OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics B

General Certificate of Secondary Education

Unit **B751/01:** Modules P1, P2, P3 (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.

For answers marked by levels of response:

a. **Read through the whole answer from start to finish**

b. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor

c. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

d. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

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

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

SECTION A

Question			Answer	Marks	Guidance
1	(a)		colour(s) (1) thermogram (1)	2	**ignore** shades of grey / black and white **allow** thermograph **allow** thermophotograph **ignore** thermal image / photograph **ignore** infrared image / photograph
	(b)		**max two from:** double glazing (in the windows) cavity wall insulation / foam in wall cavity loft insulation insulation above ceiling (2) **max two from:** measure(s) suggested have trapped air in them (1) (trapped) air is a good insulator (1)	3	**allow** carpets on the floor **allow** curtains at the window **ignore** wall insulation on its own **ignore** roof insulation on its own **ignore** reduces energy loss **allow** higher level answers in terms of correctly identified reduction of conduction / convection / radiation
	(c)	(i)	70% (3) **but if answer is incorrect** (7000 ÷ 10000) x 100 (2) **but if this is incorrect** useful energy = 7000(J) or (3000 ÷ 10000) x 100 (1)	3	**ignore** 0.7 on answer line unless % clearly crossed out and no other unit added 0.7 **on its own** scores a maximum (2)
		(ii)	yes (no mark) in the second worst / second bottom (efficiency) band or in the worst / lowest two (efficiency) bands / in band F (1)	1	**allow** ecf from c (i) if correctly linked **allow** one of the worst / there are five bands above it
			Total	**9**	

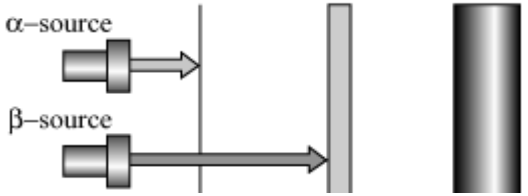
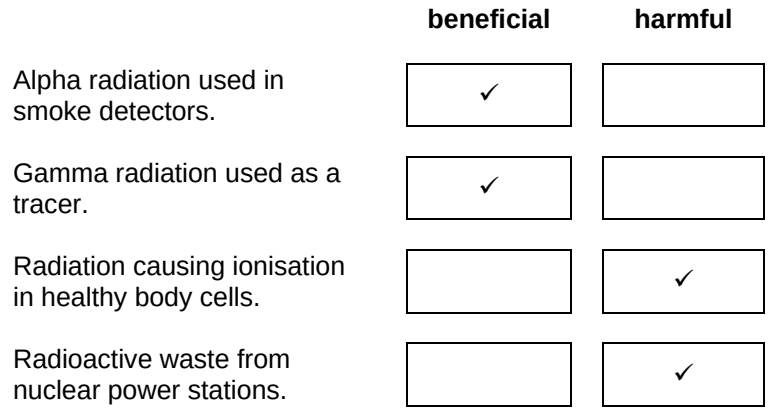
Question			Answer	Marks	Guidance
2	(a)		**Level 3 (5–6 marks)** Candidates make 3 valid points about cooking at least one for infrared and one for microwaves. **AND** Gives a reasoned comparison explaining why the microwave method is quicker cooking food / ora. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Candidate makes a comment about both microwave cooking **AND** infrared cooking. **OR** Candidate makes valid comparisons between microwave and infrared cooking. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Candidate makes a valid statement about infrared cooking **OR** Candidate makes a valid statement about microwave cooking. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted up to grade C** **A. microwave cooking** • m.w. penetrate 1-2 cm / short distance into food • m.w. absorbed by water / fat / sugar • this causes heating / particles gain energy • rest of food cooked by conduction / covection • m.w. reflected by sides of oven • m.w. pass through (glass) dish. **B. infrared cooking** • only heats the **surface** of the food • infrared reflected by sides of oven • rest of food cooked by conduction / convection • idea of some infrared reflected from (glass) dish. **C. comparison / explanation of longer or shorter cooking times** • more food heated directly / at start in m.w. oven / ora • less food needs cooking by conduction / convection in m.w. oven / ora • energy of m.w. goes directly into food • all of the oven / larger oven or space needs heating in conventional oven • greater energy need for i.r. method because of need to heat all of food / oven (space). • waves penetrate further in mw than in ir. **allow higher level answers** • i.r transfers KE to surface molecules / particles • m.w. increase KE of water / fat molecule / particles • KE transferred to centre of food by conduction / convection. Use the L1, L2, L3 annotations in scoris. Do not use ticks.

Question			Answer	Marks	Guidance
	(b)		**any two from:** idea that Damien comments on an opinion / just an idea / no evidence given (1) Susie's is based on evidence / gives data (1) need evidence / research for Damien's claim (1) more tests / research / evidence needed to validate Susie's statement (1) long term study for Susie's claim so evidence reliable (1) recent study for Susie's claim so using modern phones could be safer (1)	2	**allow** for lowest limit of acceptability idea that Susie's is based on data but Damien's is not (2)
			Total	**8**	

Question			Answer	Marks	Guidance
3	**(a)**		the temperature stays constant after 300s / 5 min / near the end / later in the experiment / AW (1)	1	**allow** flat line (1) **ignore** straight line **ignore** liquid cannot get any hotter **allow** horizontal / levels off / zero gradient
	(b)		106 (^{o}C)	1	
			Total	**2**	

Question			Answer	Marks	Guidance
4	(a)	(i)	by reflection (1) **but** TIR or description scores (2) from the side(s) of the fibre / cable (1)	2	If refraction mentioned max 1 **allow** multiple / many continued reflections from sides (2) **ignore** bounces on its own **but allow** answers such as bounces off the sides reflecting along the cable for (2) as bouncing is explained as reflecting
		(ii)	remote controls / (short distance) links between hardware eg computers / printers / mobile phones / IR / motion sensors / PIR sensors IR cameras / cameras / telescopes that detect heat / IR telescopes	1	**allow** examples eg TV / DVD / garage door / car locks **allow** lasers **ignore** communications and cooking **ignore** ideas about heating eg electric fires etc.
	(b)		no direct connection to phone line / socket needed / portable or convenient / can access when on the move (1)	1	**ignore** can be used wirelessly **allow** can be used wherever you are as limit of acceptability
	(c)		**digital (1)** because it is a series of on / off **or** 0 / 1 **or** high / low (1) **OR** then not **analogue (1)** because analogue is continuously variable / has a range of values / can be any value (1)	2	**allow** because digital is not variable / does not have a range of values / cannot be any value (1) description of wave on its own does not score a mark eg it's a square wave (0)
			Total	**6**	

SECTION B

Question			Answer	Marks	Guidance
5	(a)		arrow or line from alpha to front / rear face of paper and arrow or line from beta to front / rear of aluminium (1)	1	**allow** alpha line slightly penetrating paper and beta line slightly penetrating aluminium but not passing all the way through  **Do not allow** if radiation emerges from the barrier
	(b)		**any two from:** wear protective clothing (1) use tongs / keep your distance (1) short exposure time (1) use a shield / lead lined containers (1) direct away from people / AW (1)	2	**ignore** lab coat / gloves /safety clothing **allow** stand a safe distance away
	(c)		 	2	4 correct = 2 marks 2 / 3 correct = 1 mark 0 / 1 correct = 0 marks
			Total	**5**	

Question			Answer	Marks	Guidance
6			**Level 3 (5–6 marks)** Gives several reasons why scientists are watching this asteroid **AND** describes in detail what could happen if this asteroid collides with the Earth. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Gives a reason why scientists are watching this asteroid **AND** a general description of what could happen if this asteroid collides with the Earth **OR** Gives several reasons why scientists are watching this asteroid **OR** Gives several consequences of a collision between Earth and a large asteroid Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Gives a reason why scientists are watching this asteroid **OR** a brief and limited description of what could happen if this asteroid collides with the Earth. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted up to level E** **Relevant points include:** **why scientists are watching this NEO** • (idea that) although there is a low probability it is on a collision course / asteroid may hit Earth • there is a still a slight chance it may collide with the Earth • (idea that) this NEO is large • large asteroids cause more damage than small asteroids • (idea that) the consequence of a collision is so severe it must be observed • (idea that) 2019 is not that distant in the future. **accept higher level answers** • to get an accurate path • to get the speed • to determine if it will hit Earth • to plan for action such as deflecting it **what could happen if this asteroid collides with Earth** • make a crater in the surface of the Earth • widespread fires • dust created • dust will block out sunlight • climate change • species extinction / animals killed / people killed • cities destroyed • tsunami (if it hits an ocean). Use the L1, L2, L3 annotations in scoris. Do not use ticks.
			Total	**6**	

Question			Answer	Marks	Guidance
7	(a)		**any two from:** idea of renewable energy (1) idea of no polluting waste produced (1) crops can be grown under them / placed at sea (1) useful in remote locations (1) (idea that) new technology are making wind turbines more efficient (than conventional power stations) (1)	2	**allow** does not need **fossil** fuels / named fossil fuel (1) **allow** no carbon dioxide produced / no greenhouse gases (1) **allow** idea of less global warming (1) **allow** idea of less maintenance / labour or staff required (1) **allow** generation close to consumer / AW (1) **ignore** pollution unless qualified
	(b)	(i)	as wind speed increases the noise increases / ora (1)	1	
		(ii)	idea of: For **low** speeds / up to 5 m/s / up to mean speed – the noise level is below background / 33dB (1) idea of: for high speeds / above 5m/s / above mean speed – the noise level is generally below / not much above background (1)	2	**allow** 'most dots below background (1) **eg.** 'turbine noise less than tree noise' (1) **eg** 'at high wind speeds is the noise above background' (1) **allow** (if no other mark awarded) normal background is usually higher than turbine noise
			Total	**5**	

Question			Answer	Marks	Guidance
8	(a)		115 (W) (2) **but if answer incorrect** 0.5 x 230 (1)	2	
	(b)		(monitor) desktop PC keyboard mouse (1)	1	all three correct = 1 mark
	(c)		Must be clear who's idea is being discussed either named or by content eg mention of light bulbs (idea that) Fatima's / Claire's view would reduce energy use / could reduce global warming / climate change (1) eg • use less fossil fuels • reduce greenhouse gases (idea that) Sara's view would not reduce global warming / climate change / could increase it (1)	2	Eg it would reduce energy use = 0 Fatima's idea would reduce energy use = 1 **allow** idea that Fatima / Claire are correct / but would have little effect (1) **allow** Sarah's idea is sensible but every little helps and ignoring the problem could make matters worse (1) **allow** idea that Sara's view is sensible because the problem is so big (1)
			Total	**5**	

Question			Answer	Marks	Guidance
9	(a)		0.34 or 34% (2) **but if answer incorrect** 170 000 (MJ) / 500 000 (MJ) (x100) (1)	2	0.34% (1) 34 (1)
	(b)	(i)	direct (current) (1)	1	**allow** dc (1)
		(ii)	idea that readings change each side of the 0 / idea that readings are positive and negative or flow in two directions (during a cycle)/AW (1)	1	**allow** all change (in) direction (1) **allow** change from + to -
			Total	**4**	

SECTION C

Question			Answer	Marks	Guidance
10	**(a)**	**(i)**	Jaguar (1)	1	**allow** 375 (1)
		(ii)	lower mass than most / Rolls (1) less force needed to accelerate it / AW (1) **or** lower engine **capacity** / less than most / Rolls only 5l (1) less fuel burned per second (1) 1 mark for reason 2nd mark for explanation	2	**allow** (relatively) low mass / only 1900 / not weigh much (1) **ignore** has a small engine – needs to be comparative **allow** sensible ideas relating to streamlined shape / tyres / engine design
		(iii)	Volvo (1) lowest mass (1) smallest engine **capacity** / litres / AW (1)	3	**allow** smallest engine **allow** lightest (1) **allow** least power (1) **allow** idea more streamlined AW for (1)
	(b)	**(i)**	Mum ('s) (1)	1	more than one answer scores zero
		(ii)	Grandma ('s) (1)	1	more than one answer scores zero
	(c)	**(i)**	to develop more tests / improve the tests / carry out further research / see if their research agrees / check conclusions (1)	1	**allow** idea of general safety of cars is improving so standards change (1) **allow** so they can compare data between cars (1) **allow** so improvements can be added to the safety features of cars
		(ii)	**any two from:** initial tests and findings are provisional / AW (1) more (real) evidence comes to light – eg real accidents / AW (1) equipment is more accurate / sensitive / reliable (1) idea of cars being improved / adapted (1)	2	**allow** idea of new safety features added to cars (1)
	(d)		**any two ideas from the use of:** crumple zones (1) seatbelts (1) air bags (1) collapsible steering wheel (1)	2	**allow** bumpers (1) soft internal materials (1)
			Total	**13**	

Question			Answer	Marks	Guidance
11			**Level 3 (5–6 marks)** Answers give a detailed description of the journey and must refer clearly to the (steady) speeds and / or gradients of the graph. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Answers refer to the idea of the speeds being steady for the first and final 2 second periods or during the first and final distances. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Answers are limited to a simple description of one or two of the movements. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted to grade C** **Relevant points about level 3 include:** • Speed lower in first two seconds and higher in last two seconds **allow** higher level answers such as speeds are 4m / s, 0m / s and 6m / s. **Relevant points about level 2 include:** • steady speed for two seconds then stationary for two seconds then steady speed for 2 seconds • compare distances travelled in first two seconds and the last two seconds eg 8m and 12m • steady speed for first 8 m • steady speed for last 12m • stops after 8 m **Relevant points about level 1 include:** • moves then stationary then moves again (eg starts, stops then starts again). Use L1, L2, L3 annotations in scoris. Do not use ticks.
			Total	**6**	

Question			Answer	Marks	Guidance
12			weight – 2500 (N) (1) distance – 2 (m) (2) but if final answer is incorrect then look for: d = W / F 5000 / 2500 and award (1)	3	 **allow** 5000 divided by incorrect calculated weight Eg weight = 25N (0) 5000 / 25 scores (1) **but** 5000 / 25 = 200 scores (2) 200m without working scores 0
			Total	**3**	

Question			Answer	Marks	Guidance
13	(a)		12 (km / l) (1)	1	**allow** 30 / 2.5 (1)
	(b)		**any two from:** may have window(s) open (1) more electrics on / AW (1) heavier load (1) more acceleration (1) more braking (1)	2	 **allow** higher level answers: eg driving with different speeds / styles (1) eg faster driving (1) **ignore** travelled different distances
			Total	**3**	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553