AQA GCSE Physics | 8463

SPECIFICATION POINT 4.7.1.2

Magnetic fields

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**18**
Available paper years	**2008–2025**

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.

4.7.1.2 Magnetic fields

Answer 01 · Mark scheme

Question 6

question	answers	extra information	mark
(a)	increase the current (1)	credit increase the p.d./voltage credit reduce the resistance credit have thicker wiring credit add extra / more cells	1
	increase the magnetic field (strength) (1)	credit 'have stronger magnet(s) do **not** credit 'bigger magnets' **either order**	1
(b)	**either** reverse polarity **or** connect the battery the other way round		1
	either reverse direction of the magnetic field **or** put the magnet the other way round / reverse the magnet	do **not** give any credit to a response in which both are done at the same time **either order**	1
(c)	**either** conductor parallel to the magnetic field **or** lines of magnetic force and path of electricity do not cross		1
total			5

4.7.1.2 Magnetic fields

Answer 01 · Mark scheme January 2008 | PHY3F | Original Q6 | Legacy

PHY3F

4.7.1.2 Magnetic fields

Answer 02 · Mark scheme

Question 8

question	answers	extra information	mark
8(a)	C → B (1st two boxes) D → A (end two boxes)	allow **1** mark for either linkage in any position	1 1
8(b)	any **two** from: • more powerful / stronger magnet • smaller gap between coil and magnet • coil with more turns / longer coil • coil with bigger area	do **not** accept just bigger magnet accept more coils do **not** accept just bigger coil do **not** accept just more wire do **not** accept shake faster do **not** accept shake for longer	2
8(c)(i)	the longer the torch is shaken, the longer the light lasts	accept the converse accept it is a (strong) positive (non-linear) relationship do **not** accept '.... are (directly) proportional ....'	1

Question 8 is continued on the next page . . .

4.7.1.2 Magnetic fields

Answer 02 · Mark scheme

PHY3F

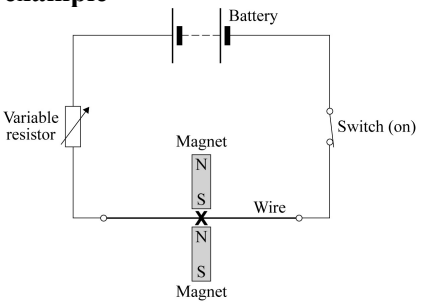
Question 8 continued . . .

question	answers	extra information	mark
8(c) (ii)	any **two** from: • if this investigation is repeated the result would not be the same • rate / amplitude / angle of shaking could vary • personal judgement when the LED / light has 'gone out' • results / data / measurements have not been repeated / averaged		2
Total			**7**

4.7.1.2 Magnetic fields

Answer 03 · Mark scheme

Question 6

question	answers	extra information	mark
6(a)	centre of the **X** midway between the poles	intention correct as judged by eye **example**  	1
6(b)	move the poles further apart	accept turn for move accept ends / magnets for poles accept use weaker magnets do **not** accept use smaller magnets	1
6(c)(i)	add more cells (to the battery) **or** reduce the resistance (of the variable resistor)	do **not** accept 'use a bigger battery' accept increase the potential difference / voltage accept increase the current do **not** accept any changes to the magnets, to the wire or to their relative positions	1

Question 6 continues on the next page . . .

PHY3F

Question 6 continued . . .

question	answers	extra information	mark
6(c)(ii)	reverse (the polarity of) the battery	accept turn the battery / cells round accept swap the connections to the battery do **not** accept any changes to the magnets, to the wire or to their relative positions	1
Total			**4**

4.7.1.2 Magnetic fields

Answer 03 · Mark scheme

January 2010 | PHY3F | Original Q6 | Legacy

PHY3F

Answer 04 · Mark scheme

March 2010 | PHY1BP | Original Q4 | Legacy

Four	**A**	alpha	**3**
	B	beta	**4**
	C	gamma	**2**
	D	X-rays	**1**

Answer 05 · Mark scheme

June 2010 | PHY1BP | Original Q6 | Legacy

Six	4	2	2	1

4.7.1.2 Magnetic fields

Answer 06 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)	**1** mark for each correct line **List A** Type of nuclear radiation Alpha Beta Gamma **List B** Property of radiation Has the same mass as an electron Very strongly ionising Passes through 10 cm of aluminium Deflected by a magnetic field but not deflected by an electric field	if more than 1 line is drawn from any box in List **A**, none of those lines gain any credit	3
3(b)(i)	(the detector) reading had gone down	'it' equals detector reading accept the reading in the table is the smallest accept 101 is (much) lower than other readings / a specific value eg 150 do **not** accept this answer if it indicates the readings are the thickness	1
	more beta (particles / radiation) is being absorbed / stopped	accept radiation for beta particles / radiation accept fewer particles being detected	1
3(b)(ii)	six years		1

Question 3 continues on the next page . . .

4.7.1.2 Magnetic fields

PHY1F

Question 3 continued . . .

question	answers	extra information	mark
3(b)(iii)	alpha would not penetrate the cardboard	accept the basic property- alpha (particles) cannot pass through paper / card accept alpha (particles) are less penetrating (than beta) range in air is neutral	1
Total			**7**

4.7.1.2 Magnetic fields

Answer 06 · Mark scheme January 2011 | PHY1F | Original Q3 | Legacy

PHY1F

4.7.1.2 Magnetic fields

Answer 07 · Mark scheme

June 2013 | PH3FP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)	A		1
5(b)(i)	9000	an answer of 9 k(N) gains **1** mark	1
5(b)(ii)	increase	accept other comparative terms, eg give a bigger affect / change is insufficient	1
5(b)(iii)	smaller	accept other comparative terms, eg less	1
5(c)	Q N M	all three in correct boxes one statement in correct box gains **1** mark	2
5(d)	any **two** from: • increase the current / p.d. (supplied to the coil) • increase number of turns (on the coil) • increase the area (of the coil) • increase the (strength of the permanent) magnetic field	accept reduce the resistance of the coil **or** increase cross sectional area of wire accept more cells / batteries **or** turn up the power supply increase power is insufficient accept increase the width of the coil increase width / size is insufficient accept move the magnets closer to the coil accept use stronger magnets do **not** accept use larger magnets	2
5(e)	an economic		1
Total			**9**

4.7.1.2 Magnetic fields

Answer 07 · Mark scheme

June 2013 | PH3FP | Original Q5 | Legacy

PH3FP

4.7.1.2 Magnetic fields

Answer 08 · Mark scheme June 2015 | PH3FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. ref.
4(a)	motor		1	AO1 P3.3.1b
4(b)	increase the strength of the magnetic field	accept use a stronger magnet use a larger / bigger magnet is insufficient do **not** accept move magnets closer	1	AO1 P3.3.1c
	increase the (size of the) current	accept use a current greater than 2 (A) accept increase the p.d./voltage (of the power supply) increase the power supply is insufficient	1	
4(c)	any **one** from: • (reverse the) direction of the current	accept swap the wires at the power supply connections swap the wires around is insufficient	1	AO1 P3.3.1e
	• (change the) direction of the magnetic field	accept turn the magnet around do **not** accept use an a.c. supply		
4(d)	The wire is parallel to the direction of the magnetic field.		1	AO1 P3.3.1d
Total			5	

4.7.1.2 Magnetic fields

Answer 08 · Mark scheme

June 2015 | PH3FP | Original Q4 | Legacy



4.7.1.2 Magnetic fields

Answer 09 · Mark scheme

June 2016 | PH2FP | Original Q9 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
9(a)	2 protons and 2 neutrons	accept 2p and 2 n accept (the same as a) helium nucleus symbol is insufficient do not accept 2 protons and neutrons	1	AO1 2.5.2c
9(b)(i)	gamma rays		1	AO1 2.5.2e
9(b)(ii)	loses/gains (one or more) electron(s)		1	AO1 2.5.1d
9(c)	any **one** from: • wear protective clothing • work behind lead/concrete/glass shielding • limit time of exposure • use remote handling	accept wear mask/gloves wear goggles is insufficient wear protective equipment/gear is insufficient accept wear a film badge accept handle with (long) tongs accept maintain a safe distance accept avoid direct contact	1	AO2 2.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
9(d)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 4 and apply a 'best-fit' approach to the marking.		6	AO1 2.5.2e 2.5.2f

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant information	There is a description of at least one type of radiation in terms of one or more properties.	There is a description of at least two types of radiation in terms of some properties **or** a full description of one type of radiation in terms of all three properties **or** the same property is described for all three radiations	There is a description of all three types of radiation in terms of at least two of their properties **or** a full description of two types of radiation in terms of all three properties.

examples of physics points made in the response	extra information
alpha particles • are least penetrating • are stopped by paper / card • have the shortest range • can travel (about) 5cm in air • are (slightly) deflected by a magnetic field • alpha particles are deflected in the opposite direction to beta particles by a magnetic field	
beta particles • (some are) stopped by (about) 2mm (or more) of aluminium/metal • can travel (about) 1 metre in air • are deflected by a magnetic field • beta particles are deflected in the opposite direction to alpha particles by a magnetic field	accept (some are) stopped by aluminium foil
gamma rays • are the most penetrating • are stopped by (about) 10cm of lead • have the longest range • can travel at least 1 km in air • are not deflected by a magnetic field	

Total			10

4.7.1.2 Magnetic fields

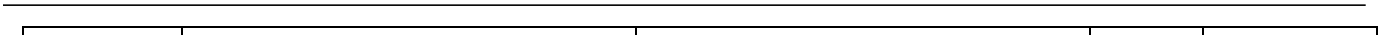
Answer 10 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	less than		1	AO1 3.3.2f
2(a)(ii)	because there are fewer turns (on the secondary coil)	do not accept coils for turns accept because it is a step down transformer reason only scores if correct answer is chosen in part 2 (a)(i)	1	AO1 3.3.2f
2(b)	(soft) iron		1	3.3.2c
2(c)	A potential difference is induced across the secondary coil.		1	AO1 3.3.2d
2(d)	50 hertz		1	AO1 3.3.2j
2(e)	2 (W)		1	AO1 3.3.2h
Total			**6**	

4.7.1.2 Magnetic fields

Answer 10 · Mark scheme

June 2017 | PH3FP | Original Q2 | Legacy



4.7.1.2 Magnetic fields

Answer 11 · Mark scheme

June 2018 | 8463/2F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	top of each paper clip labelled N / north **and** bottom of each paper clip labelled S / south	both parts required	1	AO2 4.7.1.1
04.2	so the paper clips have the same weight / mass which allows the results for different numbers of turns to be compared (fairly)	 allow fair test allow the control variable (is the weight / mass of a paper clip) allow to obtain valid results ignore accurate results	1 1	AO3 4.7.2.1
04.3	as the number of turns increases so does the number of paper clips (held) in a linear pattern	allow positive correlation directly proportional scores **2** marks allow a correct description of directly proportional for **2** marks	1 1	AO3 4.7.2.1
04.4	some of the paper clips were already magnetised		1	AO3 4.7.2.1

4.7.1.2 Magnetic fields

Answer 11 · Mark scheme

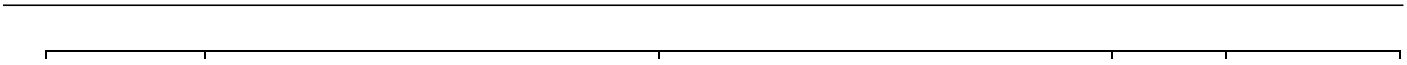
June 2018 | 8463/2F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	discount the result of 18	ignore repeat experiment / measurements	1	AO3 4.7.2.1
	as the three new results are similar (and not close to 18)		1	
	and use 15 (the mean of the new results)	allow find the mean of the remaining results (16,14 and 15) if no other marks have been awarded: calculate the mean (of all four results) (1) round down to 15 (1) – this mark only scores if the mean of 15.75 has been calculated	1	
04.6	keep number of turns constant	allow a specific number of turns	1	AO3 4.7.2.1
	(use the variable resistor to) change the current (several times)	change the p.d. is insufficient	1	
	(for each current value) count how many paper clips the electromagnet will hold		1	
Total			**12**	

4.7.1.2 Magnetic fields

Answer 11 · Mark scheme

June 2018 | 8463/2F | Original Q4



4.7.1.2 Magnetic fields

Answer 12 · Mark scheme

June 2019 | 8463/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3.1	both arrows pointing horizontally and to the right	judged by eye	1	AO1/1 4.7.1.2
3.2	(two south) poles would repel so the coat would not be held together	allow magnets would repel allow so the coat would not fasten	1 1	AO1/1 AO2/1 4.7.1.1
3.3	C		1	AO1/1 4.7.2.1
3.4	steel rod		1	AO1/1 4.7.2.1
3.5	electromagnet exerts a downwards force on the iron bar	allow electromagnet pulls the iron (bar) down(wards) allow electromagnet attracts the iron (bar)	1	AO1/1 4.7.2.1
3.6	1.5 (cm)		1	AO2/2 4.5.3
3.7	 F = 0.18 × 1.5 OR F = 0.18 × their 3.6 F = 0.27 (N)	an answer 0.27 (N) scores **2** marks allow 0.18 × their 3.6 correctly calculated	 1 1	AO2/1 4.5.3
3.8	it increases and reaches a maximum	 allow and then does not change any change other than current causing strength to increase scores **0**	1 1	AO3/1a 4.7.2.1 WS3.5
Total			**11**	

Answer 13 · Mark scheme

November 2020 | 8463/2F | Original Q5

Question 5

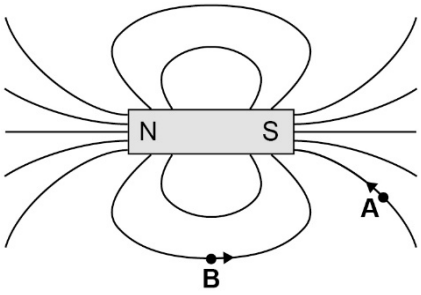
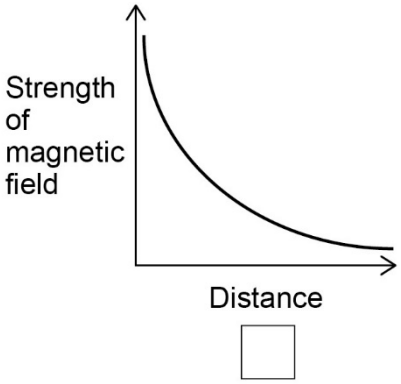
Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(the north pole of the floating magnet is) repelled from the north pole (of the fixed magnet) and attracted to the south pole (of the fixed magnet)	allow following a magnetic field line for **1 mark** if no other marks scored	1 1	AO3 4.7.1.1 4.7.1.2
05.2	it was attracted (to the fixed magnet)	allow it sticks / joins to the (fixed) magnet allow it becomes an induced magnet allow it becomes magnetised	1	AO1 4.7.1.2
05.3	**Level 2:** The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		3–4	AO1 4.7.1.2
	Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	
	No relevant content		0	
	Indicative content: • mark where the compass points on the paper • move the compass to the marked point • repeat until you go back to the magnet • join up the points • add an arrow pointing from the north pole to the south pole • repeat for positions (above and below the bar magnet)			
05.4	C B A	allow **1** mark for one letter in the correct box	2	AO2 4.7.2.1
05.5	$E_e = 0.5 \times 200 \times 0.040^2$ $E_e = 0.16$ (J)		1 1	AO2 4.5.3
Total			**11**	

4.7.1.2 Magnetic fields

Answer 14 · Mark scheme

November 2021 | 8463/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	both arrows correct		1	AO1 4.7.1.2
07.2	a permanent magnet		1	AO1 4.7.1.1
07.3	third box ticked any **one** from • (the only graph) that shows the magnetic field getting weaker (as distance increases) • both other graphs show the magnetic field getting stronger (as the distance increases)	 only scores if correct box is chosen	1 1	AO3 4.7.1.2
07.4	steel cans are attracted to the electromagnet and are transferred to the container (by the conveyor belt) aluminium cans are not attracted to the electromagnet		1 1	AO1 4.7.1.2

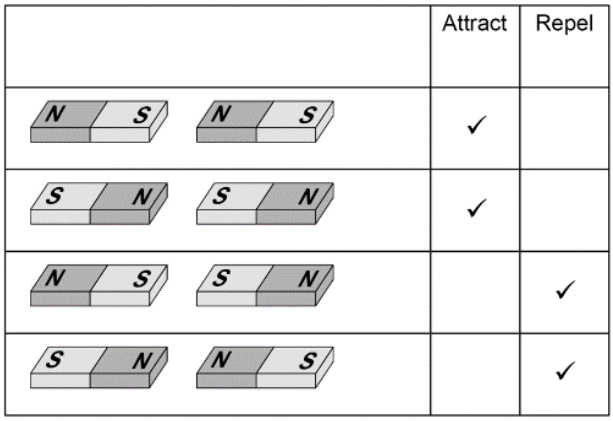
	and are left behind on the table	If no other mark scored: Steel cans are attracted (to the electromagnet) but aluminium cans are not – scores one mark		
07.5	raise the height of the table use a larger potential difference / current **or** use a stronger electromagnet	allow longer legs on the table allow put a (non-magnetic) box on top of the table allow lower the electromagnet allow more turns on the coil (of the electromagnet) do **not** accept insert a (soft) iron core	1 1	AO3 4.7.2.1
07.6	distance travelled = speed × time **or** $s = v\,t$		1	AO1 4.5.6.1.2
07.7	$3.3 = 1.7 \times t$ $t = \frac{3.3}{1.7}$ $t = 1.941$ (s) $t = 1.9$ (s)	 allow a calculation using the given data incorrectly but correctly rounded to 2 sig figs	1 1 1 1	AO2 4.5.6.1.2
Total			**13**	

4.7.1.2 Magnetic fields

Answer 15 · Mark scheme

June 2022 | 8463/2F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	all ticks correct  allow **1** mark for 3 correct ticks		2	AO2 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	the magnetic field gets weaker further from the magnet the magnetic field is strongest at the poles		1 1	AO1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	iron		1	AO1 4.7.1.2

4.7.1.2 Magnetic fields

Answer 15 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	coil		1	AO1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	the magnetic field would be stronger		1	AO1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	the magnetic field would be weaker		1	AO1 4.7.2.1

Total Question 1		**8**

4.7.1.2 Magnetic fields

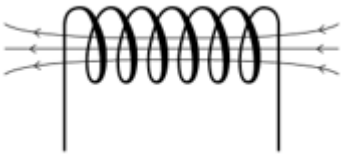
Answer 16 · Mark scheme

June 2023 | 8463/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	direction (of the magnetic field)		1	AO1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	increase the current in the wire		1	AO1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3			1	AO1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	**D A B C**	allow **1** mark for D B A C	2	AO2 4.7.2.1 4.2.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	decrease the distance between the electromagnet and the iron arm		1	AO3 4.7.1.2 4.7.2.1

4.7.1.2 Magnetic fields

Answer 16 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	period = $\frac{1}{6.25}$ period = 0.16 (s)		1 1	AO2 4.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	**B**		1	AO1 4.6.1.1

Total Question 3	9

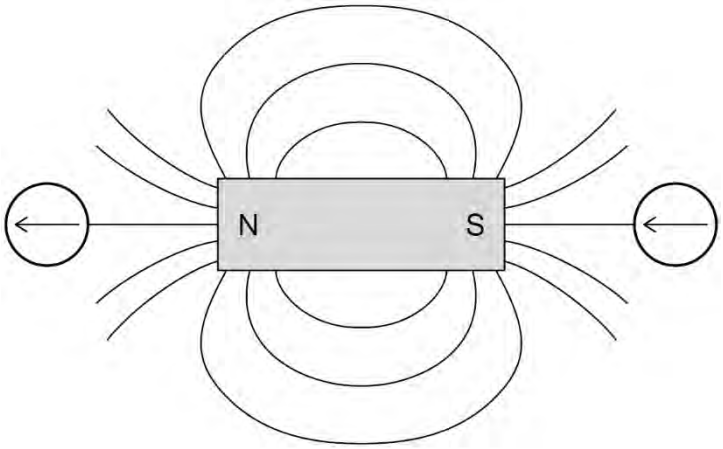
4.7.1.2 Magnetic fields

Answer 17 · Mark scheme

June 2024 | 8463/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	cobalt		1	AO1 4.7.1.2

Question	Answers	Mark	AO / Spec. Ref.
02.2	 2 arrows pointing left allow 1 mark for 1 correct arrow	2	AO1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	A		1	AO1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	S-S		1	AO1 4.7.1.2

4.7.1.2 Magnetic fields

Answer 17 · Mark scheme

June 2024 | 8463/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	switching the current on / off causes the compass needle to move **OR** moving the compass (around the wire) (1) changes the direction of the compass needle (1)	MP2 dependent on MP1	1 1	AO3 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	decreases		1	AO1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	it reverses (direction)	allow it changes direction allow it goes clockwise	1	AO3 4.7.2.1

Total Question 2	9

4.7.1.2 Magnetic fields

Answer 18 · Mark scheme

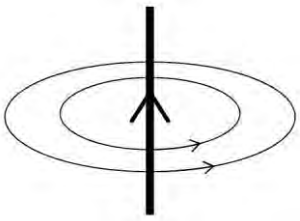
June 2025 | 8463/2F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	cobalt steel		1 1	AO1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	induced magnets		1	AO1 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	←		1	AO3 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4			1	AO1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	increase the current shape the wire into a solenoid		1 1	AO1 4.7.2.1

Total Question 6	7

4.7.1.2 Magnetic fields

Answer 11 · Examiner comments

June 2018 | 8463/2F | Original Q4

Question 4 (Low demand)

04.1 Just over 60% of the students correctly indicated the north and south ends of both paper clips. Most of the other students indicated only a north pole on the top paper clip and a south pole at the lower end of the second paper clip.

04.2 Many of the students stated that keeping all of the paper clips the same size would make it a 'fair test'. Fewer suggested that the paper clips should all have the same weight or mass to allow for a fair comparison of the results. Common incorrect answers referred to current travelling in the paper clips or implied that larger paper clips would take more of a share of the magnetic field.

04.3 92% of the students scored at least one mark. Few of the students failed to recognise that the number of paper clips increased as the number of turns of wire increased. Many scored two marks by stating that the relationship was directly proportional or described the number of paper clips held increasing by three for every ten extra turns of wire on the electromagnet.

04.4 Just over 80% of the students scored this mark.

04.5 78% of students scored one mark for this question. Few of the students picked up on 18 paper clips being an anomalous result and as such should be disregarded as the three remaining results were similar. A mean of the three similar results could then be found and used in the table. Students scoring one mark calculated the mean of all four results but did not gain a second mark for rounding down to the nearest whole paper clip.

04.6 Most of the students appreciated that the current would need to be changed, with many specifying how. Fewer students explicitly stated that the number of turns needed to be kept constant. Only a minority explained that the number of paper clips held could be used to show the strength of the electromagnet.

Answer 12 · Examiner comments

June 2019 | 8463/2F | Original Q3

Question 3 (Low demand)

03.1 Only 11% of the students scored this mark. Although the arrows were generally in the circles as requested, the majority of incorrect answers had arrows pointing towards each pole of the magnet or both arrows pointing away from the magnet.

03.2 Students were asked to explain why the coat must not have two south poles facing each other. The first mark was for stating that two south poles would repel and the second mark was for stating what that would mean for the coat e.g. it would not fasten. 85 % of the students did score the first marking point.

03.3 Just under half of the students recognised that the arrows should point in the same direction and made the correct choice.

03.4 Most of the students knew that steel is a magnetic material, with 95% scoring this mark.

03.5 This was well answered with students explaining that the iron bar was attracted to the electromagnet causing the spring to stretch. A number of students who did not score the mark described the electromagnet stretching the spring.

03.6 Students were expected to use the graph to calculate the spring extension between the currents of 0.6 A to 1.2 A. While 65% of the students scored the mark, most of the others simply subtracted the two current values.

03.7 Just over 77% of the students scored both marks. However this was sometimes due to error carried forward from part 03.6.

03.8 Very few of the students scored both marks. Approximately 50% scored 1 mark. A significant number of the students gave an answer in terms of the spring reaching its elastic limit. Some students appeared to misinterpret the graph, saw the gradient decrease, and stated incorrectly that the electromagnet was decreasing in strength. For the second mark students were expected to state that the electromagnet reached a maximum strength or that the strength levelled off - only 4% of the students did this.

4.7.1.2 Magnetic fields

Answer 15 · Examiner comments June 2022 | 8463/2F | Original Q1

Question 1 (Low demand)

01.1 Most of the students were able to identify correctly which pairs of magnets would attract and which would repel.

01.2 Most of the students scored at least one mark with just over half of the students scoring both marks.

01.3 This was not well known with only just over half of the students choosing iron.

01.4 Just over half of the students knew that when the circuit was complete there would be a current in the coil

01.5 Approximately three quarters of the students realised that the magnetic field would be stronger.

01.6 Around three quarters of the students realised that the magnetic field would be weaker.

Answer 16 · Examiner comments June 2023 | 8463/2F | Original Q3

03.1

Many students confused the arrows with the direction of current.

03.2

Almost 88% of students knew that increasing the current in the wire would increase the strength of the magnetic field.

03.3

62% identified the correct magnetic field pattern for a solenoid.

03.4

Most students identified the correct sequence, or got a mark for identifying the first and last letters correctly.

03.6

Most students calculated the period correctly.

03.7

75% of students recognised an area of compression in a longitudinal wave.

4.7.1.2 Magnetic fields

Answer 17 · Examiner comments June 2024 | 8463/2F | Original Q2

02.1
33% of students were able to identify cobalt as a magnetic material. Copper was a common wrong choice.

02.2
22% of students scored both marks and 46 % scored one for showing the direction of the magnetic field in the circles. Despite clear instructions, many students put their arrows on the magnetic field lines

02.3
46% of students knew where the magnetic field was strongest.

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Answer 17 · Examiner comments June 2024 | 8463/2F | Original Q2

02.4
Most students choose identified the correct arrangement of the bar magnets.

02.5
This proved to be a very difficult question. Students often thought that the compass needle pointed in the direction of the current. Only 7% scored 2 marks. Approximately 16 % of students did not attempt this question.

02.6
Most students knew that decreasing the current would decrease the strength of the magnetic field.

02.7
Many responses to this question were unclear or vague. Students do not understand that the magnetic file around a straight wire does not have poles.

4.7.1.2 Magnetic fields

Questions matter

GCSE
Physics
8463/2F

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4.7.1.2 Magnetic fields

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General comments

Students should pay attention to the number of options that need to be ticked when doing multiple choice questions. They should make sure they cross out wrong options when they change their minds, as marks cannot be awarded where there are multiple ticks instead of one.

Many students demonstrated good maths skills, although there are always issues with rearrangements. Formula triangles are not always helpful. Students who had correctly written down an equation in a previous question and then tried to use a formula triangle often scored no marks, because they don't understand how to use them. If they had substituted into the equation from the equations sheet they would have scored the 1st mark.

Students had access to the equations sheet for this examination series. A minority of the students however did not use them to find the appropriate equation.

Levels of demand

Questions are set at two levels of demand on this paper:

- Low demand questions are targeted at students working at grades 1–3.
- Standard demand questions are targeted at students working at grades 4–5.

A student's final grade, however, is based on their attainment across the qualification, not just on questions that may have been targeted at the level at which they are working.

01.1

Over 90 % of the students knew that a protractor is used to measure angles. The phonetic spelling of protractor was allowed.

01.2

Almost 70% of the students scored all four marks for completing the graph. Despite a clear instruction a significant number did not label the y-axis. A number of the students did not use a ruler to draw the line of best fit.

01.3

Most of the students correctly identified the relationship between the angle of incidence and the angle of reflection.

01.4

Half of the students knew which measurement was the amplitude of a wave. Most of the others thought the vertical distance between a peak and a trough was the amplitude.

01.5

About 80 % of the students knew which line showed the wavelength of the wave. The most common incorrect answer was the distance showing half the wavelength.

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01.6

Over 90 % of the students correctly calculated the wavelength. Those who did not achieve full marks mainly did so by not choosing the correct unit for wavelength, with Pa being a popular incorrect choice.

01.7

This was well answered, with most of the students scoring both marks. A few inverted the equation and thus calculated the period incorrectly.

02.1

Most of the students correctly calculated the weight of coal.

02.2

Just over 90% of the students were able to use the work done equation correctly. Those that did not get full marks tended to put an additional step into the calculation by dividing the answer 68 000 000 by 4; the number of engines in total.
Occasionally a student would attempt to convert the number calculated into standard form. Whilst not being penalised, this was not required.

02.3

Well answered by most students. As with part 02.2, occasionally a student would attempt to convert the number calculated into standard form.

02.4

Nearly 90% of the students could identify that friction was a contact force.

02.5

Most of the students identified the correct distance-time graph for constant speed.

02.6

This was the 1st calculation that was more challenging for many students. A common error was to use only one of the quoted velocities to calculate the acceleration rather than using the difference between the velocities. However just over 80 % did score full marks, with 10 % scoring zero or not attempting the question.

03.1

Approximately 60% of the students scored both marks. Often students did not know the correct word for a natural satellite. However, many correctly identified ‘star’ for the second word.

03.2

Most of the students knew that we are part of the Milky Way galaxy.

03.3

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Only about 40 % of the students knew that the Sun will eventually become a black dwarf. The most popular wrong answer was that it would become a black hole.

03.4

Just fewer than 40 % of the students knew that a very distant galaxy moves faster than a nearer galaxy.

03.5

About 70 % of the students knew that an increase in the wavelength of light from a distant galaxy is called red-shift.

03.6

About 60 % of the students selected the correct word to describe the beginning of the universe.

03.7

Almost 80 % of the students knew that the universe is expanding.

04.1

Just over 70 % of the students were able to make the connection between the mass of a vehicle and how it would affect the maximum acceleration.

04.2

Over 90 % of the students scored full marks for calculating the resultant force using F = ma. However, some of the students thought that the value of acceleration needed to be squared and then multiplied by mass.

04.3

This level of response question proved too challenging for many. Only just over 1 % of the students scored full marks. Most identified that the driving force would increase, but fewer recognised that as this happened the air resistance would also increase, with many stating that the air resistance would decrease as the cars speed increased.

04.4

Most of the students knew that the thinking distance is affected by the driver's reaction time.

04.5

Just fewer than 70 % of the students were aware that the braking distance is the distance travelled under the braking force.

04.6

Only just over 20 % of the students scored full marks for using the graph of distance against speed to find the stopping distance. The correct distances were often identified from the graph. However, these were then either subtracted from each other, divided or multiplied rather than added.

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4.7.1.2 Magnetic fields

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04.7

Nearly 80 % of the students identified factors that would increase the stopping distance of a car. Despite two being emboldened twice in the question, some students only ticked one box.

05.1

The principal focus was correctly identified by just over 60 % of the students.

05.2

About 80 % of the students knew that the change in direction of light as it enters a lens is called refraction.

05.3

Nearly 70 % the students recognised the shape of a convex lens.

05.4

Under a half of the students managed to correctly measure the object height and image height. This may have been due to a lack of skill or a lack of equipment.

05.5

This was much more successfully answered than part 05.4 with nearly 90 % of the students scoring both marks. These students used their values from part 05.4 to calculate magnification.

05.6

Just fewer than 50 % of the students knew that magnification is a ratio, but almost the same number thought it is a power.

05.7

This was a challenging question. Most of the students that did score a mark were awarded only the first mark point. This was for explaining that white light is transmitted through colourless glass. A lot of the students think of white light as an entity in itself rather than the result of the colours of the visible light combined. Few used the word transmitted but rather described it as passing through or goes through.
For the 2nd and 3rd mark points many of the students decided that white light was reflected or refracted, reinforcing the misconception that white light is a single entity rather than being made up of a combination of wavelengths. The idea that filters would absorb different wavelengths of light seemed to be difficult for the students to express, with very few achieving the third mark.

06.1

Only just over 30 % of the students could identify two magnetic materials from the list, with about 60 % being able to identify one. Again, a number of students ticked just one box or more than two boxes.

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4.7.1.2 Magnetic fields

06.2
Just over 70 % of the students correctly named the iron nails as induced magnets.

06.3
Just fewer than 40 % of the students knew the direction of the magnetic field.

06.4
Nearly 80 % of the students recognised the shape of the magnetic field around a current carrying wire.

06.5
Very few of the students could give two changes that would increase the magnetic field strength. 'Increasing the current' was a common correct response. Many of the students answered 'increasing the number of coils' as such they were implying the wire was already coiled and not answering the question asked, which was about the straight wire shown in Figure 10.

07.1
Nearly 60 % of the students understood what is meant by the moment of a force. The most common incorrect option was 'The direction of the force.'

07.2
The correct resultant moment was selected by just over 80 % of the students.

07.3
Students generally answered this well, identifying position 7 and on which side of the balance the tag should be placed. Some indicated this on the diagram which was an accepted alternative response, provided what was written did not contradict it.

07.4
Some students wrote the equation for the moment of a force in words and then in symbols. This risks not gaining the mark if either is incorrect. Also, correct use of symbols should be stressed, especially when they are given in the question. It was surprising that some of the students scored zero or did not attempt to write down an equation despite having the equations sheet.

07.5
Almost three quarters of the students were able to rearrange the equation and then calculate the distance between the pivot and the tag on the balance.

08.1
Most of the students found this level of response question difficult to answer. Only just over 1 % gave a level 2 answer. Many of the students scored 2, 1 or 0 marks. Of those that scored a mark the most common response was light travels faster than sound. Many also tried to describe light and sound as transverse and longitudinal waves, with the majority getting this

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confused. Very few identified acceptable similarities. Common answers that did not gain credit included light travels at the speed of light, sound travels at the speed of sound, light can be seen and sound cannot be seen.

08.2

Just fewer than 80 % of the students choose the correct equation for calculating speed.

08.3

This question required students to rearrange the equation. About three quarters of the students scored all three marks.

09.1

About 65 % of the students correctly stated the independent variable in this investigation.

09.2

Just over 40 % of the students scored both marks for identifying a risk of harm and a suitable safety precaution to reduce the risk. Too few students connected a hazard, such as a falling weight, becoming a risk of harm when it hit or hurt the student.

09.3

Students were expected to clearly describe two improvements to the arrangement shown that would improve the accuracy of the results. Many had difficulty describing their ideas clearly and answers were often too vague to gain credit.

09.4

Almost 40 % of the students scored this mark usually by explaining that the spring length was not 0 cm rather than describing the relationship between spring length and force.

09.5

This was not successfully answered, with only about 2 % of the students scoring both marks and a further 13 % scoring one mark. The 1st mark point was for stating or giving a clear description of inelastic deformation. Of those who were awarded marks most of them described how the spring had reached or passed its limit of proportionality.

09.6

Over 90 % of the students selected the correct equation.

09.7

Nearly 80 % of the students scored all three marks. Those that did not often rearranged the equation incorrectly.

10.1

Only about 5% of the students correctly calculated the uncertainty correctly from either the range or the mean.

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10.2

Just over 40 % of the students identified that a random error had caused the variation in this investigation. A greater proportion of the students thought there was a systematic error but this would not have accounted for the variation in the results.

10.3

This mark was awarded for a clear description of variation in the way the ball was dropped. For example, through different heights, at different speeds, or a different delay each time. Common answers giving reaction time or human error were too vague, to be awarded marks unless qualified.

10.4

Just fewer than 30 % of the students scored all three marks. Many of the students took only one value from the graph rather than a corresponding pair of values and so scored 0. Those that used a pair of correct values often then used them the wrong way round when calculating the gradient.

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Mark Ranges and Award of Grades

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