OCR
Oxford Cambridge and RSA

GCSE

Physics A

Unit **A181/01:** Unit 1 – Modules P1, P2, P3 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2016

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2016

Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
not/reject	answers which are not worthy of credit
ignore	statements which are irrelevant - applies to neutral answers
allow/accept	answers that can be accepted
(words)	words which are not essential to gain credit
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	alternative wording
ORA	or reverse argument

Available in scoris to annotate scripts

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	no benefit of doubt
	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

Subject-specific Marking Instructions

a. If a candidate alters his/her response, examiners should accept the alteration.

b. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

E.g.

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.
☐	☐	☒
☐	☐	☒
☒	✓	✓
☒	☒	✓
☐	☐	☐
This would be worth 1 mark.	This would be worth 0 marks.	This would be worth 1 mark.

c. The list principle:
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

d. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.
Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	**2**	**2**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**NR**

MARK SCHEME: overlap with A181/01 shown by shading in column 3

Question			Answer	Mark	Guidance
1			crust (1); core (1); mantle (1)	3	
			Total	3	
2			2nd & 4th boxes (large distances, motion of distant objects)	2	one mark each
			Total	2	
3			C B A	2	all 3 correct = 2 marks 1 or 2 correct = 1 mark
			Total	2	
4	a	i	Speed = 8 (km/s)	1	
		ii	Time is 12.5s + 12.5s = 25s (1); Speed = 100 km / 25s = 4 (km/s) (1)	2	4 km/s without working = 2 marks 8 km/s = 1 mark
	b	i	All places 100 km from A are on this circle (1); Trace/equipment doesn't tell you the direction waves came from (1)	2	e.g. Because the 'quake happened 100 km away/trace tells you how far away the 'quake was (1) e.g. could have come from any direction/waves travel in all directions Must have idea of direction for m.p.2
	b	ii	X equidistant from B and A (1); on dotted circle (1)	2	Assessor overlay Candidates who correctly choose both possible locations would get both marks.
			Total	7	

Question			Answer	Mark	Guidance
5			**(Level 3)** Partial but essentially correct description of formation of sedimentary rocks **and** identifies the presence on the diagram of many layers /different types of rock, linked to formation over a long time. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **(Level 2)** **Either** a partial but essentially correct description of formation of sedimentary rocks **or** identifies the presence on the diagram of many layers /different types of rock, linked to formation over a long time. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **(Level 1)** **Either** a superficial description of structure of sedimentary rocks e.g. layers **or** describes one relevant feature of the diagram, possibly without consideration of time taken. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	**[6]**	**This question is targeted at grades up to C** **Indicative scientific points may include:** **formation of sedimentary rocks** • rock formed in layers of sediment/mud/rock • new layers on top of older ones • weathering/erosion of rocks • layers of sediment in seas/lakes • pressure from above compacts layers into a rock **how the diagram supports Hutton's theory** • layers on top of layers • laid down over a long time • red sandstone more recent than grey sandstone • red sandstone in horizontal layers (as laid down) • grey sandstone layers almost vertical • red sandstone layers are more regular (undisturbed) • top of grey sandstone shows weathering • grey sandstone layers very distorted / rotated / bent (by movements in the Earth) • difference in colouration of stone is evidence of changes with time **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Mark	Guidance
6			electromagnetic (1); photons (1); red (1)	3	
			Total	3	
7	a		damage to cells/tissues OR causes cancer	1	**Accept** answers more appropriate to H-tier or to Unit P6 e.g. ionise atoms, cause mutations in DNA. **Accept** types of cancer including skin cancer **Ignore** kill you, make you ill **Accept** kill cells
	b		Method, any one of: Barrier or example of a barrier; Special/protective clothing /suitable example; Increase distance; Decrease time of exposure Explanation, any one of: To block/absorb radiation; To stop them penetrating the body; To reduce exposure/dose	1 1	**Reject:** if all examples given will not stop X- rays e.g. 'plastic barrier' **Accept:** glass **Reject:** if **all** examples given are incorrect e.g. unsuitable clothing: goggles, lab coat, gloves **Allow:** 'stand behind absorbent material' (2) **Accept:** wear a badge (to monitor dose received) with explanation e.g. so they can make sure dose is not too high (2);

Question			Answer	Mark	Guidance
7	c		Any two of the following: X-ray machine can be switched off; radioactive sources produce gammas all the time; Gamma rays have higher energy/power/frequency; direction of X-rays predictable; Gamma rays come out in all directions; Gamma rays more penetrating; Gamma rays need (more) shielding; Danger of contamination by radioactive material; Gammas are more ionising.	2	**Allow** reverse argument **Ignore** rewording of question e.g. 'more harmful' **Ignore** 'stronger', 'gamma causes more damage', 'causes cancer'
			Total	**5**	
8	a		(2.4 + 2.2 + 2.0)/3 (1); = 2.2 (MB) (1)	**2**	6.6/3 (1) 2.2 (MB) gets 2 marks without any working
	b		500 / 2.5 (1); = 200 (1)	**2**	200 gets 2 marks without any working
	c		1st & 5th boxes (more images, better quality images)	**2**	one mark each
			Total	**6**	

Question			Answer	Mark	Guidance
9			**(Level 3)** States at least one point describing either radiation from Earth or radiation from the Sun. **AND** states at least one relevant point about the greenhouse effect **AND** includes the idea that energy or radiation is trapped (in the atmosphere) Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **(Level 2)** States a relevant point about the greenhouse effect **AND** includes the idea that energy or radiation is trapped (in the atmosphere) **OR** States at least one point describing either radiation from Earth or radiation from the Sun **AND** includes the idea that energy or radiation is trapped (in the atmosphere) **OR** States at least one point describing either radiation from Earth or radiation from the Sun **AND** states a relevant point about the greenhouse effect Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **(Level 1)** States at least one point describing either radiation from Earth or radiation from the Sun. **OR** States a relevant point about the greenhouse effect **OR** Includes the idea that energy or radiation is trapped (in the atmosphere)	**[6]**	**This question is targeted at grades up to E** **Indicative scientific points related to difference in radiation from the Sun and Earth may include:** • Sun's radiation includes visible/UV/other types of EM radiation • radiation emitted by Earth is infrared • radiation from the Sun has more energy /power/ intensity/is more ionising than radiation from the Earth • atmosphere does not absorb (much) light/radiation from Sun • atmosphere/greenhouse gases absorb radiation from Earth • Sun's radiation/light gives energy for plants/photosynthesis **Indicative scientific points related to the greenhouse effect may include:** • If energy in > energy out Earth will heat up • Earth's radiation is absorbed. • Sun's radiation is transmitted • atmosphere/gases absorb infrared/radiation from Earth • these (greenhouse) gases include carbon dioxide (and methane & water) • this results in global warming **Example of ideas of energy/radiation is trapped** • 'Radiation from the Sun cannot escape' • 'Prevents radiation from the Sun leaving' • 'Heat is trapped' **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**

Question			Answer	Mark	Guidance
			Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)		
			Total	**6**	

Question			Answer	Mark	Guidance
10	**a**		water/ H_2O (1); generator/ dynamo/ alternator (1); magnet/ electromagnet (1)	**3**	
	b		38 %	**1**	
			Total	**4**	
11	**a**		333	**1**	
	b		2nd box (no of kWh × cost of 1 kWh)	**1**	
	c		1st & 3rd boxes (colder in March, used electric lights more)	**2**	one mark each
			Total	**4**	

Question			Answer	Mark	Guidance
12			**(Level 3)** Addresses Brian's comments including at least two scientific points **AND** Makes at least two suggestions to reduce a problem. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **(Level 2)** Explains the science that supports one of Brian's comments **AND** suggests one way to reduce a problem. **OR** Several explanations of the science that supports Brian's comments, **OR** Suggests several ways to reduce problems. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **(Level 1)** Attempts to explain the science that supports one of Brian's comments **AND** suggests a simple way to reduce a problem, e.g. 'Don't waste so much energy', 'turn off lights' Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	**[6]**	**This question is targeted at grades up to E** **Indicative scientific points may include:** **Brian's comments** inefficient power stations • buildings/houses lose heat • so need to use energy to heat them more • vehicles burn petrol/diesel/fossil fuels • vehicle (engines) are inefficient • fossil fuels running out or not renewable • pollution, global warming, or other example. • There are other causes, suitable example (e.g. electrical appliances left on standby, inefficient lights) **Indicative ways to reduce a problem:** • Reduce the use of fossil fuels • use example alternative sources (e.g. nuclear power, solar) • make power stations more efficient/use waste heat from power stations • improving insulation (examples of which double glazing, draught proofing, cavity walls = three ways) • use electric vehicles or more efficient engines • use public transport, walk, cycle (= one way). • reduce other causes of energy waste e.g. energy efficient lights. • encourage fuel efficient technology (legislation, financial incentives) • encourage fuel efficient behaviour (use smart meters, increase price of fuel/electricity, offers on improvements) 'More efficient' (cars, power stations, etc.) suggests inefficiency and an improvement.

Question			Answer	Mark	Guidance
					Use the L1, L2, L3 annotations in Scoris; do not use ticks.
			Total	**6**	

Question			Answer	Mark	Guidance
13	**a**		230 V x 2.5 A (1); = 575 (W)(1)	**2**	575 with no working gets both marks
	b		600 W × (5 × 60 s) (1); = 180 000 (J) (1)	**2**	3000 J = 1 mark 180 000 / 180 k / 0.18 M with no working gets both marks
	c		Two of: Is easier (concept) to understand; a joule is a (much) smaller unit than a kWh; joules = 3600000 x kWh; idea that an electricity bill in joules has many figures; easier to read/manage/calculate with; kWh is a traditional unit that everyone is used to;	**2**	Any two points **Allow** reverse arguments e.g. longer, bigger
			Total	**6**	

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

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2016

PART OF THE CAMBRIDGE ASSESSMENT GROUP

LLOYD'S REGISTER QUALITY ASSURANCE ISO9001
UKAS MANAGEMENT SYSTEMS 001