

Mark Scheme for June 2011

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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.

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The **Abbreviations, annotations and conventions** used in the detailed Mark Scheme are:

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

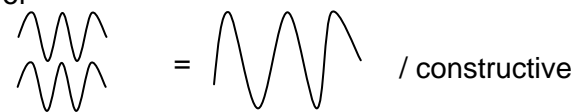
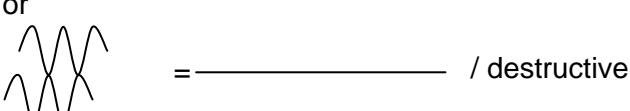
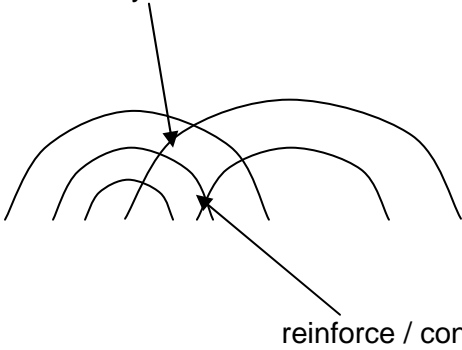
Question		Expected Answers	Marks	Additional Guidance
1	a	Neutron(s) (1) Nucleus / nuclei (1)	2	
	b	absorb (excess) neutrons (1)	1	ignore slows reaction / absorbs energy/ slows neutrons allow stops neutrons
	c	steam turns turbine (1) turbine turns generator (1)	2	ignore steam passes through turbine ignore generator produces electricity not steam turns generator / magnet allow steam powers turbine
		Total	5	

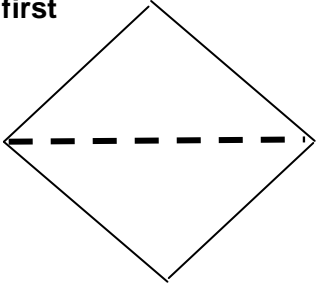
Question		Expected Answers	Marks	Additional Guidance
2	a	explosion (1)	1	allow fire / spark (1) ignore references to fuel spillage etc ignore shock not to stop fire
	b	electrons move from fuel / AW (1)	1	electrons move (0) electrons lost from fuel (1)
	c	any one from: dust on tv / other household object (1) clothes sticking (1)	1	allow shock / tv / touching a car or door handle allow hair sticking up (1)
		Total	3	

Question		Expected Answers	Marks	Additional Guidance
3	a	charge (1)	1	allow electrons / correct symbol e.g. e ⁻ (1) ignore electricity /ions
	b	4 (2) but if answer not correct 6/1.5 (1)	2	
	c	i	1	not snaps not blows up / burns e.g. melts and blows up=0 ignore current stops / switches circuit off / references to circuit e.g. switches off ignore completes circuit / overheats
		ii	1	ignore voltage / electricity / current too strong /charge allow too much power / amps / A (1) not merely fuse is only 0.5 amps / current is 1.5 amps but current is 1.5A and fuse is 0.5A = 1 as comparison
	d	5 (2) but if answer not correct 2.5/0.5 (1)	2	
		Total	7	

Question		Expected Answers	Marks	Additional Guidance
4	a	(high speed) electron (1)	1	allow e ⁻
	b	¹⁴ ₇ nitrogen-14 (1)	1	more than one answer ringed scores (0)
	c	<p>any two from: carbon-14 in all living things (1) amount of carbon-14 in air constant for long time (1) when living things die, gaseous exchange with air stops (1) idea of carbon fixed (at death) [1] carbon-14 in material decreases over time (1) ratio / comparison of current activity/amount from living matter to activity/amount from sample leads to estimate of age (1)</p>	2	allow radiocarbon/ radioactive carbon for carbon -14
	d	tracer (1)	1	<p>allow cancer /tumour treatment or detection(1) allow paper mill / thickness testing (1) not smoke alarms / not blood flow</p>
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
5	a	idea that (different colours) have different wavelengths / different frequencies or travel at different speeds in glass (1)	1	allow different refractive index ignore simple references to refractions, angle or bending
	b	ray along the base of the block (1)	1	ignore reflected rays
		Total	2	

Question		Expected Answers	Marks	Additional Guidance	
6	a	diffracts (1) over mountain / obstacle (1)	2	both marks can be scored by diagram allow around mountain (1) not through mountain	
	b	<p>Any one from two waves combine with each other (to produce a single wave) (1)</p> <p>constructive interference / reinforce or destructive interference / cancel out (1)</p> <p>or</p>  <p>or</p>  <p>(1)</p>	1	mark can be in the form of a written answer or as a labelled diagram ignore paths cross allow diagrams or descriptions to show two waves in phase with a (correct or incorrect) outcome two waves out of phase with a (correct or incorrect) outcome “umbrella diagram” with any interference points labelled allow correct wave front diagram / ripple tank diagrams eg cancel out / destructive /no waves not merely interference 	
	c	i	less diffraction (1)	1	allow correct diagram / description (1) ignore no diffraction
		ii	less diffraction (1)	1	allow correct diagram / description (1) ignore no diffraction
		iii	idea of wavelength is equal to the gap size (1)	1	
Total			6		

Question		Expected Answers	Marks	Additional Guidance
7	a	200(N) (2) if answer incorrect then Correct diagram showing resultant (1) or $120^2 + 160^2 = R^2$ (1)	2	mark answer first  Diagram with correct resultant – 200 (N) [2] Correct resultant drawn but incorrect / no figure [1] Award same marking points from a correct triangle
	b	$(v = u + at)$ 80 (m/s) (2) but if answer incorrect 10 x 8 unless contradicted (1)	2	mark answer first
	c	any from: inverse square relationship (2) or description ie doubling the separation reduces the force by a factor of four (2) or idea of doubling the separation - force is less than half / force drops faster than separation increases / aw (1)	2	allow goes down quickly at first and then slows down if no other marks awarded
	d	spying / weather (forecasting) / mapping (1)	1	ignore communication / GPS not mobiles / TV
Total			7	

Question		Expected Answers	Marks	Additional Guidance
8		<p>must use ideas of momentum in answer</p> <p>idea that momentum changes in a collision / crumple zone increases the time of collision (1)</p> <p>idea that size of force = rate of change of momentum [1]</p>	2	<p>eg longer collision time means momentum changes more slowly and so force is less (2)</p> <p>eg force = change in momentum over a longer time (2)</p> <p>allow stated in equation format</p>
		Total	2	

Question		Expected Answers	Marks	Additional Guidance
9	a	focuses it / diminishes it / inverts it (1)	1	not change lens or shape
	b	move the lens away from the film (1)	1	allow any description indicating a different distance between film and lens not just move the lens
	c	(real) it is formed on the film (1)	1	virtual negates the mark
		Total	3	

Question			Expected Answers	Marks	Additional Guidance
10	a	i	motor gets faster / AW (1)	1	allow 'spins more' (1) allow 'more powerful' (1) any reference to generating electricity = 0 eg generates more electricity = 0
	a	ii	motor goes slower / AW (1)	1	allow 'spins less' (1) allow stops spinning / turning / working(1) allow 'less powerful' (1) any reference to generating electricity = 0
	b	i	alternating current	1	allow AC
		ii	Increases increases	1	both required for the mark
			Total	4	

Question			Expected Answers	Marks	Additional Guidance
11	a	i	idea that user cannot be connected to live / mains (1)	1	allow only a magnetic link between the two parts of the circuit
		ii	1500 / equal number of turns on (primary and secondary) coils (1)	1	
	b	i	100 (turns) scores [2] but if answer is incorrect then 20 000 / 500 = 4 000 / N_s / AW scores [1] (Before erratum) 10 000 (turns) scores (2) but if answer is incorrect then 20 000/500 = 400 000 / N_s / AW scores (1)	2	Allow answer using figures on diagram allow $\frac{N_s}{500} = \frac{4\ 000}{20\ 000}$ (1) allow $N_s = \frac{4\ 000}{20\ 000} \times 500$ (1) (Before erratum) allow $\frac{N_s}{500} = \frac{400\ 000}{20\ 000}$ (1) allow $N_s = \frac{400\ 000}{20\ 000} \times 500$ (1) allow any error carried forward from amended diagram (2)
		ii	(step-down) has fewer turns on secondary / AW (1)	1	assume explanation of step=down unless indicated otherwise allow step-up has more turns on the secondary / fewer on primary allow correct reference to diagram eg fewer turns on the right
	c		idea of smoothes the output (1)	1	allow a diagram showing smoothing (1) allow stores charge and releases it slowly
	d		Any two from holes lack electrons / holes are positive / AW (1) holes 'move' in the opposite direction to electrons (1) holes (appear to move) towards the negative (1) electrons fill up the holes (1)	2	ignore incorrect descriptions of n type and p type allow holes attract electrons
			Total	8	

Question		Expected Answers	Marks	Additional Guidance																		
12	a	<table border="0"> <tr> <td>Input A</td> <td>Input B</td> <td>output</td> </tr> <tr> <td>(0)</td> <td>(0)</td> <td>1</td> </tr> <tr> <td>(0)</td> <td>(1)</td> <td>1</td> </tr> <tr> <td>(1)</td> <td>(0)</td> <td>1</td> </tr> <tr> <td>(1)</td> <td>(1)</td> <td>0</td> </tr> <tr> <td>(1)</td> <td></td> <td></td> </tr> </table>	Input A	Input B	output	(0)	(0)	1	(0)	(1)	1	(1)	(0)	1	(1)	(1)	0	(1)			1	all 4 correct outputs needed for the mark
Input A	Input B	output																				
(0)	(0)	1																				
(0)	(1)	1																				
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(1)	(1)	0																				
(1)																						
	b	<p>ideas of small current switches or controls a larger current (1)</p> <p>logic gate (electronic circuit) has low current output / low power output (1)</p> <p>relay isolates from mains / protection of circuit / protection of user (1)</p>	3	allow as alternative to first marking point correct description of the working of the relay e.g. magnetic explanation																		
		Total	4																			

Question		Expected Answers	Marks	Additional Guidance
13	a	resistance changes / it is non-ohmic (1)	1	allow higher level answers eg resistance increases ignore resistance decreases ignore it gets hotter
	b	LDR's have LOW resistance thermistorswhen temperature FALLS / AW (1)	1	both LOW and FALLS / AW needed for the mark
		Total	2	

Question	Expected Answers	Marks	Additional Guidance
14	3 (V) scores (2) but if calculation is incorrect then: 5 x 15/25 or 5 x 15/(10+15) scores (1)	2	
	Total	2	

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