

Physics B J645

Gateway Science Suite

General Certificate of Secondary Education

Mark Scheme for the Units

January 2009

J645/MS/R/09J

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Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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GCSE Gateway Physics B (J645)

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Mark Scheme Guidance

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

/ = alternative and acceptable answers for the same marking point

(1) = separates marking points

not = answers which are not worthy of credit

reject = answers which are not worthy of credit

ignore = statements which are irrelevant

allow = answers that can be accepted

() = words which are not essential to gain credit

= underlined words must be present in answer to score a mark

ecf = error carried forward

AW = alternative wording

ora = or reverse argument

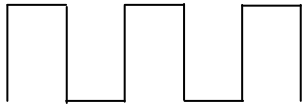
B651/01 Unit 1: Modules P1, P2 and P3 Foundation Tier

Question		Expected Answers	Marks	Additional Guidance
1	(a)	cup of tea (1)	1	mark answer on line first allow answer ringed, underlined or ticked if there is no answer on the answer line
	(b)	melting (1)	1	mark answer on line first allow answer ringed, underlined or ticked if there is no answer on the answer line
		Total	2	

Question		Expected Answers	Marks	Additional Guidance																					
2	(a)	<table border="0"> <tr> <td>material conductor</td> <td>good conductor</td> <td>bad</td> </tr> <tr> <td>steel</td> <td>(✓)</td> <td></td> </tr> <tr> <td>copper</td> <td>✓</td> <td></td> </tr> <tr> <td>wooden</td> <td></td> <td>✓</td> </tr> <tr> <td>glass</td> <td></td> <td>✓</td> </tr> <tr> <td>aluminium</td> <td>✓</td> <td></td> </tr> <tr> <td>polystyrene</td> <td></td> <td>✓</td> </tr> </table>	material conductor	good conductor	bad	steel	(✓)		copper	✓		wooden		✓	glass		✓	aluminium	✓		polystyrene		✓	2	<p>any two correct = (1) mark</p> <p>all five correct = (2) marks</p>
material conductor	good conductor	bad																							
steel	(✓)																								
copper	✓																								
wooden		✓																							
glass		✓																							
aluminium	✓																								
polystyrene		✓																							
	(b)	(fibreglass) loft insulation / cavity wall insulation / (thick) carpets / double glazing / underlay / (thick) curtains (1)	1	<p>allow any sensible named insulator (1) ignore just 'insulate' or 'insulation'</p> <p>allow insulate pipes / (hot) water tank (1)</p> <p>allow put a cavity wall in (1)</p> <p>not foil (behind radiator)</p> <p>not just floor insulation BUT under floor insulation scores (1)</p> <p>not draught excluders</p> <p>when more than one answer given with an incorrect response = (0)</p>																					
2	(c)	<p>efficiency = 0.25 (2)</p> <p>but if answer is incorrect</p> <p>$\frac{10\ 000}{40\ 000} \times (100)$ (1)</p>	2	<p>allow $\frac{1}{4}$ (2)</p> <p>allow 25% (2) if % shown clearly</p> <p>25 on its own scores(1)</p> <p>ignore any other units in answer</p>																					
		Total	5																						

Question		Expected Answers	Marks	Additional Guidance
3	(a)	vertical arrow on top of / to side of radiator pointing up (1)	1	allow near vertical arrow up to 45 degrees or correct circulation line allow upward curved arrow
	(b)	reflects the radiation (1)	1	not insulation allow bounces back into room
	(c)	graph: starting at the same temperature within 1mm above or below line by inspection (1) above graph already drawn over whole length showing a decreasing temperature (1)	2	
Total			4	

Question			Expected Answers	Marks	Additional Guidance
4	(a)	(i)	microwaves penetrate into potato (1) OR infrared only heats the outside surface (1)	1	allow microwaves penetrate more (1) allow microwaves heat the water (molecules / particles) in the potato (1) allow energy absorbed by water (1) but not by food ignore cooks from inside out not microwaves reach the centre or pass through allow infrared only heats the skin / surface / outer part (1)
		(ii)	communication / transferring information / signals / (using) mobile phones (1)	1	allow satellite dishes (1) not other references to heating with microwaves e.g. defrosting / certain types of hot water bottle / cooking
	(b)	(i)	any two from: sunburn (1) suntan (1) skin cancer (1)	2	allow eye damage allow burns the skin allow skin damage if no other skin answer not just burns
		(ii)	any two from: sun screen (1) cover skin (1) spend less time in sun / go out when sun is less hot / late afternoon / early evening AW (1)	2	allow sunglasses allow sun lotion / sun cream not sun tan lotion
Total				6	

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	B (1)	1	more than one answer scores 0
		(ii)	A and E (1)	1	both needed for the mark either order
	(b)		can have two values / 0, 1 / high, low / on, off / pulsed (1) 	1	allow a series of binary codes (1) not a range between 0 and 1 not can be turned off and on not any two values allow a correct diagram of pulses only if the answer line is blank or the answer is neutral, if answer is incorrect a diagram can not score(1)
Total				3	
6	(a)		light (1) electrical (1) direct (1)	3	allow sunlight but not sun allow electricity / electric allow dc / d.c. / DC / D.C. / d / D

Question		Expected Answers	Marks	Additional Guidance
6	(b)	<p>advantages idea of low maintenance / running costs (1) no need for power (supply) cables / lines (1) no need for fuel / saves fossil fuels (1) long life (1) rugged / hard wearing (1) renewable energy source (1) no polluting waste (at point of use) / give out no greenhouse gases / does not cause pollution(1) can be used in remote locations (1)</p> <p>disadvantages no / low power at night / dull or cloudy weather (1) idea of low power output (1) will not work (well) if covered by snow or dirt (1)</p>	2	<p>must have one advantage and one disadvantage for 2 marks allow cheap to run / energy (source) is free / saves money on electricity (1) not just cheap / cost effective / reliable</p> <p>not just 'it's renewable' / reusable</p> <p>not just no / less pollution / non polluting must have idea of no / less pollution given out ignore just environmentally friendly / does not harm environment</p> <p>allow power / energy needs to be stored in battery (1) allow no sun no electricity / power (1) allow can only work efficiently in sunlight (1) allow will not work without sunlight / in low light levels (1) ignore vague references to weather eg weather not reliable / bad weather (0)</p> <p>ignore reference to cost ignore visual pollution</p>
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
7		moving magnet (1) moving coil / wire / turns (1)	2	relative movement between coil and magnet = (2) not merely move the equipment any order
		Total	2	
8	(a)	(i) deep fat fryer (1)	1	
		(ii) twice the power / 2000W (1)	1	allow 2 000 (W) = 2 x 1 000 (W) allow answer clearly indicated correctly in table allow 3000 and 6000 (both multiplied by 3 mins)
	(b)	180 (pence) (2) but if answer is incorrect 5 x 3 x 12 (1)	2	£1.80 = (2) allow £180 / 180000p / £1800 = (1)
		Total	4	
9	(a)	stars / named type of star (1) comets (1) asteroids / (1) meteors (1) black holes (1) galaxies (1)	2	e.g. red giant / white dwarf / quasar any two valid points scores max (2) ignore references to human space debris allow (large) groups of stars BUT ignore constellations
	(b)	any two from: (idea of collision) between planets / asteroid and planet (1) idea of Moon formed from ejected material / material or debris broken away(1) idea of (iron) cores merge (to form Earth) (1) idea that other (less dense) material orbits the planet / Earth (as the Moon) (1)	2	allow planetoid allow material broken away or thrown into space ignore just Earth's core created (through collision) allow other material / smaller mass orbits Earth or planet
		Total	4	

Question		Expected Answers	Marks	Additional Guidance
10		artificial satellites cosmic rays flares... Sun Big Bang	Universe began... causes solar ionising radiation... used for...	3 4 links correct = (3) 2/3 links correct = (2) 1 link correct (1)
		Total	3	
11		1 alpha particles 2 beta particles 3 gamma rays	2	any order all three correct = (2) marks 1/2 correct = (1) mark allow answer ringed, underlined or ticked if there is no answer on the answer line
		Total	2	
12	(a)	measuring tape / trundle wheel (1) stopwatch / stopclock (1)	2	allow metre wheel but not metre rule / stick not merely clock, watch or timer
	(b)	6 (m/s) (2) but if answer is incorrect 120/20 (1)	2	
	(c) (i)	BC (1)	1	allow answer ringed, underlined or ticked if there is no answer on the answer line
	(ii)	D (1)	1	allow answer ringed, underlined or ticked if there is no answer on the answer line
		Total	6	

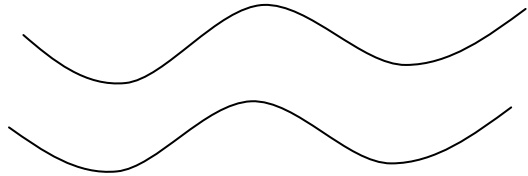
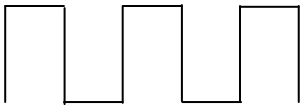
Question		Expected Answers	Marks	Additional Guidance
13	(a)	3600 (2) but if answer is incorrect 1200 x 3 (1)	2	converting g to kg scores (0)
	(b)	idea of greater mass / weight in car (1) higher speed / moving faster (1)	2	allow examples eg more people in car / packages in boot etc ignore bigger / heavier / car or a different car not just speed must be greater speed or higher speed allow accelerates / increases acceleration (1) ignore reduce air resistance
	(c)	petrol / diesel / LPG (1)	1	allow higher level answers but not just gas
		Total	5	
14	(a)	any three from: active ABS (brakes) (1) safety cage (1) crumple zones (1) seat-belts (1) air bags (1) passive electric windows (1) cruise control (1) paddle shift control / example of e.g. radio control on steering wheel (1)	3	allow bumpers
	(b)	work watts higher fuel	3	4 correct = (3) marks 2/3 correct = (2) marks 1 correct = (1) mark
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
15	(a)	increases / AW (1)	1	
	(b)	gravity (1)	1	allow weight
	(c)	air resistance / drag (1)	1	allow (air) friction not wind resistance
		Total	3	

B651/02 Unit 1: Modules P1, P2, P3 Higher Tier

Question		Expected Answers	Marks	Additional Guidance
1	(a)	(different) colours / (using) colour (1)	1	allow description of different colours (1) eg red shows warm areas / blue shows cold(er) areas ignore shades of grey
	(b)	latent heat of fusion of ice = 357 (J/g) (2) but if answer is incorrect latent heat of fusion = $1500 \div 4.2$ (1) OR latent heat of fusion = 357 143 (J/kg) (2) but if answer is incorrect latent heat of fusion $1500 \div 0.0042$ (1)	2	allow any number of correct decimal places allow answer in J/kg if kilogram clearly indicated
		Total	3	

Question		Expected Answers	Marks	Additional Guidance
2	(a)	(fibreglass) loft insulation / cavity wall insulation / (thick) carpets / double glazing / underlay / (thick) curtains (1)	1	allow any sensible named insulator (1) ignore just 'insulate' or 'insulation' allow insulate pipes / (hot) water tank(1) allow put a cavity wall in(1) not foil (behind radiator) not just floor insulation but under floor insulation scores (1) not draught excluders when more than one answer given with an incorrect response = (0)
	(b)	efficiency = 0.25 (2) but if answer is incorrect $\frac{10\ 000}{40\ 000} \times (100)$ (1)	2	allow $\frac{1}{4}$ (2) allow 25% (2) if % shown clearly 25 on its own scores(1) ignore any other units in answer
	(c)	any three from: air / atmosphere / particles (by radiator) heat up / gain energy (1) (air) expands / becomes less dense (1) less dense air / hot air or hot (air) particles rise(s) (1) replacing / displacing the cold air / particles / ora (1) more dense air / cold air or cold (air) particles fall(s) (1) replacing / displacing the hot air / particles / ora (1)	3	allow hot air is less dense than cold air / ora (1) ignore particles expand / become less dense allow air near or in contact with radiator or heater rises (1) this marking point is dependent on the gaining the previous one less dense air replaces more dense air = (2) this marking point is dependent on the gaining the previous one more dense air replaces less dense air = (2)
		Total	6	

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	(very) bright (1)	1	allow high number of photons/sec / AW (1) allow concentrated (1) ignore powerful / high energy / strong / focused not just a lot of light
		(ii)	peak matches with peak / AW (1) 	1	allow all parts in step or description of all parts (of wave) being in step (1) eg rise and sink at the same time or rate scores (1) allow diagram (1) ignore all peaks and troughs line up ignore same frequency / wavelength ignore in sync. or in sequence
		(iii)	can have two values / 0, 1 / high, low / on, off / pulsed (1) 	1	allow a series of binary codes (1) not a range between 0 and 1 not can be turned off and on not any two values allow a correct diagram of pulses only if the answer line is blank or the answer is neutral, if answer is incorrect a diagram can not score(1)
	(b)	(i)	microwaves penetrate into potato (1) OR infrared only heats the outside surface (1)	1	allow microwaves penetrate more (1) allow microwaves heat the water (molecules / particles) in the potato (1) allow energy absorbed by water (1) but not by food ignore cooks from the inside out not microwaves reach the centre or pass through allow infrared only heats the skin / surface / outer part (1)
		(ii)	shiny reflects / does not absorb microwaves or radiation (1)	1	allow reflects heat (radiation) / rays / waves /energy (1) but not light but ignore does not absorb heat ignore references to bounce
		(iii)	communication / transferring information / signals / (using) mobile phones (1)	1	allow satellite dishes (1) not other references to heating with microwaves eg defrosting / certain types of hot water bottle / cooking
Total				6	

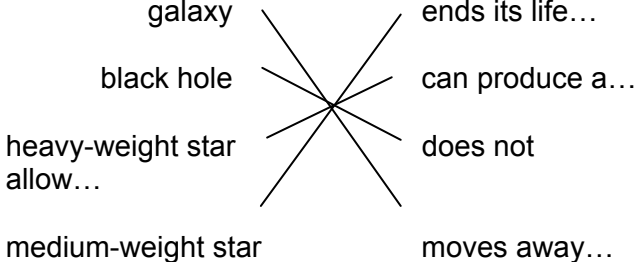
Question		Expected Answers	Marks	Additional Guidance
4	(a)	light in straight lines and reflects at surface (1)	1	maximum of five reflections at any point of reflection ray must not penetrate surface of fibre ray must reach the end of fibre ignore any ray drawn beyond right hand edge of the fibre allow candidates starting by drawing their own incident ray must be one ray only and continuous
	(b)	one medium / substance (and) another (medium or substance) (1) incident angle greater / bigger / larger / more than critical angle (1)	2	allow named materials / medium eg glass / air or water / air or fibre / air (order of medium is not needed)
		Total	3	
5	(a)	CFC's (1)	1	ignore liquids from fridges or aerosols allow words written out if they are phonetically acceptable any mention of CO ₂ scores (0)
	(b)	(more) skin or eye damage / skin cancer (1)	1	allow absorbs or stops UV / less UV allow (more) UV gets through (to Earth's surface) ignore less protection / harmful radiation
		Total	2	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	<p>advantages</p> <p>idea of low maintenance / running costs (1)</p> <p>no need for power (supply) cables / lines (1)</p> <p>no need for fuel / saves fossil fuels (1)</p> <p>long life (1)</p> <p>rugged / hard wearing (1)</p> <p>renewable energy source (1)</p> <p>no polluting waste (at point of use) / give out no greenhouse gases / does not cause pollution(1)</p> <p>can be used in remote locations (1)</p> <p>disadvantages</p> <p>no / low power at night / dull or cloudy weather (1)</p> <p>idea of low power output (1)</p> <p>will not work (well) if covered by snow or dirt (1)</p>	2	<p>must have one advantage and one disadvantage for 2 marks</p> <p>allow cheap to run / energy (source) is free / saves money on electricity (1)</p> <p>not just cheap / cost effective / reliable</p> <p>not just 'it's renewable' / reusable</p> <p>not just no / less pollution / non polluting must have idea of no / less pollution given out</p> <p>ignore just environmentally friendly / does not harm environment</p> <p>allow power / energy needs to be stored in battery (1)</p> <p>allow no sun no electricity / power (1)</p> <p>allow can only work efficiently in sunlight (1)</p> <p>allow will not work without sunlight / in low light levels (1)</p> <p>ignore vague references to weather eg weather not reliable / bad weather (0)</p> <p>ignore reference to cost</p> <p>ignore visual pollution</p>

Question		Expected Answers	Marks	Additional Guidance
6	(b)	dull / dark weather conditions / at night / when it's foggy / low light (intensity) (1) part of photocells covered up / (surface) of photocells dirty / covered by snow / in shade (1)	2	allow not enough light / no sunlight (1) eg photocells blocked by (leaves of) trees / snow scores (1) BUT light blocked by (leaves of trees) = (2) ignore just lower surface area ignore references to light reflecting off photocells ignore references to position of the Sun ignore references to charging / needs recharging
		Total	4	
7		180 (pence) (2) but if answer is incorrect 5 x 3 x 12 (1)	2	£1.80 = (2) allow £180 / 180000p / £1800 = (1)
		Total	2	

Question		Expected Answers	Marks	Additional Guidance	
8	(a)	<p>any two from</p> <p>moving the coil / wire / turns faster (1)</p> <p>insert iron / steel (core) in coil (1)</p> <p>moving the magnet faster (1)</p> <p>more coils / turns / turns per metre (1)</p> <p>stronger magnet (1)</p>	2	<p>not just insert a 'core'</p> <p>ignore longer coil / tighter coil</p> <p>ignore bigger magnet</p> <p>allow stronger field (1)</p>	
	(b)	(i)	C (1)	1	if answer line is blank credit correct answer ticked / crossed / circled or underlined in list
		(ii)	D (1)	1	if answer line is blank credit correct answer ticked / crossed / circled or underlined in list
		(iii)	4 cycles / AW (1)	2	<p>allow waves / oscillations / vibrations</p> <p>the number of cycles per second scores (1)</p> <p>allow references to current alternating</p> <p>eg amount of times the current alternates per second = (1)</p> <p>the current alternates 4 times per second = (2)</p>
Total			6		

Question		Expected Answers	Marks	Additional Guidance
9	(a)	<p>any two from: (idea of collision) between planets / asteroid and planet (1)</p> <p>idea of Moon formed from ejected material / material or debris broken away (1)</p> <p>idea of (iron) cores merge (to form Earth) (1)</p> <p>idea that other (less dense) material orbits the planet / Earth (as the Moon) (1)</p>	2	<p>allow planetoid</p> <p>allow material broken away or thrown into space</p> <p>ignore just Earth's core created (through collision)</p> <p>allow other material / smaller mass orbits Earth or planet</p>
	(b)	<p>any two from: astronauts have brought back rocks from the Moon (1)</p> <p>(idea that) <u>rocks</u> have similar composition or elements to <u>rocks</u> on Earth (1)</p> <p>Moon no iron / no magnetic field / no (iron) core (1)</p> <p>rocks on Earth and Moon have same oxygen content (1)</p> <p>(average) density of the Earth > Moon (1)</p>	2	<p>allow similar <u>rocks</u> (on Earth and Moon)</p> <p>ignore Moon made up of similar materials</p> <p>ignore references to the Moon being (still) trapped in Earth's gravitational field / gravity</p>
		Total	4	

Question	Expected Answers	Marks	Additional Guidance
10		2	all 4 correct = (2) marks 2/3 correct = (1) mark only one correct = 0 if no lines are drawn credit correct numbering or lettering of boxes
	Total	2	

11	<p>explanation must be correctly linked to the problem to score two marks mark the two parts together and award problem and explanation mark in either response if no problem identified or radiation / radioactivity not mentioned an explanation mark cannot be awarded</p> <p>1 <u>problem</u> may leak into groundwater / drinking water (1) <u>explanation</u> harmful to wildlife / people (1)</p> <p>2 <u>problem</u> remains radioactive for a (very) long time (1) <u>explanation</u> needs safeguarding / expense of long term storage / running out of (suitable) space / dangerous to or could harm workers health / needs storing underground / landfill sites / under water / in mines (1)</p>	2	<p>allow rivers/ lakes / streams / sea / water supply for groundwater ignore references to radioactivity and radiation but allow an explanation mark if 'problem' is 'its radioactive' eg its radioactive and is dangerous to people scores (1) allow cancer risks for 'harmful'</p> <p>allow has a long half-life / breaks down very slowly ignore references to radioactivity and radiation but allow an explanation mark if 'problem' is 'its radioactive' eg its radioactive and it has to be stored in mines scores (1) allow cancer risks for 'could harm workers'</p>
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Question		Expected Answers	Marks	Additional Guidance
11		<p>3 problem needs storing underground / landfill sites / under water / in mines (1) explanation needs safeguarding / expense or difficulties of long term storage / running out of (suitable) space / possible geological problems (1)</p>		<p>ignore difficult to store ignore references to radioactivity and radiation but allow an explanation mark if 'problem' is 'its radioactive' eg its radioactive and needs safeguarding scores (1)</p>
		<p>4 problem terrorist threat / could be made into weapons (1) explanation needs safeguarding or (high) security (for a long time) / cost of security (1)</p>		<p>ignore references to radioactivity and radiation but allow an explanation mark if 'problem' is 'its radioactive' eg its radioactive and it costs a lot to guard it scores (1)</p>
		<p>5 problem acceptable level of radiation / radioactivity today may change in future (1) explanation further / future studies / research / information may show low levels are harmful (1)</p>		<p>ignore references to radioactivity and radiation but allow an explanation mark if 'problem' is 'its radioactive' eg its radioactive and scientists could find that low levels are harmful scores (1)</p>
		Total		2
12	(a)	6 (m/s) (2) but if answer is incorrect 120/20 (1)	2	
	(b)	(i) increases / AW (1) (ii) decreases / AW (1)	2	allow longer / further (distance) (1) allow shorter (time) (1)
	(c) (i)	(speed) increasing (steadily) / AW (1)	1	allow accelerating allow speeding up
	(ii)	(speed) decreasing (steadily) / AW (1)	1	allow deceleration or negative acceleration allow idea of stopping at D allow slowing down
	(iii)	idea of area under the graph (1)	1	ignore speed or average speed x time
		Total	7	

Question		Expected Answers	Marks	Additional Guidance
13	(a)	3600 (2) but if answer is incorrect 1200 x 3 (1)	2	converting g to kg scores (0)
	(b)	idea of greater mass / weight in car (1) higher speed / moving faster (1)	2	allow examples eg more people in car / packages in boot etc ignore bigger / heavier / car or a different car not just speed must be greater speed or higher speed allow accelerates / increases acceleration (1) ignore reduce air resistance
		Total	4	

Question		Expected Answers	Marks	Additional Guidance
14	(a)	<p>any three from:</p> <p>idea of helps driver keep the car in a straight line when brakes supplied (1)</p> <p>prevents car skidding (during hard braking) (1)</p> <p>prevents the wheels locking (1)</p> <p>better control / can steer the car (1)</p> <p>idea of higher (average / net) frictional force (1)</p> <p>idea of during skidding car is not slowing down as effectively / braking force is not as effective (1)</p> <p>braking distance (can be) reduced (1)</p> <p>high / hard braking force needs to be maintained / is needed (1)</p> <p>car does not necessarily stop more quickly (1)</p>	3	<p>allow one mark for idea of sensors / controlled by 'on board' processor / computer (1) in addition to the expected answers</p> <p>allow better grip / more friction / more force (with road) or greater surface area in (contact with road) (1)</p> <p>ignore force on or in pedals</p> <p>not greatly reduced</p> <p>ignore braking distance increased</p> <p>allow keep foot pressed hard on the pedal (1)</p>
	(b)	<p>50 000 (W) (3)</p> <p>but if answer is incorrect</p> <p>$3000 \times 250 \div 15$ (2)</p> <p>3000×250 (1)</p> <p>OR incorrect work done $\div 15$ (1)</p> <p>OR speed calculation $250 \div 15 = 16.6(66..)$ (1)</p>	3	<p>for an incorrect attempt to convert to kW look to credit 1 or 2 marks for working</p> <p>max one mark no further mark for correctly computed answer</p>
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
15	(a)	gravity pulls her down / (force of) gravity > air resistance (1) <u>weight</u> = drag / air resistance (1)	2	allow weight for gravity ignore downward force > upward force ignore references to upthrust ignore just forces equal or forces balanced but weight and air resistance balance out / are equal scores (1) ignore references to upthrust allow drag / friction for air resistance in both marking points
	(b)	increased (surface) area or more drag / air resistance / friction (1)	1	allow less streamlined / less aerodynamic (1) ignore references to upthrust ignore wind resistance
		Total	3	

B652/01 Unit 2: Modules P4, P5 and P6 Foundation Tier

Question			Expected Answers	Marks	Additional Guidance
1	(a)	(i)	neutral (1)	1	no mark for two answers on the answer line allow correct answer circled if answer line is blank
		(ii)	earth (1)	1	no mark for two answers on the answer line allow correct answer circled if answer line is blank
	(b)	live and neutral (1)	1	allow correct answer circled if answer line is blank	
	(c)	3.3 (ohms) = (2) BUT 10/3 = (1)	2	correct answer alone = (2) marks only look at working if answer is incorrect	
Total			5		
2	(a)		longitudinal (1)	1	
	(b)	any two from: scans / pregnancy scan / AW (1) blood flow measurements (1) breaking (kidney) stones (1)		2	allow look for / treat tumours allow cleaning delicate equipment allow to treat muscle injury
		Total		3	
3	(a)		background (1)	1	allow cosmic (rays)
	(b)		alpha (1)	1	allow symbol allow correct answer circled if answer line blank
	(c)		decreases / gets less / reduces / half (1)	1	allow idea that radioactivity goes down / decays not runs out
	(d)		nucleus (1)	1	ignore middle
	(e)		(inside a) nuclear reactor (1)	1	allow idea that it needs to absorb neutrons / fire neutrons at it must indicate reactor / core not merely power plant
	Total			5	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	radiographer (1)	1	allow radiologist allow incorrect but recognisable spelling but not radiophotographer or similar
	(b)	damage / kills cells / cause cancer / damage to DNA (1)	1	must have idea of killing / damaging / mutating cells not merely interfering with
	(c)	sterilizing equipment (1)	1	allow tracers / (gamma) scans / imaging not kill tumours not CT / CAT scan
		Total	3	
5	(a)	B (1)	1	no mark for two answers on the answer line allow correct answer circled / ticked if answer line is blank
	(b)	any three from: object charged opposite to paint / AW (1) attracts paint (1) produces even coat / less waste / shadows painted / goes everywhere / AW (1) droplets have same charge (1) droplets repel (1) produce mist / fine spray / AW (1)	3	not paint stuck to object
		Total	4	
6		Moon placed military height	3	4 correct = (3) 3 or 2 correct = (2) 1 correct = (1)
			Total	3

Question		Expected Answers	Marks	Additional Guidance
7	(a)	increase / AW (1)	1	allow 17 m/s or 12 m/s + 5 m/s
	(b)	300 (m) (2) BUT correct average speed / correct working (10 or $15 + 5 \div 2$) (1)	2	correct answer alone = (2) marks only look at working if answer is incorrect
	(c)	idea of momentum / (kinetic) energy transfer / large force exerted (1) acceleration on body / driver (1) but rapid acceleration gains (2)	2	allow short stopping time / distance for driver instead of acceleration mark
		Total	5	
8	(a)	any two correct suggestions (2) eg netball / tennis ball / javelin / dart / rugby ball / basketball / golf ball (in flight) / cricket ball etc	2	any sensible sport <u>projectile</u> not merely name of sport eg rugby / golf / cricket reject description of collision eg hitting a golf ball / kicking a rugby ball
	(b)	collision / AW (1)	1	allow impulse ignore hit / kick
	(c)	10 (kg m/s) (2) BUT correct working (0.5×20) if answer is not correct (1)	2	correct answer alone = (2) marks only look at working if answer is incorrect
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
9		light travels... ✓	2	4 correct = (2) 3 or 2 correct = (1) 1 correct = (0)
		interference... ✗		
		an aerial... ✓		
		a dish... ✓		
Total			2	

10	(a)	(i)	refraction (1)	1	ignore dispersion
		(ii)	violet (1)	1	allow blue / indigo ignore purple
		(iii)	medium (1)	1	allow transparent not see through / clear ignore translucent
	(b)	(i)	converging (1)	1	allow positive
		(ii)	focal / focus (1)	1	
		Total			5

11	(a)	(i)	diode (1)	1	more than one answer scores (0) accept answers from the list only
		(ii)	LDR (1)	1	more than one answer scores (0) accept answers from the list only
		(iii)	thermistor (1)	1	more than one answer scores (0) accept answers from the list only
		(iv)	transformer (1)	1	more than one answer scores (0) accept answers from the list only
		(v)	capacitor (1)	1	more than one answer scores (0) accept answers from the list only
	(b)	(i)	decreases / gets shorter / more / AW (1)	1	
		(ii)	decreases / reduces (1)	1	
		(iii)	increases / gets brighter / AW (1)	1	
		Total			8

Question			Expected Answers	Marks	Additional Guidance
12	(a)		ammeter and wire in loop or complete circuit (1) magnet moving near complete circuit (1)	2	allow wire in complete loop without ammeter (1) purple reject any circuit containing magnet as part of the circuit
	(b)	(i)	50 (1)	1	
(ii)		transformer will not work / needs AC (1)	1		
			Total	4	
13	(a)		any one from: mixer / blender / microwave / fan oven / washing machine / dishwasher / tumble drier / extractor fan (1)	1	any reasonable kitchen device using a motor (1) not merely oven (0) not fridge
	(b)	(i)	moves faster / AW (1)	1	ignore melting / fuse blowing allow spins more
		(ii)	moves faster / AW (1)	1	allow more powerful
		(iii)	moves slower / AW (1)	1	
		(iv)	changes direction / AW (1)	1	allow goes backwards not merely goes forwards
			Total	5	
14	(a)	(i)	output 1 on top followed by 0 underneath (1)	1	both need to be correct for 1 mark
		(ii)	0 means off / 0V / low (voltage) and 1 means on / 5V / higher (voltage) (1)	1	both need to be correct for 1 mark allow current
	(b)	relay (1)	1		
			Total	3	

B652/02 Unit 2: Modules P4, P5 and P6 Higher Tier

Question		Expected Answers	Marks	Additional Guidance
1	(a)	B (1)	1	no mark for two answers on the answer line allow correct answer circled / ticked if answer line is blank
	(b)	any three from: object charged opposite to paint / AW (1) attracts paint (1) produces even coat / less waste / shadows painted / goes everywhere / AW (1) droplets have same charge (1) droplets repel (1) produce mist / fine spray / AW (1)	3	not paint stuck to object
		Total	4	
2	(a)	3.3 (ohms) = (2) BUT 10/3 = (1)	2	correct answer alone = (2) marks only look at working if answer is incorrect
	(b)	current (1) melts / blows (1)	2	allow power ignore energy not voltage not blows up / burns / snaps / breaks
	(c)	case made of insulator / plastic (1) idea that it cannot become live (1)	2	allow cannot normally give a shock / stops electrocution
		Total	6	
3	(a)	ring around second diagram (side to side)	1	allow two rings around 4th + 6th arrow
	(b)	can give image of soft tissue (1) does not damage cells (1)	2	allow non-ionising not just less damaging / less harmful / safer
		Total	3	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	237 (1) 93 (1) 144 (1)	3	no ecf for third marking point
	(b)	${}^{237}_{93}\text{X} + {}^4_2\alpha$ (1)	1	correct equation or ecf from 4a ${}^4_2\alpha$ scores 0
		Total	4	
5	(a)	fission (1)	1	no mark for two answers on the answer line allow correct answer circled / ticked if answer line is blank
	(b)	neutron (1)	1	no mark for two answers on the answer line allow correct answer circled / ticked if answer line is blank
	(c)	control / boron rods placed in reactor (1)	1	allow higher level answers about allowing enough neutrons to remain to keep the process operating
			Total	3
6	(a)	poles low (polar) high / AW hours	3	4 correct = (3) marks 2 / 3 correct = (2) marks 1 correct = (1) mark
	(b)	24 hours (1)	1	allow 1 day 24 scores 0
			Total	4

Question		Expected Answers	Marks	Additional Guidance
7	(a)	7 (m/s) (1)	1	allow 12 - 5 without final answer
	(b)	300 (m) (2) BUT correct average speed / correct working (10 or $15 + 5 \div 2$) (1)	2	correct answer alone = (2) marks only look at working if answer is incorrect
	(c)	idea of momentum / (kinetic) energy transfer / large force exerted (1) acceleration on body / driver (1) but rapid acceleration gains (2)	2	allow short stopping time / distance for driver instead of acceleration mark
		Total	5	
8	(a)	10 (kg m/s) (2) BUT correct working (0.5×20) if answer is not correct (1)	2	correct answer alone = (2) marks only look at working if answer is incorrect
	(b)	any two from: vector sum / resultant (of horizontal and vertical velocities) (1) no acceleration in the horizontal direction for a projectile (1) accelerates in the vertical position (1)	2	allow answers in the form of diagrams allow acceleration in horizontal directions due to air resistance
		Total	4	

Question		Expected Answers	Marks	Additional Guidance
9		reflection ————— evidence... polarisation ————— helps... diffraction ————— this can... interference - - - - - used to...	2	3 correct = (2) 2 correct = (1)
		Total	2	
10		✓ × × ✓	2	4 correct = (2) marks 2 / 3 correct = (1) marks 1 correct = (0) mark
		Total	2	
11	(a)	ray completed to pass through focus on RHS of lens (1) ray through centre of lens / ray through focus on object side of lens then parallel to P. Axis (1)	2	if no image shown to be formed max (1) vertical arrow not required for image as long as there is intersection of rays and image is labelled rays must intersect for both marks to be awarded
	(b)	can be projected / AW (onto a screen etc) (1)	1	ignore inverted
		Total	3	
12	(a)	(i) decreases / reduces (1)	1	
		(ii) increases / gets brighter / AW (1)	1	
	(b)	resistance of bulb increases / temperature of bulb is high / bulb is non-ohmic / AW (1)	1	must make clear reference to bulb / lamp
		Total	3	

Question			Expected Answers	Marks	Additional Guidance
13	(a)	(i)	decreases / reduces / AW (1)	1	resistance increases scores (0)
		(ii)	increases / speeds up / spins faster / AW (1)	1	ecf if resistance increase given for a(i) and reduced given for a(ii) then award 1 mark only for a(ii)
	(b)	(i)	decreases / reduces / AW (1)	1	resistance increases scores (0)
		(ii)	increases / speeds up / spins faster / AW (1)	1	ecf if resistance increase given for b(i) and reduced given for b(ii) then award 1 mark only for b(ii)
	(c)		3.75 (V) scores (2) BUT correct substitution $5 \times 36 / (12 + 36)$ / AW scores (1)	2	correct answer alone = (2) marks only look at working if answer is incorrect
			Total	6	
14	(a)	(i)	moves faster / AW (1)	1	ignore melting / fuse blowing allow spins more
		(ii)	moves faster / AW (1)	1	allow more powerful
		(iii)	moves slower / AW (1)	1	
		(iv)	changes direction / AW (1)	1	allow goes backwards not merely goes forwards
	(b)	(i)	safety / water on socket / less chance of shock (1)	1	not just water in bathroom allow higher level answers eg (no) less chance of live connecting to earth / isolate from mains (1) not unqualified isolate
		(ii)	same number of turns on each coil / AW (1)	1	allow same number of coils
			Total	6	
15			use of relay / AW (1)	3	
			isolating from high voltage / power mains (1) gates (only) have low power (output) (1)		
			Total	3	
16			collect current from coil (1)	1	not unqualified completes circuit
			allows coil to spin freely / wires do not become twisted (1)	1	allow generates AC / not generates DC
			Total	2	

Grade Thresholds

General Certificate of Secondary Education
Physics B (Specification Code J645)
January 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
B651/01	Raw	60	-	-	-	39	33	27	21	15	0
	UMS	69	-	-	-	60	50	40	30	20	0
B651/02	Raw	60	46	38	30	23	16	12	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B652/01	Raw	60	-	-	-	31	26	21	16	11	0
	UMS	69	-	-	-	60	50	40	30	20	0
B652/02	Raw	60	48	40	32	25	18	14	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J645	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J645	29.2	81.3	91.7	97.9	100.0	100.0	100.0	100.0	100.0	48

85 candidates were entered for aggregation this series

For a description of how UMS marks are calculated see:

http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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