together they exert a force on each other.

0 1 . 1 Complete **Table 1** to show if the magnets would attract or repel.

[2 marks]

Tick (✓) **one** box in **each** row.

Table 1

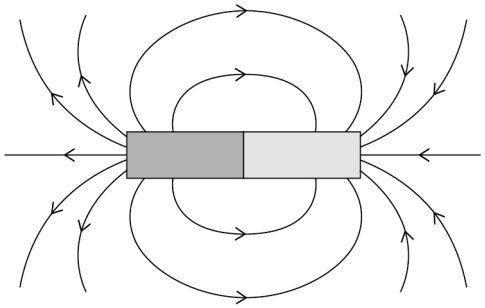
	Attract	Repel
		
		
		
		

4.7.1.1 Poles of a magnet

Question 06 · continued

0 1 . 2 **Figure 1** shows the magnetic field around a bar magnet.

Figure 1



Which statements are true for the magnetic field shown in **Figure 1**?

[2 marks]

Tick (✓) **two** boxes.

- The magnetic field gets weaker further from the magnet. ☐
- The magnetic field is strongest at the poles. ☐
- The magnetic field is uniform away from the poles. ☐
- The magnetic field lines all meet at a single point. ☐
- The magnetic field lines point from south to north. ☐

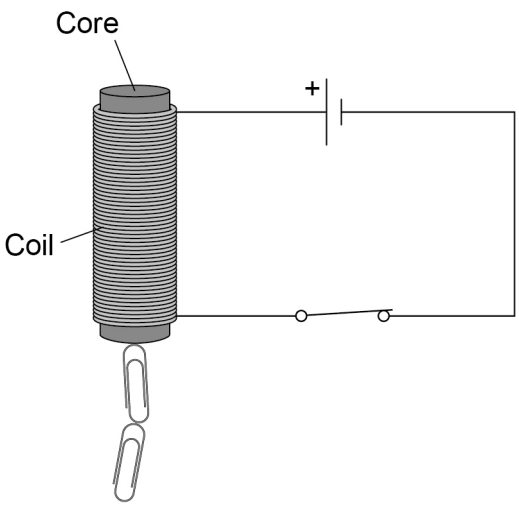
Question 1 continues on the next page

4.7.1.1 Poles of a magnet

Question 06 · continued

Figure 2 includes an electromagnet.

Figure 2



0 1 . 3 Which metal is used to make the core of the electromagnet?

[1 mark]

Tick (✓) **one** box.

- Aluminium ☐
- Copper ☐
- Iron ☐
- Magnesium ☐

0 1 . 4 Complete the sentence.

Choose the answer from the box.

[1 mark]

coil	**metal core**	**paper clip**

The switch is closed. There is a current in the _____.

4.7.1.1 Poles of a magnet

Question 06 · continued

0 1 . 5 The number of turns on the coil is increased. The current remains the same.

How does this affect the strength of the magnetic field around the electromagnet?

[1 mark]

Tick (✓) **one** box.

- The magnetic field would be stronger. ☐
- The magnetic field would stay the same. ☐
- The magnetic field would be weaker. ☐

0 1 . 6 The metal core was removed. The current remains the same.

How does this affect the strength of the magnetic field around the electromagnet?

[1 mark]

Tick (✓) **one** box.

- The magnetic field would be stronger. ☐
- The magnetic field would stay the same. ☐
- The magnetic field would be weaker. ☐

8

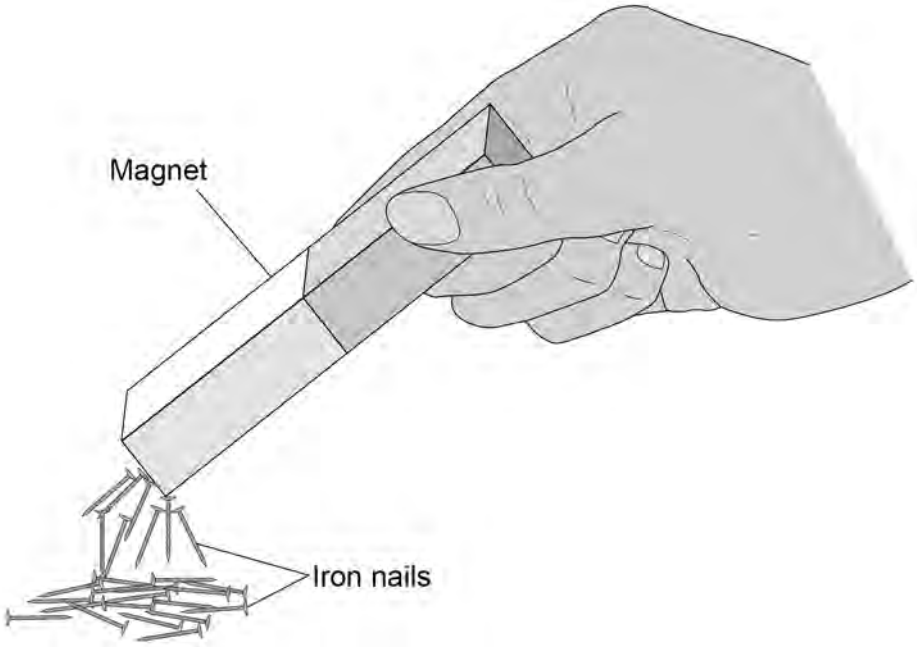
4.7.1.1 Poles of a magnet

Question 07

June 2025 | 8463/2F | Original Q6

0 6 **Figure 8** shows iron nails being attracted to a magnet.

Figure 8



0 6 . 1 Iron is a magnetic material.

Which **two** of the following are also magnetic materials?

[2 marks]

Tick (✓) **two** boxes.

- Cobalt ☐
- Copper ☐
- Gold ☐
- Steel ☐
- Zinc ☐

4.7.1.1 Poles of a magnet

Question 07 · continued

0 6 . 2 The iron nails become magnets when they are attracted to the bar magnet.

Complete the sentence.

Choose the answer from the box.

[1 mark]

electromagnets	**induced magnets**	**permanent magnets**

The iron nails become _____.

0 6 . 3 **Figure 9** shows two bar magnets next to each other.

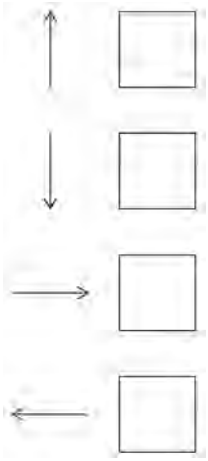
Figure 9



Which arrow shows the direction of the magnetic field between the magnets?

[1 mark]

Tick (✓) **one** box.



4.7.1.1 Poles of a magnet

Question 07 · continued

Figure 10 shows the direction of the current in a wire.

The current causes a magnetic field around the wire.

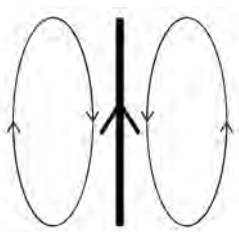
Figure 10



0 6 . 4 Which of the following shows the magnetic field pattern around the wire?

[1 mark]

Tick (✓) **one** box.



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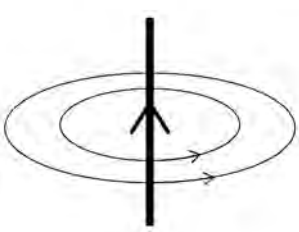

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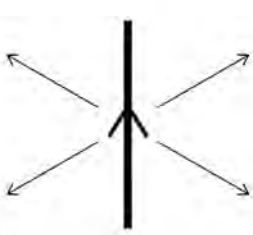

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4.7.1.1 Poles of a magnet

Question 07 · continued

0 6 . 5 What **two** changes would increase the strength of the magnetic field around the wire?

[2 marks]

1 _____

_____

2 _____

_____

7

Turn over for the next question