OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics A

General Certificate of Secondary Education

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

Mark Scheme for January 2012

Oxford Cambridge and RSA Examinations

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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
	draw attention to particular part of candidate's response
NBOD	no benefit of doubt
R	reject
	correct response

L1 , L2 , L3	allocate 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. If a candidate alters his/her response, examiners should accept the alteration.

c. 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:



This would be worth 1 mark.



This would be worth 0 marks.



This would be worth 1 mark.

d. 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.

e. 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	
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**

f. 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

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.

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td>(i)</td><td>
<table>
<tr><th></th><th>evolution theory</th><th>steady state theory</th><th>both theories</th></tr>
<tr><td>the number of galaxies increases</td><td></td><td>✓</td><td></td></tr>
<tr><td>galaxies move away from each other</td><td></td><td></td><td>✓</td></tr>
<tr><td>the space between galaxies increase</td><td>✓</td><td></td><td></td></tr>
</table>
</td><td>2</td><td>3 rows correct = 2 marks
1 or 2 rows correct = 1 mark</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>2.5 million / 2 500 000</td><td>1</td><td>reject light years.
allow 2.5 M</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>(in) stars</td><td>1</td><td>allow any (named) star at any stage in its life cycle e.g. the sun, a supernova, a red giant etc
not nebula</td></tr>
<tr><td></td><td>(b)</td><td></td><td>parallax;
(relative) brightness;</td><td>2</td><td>allow any correct description of parallax.
e.g. 2 observations of a star 6 months apart.</td></tr>
<tr><td></td><td>(c)</td><td></td><td>
<table>
<tr><td>a collision between planets</td><td></td></tr>
<tr><td>an asteroid exploding</td><td></td></tr>
<tr><td>a cloud of dust and gas</td><td>✓</td></tr>
<tr><td>a collision between stars</td><td></td></tr>
</table>
</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>7</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
2			**Level 3:** There is a correctly labelled diagram showing 3 sections: core mantle and crust. The candidate may identify some layers of the Earth correctly as solid or liquid. The candidate may identify earthquake waves as P and S waves OR make a relevant comment regarding plate movement. Quality of written communication does not impede communication of the science at this level. **(5 – 6 marks)** **Level 2:** A diagram consists of at least 2 concentric circles and is partially labelled. Candidate may be aware that earthquake waves can be P and S waves OR may make a relevant comment about the structure of the Earth. Quality of written communication partly impedes communication of the science at this level. **(3 – 4 marks)** **Level 1:** The candidate may attempt to draw a diagram to represent the Earth OR make a relevant comment about the structure of the Earth. They may show awareness of either P or S waves. 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 F** Although a diagram is expected, candidates who produce no diagram but provide a written response which meets the Level 2 or Level 3 criteria sufficiently well can still be awarded these levels. **Indicative Science** labelled diagram with: crust mantle core (accept inner and outer core) earthquake waves can tell us: thickness of crust size of mantle and core (outer) core is liquid mantle is solid **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
3	(a)	(i)*	6÷12s 0.5 (Hz)	2	 correct numerical answer gains both marks
		(ii)*	10m÷4 2.5 (m)	2	correct numerical answer gains both marks
	(b)	(i)*	0.5 x 2.5 1.25 (m/s)	2	ecf from a(i) x a(ii) correct numerical answer gains both marks **accept** 1.3
		(ii)*	(No) **any two from** the ball will only move up and down water waves are transverse particles will only move up and down only energy is transferred by a wave, (not matter) idea that matter is not transferred by wave (only energy)	2	 **accept** idea of vertical motion not horizontal movement **accept** 'cannot move matter'
			Total	**8**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4</td><td>(a)</td><td></td><td>
<table>
<tr><td>they can be used for listening to music</td><td></td></tr>
<tr><td>they are not absorbed by the atmosphere</td><td>✓</td></tr>
<tr><td>they are a health hazard</td><td></td></tr>
<tr><td>they can be used to carry information</td><td>✓</td></tr>
</table>
</td><td>2</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>
<table>
<tr><th>Statement</th><th>analogue signal</th><th>digital signal</th><th>both analogue and digital</th></tr>
<tr><td>the signal is made up of short pulses</td><td></td><td>✓</td><td></td></tr>
<tr><td>the signal varies continuously</td><td>✓</td><td></td><td></td></tr>
<tr><td>the signal is a code made up of 1s and 0s</td><td></td><td>✓</td><td></td></tr>
<tr><td>the signal is transmitted as an electromagnetic wave</td><td></td><td></td><td>✓</td></tr>
</table>
</td><td>4</td><td>treat a tick in the first 2 columns as equivalent to a tick in the third column.</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td></td><td>
<table>
<tr><td>Venus gets more energy because it is closer to the Sun than the Earth.</td><td>✓</td></tr>
<tr><td>The Earth gets more energy because we live there and use the energy.</td><td></td></tr>
<tr><td>Venus gets more energy from the Sun because it gets hit by more photons.</td><td>✓</td></tr>
<tr><td>Venus gets less energy because it is in space, which is very cold.</td><td></td></tr>
</table>
</td><td>2</td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>carbon dioxide/CO_2</td><td>1</td><td>allow any clear selection of carbon dioxide.</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>any three from:
some reference to carbon dioxide (1)
more on Venus (1)
(CO_2) is the majority/ most common gas on Venus (1)

relates data on CO_2 to increased temperature or greenhouse effect OWTTE. (1)</td><td>3</td><td>ignore any comparison of other gases.

allow 96% on Venus for third marking point.

must score at least 1 mark from first 3 points for this mark to be awarded.</td></tr>
<tr><td></td><td>(c)</td><td></td><td>carbon dioxide/CO_2 (1)
photosynthesis (1)
(less than) 0.05(%) oxygen/O_2 (1)</td><td>3</td><td>allow CO2 but not CO^2 or CO

allow O or O2</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>9</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
6			**Level 3:** Considers balance of risk and benefit. Identifies a risk and identifies a benefit and considers methods of modifying risk. Gives explanations of at least two of risk, benefit or modifying risk. May give a perceived risk argument. Quality of written communication does not impede communication of the science at this level. **(5 – 6 marks)** **Level 2:** A comparison between risks and benefits is at least implied. Identifies a risk and a benefit. Gives an explanation of at least one. Quality of written communication partly impedes communication of the science at this level. **(3 – 4 marks)** **Level 1:** Identifies a risk and a benefit OR identifies either a risk or a benefit and gives some explanation. 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:** **Risks e.g.** exposure to UV - result in cancer or sunburn sunburn or sun stroke or cancer – bad effect on health damage to skin – less attractive affects eyesight – cataracts **Benefits e.g.** tan - social benefits e.g. more attractive / feel better relaxing – reduces stress reduction in other cancers – health benefit. **accept** vitamin D production – health benefits **accept** SAD – reducing depression **Factors affecting the risk/ benefit decision e.g.** exposure does not always lead to harm / cancer sunscreen blocks UV short exposures less likely to lead to skin cancer skin type may reduce risk the benefits are immediate, the risks may show up much later the sunbather does not know the risks **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
7	(a)	(i)	P= I x V P = 19 V x 2.1 A 39.9 (W)	3	3 marks for correct numerical answer. **allow** calculation without units. **allow** 40 (W) **allow** 1 mark if a voltage of 120 V is used (gives 252 W).
		(ii)	(lamp) uses more energy OWTTE	1	**allow** computer ecf from a (i) if power greater than 60W. **allow** higher power in place of energy.
	(b)		230 (V)	1	
			Total	**5**	

8	(a)	(i)	B = furnace (1) turbine immediately to left of generator (1)	2	
		(ii)	immediately after furnace	1	e.g. if furnace at B answer is **B-C** if furnace at C answer is **C-D** if furnace at D answer is **D-E**
		(iii)	wind/water/wave/hydroelectric/tidal/solar/geothermal	1	do **not** accept nuclear or biomass.
	(b)		(choice clearly stated.) comparative comments made regarding: efficiency (1) cost (1) environmental (1) consistent with the choice made.	3	answers must only be based on the information in the table. answers where no clear choice is made but the candidate has made a valid comparative comment can score a maximum of 1 mark. the environmental mark can be awarded if the candidate has either acknowledged concerns regarding the environmental problem or suggested a means for mitigating the environmental problem. e.g. careful management of nuclear waste etc. **allow** gas has 38% efficiency to imply most efficient. **allow** nuclear costs 2 to 2.5 p per kWh to imply cheapest.
			Total	**7**	

Question			Answer	Marks	Guidance
9			**Level 3** Identifies a group in favour and a group against. Explains the concerns for each group and may consider the effect on the wider community. Quality of written communication does not impede communication of the science at this level. **(5 – 6 marks)** **Level 2** Suggests that some people may be in favour and some against the project. Provides some negative and positive effects of the project that may be related to these people. Quality of written communication partly impedes communication of the science at this level. **(3 – 4 marks)** **Level 1** Identifies some positive or negative effects of the proposed project. They may imply that there are people either in favour or against. 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 D** **Indicative scientific points may include:** **In favour:** eg any environmental group because: replaces pollution-producing coal less CO_2 produced provides new habitat eg local workers/businesses because provides work during building lake can be used for recreation/sailing etc. **Against:** eg farmers because they will lose their farms above the dam which will effect their livelihood. less water available below the dam eg people living in area above the dam because they will lose their homes/have to move eg environmental group because it will destroy existing habitats. **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

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