

GCSE

Physics B

Unit **B751/01**: Modules P1, P2, P3 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2016

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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.

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Annotations used in scoris

| Annotation | Meaning |
|---|--|
|  | Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response. |
|  | correct response |
|  | incorrect response |
|  | benefit of the doubt |
|  | benefit of the doubt not given |
|  | error carried forward |
|  | information omitted |
|  | ignore |
|  | reject |
|  | contradiction |

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

| | |
|---------------|---|
| / | = alternative and acceptable answers for the same marking point |
| (1) | = separates marking points |
| allow | = answers that can be accepted |
| not | = answers which are not worthy of credit |
| reject | = answers which are not worthy of credit |
| ignore | = statements which are irrelevant |
| () | = words which are not essential to gain credit |
| <u> </u> | = underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated) |
| ecf | = error carried forward |
| AW | = alternative wording |
| ora | = or reverse argument |

MARK SCHEME

| Question | Answer | Marks | Guidance |
|----------|--|-------|--|
| 1 a | <p>any three from</p> <p>skin cancer / skin cells mutate[1]</p> <p>eye damage / cataracts [1]</p> <p>premature aging of skin [1]</p> <p>suntan / sunburn [1]</p> | 3 | <p>ignore just cancer /mutate</p> <p>allow problems with eyes</p> <p>allow skin becomes wrinkly</p> <p>allow skin damage /harm/ burn if no mention to premature aging of skin / suntan / sunburn [1]</p> |
| b | <p>use sun-cream / sun-block / sun(tan) lotion / sun screen [1]</p> <p>idea of reduced exposure / less sunbathing / wear a sunhat / wear clothing / put on sunglasses / move to the shade / AW [1]</p> | 2 | |
| c i | <p>idea of a thinning or depletion of the ozone layer / /hole AW [1]</p> <p>air pollution or correctly named air pollution [1]</p> | 2 | <p>allow higher level answers: e.g. ozone broken down / converted to oxygen [1]</p> <p>allow use of aerosols / higher level answers e.g. CFC's [1]</p> <p>ignore global warming / CO₂</p> |

| Question | Answer | Marks | Guidance |
|--------------|---|----------|--|
| C ii | <p>any one from</p> <p>repeat measurements [1]</p> <p>use new or different equipment / technology [1]</p> | 1 | <p>Look for an action</p> <p>Eg. repeat their experiments / use a longer period of time / use measurements from other scientists / collect more evidence / peer review [1]</p> <p>Allow more experiments [1]</p> |
| C iii | <p>any one from</p> <p>results / findings / patterns or trends confirmed [1]</p> <p>explanations tested by using new experiments / better equipment / techniques / technology [1]</p> <p>CFCs are banned so their effects are reduced [1]</p> | 1 | <p>Look for a reason</p> <p>Eg. more evidence to support the explanations [1]</p> <p>Eg. more / other scientists come to the same conclusion</p> |
| | Total | 9 | |

| Question | Answer | Marks | Guidance |
|----------|---|-------|---|
| 2 a i | (£) 562 [1] | 1 | |
| ii | no (no mark) any one from (£) 5320 is more than (£) 4100 / AW [1] It will cost £5320 (to fit all insulation) [1] | 1 | allow (£) 1220 shortfall [1] |
| iii C | payback time (of double glazing) is 25 (years) [2] but if incorrect or no calculation then long(est) payback time scores [1] | 2 | allow 25 on / at side of table clearly linked to double glazing [2] allow CWI saves £50 per year more than DG [2] allow takes a long time to payback / takes a long time to get your money back / AW [1] allow other correct payback calculations to help prove point: eg. CWI 4 years or DP 120/72 (1.67) or LI 3 years [1] allow does not save as much money per year as cavity wall insulation [1] ignore comparisons of the 'cost to fit' |

| Question | Answer | Marks | Guidance |
|----------|---|-----------|--|
| 2 b | <p>Level 3: (5 – 6 marks) Reference to red and yellow show most heat escaping AND more heat escapes on a cold day. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2: (3 – 4 marks) Simple reference to red and yellow on thermogram show hottest areas OR more heat escapes on a cold day. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1: (1 – 2 marks) Simple reference to colours on thermogram show hottest areas. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0: (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p> | 6 | <p>This question is targeted up grade C Indicative scientific points may include:</p> <p>Level 3:</p> <ul style="list-style-type: none"> yellow / red / white shows higher temperatures than other colours AND cold day means more heat is lost (because of bigger temperature difference) <p>allow reverse argument e.g. blue / black shows lower temperatures than others AND cold day means more heat is lost (because of bigger temperature difference / heating is on) ORA less heat loss on warm day (because of smaller temperature difference)</p> <p>Level 2:</p> <ul style="list-style-type: none"> yellow / red / white / lighter colours show higher temperatures than others OR cold day means more heat escapes / have heating on inside the house on a cold day <p>allow reverse argument e.g. blue / black shows lower temperatures than others OR cold day means more heat escapes / have heating on inside the house on a cold day .</p> <p>Level 1:</p> <ul style="list-style-type: none"> some colours show higher temperatures than others <p>Use the L1, L2, L3 annotations; do not use ticks.</p> |
| | Total | 10 | |

| Question | Answer | Marks | Guidance |
|----------|--|----------|---|
| 3 a | <p>any two from</p> <p>same amount of milk [1]</p> <p>same type of milk [1]</p> <p>same thickness / mass / size / volume of beaker [1]</p> <p>same starting temperature (of milk) [1]</p> | 2 | <p>allow same oven power [1]</p> <p>if no other answers allow 'only change one thing at a time' for [1]</p> |
| b | heat the water (in milk) / AW [1] | 1 | <p>allow heat the fat (in milk) [1]</p> <p>allow microwaves are absorbed by water / fat [1]</p> <p>allow higher level answers e.g. water molecules vibrate faster / water molecules increase in kinetic energy [1]</p> |
| c | microwaves are not absorbed by glass / do not heat the glass / only heat the milk AW [1] | 1 | allow microwaves penetrate the glass / beaker [1] |
| d | <p>black absorbs more IR / heat (than white) / ORA [1]</p> <p>white reflects more IR /heat (away than black) / ORA [1]</p> | 2 | <p>allow black absorbs heat more quickly ORA [1]</p> <p>allow SHC is the same [1]</p> <p>If no comparison then allow 1 mark for either black is a good absorber of IR/heat or White reflects IR / heat</p> |
| | Total | 6 | |

Section B MARK SCHEME

| Question | Answer | Marks | Guidance |
|------------|---|----------|--|
| 4 a | <p>any two from</p> <p>use light (energy) from sun / sunlight / light [1]</p> <p>converted to electricity [1]</p> <p>charges the battery [1]</p> | 2 | allow absorb light / light hits photocell [1] |
| b | <p>by the (charged) battery / AW [1]</p> <p>but</p> <p>battery provides electricity / power(at night) / AW [2]</p> <p>or</p> <p>battery has stored energy [2]</p> | 2 | <p>allow battery makes it work [1]</p> <p>allow by the sensor triggering the battery [1]</p> |
| c | <p>no need for wires / no need for mains supply / can be used in remote locations / renewable energy resource / AW [1]</p> | 1 | <p>allow energy is free /saves money[1]</p> <p>allow no need for generator</p> |
| | Total | 5 | |

| Question | Answer | Marks | Guidance |
|--|---|-------|--|
| <p>5 a</p> <p style="text-align: right; color: red;">c</p> | <p>(Water vapour) – (water evaporating) from sea / lakes / rivers / clouds / rain / or combustion [1]</p> <p>(CO₂) – combustion / respiration / AW [1]</p> <p>(Methane) – decomposition / AW [1]</p> | 3 | <p>allow specific examples such as large scale boiling of water [1] eg. (fuel) power stations [1] ignore using kettle and other small scale water vapour production methods. allow volcanoes [1]</p> <p>allow volcanoes / (using) vehicles or engines / (fossil or biofuel) power stations / factories or industry / breathing (out) / release from oceans [1] ignore nuclear power station ignore simply ‘human activity’</p> <p>allow named decomposition e.g. (gas from) cows / animal waste / permafrost / bogs / rice fields / biofuels / fermentation [1] allow volcanoes [1]</p> |
| <p>b</p> <p style="text-align: right; color: red;">c</p> | <p>Atmosphere absorbs IR / AW [1]</p> | 1 | <p>allow atmosphere traps IR / stops or reduces the IR reaching the Earth [1] allow higher level answers e.g. refracts the IR [1]</p> <p>ignore merely reflects IR / changes the wavelength / ozone</p> <p>ignore references to heat</p> |

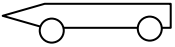
| Question | Answer | Marks | Guidance |
|---------------------------------|---|----------|--|
| <p>c</p> <p>C</p> | <p>(UK may be colder but) other places are probably hotter / AW [1]</p> <p>It is just an opinion / belief (rather than based on reliable scientific evidence) [1]</p> <p>average (global) temperature is more reliable [1]</p> <p>temperature fluctuations (locally) do not undermine the trend [1]</p> <p>her experience is over a short period of time [1]</p> <p>global changes need data from longer periods of time / AW [1]</p> | 2 | <p>Allow only looking at one area / UK [1]</p> <p>Allow there are extreme weather events / flooding / melting ice caps (elsewhere) [1]</p> <p>Allow weak limited or no evidence [1]</p> <p>Eg. (local) weather is not a good indicator [1]</p> <p>allow idea that her experience is over a limited time but global temperature changes may take decades [2]</p> |
| <p>d</p> <p>C</p> | <p>(natural) forest fires / volcanoes / decomposition of living matter [1]</p> | 1 | <p>allow specific examples e.g. peat bogs / gas from cows/ animal waste [1]</p> |
| | Total | 7 | |

| Question | Answer | Marks | Guidance |
|--------------|--|----------|--|
| 6 a | 460 (W) [2] but if answer incorrect 230 x 2 [1] | 2 | allow answer in the table if answer line blank [1] |
| b | oven (no mark) greatest power / most watts [1] longest time / used for longer / greatest hours [1] | 2 | If appliance line blank allow greatest power / 2000W or longest time / 5hours to identify oven. If appliance line incorrect zero marks allow power is 2000 and time is 5 [1] allow higher level answers e.g. longest power x time [2] not just used most must mention time |
| c | (step down) transformer [1] | 1 | ignore type of transformer |
| Total | | 5 | |

| Question | Answer | Marks | Guidance |
|--------------|---|----------|---|
| 7 | made of rock [1] have caused craters / dust / fires / species extinction / named species [1] | 2 | ignore ice / metal / dust ignore collided with Earth |
| Total | | 2 | |

| Question | Answer | Marks | Guidance |
|--------------|--|----------|--|
| 8 | <p>Level 3: (5 – 6 marks) Reference to the three types of radiation <u>AND</u> two safety precautions. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2: (3 – 4 marks) Reference to two types of radiation <u>AND</u> a simple safety precaution. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1: (1 – 2 marks) Simple reference to two types of radiation <u>OR</u> a simple safety precaution. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0: (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p> | 6 | <p>This question is targeted up to grade E Indicative scientific points may include:</p> <p>radiations</p> <ul style="list-style-type: none"> • alpha • beta • gamma <p>safety precautions</p> <ul style="list-style-type: none"> • use tongs • keep a safe distance • do not point at people or body part • protective clothing • short exposure time • shielded storage • labelled storage <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p> |
| Total | | 6 | |

| Question | Answer | Marks | Guidance |
|----------|--|----------|--|
| 9 a | 8.3 (m/s) [2] but if incorrect $\frac{100}{12}$ [1] | 2 | allow 8.333 (m/s) [1] |
| b i | 2.5 [2] but if incorrect $\frac{10}{4}$ [1] m/s^2 [1] | 3 | allow m/s/s [1] |
| b ii | 150 (N) [2] but if incorrect 60×2.5 [1] | 2 | allow ecf answer to b x 60 correctly calculated [2] allow ecf answer to b x 60 uncalculated [1] |
| | Total | 7 | |

| Question | Answer | Marks | Guidance | | | | | | | | | | | | |
|--------------|--|----------|--|---|--|---|---|--|--|---|--|--|---|---|---|
| 10 a | <table border="1" data-bbox="414 197 927 308"> <tr> <td data-bbox="414 197 539 232">A</td> <td data-bbox="539 197 665 232"></td> <td data-bbox="665 197 790 232">✓</td> <td data-bbox="790 197 927 232"></td> </tr> <tr> <td data-bbox="414 232 539 267">B</td> <td data-bbox="539 232 665 267">✓</td> <td data-bbox="665 232 790 267"></td> <td data-bbox="790 232 927 267"></td> </tr> <tr> <td data-bbox="414 267 539 303">C</td> <td data-bbox="539 267 665 303"></td> <td data-bbox="665 267 790 303"></td> <td data-bbox="790 267 927 303">✓</td> </tr> </table> <p data-bbox="981 329 1025 360">[2]</p> | A | | ✓ | | B | ✓ | | | C | | | ✓ | 2 | <p data-bbox="1167 197 1346 227">all correct [2]</p> <p data-bbox="1167 227 1384 258">any 1 correct [1]</p> <p data-bbox="1167 294 1682 324">ignore any line with more than one tick</p> |
| A | | ✓ | | | | | | | | | | | | | |
| B | ✓ | | | | | | | | | | | | | | |
| C | | | ✓ | | | | | | | | | | | | |
| b | <p data-bbox="315 406 891 437">decrease speed / travel at a lower speed [1]</p> <p data-bbox="315 505 969 535">make the car (more) streamlined /aerodynamic [1]</p> | 2 | <p data-bbox="1167 406 1570 437">allow diagram streamlining e.g</p> <div data-bbox="1442 443 1615 489" style="text-align: center;">  </div> <p data-bbox="1644 474 1688 505">[1]</p> <p data-bbox="1167 505 1951 535">Allow examples eg close the windows /remove roof-rack (1)</p> | | | | | | | | | | | | |
| Total | | 4 | | | | | | | | | | | | | |

| Question | Answer | Marks | Guidance |
|--------------|---|----------|--|
| 11 | <p>[Level 3] Describes the correct trend in speed AND acceleration using numerical figures from the graph. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Describes the correct trend in speed using numerical figures from the graph. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Describes the correct trend in the speed. 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 C</p> <p>Indicative scientific points at level 3 may include:</p> <ul style="list-style-type: none"> • acceleration for 10 seconds • steady speed / no change in acceleration for 60 seconds • deceleration for 10 seconds • acceleration is same as deceleration • acceleration = 1.5 m/s^2 <p>allow higher level calculations of acceleration</p> <p>Indicative scientific points at level 2 may include:</p> <ul style="list-style-type: none"> • speeds up (steadily) for 10 seconds • steady speed for 60 seconds • slows down (steadily) for 10 seconds <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> • speeds up • steady speed • slows down <p>Use the L1, L2, L3 annotations; do not use ticks.</p> |
| Total | | 6 | |

| Question | Answer | Marks | Guidance |
|----------|--------------|----------|---|
| 12 a | Nick [1] | 1 | |
| b i | B [1] | 1 | allow correct answer circled, ticked or underlined if no answer on the answer line |
| ii | A [1] | 1 | allow correct answer circled, ticked or underlined if no answer on the answer line |
| | Total | 3 | |

| Question | Answer | Marks | Guidance |
|----------|--|----------|--|
| 13 a | <p>C</p> <p>Maximum of one for: compare injuries from (a variety of) crashes / compare effects on crash dummies / measure force / acceleration / stretch / momentum [1]</p> <p>and maximum of one from</p> <p>for different materials / seatbelts [1]</p> <p>for different people [1]</p> <p>for different speeds [1]</p> <p>for seat positions [1]</p> | 2 | <p>Marking points are independent</p> <p>eg. different types of seatbelt [1] old design of belt compared with new designs [1] lap belt compared to 3-point belt [1]</p> <p>eg. sizes</p> |
| b | <p>any two from</p> <p>crumple zones [1]</p> <p>air bags [1]</p> <p>collapsible steering wheel [1]</p> <p>side impact bars [1]</p> | 2 | |
| c | D [1] | 1 | allow correct answer circled, ticked or underlined if no answer on the answer line |
| | Total | 5 | |

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