



**GCSE**

**Physics B**

Unit **B752/01**: 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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## Mark Scheme

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## 1. Annotations used in scoris

Annotation	Meaning
	correct response
	incorrect response
<b>BOD</b>	benefit of the doubt
<b>NBOD</b>	benefit of the doubt <b>not</b> given
<b>ECF</b>	error carried forward
	information omitted
<b>I</b>	ignore
<b>R</b>	reject
<b>CON</b>	contradiction

## 2. 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

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Question	Answer	Marks	Guidance
1 a	<b>any one from</b> cancer treatment or radiotherapy [1] sterilisation (of equipment or instruments) [1]	1	<b>not</b> breaking down kidney stones <b>not</b> neo natal scans
b	beta [1] gamma [1]	2	<b>either order</b>
c	<b>any two from</b> stay behind a screen [1] use a remote control [1] stay at a (safe) distance [1] wear protective clothing [1]	2	<b>allow</b> stay behind a lead screen [2]  <b>allow</b> go into another room [1]  <b>allow</b> wear lead (lined) clothing [2]  <b>allow</b> idea of limit exposure e.g. monitor exposure or wear a film badge [1]
	<b>Total</b>	<b>5</b>	

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Question	Answer	Marks	Guidance
2	<p><b>[Level 3]</b>  <b>Identifies the correct colour coding</b>  <b>AND describes why a 13A fuse is important</b>  <b>AND how the fuse operates.</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>Must have at least 2 from</b>  <b>Identifies the correct colour coding</b>  <b>OR recognises that no earth wire is required</b>  <b>OR describes why a 13A fuse is important.</b>            Quality of written communication partly impedes communication of the science at this level.            (3 – 4 marks)</p> <p><b>[Level 1]</b>  <b>Identifies the correct colour coding</b>  <b>OR recognises that no earth wire is required</b>  <b>OR basic understanding of a fuse.</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>Description about why the 13A fuse is important:</b></p> <ul style="list-style-type: none"> <li>• prevents further damage to hairdryer</li> <li>• 13A fuse is just above the normal working current for the hairdryer</li> <li>• a smaller fuse would blow</li> </ul> <p><b>Description about how the fuse operates:</b></p> <ul style="list-style-type: none"> <li>• currents above 13A cause the fuse to melt</li> <li>• this prevents current flow</li> <li>• disconnects from mains voltage</li> </ul> <p><b>Basic description of fuse</b></p> <ul style="list-style-type: none"> <li>• stops overloading</li> <li>• reduces risk of fire</li> </ul> <p><b>Recognises that no earth wire is required:</b></p> <ul style="list-style-type: none"> <li>• only two wires drawn on diagram / only two wires are needed</li> <li>• written indication that no earth wire is required e.g. no need to earth / no green-yellow wire</li> </ul> <p><b>Identification of the colour coding:</b></p> <ul style="list-style-type: none"> <li>• live is brown</li> <li>• neutral is blue</li> </ul> <p><b>Use the L1, L2, L3 annotations in scoris.</b>  <b>Do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	

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Question	Answer	Marks	Guidance
3 a	<p><b>any three from</b></p> <p>the balloon is an insulator [1]</p> <p>balloon is charged/ gains or loses electrons [1]</p> <p>opposite charges attract [1]</p> <p>water is attracted [1]</p>	3	<p><b>ignore</b> water bends</p> <p><b>allow</b> the idea that the balloon and water (closest to the balloon) are oppositely charged [2]</p> <p><b>ignore</b> pulling</p> <p><b>allow</b> higher level answers about induction</p>
b	<p><b>benefit: any one from</b> the idea that (as the petrol is pumped faster):</p> <p>people can fill up their cars faster [1]</p> <p>there will be fewer queues for petrol [1]</p> <p><b>risks: any one from the</b> idea that (as the petrol is pumped faster):</p> <p>charge could build up (quicker) [1]</p> <p>there is a (greater) risk of sparks / explosion / fire / static discharge [1]</p>	2	<p>Do not credit simple statements such as 'petrol leaves pump quickly' (as this is in the question).</p> <p><b>allow</b> it is quicker (to fill up) [1]</p> <p><b>allow</b> (idea that as the petrol is pumped faster) garage sells more fuel / increases profits [1]</p> <p><b>ignore</b> getting splashed with fuel / electric shock / static electricity</p>
<b>Total</b>		<b>5</b>	

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Question	Answer	Marks	Guidance
4 a i	<p><b>any one from</b></p> <p>both heat water / both produce steam [1]</p> <p>both have turbines [1]</p> <p>both use a generator (to generate electricity) [1]</p>	1	<p><b>ignore</b> nuclear 'fuel burns'</p> <p><b>ignore</b> merely 'different fuels used'</p> <p><b>ignore</b> just generate electricity</p>
ii	<p><b>any one from</b></p> <p>(nuclear power stations) use uranium [1]</p> <p>(nuclear power stations) use a nuclear reaction / coal burns but nuclear does not [1]</p> <p>(nuclear power stations) have a reactor / (nuclear power stations) do not have a furnace [1]</p> <p>(nuclear power stations) do not produce (named) greenhouse gases [1]</p> <p>(nuclear power stations) produce radioactive waste [1]</p>	1	<p><b>allow</b> plutonium or thorium [1]</p> <p><b>ignore</b> just 'different fuel'</p>
b	<p>fission [1]</p> <p>splitting [1]</p>	2	<p><b>allow</b> 'fission' for 2<sup>nd</sup> answer [1]</p>
<b>Total</b>		<b>4</b>	

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Question	Answer	Marks	Guidance
5 a	94 (W) [2]  <b>but if answer incorrect</b>  20 x 4.7 [1]	2	<b>allow</b> 230 x 4.7 or 1081 scores [1]
b i	Kenya <b>and</b> <b>high</b> (est) voltage / <b>high</b> (est) number (of volts in table) / 240(V) [1]	1	<b>Both required for the mark</b>  <b>Eg.</b> Kenya has a high number [1] <b>allow</b> since the current is constant it needs a high(er) voltage to get a high(er) power / wtte [1]
ii	Japan has low(est) input voltage [1]  <b>and one from</b> (so) less power output [1]  (so) less heat produced by the iron or iron does not get hot (enough)  (so) takes too long to heat up [1]	2	<b>allow</b> not powerful enough [1]  <b>allow</b> less energy supplied [1]
	<b>Total</b>	<b>5</b>	



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Question	Answer	Marks	Guidance
6 a	idea that the force is caused by the seat belt <b>slowing</b> the dummy down [1]	1	<b>allow</b> air bag or steering wheel or dash board or windscreen stops slows down the dummy [1]
b	particles move/ AW or spread out [1]  particles hit inside (surface) of airbag / AW [1]	2	<b>allow</b> moving particles push the bag outwards [2]
<b>Total</b>		<b>3</b>	

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Question	Answer	Marks	Guidance
7 a	transverse (waves.) [1]	1	if answer line blank <b>allow</b> correct answer circled or underlined in the list more than one answer = 0 marks
b i	1000 (metres) or 10000 (metres) or 100000 (metres) [1]	1	<b>allow</b> any number more than 1000 (metres) [1]
ii	(idea that) waves travel around the Earth / waves travel over horizon / do not need a satellite [1]	1	<b>allow</b> it allows ships to navigate (over great distances) [1] <b>allow</b> ships to send signals a <b>long</b> way [1]
c	(0.01 m waves) can pass through the atmosphere [1]	1	<b>allow</b> longer wavelengths cannot pass through the atmosphere [1] <b>allow</b> not deflected by atmosphere [1] <b>allow</b> satellites are beyond the atmosphere [1]
d	(strong signal because) waves add together [1]  (weak signal because) waves subtract or cancel from each other [1]	2	<b>allow</b> marking points illustrated by diagrams <b>allow</b> specific examples e.g. light waves add to produce bright light [1] <b>allow</b> higher level answers e.g. two peaks cause a high(er) peak [1]  <b>allow</b> higher level answers e.g. a peak and a trough cancel out [1]  if no other marks awarded <b>allow</b> waves interact or waves overlap or unexplained reference to constructive or destructive interference [1]
<b>Total</b>		<b>6</b>	

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Question	Answer	Marks	Guidance
8 a	<b>any two from</b> shadows [1] eclipses [1] lasers [1] pinhole camera [1]	2	<b>allow any two</b> reasonable illustrative examples eg dust in a ray of sunlight
b	<b>refracts</b> [1] <b>violet</b> [1] <b>shortest</b> [1]	3	
	<b>Total</b>	<b>5</b>	

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Question	Answer	Marks	Guidance
9 a i	speed is scalar / velocity is vector [1]  or  velocity gives direction / speed does not have direction / AW [1]	1	<b>allow</b> one is scalar and the other is vector [1]  <b>allow</b> speed <b>only</b> has size / magnitude [1]
ii	Y [1]  Maximum of one mark for the (idea that):  - same direction so add velocities [1]  - opposite direction so subtract velocities [1]  - (resultant is) <b>6m/s</b> [1]	2	<b>more than one letter = 0 marks</b> <b>if V, W or X is chosen then [0]</b> (see advice below) if no letter is chosen one mark is still available  ----- In the unusual circumstances that a candidate misinterprets the information such that boat velocity is taken as the resultant velocity then award a maximum of [1] mark for W <b>and</b> X.
b	28 (m) scores [2]  but if answer is incorrect or incomplete then either  $4 \times 7$ or $\frac{8 \times 7}{2}$ or $\frac{2+6}{2} \times 7$ [1]	2	<b>allow</b> alternative approach using $s=ut + \frac{1}{2}at^2$
	<b>Total</b>	<b>5</b>	

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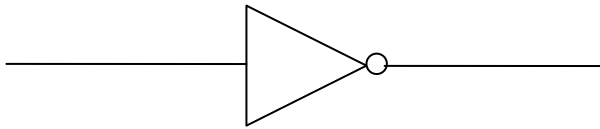
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Question	Answer	Marks	Guidance
10	<p><b>Level 3: (5 – 6 marks)</b>  <b>Correct statement regarding acceleration in vertical OR horizontal direction</b>  <b>AND compares trajectories or relative speeds.</b>            Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2: (3 – 4 marks)</b>  <b>Answer compares the speeds of marbles with a reason</b>  <b>AND</b>  <b>compares the trajectories</b>            Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1: (1 – 2 marks)</b>  <b>Answer compares the speeds of marbles</b>  <b>OR describes the trajectories simply.</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><b>This question is targeted up to grade C</b></p> <p><b>To reach Level 3 a correct statement regarding acceleration in at least one direction is needed</b></p> <p><b>Indicative scientific points may include:</b></p> <p><b>Describing the accelerations</b></p> <ul style="list-style-type: none"> <li>• no horizontal acceleration</li> <li>• there is constant vertical acceleration</li> </ul> <p><b>Comparing trajectories</b></p> <ul style="list-style-type: none"> <li>• paths are parabolic</li> <li>• path V3 is more curved as it is moving faster (horizontally)</li> </ul> <p><b>Comparing speeds</b></p> <ul style="list-style-type: none"> <li>• V1 slowest / V3 fastest / AW</li> <li>• because V3 travels furthest</li> </ul> <p><b>Simple description of trajectory</b></p> <ul style="list-style-type: none"> <li>• curved paths</li> </ul> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></p>
	<b>Total</b>	<b>6</b>	

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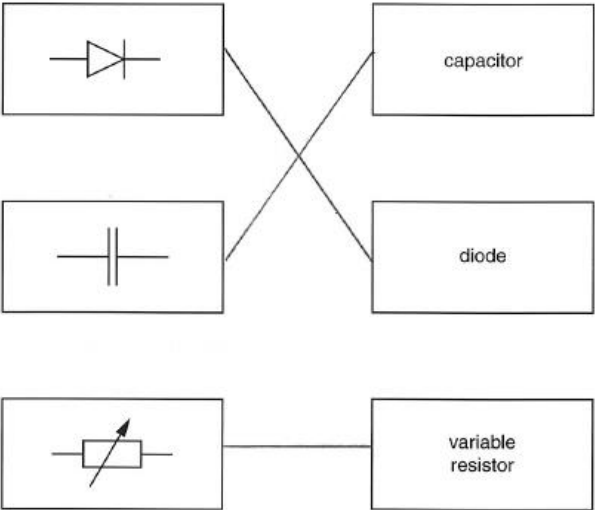
Question	Answer	Marks	Guidance									
11 a i	 <p style="text-align: right;">[1]</p>	1										
ii	<table border="0"> <tr> <td>(input)</td> <td>output</td> <td></td> </tr> <tr> <td>(0)</td> <td>1</td> <td></td> </tr> <tr> <td>(1)</td> <td>0</td> <td>[1]</td> </tr> </table>	(input)	output		(0)	1		(1)	0	[1]	1	<b>all three required for 1 mark</b>
(input)	output											
(0)	1											
(1)	0	[1]										
b i	<p><b>any two from</b></p> <p>NOT gate can only give a small current [1]</p> <p>LED needs a small current [1]</p> <p>filament bulb needs a large current [1]</p>	2	<p><b>allow</b> NOT gate not powerful enough to light filament bulb [1]</p> <p><b>allow</b> LED is low power [1]</p>									
ii	<p><b>advantage</b>  <b>any one from</b>  works straight away from the logic gate  LED can be seen (above the noise)  LED can be noticed (above the noise)  LED are cheap / LED are cheap to run [1]</p> <p><b>disadvantage</b>  <b>any one from</b>  LED isn't very bright  LED may not be noticed  LED is very small [1]</p>	2	<b>allow</b> LED does not need to be replaced (as) often [1]									
<b>Total</b>		<b>6</b>										

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Question	Answer	Marks	Guidance
12 a	150 (ohms) [1]	1	
b	<b>B</b> [1]  <b>idea</b> that the ratio of these resistors is the same as required for the voltage split [1]	2	<b>if another choice made then [0] marks awarded</b> if answer line blank <b>allow</b> correct row identified in the table  <b>allow</b> ratio is 1:2 or a calculation with 4V as the answer
c	4 (ohms) <b>and</b> no [2]  <b>but if answer incorrect</b>  4 (ohms) <b>and</b> yes [1]  <b>or</b>  4 (ohms) and question unanswered [1]  <b>or</b>  $\frac{12}{3}$ [1]	2	
	<b>Total</b>	<b>5</b>	

Question	Answer	Marks	Guidance
13 a	<p data-bbox="421 263 555 284">circuit symbol</p> <p data-bbox="831 263 891 284">name</p>  <p data-bbox="987 874 1025 906">[2]</p>	2	3 lines correct = 2 marks 1 or 2 lines correct = 1 mark
<b>Total</b>		<b>2</b>	



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Question	Answer	Marks	Guidance
14	<p><b>Level 3: (5 – 6 marks)</b>  <b>Answer shows a detailed explanation of how temperature affects the resistance of a filament bulb.</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>Answer gives a simple explanation of how temperature affects the resistance of a filament bulb</b>  <b>AND</b>  <b>resistance is caused by collisions.</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 description of resistance changes</b>  <b>OR simple description of a change in the bulb</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 C</p> <p>Indicative scientific points may include (but are not limited to) the following:</p> <p><b><u>Detailed explanation</u></b></p> <ul style="list-style-type: none"> <li>• as current increases, temperature increases</li> <li>• as current increases, resistance increases</li> <li>• electrons collide with atoms/ions in the conductor</li> <li>• more collisions equals more resistance</li> <li>• as temperature increases the atoms vibrate more</li> <li>• more collisions causes temperature increase</li> <li>• more vibrations cause more collisions, so resistance increases</li> </ul> <p><b><u>Simple explanation</u></b></p> <ul style="list-style-type: none"> <li>• as temperature increases, resistance increases</li> <li>• current is a flow of charge/electrons in a filament</li> <li>• simple idea of resistance caused by electrons hitting atoms/ions</li> </ul> <p><b><u>Simple descriptions</u></b></p> <ul style="list-style-type: none"> <li>• bulb heats up / temperature increases</li> <li>• resistance increases</li> </ul> <p><b>allow</b> wire in place of filament  <b>allow</b> nuclei, positive nuclei, in place of atoms</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks</b></p>
	<b>Total</b>	<b>6</b>	

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Question	Answer	Marks	Guidance
15 a	box next to 50Hz ticked [1]	1	<b>allow</b> any indication of the correct answer more than one box ticked = 0 marks
b i	12 (V) [1]	1	<b>ignore</b> any sign e.g. + or -
ii	during <b>A</b> and <b>C</b> current gets though [1] during <b>B</b> and <b>D</b> current does not get through [1]  <b>or</b> during <b>A</b> and <b>C</b> current does not get though [1] during <b>B</b> and <b>D</b> current gets through [1]	2	<b>if no other marks are scored allow</b> diode allows current to flow in one direction only [1]
<b>Total</b>		<b>4</b>	

Question	Answer	Marks	Guidance
16	<b>B</b> and <b>C</b> [1]  (idea that) the output voltage is higher than the input voltage / ora [1]	2	<b>both</b> required in either order
<b>Total</b>		<b>2</b>	

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Question	Answer	Marks	Guidance
17 a i	140 (kWh) [2]  <b>but if answer is incorrect</b>  5 x 4 x 7 scores [1]	2	also if answer is incorrect or incomplete then as an alternative <b>allow:</b> 28 x 5 or 20 x 7 [1]
ii	Austria [1]  Germany [1]	2	any order  if more than two countries then deduct [1] for each incorrect response e.g. Austria, Germany, UK [1] Austria, UK [1] Austria , UK, Sweden [0]
iii	others will be using more than 20.5kWh /AW [1]	1	<b>allow</b> some will use more and some will use less [1] <b>allow</b> it is an average so people use more or less [1] <b>ignore</b> it is just an average <b>ignore</b> people do not use the same
iv	(idea of) more people in UK or less people in Belgium [1]	1	<b>allow</b> different populations [1] <b>allow</b> justified examples e.g. industry use in UK is higher [1] Belgium uses more gas / wastes less energy [1] (idea that) Belgium uses more efficient appliances (than the UK) [1] <b>Eg.</b> Belgium uses more LEDs than the UK [1] <b>Allow</b> other sources of power used. Eg solar heating of water [1]

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Question	Answer	Marks	Guidance
<b>b i</b>	1200 [2]  J [1]  but if answer is incorrect  2.00 x 12 x 50 scores [1]	3	<b>NOT</b> W/s or W But <b>allow</b> J/s [1] mark unit independently e.g. 6 J [1] 1200 W [2] 2 x 12 x 50 J [2] 2 x 12 x 50 W [1]
<b>ii</b>	increases / AW [1]	1	<b>allow</b> 'faster' conduction / AW [1]
	<b>Total</b>	<b>10</b>	

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