

## **GCSE**

### **Physics B**

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

General Certificate of Secondary Education

### **Mark Scheme for June 2017**

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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 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.

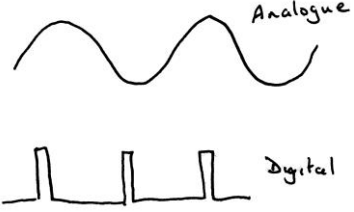
- / = alternative and acceptable answers for the same marking point
- (1) = separates marking points
- allow** = answers that can be accepted
- not** = answers which are not worthy of credit
- reject** = answers which are not worthy of credit
- ignore** = statements which are irrelevant
- ( ) = words which are not essential to gain credit
- = 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

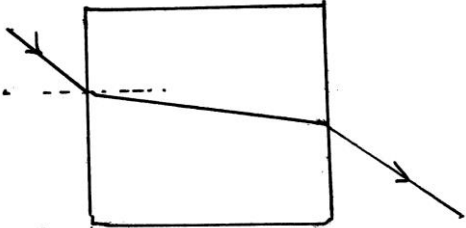
## MARK SCHEME

Question	Answer	Marks	Guidance
1 a	solidifying (1)  energy is given off due to a change in state/AW (1)	2	<b>allow</b> freezing (1) <b>allow</b> changing from liquid to solid (1) <b>allow</b> temperature staying the same (1)
b	<b>any two from:</b>  (approaches, stays) at room temperature (1)  temperature difference is reduced/zero (1)  no (net) transfer of energy (1)	2	
		<b>4</b>	

Question	Answer	Marks	Guidance
2	one payback time calculated (1)  <b>and any one from:</b>  draught proofing because it has the shortest payback time (2)  loft insulation because it saves the most each year/AW (2)  cavity wall insulation because it has the largest yearly saving/AW (2)	3	double glazing 100 years loft insulation 2 years cavity wall insulation 3 years draught proofing 0.5 years /6 months  no marks for insulation on its own, must be linked to correct reason for (2) allow 1 mark for draught proofing is cheapest to install  if no marks scored on the second part, allow a second mark if two correct payback times calculated
	<b>Total</b>	<b>3</b>	

Question	Answer	Marks	Guidance
3 a	<p><b>Level 3: 5-6 marks</b>  <b>Three correct uses identified AND at least two advantages of wireless communication suggested.</b>  Quality of written communication does not impede communication of science at this level.</p> <p><b>Level 2: 3-4 marks</b>  <b>Two correct uses identified AND at least one advantage of wireless communication suggested.</b>  Quality of written communication partly impedes communication of science at this level.</p> <p><b>Level 1: 1-2 marks</b>  <b>At least one correct communication use identified</b>  Quality of written communication impedes the communication of science at this level</p> <p><b>Level 0: 0 marks</b>  Insufficient or irrelevant science. Not worthy of credit.</p> <p><b>Look</b> for links in the table. If only the table completed max level 1.</p>	6	<p>This question is targeted up to C</p> <p><b>Indicative scientific points may include (but are not limited to) the following:</b></p> <p><b><u>Uses</u></b></p> <p>radio waves – TV signals</p> <p>microwaves – mobile phones</p> <p>infrared – TV remote control</p> <p><b>allow</b> visible light – Morse code</p> <p><b><u>Advantages</u></b></p> <p>allows tracking</p> <p>portable</p> <p>convenient</p> <p>allows access when on the move</p> <p>no trailing wires</p> <p>no connection to a landline required</p> <p>works in remote locations</p>

<b>b</b>	<p><b>any two from:</b></p> <p>enables data to be checked/challenged/developed /shared (1)</p> <p>inform the public (1)</p> <p>peer review (1)</p> <p>scientists get credit for work / prevents plagiarism (1)</p>	2	
<b>C i</b>	<p>digital signals can only have two values/1 or 0/on or off (1)</p> <p>analogue signals have a continuously variable value/AW (1)</p>	2	<p><b>allow</b> full marks for two clearly labelled diagrams</p> 
<b>ii</b>	<p><b>any one from:</b></p> <p>more stations/channels available (1)</p> <p>less interference (with other broadcasts) (1)</p> <p>clearer broadcasts (1)</p> <p>better quality sound (1)</p>	1	—
	<b>Total</b>	<b>11</b>	

Question	Answer	Marks	Guidance
4 a	ray bends towards the normal within the block (up to the normal is acceptable but not past the normal)(1)  ray bends away from the normal as it leaves the block (1)  ray leaving the block is parallel to the ray entering the block – by sight (1)	3	 <p>If no other mark scored allow (1) for ray bending away from normal within the block</p>
b	15.0 (m/s) (1)	1	Allow 15
<b>Total</b>		<b>4</b>	

Question	Answer	Marks	Guidance
5 a	<b>any two from:</b> suntan (1)  sunburn (1)  skin cancer (1)  cataracts (1)  premature skin aging/AW (1)	2	<b>Allow</b> burns skin  <b>ignore</b> just cancer  <b>ignore</b> just eye damage
b	<b>any one from:</b> keep out of the sun (1)  cover up/wear clothing (1)  use sunscreen / suncream / sun lotion /sun protection / sun block(1)	1	<b>allow</b> stay inside
<b>Total</b>		<b>3</b>	



Question	Answer	Marks	Guidance
6 a	AC DC DC	2	all 3 correct = 2 marks 1 or 2 correct = 1 mark
b	<p><b>maximum two from:</b></p> <p>you need a sources of energy / fuel burned (1)</p> <p>steam produced (1)</p> <p>to cause a generator to turn / turbine spins (1)</p> <p><b>maximum two from:</b></p> <p>(electricity) passes through a (step-up) transformer (1)</p> <p>through a network of power lines / National Grid (1)</p> <p>it passes through a (step-down) transformer (1)</p> <p><b>low voltage</b> supplied to consumers (1)</p>	3	<b>Allow</b> boils water
c	<p>0.3 or 30% (2)</p> <p><b>If incorrect or incomplete then:</b></p> <p>30 / 100 <b>or</b> 30 x 100/100 <b>or</b></p> <p>0.3% <b>or</b></p> <p>30 (1)</p>	2	
		7	

Question	Answer	Marks	Guidance
7	<p><b>Level 3: 5-6 marks</b> Two detailed quantitative comments / comparisons <b>and</b> a reasoned decision made.</p> <p>Quality of written communication does not impede communication of science at this level.</p> <p><b>Level 2: 3-4 marks</b> Two quantitative comments / comparisons <b>or</b> two simple comments / comparisons and reasoned decision.</p> <p>Quality of written communication partly impedes communication of science at this level.</p> <p><b>Level 1: 1-2 marks</b> <b>Two simple comments / comparisons (qualitative)</b></p> <p>Quality of written communication impedes the communication of science at this level</p> <p><b>Level 0: 0 marks</b> Insufficient or irrelevant science. Not worthy of credit.</p>	6	<p><b>This question is targeted up to C</b></p> <p><b>Indicative scientific points may include (but are not limited to) the following:</b></p> <p><b>Allow</b> correct statements that refer to halogen bulbs</p> <p><b>Level 3</b> Leo should buy LED bulbs</p> <p>for 25000 hours you need 1 LED bulb for £6 and 10 halogen bulbs for £15 the saving is £9 for LED bulbs</p> <p>the energy cost for the LED bulb will only be a sixth of that for halogen bulbs</p> <p><b>Level 2</b> LED bulbs cost four times halogen bulbs to buy</p> <p>LED bulbs last ten times longer than halogen bulbs</p> <p>halogen bulbs use six times the energy compared to LED bulbs</p> <p><b>Level 1</b> halogen bulbs are cheaper to buy</p> <p>LED bulbs last longer</p> <p>halogen bulbs use more energy than LED bulbs</p>
	<b>Total</b>	<b>6</b>	

Question	Answer	Marks	Guidance
8 a	<p><b>any one from:</b></p> <p>Ptolemaic – all planets orbit the Earth (1)</p> <p>Ptolemaic – geocentric (1)</p> <p><b>AND</b></p> <p><b>any one from:</b></p> <p>Copernican – Earth and other planets orbit the Sun (1)</p> <p>Copernican – heliocentric (1)</p>	2	
b	<p><b>any one from:</b></p> <p>telescopes (1)</p> <p>computers (1)</p> <p>satellites/space travel (1)</p> <p>mathematical modelling (1)</p>	1	

<b>c i</b>	Anka (1) Imani (1)	2	<b>either order</b>
<b>ii</b>	<b>any one from:</b>  most galaxies are moving away from us (1)  few galaxies are moving towards us (1)  further galaxies travel faster (1)  closer galaxies travel slower than further galaxies (1)	1	<b>Allow</b> Galaxies travel at different speeds /AW (1) Not all galaxies travel at the speed of light (1)
<b>d</b>	an asteroid / comet / object on a <b>possible collision</b> course with Earth / AW (1)	1	<b>Idea that</b> it might hit Earth eg coming towards Earth
	<b>Total</b>	<b>7</b>	

Question	Answer	Marks	Guidance
<b>9 a</b>	source <b>A</b> : Beta (1) source <b>B</b> : Gamma (1)	2	<b>allow</b> $\beta$ <b>allow</b> $\gamma$
<b>b</b>	<b>any two from:</b> wear protective clothing (1) use tongs/keep your distance (1) keep exposure time short (1) use shielding / keep in lead box AW (1) face sources away from people (1)	2	
<b>c</b>	Harry (no mark) <b>Any one from:</b> deforestation reduces the number of trees (1) less carbon dioxide absorbed / removed from the atmosphere / less photosynthesis AW (1)	1	<b>allow</b> answer without mention of Harry if deforestation reason correct
	<b>Total</b>	<b>5</b>	

Question	Answer	Marks	Guidance
10 a i	2 (2)  <b>if incorrect allow</b>  26/13 (1)  m/s <sup>2</sup> (1)	3	<b>allow 2.0</b>          mark units independently <b>allow m/s/s or ms<sup>-2</sup> (1)</b>
ii	<b>any two from:</b>  avoid bias /AW (1)  to allow (accurate) comparisons (1)  level playing field (1)	2	Eg so that the manufacturer does not influence the outcome.  <b>Idea of</b> reliable data  Eg all manufacturers / tests are treated / performed in the same way. <b>Idea of</b> fair testing
b	<b>any one from:</b>  make it lighter/AW (1)  make it more streamlined/AW (1)  increase traction / AW (1)	1	
		<b>6</b>	

Question	Answer	Marks	Guidance
11	<p><b>Level 3: 5-6 marks</b> Explains fully the changes in KE and GPE between A and B or B and C. Quality of written communication does not impede communication of science at this level.</p> <p><b>Level 2: 3-4 marks</b> Gives a partial explanation of the changes in GPE and KE between A and B or B and C Quality of written communication partly impedes communication of science at this level.</p> <p><b>Level 1: 1-2 marks</b> Simple statement about KE and GPE. Quality of written communication impedes the communication of science at this level</p> <p><b>Level 0: 0 marks</b> Insufficient or irrelevant science. Not worthy of credit.</p>	6	<p>This question is targeted up to grade C</p> <p>Indicative scientific points may include (but are not limited to) the following:</p> <p><b>KE Statements</b></p> <p>at <b>A</b> kinetic energy is zero/a minimum at <b>B</b> kinetic energy is a maximum at <b>C</b> kinetic energy is zero/a minimum <b>allow</b> correct changes e.g. KE increases from zero to a maximum between <b>A</b> and <b>B</b> / decreases from maximum to zero between B and C</p> <p><b>GPE Statements (allow PE for GPE)</b></p> <p>at <b>A</b> gravitational potential energy is a maximum at <b>B</b> gravitational potential energy is a minimum/zero at <b>C</b> gravitational potential energy is a maximum <b>allow</b> correct changes e.g. GPE decreases from maximum to minimum between <b>A</b> and B / increases from minimum to maximum between B and C <b>allow</b> GPE for gravitational potential energy allow just potential energy for GPE as this is in the question <b>allow</b> KE for kinetic energy allow PE at C is less than PE at A</p> <p><b>simple statements include:</b> car has KE at B Car has PE at A or C KE depends on speed PE depends on / increases with height</p>
	<b>Total</b>	<b>6</b>	

Question	Answer	Marks	Guidance
12 a	B and C (1)	1	Both required in either order for the mark
b	D (1)	1	
c	A (1)	1	
	<b>Total</b>	<b>3</b>	

Question	Answer	Marks	Guidance
13 a	(work is done) when you lean against a wall (1) (work done depends on) the time it takes (1) (energy is) never transferred when work is done (1)	3	Look at parts (a) and (b) together. Eg. If work depends on distance and time in part (a) and part (b) corrects it to work depends on distance and force give credit in both parts. If part (a) has work depends on distance and time but this is not corrected in part (b) then the answer in (a) should be marked incorrect in line with the guidance below. If full statement or any correct part of statement is included in the answer to (a) then the answer is incorrect unless fully corrected in (b). Give marks for each statement if clear which parts were wrong even if written in correct form in this section.
b	<b>any one from:</b> no work is done when you lean against a wall/AW (1) work done depends on the distance and the force/AW (1) energy is transferred when work is done/AW (1)	1	
	<b>Total</b>	<b>4</b>	



Question	Answer	Marks	Guidance
14 a	kinetic energy/KE increases as speed increases (1)  <b>but</b>  kinetic energy/KE quadruples when speed doubles/AW (2)	2	
b	mass (1)	1	<b>ignore</b> weight
c	<b>any three from:</b>  take 2 images (1)  a set distance apart (1)  measure the time between the images (1)  calculate average speed using distance / time (1)	3	If not average speed camera max 2 marks.
	<b>Total</b>	<b>6</b>	

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