



GCSE

Physics B

Unit **B752/01**: Unit 2 – Modules P4, P5, P6 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2014

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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 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

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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

Question	Answer	Marks	Guidance
1 a i	B [1]	1	more than one scores 0 marks if answer line blank allow correct answer indicated in list or on diagram
ii	wavelength [1]	1	
b	<p>no (no mark)</p> <p>(idea that) we can't hear high pitched sounds [1]</p> <p>BUT</p> <p>We cannot hear 20 000 (Hz) (or above) scores [2]</p> <p>no (no mark)</p> <p>(idea that) humans cannot hear high pitched sounds cannot frequency or 25 000 (Hz) is higher than humans can hear / [1]</p> <p>but</p> <p>we cannot detect frequencies above 20 000 Hz / (idea that) humans cannot hear sounds above 20 000 Hz [2]</p>	2	<p>'yes' scores [0]</p> <p>Aallow (idea that) 25 000 (Hz) is higher than we can hear [1]</p> <p>Aallow frequencies above a threshold: eg. Can't hear above 18 000 (Hz) [1]</p> <p>Aallow 20kHz</p> <p>Aallow correct references to wavelength for [1]</p>
c	<p>any two from</p> <p>so doctor knows where /what the problem is [1]</p> <p>so doctor knows what the problem is/to diagnose the problem [1]</p> <p>so the doctor knows how severe / bad the problem is</p>	2	<p>allow so the doctor know where to make the cut in the skin [1]</p> <p>allow so the doctor knows how big to make the cut /or if the problem can be treated by keyhole surgery [1]</p>

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	[1] so the doctor knows if an (surgical) operation is needed/AW [1]		<u>allow it is safer than invasive surgery to see the problem [1]</u>
	Total	6	

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Question	Answer	Marks	Guidance
2	<p>[Level 3] Calculate two resistances correctly AND identifies how current and resistance changes with length of resistance wire AND gives a basic quantitative relationship Quality of written communication does not impede communication of the science at this level (5 – 6 marks)</p> <p>[Level 2] Calculate two resistances correctly AND identifies how current or resistance changes with length of resistance wire, <u>OR how resistance changes with length of resistance wire</u> Quality of written communication partly impedes communication of the science at this level (3 – 4 marks)</p> <p>[Level 1] Calculate at least one resistance correctly OR identifies how current or resistance changes with length of resistance wire 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. <u>To reach L3 both resistances must be calculated correctly.</u></p> <p>Indicative scientific points at level 3 may include: both calculations and descriptions from level 1 and 2 and</p> <ul style="list-style-type: none"> • <u>example of a quantitative relationship e.g. doubling the length of the resistance wire approximately doubles the resistance</u> <p>Indicative scientific points at level 1 and 2 may include:</p> <ul style="list-style-type: none"> • <u>resistance for length 20 cm = 3(.00)(ohms)</u> • <u>resistance for length 10 cm = 1.5(0) (ohms)</u> • <u>idea that as length of resistance wire increases the current decreases / ora</u> • <u>idea that as length of resistance wire increases the resistance increases / ora</u> <p>Use the L1, L2, L3 annotations in scoris. Do not use ticks.</p>
	Total	6	

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Question	Answer	Marks	Guidance
3 a i	(idea that it) varies [1]	1	<p>allow named examples ie it is higher in Finland / Spain [1]</p> <p>allow named examples ie it is lower in UK / Austria [1]</p>
ii	<p>any one from</p> <p>(more) radioactive rocks / uranium in rocks [1]</p> <p>(more) granite [1]</p> <p>(more) radon gas [1]</p>	1	<p>Consider 'more rocky' / type of rock at SSU</p> <p>allow (more) cosmic rays [1]</p> <p>allow higher level answers in terms of northern lights / near the northern lights [1] but not just Finland is further north / near the north pole</p>
b	<p>any one from</p> <p>to track dispersal of waste [1]</p> <p>to find leaks / blockages in underground pipes [1]</p> <p>to find the route of underground pipes / checking thickness or condition of metal [1]</p>	1	<p>ignore medical tracers at SSU</p> <p>consider measuring thickness of paper?</p> <p>and use of tracers in a named medical process (not just in medicine as this is in question 4)</p>
Total		3	

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Question	Answer	Marks	Guidance
4 a i	<p><u>Decreases</u> [1]</p> <p>but</p> <p>decreases by half / by 30 (decays per second) [2] decreases (by 30) (decays per second) [1]</p> <p>but</p> <p>reduces by half [2] decreases (by 30 (decays per second)) [1]</p> <p>but</p> <p>reduces by half [2]</p>	<p>222</p>	<p>allow from 60 to 30 [2] eg 60 and 30 indicated on graph scores [2]</p> <p>if NO marks awarded allow by one half life [1]</p> <p>allow from 60 to 30 [2] eg 60 and 30 indicated on graph scores [2]</p> <p>But if no other marks scored allow one half life [1]</p> <p>ignore decayed rapidly</p> <p>allow from 60 to 30 [2]</p>
ii	<p>line starting at 120 and always to the right and above right element A [1] line starting at 120 and always above and to the right of element A [1] line starting at 120 and decreasing with less steep gradient than element A [1]</p>	<p>111</p>	<p>Any line curving upwards (at any part) scores [0] graphs must not cross each other</p> <p>Look at first 4 days of the graph. NOT positive gradient</p>
b i	(idea that nuclear radiation) can increase risk of cancer or cell damage [1]	1	allow (idea that) the radioactivity is not in the body for a long time (to cause damage) [1]
ii	beta and gamma [1]	1	more than one scores 0 marks if answer line blank allow correct answer indicated in list

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Question	Answer	Marks	Guidance
5 a	<p>any three from</p> <p>spread of (paint) spray less for normal paint gun / spread of (paint) spray more for electrostatic paint gun [1]</p> <p>(idea that) paint (droplets) in normal paint gun uncharged [1]</p> <p>(idea that) <u>paint droplets in electrostatic gun have the same charge</u> [1]</p> <p>(idea that) <u>opposite-like</u> charged (paint) <u>particless</u> repel (so spreading the paint further) [1]</p> <p>(idea that) object is charged (oppositely to paint) [1]</p> <p><u>(idea that) in electrostatic gun paint droplets are attracted to object</u> [1]</p>	3	<p>allow marking points from labels on the diagrams</p> <p>allow (paint) spray identified as spreading once it leaves the paint gun [1]</p>
b	<p>become charged/ <u>loses or gains electrons</u>[1]</p> <p>(then) become earthed / charge or <u>electrons transferred to make object neutral</u>[1]</p>	2	<p>allow examples of becoming charged e.g. (insulating) materials rubbing together / taking sweater off / walking on carpet [1]</p> <p>allow when touching something that is earthed [1]</p> <p>BUT</p> <p>allow touching charged object causes current to flow to earth [2]</p>
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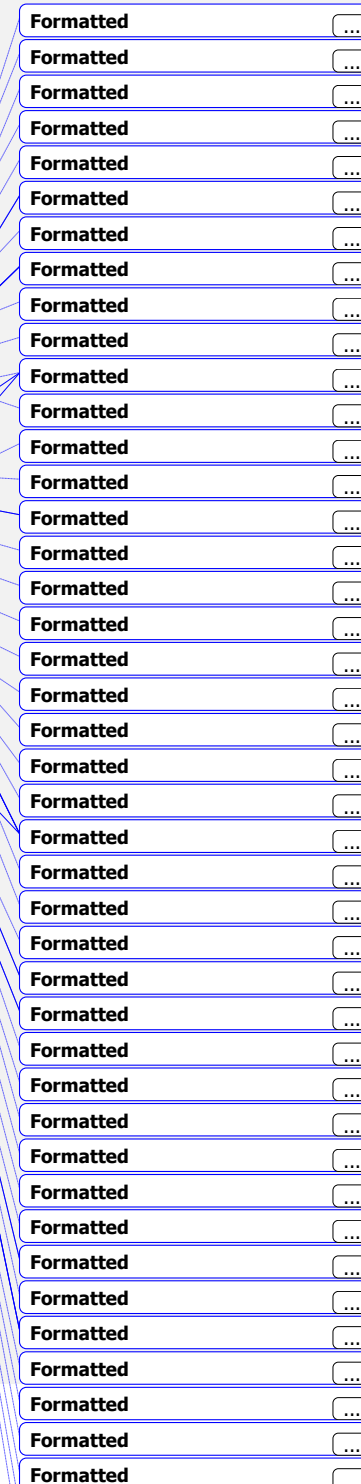
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Question	Answer	Marks	Guidance
8	<p>[</p> <p>Level 3]: (5 – 6 marks) Answer describes measurement of image distance AND at least 1 all other key points feature to of the experiment AND indicates producing an image on paper AND measures image distance with a ruler , AND explains focal length. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] : (3 – 4 marks) Answer indicates Describes at least two features of experiment producing an image on paper AND measures image distance with a ruler , OR OR explains focal length. Quality of written communication partly impedes communication of the science at this level. (3 - 4 marks)</p> <p>[Level 1]: (1 – 2 marks) Answer indicates Describes one feature of experiment idea of measuring thicknesses of lenses OR produces an image on paper OR explains focal length Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p>	6	<p>This question is targeted up grade E To reach Level 3 image must be formed on a screen</p> <p>Indicative scientific points may include:</p> <p>Focal length</p> <ul style="list-style-type: none"> • focal length is distance between lens and image (of a distant object) or distance between lens and focal point <p>Features of experiment:</p> <ul style="list-style-type: none"> • measures thickness of all lenses (with the mm ruler) • produce an image (of the tree on the card) • measure image distance • try all lenses <p>Allow for level 1 correct comparison of focal lengths of lenses</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks. This question is targeted up grade E Indicative scientific points may include:</p> <p>Level 3:</p> <ul style="list-style-type: none"> • Focal length is distance between lens and image (of a distant object) • Measure image distance with rule or ruler • Produce an image of the tree on the paper • Try all lenses



	<p>Level 0: (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p>		<p>Level 2:</p> <ul style="list-style-type: none"> • Produce an image of the tree on the paper • AND either Measure image distance with the cm ruler 1. OR explains focal length. <p>Level 1:</p> <ul style="list-style-type: none"> • either measures thickness of all lenses (with the mm ruler) • OR produces an image on paper • OR explains focal length <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
	<p>Total</p>	<p>6</p>	

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Question	Answer	Marks	Guidance
9 a	<p>Maximum range (achieved) at 45° [1]</p> <p>BUT</p> <p>Range rises with angle until 45° then falls [2]</p> <p>Maximum range (achieved) at 45° [1]</p> <p>Range rises with angle until 45° then falls [2]</p>	2	<p><u>ignore references to height</u></p> <p>eg 'the further away from 45° the lower the range scores' [2]</p> <p>if no marks awarded: <u>allow EITHER 'rises and falls' OR 'as the angle increases the range decreases' [1]</u> eg 'range goes up and then goes down' [1] <u>ignore references to height</u></p> <p><u>allow rises and falls</u> if the angle is too high or too low the range is low(or)[1]</p> <p><u>allow as angle increases range decreases (1)</u></p>
b	90° [1] 90° [1]	1+	<p><u>allow vertical / AW [1]</u></p> <p><u>allow suitable annotation of the diagram</u></p> <p><u>allow vertical / AW [1]</u></p> <p><u>allow suitable annotation of the diagram</u></p> <p><u>at SSU ask for cropping to include top diagram in case candidates draw their answer on the diagram</u></p> <p><u>at SSU ask for cropping to include top diagram in case candidates draw their answer on the diagram</u></p>
c i	<p>Parabolic / parabola [1]</p> <p>Parabolic / parabola [1]</p>	1+	<p><u>ignore curve / arc / arch on its own</u></p> <p><u>ignore trajectory</u></p> <p><u>ignore curve / arc / arch on its own</u></p> <p><u>ignore trajectory</u></p>

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			ignore curve on its own ignore trajectory
ii	<p><u>(Vertical / upward) velocity decreases [1]</u></p> <p><u>Acceleration (remains) constant / AW [1]</u></p> <p><u>Vertical / upward velocity decreases [1]</u></p> <p><u>Acceleration remains constant / AW [1]</u></p>	<u>22</u>	<p>Mark points independently: eg. vertical velocity and acceleration are reduced for a maximum of [1]</p> <p>eg. vertical velocity and acceleration are constant for a maximum of [1]</p> <p>eg. Gravity causes vertical velocity and acceleration are constant [1]</p>
iii	no effect (by gravity) / AW [1]	1	<p>allow doesn't (change) [1]</p> <p>allow (stays) constant [1]</p>
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Question	Answer	Marks	Guidance
10 a	<p>A LDR / light dependent resistor [1]</p> <p>B thermistor [1]</p> <p>A responds to light OR B responds to heat or temperature [1]</p>	3	<p>allow ecf on the naming of the components e.g. A is a thermistor that responds to temperature and B is an LDR that responds to light [1]</p> <p><u>allow resistance of thermistor increases with temperature OR</u></p>

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			resistance of LDR increases with light intensity [1]
b	 [1]	2	<p>one mark for symbol correct symbol [1]</p> <p>allow circle around diode symbol, triangle shaded in, or horizontal line through the triangle for symbol mark [1]</p> <p>one mark for direction correct direction [1]</p> <p>allow if symbol incomplete but includes triangle pointing in forward bias direction[1]</p>
	<p>BUT</p>  [2]		
	Total	5	

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Question	Answer	Marks	Guidance
<p><u>111</u> 4</p>	<p>[Level 3] <u>Answer includes one difference in output Voltage AND one similarity AND one difference in construction AND describes a correct use for either A or B Answer includes similarities and differences about construction, output voltage and uses</u> Quality of written communication does not impede communication of the science at this level (5 – 6 marks)</p> <p>[Level 2] <u>Answer includes one similarity and one difference in construction AND a correct use for either A or B OR one correct comparison of output voltage Answer includes similarities AND differences AND uses</u> Quality of written communication partly impedes communication of the science at this level (3 – 4 marks)</p> <p>[Level 1] <u>Answer includes two correct statements in terms of construction OR or output voltage or uses</u> 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><u>This question is targeted at grades up to C. Indicative scientific points may include:</u></p> <p><u>Construction -Similarities</u></p> <ul style="list-style-type: none"> • <u>both have an iron core / same material</u> • <u>both have the same input voltage / 20 volts/ AC</u> • <u>both have different numbers of turns on the primary compared to the secondary coils</u> • <u>both isolating transformers</u> • <u>input voltage is connected to the primary coil / output voltage is connected to the secondary coil</u> <p><u>Construction -Differences</u></p> <ul style="list-style-type: none"> • <u>transformer A has less turns on the primary / transformer B has more turns on the primary</u> • <u>transformer A has more turns on the secondary / transformer B has less turns on the secondary</u> <p><u>Output voltage</u></p> <ul style="list-style-type: none"> • <u>both change the output voltage</u> • <u>transformer A is a step-up transformer</u> • <u>transformer B is a step down transformer</u> • <u>the output of transformer A will be 40V or more than 20 V</u> • <u>the output of transformer B will be 10V or less than 20 V</u> <p><u>Uses</u></p> <ul style="list-style-type: none"> • <u>transformer A is used in the National Grid / used in (CRT) TVs</u> • <u>transformer B is used in e.g. mobile phone chargers / radios / laptops / National Grid (to decrease voltage) / any electronic device that is mains powered e.g. halogen lights</u> <p><u>Use the L1, L2, L3 annotations in scoris. Do not use ticks</u><u>This question is targeted at grades up to C.</u></p>

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			<p>Indicative scientific points may include:</p> <p>Similarities (in order of increasing demand)</p> <ul style="list-style-type: none"> • both have an iron core / same material • both have the same input voltage / 20 volts • both use AC • both have different numbers of turns on the primary compared to the secondary coils • both change the output voltage • both isolating transformers <ul style="list-style-type: none"> • input voltage is connected to the primary coil / output voltage is connected to the secondary coil <p>Differences (in order of increasing demand)</p> <ul style="list-style-type: none"> • transformer A has less turns on the primary / transformer B has more turns on the primary • transformer A has more turns on the secondary / transformer B has less turns on the secondary • transformer A is a step-up transformer • transformer B is a step-down transformer <p>Differences in output voltage</p> <ul style="list-style-type: none"> • the output of transformer A will be more than 20 V / correct value • the output of transformer B will be less than 20 V / correct value <p>Differences in uses</p> <ul style="list-style-type: none"> • transformer A is used in the National Grid (to increase voltage) / used in (CRT) TVs • transformer B is used in e.g. mobile phone chargers / radios / laptops / National Grid (to decrease voltage) / any electronic device that is mains powered e.g. halogen lights <p>Use the L1, L2, L3 annotations in scoris. Do not use ticks.</p>
	Total	6	
Question	Answer	Marks	Guidance

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12 a	<p>Input Output</p> <p>0 1</p> <p>1 (0)</p> <p>[1]</p>	1	all correct for 1 mark
b i	A and B [1]	1	more than one scores 0 marks if answer line blank allow correct answer indicated in list
ii	E [1]	1	more than one scores 0 marks if answer line blank allow correct answer indicated in list
iii	row X [1]	1	more than one scores 0 marks if answer line blank allow correct answer indicated in list
	Total	4	

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Question	Answer	Marks	Guidance
13 a are all straight lines / AW [1]	1	allow are not curved <u>or increase at steady rate [1]</u>
b i	(The voltage at X) is 2.4 (volts) and (The current at X is) 0.32 (amps) [1]	1	both required for 1 mark
ii	7.5 ohms [1]	1	more than one scores 0 marks if answer line blank allow correct answer indicated in list
c	E [1]	1	more than one scores 0 marks if answer line blank allow correct answer indicated in list
d	(charge carriers are) not neutrons they are electrons [1] (resistance does not stay the same) it changes / increases [1]	2	allow mistakes indicated on the text not resistance decreases
	Total	6	

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Question	Answer	Marks	Guidance
14 a	any two appliances in the home with motors correctly described [2]	2	<p>examples of appliances in the home with motors include</p> <p>CD player to turn CDs</p> <p>food processor to mix food</p> <p>electric drill to make a hole/ turn the drill (bit)</p> <p>electric screwdriver to turn the screw</p> <p>fan to turn the blades</p> <p><u>blender or food processor to chop and blend food</u></p> <p><u>microwave to spin the cooking plate</u></p> <p><u>dishwasher to move the water round</u></p> <p><u>fridge motor to move air/coolant around</u></p> <p><u>fan ovens to cook the food (faster)</u></p> <p><u>allow</u> lawnmower to turn blades / <u>cut grass</u></p>
b	<p>Factor (no mark)</p> <p>any two from</p> <p>(idea that) efficiency decreases with increasing current [1]</p> <p>best efficiency at 4 amps is 94% [1] <u>or best efficiency at 4 amps is 94% [1]</u></p> <p><u>best efficiency at 6 amps is 87% [1]</u></p> <p>best efficiency at 6 amps is 87% [1]</p> <p>(idea that) motor needs to have the best efficiency <u>in</u> range between 4 amps and 6 amps [1+]</p>	2	<p>ignore choice of motor</p> <p>if no marks awarded allow the idea that Factor has the highest average efficiency [1]</p>
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Question	Answer	Marks	Guidance
15 a	Maximum 2 marks B (Front row music festival) C (Large orchestra) D (Aircraft at take-off) H (MP3 player at maximum volume)	2	Mark letters on the line first If nothing on the line accept circled or ticked or underlined letters All 4 correct (with none wrong) [2] BUT 3 or 4 correct with one wrong [1] <u>No mark awarded if 2 incorrect</u>
b i	Loudness reduces with (increasing) distance [1] BUT (idea that) loudness falls quickly (with increasing distance) at first and slower later [2]	2	allow higher level answers <u>allow it changes very little after 22 to 24 metres [1]</u>
ii	82 to 83 (dB) [1]	1	
iii	<u>any two from</u> <u>Maximum 2 marks</u> Gardener above safe level / 90dB AW [1] People in house under safe level /90dB AW [1] <u>(idea that) gardener is exposed to the noise for more time [1]</u>	2	allow (idea that) <u>gardener is very close (so it is much louder) [1]</u> allow (idea that) <u>sound is stopped by walls or windows [1]</u>
c i	4 (hours) [1]	1	allow <u>Consider tolerance at SSU eg 3 - 6 (hours)?</u>
ii	Less than (4 minutes) [1]	1	NOT <u>less than or equal to 4 minutes</u> allow <u>up to 4 minutes [1]</u>
iii	<u>Any value from 78 to 79 (dB) [1]</u>	1	<u>Consider tolerance at SSU</u>
	Total	10	

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