OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics B

General Certificate of Secondary Education

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

Mark Scheme for June 2013

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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

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt **not** given
	error carried forward
	information omitted
	ignore
	reject
	contradiction
	Level 1
	Level 2
	Level 3

ADDITIONAL OBJECTS: You **must** assess and annotate the additional objects for each script you mark. Where credit is awarded, appropriate annotation must be used. If no credit is to be awarded for the additional object, please use annotation as agreed at the SSU.

When you open the script if the message appears that there are additional objects you must check these additional objects.

The additional objects are normally additional sheets of answers that must be marked. You should immediately link each extra answer with the appropriate question using the paper clip icon.

PLEASE ASK YOUR TEAM LEADER IF YOU DO NOT KNOW HOW TO DO THIS.

It is vitally important that all parts of the candidate's answer are marked.

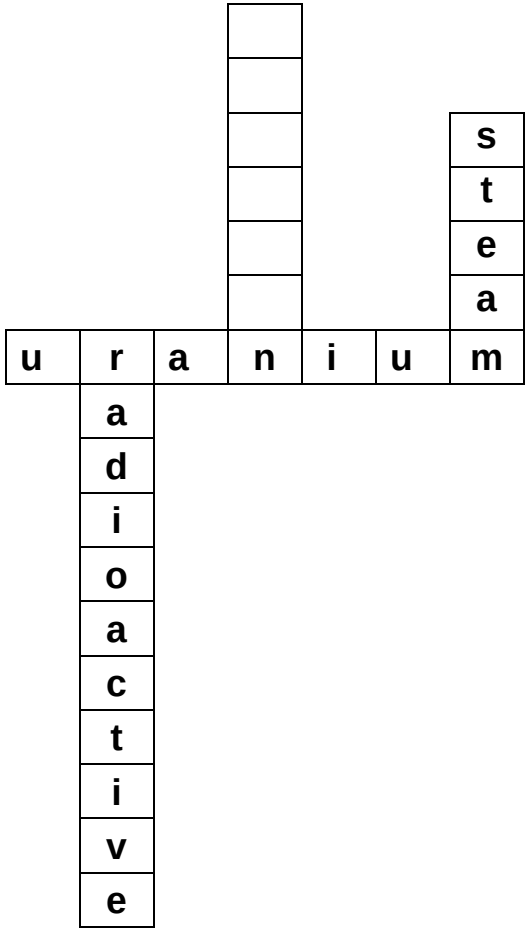
Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/	=	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)	(letter) **A** (and letter) **D** (1)	1	both required either order
		(ii)	**B** (1)	1	more than one letter scores 0 marks
	(b)	(i)	to find the position of the problem/to find out where the stones are / AW (1)	1	**allow** idea of non-intrusive assessment before incision / check before operating **allow** idea of assessing how significant is the problem e.g. how big (the stones are) / how many (stones) **allow** to try to break up the stones (so they do not have to operate) **but ignore** just to see problems / to see image
		(ii)	scan the body / pregnancy scan / measure the speed of blood flow (1)	1	**allow** to break the kidney stones down only if not awarded for (b)(i) **allow** check for cancer or tumour/treat cancer or HIFU **allow** named medical procedures e.g. check for DVT **ignore** pregnancy test **allow** non-destructive testing for cracks in metals **allow** named specific example e.g. ultrasonic cleaning / ultrasonic tape measure / echo location / dog whistles / cat scarers
			Total	**4**	

Question			Answer	Marks	Guidance
2			**[Level 3]** Detailed description of what the graph shows **AND** an explanation of how the information could be interpreted **AND** used. Quality of written communication does not impede communication of the science at this level **(5–6 marks)** **[Level 2]** Describes what the graph shows **AND** an explanation of how the information could be interpreted **OR** used. Quality of written communication partly impedes communication of the science at this level Quality of written communication partly impedes communication of the science at this level **(3–4 marks)** **[Level 1]** Describes what the graph shows **OR** a description of how the information could be interpreted **OR** used. 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/D.** **Relevant points include:** **Description of what the graph shows.** • level of radioactivity changes as the detector moves along the pipe. • radioactive level is relatively low at the start • as the detector moves along the pipe the level rises rapidly/reaches a peak • level then falls rapidly after peak • level is lower after the peak is lower than it was at the start **Explanation of how the information can be interpreted** • to find where there is a problem with the pipe • the peak shows that tracer is leaking and indicates a crack or break • there is a blockage as the level after is lower than before the peak • the blockage is not complete as radioactivity is not zero • radiation used must be gamma **Explanation of use of the information** • so that workers dig in the right place • so that workers do not waste time/energy resources digging up the whole pipe • the peak shows where the problem is **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
3	(a)	(i)	5.0 (ohms) **or** 2 x 2.5 (ohms) (2) **but if answer is incorrect** **attempt** to extend the line graph linearly to 1.0 metres **or** **attempt to** use a linear relationship (1)	2	**allow** answer in the range of 4.8 – 5.2 (ohms) (2) e.g. 10 x 0.5 (1)
		(ii)	**0.63 ohms** (1)	1	more than one answer circled gains 0 marks
		(iii)	(only) first sentence correct **or** sentence two incorrect / (idea that) answer to part (ii) is smaller than answer to part (i) / 0.63 ohms for thick wire and 5.0 ohms for thin wire / 0.63 is less than 5.0 (1) idea of resistance is lower **so** current is higher / idea of resistance is lower **so** same current will be produced by a smaller voltage (1)	2	**allow** Kiri only partly correct **ignore** Kiri is correct / Kiri is not correct **not** both sentences are correct **apply** ecf for first marking point only from figures quoted in (i) and (ii) e.g. (if 0.5 for (i) and 0.63 for (ii) then) sentence 1 is incorrect (1) **allow** reverse arguments e.g. (greater area so) less resistance so more current
	(b)		(idea of turning the switch) increases the **resistance** (1) (increased resistance) decreases the current (1)	2	**allow** (idea of turning the switch) changes the **resistance** / (idea of) changing length of wire changes **resistance** **ignore** changes the thickness of the wire **allow** (increased resistance) decreases the voltage (across the bulb) **allow** reverse argument for increasing brightness
			Total	**7**	

Question	Answer	Marks	Guidance
4 (a)	 (2)	2	answers in crossword take precedent but if crossword blank **allow** answers next to the clues 1 or 2 correct = 1 mark 3 correct = 2 marks

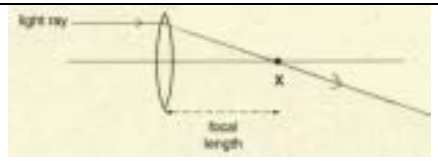
Question			Answer	Marks	Guidance
	(b)		idea of a (large) nucleus splitting (1) to give two nuclei (1)	2	**reference to neutron splitting maximum one mark** **allow** (large) nucleus breaks up / breaks down / divides **allow** to give two nucleus **ignore** nuclei are produced **allow** nucleus splits into two (nuclei) (2) **but** nucleus splits into two atoms / nucleus splits into two molecules (1) as extra marking points: **allow** energy released (1) **allow** more neutrons are given out (1)
			Total	**4**	

Question			Answer	Marks	Guidance
5	(a)		(idea that) Tanida has become charged (1) (idea that when Tanida gets off the trampoline) she is earthed (1)	2	**Any reference to positive electrons during charging or earthing scores a maximum of one mark** **allow** description of charging e.g. she has gained electrons / she has lost electrons / she has become positive / she has become negative **allow** correct description of earthing **/** charge flows to earth / charge flows from earth / Tanida loses charge / Tanida becomes neutral **ignore** grounded / grounding **ignore** shock when she touches the ground
	(b)		only using trampoline when there is moisture in the air (1) moisture conducts/moisture is not an insulator/charge leaks away/ static cannot build up (1)	2	 **allow** so she cannot be charged (as much)
			Total	**4**	

Question			Answer	Marks	Guidance
6	(a)			2	**second marking point must give an indication of a force or reaction (on the rocket)**
			(some hot) gas escapes backwards / downwards / AW (1)		**allow** gas released out of the bottom of the rocket / gas leaves the bottom of the rocket **ignore** just gases are released
			(hot other gas) pushes or forces the rocket forwards / hot gas creates thrust or lift / AW (1)		**allow** descriptions e.g. force pushing gas particles backwards equals **force** pushing rocket forwards (2) **allow** idea of equal and opposite reactions (2)
	(b)		**idea of more acceleration (no mark)** **and any 2 from** more gas (or fuel) (1) (so) higher temperature / AW (1) (so) more pressure / AW (1) (so) more force (1)	2	**ignore** references to speed increasing or top speed being higher **ignore** more heat **allow** greater mass per second / gas escapes faster
			or		**allow as additional marking points** higher level explanations in terms of kinetic / particulate theory
			idea of less acceleration (no mark) more fuel (to move) (1) **BUT**		**allow** heavier or more mass (so less acceleration)
			more (gas or) fuel **so** more mass or inertia (to move) (2)		**allow** acceleration increases as mass is lost (2) **if no marks awarded** **allow** rocket travels for longer or travels further (1)

Question			Answer	Marks	Guidance
	(c)	(i)	gravity (1)	1	**allow** centripetal force **allow** gravitational force / gravitational pull **ignore** centrifugal **ignore** gravitational potential energy / GPE
		(ii)	Moon / other correctly named moon (of another planet) (1) (natural satellite) not put into space by man / not controlled by man / cannot be adjusted by man / not made by man / made of rock / not made of just metal / ora (1)	2	**allow** named planet as a satellite of the Sun e.g. Jupiter is a satellite of the Sun **allow** moon is (much) larger / artificial satellite is (much) smaller **ignore** references to uses of artificial satellites
	(d)	(i)	703 scores (2) **but if answer is incorrect** 185 x 3.8 scores (1)	2	

Question			Answer	Marks	Guidance
		(ii)	**any two from:** weight of Rover on Earth is 1850 (N) /AW (1) too heavy on Earth (1) weight too near to safe limits / more likely to break (1)	2	 **allow** Rover is 50 (N) more than it can take (2) **allow** heavier / weighs too much (1) e.g. legs / wheels not able to support (1) incorrect statement about mass scores a maximum (1)
			Total	**11**	

Question			Answer	Marks	Guidance
7	(a)		8 (1)	1	
	(b)	(i)	ray drawn from lens (near light ray) to or through point **X** (1)	1	 (1)
		(ii)	focal point (1)	1	**allow** 'focus' (1)
		(iii)	thicker lenses decrease focal length / have a short focal length (1) **or** thinner lenses increase focal length / have a long focal length (1)	1	
			Total	**4**	

Question			Answer	Marks	Guidance
8			idea of opposite directions (1) (in C it) is 11 (m/s) / the speeds are added / 11(m/s) is higher than 10 (m/s) / 11(m/s) is higher than 5 (m/s) (1) **but** C is 11 (m/s) **AND** A is 5 (m/s) **AND** B is 10 (m/s) (2) **or** idea of opposite directions add speeds (2)	2	**allow** correct relative speed for C is -11 (m/s) (2)
			Total	**2**	

Question			Answer	Marks	Guidance
9			**[Level 3]** **Both types of wave linked to transmission method OR redirection** **OR** **One type of wave linked to transmission method AND redirection** Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** **[Level 2]** **One type of wave linked to transmission OR redirection** Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** **[Level 1]** **Simple statement to name an appropriate wave OR simple statement about transmission or redirection** 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 E.** **Indicative scientific points may include:** Relevant points about **redirection / changing direction** • waves reflected from upper atmosphere/ionosphere • waves sent to satellite (through atmosphere) • waves sent (back to Earth) **allow** long wave radio can be diffracted by hills / obstacles Relevant points about **transmission** • short wave / microwaves penetrate atmosphere • short wave / microwaves sent to / from satellites • long wave reflect from atmosphere **allow** answers in terms of frequency **Types of waves** • short wave / microwave • long wave / radio wave scientific points can be awarded from a labelled diagram **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
10			<table><tr><td></td><td>reflection</td><td>interference</td></tr><tr><td>particle model</td><td>✓</td><td></td></tr><tr><td>wave model</td><td>✓</td><td>✓</td></tr><tr><td></td><td>(1)</td><td>(1)</td></tr></table>	2	**one mark for each correct column**
			Total	**2**	

Question			Answer	Marks	Guidance
11	(a)	(i)	**C** (1)	1	
		(ii)	**E** (1)	1	
	(b)	(i)	8 (ohms) (2) **but if answer is incorrect** $\frac{12}{1.5}$ (1)	2	
		(ii)	3 (ohms) (1)	1	**apply** ecf from (b)(i) e.g. 10.5 in (b)(i) gives 5.5 (1)
			Total	**5**	

Question			Answer	Marks	Guidance
12	(a)		<table><tr><td>cd player</td><td>✓</td></tr><tr><td>kettle</td><td></td></tr><tr><td>lamp</td><td></td></tr><tr><td>radio</td><td></td></tr><tr><td>washing machine</td><td>✓</td></tr></table> (1)	1	**both needed and no additional ticks**
	(b)		circuit contains diode (1) **then** only allows current in one direction / AW (1) **but** diode connected wrong way in circuit (2)	2	**allow** diode labelled on diagram **allow** the  is the wrong way round (1) **allow** cells / battery wrong way round (1)
	(c)		idea of half wave rectification / current only flows half of the time / current only flows part of the time (1)	1	**allow** the current is changing direction / the current is going back and forth **ignore** just the current is alternating / it is an alternating current **ignore** the current changes
			Total	**4**	

Question			Answer	Marks	Guidance
13			**[Level 3]** **Gives a description of resistance in terms of atomic structure** **AND** **gives an explanation of why resistance increases.** Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** **[Level 2]** **Gives a simple description of resistance or current in terms of the atomic structure** **AND** **describes how resistance changes.** May not give an explanation for this increase. Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** **[Level 1]** **Gives a simple description of resistance or current in terms of the atomic structure** **OR** **describes how resistance changes.** 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.	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** **At level 3 (in addition to points at levels 1 and 2):** **Explanation of why resistance increases** • collisions make the atoms vibrate more • increased vibrations causes more collisions • increased current causes more collisions • increased collisions causes the temperature of the wire to increase **At level 1 and 2:** **Description of resistance and current in terms of atomic structure** • electric current is a flow of electrons (through a wire) • atoms get in the way / hinder the movement of electrons • resistance is caused by collisions between electrons and atoms(ions) in the wire **Description of how resistance changes** • resistance increases (as current or voltage increases) • resistance increases as the bulb gets hotter **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
14	(a)		<table><tr><th>A</th><th>B</th><th>C</th><th>output</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table> (1)	1	**all four zeros needed**
	(b)		dark / not light (1) hot / wet (1)	2	**allow** night(time) / dim

Question			Answer	Marks	Guidance
	(c)		**any 2 from:** must be robust (to withstand take off) / AW (1) must be reliable / if it breaks in space it cannot be easily repaired / AW (1) must be able to operate without overheating / cooling system or heat sinks needed (during manufacture) (1) must be able to withstand large variations in temperature (in space) (1) must be clean /dust free (1) difficult to make connection to small objects / difficult to see faults (1) (idea that it is) difficult to obtain very pure silicon (1) (idea that) specialised manufacturing equipment or expertise is required (1)	2	**allow** very expensive to repair (in space) **allow** need to be made in a clean room / must be made in a dust free environment **allow** difficulty to hold small objects / difficult to hold small objects still e.g. fiddly **allow** need to use specific equipment e.g. must use microscopes
			Total	**5**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>15</td><td>(a)</td><td></td><td><table><tr><th>step up</th><th>step down</th><th>isolating</th></tr><tr><td>(✓)</td><td></td><td></td></tr><tr><td></td><td>✓</td><td></td></tr><tr><td></td><td></td><td>✓</td></tr><tr><td></td><td>✓</td><td></td></tr><tr><td>✓</td><td></td><td></td></tr><tr><td colspan="3">(2)</td></tr></table></td><td>2</td><td>all correct (2)
2 or 3 correct (1)</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>(P =) collector
and
(Q =) base (1)</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>0.6(0) (mA) (1)</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>logic gate / (electronic) switch / amplifier (1)</td><td>1</td><td>allow specific examples e.g. radio / chip / processor / memory/ computer/ (mobile) phone
ignore transformer
ignore circuit</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>5</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
16	(a)	(i)	Ranger Veloster M-Class	1	only all three required in any order for mark
		(ii)	Veloster (1)	1	more than one car selected scores zero
		(iii)	66% (1) lowest overall percentage (1)	2	if answer line blank **allow** correct answer in table **allow (**only) one below 70% **allow** it is the low**est** in every category
	(b)		**any two marks from:** (idea that) less depth gives a greater braking distance/AW (1) **but** (idea that) braking distance increases **more** as tread depth reduces / to below 3mm (2) (idea of) greater braking distances on concrete / AW (1)	2	 **allow** more depth gives shorter braking distance / AW **allow** the relationship is not linear / AW (1) **allow** reverse argument e.g. (idea of) smaller braking distance on tarmac **allow** it takes longer to stop on concrete /AW/ ora **allow as an additional marking point** less friction on concrete/ AW/ ora (1) **ignore** reference to just better or worse, answer must imply distance or time

Question			Answer	Marks	Guidance
	(c)	(i)	30 000 (km) (3) **but if final answer incorrect** $\frac{5.1}{0.17}$ (2) **or** 30 (2) **but if none of the above** 5.1 (mm) scores (1)	3	**allow** 30001(km) (3) **allow** $\frac{5.2}{0.17}$ (2) **allow** 5.2 (mm) (1)
		(ii)	**any one from** (idea that) tyres would have a large stopping distance (1) the stopping distance may depend on the surface (1) the tyre may have worn more than the calculated amount (1)	1	 **allow** long time to stop **allow** named examples e.g. it will take too long on tarmac in the wet / it will take longer on icy roads to stop / the wearing down of the tyre tread depends on the surface **allow** depends on the style of driving / depends on the load in the car / depends on the terrain
			Total	**10**	

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