



## General Certificate of Education

# Science for Public Understanding 5401

*SPU1 Issues in the Life Sciences*

## Mark Scheme

*2005 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.



**SPU1 Issues in the Life Sciences**

<p><b>Question 1</b> (a)</p>	<ul style="list-style-type: none"> <li>• dead/weakened virus</li> <li>• immune response/antibody/white cells</li> <li>• on infection, faster response/memory cells/antibodies present/recognition/immune system resists infection</li> </ul> <p><b>must have reference to a part of immune system for 2 marks</b></p>	<p>any 2 for 1 mark each</p>	<p><b>2</b></p>
<p>(b)</p>	<ul style="list-style-type: none"> <li>• cannot afford/vaccine not available</li> <li>• lack of health workers/health infrastructure</li> <li>• poor transport links (within the country)</li> <li>• war/civil unrest</li> <li>• local production not possible</li> </ul>	<p>any 2 for 1 mark each</p>	<p><b>2</b></p>
<p>(c)</p>	<ul style="list-style-type: none"> <li>• patients cannot infect others/prevents spread</li> <li>• those at risk all immune/resistant/vaccinated</li> <li>• only transmission is human-human/no other source of infection</li> <li>• no healthy carriers/patients recover or die</li> <li>• smallpox mutation not an issue</li> <li>• single vaccine</li> </ul>	<p>any 2 for 1 mark each</p>	<p><b>2</b></p>
<p>(d)</p>	<p><b>yes</b></p> <ul style="list-style-type: none"> <li>• need for vaccine/preparedness/defence needs</li> <li>• helps understanding of the disease</li> <li>• existence of vaccine deters bioterrorists</li> <li>• no cure/risk of epidemic/many would die</li> <li>• real risk of bioterrorism</li> </ul> <p>no mark for 'make people feel safer'</p> <p><b>no</b></p> <ul style="list-style-type: none"> <li>• bioterrorist risk actually small</li> <li>• scientists should not work on doing harm/could be used as weapons/future use may not be defensive</li> <li>• accidental escape/must be kept very secure</li> <li>• risk of epidemic</li> <li>• theft/this work increases risk/bioterrorists could gain access</li> <li>• risk from time lag between disease and vaccine</li> <li>• may jump species/GM may have unexpected effects</li> </ul> <p>maximum 2 marks for general animal rights argument no marks for general opposition to GM</p>	<p>any 4 for 1 mark each</p>	<p><b>4</b></p>
<p>Quality of Written Communication</p>			<p><b>2</b></p>

<p><b>Question 2</b> (a) (i)</p>	<ul style="list-style-type: none"> <li>• (almost) directly proportional</li> <li>• risk increases as alcohol consumption increases</li> </ul>	<p>for 1 mark</p>	<p><b>1</b></p>
<p>(ii)</p>	<ul style="list-style-type: none"> <li>• u shaped curve</li> <li>• minimum risk at 5 - 10 units a week/risk falls up to 5/10/20</li> <li>• risk same at zero and 20 units</li> <li>• risk increases <b>above</b> 20/10 units</li> </ul> <p>must state a value at which trend changes for 2 marks (exact value not important)</p>	<p>any 2 for 1 mark each</p>	<p><b>2</b></p>
<p>(iii)</p>	<ul style="list-style-type: none"> <li>• correlation/proof is an exaggeration</li> <li>• may be due to common variable/example of such a variable e.g. social class</li> <li>• no evidence of repeat</li> <li>• no information on sample size</li> <li>• no evidence of causative mechanism</li> <li>• no data on over-54s</li> </ul> <p>no marks for quibbles about exact number of units at which risk rises</p>	<p>any 2 for 1 mark each</p>	<p><b>2</b></p>
<p>(b)</p>	<ul style="list-style-type: none"> <li>• experience/qualifications/institution of researchers?</li> <li>• role of alcohol industry/vested interests?</li> <li>• published in peer review journal?</li> </ul> <p>allow maximum 1 mark for study design such as sample size or repeat if same point not already credited in (a) (iii)</p>	<p>any 2 for 1 mark each</p>	<p><b>2</b></p>
<p>(c) (i)</p>	<ul style="list-style-type: none"> <li>• (16 – 24) 1.2</li> <li>• (45 – 54) 1</li> </ul> <p>no marks for risk per 10,000</p>	<p>both for 1 mark</p>	<p><b>1</b></p>
<p>(ii)</p>	<ul style="list-style-type: none"> <li>• overall/non-drinker death rate much less in 16 – 24/death rate higher in 45 – 54</li> <li>• fewer other causes of death in 16 – 24/examples of causes of death in 45-54</li> <li>• <b>example of alcohol related risk behaviour</b> in 16-24</li> <li>• small change in relative risk less significant than absolute</li> </ul>	<p>any 2 for 1 mark each</p>	<p><b>2</b></p>
<p>(d)</p>	<ul style="list-style-type: none"> <li>• pleasurable</li> <li>• familiarity/part of social culture (not 'popular')</li> <li>• peer pressure</li> <li>• widely available/relatively cheap</li> <li>• power of advertising</li> <li>• risks under personal control (always more acceptable)</li> <li>• delayed effect</li> <li>• consumption under-estimated</li> <li>• relieves emotional stress/depression</li> <li>• addictive</li> </ul>	<p>any 3 for 1 mark each</p>	<p><b>3</b></p>

<p><b>Question 3</b> (a) (i)</p>	<ul style="list-style-type: none"> <li>• mother Rr</li> </ul>	<p>for 1 mark</p>	<p><b>1</b></p>
<p>(ii)</p>	<ul style="list-style-type: none"> <li>• father Rr</li> </ul>	<p>for 1 mark</p>	<p><b>1</b></p>
<p>(b)</p>	<ul style="list-style-type: none"> <li>• testing fetus/amniocentesis/CVS (must be clear that test is on fetus and is a genetic test not ultrasound/scan)</li> <li>• abortion</li> <li>• In vitro fertilisation/IVF</li> <li>• extraction of several eggs</li> <li>• pre-implantation genetic diagnosis/PGD/removal of cell from embryo for testing/DNA test on embryo</li> <li>• implantation of unaffected embryos</li> <li>• discarding of embryos with CF</li> <li>• sperm/egg donation</li> <li>• surrogacy/adoption</li> </ul>	<p>any 4 for 1 mark each</p>	<p><b>4</b></p>
<p>(c) (i)</p>	<ul style="list-style-type: none"> <li>• family member/example of family member has the disease</li> </ul>	<p>for 1 mark</p>	<p><b>1</b></p>
<p>(ii)</p>	<ul style="list-style-type: none"> <li>• negative means mutated gene not detected/test indicates normal gene</li> <li>• false because later shown to be Rr/child later born with CF</li> <li>• undetected mutation (for 2 marks)</li> </ul>	<p>for 1 mark each</p>	<p><b>2</b></p>
<p>(iii)</p>	<ul style="list-style-type: none"> <li>• for many <b>groups</b> incidence is very low (do not allow Europeans alone here)</li> <li>• not cost- effective/waste of resources (but not just 'test expensive')</li> <li>• (some groups have) <b>high</b> false negative rate</li> <li>• not all CF births prevented</li> <li>• risk of prejudice against carriers</li> <li>• some people do not wish to know</li> </ul> <p><b>no marks for argument based on false positives (unless (c) (ii) already penalised for this)</b> <b>no marks for risk of racism argument</b></p>	<p>any 1 for 1 or 2 marks each</p>	<p><b>2</b></p>

<p><b>Question 4</b> (a) (i)</p>	<ul style="list-style-type: none"> <li>• maize</li> <li>• 8g weeds compared to 22/46/11 insects compared to 17/20/16/14</li> <li>• least weeds and insects of the three</li> </ul>	<p>for 1 mark</p>	<p><b>1</b></p>
<p>(ii)</p>	<ul style="list-style-type: none"> <li>• maize</li> <li>• weeds &amp; insects <b>increased</b> with GM maize</li> <li>• 8 up to 14/11.57 up to 15/11.02 up to 11.32 (<b>any 2</b>)</li> <li>• weeds &amp; insects <b>decreased</b> with beet &amp; rape</li> </ul>	<p>for 1 mark each</p>	<p><b>2</b></p>
<p>(iii)</p>	<ul style="list-style-type: none"> <li>• less <b>weeds</b></li> <li>• plant eating insects die from lack of food</li> <li>• less plant eaters means less food for insect eaters</li> </ul> <p><b>no marks for confusion between herbicide and insecticide</b> i.e. 'insects can't eat beet'</p>	<p>for 1 mark each</p>	<p><b>2</b></p>
<p>(b)</p>	<ul style="list-style-type: none"> <li>• to eliminate other variables/to ensure same conditions</li> <li>• same weather</li> <li>• same soil type</li> <li>• an argument justifying separate halves of field rather than mixing</li> <li>• reproducible/eliminate bias</li> </ul> <p><b>no mark for 'control' or 'to compare'</b></p>	<p>for 1 mark each</p>	<p><b>2</b></p>
<p>(c)</p>	<ul style="list-style-type: none"> <li>• no way of ever showing total safety/'safe' a very vague meaning</li> <li>• no mention of cross breeding with wild plants</li> <li>• no mention of human health, allergies etc</li> <li>• no information on long term effects</li> <li>• yes it is safe, it does not harm weeds or insects/environment</li> </ul>	<p>for 1 mark each</p>	<p><b>2</b></p>
<p>(d)</p>	<p><b>yes</b></p> <ul style="list-style-type: none"> <li>• maize less likely to cause harm than other two crops</li> <li>• no difference/benefit for <b>environment</b> between GM and conventional maize</li> <li>• technology has great potential/an example of potential</li> <li>• important to encourage research</li> <li>• good that government considers environmental as well as economic factors</li> <li>• sensible compromise on public opinion</li> </ul> <p><b>no</b></p> <ul style="list-style-type: none"> <li>• long term effects unsure/more research needed</li> <li>• research does not consider other possible risks</li> <li>• should listen to public opinion</li> <li>• risk of contamination of non-GM crops/example of other risk</li> <li>• no real benefits from GM maize</li> </ul>	<p>any 4 for 1 mark each</p>	<p><b>4</b></p>
<p>Quality of Written Communication</p>			<p><b>2</b></p>

<b>Question 5</b> (a)	<ul style="list-style-type: none"> <li>• Neanderthal &amp; Erectus</li> </ul>	both for 1 mark	<b>1</b>
(b)	<ul style="list-style-type: none"> <li>• development of new <b>species</b> over time</li> <li>• more recent species show increasing brain size</li> <li>• <b>extinction of</b> smaller brain size/<b>less</b> adapted species</li> <li>• <b>better</b> adapted/more intelligent more likely to survive</li> <li>• able to pass on advantageous characteristics</li> <li>• advantages may be language/tool making</li> <li>• example of exception (Neanderthal or chimpanzee)</li> <li>• species over reproduce</li> </ul>	any 4 for 1 mark each	<b>4</b>
(c) (i)	<ul style="list-style-type: none"> <li>• fossil record consistent with evolution</li> <li>• detail of supporting evidence e.g. DNA, carbon dating</li> <li>• no contradictory evidence</li> <li>• good evidence for evolution of non-human species</li> </ul> <p>no marks for general similarity to chimps</p>	any 2 for 1 mark each	<b>2</b>
(ii)	<ul style="list-style-type: none"> <li>• we seem to be different from animals/ common ancestor with chimpanzees seems improbable/ only humans have language/self awareness/ moral sense/developed intelligence/technology</li> </ul> <p>not 'superior' or 'advanced' unless explained</p> <ul style="list-style-type: none"> <li>• religious books such as Bible describe creation/ evolution breaks special relationship with God/ some people consider humans superior timescale</li> </ul>	any 2 for 1 mark each	<b>2</b>