OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics A

General Certificate of Secondary Education

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

Mark Scheme for June 2013

Oxford Cambridge and RSA Examinations

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

© OCR 2013

1. **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:

	correct response
	incorrect response
BOD	benefit of doubt
NBOD	no benefit of doubt
ECF	error carried forward
0 , L1 , L2 , L3	indicate level awarded for a question marked by level of response
^	information omitted
CON	contradiction
R	reject

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

2. **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.

3. 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 should be blank (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:

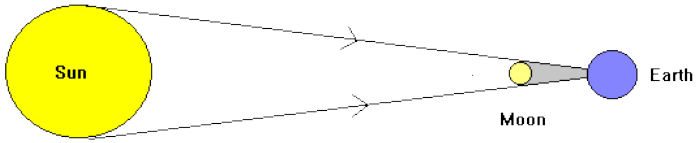
i. **Read through the whole answer from start to finish**
ii. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor
iii. **To determine the mark within the level**, consider the following:

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.

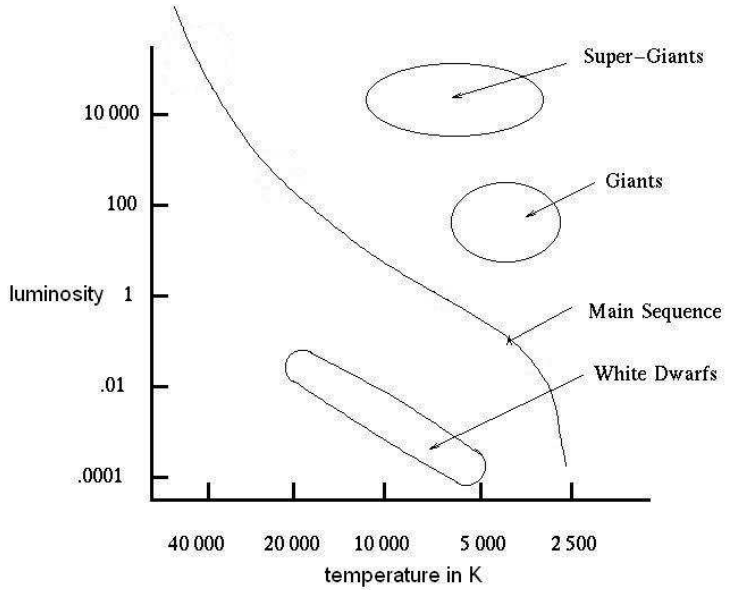
Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- 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.

Question			Answer	Marks	Guidance
1			**Level 3 (5–6 marks)** A complete diagram in all details **OR** A detailed diagram AND an explanation with at least two features of the eclipse **OR** A detailed explanation AND a simple diagram Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** A more detailed diagram **OR** an explanation with at least two features of the eclipse **OR** a simple diagram AND a simple explanation that describes a feature of the eclipse Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** a simple diagram showing relative position of Sun Moon and Earth **OR** a simple explanation that describes a feature of the eclipse Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to E** **Indicative scientific points may include:** • Moon orbits the Earth / much closer to Earth • Moon orbits at an angle • sometimes Moon between Sun and the Earth • alignment is rare • Moon blocks/moves in front of Sun / light • shadow reaches (only small parts of) Earth / last for a short time • Moon is the same apparent size as the Sun / particular size and distance • total/full eclipse seen within shadow region • partial eclipse seen just outside main shadow zone (penumbra).  **Details of diagram** • relative size of Sun, Earth and Moon • relative distances of Sun, Earth and Moon • indication of orbital paths • light rays / shadow zone / umbra / penumbra **allow** up to Level 2 for diagrams and/or explanations where the Sun is orbiting the Earth, or the Earth is eclipsing the Moon (lunar eclipse) **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
2	(a)	(i)	parallel rays into lens (1) rays converge to a focus (1)	2	Arrows not needed but do not accept if the direction is incorrect **ignore** star labels **allow** - - - - - for rays
		(ii)	refraction	1	**allow** any unambiguous indication e.g. refraction circled or underlined
		(iii)	The image becomes clearer. ☐ The light waves turn upside down. ☐ All the light is reflected by the lens. ☐ The speed of the light wave changes. ✓ The direction of the light wave changes. ✓	2	
	(b)	(i)	**D**	1	
		(ii)	1 / 0.5 (1) 2 (1)	2	correct numerical answer scores both marks
	(c)		Eyepiece: **X** (1) the most powerful / magnifies the most (1) Objective: **Y** (1) the largest (diameter/area) / collects most light (1)	4	**allow** 1 mark for correct property of Y If Y is chosen **allow** 1 mark for correct property of X If X is chosen **not just** 'thickest' **ignore** irrelevant justifications e.g Y has the weakest magnification but is the largest lens = 2 marks but **do not accept** contradictions
			Total	**12**	

Question			Answer	Marks	Guidance
3			**Level 3 (5–6 marks)** Lists at least one general advantage of computer control with detail AND at least one HST specific advantage with detail Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Lists two general advantages of computer control with detail **OR** two HST specific advantages of computer control with detail Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Gives one advantage of computer control with detail **OR** two advantages without detail Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to E** **Indicative scientific points may include:** **General Advantages of computer control …*with detail*:** • being able to work remotely …*convenience (of time, cost etc)* • continuously track …*objects* • pointing of telescope … *with precision / automatic / remotely / with speed / with ease* • computer recording …*of data / images* • computer processing …*of data / images* • data recording / processing … *with speed / precision / volume* **HST Specific Advantages of computer control …*with detail*:** • astronomers in space *….not needed / difficult / costly* • ground control*… less risk / safer* • controlling the telescope wearing a space suit…*difficult* • continuously tracking impossible... *without people being there* • images recorded on film … *returned to Earth for analysis.* • HST images …*higher quality* / *no light or atmospheric pollution* **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
4	(a)			4	**accept** red/blue supergiants **accept** red giants
	(b)		X on main sequence in a horizontal line with 1 on the vertical axis	1	By eye **accept** any unambiguous symbol
	(c)		arrow points below horizontal (1) arrow points to the right (1)	2	arrow should relate to the star
			Total	**7**	

Question			Answer	Marks	Guidance
5	(a)	(i)	Ann Byron Frances	2	any order all three correct = 2 marks any two correct = 1 mark
		(ii)	Edward	1	
		(iii)	Chris (1) Danni (1)	2	any order
	(b)		astronauts ☐ hospital workers ☐ politicians ✓ scientists ✓ teachers ☐	2	
	(c)		**any two from:** idea of cost ; better spent on other things / named example ; **plus any one explanation from:** idea of environmental damage ; idea of disruption while building	3	 **allow** named example e.g. spoils the view / affects habitats / affects wildlife **allow** named example e.g. pollution / noise pollution / access roads
			Total	**10**	

Question			Answer	Marks	Guidance
6			**Level 3 (5–6 marks)** Describes the Curtis-Shapley debate AND describes the changing data which showed Curtis to have the correct interpretation Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Describes the debate AND gives an example of data they used **OR** Describes debate AND gives an example of their interpretations **OR** Gives an example of their interpretations AND gives and example of the data the used Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Attempts to describe the Curtis-Shapley debate **OR** gives an example of either Curtis and/or Shapley's interpretation **OR** gives an example of the data that was used in the debate Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** **The debate** • Disagreement about (spiral) nebulae / fuzzy objects in the sky • Shapley – gas clouds • Curtis – systems of stars **ignore** If Shapley and Curtis are reversed or not named. If response indicates debate between 'Curtis-Shapley' and Hubble, limit to Level 1. **Allow** Position of Sun in galaxy / Curtis has Sun at centre of galaxy / Shapley has Sun at edge **The data** • Both agreed distance to nebulae *(Andromeda)* was very large / greater than any other star • Hubble provided new distance measurement / evidence from Cepheid variables • Curtis – (Hubble's method showed) distance to nebulae much too large to be inside the galaxy **The interpretations** • Shapley – the nebulae are inside the Milky Way / The Universe is one big galaxy • Curtis – the systems of stars are outside the Milky Way / Universe has more than one galaxy **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
7	(a)		gravity	1	
	(b)	(i)	pressure/temperature = constant (1) volume/temperature = constant (1)	2	**allow** temperature is proportional to pressure **allow** temperature is proportional to volume
		(ii)	(in the) **core**	1	
		(iii)	combustion ☐ conduction ☐ convection ✓ radiation ✓ reflection ☐	2	
	(c)	(i)	5800 – 273 (1) 5527 (1)	2	**allow** 1 mark for 6073 (ie adds 273) correct numerical answer = 2 marks
		(ii)	(temperature) lower than the Sun / 5800K / 5527^{O}C	1	**allow** lower than ecf from **(c)(i)** **allow** 'it is lower'
	(d)		**any two from:** (Sun fuses) hydrogen ; Hydrogen less positive OR Helium more positive ; Hydrogen less energy needed/easier to bring together **OR** Helium more energy needed/harder to bring together ; Higher energy linked to higher temperature needed for fusion ORA	2	

Question			Answer	Marks	Guidance
7	(e)		By comparing its brightness with a star of similar luminosity / temperature (1) the brighter (the star) the closer (1) ORA **OR** if two stars look the same brightness then the hotter/more luminous one must be further away (2) ORA **OR** if two stars have the same luminosity/temperature the dimmer one is further away (2) ORA	2	**allow** compare brightness with the Sun / with a similar star **do not credit** the more luminous / hotter the closer the star ORA **do not credit** the less luminosity the further away
			Total	**13**	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2013

PART OF THE CAMBRIDGE ASSESSMENT GROUP

LLOYD'S REGISTER QUALITY ASSURANCE · ISO9001 · UKAS MANAGEMENT SYSTEMS 001