

Mark Scheme for January 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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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.

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

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, 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.

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, 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.

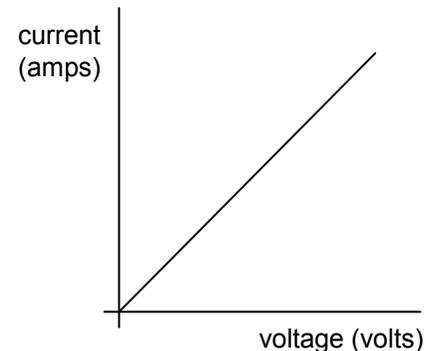
E.g. If a question requires candidates to identify a city in England, then in the boxes

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		Answer	Marks	Guidance										
1	(a)	DBAC D anywhere before B B anywhere before A A anywhere before C	2	3 correct = 2 marks 2 correct = 1 mark 1 correct = 0 marks										
	(b)	<table border="1"> <tr> <td>turning the magnet faster</td> <td>√</td> </tr> <tr> <td>heating the wire</td> <td></td> </tr> <tr> <td>having more turns on the coil</td> <td>√</td> </tr> <tr> <td>placing a wooden core inside the coil</td> <td></td> </tr> <tr> <td>using a weaker magnet inside the coil</td> <td></td> </tr> </table>	turning the magnet faster	√	heating the wire		having more turns on the coil	√	placing a wooden core inside the coil		using a weaker magnet inside the coil		2	one mark per correct tick
turning the magnet faster	√													
heating the wire														
having more turns on the coil	√													
placing a wooden core inside the coil														
using a weaker magnet inside the coil														
	(c)	<table border="1"> <tr> <td>...does not need a closed circuit</td> <td></td> </tr> <tr> <td>...can be used with transformers</td> <td>√</td> </tr> <tr> <td>... is only made in wind turbines</td> <td></td> </tr> <tr> <td>... does not transfer energy</td> <td></td> </tr> <tr> <td>... changes direction</td> <td>√</td> </tr> </table>	...does not need a closed circuit		...can be used with transformers	√	... is only made in wind turbines		... does not transfer energy		... changes direction	√	2	one mark per correct tick
...does not need a closed circuit														
...can be used with transformers	√													
... is only made in wind turbines														
... does not transfer energy														
... changes direction	√													
	(d)	electrons (1) positively (1) attracted (1)	3	allow positive allow attract										
Total			9											

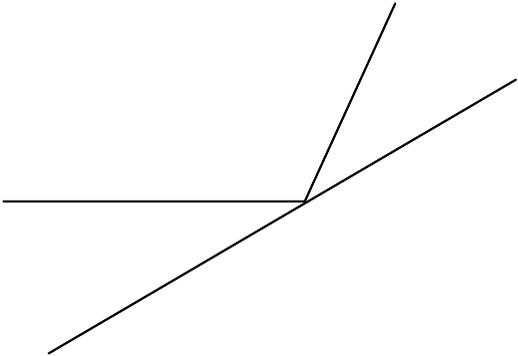
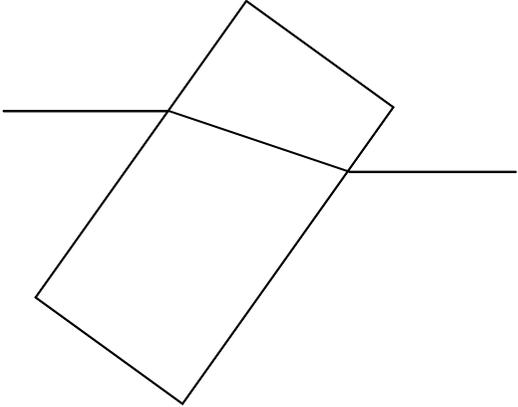
Question			Answer	Marks	Guidance								
2	(a)	(i)	resistance increases	1	both answers required								
		(ii)		1	line must look straight and go through the origin allow 2mm tolerance.								
	(b)		<table border="1" data-bbox="369 829 1097 973"> <tr> <td>...has an efficiency of 15%</td> <td></td> </tr> <tr> <td>...uses 15 amps of current</td> <td></td> </tr> <tr> <td>... uses a potential difference of 15 volts</td> <td></td> </tr> <tr> <td>... transfers 15 joules of energy every second</td> <td>√</td> </tr> </table>	...has an efficiency of 15%		...uses 15 amps of current		... uses a potential difference of 15 volts		... transfers 15 joules of energy every second	√	1	
...has an efficiency of 15%													
...uses 15 amps of current													
... uses a potential difference of 15 volts													
... transfers 15 joules of energy every second	√												
	(c)		idea of current /moving charges in the filament (1) (current) causes a heating effect (1)	2	allow higher level responses involving energy transfer. allow (filament) heats up/gets hotter/temperature increases etc								
	(d)		£30.00	1									
Total				6									

Question		Answer	Marks	Guidance																
3	(a) (i)	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 20%;">The motorbike speeds up when...</div> <div style="border: 1px solid black; padding: 5px; width: 20%;">...the driving force is the same as the counter force.</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 20%;">The motorbike slows down when...</div> <div style="border: 1px solid black; padding: 5px; width: 20%;">...the driving force is greater than the counter force.</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 20%;">The motorbike moves at a constant speed when...</div> <div style="border: 1px solid black; padding: 5px; width: 20%;">...the driving force is smaller than the counter force.</div> </div>	2	three lines correct = 2 marks one or two lines correct = 1 mark																
	(ii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>increases</th> <th>decreases</th> <th>stays the same</th> </tr> </thead> <tbody> <tr> <td>the motorbike moves at a steady speed</td> <td></td> <td></td> <td style="text-align: center;">√</td> </tr> <tr> <td>the motorbike slows down</td> <td></td> <td style="text-align: center;">√</td> <td></td> </tr> <tr> <td>the motorbike speeds up</td> <td style="text-align: center;">√</td> <td></td> <td></td> </tr> </tbody> </table>		increases	decreases	stays the same	the motorbike moves at a steady speed			√	the motorbike slows down		√		the motorbike speeds up	√			1	all correct for 1 mark
	increases	decreases	stays the same																	
the motorbike moves at a steady speed			√																	
the motorbike slows down		√																		
the motorbike speeds up	√																			
	(b)	$KE = 0.5 \times 250 \times 20^2$ (1) $= 50\,000$ (J) (1)	2	correct answer = 2 marks																
	(c)	any two from (kinetic energy/KE) becomes heat (and sound) (1) in the brakes/brake pads/to the air/surroundings (1) conservation of energy idea eg <u>all</u> KE/50 000J transferred (1)	2	answers involving transfer to GPE score 0 marks allow higher level responses involving work done (by friction etc.) e.g. K.E. is transferred into heat by friction from the brakes would score 2 marks. allow ecf from previous question in terms of amount of K.E.																
Total			7																	

Question		Answer	Marks	Guidance										
4	(a)	50 x 100 (1) = 5000 (J) (1)	2	if correct final answer given award 2 marks										
	(b)	Darrell	1											
	(c) (i)	<table border="1"> <tr> <td>the amount of light hitting the bag</td> <td></td> </tr> <tr> <td>the amount of work done on the bag</td> <td>√</td> </tr> <tr> <td>the colour of the bag</td> <td></td> </tr> <tr> <td>the force with which Emily hits the bag</td> <td>√</td> </tr> <tr> <td>the height of the bag above the floor</td> <td></td> </tr> </table>	the amount of light hitting the bag		the amount of work done on the bag	√	the colour of the bag		the force with which Emily hits the bag	√	the height of the bag above the floor		2	
the amount of light hitting the bag														
the amount of work done on the bag	√													
the colour of the bag														
the force with which Emily hits the bag	√													
the height of the bag above the floor														
	(ii)	<table border="1"> <tr> <td>kinetic energy → gravitational potential energy</td> <td></td> </tr> <tr> <td>sound energy → kinetic energy</td> <td></td> </tr> <tr> <td>gravitational potential energy → light energy</td> <td></td> </tr> <tr> <td>gravitational potential energy → kinetic energy</td> <td>√</td> </tr> </table>	kinetic energy → gravitational potential energy		sound energy → kinetic energy		gravitational potential energy → light energy		gravitational potential energy → kinetic energy	√	1			
kinetic energy → gravitational potential energy														
sound energy → kinetic energy														
gravitational potential energy → light energy														
gravitational potential energy → kinetic energy	√													
Total			6											

Question		Answer	Marks	Guidance
5		diffraction (1) amplitudes (1) constructive destructive (1)	3	words must be in the correct order.
Total			3	

Question			Answer	Marks	Guidance				
6	(a)	(i)	<table border="1"> <tr> <td>gamma (rays) (1)</td> <td>X-rays</td> <td>ultraviolet (1)</td> <td>visible light</td> </tr> </table>	gamma (rays) (1)	X-rays	ultraviolet (1)	visible light	2	allow γ allow UV (rays)
		gamma (rays) (1)	X-rays	ultraviolet (1)	visible light				
(ii)	wavelength	1							
	(b)		<pre> graph LR A[X-rays] --- B[to produce shadow pictures of bones] C[microwaves] --- D[to carry satellite signals] E[visible light] --- F[to carry information along optical fibres] </pre>	2	three lines correct = 2 marks one or two lines correct = 1 mark				
			Total	5					

Question	Answer	Marks	Guidance
7	<p>reflection (1)</p>   <p>refraction (1)</p>	6	<p>2 marks for each correct diagram 1 mark for each correct label</p> <p>ignore arrows</p> <p>accept dotted lines straight and reflected line (1) angle of incidence = angle of reflection (1)</p> <p>show refraction in correct direction on entry (1) exit beam parallel to entry beam (1) ignore any normal drawn</p> <p>do not allow “refraction”</p>
	Total	6	

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