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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Science for Public Understanding 5401

SPU1 Issues in the Life Sciences

Mark Scheme

2007 examination - June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Dr Michael Cresswell Director General

SPU1 Issues in the Life Sciences

Question 1			
(a) (i)	• overcrowded housing • poor nutrition • poor hygiene	any 1 for 1 mark	
(ii)	• evidence that it is transmitted person to person leads to preventive measures • isolation of cases • stopping coughing/spitting near others **note** no vaccine or drugs at this time	any 1 for 1 mark	**3**
(iii)	• HIV infection reduces chance of recovery • drugs too expensive • poor health service (to deliver drugs) **note** must say more than 'drugs not available'/no roads	any 1 for 1 mark	
(b) (i)	• incomplete treatment encourages development of resistant strains • resistant strains spread/infect others • costs much more/more difficult to treat resistant strains **note** 2nd mark must imply public health, not individual	any 2 for 1 mark each	
(ii)	• resistant to one antibiotic but • killed by a different one • so resistant strain does not multiply • each mutation gives resistance to only one antibiotic **no marks** for repeat of stem 'resistance less likely to develop' in different words like 'combination more powerful', 'harder for bacteria to fight'	any 2 for 1 mark each	**4**
(c) (i)	• weakened/dead form of bacteria/microbe/virus • immune **system** destroys/produces antibodies/white cells • more rapid/effective response/immune response, on next infection	any 2 for 1 mark each	**2**

(ii)	The marking scheme for this section includes an overall assessment for the quality of written communication. There are no discrete marks for the assessment of written communication but quality of written communication will be one of the criteria used to assign the answer to one of the three levels. **level 3 – good** claims supported by an appropriate range of evidence good use of information or ideas about science going beyond those given in the question argument well structured with minimal repetition or irrelevant points accurate and clear expression of ideas with only minor errors of grammar, punctuation and spelling	**5-6**
	level 2 – modest claims partially supported by evidence good use of information or ideas about science given in the question but limited beyond this the argument shows some attempt at structure the ideas are expressed with reasonable clarity but with a few errors of grammar, punctuation and spelling	**3-4**
	level 1 – limited valid points but not clearly linked to an argument structure limited use of new information or ideas about science unstructured errors in grammar, punctuation and spelling or lack of fluency	**1-2**
	incorrect or no response	**0**
	examples of the sort of information or ideas that might be used to support an argument • important to seek full information first • example of information needed **yes** • humanitarian grounds • essential to test for side effects under controlled experimental conditions • overall risk low/only one serious case in many years • they monitor volunteers very carefully • a way to make money and help **no** • animals not a good model • low risk but potentially serious/reference to recent case • should test on those who will benefit/some other reasonable suggestion on who • danger that money will encourage risk taking	**max 6**
		Total 15

Question 2				
(a)		• smoking/obesity/genetics/**lack of** exercise/getting older/high blood pressure/stress/**high** salt/ **high** alcohol • **no marks** for high fat diet	any 2 for 1 mark	**1**
(b)	(i)	• 1000 × 0.2 • 200	any 1 for 1 mark	**3**
	(ii)	• 200 – (200 × 0.21) • 200 × 0.79 • 158	any 1 for 1 mark	
	(iii)	• 42 × 100/1000 (200 – 158 = 42) • 4.2% mark this consequential on answer to (ii) i.e. 200 – answer (ii)	any 1 for 1 mark	
(c)	(i)	• 2 groups, **one treatment**, **one control** • people assigned at random (to group) • not selected from population at random	for 1 mark	**3**
	(ii)	• E	for 1 mark	
	(iii)	• E	for 1 mark	
(d)	(i)	• far more people need to be given medicine – to save one life • impossible to reduce any risk to zero – the increasing costs of reducing any risk to a very low level	any 2 for 1 mark each	**3**
	(ii)	• not cost effective/benefit not worth costs • very expensive/too expensive • takes money from other needs	any 1 for 1 mark	
(e)		• less money for some other disease/care for elderly etc • side effects of statins • people might not take care of themselves in other ways	any 2 for 1 mark each	**2**
				Total 12

Question 3				
(a)		• drink with no additives	for 1 mark	**1**
(b)	(i)	psychologist • more reliable, trained/more repeatable tests • more reliable, less bias of expectations • less reliable, children in unusual environment parents more reliable • know children better/more sensitive to mood/able to detect differences from norm • see children for more of the time	any 2 for 1 mark each	
	(ii)	• weeks 1, 2, 3/weeks with no additives - parents reported very different behaviour in week 2 from weeks 1 and 3 • weeks 2 & 4/weeks on drinks/weeks when additives **might** be present - parents reported same behaviour though no additives in week 2 **must** discuss specific results for 2 marks	for 2 marks	**4**
	(iii)	• weeks 2 & 4/weeks on fruit juice – parents difference within range of uncertainty/week 2 shows bias/psychologists no difference at all • weeks 3 & 4 – difference **may** be significant or may be due to expectations • differences between additives and no additives very small **must** discuss specific results and compare at least 2 different weeks for 2 marks	any 2 for 1 mark each	
	(iv)	• larger sample • more precise measures of behaviour (for parents to use) • sensible suggestion on how to reduce placebo effect	any 1 for 1 mark	

(c)		• **confirm** not correct • study has not been repeated • there is no causative mechanism • the difference is very small/article exaggerates effect • deficiency in study design • selective use of results	any 2 for 1 mark each	**2**
(d)	(i)	• do more research/better research • admit results are indeterminate • no mark for ban additives	any 1 for 1 mark	**3**
	(ii)	• stop worrying • if there is an effect it is very small • consider other reasons for bad behaviour • remove additives (this must be qualified correctly to get mark e.g. as a precaution, contribute nothing to diet) • follow new research evidence/monitor own child	any 2 for 1 mark each	
				Total 13

Question 4				
(a)		• all cells carry the whole genome/all genes/all chromosomes/all DNA • genome/DNA copied when cells divide	any 1 for 1 mark	**1**
(b)	(i)	• carrier • 1 normal and 1 CF	for 1 mark each	**3**
	(ii)	• 2 CF genes	for 1 mark	
(c)	(i)	• amniocentesis • removal of fluid from around baby • CVS • removal of cells from placenta	any 1 for 1 mark	**2**
	(ii)	• PGD may be wrong/false negative • need to repeat any test **no mark** for 'further mutation may have happened'	for 1 mark	

(d)	The marking scheme for this section includes an overall assessment for the quality of written communication. There are no discrete marks for the assessment of written communication but quality of written communication will be one of the criteria used to assign the answer to one of the three levels.	
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	level 1 – limited valid points but not clearly linked to an argument structure limited use of new information or ideas about science unstructured errors in grammar, punctuation and spelling or lack of fluency	**1-2**
	incorrect or no response	**0**
	examples of the sort of information or ideas that might be used to support an argument **no** • ethics of discarding potential humans/only acceptable if risk of death in early life is 100% • only eliminates small part of cancer risk • new cancer treatments means less likely to die from cancer • could lead to other tests for more minor problems/'designer babies' • IVF low success rate **yes** • for risk greater than….% • right to use technology to prevent suffering • these cancers strike younger people • anxiety of child or family throughout their life • suffering of families where several members have died of inherited cancer • may be cost effective for health service	**max 6**
		Total 12

Question 5			
(a)	• gene from bacterium cut out • put into carrier/vector/plasmid/'gun'/use of enzymes • inserted into plant/chromosome/cell/DNA • inserted gene replicates when cell divides	any 2 for 1 mark each	**2**
(b)	• greater yield • less expense **on insecticide** • less crop lost to pest/plant resistant to insects • no need to handle toxic insecticide	any 2 for 1 mark each	**2**
(c)	• pollen escaping • cross fertilisation/resistant gene may be spread to wild **not** insect resistance, contamination (unless explained)	any 1 for 1 mark	**1**
(d)	• seed too expensive (for poorest farmers) • yield depends on water • yield depends on soil/fertiliser too expensive • other insect pests may not be killed by Bt • insects may become resistant • economic/land tenure etc arguments/transport issues • terminator technology would prevent farmers saving seeds **not** effect on food chain, risk of cross fertilisation terminator technology would prevent farmers saving seeds	any 2 for 1 mark each	**2**
			Total 7