



# GCSE

## Physics A

General Certificate of Secondary Education

Unit **A182/01**: Unit 2 – Modules P4, P5, P6 (Foundation Tier)

# Mark Scheme for June 2013

---

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. Contradictory Responses:**



When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.





**2. Annotations**

Used in the detailed Mark Scheme:

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
<b>not/reject</b>	answers which are not worthy of credit
<b>ignore</b>	statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	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:

	correct response
	incorrect response
<input type="text" value="BOD"/>	benefit of doubt
<input type="text" value="NBOD"/>	no benefit of doubt
<input type="text" value="ECF"/>	error carried forward
<input type="text" value="0"/> , <input type="text" value="L1"/> , <input type="text" value="L2"/> , <input type="text" value="L3"/>	indicate level awarded for a question marked by level of response
<input type="text" value="A"/>	information omitted

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

3. **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.

4. 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 and fourth boxes are required for the mark:*

<del>✗</del>
<del>✗</del>

*This would be worth 1 mark.*

✓
<del>✗</del>

*This would be worth 0 marks.*

<del>✗</del>
<del>✗</del>
✓
✓

*This would be worth 1 mark.*

c. 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		✓		✓	✓		✓	
<b>Score:</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>NR</b>

- d. 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.

A182/01

Mark Scheme

June 2013

Question			Answer	Marks	Guidance
1	(a)	(i)	decays (1)  (is) radioactive (1)	2	<b>allow</b> material decays (1)  <b>allow</b> radioactive material (1) <b>NOT</b> radioactive material decays
		(ii)	alpha – beta – gamma	1	<b>allow</b> correct symbols or a mixture of words and symbols
	(b)	(i)	can break molecules into bits    kills living cells	2	
		(ii)	The decay is not affected by chemicals in the body.	1	
	(c)		to send messages from mobile phones	1	



Question		Answer	Marks	Guidance
	(d)	<p>(substance 2) <b>any three from</b></p> <p>substance 2 – is active at 6 months (1) <b>or</b> activity decreases after 6 months (1) <b>or</b> is low after 6 months (1)</p> <p>substance 2 – less risk after 6 months (1) <b>or</b> less risky than substance 3 (1)</p> <p>substance 1 – not active for long enough / not active after 2 months (1)</p> <p>substance 3 – High activity for too long is risky (1)</p> <p><b>OR</b> (substance 3) substance 3 – is active at 6 months (1)</p> <p>substance 1 – not active for long enough / not active after 2 months (1)</p>	3	<p>substance 1 chosen = 0 marks</p> <p><b>allow</b> it will last long enough (1) not just 'the activity decreases'</p> <p><b>allow</b> it won't be effective / it won't work (1)</p> <p>maximum of 2 marks for choosing substance 3</p> <p><b>allow</b> it will last long enough (1)</p> <p><b>allow</b> it won't be effective / it won't work (1)</p>
	(e) (i)	<p><b>any three from</b></p> <p>statement that: the benefits outweigh the risks (1)</p> <p>idea that for the treatment the chance/rate of success is good/high/likely/probable ORA e.g. failure is rare (1)</p> <p>risk (of secondary cancer) is low <b>or</b> secondary cancer could occur anyway (1)</p> <p>risk from prostate cancer is reduced <b>or</b> cancer will spread without treatment (1)</p> <p>will be being checked for secondary cancer <b>or</b> secondary cancer can also be treated (1)</p>	3	<p><b>ignore</b> just restating the bullet points</p> <p><b>allow</b> 2 in 125 is a low risk (1)</p> <p><b>allow</b> he will be cured (1)</p>

Question			Answer	Marks	Guidance
		(ii)	a measure of the possible harm to the body from radiation <div style="display: flex; align-items: center; margin-left: 400px;"> <input checked="" type="checkbox"/> </div>	1	
<b>Total</b>				<b>14</b>	

A182/01

Mark Scheme

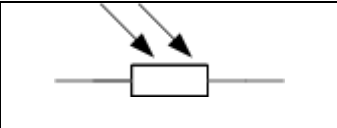
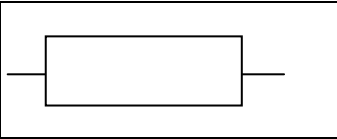
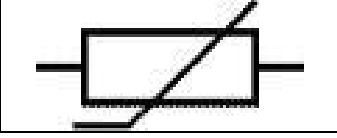
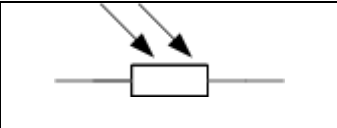
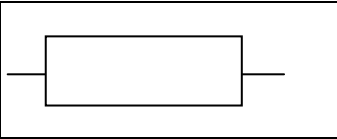
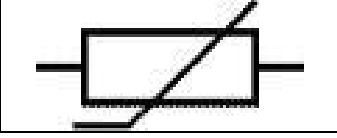
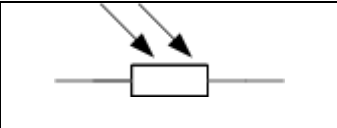
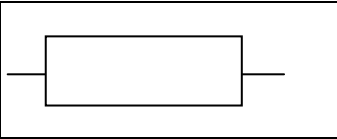
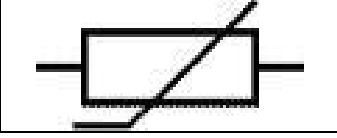
June 2013

Question	Answer	Marks	Guidance
2	<p><b>Level 3 (5–6 marks)</b> A description of the nucleus that includes at least two features <b>AND</b> a description of fusion that includes high temperature or energy release as one of at least two features Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> A description of the nucleus that includes at least two features <b>OR</b> a description of fusion that includes at least two features <b>OR</b> a simple description of the nucleus <b>AND</b> a simple description of fusion Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> a simple description of the nucleus or atom <b>or</b> a simple description of fusion <b>or</b> a simple description of fission Quality of written communication impedes communication of the science at this level</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to D</b> <b>Indicative scientific points:</b></p> <p>discussion of nuclear fusion</p> <ul style="list-style-type: none"> <li>• hydrogen/small nuclei</li> <li>• brought close to each other</li> <li>• fuse (owtte)</li> <li>• to make larger nuclei</li> <li>• lots of energy released.</li> <li>• large energy required to bring nuclei together</li> <li>• (even larger) amounts of energy released</li> <li>• need for magnetic containment</li> <li>• due to high temperatures</li> <li>• ionising radiation</li> </ul> <p>description of what nuclei are</p> <ul style="list-style-type: none"> <li>• the centre of atoms</li> <li>• protons</li> <li>• neutrons</li> <li>• the electrons are round the outside.</li> </ul> <p>correct description of fission for level 1 information from diagram</p> <p><b>ignore</b> chemical reaction ideas where atoms join and energy is released</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	

A182/01

Mark Scheme

June 2013

Question			Answer	Marks	Guidance												
3	(a)	(i)	<table border="1"> <tr> <td>A</td> <td>fixed resistor</td> <td></td> </tr> <tr> <td>B</td> <td>LDR</td> <td></td> </tr> <tr> <td>C</td> <td>thermistor</td> <td></td> </tr> </table>	A	fixed resistor		B	LDR		C	thermistor		4	mark per side 3 lines correct on either side, 2 marks for that side 1 or 2 lines correct per side, 1 mark for that side			
A	fixed resistor																
B	LDR																
C	thermistor																
		(ii)	<table border="1"> <thead> <tr> <th></th> <th>true</th> <th>false</th> <th>cannot tell</th> </tr> </thead> <tbody> <tr> <td>Anita repeated her experiment three times.</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>Anita had an outlier in her results.</td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table>		true	false	cannot tell	Anita repeated her experiment three times.			✓	Anita had an outlier in her results.	✓			2	one mark per correct row
	true	false	cannot tell														
Anita repeated her experiment three times.			✓														
Anita had an outlier in her results.	✓																
	(b)	(i)	resistance = $V/I = 6/0.06$ = 100 $\Omega$	2													
		(ii)	10 $^{\circ}\text{C}$	1													
<b>Total</b>				<b>9</b>													

Question	Answer	Marks	Guidance
4	<p><b>Level 3 (5–6 marks)</b> At least three parts labelled or referred to (not including switch but allowing slight errors in vocabulary) <b>AND</b> links motion to electricity/current <b>or</b> explains how the commutator works (accept confusion with descriptions of generators at this level) Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> At least two parts of the diagram labelled or referred to using recognised scientific vocabulary <b>AND</b> an attempt to explain the cause of motion which may be incorrect Quality of written communication partly impedes communication of the science at this level</p> <p><b>Level 1 (1–2 marks)</b> Two parts of the diagram correctly labelled or referred to <b>or</b> A correct label and a use of motors <b>or</b> an attempt to explain the cause of motion which may be incorrect Quality of written communication impedes communication of the science at this level</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to E</b> <b>Indicative scientific points:</b></p> <p><b>Parts of diagram labelled:</b></p> <ul style="list-style-type: none"> <li>• magnet / identifies poles</li> <li>• coil (of wire)</li> <li>• split rings/brushes/commutator</li> <li>• power supply/battery/cell.</li> <li>• flux / magnetic field / lines of force</li> </ul> <p><b>Explanation</b></p> <ul style="list-style-type: none"> <li>• electricity/current produces rotation</li> <li>• uses direct current.</li> </ul> <p><b>accept</b> higher level answers regarding interaction of magnetic field and current.</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	

Question		Answer	Marks	Guidance																				
5	(a)	<p><b>any three from</b></p> <p>rubbing the objects causes them to become charged (1)</p> <p><u>electrons</u> move from cloth to object (or other way around) (1)</p> <p>tray and flyer must have the same charge (1)</p> <p>so <u>repel</u> (each other) (1)</p>	3	<p><b>allow</b> they become charged / they gain charge / become positive / become negative</p>																				
	(b)	<table border="1"> <thead> <tr> <th></th> <th>Static electricity</th> <th>Current electricity</th> <th>Both</th> </tr> </thead> <tbody> <tr> <td>involves electrons</td> <td>(✓)</td> <td>(✓)</td> <td>✓</td> </tr> <tr> <td>involves a flow of charge</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>requires a power supply or battery</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>involves charged insulators</td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table>		Static electricity	Current electricity	Both	involves electrons	(✓)	(✓)	✓	involves a flow of charge		✓		requires a power supply or battery		✓		involves charged insulators	✓			3	<p>4 rows correct: 3 marks 3 rows correct: 2 marks 2 rows correct: 1 mark</p> <p>allow ticks in all three columns or both of the first two columns for involves electrons</p>
	Static electricity	Current electricity	Both																					
involves electrons	(✓)	(✓)	✓																					
involves a flow of charge		✓																						
requires a power supply or battery		✓																						
involves charged insulators	✓																							
<b>Total</b>			<b>6</b>																					

A182/01

Mark Scheme

June 2013

Question		Answer	Marks	Guidance									
6	(a)	<p>mean time calculated <math>(1.3+1.2+1.1)/3</math> or 1.2 (1)</p> <p>Speed calculated = 1.5 (1)</p> <p>m/s (1)</p>	3	<p><b>NOT</b> if either is incorrect <b>allow</b> an average of the speeds (1)</p> <p><b>but</b> 1.5 gets 2 marks if no working is shown <b>allow</b> ecf calculated from <math>1.8 \div</math> their mean time (1)</p> <p><b>NOT</b> mps <b>allow</b> <math>\text{ms}^{-1}</math> or 'metres per second' (1)</p>									
	(b)	(i)	1	both required for the mark.									
		<table border="1"> <thead> <tr> <th></th> <th>True</th> <th>False</th> </tr> </thead> <tbody> <tr> <td>As the shoe size increases, the time taken to slide down the ramp increases.</td> <td>✓</td> <td></td> </tr> <tr> <td>As some of the repeats are different, Ross must have made mistakes in his experiment.</td> <td></td> <td>✓</td> </tr> </tbody> </table>		True	False	As the shoe size increases, the time taken to slide down the ramp increases.	✓		As some of the repeats are different, Ross must have made mistakes in his experiment.		✓		
	True	False											
As the shoe size increases, the time taken to slide down the ramp increases.	✓												
As some of the repeats are different, Ross must have made mistakes in his experiment.		✓											
		(ii)	3	<p>the maximum mark is 3</p> <p><b>allow</b> e.g length/start-point/steepness/friction <b>allow</b> e.g weight/tread/friction</p>									
		<p><b>ignore</b> yes or no <b>a maximum of 2 marks from:</b> (<i>Ross thinks the mistakes are</i>):</p> <ul style="list-style-type: none"> <li>*Idea that ramps are different</li> <li>*idea that shoes are different</li> <li>*Results are affected by different reaction times</li> </ul> <p><b>a maximum of 2 marks from:</b> (<i>Discussion of data</i>):</p> <ul style="list-style-type: none"> <li>*New result doesn't fit his data e.g. the times should be lower than size 5/7 ORA</li> <li>*Sample size is small</li> <li>*Time differences are small, so correlation (between shoe size and slide-time) is weak</li> <li>*Slide-time depends on a combination of factors</li> <li>*calculation of the average of the other student's results = 1.3 seconds (1)</li> <li>*idea that both sets of data show good repeatability (1)</li> </ul>											

Question		Answer	Marks	Guidance
	(c)	ramp (1) Earth (1) balanced (1)	3	reject equal
	(d) (i)	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">all shoes were size 7</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">repeat the experiment three times</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">to control this factor</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">to get a better estimate of the real value</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">to increase the range of the experiment</div> <div style="border: 1px solid black; padding: 5px;">to improve the precision of the experiment</div> </div>	1	both lines required for the mark
	(ii)	C	1	
	(iii)	C A B	1	all correct for one mark
<b>Total</b>			<b>13</b>	



A182/01

Mark Scheme

June 2013

Question	Answer	Marks	Guidance
7	<p><b>Level 3 (5–6 marks)</b> Correctly links changes in speed or height to changes in KE or GPE <b>or</b> describes the energy transfer from GPE to KE <b>and</b> explains why the vehicle has lost speed or KE or height or GPE during the ride Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Links changes in speed or height to changes in KE or GPE at correct points in the ride <b>or</b> describes the energy transfer from GPE to KE <b>or</b> explains why the vehicle has lost speed or KE or height or GPE during the ride Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Correctly links GPE with height <b>or</b> Correctly links KE with speed <b>or</b> limited discussion of energy or forces Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to C</b></p> <p><b>Indicative scientific points:</b></p> <ul style="list-style-type: none"> <li>• gains GPE as raised</li> <li>• this turns to KE as falls</li> <li>• KE increase means speed increases</li> <li>• on other side, KE drops, so speed decreases</li> <li>• GPE increases again</li> <li>• energy lost on each move</li> <li>• due to friction</li> <li>• heat</li> <li>• surroundings/structure/wheels etc</li> <li>• so lower speed/lower rise</li> <li>• no more energy needed after initial input</li> <li>• total energy is conserved.</li> </ul> <p><b>accept</b> correct discussion of forces use of diagrams to explain</p> <p><b>ignore</b></p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	

**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](mailto:general.qualifications@ocr.org.uk)

**[www.ocr.org.uk](http://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

