

Physics A

Twenty First Century Science Suite

General Certificate of Secondary Education J635

Mark Schemes for the Units

January 2010

J635/MS/10J

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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.

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Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

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MARK SCHEMES FOR THE UNITS

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Guidance for Examiners

Additional Guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
not/reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant - applies to neutral answers
allow/accept	= answers that can be accepted
(words)	= words which are not essential to gain credit
<u>words</u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW/owtte	= alternative wording
ORA	= or reverse argument

Eg mark scheme shows 'work done in lifting/(change in) gravitational potential energy' (1)
work done = 0 marks
work done lifting = 1 mark
change in potential energy = 0 marks
gravitational potential energy = 1 mark

5. Annotations:
The following annotations are available on SCORIS.

✓	= correct response
✗	= incorrect response
bod	= benefit of the doubt
nbod	= benefit of the doubt not given
ECF	= error carried forward
^	= information omitted
I	= ignore
R	= reject

6. If a candidate alters his/her response, examiners should accept the alteration.
7. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

Eg

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth one mark.

Put ticks (✓) in the two correct boxes.

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth one mark.

8. The list principle:

If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, eg one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

9. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, eg shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

Eg If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

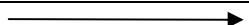
Edinburgh	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Manchester	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Paris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Southampton	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Score:	2	2	1	1	1	1	0	0	0	NR

A331/01 Modules P1, P2, P3 Foundation Tier

Question		Expected Answers	Marks	Rationale			
1	a	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding: 2px 5px;">A</td> <td style="padding: 2px 5px;">C</td> <td style="padding: 2px 5px;">B</td> </tr> </table> (1)	A	C	B	[1]	accept any clear and unambiguous response
	A	C	B				
b	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding: 2px 5px;">B</td> <td style="padding: 2px 5px;">C</td> <td style="padding: 2px 5px;">A</td> </tr> </table> (1)	B	C	A	[1]	accept any clear and unambiguous response	
B	C	A					
		Total	[2]				
2	star (1) galaxy (1) cloud of gas (1)		[3]	accept any clear and unambiguous response.			
			Total	[3]			
3	a	i	A (1)	[1]			
		ii	B (1)	[1]			
		iii	D (1)	[1]	accept B		
	b	results may be unreliable if not repeated / owtte (1)	[1]	mark is for improved reliability by repetition			
			Total	[4]			

Question		Expected Answers	Marks	Rationale
4	a	B (1) D (1) E (1)	[3]	answers can be in any order. accept any clear and unambiguous response
	b	The rock processes seen ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	[1]	accept any clear and unambiguous response.
Total			[4]	

Question			Expected Answers	Marks	Rationale
5	a	i	<p style="text-align: center;">The longer the exposure ...</p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input checked="" type="checkbox"/> (1)</p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p>	[1]	accept any clear and unambiguous response
		ii	(radiation) absorbed (1) heats up cells/tissue/body (1)	[2]	accept burning for 'heats up' must be a clear process for the second mark
		iii	<p style="text-align: center;">... is an ionising radiation</p> <p style="text-align: center;"><input checked="" type="checkbox"/> (1)</p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p>	[1]	accept any clear and unambiguous response
		iv	<p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;">There is only one example. <input checked="" type="checkbox"/> (1)</p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;">The boy did not use ... <input checked="" type="checkbox"/> (1)</p>	[2]	accept any clear and unambiguous response

Question			Expected Answers	Marks	Rationale
5	b	i	arrow pointing right  (1)	[1]	accept any clear and unambiguous response
		ii	infrared (1)	[1]	allow IR
	c		ozone (1)	[1]	accept any clear and unambiguous response
			Total	[9]	

6	a		less trees means less (photosynthesis) absorbing CO ₂ (1) burning trees release CO ₂ (1) CO ₂ levels increase (1)	[3]	allow carbon for CO ₂ do not allow burning fossil fuels produces CO ₂ must be explicit
	b		any two suggestions that will result in less CO ₂ emitted eg use of renewable energy sources; burn less fossil fuels; travel less; domestic level changes; any carbon sequestration idea such as plant more forests;	[2]	allow any specific examples eg use public transport or buses, energy efficient bulbs, use heating less allow recycling. do not allow suggestions involving animals
			Total	[5]	

Question			Expected Answers	Marks	Rationale																																																						
7	a	i	A (1)	[1]	accept any clear and unambiguous response																																																						
		ii	C (1)	[1]	accept any clear and unambiguous response																																																						
		iii	C (1)	[1]	accept any clear and unambiguous response																																																						
	b	i	radiographer (1)	[1]	accept any clear and unambiguous response																																																						
		ii	any three from: benefit: cures cancer; kills cancer cells; risk: side effects; kills <u>other</u> cells; causes (another) cancer;	[3]	maximum of two benefits can be counted maximum of two risks can be counted accept stop spreading / slows growth (of cancer) two separate side effects can be counted as two risks																																																						
	c		<table style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">Sue</td> <td style="text-align: center;">Tim</td> <td style="text-align: center;">both</td> <td style="text-align: center;">neither</td> <td></td> </tr> <tr> <td>... risk?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: right;">(1)</td> </tr> <tr> <td>... regulations?</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: right;">(1)</td> </tr> <tr> <td>... cost?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: right;">(1)</td> </tr> <tr> <td>... social issues?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: right;">(1)</td> </tr> </table>		Sue	Tim	both	neither		... risk?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(1)	... regulations?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(1)	... cost?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(1)	... social issues?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(1)	[4]	accept <table style="width: 100%; border-collapse: collapse;"> <tr> <td>... risk?</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: right;">(1)</td> </tr> <tr> <td>... regulations?</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: right;">(1)</td> </tr> <tr> <td>... cost?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: right;">(1)</td> </tr> <tr> <td>... social issues?</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: right;">(1)</td> </tr> </table>	... risk?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(1)	... regulations?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(1)	... cost?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(1)	... social issues?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(1)
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Total				[11]																																																							
8			furnace/boiler (1) turbine (1) generator/dynamo (1) in correct order (furnace – turbine – generator) (1)	[4]	one mark for each label in any box fourth mark is for the correct order allow description of process in place of furnace eg burning (coal), combustion, boiling, steam generation etc																																																						
Total				[4]																																																							

A331/02 Modules P1, P2, P3 Higher Tier

Question		Expected Answers	Marks	Additional Guidance
1	a	B (1) D (1) E (1)	[3]	any order
	b	The rock processes seen today <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	[1]	
Total			[4]	
2	a	4000 5000 5000 14 000 100	[4]	all five correct = 4 marks four correct = 3 marks three correct = 2 marks two correct = 1 mark one correct = 0 marks
	b	i E (1)	[1]	
		ii A C	[1]	both required for mark any order
Total			[6]	

Question		Expected Answers	Marks	Additional Guidance
3		<p>peer review other scientists/astronomers evaluate/review/check the claim (1)</p> <p>replicate results other scientists repeat the experiment/observations and get the same results / other scientists get the same results using a different method (1)</p> <p>strength of claim idea of identifying mistakes/errors in the original claim EITHER through peer review OR replication of results(1)</p>	[3]	<p>ignore repeat or replicate</p> <p>if the word repeated is used it must clearly refer to the work of another/other scientists.</p> <p>allow repeated experiments give different results will weaken the claim allow repeating results increases reliability</p>
		Total	[3]	
4	a	<p>less trees means less (photosynthesis) absorbing CO₂ (1) burning trees release CO₂ (1) CO₂ levels increase (1)</p>	[3]	<p>allow carbon for CO₂</p> <p>do not allow burning fossil fuels produces CO₂ must be explicit</p>
	b	<p>any two suggestions that will result in less CO₂ emitted eg use of renewable energy sources; burn less fossil fuels; travel less; domestic level changes; any carbon sequestration idea such as plant more forests;</p>	[2]	<p>allow any specific examples eg use public transport or buses, energy efficient bulbs, use heating less allow recycling. do not allow suggestions involving animals</p>
		Total	[5]	

Question		Expected Answers	Marks	Additional Guidance
5	a	links time of exposure to burns (1) gets direction eg. as time increases burns increase / 'positive correlation' (1)	[2]	allow a maximum of 1 mark for correlation of cancer with UV exposure/sunbed
	b	<div style="text-align: right;"><input type="checkbox"/></div> <div style="text-align: right;">... has energetic photons. <input checked="" type="checkbox"/> (1)</div> <div style="text-align: right;"><input type="checkbox"/></div> <div style="text-align: right;">... is an ionising radiation. <input checked="" type="checkbox"/> (1)</div> <div style="text-align: right;"><input type="checkbox"/></div>	[2]	
	c	not used according to instructions (1) idea of insufficient evidence eg only one person / very small sample / no control / no comparison with others (1)	[2]	accept a specific example eg stayed more than 6 minutes do not allow 'no evidence' ignore 'no proof' ignore 'fair test'
Total			[6]	

Question			Expected Answers	Marks	Additional Guidance
6	a	i	ozone (1)	[1]	allow O ₃ do not allow ozone layer do not allow oxygen/O/O ₂
		ii	<div style="text-align: center;"> <input type="checkbox"/> <input type="checkbox"/> It causes chemical reactions. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </div>	[1]	
	b		carbon dioxide (1) methane (1)	[2]	any order accept correct chemical symbols CO ₂ for carbon dioxide CH ₄ for methane
			Total	[4]	
7			furnace/boiler (1) turbine (1) generator/dynamo (1) in correct order (furnace – turbine – generator) (1)	[4]	one mark for each label in any box fourth mark is for the correct order allow description of process in place of furnace eg burning (coal), combustion, boiling, steam generation etc
			Total	[4]	

Question			Expected Answers	Marks	Additional Guidance
8	a	i	D (1)	[1]	
		ii	C (1)	[1]	
		iii	B D	[1]	both required for mark either order
	b		1 (Bq) (1)	[1]	
	c		<p>Type of radiation. <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p>Amount of radioactive source. <input checked="" type="checkbox"/></p> <p>Length of time exposed ... <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p>	[2]	three correct = 2 marks two correct = 1 mark one correct = 0 marks
	d		radiographer (1)	[1]	
	e		<p><input type="checkbox"/></p> <p>... risks and benefits. <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	[1]	

Question		Expected Answers		Marks	Additional Guidance
8	f			[2]	all correct = 2 marks two correct = 1 mark one or zero correct = 0 marks accept gamma/ γ for C accept alpha/ α for A accept beta/ β for B
		irradiating surgical instruments	C		
		... chemicals inside the body	C		
		... cancer on the surface of the skin	A or B		
		Total		[10]	

A332/01 Modules P4, P5, P6 Foundation Tier

Question			Expected Answers	Marks	Additional Guidance
1	a	i	9.6 (km) (1)	[1]	
		ii	2.4 (km) (1)	[1]	
	b	i	...the lorry is travelling fastest. <input type="checkbox"/> B (1)	[2]	
...the lorry is stationary. <input type="checkbox"/> D (1)					
		ii	any line starting at X between horizontal and vertical with a negative gradient (1)	[1]	no credit for any line that goes backwards in time or vertical or horizontal does not have to reach axis
	c		A (motorway) – fast/fastest / least speed changes/ (nearly) constant speed (1)	[3]	allow A- 70 mph, C – 30 mph, D – 50-60 mph speed needs to be clearly between speeds referred to for A and C. eg fairly fast/quite fast do not allow stops
			C (town) – slow/slowest / stops (and starts) (1)		
			D (main road) – middle speed / some speed changes / not a constant speed (1)		
			Total	[8]	

Question		Expected Answers	Marks	Additional Guidance			
2	a	force (1) work (1) kinetic energy (1)	[3]				
	b	i	[1]				
		ii	[2]				
		any two from: space craft slows down; because of air resistance/parachutes/friction; energy lost <u>as heat</u> ;					
		Total	[6]				
3	a	negative (1)	[1]				
	b	i	[1]	allow 10 5 1			
		smallest <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>B</td><td>C</td><td>A</td></tr></table> largest (1)	B	C	A		
B	C	A					
		ii	[1]				
		iii	[1]				
		iv	[1]	allow movement of charge allow idea of charges colliding			
		v	[1]	allow vice versa i.e. if temperature goes down then resistance goes up allow resistance increases as temperature increases, providing it is clearly stated that it is a p.t.c (positive temperature coefficient) thermistor			
	c	$\frac{500}{1000} \times 4 \times 8 \text{ p}$ (1)	[1]				
	d	small (1)	[1]				
		Total	[8]				

Question		Expected Answers	Marks	Additional Guidance
4	a	voltage (1) a current flows (1)	[2]	
	b	any two from: as the magnet rotates; field lines cut (the coil/wire); changing magnetic field; current/voltage is produced/induced;	[2]	allow magnet moves
	c	direct (1) alternating (1) 230 (1)	[3]	
		Total	[7]	

Question		Expected Answers	Marks	Additional Guidance
5	a	wavelength (1)	[1]	
	b	sound (1)	[1]	
	c	<p style="text-align: right;"> <input type="checkbox"/> <input type="checkbox"/> They all have the same speed. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </p>	[1]	
	d	<p style="text-align: right;"> <input type="checkbox"/> The intensity of a beam... <input checked="" type="checkbox"/> (1) Photons travel at the speed of light. <input checked="" type="checkbox"/> (1) <input type="checkbox"/> </p>	[2]	if more than two ticks then deduct one for each extra incorrect tick
	e		[2]	3 lines correct = 2 marks 1 or 2 lines correct = 1 mark
	f	A (1)	[1]	
Total			[8]	

Question		Expected Answers	Marks	Additional Guidance
6	a	<p>analogue signals can take all possible values / are continuously varying (1)</p> <p>digital signals only have 0s and 1s / on and off / two values (1)</p>	[2]	<p>these points may be shown on the diagrams - however if diagrams and writing contradict then lose mark(s)</p> <p>the candidate must have indicated the type of signal on at least one diagram to gain marks from the diagrams</p> <p>ignore references to quality of signal, noise, decoding etc</p> <p>allow on diagram of digital signal small indications of noise</p> <p>ignore small errors in drawings eg backward sloping curves</p>
	b	<p>amplified (1)</p> <p>quality (1)</p> <p>digital (1)</p>	[3]	
		Total	[5]	

A332/02 Modules P4, P5, P6 Higher Tier

Question		Expected Answers	Marks	Additional Guidance
1	a	-10m/s north and 10m/s south (1)	[1]	both parts required any unambiguous correct indication is OK eg underlining etc
	b	<p>A (motorway) – fast/fastest / least speed changes / (nearly) constant speed (1)</p> <p>C (town) – slow/slowest / stops (and starts) (1)</p> <p>D (main road) – middle speed / some speed changes / not a constant speed (1)</p>	[3]	<p>allow A- 70 mph, C – 30 mph, D – 50-60 mph</p> <p>speed needs to be clearly between speeds referred to for A and C. eg fairly fast/quite fast do not allow stops</p>
		Total	[4]	
2		<p>The resultant force on Alex ... <input checked="" type="checkbox"/> (1)</p> <p style="text-align: center;"><input type="checkbox"/></p> <p>If Alex exerts a force on the ... <input checked="" type="checkbox"/> (1)</p> <p style="text-align: center;"><input type="checkbox"/></p> <p style="text-align: center;"><input type="checkbox"/></p>	[2]	if more than two ticks then deduct one mark for each incorrect tick
		Total	[2]	

Question	Expected Answers	Marks	Additional Guidance
3	Vicky (1)	[1]	allow Vicky circled etc in diagram
	Total	[1]	
4	(loss of) PE = (gain in) KE / weight x height = $\frac{1}{2} mv^2$ (1) 400 x 20 = $\frac{1}{2} 40 v^2$ or $v^2 = 400 \times 20 \times 2 \div 40$ (1) v = 20 (m/s) (1)	[3]	PE = 400 x 20 or 8000 and everything else wrong then 1 mark correct numerical answer gains full marks providing the answer does not come from incorrect physics
	Total	[3]	

Question		Expected Answers	Marks	Additional Guidance
5	a	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;"> The weight of the bricks ... </div> <div style="border: 1px solid black; padding: 5px; width: 180px;"> ... force on the bricks. </div> </div> <div style="border: 1px solid black; height: 20px; width: 180px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 20px; width: 180px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 20px; width: 180px; margin-top: 5px;"></div>	[1]	
	b	<div style="border: 1px solid black; height: 20px; width: 180px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; height: 20px; width: 180px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; height: 20px; width: 180px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; padding: 5px; margin-left: 10px;"> ... in gravitational potential energy of the bricks. </div>	[1]	

Question		Expected Answers	Marks	Additional Guidance
5	c	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;"> ... work done does not ... </div> <div style="border: 1px solid black; padding: 5px; width: 180px; height: 20px; background-color: #cccccc;"></div> <div style="border: 1px solid black; padding: 5px; width: 180px; height: 20px; margin-top: 5px;"> ... to move the bricks. </div> <div style="border: 1px solid black; padding: 5px; width: 180px; height: 20px; background-color: #cccccc; margin-top: 5px;"></div> <div style="border: 1px solid black; padding: 5px; width: 180px; height: 20px; background-color: #cccccc; margin-top: 5px;"></div> </div>	[1]	
		Total	[3]	

Question		Expected Answers	Marks	Additional Guidance	
6	a		[2]	all three correct = 2 marks two or one correct = 1 mark	
	b	i	<p>The smallest current is in circuit <input type="text" value="B"/></p> <p>The largest current is in circuit <input type="text" value="C"/></p>	[1]	both required for mark
		ii	<p>any two from: circuit C has the smallest resistance / circuit B has the largest resistance; both circuits have the same voltage; correct explanation of adding resistors in series and parallel;</p>	[2]	<p>note: circuit C has largest current and circuit B has the smallest current is <u>not</u> a marking point for first mark allow ecf eg if 6 b i has B then A allow B has the highest resistance / A has the lowest resistance if 6 b i has A then C allow A has the highest resistance / C has the lowest resistance BUT if 6 b i has C then A or B then the only mark available is the 'same voltage' mark watch out for the candidate who gives B then A for 6 b i and then writes 'in B the current is smaller because it has to travel through two resistors whereas in A it only goes through one resistor' – this is zero because there is no explanation that the resistance of B is greater than the resistance of A ie mark is for resistance NOT resistors</p>
	c	i	a current / flow of charge (1)	[1]	allow movement of charge allow idea of charges colliding

Question			Expected Answers	Marks	Additional Guidance
6	c	ii	as the temperature increases the resistance decreases (OWTTE) (1)	[1]	allow vice versa ie if temperature goes down then resistance goes up allow resistance increases as temperature increases, providing it is clearly stated that it is a p.t.c. (positive temperature coefficient) thermistor
	d		$\frac{500}{1000} \times 4 \times 8 \text{ p}$ (1)	[1]	
	e		small (1)	[1]	
	f	i	3 (J) (1)	[1]	
		ii	electrons collide with the atoms/positive ions (1) causing (the atoms/ions) to vibrate (more) (resulting in an increase in temperature) (1)	[2]	do not allow positive electrons ignore collisions with other electrons
			Total	[12]	

Question	Expected Answers	Marks	Additional Guidance															
7	<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;"></td> <td style="width: 15%; text-align: center;">switch open</td> <td style="width: 15%; text-align: center;">switch closed</td> </tr> <tr> <td>A voltage is induced only when the magnet is moved.</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>A voltage is induced whenever the magnet is near the coil.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>A current flows through the ammeter only when the magnet is moved.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>A current flows through the ammeter whenever the magnet is near the coil.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>		switch open	switch closed	A voltage is induced only when the magnet is moved.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	A voltage is induced whenever the magnet is near the coil.	<input type="checkbox"/>	<input type="checkbox"/>	A current flows through the ammeter only when the magnet is moved.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	A current flows through the ammeter whenever the magnet is near the coil.	<input type="checkbox"/>	<input type="checkbox"/>	[4]	one mark for each correct row
	switch open	switch closed																
A voltage is induced only when the magnet is moved.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																
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	Total	[4]																

Question			Expected Answers	Marks	Additional Guidance
8	a	i	<p>analogue signals can take all possible values / are continuously varying (1)</p> <p>digital signals only have 0s and 1s / on and off / two values (1)</p>	[2]	<p>these points may be shown on the diagrams - however if diagrams and writing contradict then lose mark(s)</p> <p>the candidate must have indicated the type of signal on at least one diagram to gain marks from the diagrams</p> <p>ignore references to quality of signal, noise, decoding etc</p> <p>allow on diagram of digital signal small indications of noise</p> <p>ignore small errors in drawings eg backward sloping curves</p>
		ii	<p>intensity/quality (1)</p> <p>quality (1)</p> <p>digital and analogue (1)</p>	[3]	<p>needs both digital and analogue and in correct order for this mark</p>
		iii	<p>reproduces the original sound <input type="checkbox"/></p> <p><input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	[1]	
	b		<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p>They all have the same speed. <input type="checkbox"/> (1)</p>	[1]	

Question		Expected Answers	Marks	Additional Guidance
8	c	<p><input type="checkbox"/></p> <p>The intensity of a beam ... <input checked="" type="checkbox"/> (1)</p> <p>Photons travel at the speed ... <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p>	[2]	if more than two ticks then deduct one mark for each incorrect tick
		Total	[9]	

Question		Expected Answers	Marks	Additional Guidance
9	a	<p>Visible light has a very small ...</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p>	[1]	
	b		[2]	<p>ignore a line between no interference and no waves if drawn</p> <p>loud – constructive – in step = 1 mark</p> <p>quiet – destructive – out of step = 1 mark</p>
	c	$\frac{300}{600} \text{ (1)}$	[1]	
Total			[4]	

Grade Thresholds

General Certificate of Secondary Education
GCSE Twenty First Century Physics A (J635)
January 2010 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A331/01	Raw	42				23	18	14	10	6	0
	UMS	34				30	25	20	15	10	0
A331/02	Raw	42	30	25	20	16	10	7			0
	UMS	50	45	40	35	30	25	20			0
A332/01	Raw	42				22	18	15	12	9	0
	UMS	34				30	25	20	15	10	0
A332/02	Raw	42	31	25	19	14	10	8			0
	UMS	50	45	40	35	30	25	20			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
J635	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
J635	0.0	66.7	66.7	66.7	100.0	100.0	100.0	100.0	100.0	3

66 candidates were entered for aggregation this series

For a description of how UMS marks are calculated see:

<http://www.ocr.org.uk/learners/ums/index.html>

Statistics are correct at the time of publication.

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

OCR Customer Contact Centre

14 – 19 Qualifications (General)

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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Telephone: 01223 552552
Facsimile: 01223 552553

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