

**Physics A**  
**Twenty First Century Science**

General Certificate of Secondary Education **J635**

**Mark Schemes for the Units**

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**January 2009**

**J635/MS/R/09J**

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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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### GCSE Twenty First Century Science – Physics A (J635)

#### MARK SCHEMES FOR THE UNITS

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# Guidance for Examiners

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. Each separate marking point is indicated by a (1) at the end of that marking point.
4. Abbreviations, annotations and conventions used in the detailed Mark Scheme:

ORA = or reverse argument

NOT = point that is not given credit

AW/owtte = alternative wording/or words to that effect: allow any expression that is clearly equivalent

/ = Alternative and acceptable answers for the same marking point

point = point must be present to gain the mark

(description) = description which need not be present to gain the mark

E.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy'

work done = 0 marks

work done lifting = 1 mark

change in potential energy = 0 marks

gravitational potential energy = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. The list principle: if a list of responses greater than the number requested is given, you 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, i.e. 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.
7. Marking method for tick boxes:  
If there is a set of boxes, some of which should be ticked and others left empty, then you need to judge the entire set of boxes.

E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

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). For a two-mark question, the rationale would be:

All boxes are indicated scores 0 marks.

All boxes blank scores 0 marks.

All four boxes correct scores 2 marks.

Three boxes correct scores 1 mark.

Two boxes correct scores 1 mark.

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>NR</b>

## A331/01 Modules P1, P2, P3 Foundation Tier

Question			Expected Answers	Marks	Rationale
1	a	i	alpha (1) gamma (1)	2	allow symbols $\alpha$ (1) $\gamma$ (1)
		ii	paper (1)	1	
	b		Waste from David's body will be contaminated ... (1) <input type="checkbox"/> The iodine in david's body will get less ... (1) <input checked="" type="checkbox"/>	2	1 mark for each correct If 3 boxes ticked deduct one mark 4 ticks = 0 marks  Accept any clear and unambiguous response
	c		David is at greater risk from his cancer ... (1) <input checked="" type="checkbox"/>	1	Accept any clear and unambiguous response
<b>Total</b>				<b>6</b>	

Question		Expected Answers	Marks	Rationale				
2	a	ozone (1) <div style="display: inline-block; vertical-align: middle;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> </table> </div>		✓			1	Accept any clear and unambiguous response
✓								
	b	UV radiation is harmful to living things (1) <div style="display: inline-block; vertical-align: middle;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;">✓</td></tr> </table> </div>			✓	1	Accept any clear and unambiguous response	
✓								
	c	i	carbon dioxide (1)	1	allow CO <sub>2</sub>			
		ii	oxygen (1)	1	allow O <sub>2</sub>			
<b>Total</b>			<b>4</b>					

Question		Expected Answers	Marks	Rationale			
3	a		2	one correct (1)			
	b	<p>the time taken for the level of radioactivity to fall by half (1)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td> </td></tr> <tr><td style="text-align: center;">✓</td></tr> <tr><td> </td></tr> </table>		✓		1	Accept any clear and unambiguous response
✓							
<b>Total</b>			<b>3</b>				

Question		Expected Answers	Marks	Rationale
4	a	Thousands of millions of stars (1) <div style="display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; width: 40px; height: 20px; margin-bottom: 2px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; margin-bottom: 2px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; margin-bottom: 2px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; margin-bottom: 2px; text-align: center;">✓</div> </div>	1	Accept any clear and unambiguous response
	b	The Universe is expanding (1) <div style="display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; width: 40px; height: 20px; margin-bottom: 2px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; margin-bottom: 2px; text-align: center;">✓</div> <div style="border: 1px solid black; width: 40px; height: 20px; margin-bottom: 2px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; margin-bottom: 2px;"></div> </div>	1	Accept any clear and unambiguous response



Question		Expected Answers	Marks	Rationale
4	c	14 thousand millions years (1) <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	1	Accept any clear and unambiguous response
	d	Other scientists look at your work and evaluate it (1) <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	Accept any clear and unambiguous response
<b>Total</b>			<b>4</b>	

Question			Expected Answers	Marks	Rationale
5	a	i	absorb (1) vibrate (1)	2	In correct order
		ii	microwaves are non-ionising radiation (1) <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	Accept any clear and unambiguous response
	b		The oven will not work unless the door is shut (1) <input checked="" type="checkbox"/> <input type="checkbox"/> The door has a screen fitted to it to block microwaves (1) <input checked="" type="checkbox"/> <input type="checkbox"/>	2	1 mark for each correct If 3 boxes ticked deduct one mark 4 ticks = 0 marks  Accept any clear and unambiguous response
<b>Total</b>				<b>5</b>	

Question		Expected Answers	Marks	Rationale				
6	a	mark (1) ruth (1)	2	Names can be either order				
	b	kevin (1)	1					
	c	emma (1) kevin (1)	2	Names can be either order				
	d	<p>She believes benefit outweighs the risk (1)</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table>		✓			1	Accept any clear and unambiguous response
✓								
<b>Total</b>			<b>6</b>					

Question		Expected Answers	Marks	Rationale
7	a	<p>The UK is not near the edge of a tectonic plate (1)</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px; text-align: center;">✓</div> </div> <p>Earthquakes usually happen near the edge of a tectonic plate (1)</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px; text-align: center;">✓</div> </div>	2	<p>1 mark for each correct If 3 boxes ticked deduct one mark 4,5 or 6 ticks = 0 marks</p> <p>Accept any clear and unambiguous response</p>
	b	<p>Ensure that there is a well rehearsed emergency plan in place (1)</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px; text-align: center;">✓</div> </div> <p>Encourage new building in areas away from Earthquake zones (1)</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px; text-align: center;">✓</div> </div> <p>Enforce strict building regulations to prevent buildings from collapsing (1)</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin-right: 5px; text-align: center;">✓</div> </div>	3	<p>1 mark for each correct If 4 boxes ticked deduct one mark 5 or 6 ticks = 0 marks</p> <p>Accept any clear and unambiguous response</p>
<b>Total</b>			<b>5</b>	

Question			Expected Answers	Marks	Rationale				
8	a	i	32 (1)	1	Accept any clear and unambiguous response				
		ii	35 % (1)	1	Accept any clear and unambiguous response				
	b		Carbon (1) <table border="1" style="display: inline-table; vertical-align: middle; margin-left: 20px;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table>			✓		1	Accept any clear and unambiguous response
✓									
	c		It is easy to transmit energy over long distances (1) <table border="1" style="display: inline-table; vertical-align: middle; margin-left: 20px;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table> There will be less pollution near to their homes (1)		✓	✓		2	1 mark for each correct If 3 boxes ticked deduct one mark 4 ticks = 0 marks  Accept any clear and unambiguous response
✓									
✓									
<b>Total</b>				<b>5</b>					

Question		Expected Answers	Marks	Rationale				
9	a	<p>This explanation accounts for these observations. (1)</p> <table border="1"><tr><td></td></tr><tr><td></td></tr><tr><td>✓</td></tr><tr><td></td></tr></table>			✓		1	Accept any clear and unambiguous response
✓								
	b	<p>There are other observations which do not fit with this explanation (1)</p> <table border="1"><tr><td></td></tr><tr><td></td></tr><tr><td>✓</td></tr><tr><td></td></tr></table>			✓		1	Accept any clear and unambiguous response
✓								

Question		Expected Answers	Marks	Rationale
9	c	<p>Iridium ... found near asteroid impacts (1) <input checked="" type="checkbox"/></p> <p>65 million year old layer of Iridium in Italy (1) <input checked="" type="checkbox"/></p>	2	<p>1 mark for each correct If 3 boxes ticked deduct one mark 4 ticks = 0 marks</p> <p>Accept any clear and unambiguous response</p>
<b>Total</b>			<b>4</b>	
<b>Paper Total</b>			<b>42</b>	

## A331/02 Modules P1, P2, P3 Higher Tier

Question			Expected Answers	Marks	Rationale				
1	a	i	32 (1)	1	accept any clear and unambiguous response				
		ii	35 % (1)	1	accept any clear and unambiguous response				
	b		carbon (1) <div style="display: inline-block; vertical-align: middle;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> </table> </div>			✓		1	accept any clear and unambiguous response
✓									
	c		proton (1) neutron (1) two (1) chain (1) chemical (1)	5	'proton' in 1 <sup>st</sup> answer space=1 mark, 'neutron' in 2 <sup>nd</sup> answer space=1 mark, 'two' or '2' in 3 <sup>rd</sup> answer space=1 mark, 'chain' in 4 <sup>th</sup> answer space=1 mark, 'chemical' in 5 <sup>th</sup> answer space=1 mark  No alternative words accepted. 5 Marks Max.				
<b>Total</b>				<b>8</b>					




Question		Expected Answers	Marks	Rationale
2	a	<p>Explanation accounts for observations.</p> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	1	accept any clear and unambiguous response
	b	<p>... other observations do not fit explanation.</p> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	1	accept any clear and unambiguous response
	c	<p>Iridium ... found near asteroid impacts (1)</p> <input checked="" type="checkbox"/> <input type="checkbox"/> <p>65 million year old layer of Iridium in Italy (1)</p> <input checked="" type="checkbox"/> <input type="checkbox"/>	2	<p>1 mark for each correct answer                      If 3 boxes ticked deduct 1 mark                      4 ticks = 0 marks</p> <p>accept any clear and unambiguous response</p>
<b>Total</b>			<b>4</b>	

Question		Expected Answers	Marks	Rationale				
3	a	mark (1) ruth (1)	2	Names can be in either order.				
	b	kevin (1)	1					
	c	emma (1) kevin (1)	2	Names can be in either order.				
	d	<p>She believes benefit outweighs the risk (1)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td></td></tr> <tr><td style="text-align: center;">✓</td></tr> <tr><td></td></tr> <tr><td></td></tr> </table>		✓			1	accept any clear and unambiguous response
✓								
<b>Total</b>			<b>6</b>					

Question		Expected Answers					Marks	Rationale
4		<b>theory</b>	<b>obs.</b>	<b>agree</b>	<b>dis agree</b>	<b>prov es</b>	4	Mark each row independently. 1 mark for each correct row. accept any clear and unambiguous response More than 1 tick in a row = 0 marks for that row.
		universe ...	.....		✓			
		continents ...	.....	✓				
		Mountain chains ...	.....		✓			
		Universe started ...	.....	✓				
		<b>Total</b>					<b>4</b>	

Question		Expected Answers	Marks	Rationale	
5	a	... apparent separation of stars ... (1)	<input type="checkbox"/>	1	accept any clear and unambiguous response
			<input checked="" type="checkbox"/>		
			<input type="checkbox"/>		
			<input type="checkbox"/>		
b	i	300 000 km/s (1)	<input type="checkbox"/>	1	accept any clear and unambiguous response
			<input checked="" type="checkbox"/>		
			<input type="checkbox"/>		
	ii	500 (years)	1	accept any clear and unambiguous response	
c		... currently no evidence ... (1)	<input checked="" type="checkbox"/>	2	1 mark for each correct answer If 3 boxes ticked deduct 1 mark 4 ticks = 0 marks  accept any clear and unambiguous response
			<input type="checkbox"/>		
			<input type="checkbox"/>		
			<input checked="" type="checkbox"/>		
<b>Total</b>			<b>5</b>		

Question		Expected Answers	Marks	Rationale				
6	a	low level (1)	1	accept any clear and unambiguous response				
	b	better safe than sorry (1) <table border="1" style="display: inline-table; vertical-align: middle; margin-left: 20px;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table>			✓		1	accept any clear and unambiguous response
✓								
	c	i	50 % (1)	1	accept any clear and unambiguous response			
		ii	1 / 8 (1)	1	accept any clear and unambiguous response			
<b>Total</b>			<b>4</b>					

Question	Expected Answers	Marks	Rationale
7	B (1) R (1) Y (1)	3	No error carried forward  <b>IF ANSWER BOXES ARE BLANK,</b> 1 correct link (between B and R <b>or</b> between R and Y)=2marks Allow the following links for 3 marks  
<b>Total</b>		<b>3</b>	

Question		Expected Answers	Marks	Rationale
8	a	<p>The energy of each photon arriving (1)</p> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	2	<p>accept any clear and unambiguous response</p> <p>1 mark for each correct answer If 3 boxes ticked deduct 1 mark 4 or 5 ticks = 0 marks</p>
		<p>The number of photons ... each second (1)</p> <input checked="" type="checkbox"/> <input type="checkbox"/>		
	b	<p>Some photons are absorbed ... (1)</p> <input checked="" type="checkbox"/> <input type="checkbox"/>	2	<p>accept any clear and unambiguous response</p> <p>1 mark for each correct answer If 3 boxes ticked deduct 1 mark 4 ticks = 0 marks</p>
		<p>Microwave photons spread apart ... (1)</p> <input checked="" type="checkbox"/> <input type="checkbox"/>		
<b>Total</b>			<b>4</b>	
9	a	X = 136 (1) Y = 92 (1)	2	Mark each independently, 1 mark for each correct. Allow (222-86) for X .
	b	89 (1)	1	accept any clear and unambiguous response
	c	138 (1)	1	accept any clear and unambiguous response
<b>Total</b>			<b>4</b>	
<b>Paper Total</b>			<b>42</b>	

## A332/01 Modules P4, P5, P6 Foundation Tier

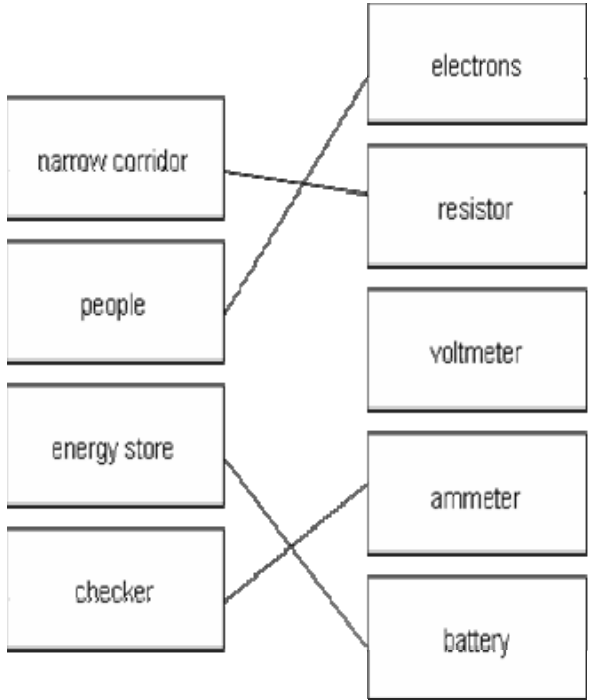
Question			Expected Answers	Marks	Rationale
1	a	i	C (1)	1	
		ii	D (1)	1	
		iii	B (1)	1	
	b		<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">A and C (1)</div> <div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; width: 30px; height: 20px; margin-left: 5px;"></div> </div> <div style="margin: 5px 0 5px 25px;">✓</div> <div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; width: 30px; height: 20px; margin-left: 5px;"></div> <div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; width: 30px; height: 20px; margin-left: 5px;"></div> <div style="margin: 5px 0 5px 25px;">B and D (1)</div> <div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; width: 30px; height: 20px; margin-left: 5px;"></div> <div style="margin: 5px 0 5px 25px;">✓</div> <div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; width: 30px; height: 20px; margin-left: 5px;"></div>	2	accept any clear and unambiguous response  1 mark for each correct answer If 3 boxes ticked deduct 1 mark 4 or more ticks = 0 marks
	c		B (1)	1	
	d	i	kinetic (1)	1	<b>allow</b> kinetic energy
		ii	gravitational potential (1)	1	<b>allow</b> gravitational / potential
	e		200 mph (1)	1	
<b>Total</b>				<b>9</b>	



Question		Expected Answers	Marks	Rationale
2	a	<p>The sprinter's speed was 12 m/s (1) <input checked="" type="checkbox"/></p> <p>The sprinter increases his...(1) <input checked="" type="checkbox"/></p>	2	<p>1 mark for each correct.</p> <p>If 3 boxes ticked deduct one mark.</p> <p>Accept any clear and unambiguous response.</p>
	b	<p>An average speed over a very...(1) <input checked="" type="checkbox"/></p>	1	<p>Accept any clear and unambiguous response.</p> <p>More than one response no marks</p>
	c	C (1)	1	
<b>Total</b>			<b>4</b>	

Question			Expected Answers	Marks	Rationale
3	a	i	2 A (1)	1	
		ii	12 V (1)	1	
		iii	$V_3$ (1)	1	
		iv	<p>the voltage of the battery...(1)</p> <p>the bigger the voltage across... (1)</p> <div style="display: inline-block; vertical-align: middle;"> <input type="checkbox"/>  <input checked="" type="checkbox"/>  <input checked="" type="checkbox"/>  <input type="checkbox"/> </div>	2	<p>accept any clear and unambiguous response</p> <p>1 mark for each correct answer            If 3 boxes ticked deduct 1 mark            4 ticks = 0 marks</p>
	b	i	W (1)	1	
		ii	$1 \Omega$ (1)	1	
<b>Total</b>				<b>7</b>	

Question		Expected Answers	Marks	Rationale
4	a	increases (1)	1	
	b		2	<p>look at lines as they leave the left-hand boxes two links correct (2) one link correct (1)</p> <p>if a candidate draws more than two lines and makes no attempt to cross them out then each extra wrong line cancels out one correct line</p>
		<b>Total</b>	<b>3</b>	

Question	Expected Answers	Marks	Rationale
5		4	<p>look at the links as they leave the left-hand boxes                      all four links correct (4)                      three links correct (3)                      two links correct (2)                      one link correct (1)</p> <p>if a candidate draws more than four lines and makes no attempt to cross them out then each wrong line cancels out one correct line</p>
<b>Total</b>		<b>4</b>	

Question		Expected Answers	Marks	Rationale
6	a	wavelength (1) <input checked="" type="checkbox"/>  frequency (1) <input checked="" type="checkbox"/>  <input type="checkbox"/> <input type="checkbox"/>	2	accept any clear and unambiguous response  1 mark for each correct answer If 3 boxes ticked deduct 1 mark 4 or more ticks = 0 marks
	b	B (1)	1	
	c	...travels at a very high speed (1) <input checked="" type="checkbox"/>  ...not absorbed much by glass (1) <input checked="" type="checkbox"/>  <input type="checkbox"/>	2	accept any clear and unambiguous response  1 mark for each correct answer If 3 boxes ticked deduct 1 mark 4 ticks = 0 marks
<b>Total</b>			<b>5</b>	

Question		Expected Answers				Marks	Rationale																		
7	a		<table border="1"> <thead> <tr> <th>statement</th> <th>analogue</th> <th>digital</th> <th>both</th> </tr> </thead> <tbody> <tr> <td>signal varies in the same way...</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>the signal code is made up of 1s...</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>the signal is transmitted as an...</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>the signal is made up of short pulse</td> <td></td> <td>✓</td> <td></td> </tr> </tbody> </table>	statement	analogue	digital	both	signal varies in the same way...	✓			the signal code is made up of 1s...		✓		the signal is transmitted as an...			✓	the signal is made up of short pulse		✓		4	mark each row independently as set of 3 tick boxes  <b>allow</b> all three boxes ticked in third row
		statement	analogue	digital	both																				
		signal varies in the same way...	✓																						
		the signal code is made up of 1s...		✓																					
		the signal is transmitted as an...			✓																				
the signal is made up of short pulse		✓																							
<b>b</b>	<b>i</b>	receiver (1)	1																						
	<b>ii</b>	decoder (1)	1																						
<b>Total</b>			<b>6</b>																						

Question	Expected Answers	Marks	Rationale						
8	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td style="text-align: center;">A</td></tr> <tr><td style="text-align: center;">F</td></tr> <tr><td style="text-align: center;">D</td></tr> <tr><td style="text-align: center;">C</td></tr> <tr><td style="text-align: center;">B</td></tr> <tr><td style="text-align: center;">E</td></tr> </table> (1) (1) (1) (1)	A	F	D	C	B	E	4	<p>D directly below F (1)            C directly below D (1)            B directly below C (1)            E directly below B (1)</p> <p>If candidates write answers in greyed out boxes:            (i) If letters present ignore written text.            (ii) If no letters, marks can be gained. If domino is correct text treat as if the letter box was completed e.g. 'reflection/two waves meet and their effects add together' = domino D</p> <p>If the candidate has misunderstood the instructions and has written in the greyed out boxes pairing an effect and its meaning as a single domino. They gain a mark for each correct pair:            diffraction – waves spread from a narrow gap            interference – two waves meet and their effects add together            reflection – a wave bounces            refraction – direction of a wave changes as it enters a different medium</p>
A									
F									
D									
C									
B									
E									
<b>Total</b>		<b>4</b>							
<b>Paper Total</b>		<b>42</b>							

## A332/02 Modules P4, P5, P6 Higher Tier

Question		Expected Answers	Marks	Rationale
1	a	<p>The sprinter's speed was 12 m/ s (1)</p> <p>The sprinter increases his...(1)</p>	2	<p>1 mark for each correct If 3 boxes ticked deduct one mark 4 ticks = 0 marks</p> <p>Accept any clear and unambiguous response</p>
	b	<p>An average speed over a very...(1)</p>	1	<p>Accept any clear and unambiguous response more than one response no marks</p>
	c	C (1)	1	<p>more than one response no marks accept any clear and unambiguous indication of graph C</p>
<b>Total</b>			<b>4</b>	

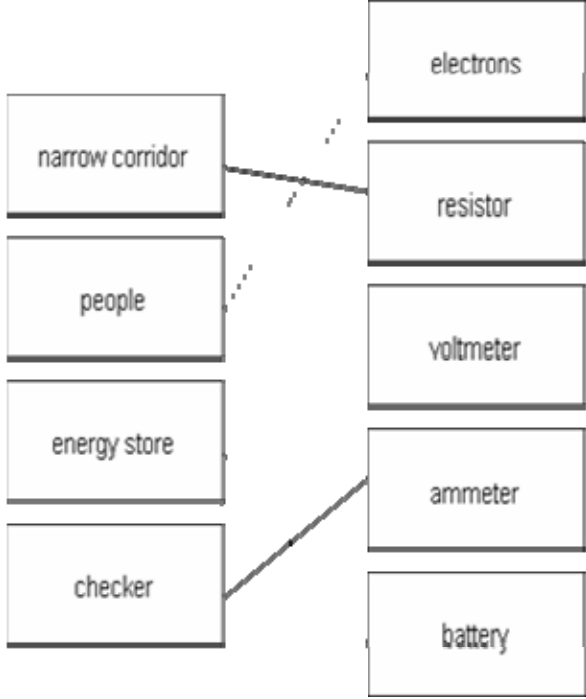


Question		Expected Answers	Marks	Rationale							
2	a	<p><b>A and C</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="text-align: center;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="text-align: center;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> </table> <p>(1)</p> <p><b>B and D</b></p> <p>(1)</p>		✓				✓		2	<p>1 mark for each correct                      If 3 boxes ticked deduct one mark                      4, 5 or 6 ticks = 0 marks</p> <p>Accept any clear and unambiguous response</p>
✓											
✓											
	b	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; vertical-align: top;"><b>force on plane</b></td> <td style="width: 70%; vertical-align: top;"><b>object interaction pair is acting on</b></td> </tr> <tr> <td style="vertical-align: top;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">A</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">B</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">C</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">D</div> </td> <td style="vertical-align: top;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;">exhaust particles ...</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;">the Earth</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">molecules of air</div> </td> </tr> </table>	<b>force on plane</b>	<b>object interaction pair is acting on</b>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">A</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">B</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">C</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">D</div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;">exhaust particles ...</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;">the Earth</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">molecules of air</div>	4	<p>look at the links as they leave the left-hand boxes                      all four links correct (4)                      three links correct (3)                      two links correct (2)                      one link correct (1)</p> <p>if a candidate draws more than four lines and makes no attempt to cross them out then each wrong line cancels out one correct line</p>			
<b>force on plane</b>	<b>object interaction pair is acting on</b>										
<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">A</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">B</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">C</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px; text-align: center;">D</div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;">exhaust particles ...</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;">the Earth</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">molecules of air</div>										

Question		Expected Answers			Marks	Rationale
2	c		take off	level flight	landing	3 mark each <b>row</b> independently as set of 3 tick boxes
		gains kinetic energy...	✓			
		work done...	✓	✓	✓	
		energy is conserved	✓	✓	✓	
		<b>Total</b>			<b>9</b>	

Question			Expected Answers	Marks	Rationale					
3	a	i	$V_1 + V_2 + V_3 = 12 \text{ V}$ (1) <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table>		✓			1	Accept any clear and unambiguous response  more than one response no marks	
✓										
		ii	6 V (1)	1	more than one response no marks accept any clear and unambiguous indication of correct answer					
		iii	2 A (1)	1	more than one response no marks accept any clear and unambiguous indication of correct answer					
	b		no change to voltage (1) <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table>			✓			1	Accept any clear and unambiguous response  more than one response no marks
✓										
<b>Total</b>				<b>4</b>						

Question		Expected Answers	Marks	Rationale	
4	a	<p>Two separate coils of wire are... (1) <input type="checkbox"/></p> <p>A changing magnetic field is... (1) <input checked="" type="checkbox"/></p> <p>A changing magnetic field induces...(1) <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	3	<p>1 mark for each correct</p> <p>If 4 boxes ticked deduct one mark</p> <p>5 or 6 ticks = 0 marks</p> <p>Accept any clear and unambiguous response</p>	
	b	i	1000 (1)	1	<p>more than one response no marks</p> <p>accept any clear and unambiguous indication of correct answer</p>
		ii	<p><math>N_s = N_p V_s / V_p</math> (1) <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	1	<p>Accept any clear and unambiguous response</p> <p>more than one response no marks</p>
	c		A C D (2)	2	<p>all three correct (2)</p> <p>any two correct (1)</p> <p>all four (0)</p> <p>If B given = 0 marks</p> <p><b>allow</b> unambiguous indication of answer</p>
<b>Total</b>			<b>7</b>		

Question	Expected Answers	Marks	Rationale
5		4	<p>look at the links as they leave the left-hand boxes                      all four links correct (4)                      three links correct (3)                      two links correct (2)                      one link correct (1)</p> <p>if a candidate draws more than four lines and makes no attempt to cross them out then each wrong line cancel</p>
<b>Total</b>		4	

Question	Expected Answers	Marks	Rationale						
6	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td style="text-align: center;">A</td></tr> <tr><td style="text-align: center;">F</td></tr> <tr><td style="text-align: center;">D</td></tr> <tr><td style="text-align: center;">C</td></tr> <tr><td style="text-align: center;">B</td></tr> <tr><td style="text-align: center;">E</td></tr> </table> <p style="margin-left: 100px;">(1)</p> <p style="margin-left: 100px;">(1)</p> <p style="margin-left: 100px;">(1)</p> <p style="margin-left: 100px;">(1)</p>	A	F	D	C	B	E	4	<p>D directly below F (1)  C directly below D (1)  B directly below C (1)  E directly below B (1)</p> <p>If candidates write answers in greyed out boxes:  If letters present ignore written text.  If no letters, marks can be gained. If domino is correct text treat as if the letter box was completed e.g. 'reflection/two waves meet and their effects add together' = domino D</p> <p>If the candidate has misunderstood the instructions and has written in the greyed out boxes pairing an effect and its meaning as a single domino. They gain a mark for each correct pair:  diffraction – waves spread from a narrow gap  interference – two waves meet and their effects add together  reflection – a wave bounces  refraction – direction of a wave changes as it enters a different medium</p>
A									
F									
D									
C									
B									
E									
<b>Total</b>		<b>4</b>							

Question		Expected Answers	Marks	Rationale
7	a	<p>two beams can produce an... (1)</p> <p>light is diffracted through small... (1)</p>	2	<p>1 mark for each correct If 3 boxes ticked deduct one mark 4 or 5 ticks = 0 marks</p> <p>Accept any clear and unambiguous response</p>
	b	i	2	<p>1 mark for each correct If 3 boxes ticked deduct one mark 4 ticks = 0 marks</p> <p>Accept any clear and unambiguous response</p>
		ii	1	<p>more than one response no marks accept any clear and unambiguous indication of correct answer</p>
<b>Total</b>			<b>5</b>	

Question			Expected Answers	Marks	Rationale						
8	a	i	10 (1)	1							
		ii	120 (1)	1	ignore units						
	b		<table border="1" style="margin-left: 20px;"> <tr><td>D</td><td>(1)</td></tr> <tr><td>A</td><td>(1)</td></tr> <tr><td>C</td><td>(1)</td></tr> </table>	D	(1)	A	(1)	C	(1)	3	
D	(1)										
A	(1)										
C	(1)										
<b>Total</b>				<b>5</b>							
<b>Paper Total</b>											
				<b>42</b>							



# Grade Thresholds

General Certificate of Secondary Education  
Physics A (Specification Code J635)  
January 2009 Examination Series

## Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A331/01	Raw	42	N/A	N/A	N/A	31	25	20	15	10	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A331/02	Raw	42	36	32	27	22	16	13	N/A	N/A	0
	UMS	50	45	40	35	30	25	20	N/A	N/A	0
A332/01	Raw	42	N/A	N/A	N/A	25	21	18	15	12	0
	UMS	34	N/A	N/A	N/A	30	25	20	15	10	0
A332/02	Raw	42	33	29	24	19	15	13	N/A	N/A	0
	UMS	50	45	40	35	30	25	20	N/A	N/A	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
<b>J635</b>	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
<b>J635</b>	0.0	25.0	75.0	100.0	100.0	100.0	100.0	100.0	100.0	4

**155 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](http://www.ocr.org.uk/learners/ums_results.html)

Statistics are correct at the time of publication.

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