OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics A

General Certificate of Secondary Education

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

Mark Scheme for January 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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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:

	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	indicate level awarded for a question marked by level of 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 and 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 should be blank (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

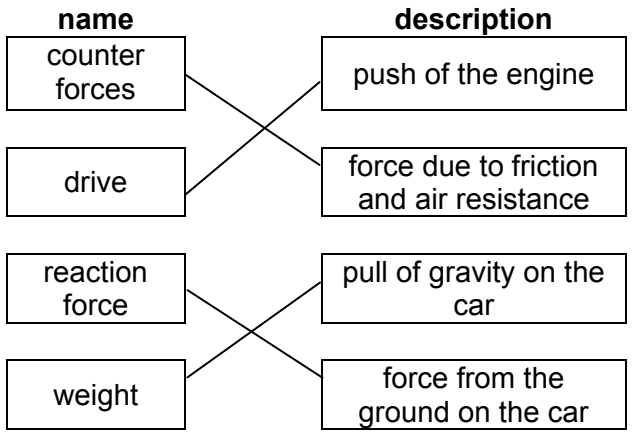
iii. **To determine the mark within the level**, consider the following:

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)		2	4 lines correct for 2 marks 3 or 2 lines correct for 1 mark
		(ii)	forces are unbalanced/different (1) identification of force which is greater (1)	2	driving force greater than counter force gets both marks
	(b)		10 m/s^2	1	
	(c)		A	1	
			Total	**6**	

Question			Answer	Marks	Guidance
2			**Level 3: (5 – 6 marks)** Uses appropriate physics to explain how helmets reduce injuries **and** discusses the data using the idea of correlation and cause. Quality of written communication does not impede communication of the science at this level. **Level 2: (3 – 4 marks)** Uses appropriate physics to explain how helmets reduce injuries **and/or** discusses the data using the idea of correlation and cause. Quality of written communication partly impedes communication of the science at this level. **Level 1: (1 – 2 marks)** Uses appropriate physics to explain how helmets reduce injuries **or** discusses the data using the idea of correlation and cause. 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** possible points relevant to data • recognises that correlation between sets of data does not automatically mean it is causal • correlation not consistent over time • cannot draw a sensible conclusion from limited data • do not know whether the people who died wore helmets/other comment about the accidents • other factors need to be considered to reach a sensible conclusion • discussion of where the data comes from Physics points **Points indicative of L2/3:** time of collision increased same momentum change / same change of speed so smaller rate of change of momentum / smaller deceleration therefore reduced force (or alternative discussion in terms of work done) **Points indicative of L1:** idea of helmet reducing force /absorbing energy comparison to crumple zones idea that collision time is longer may suggest alternative reasons for the drop in deaths **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
3	(a)	(i)	0.2	1	**ignore** wrong unit
		(ii)	gravitational potential	1	
	(b)	(i)	gravity/weight (1) air resistance / drag (force) / air friction	2	**ignore** references to sideways forces / wind **accept** a diagram with clearly labelled forces **ignore** upthrust
		(ii)	kinetic	1	
	(c)		**any three from:** less area; (so) less air resistance; same weight; net/resultant/overall force down greater / gravity has greater effect; (so) acceleration greater;	3	**accept** smaller size **do not accept** smaller object **accept** more aerodynamic/streamlined **accept** hits less air particles **do not accept** increased weight (max 2 for rest of answer) **accept** energy arguments ie: same work done on paper/same gravitational potential energy less work done against air resistance more GPE transferred to KE energy dissipated by the air/heating the air
			Total	**8**	

Question			Answer	Marks	Guidance
4			**[Level 3]** Candidate describes correlation quantitatively **and** explains mechanism in terms of energy transfer. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Candidate describes correlation quantitatively **and/or** makes some attempt to link power to number of turns, with reference to energy. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Candidate recognises and gives a qualitative description of correlation **or** links power and energy. 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:** • discussion of correlation eg clear/no outliers/both increase etc / positive correlation • when power doubles, number of turns doubles / for increase of 2 in power rotations (per second) increase by 0.25 • limit to pattern / up to 8W • power is rate of supply of energy • energy/power supplied turns the motor/weight • more rotations (per second) means more kinetic energy • discussion of variables eg input/independent is power output/outcome/dependent is number of turns **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
5	(a)	(i)	Induces (1) goes into (1) electromagnetic induction (1)	3	one mark per correct word/phrase
		(ii)	**any two from:** increase the number of turns / put turns closer together; increase the speed of the magnet / throw the magnet down: increase the strength of the magnet / use more magnets:	2	**accept** coils for turns **do not accept** more wire **accept** more powerful magnet **do not accept** 'bigger' or 'larger' applied to turns or magnet **do not accept** just change for any mp
	(b)	(i)	generator	1	
		(ii)	**Any 2 from;** voltage from power station is higher; experiment produces one cycle, power station is continuous; higher frequency in a power station owtte; both change from positive to negative owtte;	2	**accept** 230V if clearly referring to mains **ignore** reference to more electricity **accept** comparison for time of cycles **accept** both are alternating voltage/current
			Total	**8**	

Question			Answer	Marks	Guidance
6	(a)		current → the flow of charge in a circuit current → the number of bulbs in the circuit voltage → the length of the wires in the circuit voltage → the push of the battery on the charges in the circuit	2	
	(b)		power (W) → 1.5 V x 0.5 A power (W) → 1.5 V + 0.5 A 1.5 V – 0.5 A resistance (Ω) → $\frac{1.5\ V}{0.5\ A}$ $\frac{0.5\ A}{1.5\ V}$	2	
	(c)		connecting wires have no resistance / resistance can be ignored (1) (so) no change (to circuit) / same components / same current / same voltage / same resistance (1)	2	**do not accept** same electricity going through **do not accept** same power for battery
			Total	**6**	

Question			Answer	Marks	Guidance
7	(a)	(i)	The time taken for the radioactive material to completely change into another material. ; The time taken for a radioactive material to become safe. ; The time taken for half of the radioactive material to decay. ✓	1	
		(ii)	zirconium (1) caesium (1)	2	
		(iii)	60	1	**accept** 57-62
	(b)	(i)	high level waste → stored in concrete intermediate level waste → encased in glass and then stored under water until cool low level waste → put in landfill sites	2	3 lines correct, two marks 2 or 1 lines correct, one mark
		(ii)	alpha, beta/α, β	1	both required for the mark.
		(iii)	**Any 2 from:** not all radiation is stopped by Al / all/gamma stopped by Pb gamma can get out of Al α and β stopped by Al	2	
			Total	**9**	

Question			Answer	Marks	Guidance
8			**[Level 3]** Candidate shows understanding of what the chart shows **or** compares some risks or benefits. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Candidate describes some feature of the chart **or** makes a valid comment about a risk or a benefit. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Candidate makes a valid comment about the topic. 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:** • radiation dose is a measure of the amount of possible harm to the body • Sv is sieverts • dose for radiation workers is much higher than for the average person • dose for radiation workers is lower / half that definitely linked to cancer • radiation workers are monitored more than other people • may be willing to accept the risks for a more interesting job • a benefit is helping others • benefit of a well-paid job **accept** • example of how workers' dose is reduced • discussion of monitoring of radiation workers' exposure. • discussion of how people are happier to accept risks if they have a choice • discussion of how radiation is used in a hospital **ignore** • reference to types of radiation • discussion of contamination vs irradiation **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
9	(a)		when inside the body (1); could cause (lung) cancer / damage DNA or cells / cause cells to mutate/ alpha highly ionising (1);	2	**ignore** reference to ionising cells
	(b)		Max 2 marks from any one group economic argument; residents;	3	**economic arguments** idea of cost/ who pays consequence of less money for other areas/ services reduced healthcare costs (as less cases of cancer) increase in local employment **residents** reduced risk (of cancer for medium radon level) correct use of data to discuss level of risk idea that not everyone benefits disruption during fitting
			Total	**5**	

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