

MARK SCHEME for the October/November 2013 series

0608 TWENTY FIRST CENTURY SCIENCE

0608/04

Paper 4 (Extended Handwritten), maximum raw mark 60

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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Question	Expected Answers	Mks	Additional Guidance
1 (a)	<i>first box:</i> reactor <i>second box:</i> turbine <i>third box:</i> generator	[2]	all correct = 2 marks 1/2 correct = 1 mark allow uranium/nuclear fuel for 'reactor'
(b)	useful output = 450 – 320 MJ = 130 MJ efficiency = 130 / 450 × 100 (1) = 28.88% = 29% to 2 s.f.(1)	[2]	correct answer = 2 marks 28.88%/28.9% etc. = 1 mark max
(c)	regular checks made on the (total) dose received by each worker (1) if limit reached, remove worker from high radiation area/find safer place to work (1)	[2]	ignore any reference to protective clothing etc.
(d)	renewable source and disadvantage	[1]	e.g. wind – not constant / low power available hydroelectric/ geothermal – cannot be used in many places wave – not constant/ low power/need sea coast
	Total:	[7]	
2 (a) (i)	20 cm × 100 (1) = 2000 cm (1)	[2]	allow conversion to 20 m if unit changed bald correct answer gets (2)
(ii)	push from Asian mainland slowed it down (1) two plates moving together pushed up mountains (1)	[2]	
(b)	movement in the mantle	[1]	
(c)	<i>any two from:</i> Wegener was an outsider (1) movement not detectable (1) insufficient evidence (1) alternative explanations possible (1) no plausible mechanism (1)	[2]	allow other reasonable suggestions, e.g. reactionary nature of establishment
	Total:	[7]	

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3	(a)	radio (waves) infrared ultraviolet gamma (rays/photons)	[2]	all correct = 2 marks 3 correct = 1 mark
	(b)	X-rays are ionising and visible light is not ionising (1) ionising radiation can damage living cells (1)	[2]	allow 'X rays more penetrating' e.g. become cancerous, damage DNA
	(c)	risk is unknown (1) but consequence could be severe (1)	[2]	
		Total:	[6]	
4	(a)	prevent reaction of fats/oils (1) with oxygen in air (1)	[2]	needs ref to fats/oils
	(b)	<i>consideration of risk:</i> rats are different from humans/doses are larger than realistic (1) <i>consideration of benefit:</i> suggestion relating to reduction of sugar intake, e.g. diabetes, obesity (1)	[2]	
	(c)	<i>any two from:</i> some countries – have better transport (1) have refrigeration (1) can package food for longer shelf life (1) are cooler (1) have population concentrated in areas far from where food is grown (1)	[2]	allow ora in each case allow reasonable alternatives
		Total:	[6]	
5	(a)		[3]	8 lines correct = 3 marks 6/7 lines correct = 2 marks 4/5 lines correct = 1 mark if a box has more than one line that box does not count

Page 4	Mark Scheme	Syllabus	Paper
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(b)	there is not enough oxygen to form carbon dioxide (1) carbon monoxide/carbon is formed (1) carbon monoxide is poisonous/carbon causes smog/breathing problems (1)	[3]																
	Total:	[6]																
6 (a)	does not use sample 3 / 25 in calculation (1) works out average/mean = 16 (1)	[2]	one mark for 17.5															
(b) (i)	plots value calculated in (a) with correct range (expect value 16 range 14–18)	[1]	ecf from a allowed provided range bars go 14–25 in that case															
(ii)	best-fit straight line plotted (1) relates conclusion to the fit of line to best-estimate points (1) relates conclusion to range bars(1)	[3]	by eye ecf own plotting should conclude 'you cannot be confident in conclusion' should note line outside some range bars															
(c)	any pair of answers from: increase/add cross-linking (1) increase mp/hardness/strength (1) increase chain length (1) increase mp/hardness/strength (1) increase crystallinity (1) increase mp/hardness/strength (1)	[2]	ora allow other correct description of changes, e.g. decreased flexibility															
	Total:	[8]																
7 (a)	unit of inheritance/AW (1) codes for proteins (1)	[2]	accept any specific protein/enzyme															
(b) (i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td colspan="2"></td> <td colspan="2" style="text-align: center;">Sophie</td> </tr> <tr> <td colspan="2"></td> <td style="text-align: center;">F</td> <td style="text-align: center;">F</td> </tr> <tr> <td rowspan="2" style="text-align: center; vertical-align: middle;">Barney</td> <td style="text-align: center;">F</td> <td style="text-align: center;">FF</td> <td style="text-align: center;">FF</td> </tr> <tr> <td style="text-align: center;">f</td> <td style="text-align: center;">Ff</td> <td style="text-align: center;">Ff</td> </tr> </table>			Sophie				F	F	Barney	F	FF	FF	f	Ff	Ff	[2]	one mark for correct parent genotypes one mark for correct completion of the grid
		Sophie																
		F	F															
Barney	F	FF	FF															
	f	Ff	Ff															
(ii)	0.5 / ½ / 50%	[1]	ecf from (b)(i)															
(iii)	there is no risk of her child having cystic fibrosis	[1]																
(iv)	gene on Y chromosome (1)	[2]																

	determines development of sex organs/testes (1)		
(c)	will see if child will be affected (1) can lead to decisions about whether or not pregnancy should be terminated/allows preparation for child pre-birth (1)	[2]	allow other valid implications
	Total:	[10]	
8 (a)	3500	[1]	± 100
(b)	<div style="text-align: center;"> <p>reason</p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 40%;">the Earth is not old enough for natural selection to have occurred</div> <div style="border: 1px solid black; padding: 5px; width: 40%;">new data</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 40%;">Darwin couldn't explain how variation occurred</div> <div style="border: 1px solid black; padding: 5px; width: 40%;">More fossils were discovered</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 40%;">Darwin couldn't explain how characteristics were passed on</div> <div style="border: 1px solid black; padding: 5px; width: 40%;">Mendel published his ideas about inheritance</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 40%;">there were not many fossils available</div> <div style="border: 1px solid black; padding: 5px; width: 40%;">the structure of DNA was discovered</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 40%;"></div> <div style="border: 1px solid black; padding: 5px; width: 40%;">The solar system was found to be about 5 thousand million years old</div> </div> </div>	[2]	all correct = 2 marks 3 or 2 correct = 1 mark
(c)	look at similarities and differences in DNA (1) more similarities = more closely related (1)	[2]	ora
	Total:	[5]	
9 (a)	white cells (1) engulf and digest virus (1) produce antibodies (1) create memory cells (1)	[3]	any three
(b)	disease will spread/there will be epidemic (1) because there needs to be a high percentage uptake to prevent a continuing reservoir of infection (1)	[2]	
	Total:	[5]	