

Twenty First Century Science

PILOT Examination Questions

GCSE Science June 2004

**Air quality, You and your genes, Earth in the Universe
(Mark Scheme)**

Please note:

- **These questions are not Sample Assessment Materials (SAMs) for the new OCR specification (for Sept 2006).**
- **The style of question varies from that used for the new specifications.**
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- **These questions are provided for classroom use by teachers, to develop students' understanding of Ideas about Science.**
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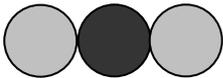
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Qn	Expected Answers	Marks	Additional guidance
1a	They have different combinations of alleles	1	
b	Alleles/genes;		
	(inherited) from both parents	2	must imply 'from both parents'
c	A gene;		
	Recessive;		
	chromosomes	3	
	Total	6	
2a	identical;	2	any two
	produced by asexual reproduction;		
b	same genes/ alleles /DNA;	1	Accept cheaper/quicker/easier production, if qualified;
	Idea of desired characteristics in all the offspring		
c	Any environmental reason eg lack of light/poor soil/lack of minerals/lack of water/ lack of space	1	
	Total	4	

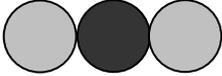
3a		ticks in 1 st and 3 rd boxes	1	
b		there are fewer; cars; (at this time)	1	
		 QWC correct spelling, punctuation and grammar. The candidates can make an average of one error per sentence without penalty. A very long sentence, which should be several shorter sentences, will automatically score zero.	1	
ci		tall buildings increase pollution; buildings close to road increase pollution; no buildings/open ground besides road decreases pollution	2	any 2
cii		buildings reduce air movement which could carry away pollution	1	
d		inconvenience to residents; longer journey times / detours; more traffic on other streets; deliveries difficult; businesses suffer from fewer customers;	2	any 2
		Total	10	
4(a)		correct labels (anticlockwise) oceanic plate; mountains; oceanic ridge;	2	3 correct =2marks 1 or 2 =1 mark
(b)		(Japan and Algeria) are at the boundaries between (tectonic) plates; movement of the plates causes the ground to shake;	2	1 mark for idea of edge or boundary (accept fault) 1 mark for idea of movement
(c)(i)		poor building construction/ buildings fell down easily;	1	do not accept 'buildings fell down'
(ii)		Any three from legislation on building industry; to build earthquake-safe houses; monitor building quality better; better disaster planning;	3	accept 'build stronger houses' 'early warnings'
		Total	8	

5ai		chromosome	1	
aii		A double helix	1	
aiii		Genetic fingerprinting / Convict criminals owtte/ Identify people/bodies/ Prove innocence	1	accept any use from the article
b		agreeing: Identify criminals; Deter criminals/less crime; Helps in medical research; Predict genetic disorders;	2	Any two points
		disagreeing Human rights argument / privacy; Identification not 100% accurate; Misuse of information such as refusing insurance; Refusing employment	2	Any two points
		Total	7	
6a		Cow genes/alleles/ DNA/ nucleus / genetic material removed; Human genes/alleles/DNA / nucleus/ genetic material inserted.	2	
b		Cow eggs easily available/many cow eggs (ora); Less objections to using cow eggs; Individual women may not be able to produce their own eggs;	2	Any two points not cheaper
		Total	4	

7a(i)	hydrocarbons	1	
(ii)	carbon dioxide ; water;	1 1	Accept carbon monoxide
b(i)		1	accept angled diagram
(ii)	plants take in CO ₂ (for photosynthesis); by solution in sea water	1 1	
c(i)	flue gas desulfurisation /burn less coal / named alternative energy sources	1	Accept 'sulfur removed from coal'
(ii)	remove sulfur from the gas before it is burned (if not given in (i))	1	Accept flue gas desulfurisation /burn less coal / named alternative energy sources if not given in (i)
(iii)	use less electricity / burn less fuel / use named alternative sources which do not burn fossil fuels/ financial incentive	1	must be different answer to those given in (i) and (ii)
	Total	9	

8(a)	one of many rocks; in orbit around the Sun;	2	accept 'between Mars and Jupiter'
(b)	5	1	
(c)	linking time of mass extinction of dinosaurs with presence of iridium; iridium is found in asteroids so asteroid may have hit Earth; (but) iridium could have come from volcanoes ; volcano or asteroid would create large amounts of dust causing climate change; climate change caused extinction of dinosaurs;	3	award marks for linking ideas given in the paragraph together – not for direct quotes ;
	 clear ordered answer The candidate has attempted to answer the question using statements which are ordered in a logical way to answer the question. Generally there will be at least three statements.	1	up to 3 marks
	Total	7	

9(a)	(A) B D C E scores 3 ie: B somewhere before D ✓ D somewhere before C ✓ C somewhere before E ✓	3	
(b)(i)	4500 (million years)	1	
(ii)	5 000 (million years)	1	
	Total	5	

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c(i)	flue gas desulfurisation /burn less coal / named alternative energy sources	1	Accept 'sulfur removed from coal'
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		9	

2(a)	(Japan and Algeria) are at the boundaries between (tectonic) plates; movement of the plates causes the ground to shake;	2	1 mark for idea of edge or boundary (accept fault) 1 mark for idea of movement
(b)(i)	poor building construction/ buildings fell down easily;	1	do not accept 'buildings fell down'
(ii)	Any three from legislation on building industry; to build earthquake-safe houses; monitor building quality better; better disaster planning;	3	accept 'build stronger houses' 'early warnings'
(c)	Volcanoes occur at plate edge/Stromboli near plate edge; the two plates interact; decay of radioactive elements heats magma; pressure builds up, eruption/ a break in the rock releases the pressure on the magma; magma melts and rises as it is less dense;	3	any 3
		9	
3a	agreeing: Identify criminals; Deter criminals/less crime; Helps in medical research; Predict genetic disorders;	2	Any two points
b	disagreeing Human rights argument / privacy; Identification not 100% accurate; Misuse of information such as refusing insurance; Refusing employment	2	Any two points
		4	
4a	Cow genes/alleles/ DNA/ nucleus / genetic material removed; Human genes/alleles/DNA / nucleus/ genetic material inserted.	2	
b	Cow eggs easily available/many cow eggs (ora); Less objections to using cow eggs; Individual women may not be able to produce their own eggs;	2	Any two points not cheaper
		4	

5a		Not exposed to infection/disease/bacteria/viruses/microorganism	1	
b(i)		(Virus carries missing) allele / gene into the cells ; cells now produce correct protein;	2	
		 spelling, punctuation and grammar The candidates can make an average of one error per sentence without penalty. A very long sentence, which should be several shorter sentences, will automatically score zero.	1	
b(ii)		Effect of virus limited to body cells / sex cells unaffected	1	
			4	
6a		form nitrogen monoxide / NO ; which is oxidised / reacts with more oxygen (to form nitrogen dioxide)	2	
b		catalytic converters ; lean burn / more efficient engines	2	allow one reason plus detailed explanation for 2 marks
ci		data on volume of traffic at different times	1	
cii		find out all other sources of NO ₂ ; confirm that most comes from cars	2	
			7	

9a	Galaxies all moving away from each other; universe is expanding; the further away they are the faster they are moving; implies that they are all spreading out from some single point; when the galaxies were concentrated it would have been very hot; there may have been an 'explosion' which threw out matter in all directions	3	any 3 points
b	gravity is pulling the Universe together; if the mass is large enough; the expansion will slow down and reverse;	2 5	any 2 points