AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.2.1.2

Electrical charge and current

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**4**
Available paper years	**2018–2025**

Using this booklet

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

Name: _____ **Date:** _____

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

6.2.1.2 Electrical charge and current

Answer 01 · Mark scheme June 2018 | 8464/P/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	a curve in the first and third quadrants only, passing through origin		1	AO1 6.2.1.4
	decreasing gradient		1	
06.2	any **two** from: • $I_1 = I_2 + I_3$ • $I_2 = I_3$ • $I_1 = 2I_2$ • $I_1 = 2I_3$	allow **1** mark for each correct description given in words	2	AO2 6.2.2
06.3		an answer of 60 scores **5** calculation marks		
	$3 = I^2 \times 12$		1	AO2 6.2.4.1
	$I = \sqrt{\left(\frac{3}{12}\right)}$		1	6.2.4.2
	$I = 0.5$ (A)		1	
	$Q = 0.5 \times 60 = 30$	allow Q = their calculated I × 60	1	
	$Q_{total} = 60$	allow an answer that is consistent with their calculated value of I	1	
	or			
	$3 = I^2 \times 12$ (1)			
	$I = \sqrt{\left(\frac{3}{12}\right)}$ (1)			
	$I = 0.5$ (A) (1)			
	$I_{total} = 1.0$ (A) (1)	allow I_{total} = their I × 2		
	$Q = 1.0 \times 60 = 60$ (1)	allow an answer that is consistent with their calculated value of I		
	coulombs **or** C		1	AO1

6.2.1.2 Electrical charge and current

Answer 01 · Mark scheme

June 2018 | 8464/P/1H | Original Q6

Question	Answers	Mark	AO / Spec. Ref.
06.4	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear.	3–4	AO2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO2
	No relevant content	0	
	Indicative content • resistance of LDR changes when light intensity changes • when light intensity increase resistance of LDR decreases • overall resistance of circuit decreases • potential difference across total resistance remains unchanged • current in ammeter increases • potential difference across fixed resistor increases • potential difference across LDR decreases • reading on the voltmeter decreases • potential difference is shared between the components in series • the lower the resistance of the LDR the smaller the share of the potential difference • reading on the voltmeter decreases		6.2.1.1 6.2.1.4
Total		**16**	

6.2.1.2 Electrical charge and current

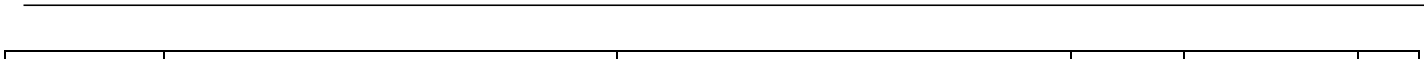
Answer 02 · Mark scheme June 2019 | 8464/P/1H | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
03.1	an energy resource that cannot be replenished as it is used	allow an energy resource that will run out ignore cannot be re-used	1	AO1.1 AO1 in isolation 6.1.3	E
03.2		an answer of 30 (A) scores **4** marks		AO2.1 6.2.4.1	E
	6.9 k(W) = 6900 (W)		1		
	6900 = 230 × I	allow correct substitution of an incorrectly/not converted value for power	1		
	$I = \frac{6900}{230}$	allow a correct transformation using an incorrectly/not converted value for power	1		
	I = 30 (A)	allow a correct calculation using an incorrectly/not converted value for power	1		
03.3	direct potential difference is always in the same direction	allow direct current is always in the same direction	1	AO1.1 6.2.3.1	E
	alternating potential difference changes direction	allow alternating current changes direction	1		
03.4	lower potential difference across the cable	allow lower power/energy dissipation	1	AO1.1 6.1.2.2	E
	it is more efficient	allow it won't get as hot	1	6.2.4.1	
	OR (lower resistance gives) a greater current (for the same potential difference) (1) so the car battery can charge faster (1)				
Total			**9**		

6.2.1.2 Electrical charge and current

Answer 02 · Mark scheme

June 2019 | 8464/P/1H | Original Q3



6.2.1.2 Electrical charge and current

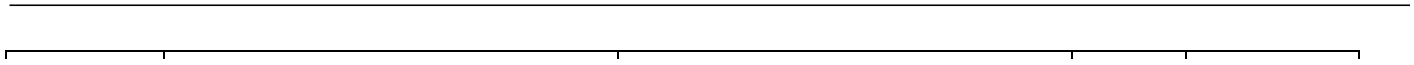
Answer 03 · Mark scheme November 2021 | 8464/P/1H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	240 mW = 0.24 W		1	AO2 6.2.4.1
	$0.24 = 2.5 \times I$	allow a correct substitution using an incorrectly/not converted value of power	1	
	$I = \frac{0.24}{2.5}$	allow a correct re-arrangement using an incorrectly/not converted value of power	1	
	$I = 0.096$ (A)	allow a correct calculation using an incorrectly/not converted value of power	1	
05.2	because the potential difference is always positive	allow because potential difference does not change direction	1	AO1 6.2.3.1
05.3	potential difference is (directly) proportional to current		1	AO2 6.2.1.4
05.4	voltmeter: the reading is the same in both circuits		1	AO2 6.2.2
	ammeter: the reading in circuit **B** is twice the reading of circuit **A**	allow **1** mark for the reading in circuit **B** is bigger than circuit **A**	2	
Total			**9**	

6.2.1.2 Electrical charge and current

Answer 03 · Mark scheme

November 2021 | 8464/P/1H | Original Q5



6.2.1.2 Electrical charge and current

Answer 04 · Mark scheme

June 2025 | 8464/P/1H | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	230 (V) 50 (Hz)	allow about 230 (V)	1 1	AO1 6.2.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	live – brown neutral – blue		1 1	AO1 6.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	alternating (potential difference) continuously changes direction direct (potential difference) is always in the same direction		1 1	AO1 6.2.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	energy / power is transferred by the laptop (when being used) (so) the power delivered to the battery is reduced	 allow (so) the rate at which energy is transferred to the battery is lower	1 1	AO2 AO3 6.1.1.4 6.1.2.1

6.2.1.2 Electrical charge and current

Answer 04 · Mark scheme

June 2025 | 8464/P/1H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	$P = 15 \times 4.8$		1	AO2 6.2.4.1
	$P = 72$ (W)		1	6.2.4.2 6.1.1.4
	$\Delta P = 97 - 72 = 25$ (W)		1	
	$25 = \frac{225\,000}{t}$	subsequent marks may be awarded if an incorrect / not converted value of E is used.	1	
	$t = 9000$ (s)		1	
	$t = 2.5$ (hours)		1	

Total Question 5	14

Answer 01 · Examiner comments

June 2018 | 8464/P/1H | Original Q6

Question 6 (Standard/high and High demand)

06.1 33% of students drew a curve in the correct quadrants which passed through the origin with decreasing gradient to score two marks. 25% of students then curved their lines back towards the *x*-axis at the ends and so did not score the gradient mark. The most common mistake was to draw a straight line in the correct quadrants through the origin as for a fixed resistor. A few drew the graph for a diode. Some students drew a curve or straight line through the second and fourth quadrants, and some drew a line or curve which was in one quadrant only, or intersected more than two quadrants.

06.2 Responses to this question were very mixed. 24% of students scored two marks and 24% of students scored one mark. Many students talked about the current being strongest close to the battery, and weaker further away. Voltage was also discussed in some responses.

Many students just stated that the current split which was not sufficient. However, there were some excellent concise answers that demonstrated a very good understanding of current in parallel circuits.

06.3 Half of the students found this multistep calculation question very challenging and scored no marks. 13 % of students scored five marks for correctly calculating a charge flow of 30 C but did not double this to determine the total.

Those who were unable to calculate the correct current could still have scored three marks for multiplying their incorrectly calculated current by 60, then doubling this number and finally naming the correct unit. Very few of these scored anything other than the unit mark. Those that did multiply a number by 60 often did not gain credit because it was unclear what their number represented.

06.4 Very few students achieved a level 3 response in this question. 38% of students gained at least one mark. A large number of students listed what they could recall about circuits despite this not being relevant to the question – information such as which meter is connected in series, which in parallel and what other components are in the circuit.

The majority of students were unable to recognise the symbol for the LDR with many stating it was a thermistor. Those that did recognise the symbol for the LDR often did not recall the correct link between light intensity and resistance or even the function of the LDR. Many students thought that the LDR was the actual light that was switched on and off by the light intensity. Many students who started the question well, correctly identifying the LDR and linking that correctly to how the resistance of the LDR would change, failed to explain how this change in resistance would affect the readings on the ammeter and voltmeter. Very few students demonstrated an understanding of how resistance affects current.

6.2.1.2 Electrical charge and current

Answer 01 · Examiner comments

June 2018 | 8464/P/1H | Original Q6

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.

6.2.1.2 Electrical charge and current

Answer 02 · Examiner comments June 2019 | 8464/P/1H | Original Q3

Question 3 (Standard/high demand)

03.1 Just over 70% of students described a non-renewable resource correctly, as either a resource which is not replenished as it is used, or as a resource which is finite and will run out.

03.2 Slightly more than 40% of students gained full marks on this question. Around one in seven students gained 3 marks, mostly for failing to convert 6.9 kW into watts, or for making an incorrect conversion. Around 35% of students gained no marks on this question.

03.3 About a third of students gained 2 marks on this question but over half the students gained 0 marks. Answers describing current or potential difference were accepted, but a proportion of students incorrectly described direct current as what happens in a series circuit, and alternating as what happens in a parallel circuit. Other misconceptions included students who suggested that direct potential difference takes a constant value but alternating potential difference changes value. While this may be true, it does not explain the difference between direct and alternating.

Answer 02 · Examiner comments June 2019 | 8464/P/1H | Original Q3

03.4 Just under half of students scored 1 mark, with around a further 15% of students gaining both marks. Many students gave answers in terms of the risk of electrocution or safety, which did not gain credit. Many students wrote of more electricity going through a lower resistance cable, which was not sufficient: they needed to either mention a lower potential difference across the cable, or a greater current in the cable for the same potential difference.

6.2.1.2 Electrical charge and current

Answer 03 · Examiner comments

November 2021 | 8464/P/1H | Original Q5

Question 5 (High demand)

05.1 Of those students who attempted to convert 240 mW to watts, there was confusion evident about whether mW referred to milliwatts or megawatts. Around 45% of students gained at least 3 marks.

05.2 Many students incorrectly suggested that the changing frequency of the potential difference explained the answer. Only around 15% of students answered correctly.

05.3 Almost 30% of students correctly identified the directly proportional relationship.

05.4 Very few students were able to correctly identify that the potential difference in both circuits would be the same. To gain full marks when discussing the ammeter readings, students had to realise that since the potential difference across each resistor is the same, and all resistors have the same resistance, the current in each resistor is the same. The current in the ammeter in circuit B is therefore double that of circuit A. The question was targeted at the highest ability students, and very few students were able to reason this through and state this relationship.

Answer 04 · Examiner comments

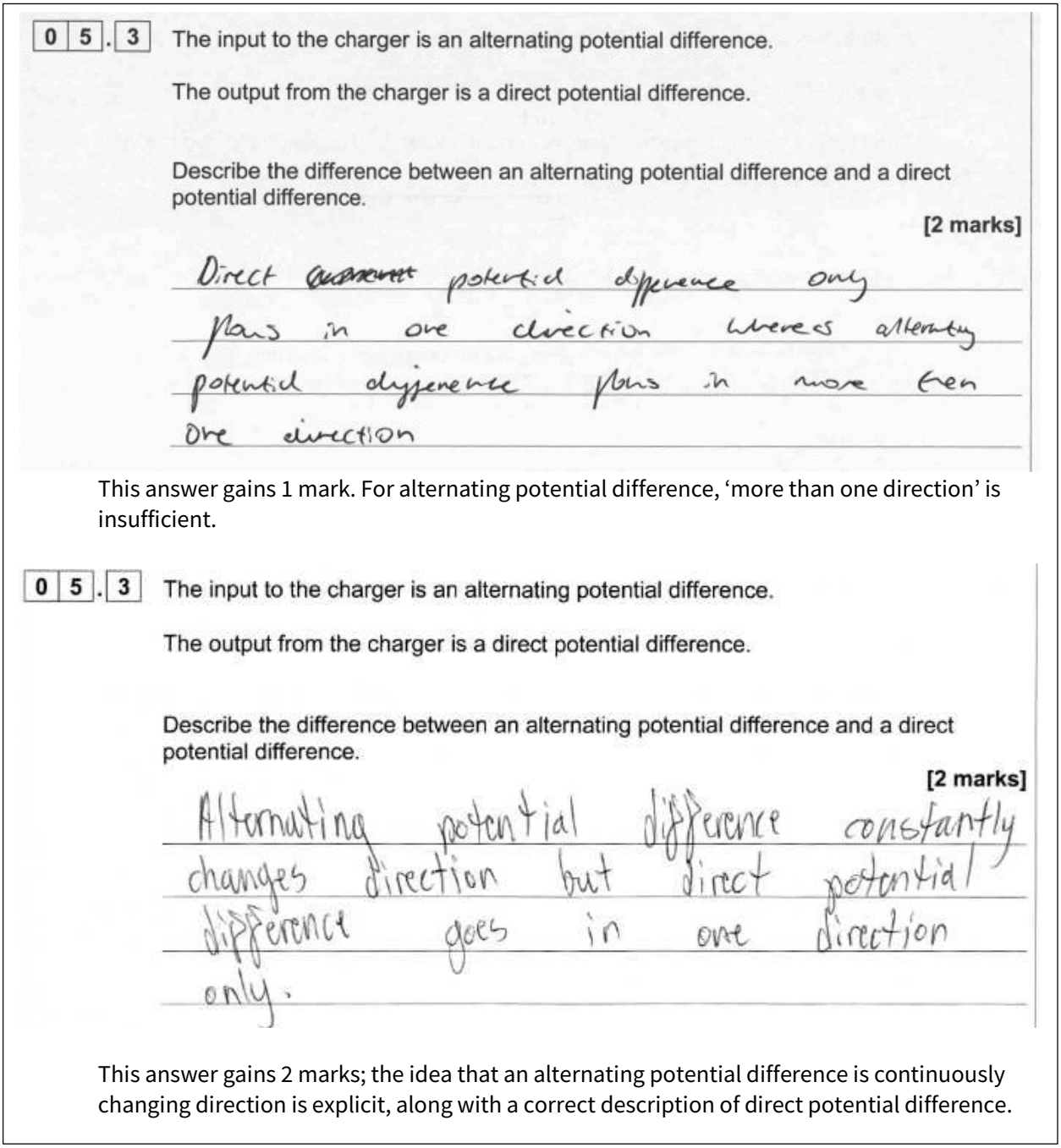
June 2025 | 8464/P/1H | Original Q5

Question 5 (Standard/high and high demand)

05.1 55% of students gave one correct value and 20% gave both correct. Where, only one was correct, the frequency was more commonly known.

05.2 75% of students correctly named both wires and the correct colour of insulation. Where only one mark was awarded, it was most common to see the live wire and colour correct, but the name of the second wire was incorrect. Incorrect responses often gave the colour of the earth wire.

05.3 43% gained 1 mark. The vast majority of these were awarded the mark for direct (potential difference) is always in the same direction. Under 10% of students also gained the mark for the alternating potential difference. For alternating potential difference, the idea that it is continuously changing direction must be explicit.



0 5 . 3 The input to the charger is an alternating potential difference.

The output from the charger is a direct potential difference.

Describe the difference between an alternating potential difference and a direct potential difference.

[2 marks]

Direct potential difference only flows in one direction whereas alternating potential difference flows in more than one direction

This answer gains 1 mark. For alternating potential difference, 'more than one direction' is insufficient.

0 5 . 3 The input to the charger is an alternating potential difference.

The output from the charger is a direct potential difference.

Describe the difference between an alternating potential difference and a direct potential difference.

[2 marks]

Alternating potential difference constantly changes direction but direct potential difference goes in one direction only.

This answer gains 2 marks; the idea that an alternating potential difference is continuously changing direction is explicit, along with a correct description of direct potential difference.

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6.2.1.2 Electrical charge and current

Answer 04 · Examiner comments June 2025 | 8464/P/1H | Original Q5

05.4 60% of students correctly identified that the laptop is using energy as it is still being used. Only a very small number correctly explained that this meant that the rate at which the energy is stored in the battery decreases.

05.5 This multi-step calculation proved to be more challenging than in previous years. Only approximately 15% of students gained full marks. 50% of students calculated the power of the laptop but could not get any further. Some students calculated the time in seconds correctly but could not convert the answer to hours. Students are reminded that they should show their working for multi-step calculations.