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 June 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 | draw attention to particular part of candidate's 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 <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.*

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 | |
| 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** |

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.

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td>(i)</td><td>10.5 (1)<br>light years (1)</td><td>2</td><td>accept 9.9 x$10^{16}$ m<br>9.9 x $10^{13}$ km</td></tr>
<tr><td></td><td></td><td>(ii)</td><td><table><tr><td>using parallax</td><td>✓</td></tr><tr><td>sending a space ship</td><td></td></tr><tr><td>comparing its relative brightness</td><td>✓</td></tr><tr><td>asking people who live there</td><td></td></tr><tr><td>using a laser</td><td></td></tr></table></td><td>2</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>A before B and B before D (1)<br>E before A (1)</td><td>2</td><td>(C)EABD<br>Care with E before A</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><td>It allows other astronomers to try and repeat the finding.</td><td>✓</td></tr><tr><td>The astronomers' friends will be able to see their results.</td><td></td></tr><tr><td>It shows the astronomers are scientists.</td><td></td></tr><tr><td>The findings can be evaluated by other astronomers.</td><td>✓</td></tr><tr><td>Only astronomers are allowed to write articles for the journal.</td><td></td></tr></table></td><td>2</td><td></td></tr>
</table>

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| | (c) | | **[Level 3]**<br>Complete diagram of new solar system. All three planets in separate (reasonable) orbits. At least one extra named object in correct orbit.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Fair diagram of new solar system. All three planets in correct separate orbits. At least one other extra named object.<br>Quality of written communication partly impedes communication of the science at this level<br>(3 – 4 marks)<br><br>**[Level 1]**<br>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.<br>Quality of written communication impedes communication of the science at this level.<br>(1 – 2 marks)<br><br>**[Level 0]**<br>Insufficient or irrelevant science. Answer not worthy of credit.<br>(0 marks) | 6 | **This question is targeted at grades up to E**<br><br>• central star<br>• 3 large planets<br>• planets with approximately circular orbits<br><br>Extra objects<br>• small/rocky/dwarf planets<br>• asteroids in circular orbits / asteroid belt<br>• comets in elliptical orbits<br>• moons orbiting planets<br><br>**ignore** dust, gas, other fixed stars<br><br>**Use the L1, L2, L3 annotations in Scoris; do not use ticks.** |
| | | | **Total** | **14** | |

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>B</td><td>1</td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>any two from:<br>moving mantle / moving magma (1)<br>hot rocks rising (in the mantle) (1)<br>convection (currents) (1)<br>heating from the core (1)<br>magma/molten rock comes out of the ridge (1)</td><td>2</td><td>allow (tectonic) plates moving apart</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>any two from:<br>shows that continents / tectonic plates moving (1)<br>sea floor spreading shows/explains how/ proves they move (1)<br>links plates to continents (1)</td><td>2</td><td>accept higher level such as the idea that new evidence of a mechanism makes an explanation more acceptable<br>ignore countries moving</td></tr>
<tr><td></td><td>(c)</td><td></td><td><table><tr><td>There was a geometric fit between continents.</td><td></td></tr><tr><td>The movement of continents could not be detected.</td><td>✓</td></tr><tr><td>The same type of fossil could be found on different continents.</td><td></td></tr><tr><td>Mountains are only found in the middle of continents.</td><td></td></tr><tr><td>There were simpler explanations for the same evidence.</td><td>✓</td></tr></table></td><td>2</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>7</td><td></td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td>(i)</td><td>sound</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>microwave</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>X-ray</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(iv)</td><td>X-ray</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(v)</td><td>ultraviolet</td><td>1</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><td>colour</td><td></td></tr><tr><td>intensity</td><td></td></tr><tr><td>speed in a vacuum</td><td>✓</td></tr><tr><td>wavelength</td><td></td></tr></table></td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

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

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td></td><td>
<table>
<tr><td>Carbon dioxide absorbs some radiation in the Earth’s atmosphere.</td><td>✓</td></tr>
<tr><td>The ozone layer is in the Earth’s atmosphere.</td><td></td></tr>
<tr><td>The atmosphere reflects radiation from the Sun.</td><td></td></tr>
<tr><td>The Earth absorbs some radiation and then emits radiation.</td><td>✓</td></tr>
<tr><td>The Earth is warmer than it would otherwise be.</td><td>✓</td></tr>
<tr><td>The north and south poles are colder than the equator.</td><td></td></tr>
<tr><td>Ultraviolet radiation comes from the Moon.</td><td></td></tr>
</table>
</td><td>3</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>
<table>
<tr><td>increase</td><td>✓</td></tr>
<tr><td>stay the same</td><td></td></tr>
<tr><td>decrease</td><td></td></tr>
</table>
</td><td>1</td><td></td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>
<table>
<tr><td>climate change</td><td></td></tr>
<tr><td>rising sea levels</td><td></td></tr>
<tr><td>increasing skin cancer</td><td>✓</td></tr>
<tr><td>icecaps melting</td><td></td></tr>
</table>
</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>correlation</td><td>1</td><td></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>Mark</th><th>Guidance</th></tr>
<tr><td>6</td><td>(a)</td><td></td><td>any two from:<br>easily transmitted (1)<br>readily available (1)<br>used in many ways/for many devices (1)<br>clean at point of use (1)<br>switched on and off easily (1)</td><td>2</td><td>allow easily transported<br>ignore easy to use<br><br>accept batteries are convenient easy to use</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><td>It is produced by motors.</td><td></td></tr><tr><td>It was the second energy source discovered.</td><td></td></tr><tr><td>It is used to power secondary schools.</td><td></td></tr><tr><td>It is produced using another energy source.</td><td>✓</td></tr></table></td><td>1</td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td>230</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>4</td><td></td></tr>
</table>

| 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)<br><br>the generator will work (as the wave speed is lower than 10m/s) (1) | 2 | <br><br>second mark is **ecf** to be consistent with numerical answer<br><br>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)<br><br>wasted energy = 7500(kJ); (1) | 2 | |
| | | (ii) | efficiency = useful energy output x100/energy input<br>**OR** efficiency =750 x 100 ÷ 8250<br><br>9(.09...) | 2 | <br><br><br>correct numerical answer gains 2 marks<br><br>**allow** 1 mark for 0.09 |
| | (d) | (i) | idea of power x time e.g. 750 x 24 (1)<br><br>**OR** 750,000 x 24 x 60 x 60 or 64,800,000,000 (1)<br><br>18,000 (1) | 2 | **accept** errors in units e.g. 750 x 24 x 60 x 60<br><br><br>correct numerical answer gains 2 marks<br>**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<br><br>198000(p) **OR** £1980 | 2 | correct numerical answer gains 2 marks<br>**ecf** from previous answer e.g,<br>18 x 11 = 198p OR £1.98 |
| | | | **Total** | **11** | |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| 8 | | | **[Level 3]**<br>At least 3 energy sources are considered. They are discussed in the context of the island situation with well justified appropriate suggestions.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br>**[Level 2]**<br>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.<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br>**[Level 1]**<br>At least 2 energy sources considered with generic justifications. Answer may be simplistic. Suggestions are not particularly related to island context.<br>Quality of written communication impedes communication of the science at this level.<br>(1 – 2 marks)<br>**[Level 0]**<br>Insufficient or irrelevant science. Answer not worthy of credit.<br>(0 marks) | 6 | **This question is targeted at grades up to C**<br>**allow** other energy sources e.g. solar, geothermal<br>**note** any justifications must be reasonable<br>**Indicative scientific points may include:**<br>• hydro - no evidence to say whether possible or not<br>• all oil is imported, this is expensive but system already in place<br>• wind can be installed offshore - (option being developed by Falkland Islands)<br>• waves/tidal should be possible on an island<br>• nuclear possible<br>**possible advantages**<br>• oil - high energy density/already established<br>• wind - little environmental cost/renewable<br>• waves/tidal - little environmental cost/renewable<br>• nuclear - well established technology/small amounts of fuel needed<br>• comparison of running costs of renewable (cheap) and expensive for fuel-using methods<br>**possible disadvantages**<br>• oil - high cost/$CO_2$ pollution/environmental consequences<br>• wind - high set up costs<br>• waves/tidal - technology still undeveloped/high set up costs<br>• nuclear - safety issues/disposal of radioactive waste - very high set up costs<br>• peat is being used up quickly and should be reduced for a small island<br>**Use the L1, L2, L3 annotations in Scoris; do not use ticks.** |
| | | | | **6** | |

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