

Twenty First Century Science

PILOT Examination Questions

GCSE Science Jan 2005

**Food matters, Material choices, Radiation and life
(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.
- For up to date SAMs see the OCR website:
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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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Q1 Breakfast				
a i		43/426 x 100 (or by subtraction from 100); = 10.09 / 10.1 (%)	1 1	Accept: 10
a ii		eg males tend to eat cereals more often; more males eat cereals; quantitative processing	2	any two comparisons ora accept: males eat more/they eat different amounts reject: they eat more
a iii		plants	1	accept: plants however indicated reject: contradictions
b i		78	1	reject: 79
b ii		lack of time / get up too late / do not want to get fat / dieting / too sleepy / not hungry	1	AW, any reasonable ignore: allergies / there is no food
b iii		to provide energy/for respiration; energy/glucose levels will be low (after not eating all night); food/energy is needed for movement/daily activities/to build tissue/growth/any specified body activity;	2	any two ignore: to get us started / to start the day off well
c		broken down; into glucose (allow maltose); into small(er) molecules/pieces; to make soluble QWC – 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.	2 1	any two Ignore: to make liquid
Total mark for question			12	

Q2 Products from oil				
a		A C F	1 1 1	accept: correct names
b		carbon and hydrogen	1	both needed for mark either order accept C and H/H ₂ reject: h

c		larger/more/stronger forces/bonds/attraction between molecules/particles / molecules/particles held together more tightly; more energy/harder/higher temperature needed to separate molecules/particles	2	
d		takes a very long time to form; finite / non-renewable / can't be replaced; will run out / none left for future if all used / ora /AW; causes pollution / bad for the environment / AW	2	any two valid points ignore: economic answers
Total for question			8	

Q3 Mobile phones				
(a)		radio; ultraviolet; X-ray	1 1 1	accept: uv
(b)		most unsightly/reduces house prices; most radiates continuously / people can choose when to use mobile phones; (people think) most radiation more powerful; most hazard unknown / phone hazard familiar / think most hazard greater; we ignore the risk for mobile phones / usefulness of mobile phones outweighs the risk;	2	any 2 good reasons mark across lines ora accept: inferred references to either mast or mobile phone
(c)(i)		reduce time on phone / make fewer calls / use phone less / send text message / use extension/ear-piece/hands free phone / hold further away	1	Ignore: redesigning phone / impractical suggestions
(ii)		more energy from the Sun / a temperature rise of only 0.1°C / less than natural variation (in brain temperature)	1	
(d)		just because it happens in a test tube/laboratory does not mean it happens in a person; effects on isolated cells may not be the same as in the body; there is no evidence/it is not certain/it is not known that it causes toxic substances to enter the brain; there is no evidence/it is not certain/it is not known that the toxic substances/this level of radiation causes cancer; hasn't harmed anyone yet / there has been no overall rise in brain cancers; not enough research has been done / more research is needed; the connection has not been proved / there is not enough evidence to show a connection/correlation;	2	any 2 AW 'not enough evidence' (unqualified) = 0
Total for question			9	

Q4 Population			
a		<p>population has increased/increases/will increase; slow at first, then faster; developing regions have shown/show/will show faster growth (than industrialised regions) / ora; developing regions growth will increase in future; industrialised regions growth will slow down/level off in future; in future difference (in growth/population) between developing regions and industrialised regions will get bigger</p>	<p>any two valid points</p> <p>growth = increase</p> <p>accept: quoted figures that correspond to the marking points</p>
b		<p>world population increasing; more demand for food; fertilizer helps to increase yields / more fertiliser produce more grain; more land under cultivation / more farms; intensive farming techniques used more / more intensive farming techniques used; making/distributing fertiliser has become easier/cheaper</p>	<p>any two</p> <p>accept: any link between increase in grain and increase in fertiliser used</p>
c i		<p>advantage: easier to store/transport; can make in bulk / larger supply available; easier to apply; easier to calculate amount needed; composition is known; composition can match crop grown; nutrients available immediately; food costs less to buy</p> <p>disadvantage: (greater) cost (of fertiliser); more risk of pollution/harms the environment; loss of soil structure; food may not taste as good; can't charge as much for food</p>	<p>any one</p> <p>any one</p>
c ii		<p>weeds; competition for resources weather/light/water; affects photosynthesis / affects growth/yield / can damage pests/viruses: damage/destroy plants / reduce yield fungi: damage/destroy plants / reduce yield mechanisation; increase yield; crop rotation; increase yield; cultivate more land; grow more; use better variety; increase yield</p>	<p>any one reason plus matching effect</p>
Total for question			8

Q5 Greenhouse effect				
a		radiation;	1	accept: correct formula
		ozone;	1	
		carbon dioxide; water; (in either order)	2	
		carbon dioxide;	1	
		warmer	1	
b		effect on living organisms based on the following headings: change in the populations of plants/animals in habitat; movement/spread of animals/plants to other habitats; behaviour changes eg hibernation; death of plants/animals;	2	two effects, each with matching explanation. marks can be scored for effect only or for explanation only
		climate change and explanation to match effect: eg hotter so polar ice melts; colder so plant growth slows / so animals hibernate longer; wetter so different plants grow; drier so some plants die and other survive; stronger so winds so trees blown down;	2	
		QWC – The candidate has attempted to answer the question using statements which are ordered in a logical way. Generally there will be at least three statements.	1	
	Total for the question		11	

Q6 Sam's Sweaters				
a(i)		wool	1	
a(ii)		(mixture) has better properties (than one fibre alone) / example of better property; properties can be adjusted by choosing proportions of each fibre / to make it more hard wearing/softer/colour easier; some materials/fibres may be in short supply; cheaper fibres can be mixed with dearer ones (to make the sweater cheaper);	2	any two fibre = material ignore: mixture is better
B		amino acids / dipeptides / peptides / polypeptides	1	reject: monomers
c(i)I		any answer from 2.2 to 2.3 g	1	ignore: units if shown
c(i)II		2.3/5 x 100; = 46 (allow ecf from (c)(i)I or allow answer to follow through eg 2.2 gives 44. 2.25 gives 45)	2	allow 1 for 2.3/5 = 0.46
c(ii)I		It allows for variability in results; it enables an average to be calculated; it enables outliers to be identified/discarded; it increases reliability	2	any two ignore: accuracy / fair test
c(ii)II		43 to 48	1	
c(ii)III		percentage of wool is over-stated / there is less wool than the label says; the % wool stated on the label is outside the range of measured results / there is actually 43 to 48% not 70%	2	reject: "wrong" unqualified 'there is actually 43 to 48% not 70% as it says on the label' = 2
Total for question			12	
Total for paper			60	

Q1 Mobile phones			
(a)		<p>most unsightly/reduces house price; most radiates continuously / people can choose when to use mobile phones; (people think) most radiation more powerful; most hazard unknown / phone hazard familiar / think most hazard greater; we ignore the risk for mobile phones / usefulness of mobile phones outweighs the risk;</p>	<p>any 2 good reasons mark across lines ora accept: inferred references to either mast or mobile phone</p>
(b) i		<p>reduce time on phone / make fewer calls / use phone less / send text message / use extension/ear-piece/hands free phone / hold further away</p>	<p>Ignore: redesigning phone / impractical suggestions</p>
(b) ii		<p>more energy from the Sun / a temperature rise of only 0.1° C / less than natural variation (in brain temperature)</p>	
(c)		<p>just because it happens in a test tube/laboratory does not mean it happens in a person; effects on isolated cells may not be the same as in the body; there is no evidence/it is not certain/it is not known that it causes toxic substances to enter the brain; there is no evidence/it is not certain/it is not known that the toxic substances/this level of radiation causes cancer; hasn't harmed anyone yet / there has been no overall rise in brain cancers; not enough research has been done / more research is needed; the connection has not been proved / there is not enough evidence to show a connection/correlation;</p>	<p>any 2 AW 'not enough evidence' (unqualified) = 0</p>
(d)		<p>increase in mobile phone use is not matched by increase in number of brain cancers / there has been a large increase in mobile phone use but no increase in brain cancers</p>	<p>accept: answer based on correct figures</p>
(e)		<p>supporting arguments e.g. against much of the world does not have the infrastructure to support mobile phones; much of the world cannot afford mobile phones; some people choose not to use mobile phones; people worry about the harm caused by mobile phones; e.g. for multinational companies will have to subsidise developing markets to maintain growth; there will be aggressive marketing of mobile phones; satellite technology makes mobile phones more accessible than land lines; mobile phones/call charges will become cheaper; most people like to use mobile phones</p>	<p>no mark for yes or no any two</p>
		Question total	9

Q3 Sam's Sweaters				
a		(mixture) has better properties (than one fibre alone) / example of better property; properties can be adjusted by choosing proportions of each fibre / to make it more hard wearing/softer/colour easier; some materials/fibres may be in short supply; cheaper fibres can be mixed with dearer ones (to make the sweater cheaper);	2	any two fibre = material ignore: mixture is better
b		amino acids / dipeptides / peptides / polypeptides	1	reject: monomers
c(i)I		any answer from 2.2 to 2.3 g	1	ignore: units if shown
c(i)II		2.3/5 x 100; = 46 (allow ecf from (c)(i)I or allow answer to follow through eg 2.2 gives 44. 2.25 gives 45)	2	allow 1 for 2.3/5 = 0.46
c(ii)I		It allows for variability in results; it enables an average to be calculated; it enables outliers to be identified/discarded; it increases reliability	2	any two ignore: accuracy / fair test
c(ii)II		percentage of wool is over-stated / there is less wool than the label says; the % wool stated on the label is outside the range of measured results / there is actually 43 to 48% not 70%	2	reject: "wrong" unqualified 'there is actually 43 to 48% not 70% as it says on the label' = 2
Total for question			10	

Q4 Global Greenhouse				
a		carbon dioxide; water vapour; methane	3	accept: nitrogen oxides / nitrous oxide / nitrogen(I) oxide; sulphur hexafluoride accept correct symbols

b	<p>effect on living organisms based on the following headings: change in the populations of plants/animals in habitat; movement/spread of animals/plants to other habitats; behaviour changes eg hibernation; death of plants/animals;</p> <p>climate change and explanation to match effect: eg hotter so polar ice melts; colder so plant growth slows / so animals hibernate longer; wetter so different plants grow; drier so some plants die and other survive; stronger so winds so trees blown down;</p> <p>QWC – The candidate has attempted to answer the question using statements which are ordered in a logical way. Generally there will be at least three statements.</p>	2	two effects, each with matching explanation.
		2	marks can be scored for effect only or explanation only.
		1	
c(i)	ozone absorbs UV; decomposing to form oxygen;	2	
c(ii)	It reduces the UV reaching the Earth's surface; UV is ionising; UV causes damage to cells/mutation/skin cancers/ tumours;	2	any two
Total for question		12	

Q5 Window frames			
a(i)	<p>sequence: extracting raw materials, manufacture, use, disposal; energy requirements (at any stage); environmental impact/sustainability of extracting material; environmental impact of making product; environmental impact of using the product; environmental impact of disposal</p>	3	<p>any three</p> <p>ignore: transport</p> <p>accept: specific examples</p>
a(ii)	<p>extraction – crude oil is non-renewable resource / energy needed for heating; manufacture – requires energy / simple to manufacture; use – little maintenance needed; disposal – non-biodegradable / not easily incinerated / burning releases toxic/poisonous gases</p>	3	
b(i)	<p>additive/something blended/mixed with the polymer to increase flexibility/softness;</p> <p>enables polymer molecules/particles to move past each other more easily</p>	1	
b(ii)	frames need to be hard/rigid/stiff/not flexible/not soft	1	ignore: strong

c(i)		bonds/forces between molecules are weak	1	
c(ii)		cross-links formed by reaction with oxygen hold the polymer molecules together	1	
Total for question			10	

Q6 Pesticides				
a		herbicides are used to kill weeds and so prevent weeds competing with crop for resources/increase crop yield/prevent damage to crops/without damaging the crops; pesticides kill pests and so prevent pests destroying crops/increase crop yield/prevent damage to crops/without damaging the crops. herbicides and pesticides/they are used to kill weeds and pests = 1 herbicides and pesticides/they prevent weeds and pests damaging crops etc = 1	1 1	reject: kill weeds/kill pests unqualified accept: insects/named pests
b		already banned in some countries; poisonous; has caused deaths; QWC – 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.	2 1	any two
c(i)		do not want chemicals to enter the food chain/web; working towards a more sustainable environment; do not want to pollute/harm the environment; does not harm non-pest organisms; can charge more for produce / there is increasing demand for produce;	2	any two
c(ii)		farmers can help to reduce both pests and weeds by crop rotation; choice of predator to control pests; selectively breeding new varieties of crops that are resistant to pests; machines/tractor attachment to remove weeds/hand weeding from between rows of crops; plant closely to avoid weeds growing; selectively breeding new varieties of crops that produce their own herbicide; use another plant to repel pests (eg marigolds sown between rows of carrots)	4	maximum three marks for answers featuring only either weeds or pests
Total for question			11	
Total for paper			60	