AQA GCSE Physics | 8463

SPECIFICATION POINT 4.7.1.1

Poles of a magnet

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**7**
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.

4.7.1.1 Poles of a magnet

Answer 01 · Mark scheme June 2008 | PHY3F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
(a)	step-down (transformer)		1
(b)	alternating current	accept minor misspellings but do **not** credit 'alternative current'	1
(c)(i) & (ii)	magnet attracts upwards	 correct order essential accept 'up'	3
total			5

Answer 01 · Mark scheme June 2008 | PHY3F | Original Q2 | Legacy

PHY3F

4.7.1.1 Poles of a magnet

Answer 02 · 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

4.7.1.1 Poles of a magnet

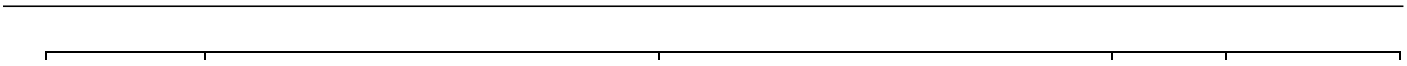
Answer 02 · Mark scheme

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**	

4.7.1.1 Poles of a magnet

Answer 02 · Mark scheme

June 2018 | 8463/2F | Original Q4



4.7.1.1 Poles of a magnet

Answer 03 · 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**	

4.7.1.1 Poles of a magnet

Answer 04 · Mark scheme

November 2020 | 8463/2F | Original Q5

Question 5

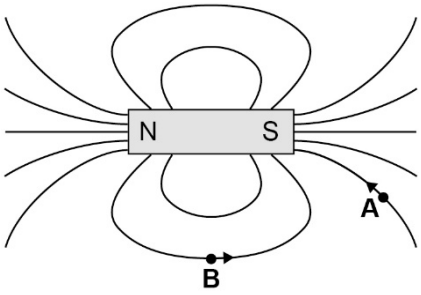
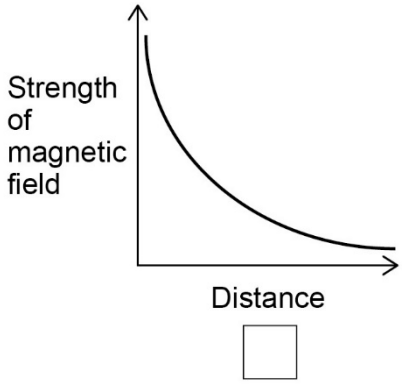
Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(the north pole of the floating magnet is) repelled from the north pole (of the fixed magnet) and attracted to the south pole (of the fixed magnet)	allow following a magnetic field line for **1 mark** if no other marks scored	1 1	AO3 4.7.1.1 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**	

4.7.1.1 Poles of a magnet

Answer 05 · 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

4.7.1.1 Poles of a magnet

Answer 05 · Mark scheme

November 2021 | 8463/2F | Original Q7

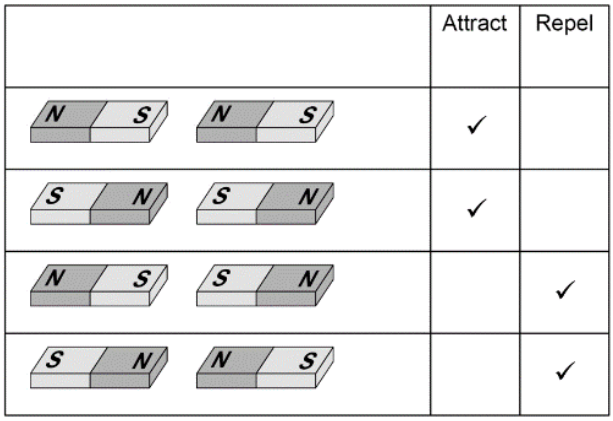
	and are left behind on the table	If no other mark scored: Steel cans are attracted (to the electromagnet) but aluminium cans are not – scores one mark		
07.5	raise the height of the table use a larger potential difference / current **or** use a stronger electromagnet	allow longer legs on the table allow 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**	

4.7.1.1 Poles of a magnet

Answer 06 · 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

4.7.1.1 Poles of a magnet

Answer 06 · 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**

4.7.1.1 Poles of a magnet

Answer 07 · Mark scheme

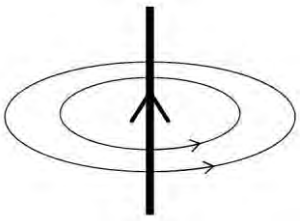
June 2025 | 8463/2F | Original Q6

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

4.7.1.1 Poles of a magnet

Answer 02 · 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.

4.7.1.1 Poles of a magnet

Answer 03 · 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.

4.7.1.1 Poles of a magnet

Answer 06 · 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.

4.7.1.1 Poles of a magnet

Questions matter

GCSE
Physics
8463/2F

Report on the examination

Version: 1.0
June 2025

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4.7.1.1 Poles of a magnet

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Report on the examination – GCSE - Physics – 8463/2H – June 2025

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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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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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

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

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