

Physics A

General Certificate of Secondary Education

Unit **A333/02**: Unit 3 – Ideas in Context plus P7 (Higher Tier)

Mark Scheme for January 2013

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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
<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:

	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

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

Subject-specific Marking Instructions

- Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- 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:

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

*This would be worth
1 mark.*

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

*This would be worth
0 marks.*

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

*This would be worth
1 mark.*

- 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	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

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

- 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.

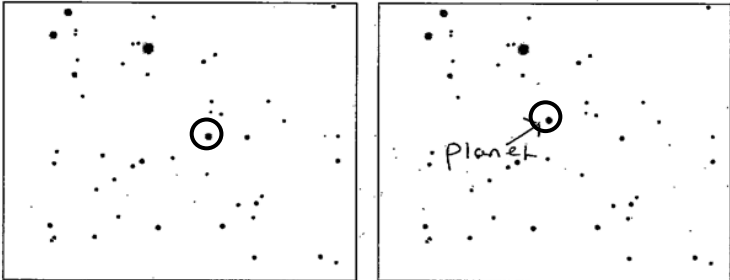
Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- 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	(a)	(i)	<p>difference to fire alarm - alarm is always on/making a noise/if it stops then something is wrong (1)</p> <p>this means you can tell it is working(1)</p>	2	
		(ii)	<p>Name/description AND how reduces risk needed for each mark.</p> <p>eg thick armoured pipes - reduce exposure to radiation/hazardous material OR shielded chambers/metre thick leaded glass windows - reduce exposure to radiation or to absorb radiation before reaching workers OR remote arms - reduce exposure to radiation/hazardous material/contamination/not in direct contact or increase distance from waste OR put in glass/steel barrels - reduce exposure to hazardous material/contamination OR to prevent leakage of waste OR glass does not degrade over time</p>	2	
	(b)		<p>decreasing line from starting activity (1)</p> <p>concave and not below background (1)</p>	2	not below the time line
	(c)		<p>evidence of halving (4096)</p> <p>128 (Bq)</p>	2	128 on its own worth 2 marks

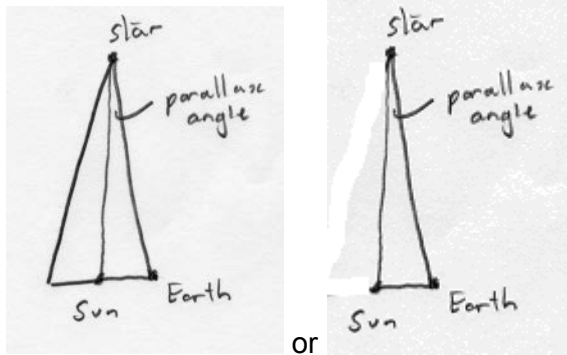
Question		Answer	Marks	Guidance
2	(a)	gravity / gravitation	1	do not accept 'g force'
	(b) (i)	pressure increase (1) <i>any one from</i> particles move faster / have more kinetic energy; (1) more frequent / energetic collisions; (1) particles have increased momentum; (1) increased forces during collision (1)	2	do not accept high pressure or pressure changes do not accept 'vibrates' ignore 'moves more' or just 'more energy' allow collisions with 'edge' or 'boundary' accept 'more collisions'
	(ii)	-270	1	minus sign must be present
	(c) (i)	name of particle charge on particle neutron none proton positive	1	both required do not accept 'neuron' or 'nucleon'
	(ii)	electrical / electrostatic / electromagnetic (repulsion)	1	accept 'repulsion of charges' or 'static' or proton repelling proton do not accept 'magnetic' repulsion is insufficient on its own
	(d) (i)	hydrogen → helium	2	per correct answer (1) allow H and He (symbols must be correct) ignore any balancing/additional numbers

Question	Answer	Marks	Guidance
(ii)	<p>top box: either photosphere (1) light/energy radiated into space / energy transferred to light (1) or convective / convection zone (1) energy transferred (outwards) by convection currents (1)</p> <p>middle box: either convective/convection zone (1) energy transferred (outwards) by convection currents (1) or radiative zone (1) energy transferred (outwards) as radiation / light / photons (1)</p> <p>bottom box: core (1) energy produced / fusion takes place (1)</p>	6	<p>accept 'emitted' or idea of energy leaving star</p> <p>requires idea of convection currents or cells</p> <p>do not accept convection zone for both</p> <p>do not accept 'fission' do not accept energy built up or energy increasing</p>
	Total	14	

Question			Answer	Marks	Guidance
3	(a)	(i)	 <p>23rd July 2009 28th July 2009</p>	1	at least one pictures must be correctly marked and other picture must not contradict
		(ii)	move differently from (fixed) stars/retrograde/complex motion (1)	1	comparison with (fixed) stars is required, not just 'it moves' allow 'move more'
	(b)	(i)	Earth rotates / spins / stars move across the sky / around the pole star / the camera is open for along time so the stars move (1)	1	'Earth moves' is insufficient Do not allow earth moves/rotates around the sun
		(ii)	6 (1)	1	
	(c)		idea of Earth on opposite sides of its orbit; facing different directions / looking at different part of the sky	2	both marks can be gained from diagram allow 1 mark only for observer has moved from northern hemisphere to southern hemisphere (ora) ignore any argument about earth rotating on its own axis

Question	Answer	Marks	Guidance
(d)	<p><i>any two from:</i></p> <p>idea that the Earth orbits the sun in the same direction of rotation as the Earth's direction of spin on its axis (1)</p> <p>idea of earth has to rotate more (than 360°) (1)</p> <p>idea for the Sun to appear in the same position (in the sky next day) (1)</p> <p>sidereal day is time for earth to rotate on its axis and solar day is time taken for sun to appear in same position in the sky on consecutive days(1)</p>	2	first two marking points can come from a diagram
(e)	<p>Any 2 from</p> <p>idea of azimuth is angle from North (pole star) to star (1)</p> <p>idea that altitude is the angle from the plane through the equator up to the star</p> <p>additional detail of how to use the angles eg across and up (1)</p>	2	<p>accept right ascension measured from the vernal equinox</p> <p>accept declination measured from equator</p> <p>accept angle up from horizon</p> <p>accept comparison with latitude and longitude for 1 mark</p> <p>ignore coordinates</p>
	Total	10	

Question		Answer	Marks	Guidance
4	(a)	B(1)	1	accept 0.5 as a unique identifier from table accept B circled in table
	(b)	(i) 1.5/1.49 (1) m (1)	2	accept 150 cm for 2 marks
		(ii) X (1)	1	accept 4 or 20 as unique identifiers from table
		(iii) Y (1) largest diameter (1) need to collect as much light as possible (1)	3	independent marking points accept 10 or 0.67 as unique identifiers from table accept biggest aperture ignore diffraction effects
		<u>concave / converging</u> mirror (1)	1	
		Total	8	

Question		Answer	Marks	Guidance
5	(a) (i)	<p>recognisable attempt at diagram to illustrate parallax with Earth, Star, Sun and angle labelled (even if incorrect angle) (1)</p> <p>base of triangle is the diameter (or radius) of Earth's orbit (do not need to have drawn the line) (1)</p> <p>parallax angle correctly labelled (1)</p>	3	<p>eg</p> 
	(ii)	4	1	
	(iii)	avoids atmospheric distortion / refraction/turbulence / can use additional parts of spectrum / increases the size of baseline;	1	<p>do not accept 'interference / affects' or 'light pollution' unqualified or 'no atmosphere' unqualified</p> <p>accept atmosphere absorbs some radiation</p> <p>allow parallax angle will be larger</p>
	(b)	one mark for finding/ linking the luminosity / intrinsic brightness from the period second mark for comparison with observed / apparent brightness	2	accept the frequency of the pulses can be linked to distance 1max
	(c)	<p>any 3 from:</p> <p>Curtis-Shapley about whether nebula are within the milky way or are separate galaxies;</p> <p>Hubble looked at Cepheid variables (in nebula);</p> <p>found they were more distant than any stars in our galaxy;</p> <p>hence there is more than one galaxy;</p>	3	<p>1st marking point relates to the question/debate</p> <p>accept debate about more than one galaxy</p> <p>this 4th marking point relates to Hubble's conclusion from the evidence</p>
Total			10	
Paper Total			55	

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