



**General Certificate of Education (A-level)
June 2011**

Science in Society

SCIS4

(Specification 2400)

Unit 4: Case study of a scientific issue

Final

Mark Scheme

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 events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process 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 standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

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For questions marked **PE** candidates can gain 1 mark for a point and 1 mark for explanation of that point.

1	<ul style="list-style-type: none"> Essential gene codes for proteins/phenotype/physical characteristics Junk DNA doesn't seem to have any effect on health/survival of the organism regular random variations in junk DNA <p>Do not allow Junk DNA does nothing</p>	2	Any 2 for 1 marks each
2	<ul style="list-style-type: none"> changes don't affect organism - so can be passed on changes in essential genes will prevent organism surviving. 	2	Any 1 for 1 or 2 marks PE
3	<p>Source B</p> <ul style="list-style-type: none"> use other technologies CCTV / DNA swabs/ scanning machines as vital tools Details from Kensley Larrier case Offenders should stay on database no matter when convicted Overseas added on return to UK By eliminating the innocent increase chance of catching guilty/ can prove innocence 	2	Any 2 for 1 mark each
4	<p>Source C</p> <ul style="list-style-type: none"> Shouldn't keep DNA if not convicted limit length of time DNA kept for Infringes human rights collected from irrelevant crimes/not proportionate not equal representation on database/too many young black men / people with mental illnesses on database Scotland no effect 	2	Any 2 for 1 mark each
5	<ul style="list-style-type: none"> three person mixes that look like two people – could help eliminate contaminated samples kinship analysis – know how likelihood of a match depends on number of relatives on database rate of typing errors – make matches more reliable / remove human error/quality control assumptions about population genetics independence of loci real world tests improve public's faith in database 	4	Any 2 for 1 or 2 marks each PE

<p>6</p>	<ul style="list-style-type: none"> • Open access to data – reproduce results / more data to use • peer review – make sure methods and data were correct • use of data to create explanations – match probabilities based on known data • publishing results – allow other scientist to reproduce/build on the results. • ethical issues • identifying errors – improve possible convictions • repeat tests/expts – to eliminate errors/improve reliability <p><i>norm doesn't have to be mentioned in text, but must be a reasonable one.</i></p>	<p>4</p>	<p>Any 2 for 1 or 2 marks each</p> <p style="text-align: center;">PE</p>
<p>7</p>	<ul style="list-style-type: none"> • unrelated people likely to match 8.7 alleles by chance (15%) • frequency of match depends on population • Genes from parents • father and child must share 13 markers • unique or highly specific pattern/one of each pair • father and child may share more if mother has same allele • For white population, father and child share on average 15.7 out of 26 markers <p>If no numerical details accept father matches more than unrelated for 1 mark</p>	<p>4</p>	<p>Any 4 for 1 mark each</p>
<p>8</p>	<ul style="list-style-type: none"> • DNA sample taken at crime scene • markers compared with DNA database • no exact match in records • records with partial match at some loci chosen • family members share DNA markers • investigate the relatives of the people (with the partial matches) 	<p>4</p>	<p>Up to 4 for 1 or 2 marks</p> <p style="text-align: center;">PE</p>
<p>9</p>	<ul style="list-style-type: none"> • choose rare STR loci – lowers chances of matching • Difference in population size • chance of matching is still small 	<p>2</p>	<p>Any 1 or 2 for 1 or 2 marks</p> <p style="text-align: center;">PE</p>
<p>10</p>	<ul style="list-style-type: none"> • allows them (university) to recover the costs of research / make money from research • prevents others using their methods without payment / permission • gives them a monopoly on that research • take credit for work / recognition • process different 	<p>2</p>	<p>Any 2 for 1 mark</p>

<p>11</p>	<ul style="list-style-type: none"> • immense distress • could lead to an 'unfair presumption of guilt' • frequently contacted by innocent people ... how distressed they were • 'if you took one million profiles.....would detections rise?' • innocent people on database being used inefficiently... • 'sinister mission creep' 	<p>2</p>	<p>Any 2 for 1 mark each</p>
<p>12</p>	<p>No</p> <ul style="list-style-type: none"> • generalisation – others might not feel the same • only one example given – may be an unusual case / other reasons for suicide • would need to look at more data • too dramatic / sensationalist • ACCEPT plural suicides in title for 1 mark <p>Yes</p> <ul style="list-style-type: none"> • innocent people have talked to AJ about their worries • only have details of one person – but there could be others • could cause distress/shame 	<p>2</p>	<p>Any 1 or 2 for 1 or 2 marks</p> <p>PE</p>
<p>13</p>	<ul style="list-style-type: none"> • technical feasibility • benefits to individuals / society e.g. crimes solved more quickly • <u>economic</u> cost • costs to human health / well-being e.g. stigma • human rights legislation • public opinion <p><i>don't credit vague statements of cost-benefit type</i></p>	<p>4</p>	<p>Any 4 for 1 mark each</p>

		12	
Level of Response	Descriptors	Guidance	Mark Range
Good – level 4	<ul style="list-style-type: none"> • clear exposition of science explanations relevant to the issue; • good overall grasp of the range and nature of the issue(s); • writes well structured argument using a range of evidence to reach a reliable conclusion; • fluency and accuracy of expression, with only minor errors of grammar, punctuation or spelling. 	<p>Includes limitations of fingerprinting Science correct Well explained, mostly suitable for jury</p>	10-12
Competent – level 3	<ul style="list-style-type: none"> • good attempt at exposition of science explanations; • general grasp of the range and nature of issue(s); • writes structured argument using some evidence to reach a conclusion; • accuracy of expression, with some errors of grammar punctuation or spelling 	<p>Details/explanation of 3 or 4 ideas Science mostly correct mostly suitable for jury</p>	7-9
Limited – level 2	<ul style="list-style-type: none"> • exposition of science explanation minimal or inaccurate • grasp of some features of the issue(s); • arguments presented but with weak structure and/or minimal evidence • accuracy of expression, but with serious errors of grammar punctuation or spelling 	<p>Outline on 1 or 2 ideas OR Science minimal or confused</p>	4-6
Inadequate – level 1	<ul style="list-style-type: none"> • exposition of science explanation confused • appears not to understand the issue; • argument presented as just a claim with no structure or evidence • expression unclear with serious errors of grammar punctuation or spelling 	<p>Vague descriptions Science minimal or wrong unacknowledged copy of sources</p>	1-3
0	incorrect or no response		0
	Total		12

B 14

		12	
Level of Response	Descriptors	Guidance	Mark Range
Good – level 4	<ul style="list-style-type: none"> • clear exposition of science explanations relevant to the issue; • appropriate and effective use of the relevant ideas about how science works; • good overall grasp of the range and nature of the issue(s); • interprets arguments presented, recognising evidence, claim and counterclaim; • writes well structured argument using a range of evidence to reach a reliable conclusion; • fluency and accuracy of expression, with only minor errors of grammar, punctuation or spelling. 	<p>Supported argument for/against with counter-argument.</p> <p>Conclusion</p> <p>References to sources (can be indirect if still clear)</p>	10-12
Competent – level 3	<ul style="list-style-type: none"> • good attempt at exposition of science explanations; • use of some relevant ideas about how science works; • general grasp of the range and nature of issue(s); • interprets arguments presented, recognising some of the main components • writes structured argument using some evidence to reach a conclusion; • accuracy of expression, with some errors of grammar punctuation or spelling 	<p>Supported argument for/against with counter-argument</p> <p>Conclusion</p>	7-9
Limited – level 2	<ul style="list-style-type: none"> • exposition of science explanation minimal or inaccurate • minimal use of ideas about how science works; • grasp of some features of the issue(s); • interprets only part of arguments presented • arguments presented but with weak structure and/or minimal evidence • accuracy of expression, but with serious errors of grammar punctuation or spelling 	<p>Argument for/against</p>	4-6

B 15

B 15	Inadequate – level 1	<ul style="list-style-type: none"> • exposition of science explanation confused • appears not to understand the issue; • argument presented as just a claim with no structure or evidence • expression unclear with serious errors of grammar punctuation or spelling 	Vague descriptions Science minimal or wrong unacknowledged copy of sources	1-3	
	0	incorrect or no response		0	
		Total			12

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