AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.7.1.2

Magnetic fields

Mark schemes and examiner comments

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

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

6.7.1.2 Magnetic fields

Answer 01 · Mark scheme

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	1st box ticked		1	AO1 6.7.1.2
08.2	(permanent magnet) has no effect on the aluminium iron is attracted (to the permanent magnet) (only) the (permanent) magnet can be repelled (by the permanent magnet)		1 1 1	AO2 6.7.1.1 6.7.1.2

6.7.1.2 Magnetic fields

Answer 01 · Mark scheme June 2018 | 8464/P/2F | Original Q8

Question	Answers	Mark	AO / Spec. Ref.
08.3	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to give a clear account.	5–6	AO2
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear.	3–4	AO2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	
	Indicative content • completing the circuit • turns the electromagnet on • there is a current in the coil • a magnetic field is produced around the coil • the iron core becomes magnetised • move electromagnet towards the blocks • the block is attracted to the electromagnet • moving the crane moves the block • switching off the current switches off the electromagnet • releasing the block		6.7.2.1
Total			**10**

6.7.1.2 Magnetic fields

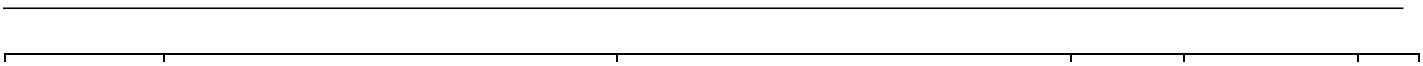
Answer 02 · Mark scheme June 2019 | 8464/P/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
01.1	electrostatic gravitational		1 1	AO1 6.5.1.2	A
01.2	D		1	AO2 6.7.1.1	A
01.3	bring two unlike poles close together bring two like poles close together	allow north and south poles allow opposite poles allow two north / south poles allow N for north and S for south	1 1	AO1 6.7.1.1	E
01.4	induced magnetism		1	AO1 6.7.1.1	A
01.5	all 4 poles correctly labelled north and south	allow N for north and S for south allow 1 mark for 2 or 3 correctly labelled poles	2	AO3 6.7.1.1	E
Total			**8**		

6.7.1.2 Magnetic fields

Answer 02 · Mark scheme

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



6.7.1.2 Magnetic fields

Answer 03 · Mark scheme November 2020 | 8464/P/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	iron and steel will be attracted (to the magnet) aluminium, copper and tin will not be attracted (to the magnet)	 allow **1** mark is one metal is in the incorrect list, but all the other four are correct if no other mark awarded allow iron and steel are magnetic for **1** mark	1 1	AO1 6.7.1.1
06.2	the paperclip would still be attracted to the magnet because of induced magnetism	 allow the paper clip becomes an induced magnet allow because the paper clip is a temporary magnet allow there is a magnetic field at the south pole	1 1	AO1 6.7.1.1
06.3	weight = mass × gravitational field strength or W = mg	do not accept gravity for gravitational field strength	1	AO1 6.5.1.3
06.4	1.0 g = 0.0010 kg weight of 1 paperclip = 0.0010 × 9.8 Force = 0.0098 x 20 = 0.196 (N)	allow 0.001 (kg) allow 0.0098 (N) allow correct substitution using incorrectly/not converted value of mass of paperclip allow correct calculation using incorrectly/not converted value of mass of paperclip	1 1 1	AO2 6.5.1.3

6.7.1.2 Magnetic fields

Answer 03 · Mark scheme

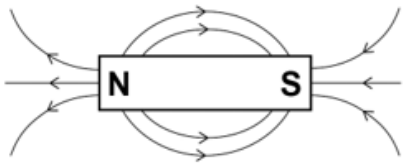
November 2020 | 8464/P/2F | Original Q6

Total			**8**	

6.7.1.2 Magnetic fields

Answer 04 · Mark scheme

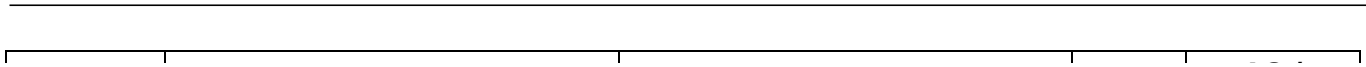
November 2021 | 8464/P/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	first box ticked 		1	AO1 6.7.1.2
02.2			1	AO3 6.7.1.1
02.3	the iron bar experiences a magnetic force of attraction		1	AO1 6.7.1.1
02.4	nickel steel		1 1	AO1 6.7.1.2
02.5	an electromagnet can be switched on and off		1	AO3 6.7.2.1
02.6	the iron nail makes the magnetic field stronger		1	AO1 6.7.2.1
02.7	use a greater current		1	AO1 6.7.2.1
Total			8	

6.7.1.2 Magnetic fields

Answer 04 · Mark scheme

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



6.7.1.2 Magnetic fields

Answer 05 · Mark scheme

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

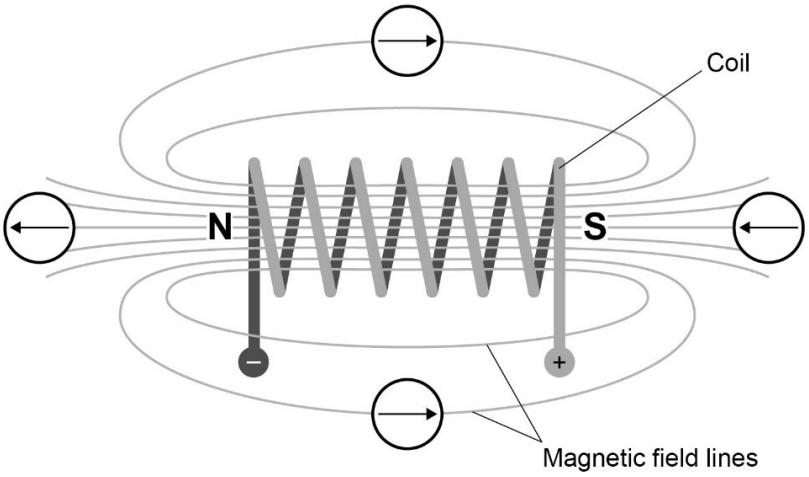
Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	the Earth has a magnetic field		1	AO2 6.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	steel		1	AO1 6.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	the field is strongest at the ends of the coil		1	AO1 6.7.2.1

Answer 05 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	all arrows in the correct direction  allow **1** mark for 2 or 3 arrows in the correct direction		2	AO2 6.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	any **two** from: • increase the current • insert an iron core • increase the number of turns	allow increase potential difference allow turns closer together	2	AO1 6.7.2.1

Total Question 4		7

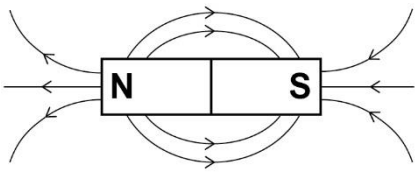
6.7.1.2 Magnetic fields

Answer 06 · Mark scheme

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

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	iron is magnetic		1	AO1 6.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	correct pattern of field lines arrows on field lines away from N and towards S  		1 1	AO1 6.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	they are opposite poles		1	AO3 6.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	they line up with the Earth's magnetic field	allow they all point north	1	AO3 6.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	circular		1	AO1 6.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	a control		1	AO3 6.7.2.1

6.7.1.2 Magnetic fields

Answer 06 · Mark scheme

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	3.6 (N)		1	AO2 6.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.8	(the force) decreases		1	AO1 6.7.2.1

Total Question 3	**9**

6.7.1.2 Magnetic fields

Answer 07 · Mark scheme

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

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	X = south Y = north	allow S for south allow N for north allow **1** mark if they are the wrong way round	1 1	AO2 6.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	→		1	AO1 6.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	iron nickel		1 1	AO1 6.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	the force is always attractive		1	AO3 6.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	$F = 0.030 \times 9.8$ 0.294 (N)	 allow 0.29 (N)	1 1	AO1 6.5.4.2.2

Total Question 4	**8**

6.7.1.2 Magnetic fields

Answer 08 · Mark scheme

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

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	pole X south **and** pole Y north opposite poles attract **or** a north pole and a south pole attract	allow X is S allow Y is N MP2 dependent on MP1	1 1	AO3 AO1 6.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	from 3.5 to 4.5 cm	either order	1	AO3 6.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	$\frac{4.0 + 3.5 + 4.0 + 3.5 + 4.5}{5}$ 3.9 (cm)	allow $\frac{19.5}{5}$	1 1	AO2 6.7.1.2

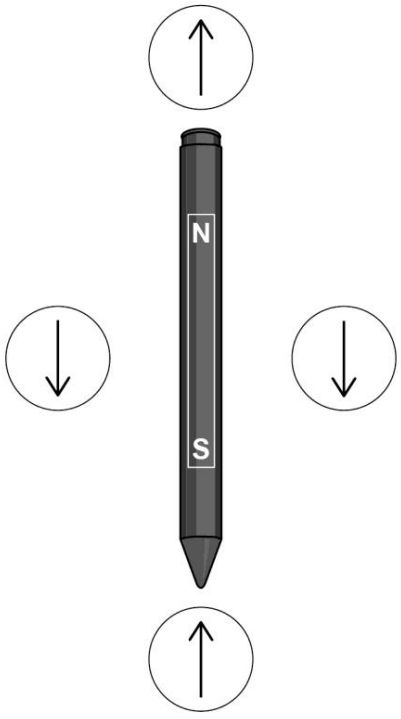
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	random errors		1	AO1 6.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	(the magnetic force) decreased		1	AO1 6.7.1.2

6.7.1.2 Magnetic fields

Answer 08 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	steel		1	AO1 6.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	arrow in circle next to south pole pointing upwards arrows in circles next to the middle of pen pointing downwards  		1 1	AO3 6.7.1.2

Total Question 4	10

6.7.1.2 Magnetic fields

Answer 04 · Examiner comments November 2021 | 8464/P/2F | Original Q2

Question 2 (Low demand)

02.1 Less than 40% of students were able to identify the pattern of the field lines around a simple bar magnet.

02.2 Approximately half of students correctly labelled the poles on the iron bar. More than 15% of students did not attempt the question. Students should be reminded that they should answer every question part, even where there is no answer line. Where marks are allocated, this is clearly indicated, and each question part has its own question number.

02.3 Nearly half of students got this question correct. Most of those that did not, thought the iron bar would be repelled.

02.4 Most students were able to identify one magnetic metal, but only about 15% were able to identify two . As expected, steel was the most common correct answer. Aluminium and magnesium were equally commonly seen incorrect answers.

02.5 A little over 40% of students correctly selected that the electromagnet can be switched on and off.

02.6 70% of students knew that the iron nail makes the magnetic field stronger.

02.7 70% of students knew that using a greater current would increase the strength of the electromagnet.

Answer 05 · Examiner comments June 2022 | 8464/P/2F | Original Q4

Question 4 (Low demand)

04.1 65% of students knew that the compass always points in the same direction due to the Earth's magnetic field.

04.2 Only 33% of students knew that steel was the only magnetic material given. Aluminium was the most popular answer.

04.3 50% of students knew that the field was strongest at the ends of the coil.

04.4 Approximately 5% of students scored 2 marks. 25% of students were able to score 1 mark for drawing 2 or 3 arrows in the correct direction.

04.5 Nearly 40% of students scored 1 mark on this question, but only approximately 10% of students scored 2 marks. Most students answered who did not score any marks referred to a stronger magnet.

6.7.1.2 Magnetic fields

Answer 06 · Examiner comments

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

Question 3 (Low demand)

03.1 75% of students correctly selected that iron is magnetic.

03.2 40% of students gained at least one mark for drawing the field lines. Most students who only scored one mark were able to draw the correct pattern but did not draw the arrows in the correct direction.

03.3 Over 90% of students knew that the magnets attract each other because opposite poles were facing each other.

03.4 25% of students knew why all the compasses point in the same direction. The most common correct response was that they are all pointing north.

03.5 Nearly 70% of students knew that the field lines would be circular.

03.6 Nearly half the students knew that the current was a control variable.

03.7 Just over half of students were able to correctly read the value off the Newton meter. 4.4 was a common incorrect response.

03.8 About 40% of students knew that the force would decrease if the distance increased. Many incorrectly stated that the force would increase.

6.7.1.2 Magnetic fields

Answer 07 · Examiner comments

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

Question 4 (low demand)

04.1 About 70% of students knew that the poles of a permanent magnet are called North and South. However, most named them the wrong way round and so only received the 'allow' mark.

04.2 Only about a third of students were able to draw the arrow in the correct direction.

04.3 25% of students were able to select the two magnetic materials from the list. A number of students selected an incorrect number of responses despite being instructed to tick two boxes.

04.4 Just under 40% of students knew that the force between a magnet and a magnetic material is always attractive.

04.5 This calculation of resultant force on the tag was well answered, with just over 80% of students gaining 2 marks. Some students appeared to find the unit of acceleration (m/s^2) confusing and squared 9.8. There were also a large number of spurious conversions of mass into grams.

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6.7.1.2 Magnetic fields

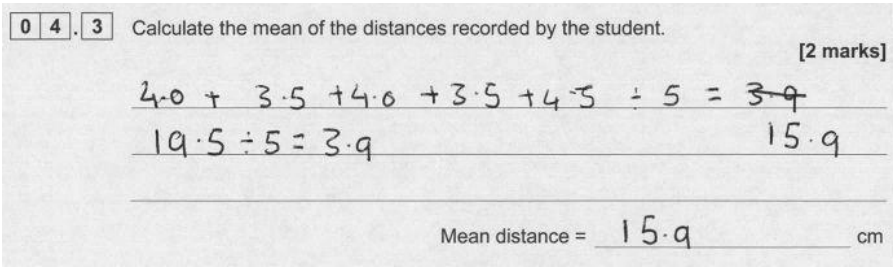
Answer 08 · Examiner comments June 2025 | 8464/P/2F | Original Q4

Question 4 (Low and standard demand)

04.1 Just over half scored at least one mark for correctly identifying the poles, with around 40% being able to give a correct reason for their answer.
Many students had misconceptions about the poles of magnets, with common answers including east and west poles, or positive and negative poles.

04.2 About four in five students were able to correctly identify the range of the values given.

04.3 Slightly less than three quarters of the students correctly calculated the mean value. Some students just added up all the values. Others apparently did not read the question carefully, with some students building on their answer to the previous question by calculating the size of the range, or by determining the uncertainty in the mean value.


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

[2 marks]

4·0 + 3·5 + 4·0 + 3·5 + 4·5 ÷ 5 = ~~3·9~~

19·5 ÷ 5 = 3·9 15·9

Mean distance = 15·9 cm

When calculating a mean, students would be well advised to use brackets appropriately, or to break the calculation down into an addition, and then a division.
This student incorrectly added the first four numbers to one-fifth of the final number, arriving at the incorrect answer, so gained no credit.
They also demonstrated that they could calculate the answer correctly, but by putting the answer of 15.9 on the answer line, they had chosen the incorrect line of working.

04.4 Approximately half the students recognised that repeating and calculating a mean reduces the effect of random errors.

04.5 Nearly two thirds recognised that increasing the distance between two magnets causes the magnetic forces between them to decrease.

04.6 Only about 40% knew that steel is magnetic.

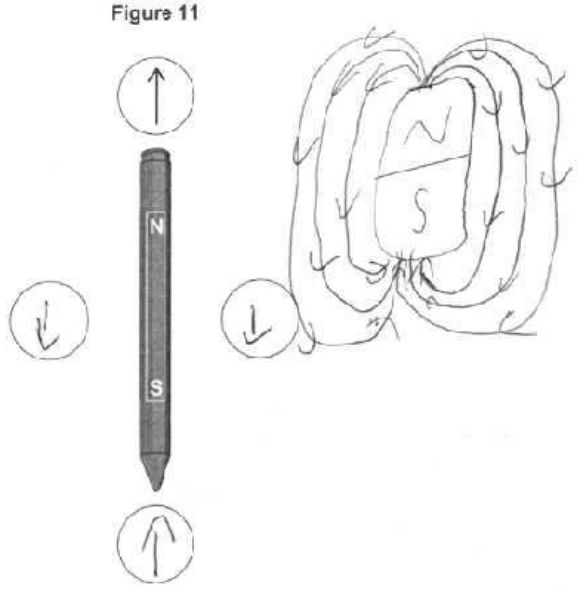
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6.7.1.2 Magnetic fields

Answer 08 · Examiner comments June 2025 | 8464/P/2F | Original Q4

04.7 This question proved to be difficult for the majority of students, with only about a fifth gaining any credit, and less than one in ten students gaining both marks. The most common answer by far was to have all of the arrows pointing away from the magnet in the pen.

Figure 11



This student draws a diagram of the field pattern that they had clearly learned. This helped them to add the arrows to the plotting compasses in the diagram and gain both marks. In physics questions, whether completing diagrams or writing descriptions or explanations, it can often help students to draw a quick sketch of a situation to help them gather their thoughts.