OCR
Oxford Cambridge and RSA

GCSE

Physics A

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

General Certificate of Secondary Education

Mark Scheme for June 2016

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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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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
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	no benefit of doubt
	reject
	correct response

L1 , L2 , L3	draw attention to particular part of candidate's response
^	information omitted

	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
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
NBOD	no benefit of doubt
R	reject
	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 sequence

Question			Answer	Marks	
1	(a)		Electrons move from the cloth on to the rod. √ Electrons move from the rod on to the cloth. ☐ Molecules move from the cloth on to the rod. ☐ Molecules move from the rod on to the cloth. ☐	1	
	(b)	(i)	negative → like charges repel neutral → unlike charges attract positive	1	Must only be **ONE** line to gain mark
		(ii)	Beth is wrong (no marks) charge does not leak away / charges do not move (1); rod is an insulator / not a conductor (1)	2	
			Total	4	

Question			Answer	Marks	Guidance
2	(a)		arrow vertical	1	either up or down but not on the wire (showing current)
	(b)		reverse current / reverse battery/cells / reverse poles	1	**allow** turn the magnet the other way up turn magnet around/ turn battery around **Reject** – change the magnet
	(c)		Motor	1	
			Total	3	

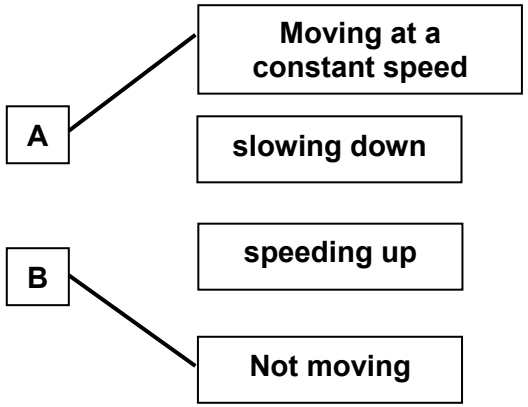
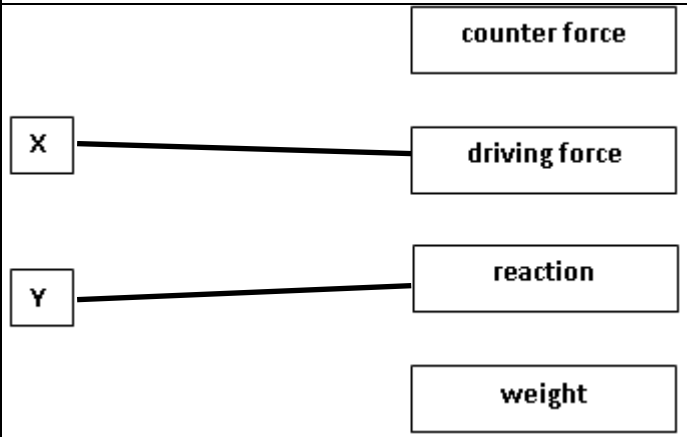
Question			Answer	Marks	Guidance
3	(a)	(i)	spiral (2nd answer)	1	
		(ii)	fluorescent (1st answer)	1	
		(iii)	two (2nd answer)	1	
	(b)	(i)	ammeter symbol ringed	1	
		(ii)	use of equation R=V/I (1); two values of R calculated (1); resistance increases (as current increases) (1)	3	10 and 15 gains the first two marks
		(iii)	repeat readings / more data	1	
			Total	8	

Question			Answer	Marks	Guidance
4			**[Level 3]** States and explains the correlation **AND** describes at least two improvements. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** States the correlation **AND** describes two improvements. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** States the correlation **OR** describes two improvements. 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:** **Correlation:** **Statement of correlation** • resistance decreases with more wires/paths/branches • negative correlation **Explanation of correlation** • more wires gives more paths for current/electrons/charge • greater cross sectional area • easier for current/electrons/charge to get through • Use of V=IR **Improvements:** • more wires / longer wires / thicker wires / other wire types • repeat readings • find mean/average reading • control variables (use same meter, leads, temperature) • connect meter to known resistor • description of other suitable correct method • someone else could reproduce the experiment **Use the L1, L2, L3 annotations in RM ASSESSOR ; do not use ticks.**
			Total	6	

Question			Answer	Marks	Guidance
5	(a)		B (1); activity halves in 1 hour owtte (1)	2	1000 halves or gets to 500 (in one hour) **Not accept** half life is1 hour
	(b)		Any three from: activity decreases with time/short half life; most gamma exit body; the benefit outweighs risk; leads to a diagnosis; leads to a cure.	3	**Allow** radiation/gamma rays get weaker / not as strong /less intense / fewer gamma rays **Allow** Dr is an expert / should be trusted **Allow** chances of harm are low **Reject** gamma /radiation does not cause cancer
			Total	5	

Question			Answer	Marks	Guidance
6	(a)		burning ☐ changes in the nucleus √ chemical reaction ☐ ionisation ☐	1	
	(b)	(i)	any **THREE** from: water cools waste water shields waste / absorbs radiation sealed to prevent contamination e.g. of water supply prevent leakage waste has high activity waste has long half-life keep waste away from people once waste is cool enough to handle safely	3	
		(ii)	lower activity /low level waste has a lower risk	1	**accept** - less dangerous than high level ora not as radioactive / not as harmful **not accept** Not dangerous
	(c)		any **THREE** from: risks of accident very small ; lots of other things he does carry a greater risk ; very little radiation escapes from power station / radiation is contained; monitoring (of radiation levels) around station; safety features (such as shielding / control rods/highly skilled staff); there is background radiation all around us;	3	**accept** lots of security / waste is safely stored away.
			Total	8	

Question			Answer	Marks	Guidance
7			**[Level 3]** Gives reason for precautions **AND** states a feature of alpha **AND** states a feature of beta. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Gives two from: reason for precautions **OR** states a feature of alpha **OR** states a feature of beta. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Gives one from: reason for precautions **OR** states a feature of alpha **OR** states a feature of beta. 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:** **Need for precautions:** • radiation is ionising • damage living cells/ mutate • avoids contamination • kill living cells • cause cancer • break molecules into bits (ions) • β can get through skin and get to internal organs • makes you ill / harmful (partial credit) **Reasons for difference:** **Alpha** • α stopped by a few cm of air • α stopped by thin sheet of paper / outer layer of skin • α cannot get to internal organs **Beta** • β can travel about 1m through air • β stopped by thin sheet of aluminium • β can penetrate skin • β travels further than α comparative - so both types of radiation mentioned but only partial credit. **Ignore** references to gamma and X-rays **Use the L1, L2, L3 annotations in RM ASSESSOR ; do not use ticks.**
			Total	6	

Question			Answer	Marks	Guidance
8	(a)			2	One mark for each correct line
	(b)	(i)	18 (m/s)	1	
		(ii)	S (4th answer)	1	
	(c)	(i)		2	One mark for each correct line
		(ii)	equal / same (length/magnitude) (1); opposite direction (1)	2	**accept** one forward and one backwards **accept** "balance" for one mark **reject** right and left
			Total	8	

Question			Answer	Marks	Guidance
9			**[Level 3]** More than one relevant statement made **AND** explanation given. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Both relevant statements made **OR** an explanation given. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** One relevant statement made. 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 D/C** **Indicative scientific points may include:** **Statements:** • Scrunched up newspaper compresses / works like a crumple zone (or other example) • To reduce / absorb the force/shock/ energy **Explanation:** • Time taken to stop increases Distance to stop becomes longer • Slower momentum change due to deceleration • Loss of kinetic energy • Use of change of momentum=resultant force x time • Use of work done=force x distance **Use the L1, L2, L3 annotations in RM ASSESSOR ; do not use ticks.**
			Total	6	

Question			Answer	Marks	Guidance
10	(a)	(i)	22 (N)	1	
		(ii)	11 (1) J (1)	2	**allow**: ECF from ai **allow**: j / Nm / joule **do not allow**: n (for N)/ mN
		(iii)	Total energy stays the same / energy is not lost (or gained) (1); (work done by Roy =) heat (wasted) **and** GPE/energy gained by tins (1)	2	**allow**: energy cannot be created or destroyed **allow**: energy is **only** transferred (into other forms) **Reject** Similar **ignore** sound / KE of Roy
	(b)		D (4th answer)	1	
			Total	6	

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