

GCSE

Physics B

Unit **B751/01**: Modules P1, P2, P3 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2015

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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.

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Question	Answer	Marks	Guidance
1 a	A (is 40g) [1] (because it has) most or more mass / most or more energy / most or more water / biggest volume / (so will cool slowest) [1]	2	Must be comparative
b i	W [1]	1	
ii	Z [1]	1	
iii	W warms quicker than Y ORA Y warms slower than W[1] ice has lower specific heat capacity ORA water has a higher specific heat capacity[1]	2	Ignore all references to melting, boiling or cooling allow ice warms faster than water [2]
iv	more energy / longer time needed to boil than melt/AW [1] latent heat of vaporisation is higher than that for fusion / AW [1]	2	Eg takes longer to change water to gas than ice to water
	Total	8	

Question	Answer	Marks	Guidance
2 a	<p>[Level 3] Sensible reference to: trapped air reducing convection, shiny foil reflecting radiation back into the building AND wall B is thicker than wall A so less conduction. ORA Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Sensible reference to trapped air as an insulator, AND shiny foil reflecting ‘heat’ back into the building OR wall B is thicker than wall A so less conduction. ORA Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Sensible reference to air or foam as an insulator OR shiny foil reflecting ‘heat’ OR wall B is thicker / better insulator than wall A. ORA Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>Level 0: (0 marks)</p>	6	<p>This question is targeted up to grade C</p> <p>Indicative scientific points may include:</p> <p>Level 3:</p> <ul style="list-style-type: none"> • trapped air reduces convection • shiny foil reflects IR / radiation back into house <p>Level 2:</p> <ul style="list-style-type: none"> • trapped air is a good insulator / poor conductor • shiny foil reflects heat back into house <p>Level 1:</p> <ul style="list-style-type: none"> • air is a good insulator / poor conductor • air is trapped in B • foam is an insulator / prevents heat loss • shiny foil reflects heat • wall A is a better conductor than wall B <p>ignore heat trapped</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>

Question	Answer	Marks	Guidance
	Insufficient or irrelevant science. Answer not worthy of credit.		
b	<p>Correct comparison: cost higher than expected / less than 18% saving / saving is less [1]</p> <p>correct relevant calculation [1]</p> <p>some years are warmer / colder than others [1]</p> <p>the average may not be representative / average calculated over atypical years AW [1]</p> <p>differences in behaviour [1]</p> <p>cost of energy higher in later years [1]</p>	3	<p>allow 2012 and 2013 are higher / 2014 is lower [1] allow average is £920</p> <p>allow any other correct use of data e.g. 2014 is £98 lower / £32 per year saving / £96 saved over 3 years [1] eg. only 15% lower / [2]</p> <p>not merely 'different weather' [0] allow examples e.g. 2009-11 may have been warmer than usual [1]</p> <p>allow examples e.g. Simon may have had windows opened more (often) / more people at home / more time at home / more heating used / more TV watched / settings on heating changed / alterations to house / different or extra appliances used / other or different insulation or energy collecting methods fitted [1]</p>
Total		9	

Question	Answer	Marks	Guidance
3 a	microwave [1]	1	
b i	<p>any two marks from:</p> <p>(potentially) increased risks to health / harmful to health [1]</p> <p>excessive use of phone [1]</p> <p>long term effects possible [1]</p> <p>possible increased heating effect on brain [1]</p> <p>may damage brain [1]</p> <p>but</p> <p>may cause brain cancers / damages brain cells /mutates brain cells scores [2]</p>	2	<p>allow children more at risk [1]</p> <p>ignore just cancer/ mutates cells Accept tumour for cancer</p>
ii	conflict / oppose / don't agree / AW [1]	1	Allow not enough evidence to prove either way [1]
	Total	4	

Question	Answer	Marks	Guidance
4 a	Ricco emits IR [1] (and) IR detected by sensor [1]	2	allow Ricco emits heat / radiation [1] sensor detects Ricco's body heat scores [2]
b i	any one from no IR from ball [1] ball same temperature as surroundings [1]	1	allow ball not hot / ball does not emit heat / ball does not emit IR/heat radiation [1] allow ball not detected / ball too small [1]
ii	any one from foil reflects IR (back to Ricco) [1] not enough IR (from Ricco) detected [1]	1	allow foil reflects heat / foil reflects radiation [1] foil blocks IR / heat from body to sensor[1] allow IR / heat not detected [1]
	Total	4	

Question	Answer	Marks	Guidance
5 a	<p>any two for one mark</p> <p>coal / oil / gas [1]</p>	1	<p>two fossil fuels required in either order for one mark</p> <p>ignore peat allow crude oil but not incorrect fractions eg. petrol</p>
b	<p>any one from</p> <p>wood(chips) [1]</p> <p>straw [1]</p> <p>manure [1]</p> <p>biomass [1]</p> <p>methane [1]</p>	1	<p>ignore nuclear fuel</p> <p>allow household waste [1]</p>
c	<p>for one mark (... power lines called the) national grid [1]</p> <p>any two for one mark (... to consumers such as) homes / factories / offices / farms / schools / buildings / shops /etc [1]</p>	2	<p>allow electricity grid / electrical grid / distribution grid [1]</p> <p>two consumers required in either order for one mark</p>
d i	<p>input = (total) output [1]</p> <p>idea that energy is wasted as heat [1]</p>	2	<p>allow answers in calculations e.g. $1000 \text{ (MJ)} = 1000 \text{ (MJ)}$ or $1000 \text{ (MJ)} = 650 \text{ (MJ)} + 350 \text{ (MJ)}$ [1]</p> <p>if no marks awarded then allow useful output is less than the input [1]</p>

Question	Answer	Marks	Guidance
ii	0.35 or 35% [2] but if answer is incorrect or incomplete then: $\frac{350}{1000} \quad [1]$ or $\frac{350 \times 100}{1000} \quad [1]$	2	allow 0.35% [1] allow 35 with no unit or incorrect unit[1]
Total		9	

Question	Answer	Marks	Guidance
6	<p>beneficial any one from smoke detectors [1] tracer [1] cancer treatment [1] diagnosis [1]</p> <p>how radiation can harm any one from damages cells / causes mutations [1] causes cancer / tumours [1] ionises (cells) [1]</p>	2	<p>Ignore fire alarm</p> <p>Ignore cleaning surgical instruments allow other valid uses: e.g. using tracers to find leaks in pipes [1] e.g. allow helps filling containers to the correct level [1] e.g. sterilising medical equipment or food [1]</p>
Total		6	

Question	Answer	Marks	Guidance
7 a	heat does not escape / heat trapped / heat reflected / heat absorbed by atmosphere [1] more greenhouse gas(es) / more CO ₂ / more methane / more water vapour [1]	2	ignore temperature increase allow radiation or IR for heat answer must be an indication of an increase in greenhouse gas(es) or named greenhouse gas allow more energy use / increased deforestation / increased global warming / more cars / more industry / more fossil fuels used [1]
b i	idea of respiration [1]	1	allow breathing out / breathing / exhaling / forest fires / decay / decomposition / volcanoes / ocean release [1]
ii	idea that global warming has happened / more CO₂ in the (distant) past [1]	1	answer must indicate idea of in the past / before man / before the industrial revolution etc. Eg 'the ice age', 'tropical eras'. allow large fluctuations in temperature in the past [1] allow had peaks and troughs in the past / had peaks and troughs before the industrial revolution [1] allow idea that global warming has always been there [1]
c i	any one from short life (in atmosphere) [1] variability of water vapour levels [1]	1	Eg. 'not in atmosphere long enough to measure properly' [1]. (Vapour only) lasts a few days [1] eg. 'they are not sure what the number is' [1] eg. only an approximation / number changes [1]
ii	any one from the following comparisons: less in atmosphere / less methane [1] lasts for less time / does not last as long [1]	1	assume answer refers to methane unless otherwise stated more CO ₂ [1] but allow CO ₂ lasts longer [1] allow figures used from the table to illustrate a comparison
	Total	6	

Question	Answer	Marks	Guidance
8	<p>full calculation($720 - 240p =$) 480p or £4.80 and Habib is correct scores [3]</p> <p>if numerical answer above is incorrect or incomplete then:</p> <p>cooker: $2 \times 6 \times 20p = 240p$ [1] immersion heater : $3 \times 12 \times 20p = 720p$ [1]</p> <p>or</p> <p>use of 2 x 6 and 3 x 12 [1] use of x 20p [1]</p>	3	<p>answers acceptable in pence or pounds allow $720 - 240p = 480p$ with no comment [2] allow $720 - 240p = 480p$ and Habib is correct [3] allow £4.80 with no comment [2] allow $720 - 240p = 480p$ [2] allow £4.80 and Alice is correct [2]</p> <p>other acceptable calculations</p> <p>$£2.40 + £5.00 = £7.40$ and this is near to £7.20 so Habib is correct [3]</p> <p>$2 \times £2.40 = £4.80$ which is less than £7.20 so Habib is correct [3]</p> <p>only award 3 marks if Habib is identified along with full calculation</p>
Total		3	

Question	Answer	Marks	Guidance
9	<p>Level 3: (5 – 6 marks) Answer shows how both ideas can be maximised AND how this will help the environment. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2: (3 – 4 marks) Answer shows how both ideas can be used OR one idea used and maximised AND how this will help the environment. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1: (1 – 2 marks) Answer shows how one idea can be used OR how it helps the environment. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0: (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted up to grade C</p> <p>Indicative scientific points may include:</p> <p>maximise output:</p> <ul style="list-style-type: none"> • large area windows / large area conservatory / large area panels • windows / panels face Sun or south • panel tracks Sun • use most efficient photocells possible <p>helping environment:</p> <ul style="list-style-type: none"> • less fossil fuels needed • no polluting waste • less CO₂ or SO₂ or acid rain • less nuclear fuel used <p>using the ideas:</p> <ul style="list-style-type: none"> • photocells / solar panels need sunlight • photocells convert light to electricity • photocells / solar panels on roof / AW • windows let in radiation / AW • heat (energy) trapped in house • passive heating of water possible <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
	Total	6	

Question	Answer	Marks	Guidance
10 a	<p>any two from</p> <p>idea of two cameras used [1] cameras are set / known distance apart (1)</p> <p>time measured between two pictures / over fixed distance (1)</p> <p>speed = $\frac{\text{(fixed) distance}}{\text{time}}$ (1)</p>	2	<p>Eg. Two photos taken[1] Eg distance between lines known [1]</p> <p>allow measure time between start and end of journey (1)</p>
b	<p>32(m/s) (2)</p> <p>but If incorrect</p> <p>$\frac{800}{25}$ (1)</p>	2	
Total		4	

Question	Answer	Marks	Guidance
11 a i	B (1)	1	mark answer on line first allow answer ringed, underlined or ticked if no answer on the answer line
ii	C (1)	1	mark answer on line first allow answer ringed, underlined or ticked if no answer on the answer line
b	17600 J (2) but If incorrect 220 x 80 (1)	2	
c	any two from risks could cause bruising / break ribs/ friction burn / cut (1) could trap passenger (1) benefits holds passenger in seat / AW (1) reduces injury or named injury (1)	2	not just causes injury, injury must be stated eg. whiplash / choking
	Total	6	

Question	Answer	Marks	Guidance
12	<p>[Level 3] Describes changes in KE over whole journey AND Correctly calculates KE at B Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Describes changes in KE over whole journey. OR Calculates KE of car at B Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Realises that the KE depends on speed OR gives an indication of what is happening to KE over part of the journey. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points at levels 2 and 3 may include:</p> <ul style="list-style-type: none"> • KE increases between A and B • KE decreases between B and C • KE increases between C and D • KE at B is greater than the KE at D • At B $KE = 1/2 \times 400 \times 8 \times 8$ • KE at B = 12800 J <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> • KE increases as speed increases • KE increases between A and B • KE decreases between B and C • KE increases between C and D • KE greatest at B • KE zero at A • KE equation involving speed (correct or not) <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
Total		6	

Question	Answer	Marks	Guidance
13 a	<p>ideas that cost (per km) does not depend on distance travelled (1)</p> <p>petrol engines / cars cost more to run(per km) than diesel engines (1)</p> <p>cost (per km) decreases with speed up to 80 km/hr / increases above 80km/hr (1)</p>	3	<p>Lower fuel consumption with diesel [1] Ignore diesel engines cost less</p> <p>allow cost is a minimum at 80km/hr</p>
b C	<p>Jo (no mark)</p> <p>idea that Jo will have the longest thinking time / distance (1)</p> <p>Chris (no mark)</p> <p>largest braking distance / less friction, grip or traction (1)</p>	2	<p>answer must be Jo to score the mark for the explanation</p> <p>allow slowest reaction [1] Not slowest time or slowest reaction time</p> <p>answer must be Chris to score the mark for the explanation</p> <p>if no marks scored allow Jo (for tired) and Chris (for icy) (1)</p>
Total		5	

Question	Answer	Marks	Guidance
14 a i	1. solar (1) 2. bio diesel (1)	2	one mark for each correct answer, either order for either mark allow electric or battery [1] ethanol or bio-ethanol or bio-fuel for bio diesel [1]
ii	any one from idea that we don't get enough sunlight to power a car (1) bio-fuels are difficult to find / few garages sell bio-fuel (1) few charging points for battery / limited range for battery / batteries take too long to charge (1)	1	
b	A (1)	1	mark answer on line first allow answer ringed, underlined or ticked if no answer on the answer line
		4	

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