

**GCSE**

**Physics A**

Unit **A183/01**: Unit 3 – Module P7 (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
<b>BP</b>	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.
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
<b>not/reject</b>	answers which are not worthy of credit
<b>ignore</b>	statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	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:

	correct response
	incorrect response
<b>BOD</b>	benefit of doubt
<b>NBOD</b>	no benefit of doubt
<b>ECF</b>	error carried forward
<b>0</b> , <b>L1</b> , <b>L2</b> , <b>L3</b>	indicate level awarded for a question marked by level of response
<b>A</b>	information omitted
<b>CON</b>	contradiction

	reject
	indicate uncertainty or ambiguity
	draw attention to particular part of candidate's response

**ADDITIONAL OBJECTS:** You **must** assess and annotate the additional objects for each script you mark. Where credit is awarded, appropriate annotation must be used. If no credit is to be awarded for the additional object, please use annotation as agreed at the SSU.

**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. 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 should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
<b>Score:</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>NR</b>

- d. 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	Mark	Guidance
1	a	i	prism with a triangular cross section (1)  diverging rays inside or outside of the prism (1)  at least one continuous ray that changes direction at a boundary (1)	3	<b>Accept</b> idea of dispersion with colour labels (which may not be diverging)
		ii	refraction	1	
		iii	diffraction grating	1	<b>accept</b> reasonable correct suggestion e.g. CD /DVD /Oil film / water droplets /soap bubbles /crystals / etc. <b>ignore</b> mirror, glass
	b		light  lines	2	
	c	i	B  C	2	any order
		ii	hydrogen  helium	2	any order
			<b>Total</b>	<b>11</b>	

Question		Answer	Mark	Guidance
2	a	A D	2	allow 1 mark for D and A reversed
	b	stars	1	
	c	i	2	correct for 5000K correct for 1 L <sub>sun</sub>
		ii	2	uses 273 in any calculation 288 allow -258 or 258 scores 1 mark correct numerical answer gains 2 marks
		iii	1	too cold / off the scales allow too dim / it is not a star / not luminous
	d	<p><b>stars</b></p> <p><b>type of star</b></p> <ul style="list-style-type: none"> <li>main sequence</li> <li>red giant</li> <li>supergiant</li> <li>white dwarf</li> </ul>	2	
<b>Total</b>			<b>10</b>	

Question	Answer	Mark	Guidance
3	<p><b>[Level 3]</b> Describes or names three or more main stages and gives the correct sequence.</p> <p>Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> Describes or names two main stages, in correct sequence. <b>OR</b> three stages are described or named, but in an incorrect sequence.</p> <p>Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> Names or describes one of the main stages, Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p><b>[Level 0]</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>nebula / cloud of gas and dust</p> <p>protostar / gravitational collapse / fusion begins</p> <p>main sequence / fuses H to He / Star for billions of years</p> <p>red giant / expands and fuses He</p> <p>white dwarf / shrinks, cools and fades</p> <p>Apply QWC to incorrect stages</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	6	

Question	Answer	Mark	Guidance
4	<p><b>[Level 3]</b> Chooses W or Y with a relevant explanation of a factor</p> <p>Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> Chooses W or Y and states relevant factors Chooses X or Z with a relevant explanation of a factor</p> <p>Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> Makes a choice and states relevant factors</p> <p>Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p><b>[Level 0]</b> 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><b>Indicative scientific points may include:</b></p> <p><b>Factors</b></p> <ul style="list-style-type: none"> <li>• height</li> <li>• cloudless nights</li> <li>• distance from town</li> </ul> <p><b>Explanations</b></p> <ul style="list-style-type: none"> <li>• higher – better visibility</li> <li>• fewer cloudless nights – more observations</li> <li>• greater distance from town – less light pollution</li> <li>• nearer to town – easier to access</li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	6	

Question		Answer	Mark	Guidance
5	a	EITHER planets (1)  OR  the discovery of many planets increases the likelihood that life exists on one of them (2)	2	<b>Accept</b> solar systems <b>accept</b> an additional mark for conditions suitable for life e.g. water / suitable temperature / atmosphere / suitable distance from star / Goldilocks zone <b>Ignore</b> planets of the solar system
	b	none/0/zero	1	
<b>Total</b>			<b>3</b>	
6		diagram includes Earth, Moon and Sun  Earth is directly between Moon and Sun  some rays from the Sun are drawn to show a shadow on the Moon	3	<b>Accept</b> a solar eclipse - 2 marks max. Moon is between Earth and Sun Some rays from the Sun are drawn to show a shadow on the Earth
<b>Total</b>			<b>3</b>	

Question		Answer	Mark	Guidance
7*	a	these were the (only) planets visible / known about / discovered	1	<b>Accept</b> other planets not bright enough <b>Ignore</b> references to distance
	b	i (24+4)/10  2.8 (AU)	2	<b>allow</b> answer in table  correct numerical answer gains both marks
		ii the distance calculated is similar ( so it supports law).	1	<b>Accept</b> yes with a reference to 2.8 is just sufficient  <b>allow</b> comment consistent with ecf from bi <b>allow</b> anything in range 2.6 – 2.9 to be similar
		iii  <i>any 2</i>  observations may be mistakes / wrong  check observation / confirm results / check predictions  greater confidence / more reliable ( if observations can be reproduced by others)	2	<b>Ignore</b> references to peer review / accuracy / calculations / bias / opinion  <b>Accept</b> in case he made them up  <b>Ignore</b> more observations



Question	Answer	Mark	Guidance
8*	<p><b>[Level 3]</b> Explains an improvement <b>and</b> states aspects of Cepheid Variable distance measurement Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p><b>[Level 2]</b> Explains an improvement due to space telescopes <b>OR</b> States two improvements <b>OR</b> States an aspect of Cepheid variable distance measurement and states an improvement due to space telescopes <b>OR</b> State aspects of Cepheid variable distance measurement Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p><b>[Level 1]</b> States an improvement due to space telescopes <b>OR</b> states an aspect of Cepheid variable distance measurement <b>OR</b> Explains how distance measurements using parallax or brightness are made Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p><b>[Level 0]</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p><b>This question is targeted at grades up to C</b> <b>Indicative scientific points may include:</b></p> <p><b>how telescopes in space improve measurements</b></p> <ul style="list-style-type: none"> <li>• increased baseline</li> <li>• lack of atmosphere</li> <li>• less light absorbed</li> <li>• improved luminosity measurement</li> <li>• parallax calculations for more distant objects</li> <li>• brightness measurements for more distant objects</li> </ul> <p><b>Explanation for improvements</b></p> <ul style="list-style-type: none"> <li>• idea that there is less absorption or refraction of light by the atmosphere / less scattering of light by the atmosphere</li> <li>• increased baseline gives bigger/more accurate angle</li> </ul> <p><b>Cepheid variables</b></p> <ul style="list-style-type: none"> <li>• Cepheids have a period of brightness / pulse / are variable</li> <li>• Cepheids have apparent brightness and luminosity</li> <li>• luminosity is related to the period of the Cepheid</li> <li>• This relationship is used to find distance to more distant Cepheid variables</li> <li>• luminosity is compared with apparent brightness to find distance of the Cepheid</li> <li>• Must know distance to nearby Cepheids</li> </ul> <p><b>Do not accept</b> space telescopes are closer to observed stars <b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	

Question		Answer	Mark	Guidance	
9	a	<p><b>any 2</b></p> <p>idea of evaluation e.g. evaluated/assessed/checked (1);</p> <p>by other scientists/experts/ (1)</p> <p>idea of before being published (1)</p>	2	<p><b>e.g.</b> agree or disagree findings / looked over /data is validated</p> <p><b>do not accept</b> any reference to doing <i>further</i> experiments</p> <p><b>ignore</b> give opinions/feedback, reviewed</p>	
	b	i	2000 (Mpc) x 70 (km/s per Mpc)	2	
			140000 km/s		
		ii	idea that Ian is not making any measurements himself	1	<b>accept</b> he's using secondary data / he's used a reference book / he looked up the data
<b>Total</b>			<b>5</b>		

\* - overlap

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