

Physics B

General Certificate of Secondary Education

Unit **B652/02**: Unit 2 – Modules P4, P5, P6 (Higher Tier)

Mark Scheme for January 2012

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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

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt not given
	error carried forward
	information omitted
	ignore
	reject
	contradiction

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)	(charged paddles placed on) chest / AW (1) good electrical contact (1)	2	allow make sure it is charged up enough (1) ignore place charged paddles on heart ignore any reference to how paddles are charged allow dries chest / shaves chest / puts gel on chest (1) allow puts conducting pads on chest (1)
		(ii)	(heart muscle) contracts (1)	1	ignore heart starts beating / heart (re)starts / heart gets shocked / heart pumps / spasm
	(b)		any one from idea of where there is a fire / explosion risk (1) idea of where there is a danger to electrical / electronic equipment (1)	1	allow named examples e.g. refuelling (a plane) / in a petrol station / tanker / operating theatre / flour mills / lightning (1) ignore unqualified reference to (excess) oxygen ignore clothing clings / dust on TV / shock
	(c)	(i)	(like charges) repel (1)	1	allow charges move away from each other (1) ignore protons repel
		(ii)	car charged oppositely (to paint) / car charged negatively (1) any one from (spray / paint) attracted (to car) (1) opposites attract (1)	2	
			Total	7	

Question		Answer	Marks	Guidance
2	(a)	(number of) waves per second (1)	1	allow (number of) waves per unit time / AW (1) allow (number of) vibrations per second or per unit time (1) allow other named examples of time e.g. waves per minute (1)
	(b)	any one from scanning (1) cleaning (equipment) (1) breaking / treating (kidney) stones (1)	1	allow baby or pregnancy scan / to confirm pregnancy (1) allow to produce images / picture of body tissues or (unborn) baby(1) ignore look at or see (unborn) baby (in womb) ignore to check the body e.g. to check ears / heart / breathing allow ultrasonic toothbrush / dental treatment (1) allow to break up lens in cataract surgery (1) allow treatment of soft tissue damage (1) allow to measure speed of blood (flow in body) (1) ignore to measure heart rate allow to treat cancer (1)
Total			2	

Question		Answer	Marks	Guidance
3	(a)	fission (1)	1	not fusion
	(b)	1 (nuclear reaction) 2 producing heat 3 producing steam 4 turning a turbine 5 (turning a generator) (1)	1	2, 3 and 4 correct for mark
Total			2	

Question	Answer	Marks	Guidance
4	<p>3.3 (A) (2)</p> <p>but if answer incorrect</p> <p><u>230</u> 69 (1)</p> <p>and</p> <p>any one from idea that 5A fuse is lowest value that will work (1)</p> <p>3A fuse will blow (1)</p> <p>13A fuse is too high and will allow excess current to flow (if there is a fault) / 13A fuse use carries a risk of fire (if there is a fault) (1)</p>	3	
	Total	3	


Question		Answer	Marks	Guidance
5	(a)	234 (Th) 90 (1)	1	both numbers needed correct way round
	(b)	14 (C) 6 (1)	1	both numbers needed correct way round
	(c)	6400 (1)	1	more than one answer scores (0)
	(d)	<u>gamma</u> tracer (in fluid pipe) (1) idea of detecting above (ground) / penetrate ground (1) idea of (build up of) tracer / (high) count before blockage / reduced or no count rate after blockage (1)	3	not beta or alpha
		Total	6	

Question		Answer	Marks	Guidance
6	(a)	3600 (kg m/s) (2) but if answer incorrect 300 or $(80 + 220) \times 12$ (1)	2	
	(b)	14.5 (m/s) (2) but if answer incorrect $12 + (0.5 \times 5)$ (1) or 2.5 (1)	2	
	(c)	288 (m) (2) but if answer incorrect $(15 + 33) \times 12 / 2$ (1) or $48 \times 12 / 2$ (1) or 48×6 (1)	2	
Total			6	

Question			Answer	Marks	Guidance
7	(a)	(i)	diffraction (1) reflection / bounce off from <u>ionosphere</u> (1)	2	must use a higher level answer not just spread around mountain / reflect from atmosphere allow transmit to and retransmit from satellite ignore reflect from satellite
		(ii)	any two from rain / dust (1) absorb / scatter (waves) (1) less diffraction (1) less reflection from ionosphere (1) because shorter wavelength / higher frequency (1)	2	allow clouds / fog
	(b)		(C) (1) any crest / crest or trough / trough–overlap (D) (1) any crest / trough overlap.	2	candidates should clearly indicate the positions
			Total	6	

Question	Answer	Marks	Guidance
8	<p>Look for two marking points – one related to speed, the other to refraction</p> <p>colours travel at different speeds (in glass) (1) red travels faster than violet / ora (2)</p> <p>MAX 2</p> <p>change of speed in glass causes refraction (1) greater change in speed causes more refraction (2) red light has lower refractive index (2) violet light has higher refractive index (2)</p> <p>MAX 2</p>		<p>allow red travels slower than violet as equivalent to different speeds (1)</p> <p>allow correct use of:- refractive index = $\frac{\text{speed of light (in vacuum)}}{\text{speed of light (in medium)}}$ (1)</p> <p>ignore reference to wavelength / frequency / diffraction / reflection</p> <p>N.B. MAX 3</p>
	Total	3	

Question		Answer	Marks	Guidance
9	(a)	equal / AW (1) opposite / AW (1)	2	allow same size (1) ignore against each other
	(b)	more time (1) same change of momentum (1) BUT lower rate of change of momentum (2)	3	allow more distance (1) allow correct argument using equation to illustrate lower rate of change of momentum (1) allow slower change in momentum (2) allow correct argument involving impulse (2)
Total			5	

Question		Answer	Marks	Guidance
10	(a)current (1)increase..... X (1)	2	both needed allow bulb or lamp for X allow correct symbol 
	(b)	20 (Ω) (1) but if answer is incorrect 8 ÷ 0.4 (1)	2	
	(c)	use gradient (1) BUT inverse / reciprocal of gradient or 1 over the gradient or divide 1 by the gradient (2)	2	allow divide voltage by current (1) allow take a given voltage and divide by corresponding current or indicated on the graph / AW (2)
Total			6	

Question		Answer	Marks	Guidance																		
11	(a)	Light (intensity) decreases / AW (1)	1	allow no light (1) allow it is night time (1)																		
	(b)	<p>truth table</p> <table border="1"> <thead> <tr> <th>Q</th> <th>T</th> <th>S</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> </tr> </tbody> </table> <p>explanation (output/buzzer on only when) cold / low temperature and dark / low light level / at night and system / control switch / power / electricity / mains is on (1)</p>	Q	T	S	0	1	0	0	1	1	1	0	0	1	0	0	1	0	0	3	<p>Q and T columns correct (1) S column correct (1)</p> <p>all three linked points needed</p>
Q	T	S																				
0	1	0																				
0	1	1																				
1	0	0																				
1	0	0																				
1	0	0																				
	(c)	<p>.....increases / AWincrease / AW (1)</p> <p>increase voltage / pd (1)</p> <p>voltage / potential / pdtemperature (1)</p>	3	<p>both needed</p> <p>both needed</p> <p>both needed</p>																		
Total			7																			

Question		Answer	Marks	Guidance
12		<p>any three from</p> <p>charge moves or flows around the circuit (1)</p> <p>this means a current passes in the circuit (1)</p> <p>charge builds up or on / is stored on the capacitor (1)</p> <p>voltage / pd / potential difference across or of the capacitor increases (1)</p>	3	<p>charge flow should be during the charging cycle</p> <p>allow ammeter deflects / AW (1)</p> <p>but ammeter deflects then falls to zero / AW (2)</p> <p>ignore just charge increases</p> <p>allow voltage / pd increases (1)</p> <p>ignore reference to voltage of power supply</p>
		Total	3	

Question		Answer	Marks	Guidance												
13	(a)	(isolating) no marks shaver not connected directly to / isolated from mains or idea of reduced risk of electrocution / no flow of current to or through user (1)	1	not step-up / step-down allow higher level answers e.g. no flow of current to user from earth (connection) is possible (1) allow blocks flow of AC from one circuit to another (1) allow decouples one circuit from another (1) allow no risk of electrocution / shock (1)												
	(b)	<table border="0" style="width: 100%;"> <tr> <td style="border: 1px solid black; padding: 2px;">alternating magnetic...core</td> <td style="border: 1px solid black; text-align: center; width: 30px;">4</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">alternating current...</td> <td style="border: 1px solid black; text-align: center;">2</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">induces voltage...</td> <td style="border: 1px solid black; text-align: center;">6</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">alternating magnetic...primary</td> <td style="border: 1px solid black; text-align: center;">3</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">alternates magnetic...secondary</td> <td style="border: 1px solid black; text-align: center;">5</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">alternating voltage...</td> <td style="border: 1px solid black; text-align: center;">1</td> </tr> </table>	alternating magnetic...core	4	alternating current...	2	induces voltage...	6	alternating magnetic...primary	3	alternates magnetic...secondary	5	alternating voltage...	1	2	all correct (2) 2,3 and 4 in correct order OR 5 and 6 in correct order (1)
alternating magnetic...core	4															
alternating current...	2															
induces voltage...	6															
alternating magnetic...primary	3															
alternates magnetic...secondary	5															
alternating voltage...	1															
	(c)	field lines always at 90° / right angles to / perpendicular to the coil / wire / current (1)	1	allow idea of coil always feels maximum / constant force as it rotates / turns / spins												
Total			4													

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