

Physics A

Advanced Subsidiary GCE

Unit **G482**: Electrons, Waves and Photons

(among other general knowledge and trivia)

What we chose to be correct for December 25 2015

All mark scheme answers have been selected from an official, qualified top hat that has a BTEC in hair and beauty.

1. Annotations

Annotation	Meaning
	Benefit of doubt given
	Contradiction
	Incorrect response (recommended for regular use)
	Error carried forward
	Follow through
	Not answered question
	Benefit of doubt not given
	Power of 10 error
	Omission mark
	Rounding error or repeated error
	Error in number of significant figures
	Correct response (do not award unless you want to be fired)
	Arithmetic error
	Wrong physics (we included something in the exam that isn't on the syllabus)

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	Separates marking points
reject	Answers which are correct but will not be awarded marks anyway
not	Answers which are not worthy of credit
IGNORE	Statements which are correct but we don't recognise it
ALLOW	Answers that can be accepted
()	Words which are not essential to gain credit
<u> </u>	Underlined words must be present in answer to score a mark
ecf	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

Highlighting is also available to highlight any particular points on the script.

2. Subject-specific Marking Instructions

CATEGORISATION OF MARKS

The marking scheme categorises marks on the MABC scheme

- B** marks: These are awarded as independent marks, which do not depend on other marks. For a **B**-mark to be scored, the point to which it refers must be seen specifically in the candidate's answer.
- M** marks: These are method marks upon which **A**-marks (accuracy marks) later depend. For an **M**-mark to be scored, the point to which it refers must be seen in the candidate's answer. If a candidate fails to score a particular **M**-mark, then none of the dependent **A**-marks can be scored.
- C** marks: These are compensatory method marks which can be scored even if the points to which they refer are not written down by the candidate, providing subsequent working gives evidence that they must have known it. For example, if an equation carries a **C**-mark and the candidate does not write down the actual equation but does correct working which shows that the candidate knew the equation, then the **C**-mark is given.
- A** marks: These are accuracy or answer marks, which either depend on an **M**-mark, or allow a **C**-mark to be scored.

Note about significant figures:

If the data given in a question is to 2 sf, then allow answers to 2 or more sf.

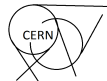
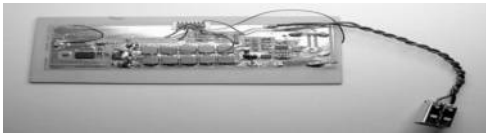
If an answer is given to fewer than 2 sf, then penalise once only in the entire paper and annotate with SF.

Any exception to this rule will be mentioned in the Guidance.

Note about rounding errors

Only penalise rounding errors once in the entire paper and annotate with RE.

Please put ticks and crosses against all sub-sections marked AAA (9 in total) in the body of the text where the mark is given

Question			Answer	Marks	Guidance
1	(a)		Use of money in which a large	B1	allow fat for large
			contribution to a scheme or project (is made)	C1	allow mafia, cartel, gang or ponzi for scheme IGNORE group or research
	(b)		a <u>type</u> of particle	A1	DO NOT ALLOW ANSWERS WITH MORE THAN FOUR WORDS
A A A	(c)			B1 B1 B1	two circles all tangents correctly drawn CERN text and gap in 2nd circle
	(d)			B1 B1 B1 B1	DO NOT ALLOW hypothetical circuit diagram correct circuit and good photograph for all 4 marks award 3 marks for circuit with no USB connector award 2 marks for low resolution images
			Total	10	

Question			Answer	Marks	Guidance
2	(a)	(i)	No	B1 B1	allow similar words to no i.e. "no way" or "nein" for full marks
		(ii)	convincing proof	M1 A1	allow answers with AA battery glued to paper answers with 9V or AAA batteries glued to paper score 1 mark
		(iii)	the lightning wanted to strike the car because it was in the <u>mood</u>	C1 A1	ALLOW mental state for mood DO NOT ALLOW murder for strike
	(b)	(i)	no I drawn	B1	
A A A		(ii)	symbol for motor drawn correctly	M1 M1 A0	ALLOW 3d drawing of fan on desk DO NOT ALLOW blood from finger cut by fan blades
		(iii)	any correct power equation 200W	C1 A1	DO NOT ALLOW explanation "resistor cannot be charged" ALLOW "nice try examiners" for 1 mark only
		(iv)	schematic for light bulb attached to paper correct calculation for said light bulb light bulb safety certification correctly authorised	C1 C1 A1	DO NOT ALLOW fake schematics drawn by candidates contact government to confirm safety authorisation
	(c)	(i)	convincing proof that candidate removed light bulb from examination hall fitting and made calculations	M1 A1	ALLOW ecf 1 mark for incorrect proof due to examination hall using halogen/LED/other light sources
		(ii)	assumption that AA battery is rechargeable answer of 0 as battery is flat	A1	ecf c(i) accept any consistent answer
			Total	17	

Question			Answer	Marks	Guidance
3	(a)	(i)	send to chief examiner in order to get a cut of the prize money	B1 B1	ALLOW answers without equations for 1 mark ONLY
		(ii)	Any two from: amazing, brilliant, fantastic, dead on the syllabus, always correct, best exam board ever, never asks questions that aren't in the book, easy to get marks, high grade boundaries	B1 B1	CENSOR any negative answers and get a gag order for the candidate from the security services
	(b)	(i)	current in $750\ \Omega = 0.020\text{ A}$	A1	
		(ii)	V across $750\ \Omega = 0.02 \times 750 = 15\text{ V}$	A1	
		(iii)	Hannah will endure extreme pain due electrocution and will die OR receive life threatening injuries	A1 A1	ALLOW any answer with positive effects of electrocution ALLOW violent scribbling on question for 1 mark ONLY
	(c)	(i)	correct symbol	B1	DO NOT ALLOW equations
A A A		(ii)	An oven is a light bulb An oven cooks food The light bulb cooks food	B1 M1 A1	ALLOW answers in terms of eating humans
		(iii)	diagram and explanation involving ray gun supercharged heating element emission of extreme amounts of infra-red radiation	M1 A1 B1	ALLOW burnt hole in examination paper for 2 marks ONLY as examination paper is not personal possession of candidate
			Total	15	

Question			Answer	Marks	Guidance
4	(a)	(i)	a wave that transfers energy but is too unfit to sprint or progress	M1 A1	ALLOW lazy or can't be bothered for unfit
		(ii)	Sprinting waves are fast Stationary waves don't move Stationary waves are lazy Sprinting waves are usually from African descent	B1 B1 B1 B1	DO NOT ALLOW answers referring to Usain Bolt as he is an exception
A A A	(b)	(i)	shape: sinusoidal and only 2 cycles amplitude constant at 0.03 m (y-axis labelled) appreciation that graph has greater frequency than that of a standard, non-antagonized chicken	B1 B1 B1 B1	
		(ii) 1 2 3	John Mo OCR	B1 B1 B1	ALLOW similar British names ALLOW Farah or Mo Farah ALLOW Willy Wonka or Oompaloompas
		(iii)	Slight smudge of coloured ink from water bottle label OR stress marks from invigilator noticing candidate using these items	B1 B1	ALLOW any reasonable stress marks such as the paper being slightly scratched.
	(c)		See guidance column for in depth complicated answers	M1 A1	correct reasoning correct answer
A A A	(d)		Examination paper causes all these symptoms So does gestapo interrogation BOTH paper and interrogation must be linked for full marks	M1 A1	ALLOW answers in german DO NOT ALLOW answers in french
			Total	17	

Question			Answer	Marks	Guidance
5	(a)	(i)	when two (or more) examiners meet at a point the resulting examiner can be found by adding the misery of all candidates affected by examiners' paper writing	B1 B1	accept alternative words which mean <i>meet</i> not <i>collide</i> , <i>interfere</i> or <i>superpose</i> DO NOT ALLOW answers containing innuendos
		(ii)	Travel through time OR fluffy like bunnies OR nice people	B1	ALLOW hungry like the wolf
		(iii)	because the books are just a rough guide, real candidates should be psychic	B1	ALLOW ora
A A A	(b)	(i)	answers involving the photoelectric effect score 4 marks	B1 B1 B1 B1	 DO NOT ALLOW answers involving absorption or emission spectra
		(ii)	wet finger move finger around edge of wine glass fill wine glass with water at various heights wine is good because it takes away the pain	B1 B1 B1 B1	 answers referring to harmonics or science score 2 marks
			Total	11	

Question			Answer	Marks	Guidance
6	(a)	(i)	emission of electrons from surface of metal when EM waves (above work function energy) are incident (upon it)	B5	
		(ii)	DO NOT ALLOW any answers if it looks like candidate will get an A grade	B5	
		(iii)	mark same as (a)(ii)	B5	
	(b)	(i)1	what OCR examiners do to scientifically correct answers	B5	
		(i)2	piece of rubbish not to be followed	B1	
		(ii)1	allow anything at all	C1 M1 A0	
		(iii)	1.06km 3sf ONLY	C1 C1 A1	ALLOW all units except metres
A A A	(c)	(i)	Electrons behave as waves/diffract (observable because) gaps/atoms are of similar wavelength to electrons <u>regular/ordered</u> pattern of atoms/atoms act as a grating/AW allowing interference to produce pattern on screen/AW rings occur because atomic 'crystals' at all possible orientations to beam/AW	B1 B1 B1 B1 B1	allow graphite for atoms max 3 from 5 marking points
		(ii)	producing pretty patterns	B1	IGNORE actual uses
			Total	14	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Torture Contact Centre

Education and Learning What Isn't Included On The Syllabus

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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OCR (Oxford Cambridge and RSA Examinations)

Head office

Telephone: 01223 552552

Facsimile: 01223 552553

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