



Physics A

General Certificate of Secondary Education

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

Mark Scheme for June 2012

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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.

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

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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	credit alternative wording / or words to that effect
ORA	or reverse argument

Available in scoris to annotate scripts:

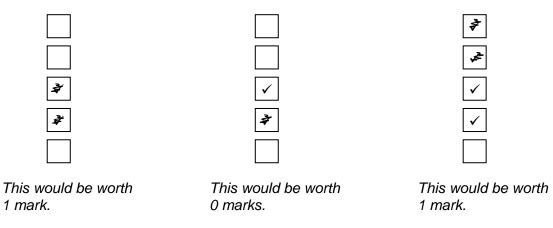
?	indicate uncertainty or ambiguity
BOD	benefit of doubt
CON	contradiction
×	incorrect response
ECF	error carried forward
\bigcirc	draw attention to particular part of candidate's response
NBOD	no benefit of doubt
R	reject
	correct response
L1 , L2 , L3	draw attention to particular part of candidate's response
•	information omitted

Mark Scheme

Subject-specific Marking Instructions

- a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- 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 the third <u>and</u> fourth boxes are required for the mark:



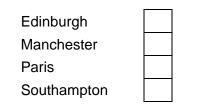
c. The list principle:

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-box questions:

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 and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. 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 cities in England:



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

e. For answers marked by levels of response:

- i. Read through the whole answer from start to finish
- ii. Decide the level that best fits the answer match the quality of the answer to the closest level descriptor
- iii. To determine the mark within the level, consider the following:

Descriptor	Award mark		
A good match to the level descriptor	The higher mark in the level		
Just matches the level descriptor	The lower mark in the level		

iv. Use the L1, L2, L3 annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Q	uesti	on	Answer			Guidance
1	(a)	(i)	10.5 (1) light years (1)			accept 9.9 x10 ¹⁶ m 9.9 x 10 ¹³ km
		(ii)			2	
			using parallax	✓		
			sending a space ship			
			comparing its relative brightness	~		
			asking people who live there			
			using a laser			
		(iii)	A before B and B before D (1) E before A (1)			(C)EABD Care with E before A
	(b)		It allows other astronomers to try and repeat the finding. The astronomers' friends will be able to see their results.		2	
			It shows the astronomers are scientists.			
			The findings can be evaluated by other astronomers.	~		
			Only astronomers are allowed to write articles for the journal.			
			It shows the astronomers are scientists. The findings can be evaluated by other astronomers. Only astronomers are allowed to write	✓ ✓		

Question	Answer	Mark	Guidance
(c)	 [Level 3] Complete diagram of new solar system. All three planets in separate (reasonable) orbits. At least one extra named object in correct orbit. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) [Level 2] Fair diagram of new solar system. All three planets in correct separate orbits. At least one other extra named object. Quality of written communication partly impedes communication of the science at this level 	6	 This question is targeted at grades up to E central star 3 large planets planets with approximately circular orbits Extra objects small/rocky/dwarf planets asteroids in circular orbits / asteroid belt comets in elliptical orbits moons orbiting planets ignore dust, gas, other fixed stars
	[Level 1] Attempts a diagram of the new solar system. All three planets on diagram, at least one planet in an orbit, possibly all planets in same orbit. One extra named object added to diagram. Answer may be simplistic. Quality of written communication impedes communication of the science at this level. $(1 - 2 \text{ marks})$ [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.
	Total	14	

C	Questio	on	Answer	Mark	Guidance	
2	(a)		В	1		
	(b)	(i)	any two from: moving mantle / moving magma (1) hot rocks rising (in the mantle) (1) convection (currents) (1) heating from the core (1) magma/molten rock comes out of the ridge (1)	2	allow (tectonic) plates moving apart	
		(ii)	any two from: shows that continents / tectonic plates moving (1) sea floor spreading shows/explains how/ proves they move (1) links plates to continents (1)	2	accept higher level such as the idea that new evidence of a mechanism makes an explanation more acceptable ignore countries moving	
	(c)		There was a geometric fit between continents.	2		
			The movement of continents could not be detected.			
			The same type of fossil could be found on different continents.			
			Mountains are only found in the middle of continents.			
			There were simpler explanations for the same vidence.]		
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			Tota	I 7		

Mark Scheme

C	Questio	on	Answer		Mark	Guidance
3	(a)	(i)	sound		1	
		(ii)	microwave		1	
		(iii)	X-ray		1	
		(iv)	X-ray		1	
		(v)	ultraviolet		1	
	(b)				1	
			colour			
			intensity			
			speed in a vacuum	✓		
			wavelength			
			Tota			

Question	Answer	Mark	Guidance
4	 [Level 3] Complete description of how each stage of the model fits the situation. Emission / source, reflection and detection all correctly described in context. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) [Level 2] Description of how each stage of the model fits the situation is incomplete, but correct where given. 2 stages correctly described including reflection. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) 	6	 This question is targeted at grades up to C radiation source is car (head)lights radiation is visible light light travels through air/air transmits light sign reflects light light detected/absorbed by eye model fully explains observations/seeing at night hence Prinul is correct accept reasons it might be a poor model not fully tested/limited evidence for this model accept some of the information can be communicated using a labelled diagram including the specialist terms
	[Level 1] Description of how each stage of the model fits the situation may be incorrect, but has correct elements. Reflection stage correctly described or named source or detector. Answer may be simplistic. Quality of written communication impedes communication of the science at this level. $(1 - 2 \text{ marks})$ [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)		 fundamental errors limit response to level 1. e.g. light leaves the eye, or eye is the source ignore other named light sources if there is no written response, please check the diagram in the question for a response Use the L1, L2, L3 annotations in Scoris; do not use ticks.
	Total	6	

Mark Scheme

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G	uesti	on	Answer		Mark	Guidance
5	(a)		Carbon dioxide absorbs some radiation in the Earth's atmosphere. ✓ The ozone layer is in the Earth's atmosphere. ✓ The atmosphere reflects radiation from the Sun. ✓ The Earth absorbs some radiation and then emits radiation. ✓ The Earth is warmer than it would otherwise be. ✓ The north and south poles are colder than the equator. ✓ Ultraviolet radiation comes from the Moon. ✓		3	
	(b)		increase ✓ stay the same decrease		1	
	(c)	(i)	climate changerising sea levelsincreasing skin cancer✓icecaps melting		1	
		(ii) correlation			1	
				Total	6	

Q	uestion	Answer	Mark	Guidance
6	(a)	any two from: easily transmitted (1) readily available (1) used in many ways/for many devices (1) clean at point of use (1) switched on and off easily (1)	2	allow easily transported ignore easy to use accept batteries are convenient easy to use
	(b)	It is produced by motors. It was the second energy source discovered. It is used to power secondary schools. It is produced using another energy source.	1	
	(c)	230	1	
		Total	4	

G	Question		Answer	Mark	Guidance
7	(a)		idea of not running out OR can be replaced within a lifetime/reasonably quickly	1	do not accept can be used again/re-used/infinite
	(b)		8 (m/s) (1)	2	
			the generator will work (as the wave speed is lower than 10m/s) (1)		second mark is ecf to be consistent with numerical answer
					an explicit link to the numerical answer is required e.g. at a minimum 'so it works'
	(c)	(i)	wave energy = 8250(kJ) AND electrical energy = 750(kJ); (1)	2	
			wasted energy = $7500(kJ)$; (1)		
		(ii)	efficiency = useful energy output x100/energy input OR efficiency =750 x 100 ÷ 8250	2	
			9(.09)		correct numerical answer gains 2 marks
					allow 1 mark for 0.09
	(d)	(i)	idea of power x time e.g. 750 x 24 (1)	2	accept errors in units e.g. 750 x 24 x 60 x 60
			OR 750,000 x 24 x 60 x 60 or 64,800,000,000 (1)		
			18,000 (1)		correct numerical answer gains 2 marks allow correct unit match to numerical answer (18) MWhr / (18,000,000) Whr OR (64,800,000,000) J/(64,800) MJ/(64,800,000) kJ
		(ii)	18,000 x 11p	2	correct numerical answer gains 2 marks ecf from previous answer e.g,
			198000(p) OR £1980		$18 \times 11 = 198 \text{p}$ OR £1.98
			Total	11	

Question	Answer	Mark	Guidance
8	[Level 3] At least 3 energy sources are considered. They are discussed in the context of the island situation with well justified appropriate suggestions. Quality of written communication does not impede communication of the science at this level. $(5 - 6 \text{ marks})$ [Level 2] At least 2 energy sources considered. At least one justification for the use of a source and one against the use of a source is suggested. Some suggestions are clearly in the context of the island. Quality of written communication partly impedes communication of the science at this level. $(3 - 4 \text{ marks})$ [Level 1] At least 2 energy sources considered with generic justifications. Answer may be simplistic. Suggestions are not particularly related to island context. Quality of written communication impedes communication of the science at this level. $(1 - 2 \text{ marks})$ [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	 This question is targeted at grades up to C allow other energy sources e.g. solar, geothermal note any justifications must be reasonable Indicative scientific points may include: hydro - no evidence to say whether possible or not all oil is imported, this is expensive but system already in place wind can be installed offshore - (option being developed by Falkland Islands) waves/tidal should be possible on an island nuclear possible possible advantages oil - high energy density/already established wind - little environmental cost/renewable waves/tidal - little environmental cost/renewable nuclear - well established technology/small amounts of fuel needed comparison of running costs of renewable (cheap) and expensive for fuel-using methods possible disadvantages oil - high cost/CO₂ pollution/environmental consequences wind - high set up costs waves/tidal - technology still undeveloped/high set up costs nuclear - safety issues/disposal of radioactive waste - very high set up costs peat is being used up quickly and should be reduced for a small island
		6	

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