

GCSE

Physics B

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

General Certificate of Secondary Education

Mark Scheme for June 2015

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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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Annotation	Meaning
	correct response
	incorrect response
BOD	benefit of the doubt
NBOD	benefit of the doubt not given
ECF	error carried forward
	information omitted
I	ignore
R	reject
CON	contradiction
L1	Level 1
L2	Level 2
L3	Level 3

Subject-specific Marking Instructions

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

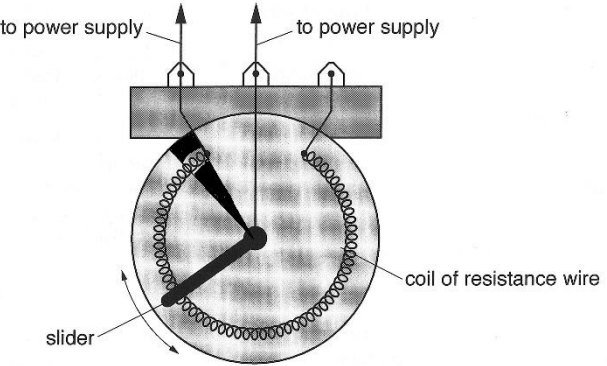
() = words which are not essential to gain credit

— = 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	D (1)	1	if answer line blank allow correct answer circled or underlined more than one answer = 0 marks
ii	D (1)	1	if answer line blank allow correct answer circled or underlined more than one answer = 0 marks
b	 <p style="text-align: right;">(1)</p>	1	allow drawn slider or clear mark anywhere within the black segment (1)

Question	Answer	Marks	Guidance
c	ohms (1) 4.7 (2) but if calculation incorrect 0.7 (1) 0.15 or 4.67 (1) or 4.66 (1)	3	allow Ω (1) allow any number of figures after the decimal point e.g. 4.6666 (1)
	Total	6	

Question	Answer	Marks	Guidance
2	<p>Level 3 Description and explanation of what is not correct for diagram AND description and explanation of what is not correct for table Quality of written communication does not impede communication of the science at this level (5 – 6 marks)</p> <p>Level 2 Description of what is not correct for diagram AND description of what is not correct for table</p> <p>OR</p> <p>Description and explanation for what is not correct in EITHER the table or the diagram Quality of written communication partly impedes communication of the science at this level (3 – 4 marks)</p> <p>Level 1 Description of what is not correct for diagram OR description of what is not correct for table 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>Descriptions of what is wrong in the diagram may include</p> <ul style="list-style-type: none"> • bands across the diagram • rarefaction wrong / compression wrong <p>Description and explanation of what is wrong in the diagram may include:</p> <ul style="list-style-type: none"> • longitudinal waves have a gradual change or do not have bands • rarefaction and compression are the wrong way round or compression is where the particles are more concentrated / ora <p>Descriptions of what is wrong in the table information may include:</p> <ul style="list-style-type: none"> • ultrasound is not a transverse wave • sound is not used to measure blood flow • ultrasound is not used for X-ray of bones • ultrasound is not used to cook food <p>Description and explanation of what is wrong in the table may include:</p> <ul style="list-style-type: none"> • ultrasound is a longitudinal wave • ultrasound is used to measure blood flow • X-rays are used to X-ray bones • microwaves / infrared are used to cook food <p>L1 can be scored by just annotating what is wrong on the diagram or table</p> <p>Use the L1, L2, L3 annotations in scoris. Do not use ticks.</p>
Total		6	

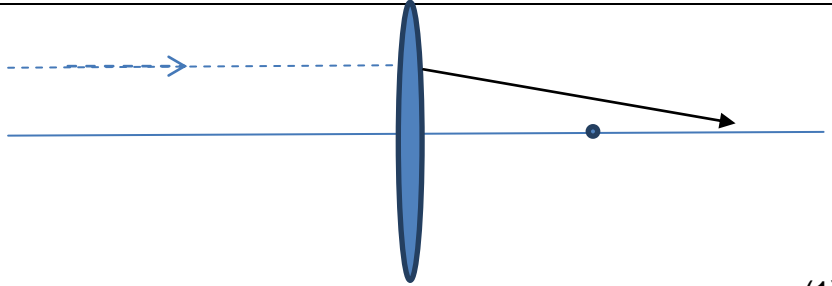
Question	Answer	Marks	Guidance
3 a	<p>any two from (idea that for absolute dating) absolute dating gives a more exact date / ora (1)</p> <p>(Idea about absolute dating) not enough Carbon-14 in old rocks (for absolute dating) or absolute dating only works when there is enough carbon in the sample (1)</p> <p>(idea that relative dating) can get the age of (very) old plants / wider age range of plants / ORA [1]</p> <p>(idea that for relative dating) need comparative data eg. requires knowledge of the ages of surrounding rocks (1)</p> <p>Idea that using both methods together gives a more reliable / valid / complete answer or both results support each other / [1]</p>	2	<p>allow Carbon dating for absolute dating</p> <p>Eg more accurate / precise / Ignore 'better result'</p> <p>allow relative dating can get the age of (very) old rocks [1]</p> <p>Eg both methods give more certain answer [1] Eg, both methods give more confidence in the result [1] Allow both methods give a more accurate answer [1]</p> <p>Accuracy mark can only be given once.</p>
b	lead (1)	1	<p>if answer line blank allow correct answer circled or underlined</p> <p>more than one answer = 0 marks</p>
	Total	3	

Question	Answer	Marks	Guidance
4 a	decrease (1) as time increases (1)	2	allow decrease with time (2) allow decrease faster initially /AW (2) allow higher level answers e.g. decrease exponentially (2)
b	the numbers half the fastest or the numbers half in less time / AW (1)	1	allow higher level answers e.g. the half-life is 50 ± 5 minutes or in each 100 minutes the numbers quartered ¹)
c	nucleus (1)	1	if answer line blank allow correct answer circled or underlined more than one answer = 0 marks
	Total	4	

Question	Answer	Marks	Guidance
5 a	<p>any one from</p> <p>gains charge from the carpet (1)</p> <p>idea of friction (between carpet and feet (1)</p> <p>the carpet is an insulator or his shoes are an insulator (1)</p> <p>he gains electrons / he loses electrons (1)</p> <p>any one from</p> <p>he touches another person (1)</p> <p>he touches something metal (1)</p> <p>(idea that) he is earthed (1)</p> <p>(idea that) he is discharged (1)</p>	2	<p>NOT Positive electrons</p> <p>Ignore ions</p>

Question	Answer	Marks	Guidance
b i	<p>electrostatic voltage or charge increases (with distance) AW (1)</p> <p>(idea of) voltage related to charge / electrons [1]</p> <p>but</p> <p>the increase in electrostatic voltage is faster at the start / increases slower at the end / the increase is not linear (2)</p>	2	<p>eg. the electrostatic voltage increases (with distance) as he gains (negative) charge or electrons [2]</p> <p>allow there is a steeper gradient at the start (1)</p> <p>allow trend shown with data from the graph: e.g. electrostatic voltage rises to 6kV in 2 metres but by only 2 in the next 3 metres [2]</p>
ii	<p>(idea that) greater voltage (gained) when there is less humidity / ORA</p> <p>Or</p> <p>idea that increase is more when there is less humidity / ORA (1)</p>	1	<p>answer needs to be comparative with reference to humidity</p> <p>allow more charge leaks away on a humid day (1)</p>

<p>iii</p>	<p>curved line starting a (0,0) with similar shape to those on graph but between the two lines (1)</p>	<p>1</p>	<p>allow any curved line starting at (0,0) and between the two lines on graph e.g.</p> <p>(1)</p> <p>BUT any line that touches either of the two original lines after the start scores (0)</p>
<p>Total</p>	<p>Total</p>	<p>6</p>	

Question	Answer	Marks	Guidance
6 a	(... it) REFRACTS (and). (1) (... colour A is) RED . (1) (... has the shortest) WAVELENGTH . (1)	3	not reflects
b	Any one from : reflective clothing / cat's eyes / reflector on the road / binoculars / periscopes / (some) cameras/ (some LCD) projectors/ optical fibres for communications (1)	1	allow named application of TIR e.g. endoscope (1) allow (fibre optic) Christmas trees
c i	convex (1)	1	allow biconvex (1)
ii	straight ray drawn from the original ray or lens to (or through) the focal point (1)	1	 <p style="text-align: right;">(1)</p> <p>ignore continuation of ray after focal point</p>
d	real image(1) on a screen or sensor or film (1)	2	allow upside down or diminished (1) allow on back of camera

Question	Answer	Marks	Guidance
e	<p>E C both in correct order and above (B) (1) (B) A D both in correct order and below (B) (1)</p>	2	<p>Allow both correct lenses above B and below B but in wrong order (1) ie C E (B) D A (1)</p>
Total		10	
7 a	<p>B [1] less than 30MHz / lowest frequency / fewest MHz / highest wavelength [1]</p>	2	<p>If B not chosen (0) Allow 15m or 20MHz [1] second mark is conditional on B being chosen look for a comparison. Eg. 'it's the low frequency one [1]</p>
b	<p>C (1) above 30GHz (waves absorbed or scattered) (1)</p>		<p>If C not chosen (0) Allow 0.006m or 50GHz [1] second mark is conditional on C being chosen</p>
Total		4	

Question	Answer	Marks	Guidance
8 a	(average speed) 3000 (m/s) (1) (distance travelled) 900000 (2) OR correct calculation of ecf average speed x 300 (2) BUT if distance answer incorrect 5 minutes converted to 300 seconds (1)	3	Allow 3000 x 5 (= 15000) OR ecf average speed x 5 (1)
b	(other) scientists (1) check work /check results / inform future direction of work or research / evaluate effectiveness (1)	2	
Total		5	

Question	Answer	Marks	Guidance
9	<p>Level 3 Description of experimental set up AND A detailed explanation of interference</p> <p>Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>Level 2 Description of experimental set up AND A simple explanation of interference</p> <p>Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 Description of experimental set up OR An attempt at an explanation of interference</p> <p>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 up to grade C</p> <p>Full marks can be awarded by labelled diagrams of experimental set up and explanation of interference effects</p> <p>Indicative scientific points may include:</p> <p>L3 Detailed Explanation Loud sounds made</p> <ul style="list-style-type: none"> • constructive interference • idea of in phase or (superpositioning of) peak + peak • constructive interference <p>Quiet sounds made by</p> <ul style="list-style-type: none"> • destructive interference • idea of out of phase or (superpositioning of) peak + trough <p>coherent sources or sources with constant phase difference</p> <p>L2 Simple Explanation Same frequency or wavelength Same amplitude at each speaker Waves add or subtract to make loud and quiet sounds</p> <p>Description of experimental set up 2 speakers a distance apart One note or pitch or same notes from each speaker Hear loud and quiet sounds (in front of speakers or when walking across)</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
	Total	6	

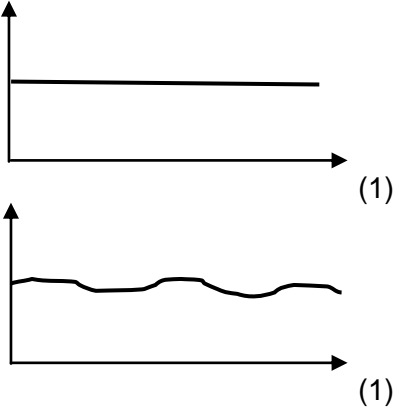
Question	Answer	Marks	Guidance								
10	<p>Level 3 Truth table all correct AND Gates correctly identified OR BOTH correct conditions for E = 1</p> <p>Quality of written communication does not impede communication of the science at this level (5 – 6 marks)</p> <p>Level 2 Any 2 from gates correctly identified OR at least two rows in truth table correct OR Identifies 2 correct conditions for E=1</p> <p>Quality of written communication partly impedes communication of the science at this level (3 – 4 marks)</p> <p>(Level 1) gates correctly identified OR at least two rows in truth table correct OR Identifies 1 correct condition for E=1</p> <p>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 may include:</p> <p>conditions when E = 1:</p> <ul style="list-style-type: none"> • E = 1 when conditions are light (cold wet and) • E = 1 when conditions are hot wet (and dark) <p>completed truth table:</p> <table border="1" data-bbox="1272 576 1391 719"> <tr><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td></tr> <tr><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td></tr> </table> <p>identification of gates:</p> <ul style="list-style-type: none"> • AND (gate) and OR (gate) either order But if specified • AND gate connected to inputs A and B • OR gate connected to inputs C and D <p>Use the L1, L2, L3 annotations in scoris. Do not use ticks.</p>	0	0	0	1	0	0	1	1
0	0										
0	1										
0	0										
1	1										
Total		6									

Question	Answer	Marks	Guidance
11 a	A (1)	1	if answer line blank allow correct answer circled or underlined more than one answer = 0 marks
b	(Transformers are devices that work with) AC . (Phone chargers use) step-down (transformers.) (Bathroom shaver sockets use) isolating (transformers.)	2	3 correct = 2 marks 1 or 2 correct = 1 mark
c	any two from transformers can be used to change voltage or increase voltage or decrease voltage (1) 110 000 V is dangerous or make the voltage safer for people (in their homes) (1) less power loss (at high voltages) or more efficient (at high voltages) (1)	2	allow idea of a step up transformer for increasing voltage from power station to power lines (1) allow idea of a step down transformer for decreasing voltage from power lines to house for safety (1) allow higher level answers e.g. increases the efficiency because it lowers the current (2)
	Total	5	

Question	Answer	Marks	Guidance			
12 a	<table border="1" style="margin-left: 20px;"> <tr><td style="text-align: center;">82</td></tr> <tr><td style="text-align: center;">104</td></tr> <tr><td style="text-align: center;">128</td></tr> </table> <p style="text-align: right;">(1)</p>	82	104	128	1	all correct for 1 mark
82						
104						
128						
b i	I_b is (always much) smaller than I_c	1				
ii	<p>(idea that) a small base current is needed to switch on the transistor (1)</p> <p>(this allows) a large current through the transistor (1)</p>	2	<p>allow higher level answers e.g. transistors have a high gain (1)</p>			

Question	Answer	Marks	Guidance
c	<p>any one from advantages lightweight (1) can be put in a pocket / easy to store (1) easy to carry (1)</p> <p>any one from disadvantages difficult to see the numbers or words or images (1) difficult to text on or difficult to enter information (1) need pen or stick to use the screen or keyboard (1) not very good at taking photographs (1) easier to lose (1) harder to repair small parts (1)</p>	2	
	Total	6	

Question	Answer	Marks	Guidance
13 a	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 2px 10px; margin-bottom: 10px;">magnet</div> <div style="border: 1px solid black; padding: 2px 10px; margin-bottom: 10px;">coil</div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 2px 10px; margin-bottom: 10px;">brush</div> <div style="border: 1px solid black; padding: 2px 10px; margin-bottom: 10px;">slip ring</div> </div> <div style="text-align: right; margin-top: 10px;">(1)</div>	1	all four required
b	moving the magnet(s) (1)	1	allow move magnet and coil (1)
c	(supply) voltage of B is lower / ORA (1) frequency of B is higher / ORA(1)	2	
	Total	4	

Question	Answer	Marks	Guidance
<p>14 a</p>	<p>Max 3 marks</p> <p>up to two from</p> <p>graph A shows no rectification (1)</p> <p>graph B shows half (-wave) rectification (1)</p> <p>graph C shows full (-wave) rectification (1)</p> <p>up to two from</p> <p>B has a diode in the circuit (1)</p> <p>C has a diode in the circuit (1)</p>	<p>3</p>	<p>allow graphs B and C show rectification (1)</p>
<p>b</p>	<p>smoother line than original graph (1)</p>	<p>1</p>	<p>allow any line that is smoother than original graph e.g.</p> 
<p>Total</p>		<p>4</p>	

Question	Answer	Marks	Guidance
15 a i	<u>elephant</u> (1)	1	
	ii <u>dolphin</u> (1)	1	
	iii <u>dolphin</u> (1)	1	
b i	Dionne (1) 20 100 – 24 (is largest value) OR 20 076 (is largest value) (1)	2	The calculated value may be shown in the table If Dionne is <i>calculated</i> to be less than 19985 (Evangelos) then award one mark for naming Evangelos.
	ii 19 780 scores (2) but if answer is incorrect or incomplete then: <u>$19\,000 + 20\,000 + 20\,100 + 19\,800 + 20\,000$</u> (1) 5	2	Mark answer on line But if no answer given and value calculated in table mark the answer calculated in the table.
	iii Any three from inaccurate measurements (1) unreliable measurements (1) idea of different sample size (1) the sample is not representative (1) some (may) have a hearing defect (1) different ages in the sample (1) other named and described reason why the sample is unrepresentative (1)	3	Eg. Equipment may be faulty [1]
	Total	10	

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