AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.7.1.1

Poles of a magnet

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**4**
Available paper years	**2020–2024**

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.

6.7.1.1 Poles of a magnet

Answer 01 · Mark scheme November 2020 | 8464/P/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	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 **1** mark for iron and steel are magnetic	1 1	AO1 6.7.1.1
01.2	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
01.3	weight = mass × gravitational field strength or W = mg	do not accept gravity for gravitational field strength	1	AO1 6.5.1.3
01.4	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

6.7.1.1 Poles of a magnet

Answer 01 · Mark scheme

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

Total			**8**	

6.7.1.1 Poles of a magnet

Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	the downward force on the balance increased	allow when there is a current in the wire there is a magnetic field around the wire (which causes a magnetic force)	1	AO3 6.7.2.2 6.5.4.2.3
	therefore the wire must experience an equal and opposite force (which is upwards)		1	
07.2	calculate the difference between the two mass readings	allow 254.8 – 252.3 = 2.5	1	AO1 6.7.2.2
	convert to kg **and** multiply by gravitational field strength	allow (2.5 / 1000) × 9.8 = 0.02375 (N)	1	
07.3	gradient $= \frac{(0.0210 - 0.0)}{(0.70 - 0.02)}$		1	AO3
	gradient = 0.031	allow answer correctly given to any number of significant figures	1	AO3
	0.031 = B × 0.125	allow correct substitution using correctly calculated value given to any number of significant figures	1	AO2
	B = 0.25 T	allow answer correctly given to any number of significant figures	1	AO2
		any rounding must be correct for subsequent marks to be awarded.		6.7.2.2
		max **2** marks if a pair of readings from the graph are used instead of gradient calculation		
Total			**8**	

6.7.1.1 Poles of a magnet

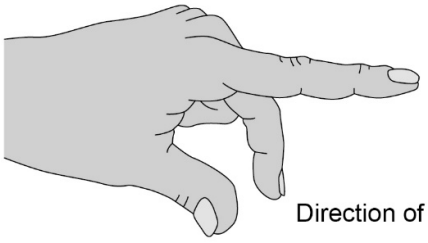
Answer 03 · Mark scheme

November 2021 | 8464/P/2H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	at the poles		1	AO1 6.7.1.2
04.2	the distance between the field lines varies		1	AO1 6.7.1.2
04.3	electromagnet is easy to demagnetise so easy to remove separated metal	allow electromagnet can be switched off allow electromagnet is (generally) stronger than a permanent magnet for **1** mark if no other marks are awarded	1 1	AO1 6.7.2.1
04.4	cobalt nickel		1 1	AO1 6.7.1.2
04.5	increases the current in the coil of the electromagnet bring the electromagnet closer to the pieces of iron and steel	allow increase potential difference across the coil	1 1	AO1 AO3 6.7.2.1

6.7.1.1 Poles of a magnet

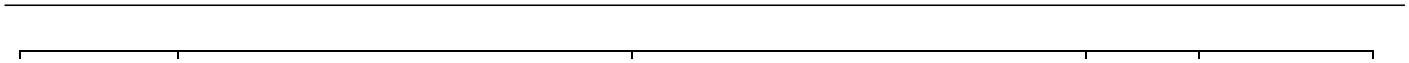
Answer 03 · Mark scheme

04.6	L = 0.120 m 0.36 = B × 4.0 × 0.120 $B = \frac{0.36}{(4.0 \times 0.120)}$ B = 0.75 T	 allow a correct substitution of an incorrectly / not converted value of L allow a correct rearrangement using an incorrectly / not converted value of L allow a correct calculation using an incorrectly / not converted value of L	1 1 1 1 1	AO2 6.7.2.2
04.7	 Direction of magnetic field Direction of current Direction of force allow **1** mark for 1 or 2 correct		2	AO1 6.7.2.2
Total			**15**	

6.7.1.1 Poles of a magnet

Answer 03 · Mark scheme

November 2021 | 8464/P/2H | Original Q4



6.7.1.1 Poles of a magnet

Answer 04 · Mark scheme

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

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	into the page		1	AO2 6.7.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	$0.092 = B \times 4.6 \times 0.080$ $B = \frac{0.092}{4.6 \times 0.080}$ $B = 0.25$ tesla or T	 allow a correct rearrangement using an incorrectly / not converted value of l allow a correct calculation using an incorrectly / not converted value of l	1 1 1 1	AO2 6.7.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	Newton's third law		1	AO1 6.5.4.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	any **two** from: • move the electromagnet closer to the permanent magnet • add more turns to the coil / electromagnet • increase the current (in the coil / electromagnet)	 allow increase the potential difference (across the coil / electromagnet)	2	AO1 6.7.2.1

6.7.1.1 Poles of a magnet

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	any **two** from • reverse the current in the coil / electromagnet • turn the electromagnet around (to reverse the poles) • wrap the coil (around the iron core) in the opposite direction		2	AO1 AO3 6.7.2.1

Total Question 4	**10**

6.7.1.1 Poles of a magnet

Answer 03 · Examiner comments November 2021 | 8464/P/2H | Original Q4

Question 4 (standard demand and standard/high demand)

04.1 33% of students knew that the field was strongest at the poles.

04.2 12% of students were able to correctly describe how the diagram showed that the field was not the same at all places. Many incorrect answers did not refer to ay feature of Figure 4.

04.3 40% of students gained 1 mark on this question. Most of them identified that the electromagnet could be easily demagnetised. A further 8% went on to say that this meant that the pieces of metal could be easily removed.

Some of the 40% that scored 1 mark scored the mark because they said that electromagnets are (generally) stronger.

04.4 20% of students could name one of the magnetic metals, and 20% of those students could name both the metals. Of those that could only name 1 magnetic metal, there was an approximately even number for each correct answer.

04.5 Approximately 35% of students scored one mark, nearly all of these suggested increasing the current. Only a handful of students also suggested moving the electromagnet closer and scored 2 marks.

04.6 This standard/high demand calculation was reasonably well answered. Nearly 40% scored 3 or 4 marks for a correct calculation, but either did not recall the unit, did not convert the length or did neither. 5% of students scored full marks.

04.7 30% of students scored at least 1 mark for getting at least 1 word correct and in the correct place. 10% were able to write the correct word in the correct place for each finger.

The majority of students that scored 0 marks wrote words that were not related to electromagnetism.

6.7.1.1 Poles of a magnet

Answer 04 · Examiner comments

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

Question 4 (standard & standard/high demand)

04.1 A third of students were able to use Fleming's left-hand rule and give the correct direction.

04.2 The majority of students were able to access this calculation, with 80% gaining at least 2 marks and 13% full marks. 25% of students either did not know the unit or missed the conversion, so were limited to gaining 2 of the 3 marks available.

04.3 About two-thirds of students knew that the forces were an example of Newton's Third Law. The most common incorrect answer was Newton's First Law.

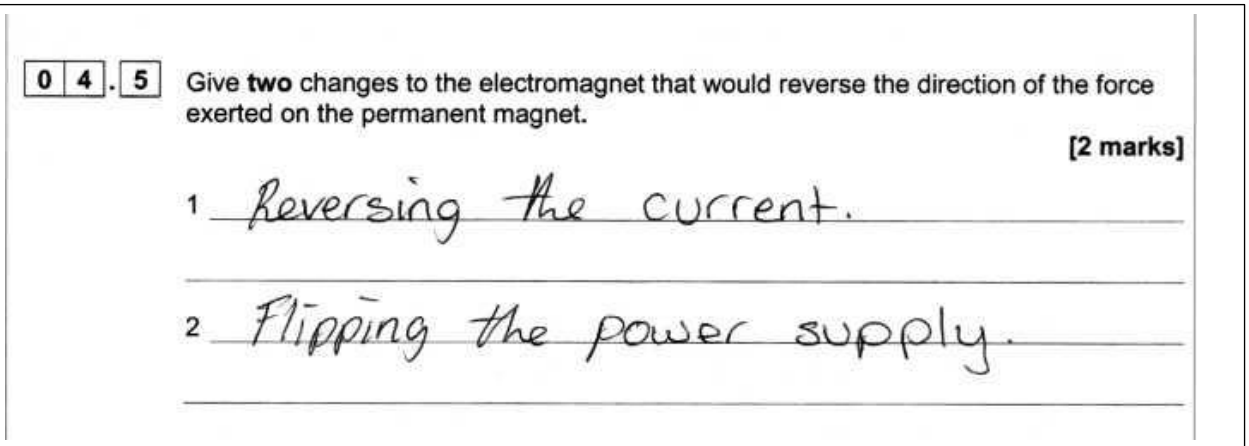
04.4 About a third of students gave two correct changes and a third of students one correct change. The most popular correct answer was to increase the current. Students should be encouraged to state that the number of turns *on the coil* should be increased, as 'increasing the number of coils' is ambiguous and would not gain the mark.

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Answer 04 · Examiner comments

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

04.5 This question was more demanding than question 04.4 with less than 50% of students gaining a mark. 10% of students were able to give two changes that would reverse the direction of the force.



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 Reversing the current.

2 Flipping the power supply.

This example shows the most popular correct response, which was to reverse the direction of the current. The second answer would have gained the mark on its own because it will result in the current's direction reversing. However, both answers are the same marking point so only 1 mark is awarded.