OCR
Oxford Cambridge and RSA

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.

Annotations used in scoris

Annotation	Meaning
BP	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
BOD	benefit of the doubt
NBOD	benefit of the doubt **not** given
ECF	error carried forward
^	information omitted
I	ignore
R	reject
CON	contradiction

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

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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	no (no mark) (idea that) we can't hear high pitched sounds [1] **BUT** We cannot hear 20 000 (Hz) (or above) scores [2] ~~no (no mark)~~ ~~(idea that) humans cannot hear **high** pitched sounds cannot frequency or 25 000 (Hz) is **high**er than humans can hear / [1]~~ ~~**but**~~ ~~we cannot detect frequencies above 20 000 Hz / (idea that) humans cannot hear sounds above 20 000 Hz [2]~~	~~2~~2	'yes' scores [0] ~~A~~**allow** (idea that) 25 000 (Hz) is higher than we can hear [1] ~~A~~**allow** frequencies above a threshold: eg. Can't hear above 18 000 (Hz) [1] ~~A~~**allow** 20kHz ~~A~~**allow** correct references to wavelength for [1]
c	**any two from** so doctor knows where ~~/ what~~ the problem is [1] so doctor knows what the problem is/to diagnose the problem [1] so the doctor knows how severe / bad the problem is	2	**allow** so the doctor know where to make the cut in the skin [1] **allow** so the doctor knows how big to make the cut ~~/~~ or if the problem can be treated by keyhole surgery [1]

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	[1] so the doctor knows if an (surgical) operation is needed/AW [1]		**allow** it is safer than invasive surgery to see the problem [1]
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Question	Answer	Marks	Guidance
2	**[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) **[Level 2]** **Calculate two resistances correctly** **AND** **identifies how current ~~or resistance~~ changes with length of resistance wire OR how resistance changes with length of resistance wire** Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[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) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C.** **To reach L3 both resistances must be calculated correctly.** **Indicative scientific points at level 3 may include:** **both calculations and descriptions from level 1 and 2 and** • example of a quantitative relationship e.g. doubling the length of the resistance wire approximately doubles the resistance **Indicative scientific points at level 1 and 2 may include:** • resistance for length 20 cm = 3(.00)(ohms) • resistance for length 10 cm = 1.5(0) (ohms) • idea that as length of resistance wire increases the current decreases / ora • idea that as length of resistance wire increases the resistance increases / ora **Use the L1, L2, L3 annotations in scoris.** **Do not use ticks.**
	Total	**6**	

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Question	Answer	Marks	Guidance
3 a i	(idea that it) varies [1]	1	**allow** named examples ie it is higher in Finland / Spain [1] **allow** named examples ie it is lower in UK / Austria [1]
ii	**any one from** (more) radioactive rocks / uranium in rocks [1] (more) granite [1] (more) radon gas [1]	1	~~Consider 'more rocky' / type of rock at SSU~~ **allow** (more) cosmic rays [1] **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
b	**any one from** to track dispersal of waste [1] to find leaks / blockages in underground pipes [1] to find the route of underground pipes / checking thickness or condition of metal [1]	1	**ignore** medical tracers~~**at SSU**~~ ~~**consider measuring thickness of paper?**~~ ~~**and use of tracers in a named medical process (not just in medicine as this is in question 4)**~~
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Question	Answer	Marks	Guidance
4 a i	Ddecreases [1] **but** decreases by half / by 30 (decays per second) [2] decreases (by 30) (decays per second) [1] **but** reduces by half [2] decreases (by 30 (decays per second)) [1] **but** reduces by half [2]	222	**allow** from 60 to 30 [2] **eg 60 and 30 indicated on graph scores [2]** if **NO** marks awarded **allow** by one half life [1] **allow** from 60 to 30 [2] **eg 60 and 30 indicated on graph scores [2]** **But if no other marks scored allow one half life [1]** **ignore** decayed rapidly **allow** from 60 to 30 [2]
ii	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]	111	Aany line curving upwards (at any part) scores [0] graphs must not cross each other **Look at first 4 days of the graph.** **NOT positive gradient**
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

	Total	**5**	

Question	Answer	Marks	Guidance
5 a	**any three from** spread of (paint) spray less for normal paint gun / spread of (paint) spray more for electrostatic paint gun [1] (idea that) paint (droplets) in normal paint gun uncharged [1] (idea that) paint droplets in electrostatic gun have the same charge [1] (idea that) ~~opposite~~ like charged (paint) particles~~s~~ repel (so spreading the paint further) [1] (idea that) object is charged (oppositely to paint) [1]~~]~~ (idea that) in electrostatic gun paint droplets are attracted to object [1]	3	**allow marking points from labels on the diagrams** **allow** (paint) spray identified as spreading once it leaves the paint gun [1]
b	become charged/ loses or gains electrons[1] (then) become earthed / charge or electrons transferred to make object neutral[1]	2	**allow** examples of becoming charged e.g. (insulating) materials rubbing together / taking sweater off / walking on carpet [1] **allow** when touching something that is earthed [1] **BUT** **allow** touching charged object causes current to flow to earth [2~~1~~]
	Total	**5**	

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Question	Answer	Marks	Guidance
6 a	**any 2 from** (idea that) satellite has a wide coverage [1] (idea that) satellite always in same (relative) position [1] (idea that) satellite receivers (on the house) don't need to be moved to follow satellite / AW [1]	2	
b	**any 2 from** ~~Short~~ short waves penetrate atmosphere / Long waves don't penetrate atmosphere / AW [1] long waves absorbed ~~or reflected~~ or refracted or reflected (by atmosphere) [1] (therefore) short waves **reach** the receiver / long waves don't **reach** the receiver [1]	2	
c	~~Less~~ less time [1]	1	**allow** faster[1] **allow** any time less than 24 hours
d	**Risks any one or two from:** Loss of life / need oxygen or food or water or heat/ high cost / large energy input needed / failed launch / fall back to Earth/ difficult to repair / risk of collision[1] **Benefits and uses - any one or two from:** Spying / ~~tele~~communication / scientific research / GPS / imaging of Space / [1]	3	Maximum two marks from each section **allow** higher level answers **ignore** Satellite TV **ignore** weather forecasts
	Total	**8**	

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Question	Answer	Marks	Guidance
7 a	120 [2] But if answer is incorrect or incomplete: $\frac{13+27}{2} \times 6$ scores [1]	2	
b	30 (m/s) **and** ~~speed limit broken~~yes [2] But if answer is incorrect or incomplete up to 1 mark from: 30 **OR** 0 + 3x10 **OR** 3 x 10 ~~**OR**~~ ~~'3x10 and yes' scores [1]~~	2	~~**allow** 'yes' in answer to question~~ **allow** higher level answers e.g. 'she has gone 3m/s over the speed limit'. [2] '3x10 and yes' [1]
	Total	**4**	

Question	Answer	Marks	Guidance
8	[Level 3]: (5 – 6 marks) Answer describesDescribes measurement of image distance AND at least 1 all other key pointsfeature 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) [Level 2] : (3 – 4 marks) Answer indicatesDescribes 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) [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)	6	This question is targeted up grade E To reach Level 3 image must be formed on a screen Indicative scientific points may include: Focal length • focal length is distance between lens and image (of a distant object) or distance between lens and focal point Features of experiment: • measures thickness of all lenses (with the mm ruler) • produce an image (of the tree on the card) • measure image distance • try all lenses Allow for level 1 correct comparison of focal lengths of lenses Use the L1, L2, L3 annotations in Scoris; do not use ticks. This question is targeted up grade E Indicative scientific points may include: Level 3: • 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

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	Level 0: (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.		~~**Level 2:**~~ ~~• Produce an image of the tree on the paper~~ ~~• AND either Measure image distance with the cm ruler~~ ~~1.~~ ~~**OR**~~ ~~explains focal length.~~ ~~**Level 1:**~~ ~~• **either** measures thickness of all lenses (with the mm ruler)~~ ~~• **OR** produces an image on paper~~ ~~• **OR** explains focal length~~ ~~**Use the L1, L2, L3 annotations in Scoris; do not use ticks.**~~
	Total	**6**	

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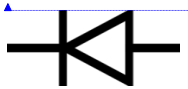
Question	Answer	Marks	Guidance
9 a	Maximum range (achieved) at 45^0 [1] **BUT** Range rises with angle until 45^0 then falls [2] ~~Maximum range (achieved) at 45^0 [1]~~ ~~Range rises with angle until 45^0 then falls [2]~~	2~~2~~	**i~~I~~gnore** references to height eg 'the further away from 45^0 the lower the range scores' [2] **if no marks awarded:** **allow EITHER** 'rises and falls' **OR** 'as the angle increases the range decreases' [1] eg 'range goes up and then goes down' [1] ~~**Ignore references to height**~~ ~~**allow** rises and falls~~ ~~if the angle is too high or too low the range is low(er)[1]~~ ~~allow as angle increases range decreases (1)~~
b	90^0 [1]~~90^0 [1]~~	1~~1~~	**allow** vertical / AW [1] **allow** suitable annotation of the diagram ~~**allow** vertical / AW [1]~~ ~~**allow** suitable annotation of the diagram~~ ~~at SSU ask for cropping to include top diagram in case candidates draw their answer on the diagram~~ ~~at SSU ask for cropping to include top diagram in case candidates draw their answer on the diagram~~
c i	Parabolic / parabola [1] ~~Parabolic / parabola [1]~~	1~~1~~	**ignore** curve / arc / arch on its own **ignore** trajectory ~~**ignore** curve / arc / arch on its own~~ ~~**ignore** trajectory~~

			~~**ignore** curve on its own~~ ~~**ignore** trajectory~~
ii	(Vertical / upward) velocity decreases [1] Acceleration (remains) constant / AW [1] ~~Vertical / upward velocity decreases [1]~~ ~~Acceleration remains constant / AW [1]~~	~~2~~2	Mark points independently: eg. vertical velocity and acceleration are reduced for a maximum of [1] eg. vertical velocity and acceleration are constant for a maximum of [1] ~~eg. Gravity causes vertical velocity and acceleration are constant [1]~~
iii	no effect (by gravity) / AW [1]	1	**allow** doesn't (change) [1] **allow** (stays) constant [1]
	Total	**7**	

Question	Answer	Marks	Guidance
10 a	**A** LDR / light dependent resistor [1] **B** thermistor [1] **A** responds to light **OR B** responds to heat or temperature [1]	3	**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] **allow** resistance of thermistor increases with temperature **OR**

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

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Question	Answer	Marks	Guidance
1~~1~~1 ~~1~~	**[Level 3]** **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**~~ Quality of written communication does not impede communication of the science at this level (5 – 6 marks) **[Level 2]** **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**~~ Quality of written communication partly impedes communication of the science at this level (3 – 4 marks) **[Level 1]** **Answer includes two correct statements in terms of construction ~~OR~~ or output voltage or uses** Quality of written communication impedes communication of the science at this level (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C.** **Indicative scientific points may include:** **Construction -Similarities** • both have an iron core / same material • both have the same input voltage / 20 volts/ AC • both have different numbers of turns on the primary compared to the secondary coils • both isolating transformers • input voltage is connected to the primary coil / output voltage is connected to the secondary coil **Construction -Differences** • 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 **Output voltage** • both change the output voltage • transformer A is a step-up transformer • transformer B is a step down transformer • the output of transformer A will be 40V or more than 20 V • the output of transformer B will be 10V or less than 20 V **Uses** • transformer A is used in the National Grid / 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 **Use the L1, L2, L3 annotations in scoris. Do not use ticks~~This question is targeted at grades up to C.~~**

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			Indicative scientific points may include: **Similarities (in order of increasing demand)** • 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 • input voltage is connected to the primary coil / output voltage is connected to the secondary coil **Differences (in order of increasing demand)** • 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 **Differences in output voltage** • 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 **Differences in uses** • 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 **Use the L1, L2, L3 annotations in scoris.** **Do not use ticks.**
	Total	**6**	
Question	**Answer**	**Marks**	**Guidance**

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12 a	**Input Output** **0 1** **1** (0) [1]	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 or increase at steady rate **[1]**
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	examples of appliances in the home with motors include CD player to turn CDs food processor to mix food electric drill to make a hole/ turn the drill (bit) electric screwdriver to turn the screw fan to turn the blades blender or food processor to chop and blend food microwave to spin the cooking plate dishwasher to move the water round fridge motor to move air/coolant around fan ovens to cook the food (faster) ~~**allow**~~ lawnmower to turn blades / cut grass
b	Factor (no mark) **any two from** (idea that) efficiency decreases with increasing current [1] best efficiency at 4 amps ~~is 94% [1]~~or best efficiency at 4 amps is 94% [1] best efficiency at 6 amps is 87% [1] ~~best efficiency at 6 amps is 87% [1]~~ (idea that) motor needs to have the best efficiency in range between 4 amps and 6 amps [1~~1~~]	2	**ignore** choice of motor **if no marks awarded allow** the idea that Factor has the highest average efficiency [1]
	Total	**4**	

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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] No mark awarded if 2 incorrect
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 **allow** it changes very little after 22 to 24 metres [1]
ii	82 to 83 (dB) [1]	1	
iii	**any two from** ~~Maximum 2 marks~~ Gardener above safe level / 90dB AW [1] People in house under safe level /90dB AW [1] (idea that) gardener is exposed to the noise for more time [1]	2	**allow** (idea that) gardener is very close (so it is much louder) [1] **allow** (idea that) sound is stopped by walls or windows [1]
c i	4 (hours) [1]	1	**allow** ~~Consider tolerance at SSU eg~~ 3 - 6 (hours)~~?~~
ii	Less than (4 minutes) [1]	1	**NOT** less than or equal to 4 minutes **allow** up to 4 minutes [1]
iii	Any value from 78 to 79 (dB) [1]~~]~~	1	~~Consider tolerance at SSU~~
	Total	**10**	

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