OCR
Oxford Cambridge and RSA

GCSE

Physics A / Additional Science A

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

General Certificate of Secondary Education

Mark Scheme for June 2017

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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.

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 RM Assessor 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

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ECF	error carried forward
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	correct response
	draw attention to particular part of candidate's response
^	information omitted

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 RM Assessor 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.

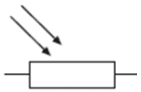
<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1</td><td></td><td></td><td>
<table>
<tr><td></td><td>No</td><td>Resultant</td><td>Balanced</td></tr>
<tr><td>a ball…</td><td></td><td>✓</td><td></td></tr>
<tr><td>a parachutist…</td><td></td><td></td><td>✓</td></tr>
<tr><td>a book…</td><td></td><td></td><td>✓</td></tr>
<tr><td>a car…</td><td></td><td></td><td>✓</td></tr>
</table>
</td><td>4</td><td>One mark for each correct tick (mark in rows).</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>4</td><td></td></tr>
</table>

<table>
<tr><td>2</td><td>(a)</td><td>(i)</td><td>(ball is) stationary / not moving / still / zero velocity/speed</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>(0.5)×mass×speed^2= 0.5 × 0.05 × 40^2 (1);
40 (1)</td><td>2</td><td>correct answer without working gets 2 marks</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>less than (first answer) (1);
club continues to move/club still has k.e. / (energy lost as) sound (1)</td><td>2</td><td>allow (energy lost as) heat
allow not all energy is transferred to the ball</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>m x v / 0.05 × 40 (1);
momentum before = 0 (1)</td><td>2</td><td>allow shows clearly that change = 2 - 0</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>4000 N (second answer)</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>(yes/agree)
use of change in momentum = force × time (1);
(Longer time=) greater change of momentum/ change in momentum larger (1)</td><td>2</td><td>no mark for yes/no

needs more than just speed greater</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>10</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
3			**[Level 3]** Describes both sections of the journey and explains one using data **OR** clear forces argument Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Describes both sections of the journey. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Describes one section of the journey. 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:** **Describe motion:** • constant speed at the start • acceleration/speeding up • **Explanation/ Justification:** • Uses data from table to explain description eg constant speed is until 30 seconds • Acceleration from 30 -80 seconds. • Acceleration is 2m/s every 10 seconds • Forces arguments • constant speed due to balanced forces • acceleration due to unbalanced/resultant force • driving and counter (air resist/friction) forces • at const speed driving fore =counter force • when accelerating driving force >counter Look for points next to table and sketch graph L2 can be gained from sketching correct graph. **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
			Total	6	

4	**(a)**	**(i)**	**series** circuit drawn (1); correct symbol for voltmeter (1); voltmeter in parallel with battery (1)	**3**	**allow** even if voltmeter in series; lines do not need to be straight must be circular with V inside
		(ii)	<table><tr><td>electrons and protons</td><td></td></tr><tr><td>electrons only</td><td>✓</td></tr><tr><td>metal ions</td><td></td></tr><tr><td>protons only</td><td></td></tr></table>	**1**	
		(iii)	Aluminium (1st answer) **AND** Copper (2nd answer)	**1**	both needed
	(b)		(300 × 100) (4th answer)	**1**	
	(c)	**(i)**	diesel emits carbon dioxide/ carbon monoxide/diesel contributes to global warming/ particulates/ soot/ carbon / electric do not cause emissions (where the cars are used)	**1**	allow burn fossil fuels, allow fumes/ harmful gases for emissions NOT just gases
		(ii)	not hear car / not notice the car	**1**	
			Total	**8**	

Question			Answer	Marks	Guidance
5	**(a)**	**(i)**	C	**1**	
		(ii)	D	**1**	
		(iii)	B **AND** D	**1**	both needed
	(b)		 (3rd answer)	**1**	
	(c)	**(i)**	none / no reading / zero / nothing	**1**	
		(ii)	move magnet out / push other pole in / turn it around / use other end of coil	**1**	**allow** magnet in the other side.
			Total	**6**	

Question	Answer	Marks	eGuidance
6	**[Level 3]** Valid comment on Zac **and** Megan's statements, with use of data to justify **both** of the comments. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Valid comment on Zac **and** Megan's statements, with use of data to justify one of the comments. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Valid comment on Zac **and** Megan's statements **OR** makes use of data e.g. does at least one correct resistance calculation. 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 grade D/C** **Indicative scientific points may include:** **Zac correlation:** *example comments:* • Zac is wrong • There is a correlation *example uses of data:* • one increase so does the other/ **positive** correlation • both increase together • Larger temperature gives larger current • Not linear/proportional / Would not give straight line graph **Megan resistance:** *example comments:* • Megan is correct • resistance does change as temp increases/gets warmer/changes *example uses of data:* • Use of resistance formula and data / Calculates resistances (20, 12, 8, 5) all kΩ **Look for resistances near table** • Resistance decreases with temperature increase • Not linear/proportional • Would not give straight line graph A contradiction will result in the lower mark at the level at level 3 e.g. a correct statment and an incorrect statement within a section **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
	Total	6	

Question			Answer	Marks	Guidance
7	(a)		fusion ---------- nuclei join (1); nucleus ---------- small massive positive (1); radioactive --------- gives out ionising radiation (1)	3	
			Total	3	

Question			Answer	Marks	Guidance
8	(a)		52 (2nd answer)	1	
	(b)		idea of halving / use 600 /at 600... (1) ...the time is 20mins	2	the time at 600 is 20mins (2) Both marks can be gained from two construction lines on the graph
	(c)		below the line for **X** (1st answer)	1	
			Total	4	

Question			Answer	Marks	Guidance
9	(a)		(radiation) all around us / (subjected to) it all the time / from the environment	1	**ALLOW** naturally occuring **ignore** named sources
	(b)		contamination: contact with **source** on/in body (1); irradiation: **source** outside body / radiation stops when person moves away/ exposure to radiation (1); illustrates with either radon products cause contamination **OR** granite causes irradiation (1)	3	 **ALLOW** exposed to alpha, beta or gamma
	(c)		<table><tr><td>Material</td><td>α</td><td>β</td><td>γ</td></tr><tr><td>Lead</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Al</td><td>✓</td><td>✓</td><td></td></tr><tr><td>Air</td><td>✓</td><td></td><td></td></tr></table>	3	Ticks below diagonal line of ticks lose a mark for each column. **Ignore** ticks above diagonal line of ticks.
			Total	7	

Question	Answer	Marks	Guidance
10	**[Level 3]** Give two harmful effects **AND** a benefit **AND** compares dose for CT with at least one of the values given in table. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Give two harmful effects **and** a benefit **OR** compares dose for CT with at least one of the values given in table. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Give one harmful effects **OR** gives benefit. 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:** **Harm to body:** • Damage (DNA in) living cells • kill living cells • cause cancer • break molecules into ions **Benefit:** • CT scan is useful for diagnosis/ can find out what is wrong with you. • Can help work out your treatment **Use of data** • CT (10) less than recommended limit (50) • CT much less than lowest indicating cancer later (100) • Background (2.7) plus CT (10) less than recommended limit(50) • other correct numerical comparison **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
	Total	**6**	

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