OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics A

General Certificate of Secondary Education

Unit **A333/02:** Unit 3 – Ideas in Context plus P7 (Higher 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
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
NBOD	no benefit of doubt

R	reject
✓	correct response
≈	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.

Section A

Question			Answers	Marks	Guidance
1	(a)	(i)	*any 2 from:* idea of evaluation e.g. evaluated/assessed/checked (1); by other scientists/experts/ (1) idea of before being published (1) QwC clear and well ordered (1)	2 1	**do not accept** any reference to doing *further* experiments **ignore** give opinions/feedback, reviewed **accept** palaeontologists, geochemists, climate modellers, geophysicists, sedimentologists answer must address the question
		(ii)	idea of past evidence/theories/data (1) to compare evidence/ to draw conclusions/ to judge theories (1)	2	**accept** identified conclusion/theory e.g. asteroid impact
	(b)		rocky object (in space) (1) (most orbit) between Mars and Jupiter / a few have orbits that intercept the Earths orbit (1)	2	**ignore** icy **accept** in asteroid belt / may collide with Earth
	(c)		*any 3 from:* idea of material/dust blasted into atmosphere (1) blocks sunlight / planet in darkness (1) causes global winter (1) disruption of food chain / plants die / dinosaur food sources lost (1)	3	**ignore** fires/earthquakes/tsunami 'blocks the sun' is not sufficient **accept** asteroid hits sulfur rich rocks resulting in acid rain

Question			Answers	Marks	Guidance
	(d)		(time interval =) 10^6 / 1 million <u>years</u> (1); (probability in one year =) 1 in 10^6 / 10^{-6} (1) probability in 100 years = 1/10000 or 0.0001 or 10^{-4} or 0.01% (1)	3	correct numerical answer gains full marks **accept** "10,000 to 1"
			Total	**13**	

Section B

<table>
<tr><th colspan="3">Question</th><th>Answers</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td>(i)</td><td>concave mirror (1);

incoming rays <u>reflect</u> to a point (1)</td><td>2</td><td>

at least two reasonable rays needed</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>bigger to collect more radiation/light (1)

from faint / distant sources / to see very distant objects (1)</td><td>2</td><td>allow better resolution / gives brighter image
ignore reduces diffraction
do not accept absorbs more light

do not accept more powerful/high magnification</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td><table><tr><td>Each lens has a different power.</td><td>✓</td></tr><tr><td>The objective lens is more powerful than the eyepiece lens.</td><td></td></tr><tr><td>The most powerful lens has a longer focal length.</td><td></td></tr><tr><td>There must be a minimum of 3 lenses.</td><td></td></tr><tr><td>The eyepiece lens has the most curved surface.</td><td>✓</td></tr></table></td><td>2</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>centre ray continues straight (1);

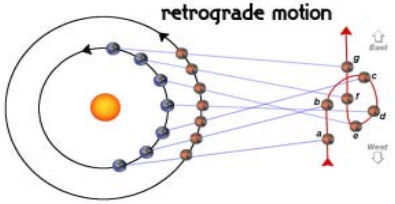
top ray crosses other 2 where they intersect (1);

point where the correct rays meet is labelled as image/star (1)</td><td>3</td><td>the centre ray intercepts the lower ray above the letters ‘scopes’ in the second word ‘telescopes’ in the line below

at least one of the first two marking points must be correct for this mark</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>computer control (1);

(the computer) can position the telescope / find the star (1)</td><td>2</td><td>

for detail of use e.g., (computer) has a sky map/ co-ordinates
ignore idea of tracking objects across sky</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>11</td><td></td></tr>
</table>

Question			Answers	Marks	Guidance
3	(a)	(i)	arch(es) across most of the sky (1) from east to west (1)	2	any arches drawn must be across most of the sky
		(ii)	moon sun stars	1	
	(b)		Mars orbit further from Sun / Mars orbits slower than Earth / Earth orbits faster than Mars (1) Earth 'overtakes' Mars as they orbit (1) as Earth 'overtakes', Mars appears to move backwards/change direction against the background stars (1)	3	**accept** any planet/named planet (not Venus or Mercury) all marks can be gained from a diagram  diagram need only indicate the difference in view when overtaking
	(c)	(i)	same as original diagram 	1	
		(ii)	¾ Moon is bright (1) dark ¼ to the right (1)	2	2 marks  1 mark 
		(iii)	*any 2 from:* the Moons orbit is tilted / at an angle; (1) to the Earth's orbit (around the Sun); (1) hence Moon appears above or below Sun/orbit (1)	2	any of these points can be shown on a diagram **accept** Earth and Moon move in different planes (2)
			Total	**11**	

<table>
<tr><th colspan="3">Question</th><th>Answers</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4</td><td>(a)</td><td></td><td>any 2 from:

less atmospheric interference / named examples e.g. light pollution / refraction (1)

larger base line (for parallax measurements) / larger (parallax) angles (1)

(Hipparcos) can use wider range of EM spectrum e.g. uv / x-ray / gamma (1)</td><td>2</td><td>

references to parts of EM spectrum that cannot penetrate the atmosphere are insufficient</td></tr>
<tr><td></td><td>(b)</td><td></td><td>idea of high cost e.g. too expensive (for one country) (1);

idea of people’s expertise e.g. technological ideas from a wide range of experts (1)</td><td>2</td><td>accept idea of shared costs

ignore any reference to what is done with the collected data</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>measure from opposite ends of Hipparcos’s orbit (1)

half the angle (subtended / moved against a background of stars) (1)</td><td>2</td><td>accept on opposite sides of the Earth’s orbit / measure the position in 6 months</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>1/0.181 (1)

= 5.5(2486) (1)</td><td>2</td><td>
correct numerical answer gains full marks
accept 5.53</td></tr>
<tr><td></td><td>(d)</td><td></td><td><table><tr><td>the speed of the star</td><td></td></tr><tr><td>temperature of the star</td><td>✓</td></tr><tr><td>the Hubble constant</td><td></td></tr><tr><td>The period of variation of brightness</td><td></td></tr><tr><td>size of the star</td><td>✓</td></tr></table></td><td>2</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>10</td><td></td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answers</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td></td><td>(core – nuclear fusion) no mark

radiative zone – as photons/radiation (1)

convective zone – convection currents (1)

photosphere – radiates into space (1)

correct order from the centre outwards (core), radiative zone, convective zone, photosphere (1)</td><td>4</td><td>

accept radiation zone

accept convection zone

accept emits light, ignore emits heat

accept recognisable misnaming for order mark e.g. radioactive zone for radiative zone</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>B A</td><td>1</td><td>either order</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>C</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>E</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(iv)</td><td>B OR D</td><td>1</td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td><table><tr><td>red giant</td><td></td></tr><tr><td>neutron star</td><td>✓</td></tr><tr><td>white dwarf</td><td>✓</td></tr><tr><td>supergiant</td><td></td></tr><tr><td>red supergiants</td><td></td></tr></table></td><td>2</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>10</td><td></td></tr>
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