

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 |
| <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 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 |

| | |
|---|---|
|  | draw attention to particular part of candidate's response |
|  | information omitted |
|  | indicate uncertainty or ambiguity |
|  | benefit of doubt |
|  | contradiction |
|  | incorrect response |
|  | 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 |
|  | no benefit of doubt |
|  | 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 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 | <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 | | ✓ | | ✓ | ✓ | | ✓ | |
| 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. <input checked="" type="checkbox"/> Electrons move from the rod on to the cloth. <input type="checkbox"/> Molecules move from the cloth on to the rod. <input type="checkbox"/> Molecules move from the rod on to the cloth. <input type="checkbox"/> | 1 | |
| | (b) (i) | | 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 (2 nd answer) | 1 | |
| | (ii) | fluorescent (1 st 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 | <p>[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)</p> <p>[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)</p> <p>[Level 1] States the correlation OR describes two improvements. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p> | 6 | <p>This question is targeted at grade D/C</p> <p>Indicative scientific points may include:</p> <p>Correlation: Statement of correlation</p> <ul style="list-style-type: none"> • resistance decreases with more wires/paths/branches • negative correlation <p>Explanation of correlation</p> <ul style="list-style-type: none"> • more wires gives more paths for current/electrons/charge • greater cross sectional area • easier for current/electrons/charge to get through • Use of $V=IR$ <p>Improvements:</p> <ul style="list-style-type: none"> • 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 <p>Use the L1, L2, L3 annotations in RM ASSESSOR ; do not use ticks.</p> |
| | 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 is 1 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 <input type="checkbox"/> changes in the nucleus <input checked="" type="checkbox"/> chemical reaction <input type="checkbox"/> ionisation <input type="checkbox"/> | 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 | <p>[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)</p> <p>[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)</p> <p>[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)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p> | 6 | <p>This question is targeted at grades up to E</p> <p>Indicative scientific points may include:</p> <p>Need for precautions:</p> <ul style="list-style-type: none"> • 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) <p>Reasons for difference:</p> <p>Alpha</p> <ul style="list-style-type: none"> • 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 <p>Beta</p> <ul style="list-style-type: none"> • β can travel about 1m through air • β stopped by thin sheet of aluminium • β can penetrate skin <p>• β travels further than α comparative - so both types of radiation mentioned but only partial credit.</p> <p>Ignore references to gamma and X-rays</p> <p>Use the L1, L2, L3 annotations in RM ASSESSOR ; do not use ticks.</p> |
| | Total | 6 | |

| Question | | Answer | Marks | Guidance |
|--------------|-----|---|----------|---|
| 8 | (a) | | 2 | One mark for each correct line |
| | (b) | (i) 18 (m/s) | 1 | |
| | | (ii) S (4 th 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 | <p>[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)</p> <p>[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)</p> <p>[Level 1] One relevant statement made. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p> | 6 | <p>This question is targeted at grades up to D/C</p> <p>Indicative scientific points may include:</p> <p>Statements:</p> <ul style="list-style-type: none"> • Scrunched up newspaper compresses / works like a crumple zone (or other example) • To reduce / absorb the force/shock/ energy <p>Explanation:</p> <ul style="list-style-type: none"> • Time taken to stop increases Distance to stop becomes longer • Slower momentum change due to deceleration • Loss of kinetic energy <ul style="list-style-type: none"> • Use of change of momentum=resultant force x time • Use of work done=force x distance <p>Use the L1, L2, L3 annotations in RM ASSESSOR ; do not use ticks.</p> |
| | 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 | |

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

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Telephone: 01223 553998

Facsimile: 01223 552627

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