AQA GCSE Physics | 8463

SPECIFICATION POINT 4.2.5.2

Electric fields

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**7**
Available paper years	**2008–2024**

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.

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Answer 01 · Mark scheme

November 2008 | PHY1BP | Original Q5 | Legacy

Five	**A** alpha radiation **3** **B** beta radiation **4** **C** gamma radiation **2** **D** visible light **1**			
	A	**B**	**C**	**D**

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Answer 02 · 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 . . .

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**

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Answer 02 · Mark scheme January 2011 | PHY1F | Original Q3 | Legacy

PHY1F

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Answer 03 · Mark scheme

June 2011 | PHY2F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	fleece rubs against shirt **or** friction (between fleece and shirt)	it refers to the fleece	1
	(causing) <u>electrons</u> to transfer from one to the other	accept a specific direction of transfer do **not** accept charge for electrons positive electrons negates this mark movement of protons negates this mark	1
4(b)	Electrical charges move easily through metals. An electric current is a flow of electrical charge.		1 1
4(c)(i)	copper (good electrical) conductor	reason only scores if copper chosen accept it is a metal any mention of heat conduction negates this mark	1 1
4(c)(ii)	lower than		1

Question 4 continues on the next page

PHY2F

Question 4 continued

question	answers	extra information	mark
4(c)(iii)	accept any sensible suggestion, eg: • too many variables (to control) • lightning strikes / storms are random / unpredictable • do not know which building will be struck • do not know when a building will be struck • do not know when lightning will happen • (very) difficult to create same conditions in a laboratory • lightning storms are not the same	it is not safe is insufficient do **not** accept lightning does not strike the same place twice	1
Total			**8**

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Answer 03 · Mark scheme June 2011 | PHY2F | Original Q4 | Legacy

PHY2F

4.2.5.2 Electric fields

Answer 04 · Mark scheme June 2018 | 8463/1F | Original Q10

Question	Answers	Extra information	Mark	AO/ Spec. Ref
10.1	transfer of <u>electrons</u>	mention of positive charge moving negates both marks	1	AO1 4.2.5.1
	from the carpet to the student		1	
10.2	three arrows perpendicular to sphere's surface with all arrows directed inwards and distributed evenly around sphere		1	AO1 4.2.5.2
10.3	there is a potential difference between the student and the tap	do **not** accept the tap / sink is charged	1	AO1 4.2.1.2 4.2.1.3
	which causes electrons / charges to transfer from the student **or** which causes electrons / charges to transfer to the tap		1	4.2.5.1
	which earths the charge	allow the tap is earthed	1	
10.4	carpet / copper has a low resistance	allow carpet is a conductor **or** copper is a conductor	1	AO3 4.2.5.1 4.2.1.3
	lower / no build-up of charge (on the student) **or** (so there is a) smaller / no potential difference between student and tap / earth		1	
Total			**8**	

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Answer 05 · Mark scheme

June 2019 | 8463/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4.1	A		1	4.4.1.3 AO1
4.2	C		1	4.4.1.3 AO1
4.3	repels increases increases	in this order only	1 1 1	4.4.1.3 4.2.5.2 AO1
4.4	another scientist repeats the experiment and gets the same results		1	WS3.7 4.4.1.3 AO1
Total			**6**	

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Answer 06 · Mark scheme

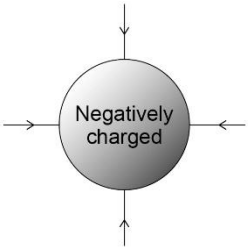
June 2022 | 8463/1F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	electrons electrons		1 1	AO1 4.2.5.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	a positive charge		1	AO1 4.2.5.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	a force of repulsion the rods have the same charge **or** the rods are both negatively charged	dependent on scoring first marking point	1 1	AO1 4.2.5.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4			1	AO1 4.2.5.2

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Answer 06 · Mark scheme

June 2022 | 8463/1F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	 **A**		1	AO1 4.2.5.2

Total Question 3		**7**

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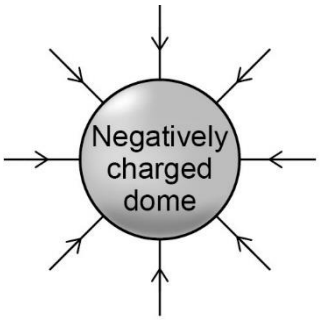
Answer 07 · Mark scheme

June 2024 | 8463/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	negative		1	AO1 4.2.5.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	repulsion		1	AO1 4.2.5.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3			1	AO1 4.2.5.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	resistance		1	AO1 4.2.5.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	ionised		1	AO1 4.2.5.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	electrons		1	AO1 4.2.5.2

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Answer 07 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	energy transferred = 0.000 002 × 300 000 energy transferred = 0.6 (J)		1 1	AO2 4.2.4.2

Total Question 1	8

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Answer 06 · Examiner comments June 2022 | 8463/1F | Original Q3

Question 3 (Low demand)

03.1 Approximately 30% of students scored 2 marks, with about 60% of students scoring 1 mark.

03.2 55% of students identified the charge correctly.

03.3 About 75% of students chose the correct box (repulsion), but many students couldn't give an appropriate reason. Students often just said 'opposite charges attract' which was insufficient, or discussed magnetic poles which was not creditworthy. Approximately 30% of students scored 2 marks on this question.

03.4 About 35% of students chose the correct electric field pattern.

03.5 Approximately 65% of students chose the correct position of the charged spheres.

Answer 07 · Examiner comments June 2024 | 8463/1F | Original Q1

Question 1 (Low Demand)

01.1 Only 38% of students scored a mark for knowing that when a person touches a negatively charged metal dome they also become negatively charged.

01.2 55% of students scored a mark for this question about the force of repulsion between like charges.

01.3 Only 29% of students scored a mark for this question. The majority of wrong answers chose the diagram for the electric field around a positively charged dome.

01.4 62% of students chose the correct answer, knowing that an insulator has a high resistance. The most common incorrect answer was temperature.

01.5 67% of students answered this question correctly, knowing that a spark jumps when the air is ionised.

01.6 78% of students answered this question correctly, identifying electrons as the particle transferred when a spark jumps between two objects.

01.7 93% of students calculated the energy transferred correctly.

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AQA

GCSE
PHYSICS

8463/1F: Paper 1
Report on the Examination

8463
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Version: 1.0

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General

Grade 1-3 calculation questions were well answered, where the equation is always given and students will not be required to rearrange the equation. Grade 4-5 calculation questions involving equation recall were answered better this year than in 2018 and students are scoring many of their marks on the paper by answering the subsequent calculation questions correctly. At grade 4-5 students are expected to be able to either rearrange an equation or convert a unit, so it is beneficial for students to be able to quickly identify if the units given in a question are correct for the use in the equation. Question 10.1 was generally well attempted and students who had carried out Required Practical Activity 2 would have had a material advantage over those who hadn't.

Handwriting sometimes makes it very difficult for examiners to read what has been written. Students who have handwriting that is difficult to read may benefit from a scribe or from word processing their answers in exams.

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 as a whole, not just on questions that may have been targeted at the level at which they are working.

Question 1 (Low demand)

01.1 Around 77% of students scored 2 marks. Around 16% of students scored 1 mark.

01.2 Only around 8% of students scored 2 marks. Both evaporation and change of state were common, insufficient answers for the first marking point. Less than half of the students scored 1 mark. The marking points were independent, so if the change of state was incorrect eg melting, the student could still score the second marking point.

01.3 Around 91% of students scored 2 marks. In calculations where students are provided with the equation (grades 1-3) students are not expected to rearrange the equation. Some students incorrectly tried to convert the kg into g and scored 0 marks.

01.4 Approximately 82% of students scored 3 marks. In calculations where students are provided with the equation (grades 1-3) students are not expected to rearrange the equation. Some students incorrectly tried to convert the kg into g and scored 0 marks for the calculation. Some students set out their calculation, but then multiplied the two values rather than dividing.

Question 2 (Low demand)

02.1 About 67% of students identified the correct decay equation.

02.2 More than three quarters of the students identified why alpha radiation is dangerous inside the human body.

02.3 Just below three quarters of students scored 2 marks. Most correct answers read the values from the graph as intended (460, 280) and students didn't need the tolerance given in the mark scheme.

02.4 About 60% of students correctly estimated the mass remaining.

02.5 Students found this question difficult, with around 55% of students scoring 2 marks and around 27% of students scoring 1 mark.

Question 3 (Low demand)

03.1 Approximately 45% of students scored 1 mark for identifying a measuring instrument that could be used. About 9% of students scored 2 marks for describing an appropriate way to use it. Pythagoras was insufficient as the triangle described would not give the height of the zip wire.

03.2 Students were often very successful in calculation, with around 91% scoring 2 marks.

03.3 This question gave a good spread of marks. Over a fifth scored 3 marks, almost two fifths scored 2 marks and slightly below a quarter scored 1 mark. Gravitational potential energy or gravitational field strength were insufficient to score a mark.

Question 4 (Low demand)

04.1 Over a third of students answered this question correctly.

04.2 About 14% of students answered this question correctly.

04.3 This question about the alpha particle scattering experiment discriminated well between students. Around 16% of students scored 3 marks, around 45% of students scored 2 marks and around 30% of students scored 1 mark.

04.4 About 77% of students correctly identified what reproducible means. .

Question 5 (Low demand)

05.1 The most common correct answers linked CO_2 to global warming. Around 38% of students scored 2 marks and around 35% scored 1 mark. Common incorrect answers were usually vague and mentioned air pollution without being specific. There were many students who incorrectly linked CO_2 with the ozone layer.

05.2 Over half of the students scored 2 marks and over a third scored 1 mark. Insufficient answers included hydro and water. Answers using specification wording eg the tides were acceptable, as were terms like tidal, etc. Oil was insufficient as this was assumed to be non-renewable oil as opposed to palm oil or other biofuel oils.

05.3 Around 83% of students scored 2 marks for this percentage calculation. An answer of 78 scored 1 mark even if spurious calculations followed.

05.4 About 67% of students scored 2 marks. Quite a large number of misreads from the graph resulting in 0 marks and around 29% of students scored 0 marks.

05.5 Only around 5% of students scored 2 marks whilst half of the students scored 1 mark. Some students failed to make the connection between the time of day and sunrise. Some students talked vaguely about the energy stored by solar panels, confusing them with solar heating panels rather than solar photovoltaic panels.

Question 6 (Low and Standard demand)

06.1 More than half of the students scored 2 marks. To score a mark a comparative statement was needed eg lower, not low mass of power source. A statement using the word 'better' would be insufficient.

06.2 Around 64% of students scored 2 marks. Many students scored 1 mark for truncating and not rounding their answers, an answer of 26.08 would score only 1 mark for the substitution.

06.3 This question discriminated well, with about 16% scoring 2 marks and more than half scoring 1 mark. 'Increases the battery's power output' was insufficient to score a mark. 'Battery lasts longer' was insufficient to score a mark.

06.4 The quantities in the question are given in alphabetical order; there is no need for students to recall the equation in this order. Any correct rearrangement of the equation or use of the correct symbols for quantities was allowed. A mixture of symbols and words would also score the mark. Approximately 70% of students answered this question correctly.

06.5 It was encouraging to see many Foundation tier students successfully rearranging the equation. Around 77% of students scored 3 marks.

Question 7 (Low and Standard demand)

07.1 About 86% of students answered this question correctly.

07.2 Approximately 83% of students answered this question correctly. Students should refer to the Physics specification for the accepted symbols for circuit components. Textbooks and revision guides do not necessarily use the specification symbols. The circles in the component symbol scored a mark even if shown as blobs rather than circles.

07.3 Around 93% of students scored 2 marks. At grade 1-3, the equation is given and no rearrangement of the equation is needed. Students need to simply substitute and calculate the answer.

07.4 Around 93% of students scored 2 marks. At grade 1-3, the equation is given and no rearrangement of the equation is needed. Students need to simply substitute and calculate the answer.

07.5 About 23% of students answered this question correctly.

07.6 About 38% of students answered this question correctly.

07.7 Students can recall the equation in any correct rearrangement. The stem of the question lists the quantities in alphabetical order, so that there is no suggestion of the correct order.

Correct letters for quantities are acceptable in place of the quantity names. Voltage or p.d. were acceptable for potential difference. Approximately 57% of students answered this question correctly.

07.8 The first mark is for the substitution into the correct equation. The second mark is for the correct rearrangement of the correct equation. The third mark is for the correct final answer. About 58% of students scored 3 marks for this question. Grade 4-5 calculation questions require either a unit change or a rearrangement of the equation.

Question 8 (Low and Standard demand)

08.1 Around 63% of students answered this question correctly.

08.2 Around 86% of students answered this question correctly. Some students gave a precaution instead of a risk, which was insufficient.

08.3 Around 62% of students answered this question correctly, demonstrating that students still confuse the terms resolution and range.

08.4 Around 96% of students answered this question correctly.

08.5 Many students failed to substitute correctly into the equation that was printed on the Physics Equations Sheet. Many students multiplied the 3 values given in the question, which scored zero marks. The unit mark was independent, but a large number of students failed to recognise the correct unit from the box. More than a third of students scored 4 marks and around 16% of students scored 3 marks. A quarter of students scored 1 mark for either the correct unit or the correct substitution.

Question 9 (Standard demand)

09.1 About 45% of students correctly identified the meaning of power input.

09.2 Only a quarter of students scored this mark. Students can recall the equation in any correct rearrangement. The stem of the question lists the quantities in alphabetical order, so that there is no suggestion of the correct order. Correct letters for quantities are acceptable in place of the quantity names. Voltage or p.d. were acceptable for potential difference.

09.3 Around 13% of students scored 3 marks and about 81% scored zero. Students found this question difficult to answer, presumably due to their inability to recall the correct equation in the preceding question.

09.4 More than half of students answered this correctly. Some students failed to score the mark by writing input for both the denominator and the numerator.

09.5 Students who successfully recalled the equation in **09.4** were likely to score all 3 marks for this question. Only around 15% of students scored zero.

09.6 Many students restated the stem, rather than going the extra stage in the reasoning and linking to efficiency because thermal energy is also transferred by the light bulb. A number of students believed that knowing the rate at which the bulbs emitted visible light was a

safety concern related to the household electrics. Only around 1% of students scored 2 marks, about 16% of students scored 1 mark and around 73% of students scored zero marks.

Question 10 (Standard demand)

10.1 This question produced a good spread of marks. A mean score of 2.1 was achieved by students on the Foundation tier. Students who had experience of a similar practical benefitted from this as they were able to describe a method in sufficient detail to achieve Level 2. To achieve Level 3, a student needed to indicate that several values of number of layers were used, referring to the interval of 8 layers (as the graph showed) or that the experiment should be done with no layers. A control variable was also needed, either the initial temperature of the water, or the volume of water in each experiment. Some students gained no credit by describing different required practical methods. Around 2% of students scored 6 marks, around 15% of students scored 4 marks and about a fifth of students scored 2 marks. Around 10% of students didn't attempt the question.

10.2 Many students stated that it wasn't necessary to use both as it would be confusing. The datalogger would produce too much data was a common insufficient answer. A number of students stated that using a normal thermometer would be more appropriate, scoring zero marks. Less than 1% of students scored 2 marks and less than a fifth of students scored 1 mark.

Question 11 (Standard demand)

11.1 Over two-fifths of students scored 3 marks for this question. It wasn't necessary to give the answer to an appropriate number of significant figures, so answers of 0.502, 0.50 and 0.5 were all creditworthy. Some students calculated the jump height to be unlikely values; students should be encouraged to consider whether it is likely that someone can jump a height of 4.92 m, a commonly seen answer achieved by multiplying the 2 values given (41 × 0.12). Less than half of the students scored zero marks.

11.2 A common incorrect answer was E_k = mass × speed, since these were the quantities given in the question. A number of students also left out the 0.5 value even if they remembered that speed should be squared. Velocity was allowed instead of speed in the equation. Correct symbols were acceptable for the quantities in the equation. About 30% of students answered this question correctly.

11.3 Despite being asked to recall the equation in 11.2, most students simply multiplied or divided the 2 values given in the question (3.0 and 270), scoring 0 marks. Only around 19% of students scored 3 marks.

11.4 Some students commented on muscle mass and strength which were insufficient to score marks. Clear comparisons, including at least one difference and one similarity, were needed to score 4 marks. This question discriminated well between students; around 6% of students scored 4 marks, around 29% of students scored 2 marks and around 13% of students scored zero.

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11.5 Some students failed to score a mark because they simply restated the question, 'the scientist wanted the highest muscle power reading' without adding any value. The answer either needed to refer to the effect of repetition on performance (improvement or worsening) or that it was the maximum (or peak) muscle power that the scientist was investigating. A fifth of students answered this question correctly.

4.2.5.2 Electric fields

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

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