

## **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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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.

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Annotations used in scoris

Annotation	Meaning
	Blank Page – this annotation <b>must</b> 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 <b>not</b> 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
<b>allow</b>	= answers that can be accepted
<b>not</b>	= answers which are not worthy of credit
<b>reject</b>	= answers which are not worthy of credit
<b>ignore</b>	= 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><b>any three from</b></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><b>ignore</b> just cancer /mutate</p> <p><b>allow</b> problems with eyes</p> <p><b>allow</b> skin becomes wrinkly</p> <p><b>allow</b> 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><b>allow</b> higher level answers: e.g. ozone broken down / converted to oxygen [1]</p> <p><b>allow</b> use of aerosols / higher level answers e.g. CFC's [1]</p> <p><b>ignore</b> global warming / CO<sub>2</sub></p>

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

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

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



Question	Answer	Marks	Guidance
3 a	<p><b>any two from</b></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 <b>starting</b> temperature (of milk) [1]</p>	2	<p><b>allow</b> same oven power [1]</p> <p>if no other answers <b>allow</b> 'only change one thing at a time' for [1]</p>
b	heat the water (in milk) / AW [1]	1	<p><b>allow</b> heat the fat (in milk) [1]</p> <p><b>allow</b> microwaves are absorbed by water / fat [1]</p> <p><b>allow</b> 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	<b>allow</b> microwaves penetrate the glass / beaker [1]
d	<p>black absorbs <b>more</b> IR / heat ( than white) / ORA [1]</p> <p>white reflects <b>more</b> IR /heat (away than black) / ORA [1]</p>	2	<p><b>allow</b> black absorbs heat more quickly ORA [1]</p> <p><b>allow</b> 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>
	<b>Total</b>	<b>6</b>	

## Section B MARK SCHEME

Question	Answer	Marks	Guidance
4 a	<p><b>any two from</b></p> <p>use light (energy) from sun / sunlight / light [1]</p> <p>converted to electricity [1]</p> <p>charges the battery [1]</p>	2	<b>allow</b> absorb light / light hits photocell [1]
b	<p>by the (charged) battery / AW [1]</p> <p><b>but</b></p> <p>battery provides electricity / power(at night) / AW [2]</p> <p><b>or</b></p> <p>battery has stored energy [2]</p>	2	<p><b>allow</b> battery makes it work [1]</p> <p><b>allow</b> 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><b>allow energy</b> is free /saves money[1]</p> <p><b>allow</b> no need for generator</p>
	<b>Total</b>	<b>5</b>	

Question	Answer	Marks	Guidance
5 a  c	(Water vapour) – (water evaporating) from sea / lakes / rivers / clouds / rain / or combustion [1]  (CO <sub>2</sub> ) –combustion / respiration / AW [1]  (Methane) – decomposition / AW [1]	3	<p><b>allow</b> specific examples such as large scale boiling of water [1] eg. (fuel) power stations [1] <b>ignore</b> using kettle and other small scale water vapour production methods. <b>allow</b> volcanoes [1]</p> <p><b>allow</b> volcanoes / (using) vehicles or engines / (fossil or biofuel) power stations / factories or industry / breathing (out) / release from oceans [1] ignore <b>nuclear</b> power station <b>Ignore simply</b> ‘human activity’</p> <p><b>allow</b> named decomposition e.g. (gas from) cows / animal waste / permafrost / bogs / rice fields / biofuels / fermentation [1] allow volcanoes [1]</p>
b  c	Atmosphere absorbs IR / AW [1]	1	<p><b>allow</b> atmosphere traps IR / stops or reduces the IR reaching the Earth [1] <b>allow</b> higher level answers e.g. refracts the IR [1]</p> <p><b>ignore</b> merely reflects <b>IR</b> / changes the wavelength / ozone</p> <p><b>ignore</b> references to heat</p>

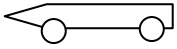
Question	Answer	Marks	Guidance
c C	<p>(UK may be colder but) other places are probably hotter / AW [1]</p> <p>It is just an opinion / belief (rather than based on reliable scientific evidence) [1]</p> <p>average (global) temperature is more reliable [1]</p> <p>temperature fluctuations (locally) do not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

Question	Answer	Marks	Guidance
6 a	460 (W) [2]  <b>but if answer incorrect</b>  230 x 2 [1]	2	<b>allow</b> 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	<b>If</b> appliance line blank allow greatest power / 2000W or longest time / 5hours to identify oven. <b>If</b> appliance line incorrect zero marks  <b>allow</b> power is 2000 and time is 5 [1]  <b>allow</b> higher level answers e.g. longest power x time [2] not just used most must mention time
c	(step down) transformer [1]	1	<b>ignore</b> type of transformer
<b>Total</b>		<b>5</b>	

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

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

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

Question	Answer	Marks	Guidance												
10 a	<table border="1"> <tr> <td>A</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>B</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>C</td> <td></td> <td></td> <td>✓</td> </tr> </table> <p>[2]</p>	A		✓		B	✓			C			✓	2	<p><b>all</b> correct [2]</p> <p><b>any</b> 1 correct [1]</p> <p><b>ignore</b> any line with more than one tick</p>
A		✓													
B	✓														
C			✓												
b	<p>decrease speed / travel at a lower speed [1]</p> <p>make the car (more) streamlined /aerodynamic [1]</p>	2	<p><b>allow</b> diagram streamlining e.g</p> <div style="text-align: center;">  </div> <p>[1]</p> <p><b>Allow</b> examples eg close the windows /remove roof-rack (1)</p>												
	<b>Total</b>	<b>4</b>													



Question	Answer	Marks	Guidance
11	<p><b>[Level 3]</b>  <b>Describes the correct trend in speed AND acceleration using numerical figures from the graph.</b>            Quality of written communication does not impede communication of the science at this level.            (5 – 6 marks)</p> <p><b>[Level 2]</b>  <b>Describes the correct trend in speed using numerical figures from the graph.</b> Quality of written communication partly impedes communication of the science at this level.            (3 – 4 marks)</p> <p><b>[Level 1]</b>  <b>Describes the correct trend in the speed.</b> Quality of written communication impedes communication of the science at this level.            (1 – 2 marks)</p> <p><b>[Level 0]</b>            Insufficient or irrelevant science. Answer not worthy of credit.            (0 marks)</p>	6	<p><b>This question is targeted at grades up to C</b></p> <p><b>Indicative scientific points at level 3 may include:</b></p> <ul style="list-style-type: none"> <li>• acceleration for 10 seconds</li> <li>• steady speed / no change in acceleration for 60 seconds</li> <li>• deceleration for 10 seconds</li> <li>• acceleration is same as deceleration</li> <li>• acceleration = <math>1.5 \text{ m/s}^2</math></li> </ul> <p><b>allow</b> higher level calculations of acceleration</p> <p><b>Indicative scientific points at level 2 may include:</b></p> <ul style="list-style-type: none"> <li>• speeds up (steadily) for 10 seconds</li> <li>• steady speed for 60 seconds</li> <li>• slows down (steadily) for 10 seconds</li> </ul> <p><b>Indicative scientific points at level 1 may include:</b></p> <ul style="list-style-type: none"> <li>• speeds up</li> <li>• steady speed</li> <li>• slows down</li> </ul> <p><b>Use the L1, L2, L3 annotations; do not use ticks.</b></p>
<b>Total</b>		<b>6</b>	

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

Question	Answer	Marks	Guidance
13 a	<p><b>C</b></p> <p><b>Maximum of one for:</b>  compare injuries from (a variety of) crashes /  compare effects on crash dummies /  measure force / acceleration / stretch / momentum [1]</p> <p><b>and maximum of one from</b></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><b>Marking points are independent</b></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><b>eg. sizes</b></p>
b	<p><b>any two from</b></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	<b>allow</b> correct answer circled, ticked or underlined if no answer on the answer line
	<b>Total</b>	<b>5</b>	

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