

Physics A

General Certificate of Secondary Education

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

Mark Scheme for January 2013

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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
<u>words</u>	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
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	no benefit of doubt
	reject
	correct response

L1 , L2 , L3	indicate level awarded for a question marked by level of response
^	information omitted

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 and fourth boxes are required for the mark:

✗
✗

*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-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:

Edinburgh	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

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	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
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.

Question		Answer	Marks	Guidance
1	(a)	Stars (1) Universe (1) Milky Way (1)	3	ignore planets reject solar systems
	(b)	correct pattern ie, speed increase with distance (1) comparative example from table (of correct pattern or contradicting Phil) (1) <u>links comment</u> about Phil's conclusion <u>to</u> evidence (1)	3	accept correct comparison between any two pairs of figures or Ursa Major is closest and has lowest speed or Hydra is furthest and fastest there is no mark for no on its own; it must be justified. Yes cannot score the final marking point
	(c)	1000 (1) million (years)	2	accept 1000 for 1 mark 1 billion years = 2marks accept standard form <u>ignore</u> light (years)
Total			8	

Question	Answer	Marks	Guidance
2	<p>[Level 3] Considers both sides of the argument, gives 2 or more examples of Wegener's evidence and 2 or more reasons against accepting. Links this is to a conclusion, must have a conclusion. No errors. Quality of written communication does not impede communication of the science at this level. . (5–6 marks)</p> <p>[Level 2] Considers both sides of the argument, gives at least one example of Wegener's evidence and a reason against accepting. There is a conclusion. May have some errors. Quality of written communication partly impedes communication of the science at this level. (3–4 marks)</p> <p>[Level 1] Only presents one side of the argument with 2 points. Quality of written communication impedes communication of the science at this level. (1–2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Relevant points include: Note: candidates may say that Wegener's idea should have been accepted, should not have been accepted or that they cannot say, as long as their conclusion matches the data presented</p> <p>Evidence for</p> <ul style="list-style-type: none"> • geometric fit of continents • matching fossils on different continents • matching rocks on different continents • provided an explanation for mountain formation. <p>Reasons for rejection</p> <ul style="list-style-type: none"> • movement of continents not detectable • too big an idea from limited evidence/not enough evidence • simpler explanations for the same evidence eg Land Bridges • Wegener an outsider to the community of geologists/not a geologist/was a meteorologist • no mechanism to explain movement was known. <p>example errors</p> <ul style="list-style-type: none"> • movement in mantle provides mechanism for continental movement • any reference to sea floor spreading in wrong context • any reference to tectonic plates in wrong context. • Wegener had no evidence <p>ignore 'Wegener was not a <u>scientist</u>'</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
	Total	6	

Question			Answer	Marks	Guidance						
3	(a)	(i)	<p>wavelength – horizontal, a single cycle of the wave indicated</p> <p>amplitude – vertical from the centre line to peak or trough</p>	2	do not award marks if not labelled accept w or λ for wavelength and A or a for amplitude						
		(ii)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>electromagnetic</td> <td></td> </tr> <tr> <td>P-wave</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>S-wave</td> <td></td> </tr> </tbody> </table>	electromagnetic		P-wave	✓	S-wave		1	
electromagnetic											
P-wave	✓										
S-wave											
	(b)		<p>$(5 \times 110) = 550 \text{ km (1)}$</p> <p>Yes 500 is close to 550/No 500 is different from 550 (1)</p>	2	<p>allow similar for calculation and comparison of speed (=4.5km/s) or time (=100s)</p> <p>a correct unit must be seen somewhere in the answer to score the first mark</p> <p>must have correct comparison for second mark</p> <p>allow ecf from calculation</p>						
Total				5							

Question	Answer	Marks	Guidance
4	<p>[Level 3] Refers to at least 2 types of wave and considers several properties/reasons with at least 1 correct property linked with reason for its use. Quality of written communication does not impede communication of the science at this level. (5–6 marks)</p> <p>[Level 2] Considers several properties/reasons for use. The reasons are not correctly linked to the properties. Quality of written communication partly impedes communication of the science at this level (3–4 marks)</p> <p>[Level 1] Mentions a couple of relevant wave properties. Answer may be simplistic. Quality of written communication impedes communication of the science at this level. (1–2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>		<p>The question is targeted at grades up to E</p> <p>Relevant points include:</p> <p>Wave properties:</p> <ul style="list-style-type: none"> • radio waves and microwaves travel through air/atmosphere/large distances • are not (strongly) absorbed by the atmosphere • not (strongly) absorbed by glass/building materials (eg can travel through windows/walls) • these are non-ionising • so safer to use/not harmful • spread out to a very wide audience (diffraction) • infra red used in optical fibres • travel very fast • microwaves used to communicate with satellites • long wavelength/low frequency • can change shape of wave to add information(modulation) • information superimposed on carrier wave • can be digital/0 and 1's • fairly easy to encode for digital signals • analogue is continuous variation • noise is less of a problem with digital/easier to recover <p>accept:</p> <ul style="list-style-type: none"> • microwave transmits from satellites • <p>ignore references to microwave ovens, thermal imaging ignore references to other EM radiations</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
	Total	6	

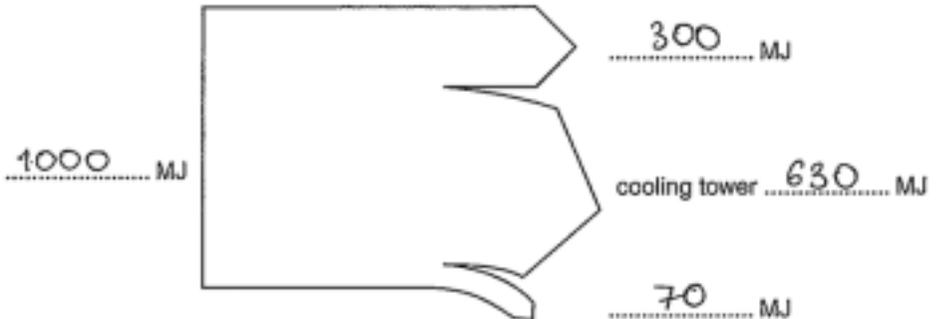
Question		Answer	Marks	Guidance
5	(a)	<p>graph shows (rapid) increase in CO₂ (1);</p> <p>human activity increased (around this time)/industrial revolution/more factories / population increase /(1);</p> <p>hence <u>correlation</u> (1);</p> <p>Use of fossil fuels/deforestation (produces CO₂)(1);</p>	4	<p>do not accept increase before 1750</p> <p>ignore named examples of human/industrial activity e.g. more cars / more technology</p> <p>must have described graph AND history of human activity for this mark</p> <p>ignore breathing out CO₂</p>
	(b)	1 mark for sensible risk and 1 mark sensible associated group (x2)	4	<p>if no sensible risk is given then group cannot score</p> <p>acceptable examples</p> <p>group: people living on the coast risk: flooding due to rising sea levels</p> <p>group: farmers risk: crops not growing due to climate changes</p> <p>group: everyone risk: extreme weather events</p> <p>allow same group twice if two separate valid risks similarly allow same risk (eg flooding) if two separate reasons (eg damage crops/ destroy low level housing)</p>
Total			8	

Question		Answer	Marks	Guidance																							
6	(a)	Emitted transmitted absorbed	3																								
	(b)	<table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="3">Intensity</th> </tr> <tr> <th>decrease</th> <th>stay the same</th> <th>increase</th> </tr> </thead> <tbody> <tr> <td>lower energy photons</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>higher frequency</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>use a smaller distance between heater and water</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>use more water</td> <td></td> <td>✓</td> <td></td> </tr> </tbody> </table>		Intensity			decrease	stay the same	increase	lower energy photons	✓			higher frequency			✓	use a smaller distance between heater and water			✓	use more water		✓		3	4 correct = 3 marks 3 correct = 2 marks 1 or 2 correct = 1 mark two ticks in the same row negates that row - CON
	Intensity																										
	decrease	stay the same	increase																								
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use more water		✓																									
Total			6																								

Question	Answer	Marks	Guidance
7	<p>[Level 3] Gives two examples from two contexts of domestic, workplace or national or one example from all three contexts. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Quality of written communication does not impede communication of the science at this level. (5–6 marks)</p> <p>[Level 2] Concentrates on one context but gives several examples or gives examples from two of domestic, workplace and national contexts. For the most part the information is relevant and presented in a structured and coherent format. Quality of written communication partly impedes communication of the science at this level. (3–4 marks)</p> <p>[Level 1] Gives two examples in a domestic, workplace or national context. Answer may be simplistic. There may be limited use of specialist terms. Quality of written communication impedes communication of the science at this level. (1–2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to E</p> <p>Relevant points include:</p> <p>Domestic, eg:</p> <ul style="list-style-type: none"> • better home insulation • double glazing • energy saving light bulbs • use public transport instead of cars. <p>Work place, eg:</p> <ul style="list-style-type: none"> • better insulation of offices • combined heat and power projects • factories use waste energy for heating. <p>National, eg:</p> <ul style="list-style-type: none"> • producing regulations to make buildings more energy efficient. • Public awareness campaign • Renewable example(s) reduce demand on power stations. • Build more efficient power stations • Recycling <p>Ignore other references to solar panels/ wind turbines/ renewable energy sources/environmentally friendly</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
	Total	6	

Question		Answer	Marks	Guidance
8	(a)	C	1	
	(b)	3	1	
	(c)	choosing 3(kW) as correct power; 3 x 0.1 x 25; 7.5p	1 1 1	3 must be in working not final answer 7.5p = 3 marks £0.075 scores 3 as long as they have included the £ any power of 10 error x 7.5 = 2 marks (eg 7500p, 0.75p,£75)
	(d)	D 230 x 6.5 / 1495W /1.495kW	1 1	ORA 1500/6.5 =230.7V or 1500/230 = 6.5A
		Total	7	

Question	Answer	Marks	Guidance
9	oil and gas (1) hydroelectric and wave (1) hydroelectric and wave (1) nuclear (1)	4	both needed either order both needed either order both needed either order
	Total	4	

10 (a)	<p>cooling tower – 630 as second label down on right (1)</p> <p>max 2 marks (coal) 1000 (MJ) (electricity) 300 (MJ) (wasted in friction) 70 (MJ)</p>  <p>The diagram shows a central rectangular box representing a process. On the left, an arrow labeled '1000 MJ' points into the box. On the right, three arrows point out of the box: the top one is labeled '300 MJ', the middle one is labeled 'cooling tower 630 MJ', and the bottom one is labeled '70 MJ'.</p>	3	3 correct = 2 marks 2 correct = 1 mark 0 or 1 correct = 0 marks
(b)	30	1	no error carried forward do not accept 0.3
	Total	4	

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