OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics A

General Certificate of Secondary Education

Unit **A181/01:** Unit 1 – Modules P1, P2, P3 (Foundation Tier)

Mark Scheme for June 2013

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.

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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 <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.

Question			Answer	Marks	Guidance
1			**Level 3 (5–6 marks)** Description includes at least 4 different types of solar system objects describes characteristics and/or motion of at least three of the objects. No incorrect objects mentioned Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Description includes at least 3 different types of solar system objects describes characteristics and/or motion of two of the objects. Some omissions in the descriptions of the objects may occur. More than just a list of objects is given. May have one incorrect astronomical object in the description Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Description includes at least 2 different types of solar system objects describes characteristics and/or motion of at least one object or may be just list a number of objects. may have several incorrect objects 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:** • Solar system is part of the Milky Way galaxy • Sun is a star • Sun at centre of solar system • Sun is made of very hot gas • Sun is most massive / largest object in solar system • Sun formed ~5000 million years ago • planets are rocky or gaseous • planets orbit the Sun • planets orbits are circular / elliptical • dwarf planets orbit the Sun • dwarf planets orbits are circular / elliptical • moons orbit planets • asteroids are small rocky objects • asteroids orbit the Sun • asteroids mostly between mars and jupiter • comets are icy objects • comets orbit the sun • comets orbits very elliptical, ie sometimes close to Sun other times very far away from Sun. **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
2	(a)	(i)	**any 2** idea of different background idea of different experience idea of different interests idea creativity leading to different ideas idea of insufficient data / data supports both interpretations	2	
		(ii)	Curnow – **C** Moore – **D**	2	
	(b)	(i)	(comparing) brightness parallax	2	**accept** Hubble Law/red shift Cepheid (variables)
		(ii)	scientific journals conferences/meetings	2	**allow** any type of written communication eg text, fax email, internet, letter, but not just 'computers' **allow** skype, telephone **ignore** 'peer review'
			Total	**8**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td></td><td>disturbance

energy

matter</td><td>3</td><td></td></tr>
<tr><td></td><td>(b)*</td><td></td><td><table><tr><th></th><th>liquid</th><th>solid</th><th>cannot tell</th></tr><tr><td>crust</td><td></td><td>✓</td><td></td></tr><tr><td>mantle</td><td></td><td>✓</td><td></td></tr><tr><td>outer core</td><td>✓</td><td></td><td></td></tr><tr><td>inner core</td><td></td><td></td><td>✓</td></tr></table></td><td>3</td><td>all 4 correct = 3 marks
3 correct = 2 marks
1 or 2 correct = 1 mark</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
4			**Level 3 (5–6 marks)** Gives a description which distinguishes between analogue and digital signals. Describes steps in the process/transmission. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Gives some indication of a difference between analogue and digital signals OR describes two steps in the process/transmission. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Can describe either an analogue or a digital signal, OR recognises that analogue signals are changed into digital (or vice versa), OR gives a piece of information about transmission. 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:** • analogue signal varies continuously • digital signal has only two values / 0 and 1 • analogue picks up (more) noise • sound is a vibration of the air (molecules) • any mention of radio waves or electromagnetic waves • sound detected by microphone • microphone converts sound to electrical signal • analogue signal converted to digital signal • signal encoded on carrier wave • radio wave turned on and off • signal / carrier wave transmitted as electromagnetic wave / radio wave • signal/radio wave detected by aerial of receiver • receiver decodes digital signal back to analogue signal • analogue signal passed to loudspeaker • radio/loudspeaker produces sound waves for Rai to hear • sound waves are different to radiowaves (eg lower frequency) **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5*</td><td>(a)</td><td></td><td>
<table>
<tr><td>They are blocked by sun-screens.</td><td></td></tr>
<tr><td>They are electromagnetic radiation.</td><td>✓</td></tr>
<tr><td>They can remove electrons from atoms.</td><td>✓</td></tr>
<tr><td>They have lower frequencies than microwaves.</td><td></td></tr>
<tr><td>They are used to carry information in optic fibres</td><td></td></tr>
</table>
</td><td>2</td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>ultraviolet stopped / blocked / absorbed by skin / cannot penetrate body [1]

any 2 from
X-rays are stopped / blocked / absorbed by (dense) parts of the body

X-rays are not stopped / blocked / absorbed by or can penetrate through other (less dense) parts of the body

idea of (shadow) picture behind body / on film / screen</td><td>3</td><td>ignore comments about damage caused

accept bones for dense parts of the body.
accept skin and soft tissues as less dense parts of the body

'picture' unqualified is insufficient accept bones for dense parts of the body.</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>any 3 from
bias in sample / samples not matched / no control group eg all had cancer / might be other cause of cancer (only if Joel wrong)
small sample size / need more data;

(the data shows a) correlation;

idea that there is a mechanism for the X-rays causing cancer</td><td>3</td><td>allow examples eg more men than women, don't know when they had X-rays</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>8</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
6	(a)		emitted reflected absorbed	3	
	(b)	(i)	blue / violet	1	
		(ii)	300 000 km/s	1	
	(c)		absorbed by ozone layer / not enough ultraviolet	1	**accept** there is not enough light **accept** absorbed by the atmosphere / clothing
			Total	**6**	

Question			Answer	Marks	Guidance
7	(a)	(i)	arrow with three heads (1) scale correct outputs 3units, 1 units (1) input (LHS) labelled 500J / electrical energy (1) outputs correctly labelled sound energy AND heat energy (1)	4	**allow** maximum of 2 marks if only two output arrows if scales are not correct then allow last mark if the sound arrow is smaller than heat arrow
		(ii)	100 (J)	1	can be labelled on diagram
	(b)		(useful output) = 120J +180J = 300J (efficiency = useful energy out / energy in =) 300J / 500J 60(%)	3	 300/500 on its own worth 2 marks correct numerical answer gains full marks 0.6 gains 2 marks
	(c)		turn down volume / sound / brightness	1	**accept** put it on standby

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td></td><td>(d)</td><td>(i)</td><td>produced from another energy source</td><td>1</td><td>Owtte
allow an example of a primary energy source</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>oil / coal / gas / nuclear / biofuels / wind / waves / sun/light / geothermal/wood/hydro</td><td>1</td><td>accept fossil fuels,
do not accept solar panels, power station, wind turbines etc</td></tr>
<tr><td></td><td></td><td>(iii)</td><td><table><tr><td>It is easily transmitted over distances.</td><td>✓</td></tr><tr><td>It is easy to store.</td><td></td></tr><tr><td>There is no a risk.</td><td></td></tr><tr><td>It can be used in many ways.</td><td>✓</td></tr><tr><td>Many people think electricity pylons are attractive</td><td></td></tr></table></td><td>2</td><td></td></tr>
<tr><td></td><td></td><td>(iv)</td><td>idea that a joule is a very small unit / amount of energy / the numbers would be very large</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>14</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
8			**Level 3 (5–6 marks)** Considers all three fuels using all data from table and other information. Considers all three key factors. Draws a clear conclusion based on and consistent with the data considered. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Considers all three fuels using some data from table. Considers two key factors. Draws a conclusion based on the data considered. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Considers two fuels using some data from table, considers one key factor. OR Considers one fuel and two factors. Draws a relevant conclusion which may not be based on the data. 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:** **key factor – Sustainability** • biogas is renewable * • diesel and petrol are non-renewable * **key factor – economics** • unit cost of fuel is the same for all • may be expensive to convert vehicles * • may be difficult to find supplies of biogas* • same amount of fuel diesel will go further • replacement costs to replace vehicles* • order of energy efficiency linked to amount used. **key factor – environmental impact** • order of CO_2 equivalent emissions • more CO_2 from diesel or / and petrol than biogas • CO_2 emissions contribute to global warming * • not clear what is meant by 'CO_2 equivalent emissions'. ***** These are examples of other information beyond that provided in the table **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

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