OCR
Oxford Cambridge and RSA

GCSE

Physics A

Unit **A183/01:** Unit 3 – Module P7 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2015

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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.

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	alternative wording
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
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	no benefit of doubt

R	reject
	correct response
	draw attention to particular part of candidate's response
^	information omitted

Subject-specific Marking Instructions

a. If a candidate alters his/her response, examiners should accept the alteration.

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 boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.

This would be worth 1 mark.

Put ticks (✓) in the two correct boxes.

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

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 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, e.g. 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.

E.g. 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 <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**

MARK SCHEME:

<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></td><td>parallel light rays (1);

concave mirror (1);

light rays drawn which reflect to a focal point (1)</td><td>3</td><td>allow rays to a focus from a plane mirror</td></tr>
<tr><td></td><td>b</td><td></td><td>reflection</td><td>1</td><td></td></tr>
<tr><td></td><td>c</td><td></td><td><table><tr><td>lenses can only be supported at the edges</td><td>✓</td></tr><tr><td>light is absorbed by mirrors</td><td></td></tr><tr><td>mirrors only work when flat</td><td></td></tr><tr><td>mirrors can be made bigger than lenses</td><td>✓</td></tr><tr><td>lenses don't bend light rays</td><td></td></tr></table></td><td>2</td><td></td></tr>
<tr><td></td><td>d</td><td></td><td><table><tr><td>large telescopes are easy to move about</td><td></td></tr><tr><td>large telescopes are very expensive</td><td></td></tr><tr><td>large telescopes can collect more light</td><td>✓</td></tr><tr><td>large telescopes can be used to observe microbes</td><td></td></tr><tr><td>large telescopes can see very distant objects</td><td>✓</td></tr></table></td><td>2</td><td></td></tr>
<tr><td></td><td>e</td><td></td><td>power = 1/focal length = ½ (1);

0.5 (D) (1)</td><td>2</td><td>allow 2 marks for correct numerical answer</td></tr>
<tr><td></td><td></td><td></td><td></td><td>10</td><td></td></tr>
</table>

Question			Answer	Mark	Guidance
2			**[Level 3]** Gives a detailed description of the sequence in the cloud and a detailed description of the sequence in particles and/or the star Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Gives a detailed description of the sequence in the cloud **and** a simple description of the sequence in either the particles or the star, Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Gives a simple description of the sequences in either the cloud, the particles or the star 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 E** **Indicative scientific points may include:** **Cloud** • hydrogen • gravity (pulls dust and gas together) • volume decrease/density increase • pressure increase/high • temperature increase/high **Particles** • particles closer together/nearer/more concentrated • KE increase/high / move faster • collisions increase **Protostar/Star** • pressure/temperature increase • em forces between nuclei overcome • hydrogen to helium • release of energy/heat/light • fusion **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
				6	

Question			Answer	Mark	Guidance
3	a	i	East – West	1	
		ii	idea of Earth rotating/spinning/turning	1	**allow** Earth moves/orbits the Sun **allow** due to parallax
		iiii	(Yes) there is a <u>correlation</u> (1); idea of inverse relationship e.g. as one increase the other decrease / negative correlation (1); variables correctly named (1)	3	**IF 'no' - do not award the correlation mark** **allow** negative correlation (2) e.g the distance changes with the time **allow** further away **ignore** faster/quicker **If no other mark awarded allow** 1 mark for explanation of sidereal day for difference between Sun and stars/ explanation of lunar orbit for difference between Sun and Moon.
	b	i	Earth at (1,1) (1); Mars at (3.50, 3.53) (1)	2	must be correct to half a division (just above 3.5)
		ii	appropriate line of best fit: a straight, unbroken line clearly drawn with a ruler, not necessarily from (0,0)	1	**allow** ecf from 3bi – which may produce a curve or a best fit line that makes the best of the plotted points, or that treats incorrect points as outliers.
		iii	1.9 to 2.0 (years^2)	1	**allow** ecf from 3bii
				9	

Question			Answer	Mark	Guidance
4	a		brightness (1); distance (1); period (1); luminosity (1)	4	**allow** one mark for luminosity period in the third line
	b	i	0.83 + 0.77 + 0.74 + 0.82 / 4 (1); 0.79 (megaparsecs) (1)	2	**allow** for one mark, their sum ÷ 4 correct numerical answer gains both marks.
		ii	Andromeda	1	**allow** ecf from bi
		iii	1 000 000	1	
	c		500 (Mpc) x 70 (km/s/Mpc) (1); 35,000 (km/s) (1)	2	**allow** power of 10 error e.g. 70 x 500 000 000 correct numerical answer gains both marks.
				10	

Question			Answer	Mark	Guidance
5	a		**[Level 3]** Two baseline observations **and** the parallax angle **and** idea of relative movement Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Two baseline observations **and** the parallax angle **OR** Two baseline observations **and** the idea of relative movement **OR** the idea that an angle has to be measured **and** the idea of relative movement Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Two baseline observations **or** the idea that an angle has to be measured **or** the idea of relative movement 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 E** **Indicative scientific points may include:** **baseline observations** • large baseline e.g. Earth's orbit, half orbit, diameter • readings taken 6 months apart • readings at each end of a baseline **parallax angle** • triangle drawn • star at apex of triangle • angle drawn or labelled • parallax angle (1/2 angle at star) • further away - smaller angle **idea of relative movement** • fixed stars as background • nearer objects appear to move further • further objects have smaller angles ORA **At level 1 accept a baseline smaller than Earth's diameter** **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	b		1÷0.2 (1); 5 (1)	2	A correct numerical answer gains both marks
				8	

Question			Answer	Mark	Guidance
6*	a		to replicate/repeat results / gain confidence in results/ confirm the results / results are reliable/ more evidence / to see if they had made a mistake	1	**ignore** to work out an average / to see if results were reproducible/ accuracy of results
	b		idea of using another telescope	1	**not** optical telescope
	c	i	an advantage (1); e.g. they may provide new knowledge /intrinsically interesting / we want to know / show we are not hostile / possibility of trade / to communicate a disadvantage (1); e.g. they may be hostile / want to use the Earth / want to visit / waste of money/resources / very long travel time for signal An explicit conclusion consistent with advantage/disadvantage (1)	3	**allow** provides evidence for/confirms/ proves extra-terrestrial life. **allow** specific cultural references – e.g. assimilation into a borg collective **allow** yes/no/don't know if fits with advantages/disadvantages
		ii	None	1	
	iii	iii	planets (around other stars)/extra solar planets / planets in other solar systems / planets similar to Earth	1	**if no response accept** this answer in the space for 6cii
	d		supernova (1) any **one** from (1); (from a) super giant / very massive star idea of remnant/core/left over not massive enough to form a black hole	2	**not just** giant / massive **e.g.** formed after a supernova for 2 marks
				9	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>7*</td><td>a</td><td></td><td>Canary Islands Chile</td><td>2</td><td></td></tr>
<tr><td></td><td>b</td><td></td><td>[Level 3]
Gives two advantages and two disadvantages and suggests an appropriate alternative location with justification
Quality of written communication does not impede communication of the science at this level.
(5 – 6 marks)

[Level 2]
Gives three advantages and/or disadvantages and suggests an appropriate alternative location
Quality of written communication partly impedes communication of the science at this level.
(3 – 4 marks)

[Level 1]
Gives two of an advantage, a disadvantage, an appropriate alternative location
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)</td><td>6</td><td>This question is targeted at grades up to C
Indicative scientific points may include:
advantages
• low atmospheric pollution
• less scattering of light
• low light pollution
• dry air/less humid
• frequent cloudless nights/above the clouds
• less absorption due to atmosphere
• less refraction due to atmosphere
• darker skies give more contrast
• image/seeing is clearer/less blurred/less distorted
disadvantages
• some absorption due to atmosphere
• some refraction due to atmosphere
• some parts of em spectrum absorbed by atmosphere
• difficult working conditions e.g. access to services / altitude sickness
• poor transport links
• lack of local labour availability
• high cost / difficult to build
• environmental impact
Appropriate alternative locations:
<table>
<tr><th>Location</th><th>justification</th></tr>
<tr><td>space/orbital</td><td>because less interference from atmosphere / can detect e.g gamma / x-ray / uv / (far)IR / microwave</td></tr>
<tr><td>underground for neutrinos</td><td>reduces interference</td></tr>
<tr><td>deserts</td><td>space for very large radio arrays / avoids radio/em interference (from man-made sources)/dry air so less refraction</td></tr>
<tr><td colspan="2">ignore – the idea of isolated locations (is in the stem of the question)
ignore as a justification space telescopes are closer to observed stars</td></tr>
</table>
Use the L1, L2, L3 annotations in Scoris; do not use ticks.</td></tr>
<tr><td></td><td></td><td></td><td></td><td>8</td><td></td></tr>
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