

Mark Scheme for June 2012

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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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
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Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	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
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW / owtte	alternative wording
ORA	or reverse argument

Available in scoris to annotate scripts

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response

	draw attention to particular part of candidate's response
	no benefit of doubt
	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

Subject-specific Marking Instructions

- If a candidate alters his/her response, examiners should accept the alteration.
- 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.

This would be worth 1 mark.

Put ticks (✓) in the two correct boxes.

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

This would be worth 1 mark.

- c. 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.
- d. 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	
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

- e. For answers marked by levels of response:
- i. **Read through the whole answer from start to finish**
 - ii. **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor
 - iii. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

- iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Question			Answers	Marks	Guidance															
1	(a)	(i)	20 m/s	1																
		(ii)	<table border="1"> <tr> <td>It is the average speed of all the cars on the motorway.</td> <td></td> </tr> <tr> <td>It is calculated using the total time taken and total distance travelled.</td> <td>✓</td> </tr> <tr> <td>It is the only speed that the car travels at on the motorway.</td> <td></td> </tr> <tr> <td>It is the speed that the car's speedometer reads</td> <td></td> </tr> </table>	It is the average speed of all the cars on the motorway.		It is calculated using the total time taken and total distance travelled.	✓	It is the only speed that the car travels at on the motorway.		It is the speed that the car's speedometer reads		1								
It is the average speed of all the cars on the motorway.																				
It is calculated using the total time taken and total distance travelled.	✓																			
It is the only speed that the car travels at on the motorway.																				
It is the speed that the car's speedometer reads																				
	(b)		<table border="1"> <tr> <td></td> <td>true</td> <td>false</td> </tr> <tr> <td>The car is moving fastest in part A.</td> <td></td> <td>✓</td> </tr> <tr> <td>The car came to a complete stop twice.</td> <td>✓</td> <td></td> </tr> <tr> <td>The speed was almost constant in part B</td> <td>✓</td> <td></td> </tr> <tr> <td>The car moved backwards in part E</td> <td>✓</td> <td></td> </tr> </table>		true	false	The car is moving fastest in part A.		✓	The car came to a complete stop twice.	✓		The speed was almost constant in part B	✓		The car moved backwards in part E	✓		2	2 marks for all <u>four ticks</u> in correct place. 1 mark for <u>three or two</u> correct ticks.
	true	false																		
The car is moving fastest in part A.		✓																		
The car came to a complete stop twice.	✓																			
The speed was almost constant in part B	✓																			
The car moved backwards in part E	✓																			
			Total	4																

Question		Answers	Marks	Guidance
2	(a)	4 kg m/s	2	1 mark for 4 1 mark for correct units allow Ns instead of kg m/s or kgms ⁻¹ do not allow kg/ms or km/s or m/skg
	(b)	For first mark allow 'driving force greater than counter force' or words to that effect For second mark allow 'acceleration/increase in speed/velocity causes momentum increase, but not just change on its own	2	
		Total	4	

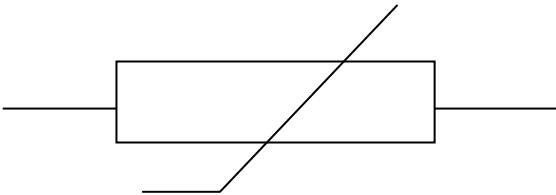
Question		Answers	Marks	Guidance													
3	(a)		<table border="1"> <tr> <td></td> <td>true</td> <td>false</td> </tr> <tr> <td>Friction acts in the opposite direction to the movement.</td> <td>✓</td> <td></td> </tr> <tr> <td>The cyclist leans forwards to reduce air resistance.</td> <td>✓</td> <td></td> </tr> <tr> <td>Air resistance pushes the cyclist forwards.</td> <td></td> <td>✓</td> </tr> </table>		true	false	Friction acts in the opposite direction to the movement.	✓		The cyclist leans forwards to reduce air resistance.	✓		Air resistance pushes the cyclist forwards.		✓	2	all three correct: two marks one or two correct: one mark
			true	false													
		Friction acts in the opposite direction to the movement.	✓														
The cyclist leans forwards to reduce air resistance.	✓																
Air resistance pushes the cyclist forwards.		✓															
(b)	<table border="0"> <tr> <td>the swimmer's weight</td> <td>the swimmer pushing against the wall</td> <td>friction from the water</td> </tr> <tr> <td>the wall pushing against the swimmer</td> <td>the swimmer's gravitational potential energy</td> <td>the kinetic energy of the swimmer</td> </tr> </table>	the swimmer's weight	the swimmer pushing against the wall	friction from the water	the wall pushing against the swimmer	the swimmer's gravitational potential energy	the kinetic energy of the swimmer	1	both required for the mark								
the swimmer's weight	the swimmer pushing against the wall	friction from the water															
the wall pushing against the swimmer	the swimmer's gravitational potential energy	the kinetic energy of the swimmer															
(c)	down up reaction	1	<u>all three</u> answers required for the mark.														
Total			4														

Question		Answers	Marks	Guidance															
4	(a)	<p>description</p> <p>made from a series of on and off pulses</p> <p>signal can vary</p> <p>it is easier to remove noise</p> <p>part of the electromagnetic spectrum</p> <p>digital</p> <p>analogue</p>	2	all three lines correct – two mark two lines correct – one mark															
	(b)	amplitude decreases / decreases in intensity noise / (random) additions to the signal (interference)	2	not interrupts / stops / absorbs															
	(c)	<table border="1"> <thead> <tr> <th></th> <th>True</th> <th>false</th> </tr> </thead> <tbody> <tr> <td>Radio waves are strongly absorbed by the atmosphere.</td> <td></td> <td>✓</td> </tr> <tr> <td>Radio waves travel very fast.</td> <td>✓</td> <td></td> </tr> <tr> <td>Radio waves are part of the electromagnetic spectrum.</td> <td>✓</td> <td></td> </tr> <tr> <td>Radio waves have a higher frequency than X-rays.</td> <td></td> <td>✓</td> </tr> </tbody> </table>		True	false	Radio waves are strongly absorbed by the atmosphere.		✓	Radio waves travel very fast.	✓		Radio waves are part of the electromagnetic spectrum.	✓		Radio waves have a higher frequency than X-rays.		✓	2	all four boxes correct – 2 marks 3 or 2 boxes correct – 1 mark
	True	false																	
Radio waves are strongly absorbed by the atmosphere.		✓																	
Radio waves travel very fast.	✓																		
Radio waves are part of the electromagnetic spectrum.	✓																		
Radio waves have a higher frequency than X-rays.		✓																	
Total			6																

Question			Answers	Marks	Guidance															
5	(a)	(i)	<table border="1"> <thead> <tr> <th>Location</th> <th>Reflection</th> <th>Refraction</th> </tr> </thead> <tbody> <tr> <td>W</td> <td></td> <td>✓</td> </tr> <tr> <td>X</td> <td>✓</td> <td></td> </tr> <tr> <td>Y</td> <td></td> <td>✓</td> </tr> <tr> <td>Z</td> <td>✓</td> <td></td> </tr> </tbody> </table>	Location	Reflection	Refraction	W		✓	X	✓		Y		✓	Z	✓		3	four ticks correct for 3 marks 3 correct for 2 marks 2 correct for 1 mark
		Location	Reflection	Refraction																
W		✓																		
X	✓																			
Y		✓																		
Z	✓																			
		(ii)	<table border="1"> <tbody> <tr> <td>light travels in a straight line through the air</td> <td></td> </tr> <tr> <td>light passes from air into glass</td> <td>✓</td> </tr> <tr> <td>light hits a mirror and bounces off</td> <td></td> </tr> </tbody> </table>	light travels in a straight line through the air		light passes from air into glass	✓	light hits a mirror and bounces off		1										
light travels in a straight line through the air																				
light passes from air into glass	✓																			
light hits a mirror and bounces off																				
	(b)		ring around visible light (1)	1																
	(c)		diffraction: waves spread outwards/waves are curved/come out curved(from narrow gap); (1) wavelength of light is (much) smaller than the aperture/gap (1)	2	allow first mark for a diagram the second mark is for a comparison															
			Total	7																

Question		Answers	Marks	Guidance										
6	(a)	A: longitudinal B: transverse	1	both required for the mark must be in the right order										
	(b)	(i)	1											
		<table border="1"> <tr> <td>the distance from one end of the spring to the other end</td> <td></td> </tr> <tr> <td>the distance from the wave crest to the wave trough of the spring</td> <td></td> </tr> <tr> <td>the thickness of the spring</td> <td></td> </tr> <tr> <td>the distance from the first wave crest to the second wave crest</td> <td>✓</td> </tr> <tr> <td>the distance from the wave crest to the dotted line</td> <td></td> </tr> </table>	the distance from one end of the spring to the other end		the distance from the wave crest to the wave trough of the spring		the thickness of the spring		the distance from the first wave crest to the second wave crest	✓	the distance from the wave crest to the dotted line			
the distance from one end of the spring to the other end														
the distance from the wave crest to the wave trough of the spring														
the thickness of the spring														
the distance from the first wave crest to the second wave crest	✓													
the distance from the wave crest to the dotted line														
		(ii)	1											
		<table border="1"> <tr> <td>the distance from one end of the spring to the other end</td> <td></td> </tr> <tr> <td>the distance from the wave crest to the wave trough of the spring</td> <td></td> </tr> <tr> <td>the thickness of the spring</td> <td></td> </tr> <tr> <td>the distance from the first wave crest to the second wave crest</td> <td></td> </tr> <tr> <td>the distance from the wave crest to the dotted line</td> <td>✓</td> </tr> </table>	the distance from one end of the spring to the other end		the distance from the wave crest to the wave trough of the spring		the thickness of the spring		the distance from the first wave crest to the second wave crest		the distance from the wave crest to the dotted line	✓		
the distance from one end of the spring to the other end														
the distance from the wave crest to the wave trough of the spring														
the thickness of the spring														
the distance from the first wave crest to the second wave crest														
the distance from the wave crest to the dotted line	✓													
	(c)	2 m/s	1											
		Total	4											

Question		Answers	Marks	Guidance															
7	(a)	<p><u>electrons</u> transferred (1) both rods have same(+ or -) charge (1) like charges <u>repel</u> (1)</p>	3	<p>accept to or from cloth as unspecified do not accept protons/particles maximum 2 marks for correct magnetic charge argument</p>															
	(b)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">metal rods contain lots of charges</td> <td style="width: 20%;"></td> <td style="width: 40%;">which can not move</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>metal rods contain few charges</td> <td></td> <td>which are free to move</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>metal rods contain no charges</td> <td></td> <td>which move only when connected to a battery</td> </tr> </table>	metal rods contain lots of charges		which can not move				metal rods contain few charges		which are free to move				metal rods contain no charges		which move only when connected to a battery	1	<p>reject more than one line</p>
metal rods contain lots of charges		which can not move																	
metal rods contain few charges		which are free to move																	
metal rods contain no charges		which move only when connected to a battery																	
Total			4																

Question		Answers	Marks	Guidance
8	(a)	current	1	
	(b)	(i) 230 V	1	
		(ii) 230/10 calculation 23 ohms	2	Ecf marks needed: allow both marks for 11 from 110 /10 V 1.2 from 12/10 V 0.15 from 1.5/10V
	(c)	92p	1	allow £0.92
	(d)		1	allow mirror images
		Total	6	

Question		Answers	Marks	Guidance																		
9	(a)	transformer	1																			
	(b)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">part</th> <th style="width: 30%;"></th> <th style="width: 40%;">description</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>iron core</td> </tr> <tr> <td>part X</td> <td></td> <td>aluminium core</td> </tr> <tr> <td></td> <td></td> <td>steel core</td> </tr> <tr> <td>part Y</td> <td></td> <td>coil of insulator</td> </tr> <tr> <td></td> <td></td> <td>coil of wire</td> </tr> </tbody> </table>	part		description			iron core	part X		aluminium core			steel core	part Y		coil of insulator			coil of wire	2	
part		description																				
		iron core																				
part X		aluminium core																				
		steel core																				
part Y		coil of insulator																				
		coil of wire																				
		Total	3																			

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