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 2014

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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.

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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

	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	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

NBOD	no benefit of doubt
R	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.

This would be worth 1 mark.

Put ticks (✓) in the two correct boxes.

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

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 <u>should be blank</u> (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 A181/02 shown by shading in column 3

Question			Answer	Mark	Guidance
1	a	i	planets closer to the Sun have a greater speed	1	
	a	ii	answer < 30 and > 13 with no explanation (1); idea that Mars is between Earth & Jupiter = (1)	2	true value is 24km/s **allow** 'between 13 and 30' **accept** '(230) is between 150 and 780'
	b		solar system (1); comets (1); asteroids (1)	3	
			Total	6	
2	a	i	Earthquakes usually happen where tectonic plates meet. Volcanoes are often found in regions where earthquakes are common.	2	ticks in last two boxes. each correct box = (1); extra ticks: mark as a list (see 11c above)
	a	ii	One stops and one carries on (1) P-waves carry on/can travel through liquids OR S-waves stop/can't travel through liquids (1);	2	**allow** marks for clear indication on diagram **ignore** reflections of P wave at boundary **ignore** changes direction/refraction **allow** P wave slows down OR changes speed. **allow** S waves reflects OR cannot travel through liquid **ignore** disappears
	b	i	(time delay = 49 – 12 =) 37 (s) (1); (distance = 8 × 37 =) 296 (km) (1)	2	Ignore incorrect or missing units allow ± 1 s on difference, i.e. 36, 37 or 38 gets the first mark ecf own time delay : 2nd mark is for 8 x (whatever) = result 36s gives 288 km and 38s gives 304 km
	b	ii	A calculation from data for 2000 km confirming the rule (1); Shows that data for 4000 km does not confirm the rule (1)	2	Calculation needed e.g. 250 x 8 = 2000 (km), 2000/8 = 250 (s) or 2000/250 = 8 (km/s) – working must be shown e.g. (4000/400 =) 10 (km/s), (4000/8 =) 500 (s)or (400 x 8 =) 3200 (km). Accept any of the three answers linked to 4000 km as evidence of equation not working Allow 2nd mark for reference to graph curving/levelling out after 2000 km but not just 'graph curves over' with no reference to when
			Total	8	

Question			Answer	Mark	Guidance
3			**(Level 3)** Either describes a method of measuring distance to a star/galaxy and identifies a specific improvement OR identifies a method of measuring distance to a star/galaxy and describes a specific improvement. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **(Level 2)** Identify a method of measuring distance to a star/galaxy and a specific improvement OR describes a method of measuring distance to a star/galaxy OR describes a specific improvement. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **(Level 1)** Identifies a distance measurement OR identifies a specific improvement. 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:** **Measurements to stars** • distance is measured by brightness • explanation that distant stars are dimmer ORA • distance is measured by parallax • explanation; idea that closer stars (appear to) move more as Earth moves ORA • **accept** measure red shift • the further away the galaxy is the greater the red shift **improvements to technology** • better lenses OR mirrors • automatic tracking of stars (by computers) • larger OR more powerful telescopes (P7 idea see below) • orbiting/space telescopes OR e.g. Hubble • outside atmosphere • on top of mountains OR at high altitude • higher in atmosphere • so less atmospheric interference • atmospheric interference makes observations difficult **Use the L1, L2, L3 annotations in Scoris; do not use ticks.** **Accept** P7 ideas may come up and should be given credit. i.e. larger telescopes, reduced diffraction effects, larger aperture gathers more light.
			Total	**6**	

Question			Answer	Mark	Guidance
4	a		T, F, T, F, T	3	All 5 correct = (3); 4 correct = (2); 3 correct = (1)
	b		**Max 2** orange has more photons (per second) OR violet has fewer photons (per second) (1); same energy reaches the surface OR (each) violet photon has more energy OR (each) orange photon has less energy (1); 3eV x no. of violet photons = 2eV x no. of orange photons (2); 3 orange photons for 2 violet photons (2)	2	**Ignore** violet light has more energy (in eV) unless it is clear this means per photon **Ignore** references to frequency of light
			Total	5	
5	a		ozone (in atmosphere) (1); absorbs UV/ the radiation(1)	2	
	b		Use suncream/sunscreen/sunblock OR cover-up with clothing OR wear hat (1); To reflect/absorb/block/reduce exposure to UV (1) OR stay in shade OR stay out of sun at mid-day OR stay out of sun when UV is most intense (1); idea of reducing exposure to UV (1)	2	**Accept** other reasonable suggestions **Accept** radiation for UV **ignore** sunlight/light/heat for UV **ignore** 'to stop UV damaging skin' as given in question **ignore** 'stop skin cancer' **ignore** 'sun protection' If there are two methods and one explanation mark the method explanation pair and ignore the other method
			Total	4	

Question			Answer	Mark	Guidance
6			(the oven) uses microwaves OR (the oven) does not use gamma (1); **Max 1** Microwaves are less dangerous than gamma ; Metal reflects/stops microwaves; Microwaves do not increase the risk of cancer; Microwaves are not ionising (1)	**2**	**Not** microwaves are not harmful **Assume** 'microwaves' (on their own) refers to waves not to the oven **Allow** one mark for 'gamma rays increase risk of cancer' **Allow** for 2 marks : The microwaves are kept/stay/reflected inside the oven **Allow** for 1 marks : 'The radiation is kept/stays/reflected inside the oven' if it does not refer to gamma rays
			Total	**2**	

Question			Answer	Mark	Guidance
7			**(Level 3)** Describes a feature of the two graphs which show correlation and identifies the CO_2 mechanism. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **(Level 2)** Describes a feature of the two graphs which show correlation OR identifies the CO_2 mechanism. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **(Level 1)** Refers to both graphs to attempt to describe correlation, OR may refer global warming. 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 related to the data may include:** • graphs follow similar trends – have a similar shape • discusses graphs in more detail e.g. 'both had low points 150 000 years ago' • as CO_2 levels rise so does T • as T rises so does CO_2 **Indicative scientific points related to mechanism may include:** • the CO_2 is the cause of the correlation • the CO_2 causes the temperature rise • CO_2 is a cause of the greenhouse effect • CO_2 causes global warming **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Mark	Guidance
8	a		byte	1	
	b		**Max 2** they can store lots of images (more easily) (1); they can share/transfer images (more easily) (1); they can manipulate/edit images (1); they process/decode information OR they use digital OR they use 0s and 1s modern images have lots of information (so computers are needed to process it) (1);	2	any 2 **accept** an example of editing/manipulation e.g. red eye removal OR noise reduction
			Total	3	
9	a		coal burning power station	1	
	b		T, F, F, T, T	3	all 5 correct = (3); 4 correct = (2); 3 correct = (1)
			Total	4	
10	a		(units used = 29030 – 28182) = 848 (kWh) (1);	1	
	b		Sensible reason (1); Relevant explanation (1)	2	Examples: It was summer/warmer/more daylight So: Didn't need so much heating/lighting OR didn't watch so much TV =2 marks OR reverse i.e. Didn't need...because it was summer... They were away (on holiday) OR didn't watch so much TV So they didn't use so much electricity =2 marks OR reverse i.e. they didn't use... because they were away. They replaced light bulbs with more energy efficient bulbs Which use less energy =2 marks **Ignore** 'which use less kWh' (in question)
			Total	3	

Question			Answer	Mark	Guidance
11	a	i	150W is 0.15kW (1) 0.15 kW × 2000 hours OR 150 W x 2000 hours (1); = 300 (kWh) (1)	3	300 with a power of ten error e.g. '300,000' = 2 marks If 300 or 300 000 etc. is followed by more calculation to get a final incorrect answer, do not award the final mark (300+further error scores 2 and 300 000 etc. +further error scores 1)
	a	ii	cost = 300 × 15 = 4500 p = £45.00	1	ecf own kWh **accept** 4500p
	b		Uses less power OR uses less energy (per unit time) OR 20W is smaller than 150W OR more efficient.	1	**Accept** other examples but must be comparative **Ignore** 'before it was 150W now it's 20W' 'now it is only 20W' scores 1 **Accept** it uses less watts **Accept** uses less current/electricity
			Total	5	

Question			Answer	Mark	Guidance
12			**EITHER** use 2500 V as gives/delivers more power (to the village) OR more efficient (1); and less power wasted OR less power heats the cables(1) **OR** don't use 250 V as gives/delivers less power (to the village) OR less efficient (1) and more power is wasted OR more power heats the cables (1)	2	Answer must identify or imply the voltage consistent with reasons. Marks are awarded for the reasons given. **Accept** answers in terms of energy (per unit time) **Accept** watts/W for power **Ignore** less heat wasted
			Total	2	

Question			Answer	Mark	Guidance
13			**(Level 3)** Uses a correct, relevant calculation(s) and discusses both advantages and disadvantages. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **(Level 2)** May quote data without calculation. Attempts a balanced argument of advantages and disadvantages OR an unbalanced argument supported by calculation. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **(Level 1)** Qualitative discussion of one side of the argument only. May not attempt a balanced argument. 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) **Use the L1, L2, L3 annotations in Scoris; do not use ticks**	**[6]**	**This question is targeted at grades up to C** **Indicative scientific points may include:** Ignore confusion between PV and solar heating panels. **Advantages** • No CO_2 / no pollution produced / won't harm environment / eco-friendly • Renewable / will not run out • Power cuts won't affect them • Reduces the household bill • Can get money for excess electricity produced in the summer • The electricity produced is free • Would help towards a government target of renewable energy generation. **Disadvantages** • Doesn't produce all of the electricity required / less electricity in winter when needed most • Needs lots of panels / not enough panels for whole bill • Initial cost / outlay of money / takes time to pay back • Cloud cover will reduce output • Won't work at night / no light at night • Will have to have other source of energy / mains supply for the night • Heavy/damaging on roof • Ugly • Maintenance needed **Data calculations** • 40 panels required to provide all the electricity • 12 panels produce 12X0.6 = 7.2 kWh not 24kWh • Total area of 12 panels is = 12 x 1.5 x 0.8 = 14.4 m2 • Energy bill is reduced by a third • The cost of 12 panels is 12 x £200 = £2400.
			Total	**6**	

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