

**MARK SCHEME for the May/June 2011 question paper  
for the guidance of teachers**

**0608 TWENTY FIRST CENTURY SCIENCE**

**0608/04**

Paper 4 (Extended Written), 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 must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

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Question	Expected Answers	Mks	Additional Guidance
1 (a)	(i) a correlation between carbon monoxide concentration and number of cars / as the number of cars increases so does the carbon monoxide concentration	[1]	
	(ii) results can be repeated (by other scientists) / more data can be obtained	[1]	allow: causal link found
	(b) (i) second nitrogen monoxide molecule on left; two carbon dioxide molecules on right	[2]	
	(ii) $2\text{CO} + 2\text{NO} \rightarrow \text{N}_2 + 2\text{CO}_2$	[1]	do not allow ecf from (b)(i)
	(iii) it causes acid rain; that attacks crops	[2]	allow: other correct damage from acid rain
	<b>Total</b>	<b>[7]</b>	
2 (a)	(i) 73 to 77	[1]	
	(ii) $(77+76+73+74+75)/5$ ; = 75	[2]	allow one mark for 77
	(b) mean of polymer A does not lie in range of polymer B;	[1]	allow: ranges do not overlap
	(c) (i) make chains longer / add cross linking	[1]	allow: increased crystallinity
	(ii) increases forces between chains; more energy is needed to separate chains	[2]	
	<b>Total</b>	<b>[7]</b>	
3 (a)	they carry out carry out risk assessments; to find the safe levels of chemicals in food	[2]	
	(b) pesticide chemicals may get into organic food from other sources; e.g. blow from other farms / in water supply	[2]	allow: soil may contain pesticides from previous use
	(c) moulds/bacteria/microbes grow on food in storage (and release toxic chemicals); toxic chemicals may be formed during cooking; toxic chemicals may be produced by a plant as it grows; chemicals in the plant may cause an allergic reaction	[2]	any two
		<b>Total</b>	<b>[6]</b>

Question	Expected Answers	Mks	Additional Guidance
4 (a)	(clouds of) gas; and dust; over long periods of time; (condensed under gravity)	[2]	Any two points
(b) (i)	Distance light travels in a year	[1]	
(ii)	300 000	[1]	
(c) (i)	above atmosphere; no light pollution; no clouds; no atmospheric distortion	[2]	Any two points
(ii)	For: increase human knowledge; find new planets; find life on other planets; find new home for mankind in future Against: very expensive project; unlikely to succeed; money would be better spent on (another more worthwhile project) e.g. health	[2]	One mark for a 'for' argument and one mark for an 'against' argument.
	<b>Total</b>	<b>[8]</b>	
5 (a) (i)	X-rays and gamma radiation	[1]	Both needed (either order)
(ii)	Damage cells/DNA/nuclear material; breaks up molecules and makes them reactive / causes mutations/cancer	[2]	allow: will kill cells
(b) (i)	Risk: skin cancer and benefit: look and feel good/vitamin D production; Reason: Benefit outweighs risk	[2]	allow: risk is small
(ii)	put on sunblock/cover up with (cotton) clothing <u>because</u> it absorbs/reflects UV	[1]	
	<b>Total</b>	<b>[6]</b>	
6 (a) (i)	$370 + 800 + 380 + 310 + 500 = 2360 \mu\text{Sv}$	[1]	
(ii)	Calculates 800 divided by own answer to (a)(i) or compares 800 to $\frac{1}{2}$ of own answer to (a)(i); draws appropriate conclusion	[2]	Correct total in (a)(i) gives the answer no.
(iii)	$(1600 + 2360 = 3960)$ $100 \times 1600/3960 = 40.4\%$ .	[1]	Allow ecf for own answer to (a)(i)
(b)	alpha all absorbed by body; absorbed by lungs (which are delicate); radon stays in lungs, as it is heavy; gammas mostly pass through without effect;	[2]	Any two points allow ionisation more for alpha than gamma
	<b>Total</b>	<b>[6]</b>	

Question	Expected Answers	Mks	Additional Guidance
7 (a)	male: XY; female: XX	[2]	
(b)	controls development of sex organs; ref to ovaries (female) or testes (male)	[2]	
(c)	may sack him / may no longer employ him; may not promote him / he may be discriminated against; it is an invasion of privacy	[2]	Any two
(d) (i)	to see if he will develop the condition when older; to see how likely it is condition will be passed onto his offspring;	[2]	
(ii)	may cause him stress / may cause him to become depressed / may affect his mental health / it is an invasion of privacy / he may have problems getting life insurance / the test may give a false positive result	[1]	
	<b>Total</b>	<b>[9]</b>	
8 (a)	poor diet / stress / cigarette smoking / excess alcohol intake / high saturated fat intake / high salt intake / lack of exercise	[2]	any two
(b) (i)	F	[1]	
(ii)	C and D	[1]	
(iii)	E	[1]	
(c)	takes time for heart disease to develop / incidence of disease is low / takes account of other factors involved	[1]	
(d)	1816/66000; 2.75	[1]	allow 2.8
	<b>Total</b>	<b>[7]</b>	
9 (a)	sun	[1]	
(b)	horseshoe crab <b>and</b> diamondback terrapin	[1]	either order
(c)	(striped bass population will) increase because: fewer turtles to eat the crabs; larger population of crabs; more food for the bass	[2]	any two reasons no marks for increase alone
	<b>Total</b>	<b>[4]</b>	