RECOGNISING ACHIEVEMENT

GCSE

Physics A

General Certificate of Secondary Education

Unit **A182/01:** Unit 2 – Modules P4, P5, P6 (Foundation 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	alternative wording
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
NBOD	no benefit of doubt
R	reject

✓	correct response
L1 L2 L3	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.
eg

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.
☐	☐	☒
☐	☐	☒
☒	✓	✓
☒	☒	✓
☐	☐	☐
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, eg 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, eg 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.

Eg 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**

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

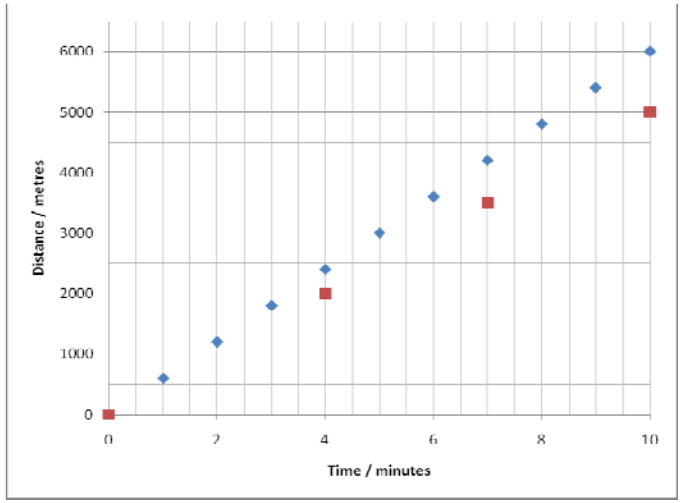
iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

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.

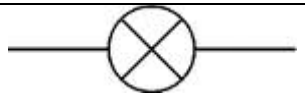
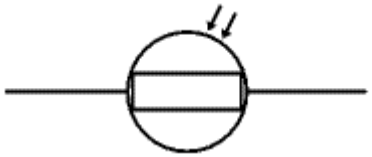
Question			Answer	Marks	Guidance
1	(a)	(i)	reaction	1	
		(ii)	The upward force is bigger than the downward force. ☐ The upwards force is the same as the downwards force. ✓ The upward force is smaller than the downward force. ☐	1	
	(b)	(i)	Gravitational potential	1	
		(ii)	1000J	1	
		(iii)	Any three of: Speed/velocity increases Gravitational potential energy decreases Kinetic energy increases Work is done by gravity	3	**allow** she accelerates/gets faster **not** falls faster **allow** GPE converted to KE (2 marks) **ignore** forces argument
	(c)		Any three of: upward force stays the same, downward force/weight stays the same, driving force gets larger, counter force gets larger,	3	**ignore** mention of vertical forces **allow** upward force and weight remain balanced for either of the first two marks (1 mark) **allow** counter force is less than driving force for third and fourth marks (2 marks) **allow** air resistance/drag/friction increases for fourth mark (1 mark) do not accept either counter or driving force reduces **unless** specific mention is made about reducing counter force eg he lowers his body reducing air resistance.
			Total	**10**	

Question			Answer	Marks	Guidance
2			**[Level 3]** Some linkage correctly shown between two factors eg Correctly recognises that the force difference is due to the difference in time. OR puts forward a reasonable balanced argument by discussing ideas on two of costs, risks and benefits. OR correctly links the reduction in force to less serious injury (or vice versa) OR Candidates recognise that the test is fair and can explain why Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Recognises some of the factors involved but no linkage or incorrect linkage between them eg Recognises there is a difference in force and a difference in time but does not link these differences Attempts a balanced argument. Some idea of how governments must consider risks May discuss idea of cost and saving lives/serious injury There may be a few errors in science. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** A simple relevant statement about some of the data or risk or injury. eg Recognises the need to save lives/serious injuries 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:** • speed change is the same • mass of car/driver is the same • so fair test • crumple zone **increases** the time of the collision • force of collision for driver of **car B** is greater • smaller force is safer • momentum change is the same/ • calculation of the momentum of each car • requirement to save lives • the risk of injury is greater without crumple zones so governments would make them a legal requirement • governments must assess what is an acceptable risk • idea that the risk of not passing the law outweighs the cost of passing it • idea of difference between the chance of a risk happening and the consequence if it does. **accept** • Higher tier concepts eg perceptions of risk are not the same as the statistically estimated risk **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
3	(a)		6000/600 (1) = 10 (m/s) (1)	2	Correct answer, no working=2marks **allow** 1 mark for 600 m/s (no conversion of minutes)
	(b)	(i)		1	All **four** points required for the mark. Judge points to be on the intersection of the correct gridlines by eye. If no points visible, but a correct straight line is drawn then award 1 mark (BOD).
		(ii)	Recognise that the slope/gradient tells us the speed (1) The steeper the slope/gradient (the faster) (1)	2	A candidate scoring the second marking point will automatically score 2 marks. Allow: The van that goes further / specific distance e.g Van A 1000m more than Van B(1) In the same time / e.g. in 10 minutes (1)
			Total	**5**	

Question			Answer	Marks	Guidance
4	(a)	(i)	DVD players ✓ Electric cars ✓ Electric irons Flat screen television	1	**BOTH** ticks required for the mark
		(ii)	Understanding that motors cause movement/turning Explanation of what is moved/turned	2	No mark for choice of device. "DVD player: To turn the disk" or "Electric car: to turn the wheels/to move the car/windows/windscreen wiper" would both get two marks.
	(b)		current force	2	

Question			Answer	Marks	Guidance
	(c)		**Any 3 of the following** **Type of circuit** eg Circuit A is series/circuit B is parallel **Comparison of voltage/potential difference** eg Lower voltage/potential difference across each motor in circuit A / Larger voltage/potential difference across each motor in circuit B voltage across components in circuit A is half/less than voltage of the battery/ voltage across components in circuit B is the same as the voltage of the battery **Comparison of current** eg Lower current (in each motor) in circuit A/higher current (in each motor) in circuit B; **Comparison of resistance** eg Higher resistance in circuit A/lower resistance in circuit B	3	maximum three marks If candidate does not specifically mention circuit A or circuit B then assume the answer is about motors in A **allow** voltage splits/shared between motors (in a series circuit/circuit A) **Do not allow: '**the same current through both motors'
			Total	**8**	

Question			Answer	Marks	Guidance
5	(a)		 Filament lamp  Switch  LDR	3	**allow** a closed switch with circles on **allow** LDR without circle around the resistor part
	(b)		115 (**w**)	1	
	(c)		Reasonable problem identified, Explanation of why the light could be a problem	2	eg example of false triggering (eg animals/trees moving in garden)(1) – annoying/disturbs sleep/you could think it is a burglar(1) OWTTE Wild life disturbed (eg Moths attracted)(1)– could change habits/interfere with reproduction or eating habits(1) Light pollution(1) – more difficult to see stars(1) Components contain toxic metals(1) – could be problematic if thrown away(1) More energy used/wasted(1) – bigger bills/global warming idea(1)
			Total	**6**	

Question			Answer	Marks	Guidance
6			**[Level 3]** Refers to charging, discharging and risk. Gives a detailed account of at least one of these. No significant errors in science. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Candidate produces a coherent discussion of charging/ discharging and/ or risk. Few, if any, errors of science are present. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Attempts to discuss either charging/ discharging or risk. Discussion of these may contain limited reference to correct scientific terms. 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 C** **Indicative scientific points may include:** • when the shoes and carpet rub, charges/ electrons are transferred • the shoes and carpet are insulators • charges can not move through insulators • negative charges/electrons are transferred • touching the metal causes charges/electrons to flow to the rail • metal is a conductor • metal contains charges that are free to move • some electric shocks may cause heart attacks • consequences of these shocks are unlikely to be dangerous • Many people experience these shocks with no observed effects • Some people may be more at risk than others **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
7	(a)		electrons nucleus – neutrons and protons	2	one mark for electrons all three required for mark. Neutrons and protons in either order.
	(b)		alpha particle scattering ✓ half life nuclear fission nuclear fusion	1	
	(c)	(i)	radioactive	1	
		(ii)	both wrong (no mark); Shami is wrong because radioactivity can be produced by natural materials (1); Puj is wrong because radioactivity can not be changed by any chemical process (1)	2	Need to see that they are wrong before marks can be given. **allow:** Shami is wrong because radiation is always around us/there is always a background count/UV from the sun is an ionising radiation
			Total	**6**	

Question			Answer	Marks	Guidance
8			**[Level 3]** Candidate recognises that there is no increased risk and uses the statistics to explain why or gives scientific detail on the harmful effects of radiation. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Any one relevant comment about no increased/small risk or harmful effects of radiation or size of study, may have some incorrect science. Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** Recognises that radiation can be a risk but may incorrectly identify the results of the study or has a considerable amount of incorrect science. 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 up to Grade E** **Relevant points include:** • nuclear workers are exposed to higher than average radiation limits ideas about radiation: • nuclear power stations produce nuclear waste which is radioactive • radioactive materials emit ionizing radiation • ionizing radiation can damage cells and cause cancer • sex cells of adults exposed to ionizing radiation may be damaged. ideas about risk and about scientific studies: • individual cases do not provide convincing evidence for or against a correlation • only a small proportion of the population get childhood cancer • the number getting cancer is in the expected range. • large sample therefore results can be trusted. **accept** sensible possible mechanisms for radiation/contamination of people. Eg discussion of transport of nuclear waste, contamination on clothing/skin **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>9</td><td>(a)</td><td></td><td>the random variation of radioactive decay/radioactive decay is a random process</td><td>1</td><td>allow experimental error/she did something different (eg the height of the detector, amount of salt changes, other experimental method difference)
allow: it might not be a fair test</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Natural radiation from environment/example of source of background radiation</td><td>1</td><td>allow: background (count)</td></tr>
<tr><td></td><td>(c)</td><td></td><td>(yes/ maybe)
The means are (very) different (1)
The ranges of the two sets of data do not overlap (1)

(no/ maybe)
Sensible suggestion to account for Billy’s results being higher (1)

2 Max</td><td>2</td><td>Allow average in place of mean.

Allow a correct numerical comparison of the two data sets for either of the first two marking points.

Sensible suggestions may include; Billy’s detector was closer/ Billy used more salt / Billy’s background count was higher etc.</td></tr>
<tr><td></td><td>(d)</td><td></td><td>beta</td><td>1</td><td></td></tr>
<tr><td></td><td>(e)</td><td></td><td>
<table>
<tr><th></th><th>Fits the textbook only</th><th>Fits Amy’s results only</th><th>Fits both</th><th>Fits neither</th></tr>
<tr><td>The activity of the sample stays the same from day to day.</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>All of the radioactivity has been used up.</td><td></td><td></td><td></td><td>✓</td></tr>
<tr><td>The half-life of the radioactive material is very long.</td><td></td><td></td><td>✓</td><td></td></tr>
</table>
</td><td>2</td><td>3 correct ticks – 2 marks
2 correct ticks – 1 mark</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>7</td><td></td></tr>
</table>

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