

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE

PHYSICS A

A183/01

Unit A183: Module P7 (Foundation Tier)

MARK SCHEME

Duration: 1 hour

MAXIMUM MARK 60

Guidance for Examiners

Additional guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	=	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	=	alternative wording
ORA	=	or reverse argument

Eg mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)

work done = 0 marks
 work done lifting = 1 mark
 change in potential energy = 0 marks
 gravitational potential energy = 1 mark

5. Annotations:
 The following annotations are available on SCORIS.

✓	=	correct response
×	=	incorrect response
bod	=	benefit of the doubt
nbod	=	benefit of the doubt not given
ECF	=	error carried forward
^	=	information omitted
I	=	ignore
R	=	reject
6. If a candidate alters his/her response, examiners should accept the alteration.

7. 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.

Eg

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth one mark.

Put ticks (✓) in the two correct boxes.

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth one mark.

8. 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, eg 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.

9. Marking method for tick boxes:

Always check the additional guidance.

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. If there are no ticks, accept clear, unambiguous indications, eg shading or crosses.

Credit should be given for each box correctly ticked. 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.

Eg If a question requires candidates to identify a city in England, then in the boxes

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		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

10. Three questions in this paper are marked using a Level of Response (LoR) mark scheme with embedded assessment of the Quality of Written Communication (QWC). When marking with a Level of Response mark scheme:
- Read the question in the question paper, and then the list of relevant points in the 'Additional guidance' column of the mark scheme, to familiarise yourself with the expected science. The relevant points are not to be taken as marking points, but as a summary of the relevant science from the specification.
 - Read the level descriptors in the 'Expected answers' column of the mark scheme, starting with Level 3 and working down, to familiarise yourself with the expected levels of response.
 - *For a general correlation between quality of science and QWC:* determine the level based upon which level descriptor best describes the answer; you may award either the higher or lower mark within the level depending on the quality of the science and/or the QWC.
 - *For high-level science but very poor QWC:* the candidate will be limited to Level 2 by the bad QWC no matter how good the science is; if the QWC is so bad that it prevents communication of the science the candidate cannot score above Level 1.
 - *For very poor or totally irrelevant science but perfect QWC:* credit cannot be awarded for QWC alone, no matter how perfect it is; if the science is very poor the candidate will be limited to Level 1; if there is insufficient or no relevant science the answer will be Level 0.

Question			Expected answers	Marks	Additional guidance
1	(a)	(i)	In order left to right – cloud of gas protostar <i>(Sun now)</i> red giant white dwarf	[4]	
		(ii)	supernova neutron star	[2]	accept red supergiant accept black hole
	(b)	(i)	hydrogen	[1]	
		(ii)	hydrogen	[1]	
		(iii)	silicon oxygen elements must be larger than helium and smaller than iron	[3]	accept carbon or nitrogen
		(iv)	lead / uranium	[1]	
Total				[12]	

Question		Expected answers	Marks	Additional guidance
2	(a)	Chile / Hawaii / Australia / Canary Islands	[1]	
	(b)	<p>[Level 3] A balanced answer which contains all the key astronomical factors, and identifies potential arguments against the location. Location is appropriate and consistent with the astronomical factors. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks)</p> <p>[Level 2] A partial answer which may contain only a limited number of factors or arguments against the location. Location is consistent with factors identified. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks)</p> <p>[Level 1] Answer may be simplistic. Describes a location. An answer which may contain only astronomical factors. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	[6]	<p>relevant points include:</p> <p>describes a location eg mountain top</p> <p>astronomical factors:</p> <ul style="list-style-type: none"> • high so less atmospheric interference • away from towns/cities to avoid light pollution • many cloudless nights • low pollution and dry air <p>other factors:</p> <ul style="list-style-type: none"> • Cost • Environmental impact • Provides employment <p>note: some factors may be presented as positive or negative eg provides employment, but remote location makes it hard to get to work</p> <p>ignore any references to space telescopes or international relations</p>

Question		Expected answers	Marks	Additional guidance
2	(c)	<p>who: government/regulators/politicians</p> <p>any two from: why: they take into account everybody's views they balance the benefits and costs they are providing the money they make the laws/rules/regulations scientists are only one group/ other groups are affected</p>	[3]	

Question	Expected answers	Marks	Additional guidance
2 (d) 	<p>[Level 3] A balanced answer which contains at least 2 arguments both for and against. Conclusion is consistent with the arguments. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks)</p> <p>[Level 2] An answer which may contain only one argument for and against or two or more arguments supporting the conclusion. Conclusion is consistent with arguments. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks)</p> <p>[Level 1] An answer which may contain only one argument and fails to recognise any counter arguments. Conclusion is poorly linked to argument. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	[6]	<p>advantage: avoids atmospheric distortion/refraction/absorption/twinkle; different parts of spectrum available; avoids light pollution from cities; no clouds; very dark</p> <p>disadvantage: cost of putting in space; cost/difficulty of maintenance/repair; uncertainty of space programme;</p> <p>reject closer to stars</p>
	Total	[16]	

Question			Expected answers	Marks	Additional guidance
3	(a)	(i)	2 arc seconds	[1]	
		(ii)	recognises inverse relationship. e.g smaller angle means bigger distance; hence A closer than B	[2]	
	(b)	(i)	1.5	[1]	accept ± 0.1
		(ii)	5 days	[2]	accept ± 1
Total				[6]	

4	(a)		<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; width: 100px; text-align: center;">object</div> <div style="border: 1px solid black; padding: 5px; width: 100px; text-align: center;">focus</div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; width: 100px; text-align: center;">lens</div> <div style="border: 1px solid black; padding: 5px; width: 100px; text-align: center;">image</div> </div>	[3]	all correct = 3 marks 2/3 correct = 2 marks 1 correct = 1 mark
	(b)		C greatest / most curved	[2]	accept thickest/fattest/shortest focal length
Total				[5]	

Question		Expected answers	Marks	Additional guidance
5	(a)	gravity	[1]	do not accept 'g force'
	(b)	pressure increases because: particles move faster/have more kinetic energy more frequent/energetic collisions between particles particles have increased momentum increased forces during collisions between particles	[2]	do not accept 'moves more' or 'vibrates' or just 'more energy' allow collisions with 'edge' or 'boundary' allow 'more collisions'
	(c)	(i) Hydrogen → Helium	[2]	(1) per correct answer allow H and He (symbols must be correct) ignore any balancing/additional numbers

Question	Expected answers	Marks	Additional guidance
5 (c) (ii)	<p>[Level 3] Answer correctly describes the processes of energy release in the Sun (hydrogen to helium fusion must be mentioned) and transport and clearly sequences them in the correct order from core to photosphere (then space). All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks)</p> <p>[Level 2] Answer may name some processes rather than describing them, and/or may not make the correct order clear. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks)</p> <p>[Level 1] An incomplete answer, naming some processes without describing them and omitting other processes. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	[6]	<p>relevant points include: applies generic knowledge of stellar interiors and processes to specific case of the Sun</p> <ul style="list-style-type: none"> energy produced by nuclear fusion, primarily of hydrogen nuclei into helium nuclei / by the fusion of other light elements into heavier elements, in the core of the star <p>then</p> <ul style="list-style-type: none"> energy is transported from core to surface / photosphere, by photons of radiation in inner region and by convection currents in outer region <p>accept reference to radiative zone as inner region and convective zone as outer region</p> <p>then</p> <ul style="list-style-type: none"> photosphere – electromagnetic radiation / photons , emitted / radiated / travels , into space
	Total	[11]	

Question		Expected answers					Marks	Additional guidance	
6	(a)						[3]	one mark per correct row accept any clear and unambiguous response more than one response in any row does not score that row	
		statement	Ryle	Hoyle	both	neither			
		In the past ...	✓						
		no pattern		✓					
		stop expanding				✓			
	(b)	(i)	28,000 ± 1000					[1]	
		(ii)	72 x 1000 72,000					[2]	correct numerical answer gains both marks
	(c)	(i)	better measurements of <u>distance</u> using Cepheid variables					[2]	allow better measurement of speed/velocity
		(ii)	distances get larger/increase recognises idea of inverse relationship (from equation)					[2]	
		Total					[10]		