

GCSE

Physics A

Session: 2010 June
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Code: J635
Units: A331; A332; A333

Physics A

General Certificate of Secondary Education **A331/01**

Unit 1: Modules P1, P2, P3 (Foundation Tier)

Mark Scheme for June 2010



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Question		Expected Answers	Marks	Additional Guidance
1	a	A C E (1)	[1]	any order
	b	E (1)	[1]	
	c	A (1)	[1]	
	d	C (1)	[1]	allow B as ecf, if B given as answer to part a
		Total	[4]	
2	a	top – crust (1) middle – core (1) bottom – mantle (1)	[3]	
	b	CAB (1)	[1]	
	c	star (1) galaxy (1)	[2]	
		Total	[6]	
3	a	A (1) C (1) E (1)	[3]	any order
	b	B (1)	[1]	
		Total	[4]	
4	a	emits (1) reflects (1) absorbs (1)	[3]	
	b	infrared (1)	[1]	allow IR
		Total	[4]	
5	a	identifies both variables i.e. risk AND area; gives direction e.g. risk <i>decreases</i> with area	[2]	one mark for just saying negative correlation 'the more you wear the less chance of getting cancer' scores one only because area not clearly implied
	b	example has two variables (1) correlation between variables explicitly stated (1)	[2]	
		Total	[4]	

Question	Expected Answers	Marks	Additional Guidance
6	carbon dioxide (1) global warming (1) ultraviolet (1) cancer (1)	[4]	
Total		[4]	
7	a	Microwaves heat by... <input checked="" type="checkbox"/> (1) Microwaves are ionising... <input type="checkbox"/> The screen on a... <input checked="" type="checkbox"/> (1) Mobile phones produce... <input checked="" type="checkbox"/> (1) Microwaves are blocked... <input type="checkbox"/> The higher the intensity... <input type="checkbox"/>	[3]
	b	...skin from getting hot <input type="checkbox"/> ...reflect or absorb... <input checked="" type="checkbox"/> (1) ...transmit... <input type="checkbox"/> ...skin from getting cold <input type="checkbox"/>	[1]
Total		[4]	

Question		Expected Answers	Marks	Additional Guidance
8	a	government officials (1)	[1]	
	b	benefit – e.g. cures cancer (1) risk – e.g. causes more cancer/protects cancerous cells (1)	[2]	
	c	cells being damaged <input type="checkbox"/> cells becoming cancer cells <input type="checkbox"/> cells killing themselves <input checked="" type="checkbox"/> (1) cells becoming radioactive <input type="checkbox"/>	[1]	
		Total	[4]	
9	a	beta (1) gamma (1) alpha (1)	[3]	
	b	gamma (1)	[1]	accept ecf as middle answer in table in part (a)
		Total	[4]	

Question		Expected Answers	Marks	Additional Guidance
10	a	<p>sensible comparison consistent with choice on efficiency (1)</p> <p>sensible comparison consistent with choice on cost (1)</p> <p>sensible comment consistent with choice on environmental factors (1)</p>	[3]	<p>marks may only be awarded for points based on information from the table..</p> <p>e.g. coal most efficient (1) relatively cheap (1) and does not produce radioactive waste (1)</p> <p>a sensible comment may be explaining why a feature is less important than another. e.g. wind is not the most efficient, but is still quite efficient.</p>
	b	idea that it is produced/made from another energy source (1)	[1]	allow named energy sources or 'primary source'.
		Total	[4]	

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1	a	A (1) C (1) E (1)	[3]	any order
	b	B (1)	[1]	
		Total	[4]	

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Question		Expected Answers	Marks	Additional Guidance
2	a	distance increases speed increases <input checked="" type="checkbox"/> (1) distance decrease speed increases <input type="checkbox"/> ...inversely related. <input type="checkbox"/> Galaxies are moving. <input checked="" type="checkbox"/> (1) distance increases speed decreases <input type="checkbox"/>	[2]	
	b	Gravity is acting... <input type="checkbox"/> Space is expanding. <input checked="" type="checkbox"/> (1) Hubble discovered... <input type="checkbox"/> ...too many galaxies... <input type="checkbox"/>	[1]	
	c	Life must exist on other planets <input type="checkbox"/> Galaxies are made up of stars. <input type="checkbox"/> The universe is orbiting our galaxy <input type="checkbox"/> Stars have a life cycle. <input type="checkbox"/> The universe started with a 'big bang'. <input checked="" type="checkbox"/> (1)	[1]	
	d	14 thousand million (1)	[1]	
Total			[5]	

Question		Expected Answers	Marks	Additional Guidance
3	a	fossils (1) rock types (1)	[2]	
	b	The theory linked... <input checked="" type="checkbox"/> (1) Mountains formed... <input type="checkbox"/> ...could not be replicated... <input type="checkbox"/> The evidence... <input checked="" type="checkbox"/> (1) ...pattern of magnetism... <input type="checkbox"/>	[2]	
	c i		[2]	one mark for identifying rows of mountains as a boundary and one mark for identifying earthquakes as a boundary list principle applies if extra lines drawn
	ii		[1]	any one arrow in the correct direction perpendicular to boundary or horizontal by eye list principle applies

			Total	[7]	
Question	Expected Answers		Marks	Additional Guidance	
4	a	<p>Microwaves heat by... <input checked="" type="checkbox"/> (1)</p> <p>Microwaves are ionising... <input type="checkbox"/></p> <p>The screen on a... <input checked="" type="checkbox"/> (1)</p> <p>Mobile phones produce... <input checked="" type="checkbox"/> (1)</p> <p>Microwaves are blocked... <input type="checkbox"/></p> <p>The higher the intensity... <input type="checkbox"/></p>	[3]		
	b	<p>...skin from getting hot. <input type="checkbox"/></p> <p>...reflect or absorb... <input checked="" type="checkbox"/> (1)</p> <p>...transmit... <input type="checkbox"/></p> <p>...skin from getting cold. <input type="checkbox"/></p>	[1]		
			Total	[4]	

Question		Expected Answers				Marks	Additional Guidance
5	a		green-house effect	holes in the ozone layer	both	[3]	allow ticks in both greenhouse and ozone layer for 'electromagnetic radiation' mark
		skin cancers		✓			
		electromagnetic radiation	(✓)	(✓)	✓		
		reversible chemical changes in the atmosphere		✓			
	b	photosynthesis (1) respiration/respiring (1)				[2]	either order allow phonetic spellings not breathing/ventilation
		Total				[5]	

Question		Expected Answers	Marks	Additional Guidance
6		<p>an example of a correlation given – the example must be related to (em) radiation exposure or global warming for this mark (1)</p> <p>the example does not have a causal link (1)</p> <p>correlation explained – e.g. There is a relationship/link between two variables, (But there is not necessarily a causal link between the variables) (1)</p> <p>cause explained – e.g. one variable depends upon another, one variable always follows the other (1)</p>	[4]	<p>if more than one example given apply list principle</p> <p>we are looking for an explanation of the meaning of ‘correlation’ not a description of their chosen correlation</p> <p>again we are looking for the meaning of ‘cause’</p>
		Total	[4]	
7	a	<p>sensible comparison consistent with choice on efficiency; (1)</p> <p>sensible comparison consistent with choice on cost; (1)</p> <p>sensible comment consistent with choice on environmental factors (1)</p>	[3]	<p>marks may only be awarded for points based on information from the table</p> <p>e.g. coal most efficient (1) relatively cheap (1) and does not produce radioactive waste (1)</p> <p>a sensible comment may be explaining why a feature is less important than another e.g. wind is not the most efficient, but is still quite efficient</p>
	b	idea that it is produced/made from another energy source (1)	[1]	allow named energy sources or ‘primary source’
		Total	[4]	

Question		Expected Answers	Marks	Additional Guidance
8	a	produces ions / ionising radiation (1)	[2]	ignore 'ionise cells' and heating effects arguments
		which disrupt chemical reactions / damages DNA (1)		accept causes mutation
	b	(damaged) cells killing themselves (1)	[1]	
	c	government officials (1)	[1]	
		Total	[4]	
9	a	i 3 (1)	[1]	
		ii 4.46 billion years (1)	[1]	must include units accept 4.5 billion for 4.46 billion accept 4 460 000 000 years accept 4.46×10^9 years ecf if $\frac{1}{4}$ for part ai 53.52 billion years for one mark if $\frac{7}{8}$ for part ai 15.29 billion years for one mark if 7 for part ai 1.91 billion years for one mark if 8 for part ai 1.67 billion years for one mark
	b	protons – 90 (1) neutrons – 144 (1) electrons – 0/none (1)	[3]	
		Total	[5]	

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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, e.g. 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

E.g. 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.

E.g.

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, e.g. 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, e.g. 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.

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).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

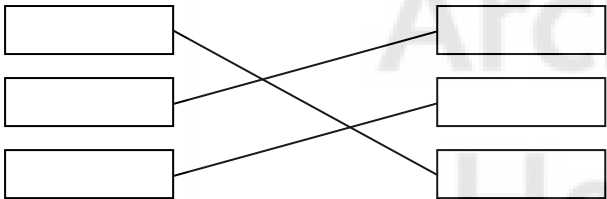
Question			Expected Answers	Marks	Additional Guidance
1	a	i	electrons (1)	[1]	
		ii	positive (1)	[1]	
	b	i	... stay still and do not move. <input type="checkbox"/> ... move together and touch. <input type="checkbox"/> ... move away from each other. <input checked="" type="checkbox"/> (1) ... spin around together. <input type="checkbox"/>	[1]	
		ii	like/same charges (1) repel (1)	[2]	allow 2 negative charges/they are both negative/both gain electrons allow push away for repel 2 positives repel = one mark
	c		... they have high melting points. <input type="checkbox"/> ... free electrons that can move. <input checked="" type="checkbox"/> (1) ... they conduct heat very well. <input type="checkbox"/> ... they are shiny. <input type="checkbox"/>	[1]	
			Total	[6]	

Question			Expected Answers	Marks	Additional Guidance	
2	a	i	generator (1) electromagnetic (1) alternating (1)	[3]		
		ii	230 (1)	[1]	not 240	
		iii	transformer (1)	[1]		
		iv	core (1) coil of wire (1)	[2]	core on left coil on right	
	b	i	move the magnet/coil (1)	[1]	accept annotation of diagram accept rotate/spin the magnet	
		ii	<p>increase the number of coils <input checked="" type="checkbox"/> (1)</p> <p>use different coloured wire <input type="checkbox"/></p> <p>use a stronger magnet <input checked="" type="checkbox"/> (1)</p> <p>use a weaker magnet <input type="checkbox"/></p> <p>use a larger voltmeter <input type="checkbox"/></p>	[2]	take off one mark for every extra box ticked	
			Total	[10]		
3	a	i	arrow pointing up from the book (1)	[1]	allow arrow pointing up towards the book	
		ii	15 (1)	[1]	accept annotation on diagram	
		iii	an interaction (1)	[1]		
		b	i	friction (1) against the book / opposite direction to motion (1)	[2]	
			ii	1.5 x 6 (1) 9 (1)	[2]	
			iii	increases (1)	[1]	not faster
			Total	[8]		

Question		Expected Answers	Marks	Additional Guidance
4	a	$\frac{13000}{20}$ (1)	[1]	
	b	any three from: burnt fuel / (hot) gases go down / downwards; there is an equal and opposite (thrust) on the rocket; weight/gravitational force/gravity acts down; upwards force/thrust greater than weight/gravity/downwards force;	[3]	owtte idea of interaction pair force pushing rocket up allow upthrust
	c	700 000 (1)	[1]	allow 700 000 000 <u>Joules</u> / <u>J</u>
		Total	[5]	

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Question		Expected Answers	Marks	Additional Guidance								
5	a	matter <input type="checkbox"/> energy <input checked="" type="checkbox"/> (1) disturbances <input checked="" type="checkbox"/> (1) particles <input type="checkbox"/> charge <input type="checkbox"/>	[2]									
	b	<table border="0"> <tr> <td style="text-align: center;">description</td> <td style="text-align: center;">type of wave</td> </tr> <tr> <td><input type="text" value="... same direction ..."/></td> <td rowspan="2"><input type="text" value="longitudinal waves"/></td> </tr> <tr> <td><input type="text" value="... right angles ..."/></td> </tr> <tr> <td><input type="text" value="needs a medium"/></td> <td rowspan="2"><input type="text" value="transverse waves"/></td> </tr> <tr> <td><input type="text" value="... vacuum"/></td> </tr> </table>	description	type of wave	<input type="text" value="... same direction ..."/>	<input type="text" value="longitudinal waves"/>	<input type="text" value="... right angles ..."/>	<input type="text" value="needs a medium"/>	<input type="text" value="transverse waves"/>	<input type="text" value="... vacuum"/>	[2]	2 or 3 lines correct = one mark 4 marks correct = two marks any two lines from a box on the left, that box is incorrect
description	type of wave											
<input type="text" value="... same direction ..."/>	<input type="text" value="longitudinal waves"/>											
<input type="text" value="... right angles ..."/>												
<input type="text" value="needs a medium"/>	<input type="text" value="transverse waves"/>											
<input type="text" value="... vacuum"/>												
	c	i C (1)	[1]									
		ii D (1)	[1]									
	d	i 5 oscillations/waves (1) every/per second (1)	[2]	allow definition of frequency eg the number of waves in given time for one mark								
		ii 50 (1)	[1]									
Total			[9]									

Question			Expected Answers	Marks	Additional Guidance
6	a		amateur modulation <input type="checkbox"/> american modulation <input type="checkbox"/> amplitude modulation <input checked="" type="checkbox"/> (1) analogue modulation <input type="checkbox"/>	[1]	
	b	i		[2]	1 or 2 lines correct = one mark 3 correct lines = two marks
		ii	idea of extra bits added to the signal (1)	[1]	do not accept idea of 'sound' allow interference
			Total	[4]	

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 work done lifting = 1 mark
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 gravitational potential energy = 1 mark

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<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, e.g. 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, e.g. 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.

E.g. 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

Question			Expected Answers	Marks	Additional Guidance
1	a	i	electrons (1)	[1]	accept any clear and unambiguous response
		ii	positive (1)	[1]	accept any clear and unambiguous response
	b	i	... stay still and do not move. <input type="checkbox"/> ... move together and touch. <input type="checkbox"/> ... move away from each other. <input checked="" type="checkbox"/> (1) ... spin around together. <input type="checkbox"/>	[1]	
		ii	like/same charges (1) repel (1)	[2]	allow 2 negative charges/they are both negative allow electrons in place of negative charges allow push away for repel 2 positives repel = 1 mark
	c		... they have high melting points. <input type="checkbox"/> ... free electrons that can move. <input checked="" type="checkbox"/> (1) ... they conduct heat very well. <input type="checkbox"/> ... they are shiny. <input type="checkbox"/>	[1]	
			Total	[6]	

Question		Expected Answers	Marks	Additional Guidance
2	a	magnets move (in relation to coil) (1) leading to a <u>changing</u> magnetic field (1) which causes voltage/potential difference/p.d. to be induced in the coil (1)	[3]	accept 'induces current' in place of voltage
	b	transformer (1)	[1]	ignore reference to step up/ step down
	c	i AC/alternating current (1)	[1]	allow 'alternating' on its own
		ii ... faster to generate. <input type="checkbox"/> ... easier to generate. <input checked="" type="checkbox"/> (1) ... used in more appliances. <input type="checkbox"/> ... less polluting. <input type="checkbox"/> ... more efficient to distribute. <input checked="" type="checkbox"/> (1)	[2]	
Total			[7]	

Question			Expected Answers	Marks	Additional Guidance
3	a	i	unit conversion 450g = 0.45kg (1) 90 (1)	[2]	allow answer of 90 000 for 1 mark correct numerical answer gains both marks
		ii	90 (J) (1)	[1]	allow the same numerical answer as part (a) (i) above for 1 mark
	b		idea of equal and opposite force (1) force <u>on</u> the foot/football boot/lan <u>from</u> the ball (1)	[2]	
	c			[2]	award 1 mark if the line on the left starts from the top box (regardless of which box in the middle it is joined to) if more than one box selected in left column, the mark for that link will be zero award 1 mark if top box in the middle is linked to the bottom box on the right if more than one box selected in middle and/or right column, the mark for that link will be zero
			Total	[7]	

Question		Expected Answers	Marks	Additional Guidance
4	a	<p>any three from: burnt fuel / (hot) gases go down / downwards; there is an equal and opposite (thrust) on the rocket; weight/gravitational force/gravity acts down; upwards force/thrust greater than weight/gravity/downwards force;</p>	[3]	<p>owtte idea of interaction pair force pushing rocket up</p> <p>allow upthrust</p>
	b	700 000 (kJ) (1)	[1]	allow 700 000 000 J
	c	$\frac{13\,000\,000\,000}{1000} \quad (1)$ $13\,000\,000 / 1.3 \times 10^7 \quad (1)$	[2]	<p>full marks for correct answer with no/unclear working allow 1 mark for correctly rearranged word formula in place of first marking point answer does not need to be in standard form allow correct answers in kN etc provided they are clearly presented</p>
		Total	[6]	

Question		Expected Answers	Marks	Additional Guidance							
5	a	matter <input type="checkbox"/> energy <input checked="" type="checkbox"/> (1) disturbances <input checked="" type="checkbox"/> (1) particles <input type="checkbox"/> charge <input type="checkbox"/>	[2]								
	b	<table border="0"> <tr> <td style="text-align: center;">description</td> <td style="text-align: center;">type of wave</td> </tr> <tr> <td><input type="text" value="... same direction ..."/></td> <td rowspan="2"><input type="text" value="longitudinal waves"/></td> </tr> <tr> <td><input type="text" value="... right angles ..."/></td> </tr> <tr> <td><input type="text" value="needs a medium"/></td> <td rowspan="2"><input type="text" value="transverse waves"/></td> </tr> <tr> <td><input type="text" value="... vacuum"/></td> </tr> </table>	description	type of wave	<input type="text" value="... same direction ..."/>	<input type="text" value="longitudinal waves"/>	<input type="text" value="... right angles ..."/>	<input type="text" value="needs a medium"/>	<input type="text" value="transverse waves"/>	<input type="text" value="... vacuum"/>	[2]
description	type of wave										
<input type="text" value="... same direction ..."/>	<input type="text" value="longitudinal waves"/>										
<input type="text" value="... right angles ..."/>											
<input type="text" value="needs a medium"/>	<input type="text" value="transverse waves"/>										
<input type="text" value="... vacuum"/>											
c	i	vertical line from central line to peak (top of wave) or trough (bottom of wave) (1)	[1]	allow approximately 1mm tolerance in drawing accept a correctly drawn line with the label 'A' missing							
	ii	C (1)	[1]	accept E for 1 mark							
d	i	stopwatch (1)	[1]	accept any clear and unambiguous response							
	ii	<u>number of waves</u> (1) time	[1]	accept any clear and unambiguous response							
Total			[8]								

Question			Expected Answers	Marks	Additional Guidance																				
6	a	i	300 000 km/s (1)	[1]	accept any clear and unambiguous response.																				
		ii	<table border="1"> <thead> <tr> <th>property of wave</th> <th>sound</th> <th>light</th> <th>both</th> </tr> </thead> <tbody> <tr> <td>can travel though a vacuum</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>needs a solid, liquid or gas to travel through</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>can show interference</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>can show diffraction</td> <td></td> <td></td> <td>✓</td> </tr> </tbody> </table>	property of wave	sound	light	both	can travel though a vacuum		✓		needs a solid, liquid or gas to travel through	✓			can show interference			✓	can show diffraction			✓	[3]	for rows 3 and 4 only, allow ticks in 'sound' and 'light' columns as equivalent to a single tick in the 'both' column four rows correct = 3 marks three rows correct = 2 marks two rows correct = 1 mark
property of wave	sound	light	both																						
can travel though a vacuum		✓																							
needs a solid, liquid or gas to travel through	✓																								
can show interference			✓																						
can show diffraction			✓																						
	b			[4]	mark left and right hand side separately for each side: four correct links = 2 marks two or three correct links = 1 mark more than one link from a box = incorrect link for that box																				
			Total	[8]																					

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Mark Scheme for June 2010

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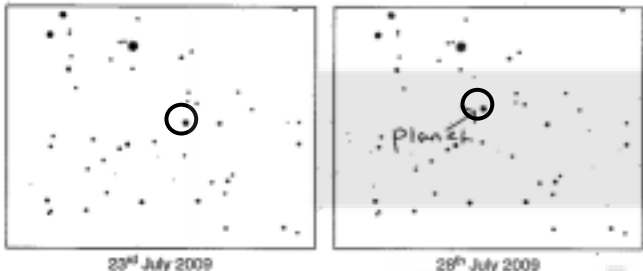
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Question		Expected Answers	Marks	Additional Guidance									
1	a	absorbs (1) more (1) damages (1)	[3]										
	b	<table border="1"> <tr> <td></td> <td>gases</td> <td>effect</td> </tr> <tr> <td>ozone</td> <td></td> <td></td> </tr> <tr> <td>greenhouse</td> <td>carbon dioxide (1)</td> <td>global warming/climate change (1)</td> </tr> </table>		gases	effect	ozone			greenhouse	carbon dioxide (1)	global warming/climate change (1)	[2]	allow methane instead of CO ₂
	gases	effect											
ozone													
greenhouse	carbon dioxide (1)	global warming/climate change (1)											
	c	i volcanic eruptions (1)	[1]	accept example of earthquake eruption. Eg Mt Pinatubo									
		ii names two variables (1) correct direction of link (1) e.g. increased sulfate particles and decreased ozone	[2]	other examples are: more sulfate particles leads to slower repair of ozone hole more sulfate particles leads to greater surface area for reactions more sulfate particles reflects more sun light more volcanic eruptions decrease ozone levels more volcanic eruptions decrease planet temperature.									
	d	any two from: food crops not growing; extreme weather conditions / a named example; rising sea levels/flooding low lying land (due to rising sea levels);	[2]	not thinning of ozone layer not "global warming" on its own allow destroy habitats leading to extinction.									
	e	i risk - idea of more uv radiation/ozone destruction (1) benefit - reduced global warming/less climate change/sunlight reflected(1) situation – when climate change is becoming catastrophic/specific example e.g. severe global flooding (1)	[3]	ignore 'planet becomes too cool' ignore 'cools the planet' or reference to temperature accept specific examples of the benefits of reduced global warming e.g. reduces sea level rising									
		ii physical barrier to uv e.g. sun-screen, clothing / keep out of sun/in shade (1)	[1]	reject general remarks such as 'protect from sun' allow 'put on sun protection' (this assumes sun protection is some form of cream)									
Total			[14]										

Question			Expected Answers	Marks	Additional Guidance
2	a	i	correctly labelled planet (1) 	[1]	
		ii	move differently from (fixed) stars / retrograde/complex motion (1)	[1]	allow 'move more' comparison with (fixed) stars is required, not just 'it moves'
	b	i	Earth rotates/spins / stars move across the sky / around the pole star / the camera is open for along time so the stars move (1)	[1]	'Earth moves' is insufficient
		ii	6 (1)	[1]	
	c		Idea of Earth on opposite sides of its orbit (1) facing different directions/looking at different part of the sky (1)	[1] [1]	both marks can be gained from diagram allow 1 mark only for observer has moved to other side of earth argument
	d		any two from: idea that the Earth orbits the sun (in the same sense as the Earth's spin) (1) idea of earth has to rotate more (than 360°) (1) idea that the Sun returns to the same position (in the sky) (1)	[2]	
	e		idea of angle (1) additional detail of how to use the angle e.g. across and up / azimuth is angle from North (1)	[1] [1]	accept declination measured from equator or right ascension measured from the vernal equinox ignore coordinates latitude and longitude are insufficient on their own
	f	i	C (1)	[1]	

Question			Expected Answers	Marks	Additional Guidance
2	f	ii	<p>any two from:</p> <p>benefit of remote control;</p> <p>Idea of greater precision;</p> <p>tracking of stars / idea of used over a long period of time (astronomical objects);</p>	[2]	<p>e.g. she doesn't have to be outside/she can do something else/saves time</p> <p>reject ideas about image processing or sharing data</p> <p>allow greater accuracy/finding stars more easily</p> <p>ignore human error</p>
			Total	[13]	
3			<p>includes Earth, Moon and Sun in explanation (1)</p> <p>Moon in between Earth and Sun (1)</p> <p>Moon blocks light from Sun/casts shadow (1)</p>	[3]	all marking points may be shown on a diagram
			Total	[3]	
4	a	i	W (1)	[1]	
		ii	<p>1/0.8 (1)</p> <p>1.25 (1)</p> <p>D or Dioptre (1)</p>	[3]	2 marks for correct numerical answer
		iii	<p>...largest diameter. <input checked="" type="checkbox"/> (1)</p> <p>...longest focal length. <input type="checkbox"/></p> <p>...the most powerful. <input type="checkbox"/></p> <p>...collect the most light. <input checked="" type="checkbox"/> (1)</p>	[2]	
	b		2 (1)	[1]	
	c		(concave) mirror (1)	[1]	ignore reflector
			Total	[8]	

Question			Expected Answers	Marks	Additional Guidance	
5	a	i	luminosity (1) peak frequency of light (1)	[2]		
		ii	6973(.15) (1)	[1]		
	b	i	A (1) C (1)	[2]		
		ii	electrons (1) line (1)	[2]		
Total				[7]		
6	a		...small positive centre. <input checked="" type="checkbox"/> (1) ...smallest possible particles. <input type="checkbox"/> ... large positive charges <input type="checkbox"/> ... large negative charge <input type="checkbox"/>	[1]		
		b	i	reflection <input type="checkbox"/> nuclear fusion <input checked="" type="checkbox"/> (1) combustion <input type="checkbox"/> nuclear fission <input type="checkbox"/>	[1]	
				ii	inside Sun: radiation (1) convection (1) Sun to Earth: radiation (1)  QWC – two ideas, clear expression/ distinction between internal and external transfers (1)	[3] [1]
Total				[6]		

Question			Expected Answers	Marks	Additional Guidance
7	a		1000000 / 1 million / 10^6 (1)	[1]	reject mega!
	b	i	B / Cepheid (variables stars) (1)	[1]	
		ii	200 x 70 (1) 14000 (1)	[2]	award 2 marks for correct numerical answer of 14000
			Total	[4]	

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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, e.g. 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

E.g. 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.

E.g.

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, e.g. 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, e.g. 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.

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

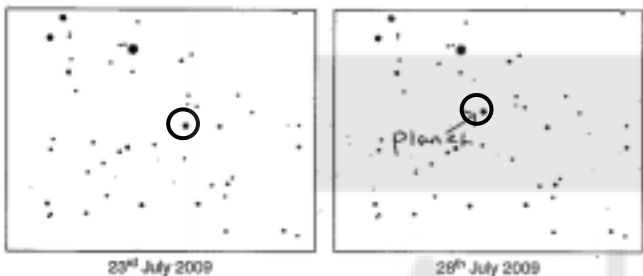
Edinburgh	
Manchester	
Paris	
Southampton	

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).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

Question			Expected Answers	Marks	Additional Guidance
1	a	i	<p>risk - idea of more uv radiation/ozone destruction (1)</p> <p>benefit - reduced global warming/less climate change/sunlight reflected(1)</p> <p>situation – when climate change is becoming catastrophic/specific example e.g. severe global flooding (1)</p>	[3]	<p>ignore 'planet becomes too cool'</p> <p>ignore 'cools the planet' or reference to temperature</p> <p>accept specific examples of the benefits of reduced global warming e.g. reduces sea level rising</p>
		ii	<p>physical barrier to uv e.g. sun-screen, clothing / keep out of sun/in shade (1)</p>	[1]	<p>reject general remarks such as 'protect from sun' or 'reduce exposure to sunlight'</p> <p>allow 'put on sun protection' (this assumes sun protection is some form of cream)</p>
	b	i	<p>evidence – volcanic eruptions (1)</p> <p>reason – very limited evidence/only one example/coincidence/just by chance (1)</p> <p> QoWC clear and ordered answer (1)</p>	[2 + 1]	<p>accept evidence as use of computer simulations or modelling</p> <p>allow 'scientists suggest more research is needed'</p> <p>ignore suggestion of other factors</p> <p>if the candidate's response makes sense on the first reading, and has addressed the question, they get the mark</p>
		ii	<p>sulfate particles <u>reflect</u> some sunlight/radiation (1)</p> <p>reduced energy/heat into atmosphere/surface (1)</p>	[2]	<p>reject 'block the sunlight' or 'absorb'</p> <p>ignore reduces temperature/less warming</p> <p>allow 'reflects energy' for 2nd marking point but not the 1st</p>
		iii	<p>any two from:</p> <p>idea of cause / causal link;</p> <p>plausible explanation supports argument;</p> <p>provides (additional) evidence;</p>	[2]	<p>accept idea of provides a mechanism/shows how it works</p> <p>'Theory' is insufficient</p>

Question		Expected Answers	Marks	Additional Guidance
1	c	<p>any two greenhouse effect points from:</p> <p>carbon dioxide/methane/water vapour;</p> <p>prevents (some) radiation escaping (from Earth);</p> <p>global warming/climate change/specific examples e.g. polar ice caps melting;</p> <p>plus</p> <p>any two ozone layer points from:</p> <p>Ozone/O₃;</p> <p>(Ozone layer) reduces ultraviolet/hole lets more through;</p> <p>ionising radiation/harmful effects to living organisms;</p>	[4]	<p>any 2 marks for greenhouse effect</p> <p>reject non greenhouse gases allow nitrous oxide/nitrogen oxide ignore etc.</p> <p>allow temperature rise</p> <p>any 2 marks for ozone layer</p> <p>accept CFCs</p>
		Total	[15]	

Question			Expected Answers	Marks	Additional Guidance
2	a	i	correctly labelled planet (1) 	[1]	
		ii	move differently from (fixed) stars / retrograde/complex motion (1)	[1]	allow 'move more' comparison with (fixed) stars is required, not just 'it moves'
	b	i	Earth rotates/spins / stars move across the sky / around the pole star / the camera is open for along time so the stars move (1)	[1]	'Earth moves' is insufficient
		ii	6 (1)	[1]	
	c		Idea of Earth on opposite sides of its orbit; facing different directions/looking at different part of the sky;	[1] [1]	both marks can be gained from diagram allow 1 mark only for observer has moved to other side of earth argument
	d		any two from: idea that the Earth orbits the sun (in the same sense as the Earth's spin) (1) idea of earth has to rotate more (than 360°) (1) Idea that the Sun returns to the same position (in the sky) (1)	[2]	
	e		idea of angle (1) additional detail of how to use the angle e.g. across and up / azimuth is angle from North (1)	[1] [1]	accept declination measured from equator or right ascension measured from the vernal equinox ignore coordinates latitude and longitude are insufficient on their own
	f	i	C (1)	[1]	

Question			Expected Answers	Marks	Additional Guidance
2	f	ii	<p>any two from:</p> <p>benefit of remote control;</p> <p>Idea of greater precision;</p> <p>tracking of stars / idea of used over a long period of time (astronomical objects);</p>	[2]	<p>e.g. she doesn't have to be outside/she can do something else/saves time</p> <p>reject ideas about processing images/sharing data</p> <p>allow greater accuracy/finding stars more easily</p> <p>ignore human error</p>
			Total	[13]	
3	a		C (1)	[1]	accept 0.75 as a unique identifier from table
	b	i	0.05 (1) m (1)	[2]	accept 5 cm for 2 marks
		ii	W (1)	[1]	accept 4 or 20 as unique identifiers from table
		iii	<p>Y (1)</p> <p>largest (1)</p> <p>need to collect as much light as possible (1)</p>	[3]	<p>Independent marking points</p> <p>accept 10 or 0.67 as unique identifiers from table</p> <p>accept large diameter or bigger aperture</p> <p>ignore diffraction effects</p>
	c		<u>concave/converging</u> mirror (1)	[1]	
			Total	[8]	

Question			Expected Answers	Marks	Additional Guidance
4	a	i	increased temperature, increased <u>luminosity</u> (1)	[1]	allow positive correlation reject proportional
		ii	Increasing temperature gives decreasing (peak) wavelength (1)	[1]	more smaller wavelengths with increasing temperature
		iii	6973(.15) (1)	[1]	
	b		A (1) C (1)	[2]	list principle applies
Total				[5]	
5	a		idea of gravity (1) volume of cloud decreases / collapse / condenses / increased cloud density (1) Idea of a pressure increase (1)	[3]	accept particle explanations for each marking point e.g. 'gravity brings about an increase in the kinetic energy of particles hence more collisions between them' gains 3 marks ignore fusion
		b	(nuclear) fusion (1)	[1]	
Total				[4]	
6	a	i	a speed ÷ a distance (1) 500 (\pm 50) (1)	[2]	correct numerical answer (500 \pm 50) gains 2 marks
		ii	750 ÷ 71 (1) 10 .6 or (10.56338) (1) Mpc/megaparsec (1)	[2] [1]	correct numerical answer gains 2 marks accept 11 for 2 marks
	b	i	A Cepheid's brightness varies (1) period luminosity relationship (1) idea of comparing luminosity/period and apparent brightness (1)	[3]	must be explicit allow rate of 'pulses' linked to luminosity accept ' (intrinsic) brightness' for luminosity
		ii	parallax (1) idea of colour/brightness/luminosity linked to distance (1)	[2]	accept using apparent brightness and luminosity
Total				[10]	

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