

Physics B

General Certificate of Secondary Education

Unit **B652/01**: Unit 2 – Modules P4, P5, P6 (Foundation Tier)

Mark Scheme for June 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

Annotation	Meaning
/	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

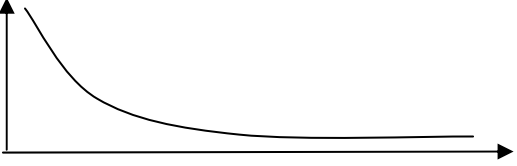
Question		Answer	Marks	Guidance												
1	(a)	negative [1] positive [1]	2	any order allow correct symbols + and – 'positive...positive' or 'negative...negative' scores' [1]												
	(b)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>the rod is a conductor</td> <td></td> </tr> <tr> <td>the rod is metal</td> <td></td> </tr> <tr> <td>the rod is an insulator</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>the cloth is a conductor</td> <td></td> </tr> <tr> <td>the cloth has metal fibres in it</td> <td></td> </tr> <tr> <td>the cloth is an insulator</td> <td style="text-align: center;">✓</td> </tr> </table> <p style="text-align: right;">[2]</p>	the rod is a conductor		the rod is metal		the rod is an insulator	✓	the cloth is a conductor		the cloth has metal fibres in it		the cloth is an insulator	✓	2	one mark for each correct tick if more than 2 ticks minus 1 mark for every extra tick to a minimum of zero
the rod is a conductor																
the rod is metal																
the rod is an insulator	✓															
the cloth is a conductor																
the cloth has metal fibres in it																
the cloth is an insulator	✓															
	(c)	attracted towards rod / move towards the rod [1]	1	allow idea of force on cork pieces [1] allow sticks to rod [1] allow higher level answers e.g. idea of becoming charged [1] ignore reference to negative / positive not just move												
Total			5													

Question	Answer	Marks	Guidance														
2	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%; padding: 5px;">Dust particles pass...</td> <td style="width: 20%; text-align: center; padding: 5px;">2</td> </tr> <tr> <td style="padding: 5px;">Dust particles are..</td> <td style="text-align: center; padding: 5px;">3</td> </tr> <tr> <td style="padding: 5px;">The metal grid...</td> <td style="text-align: center; padding: 5px;">(1)</td> </tr> <tr> <td style="padding: 5px;">Plates are..</td> <td style="text-align: center; padding: 5px;">6</td> </tr> <tr> <td style="padding: 5px;">This is because..</td> <td style="text-align: center; padding: 5px;">4</td> </tr> <tr> <td style="padding: 5px;">Up to 99%....</td> <td style="text-align: center; padding: 5px;">(7)</td> </tr> <tr> <td style="padding: 5px;">Dust particles form..</td> <td style="text-align: center; padding: 5px;">5</td> </tr> </table> <p style="text-align: right; margin-top: 10px;">[3]</p>	Dust particles pass...	2	Dust particles are..	3	The metal grid...	(1)	Plates are..	6	This is because..	4	Up to 99%....	(7)	Dust particles form..	5	3	<p>if not all correct look for correct sequencing</p> <p>Dust particles pass through ... somewhere before Dust particles are attracted ...</p> <p>Dust particles are attracted ... somewhere before This is because opposite ...</p> <p>This is because opposite ... somewhere before Dust particles form larger ...</p> <p>Dust particles form larger ... somewhere before Plates are knocked ...</p> <p>3 correct = [2] 1 or 2 correct = [1]</p>
Dust particles pass...	2																
Dust particles are..	3																
The metal grid...	(1)																
Plates are..	6																
This is because..	4																
Up to 99%....	(7)																
Dust particles form..	5																
	Total	3															

Question		Answer	Marks	Guidance
3		10 (ohms / Ω) [3] but if answer is incorrect 8 \div 0.8 [2] values of 8 and 0.8 (read from graph) [1]	3	allow any correctly paired corresponding values in the correct order e.g. 6 \div 0.6 / 2 \div 0.2 etc. [2] allow any pair of corresponding values e.g. 6 and 0.6 / 2 and 0.2 etc. [1] allow 0.6 \div 6 / 0.2 \div 2 etc. [1]
Total			3	

Question		Answer	Marks	Guidance
4		radiographer [1] and max two from: (gamma / beta) used to treat cancer / tumours / damage or kill cells [1] (gamma / beta) used as a tracer [1] (gamma) used to sterilise equipment [1] (gamma) used for scanning [1]	3	allow radiologist / radiotherapist [1] ignore clean equipment ignore CAT / MRI scan ignore unqualified diagnosis ignore X-ray or description of X-ray ignore ultrasound / examine foetus ignore break down kidney stones
Total			3	

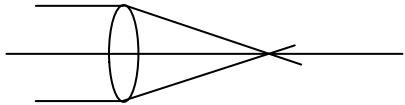
Question			Answer	Marks	Guidance
5	(a)	(i)	compression [1]	1	ignore crest / peak
		(ii)	rarefaction [1]	1	allow expansion [1] ignore trough
		(iii)	correct line from X on wave to the corresponding point on the next or previous wave [1]	1	level of tolerance is shown on screen allow clear indication of one wavelength without line e.g. dot on curve within tolerance
	(b)		break down or removal of kidney stones / measure or monitor rate of blood flow (in the body) [1]	1	not foetal scan or any other reference to looking inside the body allow idea of breaking up (eye) lens in cataract treatment [1] allow used to treat some cancers (HIFU) or example e.g. prostate cancer [1] allow dog whistle [1] allow scare animals [1] allow ultrasonic crack detection [1] allow ultrasonic cleaning [1] allow cleaning teeth [1] ignore toothbrush allow higher level answers e.g. allow echo sounding / sonar to detect oil / fish / submarines / wrecks [1] ignore unqualified reference to submarines allow electronic tape measures [1] allow bats / dolphins for communication / echo location [1] ignore unqualified reference to bats / dolphins / etc allow treat muscle injury [1] ignore unqualified reference to treating injuries
			Total	4	

Question		Answer	Marks	Guidance
6	(a)	no (no mark) graph should go down / decrease / decay [1]	1	allow answer drawn on graph [1] e.g.  allow does not go up [1] allow stays the same qualified e.g. stays the same as the time scale is very short or the radioactive material has a long half life [1]
	(b)	alpha / α [1]	1	
Total			2	

Question		Answer	Marks	Guidance
7	(a)	orbits (another object) / AW [1]	1	allow answer that states / implies going around celestial body e.g. goes around the Earth ignore references to job of satellite e.g. communications
	(b)	natural [1]	1	ignore moon / geostationary / polar
	(c)	weather forecasting / military / GPS / research / communications / TV / radio [1]	1	mark first answer if more than one answer given allow spying / mapping / taking pictures of celestial objects [1] ignore unqualified reference to weather
Total			3	

Question		Answer	Marks	Guidance
8	(a)	golf ball / cricket ball / football after being hit / kicked / thrown or dart / basketball / netball after being thrown or long jumper after take-off [1]	1	look for both object and action verb in answer the object must be moving to be a projectile e.g. dart [0] but dart in flight towards dart board [1] not bullet or anything from a gun
	(b)	trajectory / parabolic [1]	1	
	(c) (i)	30 (m/s) [1]	1	allow the same [1]
	(ii)	30 (m/s) [2] but if answer incorrect $0 + 10 \times 3$ [1]	2	allow correct answer for $g = 9.8$ e.g. 29.4 (m/s) [2] credit increase in speed calculation even if initial speed is incorrect e.g. $30 + (3 \times 10) = 60$ for [1]
Total			5	

Question		Answer	Marks	Guidance
9	(a)	<p>any three from:</p> <p>ideas / diagram / description which shows:</p> <p>named wave appropriate to the experiment, e.g. sound / light / microwave / water [1]</p> <p>experimental setup to create interference (source of waves), e.g. 2 speakers (+ detector) 2 slits or way of splitting waves 2 microwave sources (+ detector) ripple tank with 2 sources or barrier with 2 gaps [1]</p> <p>indication of what is seen / heard i.e. quiet / no sound and loud sounds light and dark areas large and small deflection on microwave detector large ripples / no ripples in ripple tank [1]</p> <p>explanation of interference – idea of 2 waves joining to either add or cancel each other [1]</p>	3	<p>allow marks for a correctly labelled diagram allow other examples of 2 source interference</p> <p>ignore radio, X-rays and gamma</p> <p>allow a suitable reflection as source</p> <p>allow in phase for constructive / ora [1]</p>
	(b)	aerial / antenna dish [1]	1	both needed in correct order
Total			4	

Question		Answer	Marks	Guidance
10	(a)	B [1]	1	if answer line blank allow correct answer circled, underlined or ticked in the list
	(b)	Anna [1]	1	if answer line blank allow correct answer circled, underlined or ticked in the list
	(c) (i)	convex [1]	1	allow positive or converging
	(ii)	rays bend at the lens towards the axis [1] both meet at the same point and on the axis [1]	2	max 1 if lines not straight by inspection
	(ii)	diagram shows rays converging [1] rays continuous, straight and converge to F [1] 	2	not multiple lines
	(iii)	magnifying glass / projector / correction of long sight (glasses) / camera / telescope [1]	1	allow glasses / reading glasses / spectacles / contact lenses [1] not short sight glasses allow eye [1] allow microscope [1]
Total			6	

Question		Answer	Marks	Guidance
11	(a)	A [1]	1	if answer line blank allow correct answer circled, underlined or ticked in the list
	(b)	B [1]	1	if answer line blank allow correct answer circled, underlined or ticked in the list
Total			2	

Question			Answer	Marks	Guidance
12	(a)	(i)	diode [1]	1	
		(ii)	capacitor [1]	1	
		(iii)	LDR / light dependent resistor [1]	1	
		(iv)	thermistor [1]	1	
		(v)	generator [1]	1	allow dynamo [1]
	(b)		adjust brightness of a lamp [1]	1	allow adjustment of any reasonable device e.g. volume of a sound device [1] brightness of a device [1] speed of a device [1] temperature control [1] allow dimmer switch [1]
			Total	6	

Question		Answer	Marks	Guidance
13	(a)	<p>any two from: washing machine dishwasher tumble dryer (electric) drill lawn mower food mixer [1]</p>	1	<p>two correct answers for [1] mark</p> <p>allow microwave / toaster / hairdryer / computer / DVD player / CD player / fridge / freezer / shower / oven / fan / any other domestic devices using a motor not TV / radio / kettle / digibox</p>
	(b)	(i)	3	<p>allow more power / turn up power [1]</p> <p>ignore resistance</p> <p>ignore idea of radial field</p> <p>allow more coils [1] ignore bigger coil / greater coil area</p> <p>if no marks awarded then allow maximum [1] from: idea of improving contact e.g. bend brushes round so remain in contact for longer length of time [1] sensible way to reduce friction e.g. use oil [1]</p>
		(ii)	1	e.g. spins backwards [1]
			Total	5

Question			Answer	Marks	Guidance
14	(a)	(i)	50 (Hz) [1]	1	
		(ii)	transformers only work with AC / need changing current / DC does not change direction [1]	1	allow do not work (with DC) [1] allow higher level answers e.g. need to have a changing magnetic field [1]
	(b)		6000 (turns) [2] but if answer incorrect $\frac{25000}{300000} = \frac{500}{NS} / AW [1]$	2	allow (because of rounding in calculation) 6002 / 6250 / 6024 (2) allow equation / ratio in other correct permutations [1]
			Total	4	

Question			Answer	Marks	Guidance						
15	(a)	(i)	<table border="1"> <tr> <td>input signal</td> <td>output signal</td> </tr> <tr> <td>(0)</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> </tr> </table> <p>all 3 correct [1]</p>	input signal	output signal	(0)	1	1	0	1	
		input signal	output signal								
(0)	1										
1	0										
		(ii)	<p>(0 means) off / low / 0V (1 means) on / high / 3V to 9V [1]</p>	1	<p>both required for [1] mark allow false / no current / no signal / no input allow true / current / signal / input not high & low current / voltage / power / electricity</p>						
	(b)	(i)	LED / light emitting diode [1]	1							
		(ii)	relay [1]	1	ignore switch						
	(c)		to keep alarm on / stay switched on / AW [1]	1							
			Total	5							

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