



General Certificate of Education

Science for Public Understanding 5401

SPU1 Issues in the Life Sciences

Mark Scheme

2008 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.

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GCE Science for Public Understanding, SPU2, Issues in the Life Sciences

Question 1				
a	i	<ul style="list-style-type: none"> • More new cases each year • Higher incidence 	<i>any 1 for 1 mark</i>	1
a	ii	<ul style="list-style-type: none"> • Same number of new cases each year 2000 to 2005 / Rate of increase has slowed/fallen to zero/dropping • Rate of infection increasing in 1995 	<i>for 1 mark each</i>	2
a	iii	<ul style="list-style-type: none"> • Not all new cases detected • People with TB may not go to doctor/clinic • Misdiagnosis/ poor record keeping 	<i>any 1 for 1 mark</i>	1
b	i	<ul style="list-style-type: none"> • body's defence against infection • white blood cells / antibodies • recognition of microbes/ prevent reinfection 	<i>for 1 mark each</i>	2
b	ii	<ul style="list-style-type: none"> • dormant TB becomes active in HIV patient • catch new infection more easily 	<i>any 1 for 1 mark each</i>	1
c	i	<ul style="list-style-type: none"> • Cost of drugs • Less health workers • poor distribution of drugs/poor transport • less well informed/educated on need to complete course <p>NOT poor hygiene</p>	<i>any 2 for 1 mark each</i>	2
c	ii	<ul style="list-style-type: none"> • research into new TB drugs/new vaccine/new combination – TB would not be resistant • research into drugs with shorter action/less side effects – people would be more likely to complete course • make existing drugs cheaper – everyone who needs could get full course • better labelling on need to continue treatment (1 mark) 	<i>any 1 for 1 or 2 marks</i>	2
c	iii	<p>use 3 level scheme; points to be covered</p> <ul style="list-style-type: none"> • complete the <u>long</u> course of treatment/ continue after symptoms gone • avoid coughing/spitting near others/isolation <p>Explanation</p> <ul style="list-style-type: none"> • meaning and implications of resistance • how resistance develops 	<i>any 4 for 1 mark each</i>	6

Question 2				
a	i	<p>A or B</p> <ul style="list-style-type: none"> • correlation over whole population too general/ correlation does not equal causation • no data to back up claim • Many other variables have changed/ no controls mentioned / change in method of diagnosis • For B only – no suggested causative mechanism 	<i>any 2 for 1 mark each</i>	2
a	ii	<ul style="list-style-type: none"> • water treatment/ chlorine – reduces water borne infection • packaging of food – reduces contamination • any other examples such as bleach, food preservatives, hand wash 	<i>any 1 for 1 or 2 marks</i>	2
b		<ul style="list-style-type: none"> • human health more important than rodent life • animals bred specially • animals must be well treated • cost benefit in favour • important to understand effects of chemicals/causes of cancer • many chemicals are not needed/more selective testing • very large number of animals not justified if only 4500 human cases • cost benefit argument over expense of testing many animals • animals suffering/ethics • animals not a good model • use alternatives to rat and mice if possible • only test chemicals that have shown some indication of harm 	<i>any 4 for 1 mark each</i>	4

Question 3				
a	i	<ul style="list-style-type: none"> two groups <u>treatment and control</u> subject does not know which group they are in doctor does not know who is in which group 	<i>for 1 mark each</i>	2
a	ii	<ul style="list-style-type: none"> expectations affect perception of health knowing may influence what they report 	<i>any 1 for 1 mark</i>	1
a	iii	<ul style="list-style-type: none"> very small sample size very small difference difference may be due to chance / other variables reporting of having cold unreliable data control group may have diets below healthy minimum level of Vitamin C/treatment group is just benefiting from minimum healthy level/not a test of high dose university students are a biased sample (can be implied) (0 for short time of trial) (0 for group sizes different) 	<i>any 3 for 1 mark each</i>	3
b	i	<ul style="list-style-type: none"> chemistry prize shows he is a good scientist / reliable not an expert in the immune system/biology/medicine/vitamins peace prize not relevant information only given to persuade/evidence more important than status 	<i>any 2 for 1 mark each</i>	2
b	ii	<ul style="list-style-type: none"> could have led to bias (0 for actual dishonesty) 	<i>any 1 for 1 mark</i>	1
b	iii	<ul style="list-style-type: none"> marketing of vitamins/ advice from friends negative results not well publicised no cure for cold placebo effect gives impression of benefit from Vitamin C self-limiting disease gives impression of benefit from Vitamin C extrapolation from benefits of low doses Pauling is a credible witness 	<i>any 2 for 1 mark each</i>	2

Question 4				
a	i	They <u>both</u> have at least one PKU gene/both carriers/one recessive gene each	<i>for 1 mark</i>	1
a	ii	<ul style="list-style-type: none"> • 1 in 4 • diagram or explanation of possible combinations (or conditional on answer to (a) (i)) 	<i>for 1 mark each</i>	2
b		<ul style="list-style-type: none"> • cost of testing large numbers/12 000 • cheaper than caring for 1 child with PKU (comparison must be implied for mark) • general definition of cost benefit give each point independently	<i>any 2 for 1 mark each</i>	2
c		use level criteria evidence that might be used: Yes <ul style="list-style-type: none"> • chance of health benefit • prevent long anxiety for parents as symptoms develop • will allow child to benefit rapidly from any new treatments • identification of gene in family • allows decisions to be made about future pregnancies • CF relatively common No <ul style="list-style-type: none"> • anxiety from false positives • need for further testing • no reassurance from negative/ many false negatives • cost benefits not clear • health benefits not clear 		6

Question 5				
a	i	<ul style="list-style-type: none"> • 500 – 350 [500 – (340 – 360)] • 150 million years (if units given penalise 'years') 	<i>for 1 mark</i>	1
a	ii	<ul style="list-style-type: none"> • reptiles 	<i>for 1 mark</i>	1
b		any value 350 – 450	<i>for 1 mark</i>	1
c	i	<ul style="list-style-type: none"> • natural variation/mutation • had survival advantage • changing environment • produce more offspring • offspring inherit advantage • gradual spread of the new characteristic • some fish able to breathe air better/some fish with stronger fins/did better in swamp <p>3 for general description of mechanism, 1 for example related to information in question Max 1 for non-Darwinian explanation</p>	<i>any 4 for 1 mark each</i>	4
c	ii	<ul style="list-style-type: none"> • fits a 'gap' as predicted • predictions made using the theory agree with observation • such agreement increases confidence in the theory • discovery adds to knowledge about evolution 	<i>any 2 for 1 mark each</i>	2
c	iii	<ul style="list-style-type: none"> • This would be a falsification/does not fit prediction from theory • theory predicts mammals after 170MYA • mammals after reptiles/mammals very different from fish • no mammal-like earlier species at this time • would need to re-evaluate theory 	<i>any 2 for 1 mark each</i>	2
c	iv	<ul style="list-style-type: none"> • gaps can be explained within theory • not all creatures died in conditions to become fossils • not all fossils have been found / lack of fossils does not mean they did not exist • new fossils when found do fit into 'gaps' /lots of fossil evidence for theory • lack of evidence is not the same as evidence for a contrary theory 	<i>any 2 for 1 mark each</i>	2

Level	Descriptor <i>an answer will meet most of the criteria given in the level descriptor</i>	Mark range
3	<p>Good</p> <p>claims supported by an appropriate range of evidence</p> <p>good use of information or ideas about science, going beyond those given in the question</p> <p>argument well structured with minimal repetition or irrelevant points</p> <p>accurate and clear expression of ideas with only minor errors of grammar, punctuation and spelling</p>	5-6
2	<p>Modest</p> <p>claims partially supported by evidence</p> <p>good use of information or ideas about science given in the question but limited beyond this</p> <p>the argument shows some attempt at structure</p> <p>the ideas are expressed with reasonable clarity but with a few errors of grammar, punctuation and spelling</p>	3-4
1	<p>Limited</p> <p>valid points but not clearly linked to an argument structure</p> <p>limited use of information or ideas about science</p> <p>unstructured</p> <p>errors in grammar, punctuation and spelling or lack of fluency</p>	1-2
0	Incorrect or no response	0