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General Certificate of Education (A-level)
June 2013

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 students' 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 students' 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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Question	Marking Guidance	Mark	Comments
1	• large number of people born on that day • Not all births are recorded • partly based on historical estimates	2	
2	Low fertility • increase in population until 2030 and then starts to decrease Intermediate fertility • increase in population until 2060 and then starts to decrease High fertility • population continues to increase to 2010	3	For low and intermediate need to include dates OR a description of shape of graph.
3	• also depends on the mortality rate. • if death rate is greater need higher birth rate to replace population • different health factors in countries / specific example of health factor *not life expectancy (of adults)*	2	
4	• improvements in health care • increased wealth	1	any 1 for 1 mark
5	• current population can live on produce of earth • without affecting livelihood of future generations.	2	
6	• many infectious diseases are water-borne • example of disease • $^{1}/_{7}^{th}$ current population lack clean water	2	any 2 from 3
7	• reduced population – increased wealth • increased industrialisation - environmental damage increase • decreased birthrate – purchasing power • decreased birthrate – spending on development	2	any 2 for 1 mark each

8	• Increased consumption is issue • Also inequality of wealth / resources • As population decreases countries consume more • reduction of population in poor countries has less impact on consumption • population in rich countries already low	4	any mp worth 1 or 2 marks

9	• reputation / authority / shows area of expertise • so that they can be contacted by other researchers (people)	1	

10	• different assumptions made / factors included • example of specific factor given • different models used / some models more complicated	2	any 2 for 1 mark each

11	• used data on actual land use (in 2005) • results compared to actual population / check again reality • model predicted population capacity 2x actual not just describing the model.	2	

12	Genghis-Khan - *Not realistic – reasons given using assumptions or other justification* • no land available for urban and recreational needs • cultivation of all productive land • no trade / local production and consumption Save-the-forests - *possibly realistic – reasons given using assumptions or other justification* • areas where natural vegetation dominated by tropical evergreen/tropical forests not cultivated • no trade / local production and consumption • may also use Genghis-khan points Burger - *not realistic – reasons given using assumptions or other justification* • All land used to grow food for animals • people eat only meat • no trade / local production and consumption	4	2 marks for assumptions, up to 2 marks for discussion

13	Sustainability • water consumption o model assumes no water for other purposes o intensive water use may lead to salinisation o irrigation may lead to soil degradation / abandonment of farm land • nutrient use o limiting factors in growth such as phosphorus in short supply • crop protection o monoculture leads to poor soil quality o monoculture leads to crops being less resistant to pests / illness o intensive agriculture requires agrochemical inputs • energy o leads to greenhouse gas emissions o requires renewable energy (because no biofuel plants used) o running out of fossil fuels Biodiversity • water consumption o use of water for irrigation would reduce biodiversity o water taken from rivers would reduce number of species • nutrient use o pollution from pesticides/herbicides/fertilisers reduces biodiversity • crop protection o monoculture reduces biodiversity due to loss of habitats o monoculture can lead to increase of pests /disease • Rain forest destruction	6	Max 4 marks for each section. 6 marks in total. if unattributed quotes max 3 marks.

14	"There's not point trying to reduce their…..another child' / Simon Ross ' need greater debate about population …. strain on natural resources / Caroline Lucas	1	either appropriate sentence or name for 1 mark.

15	may be influential because: o presents the Beckhams as a bad example o people emulate celebrities o may imply 3 or more children is 'ideal' family size • media can influence people subliminally without making explicit statements • other groups use them to raise awareness of population Unlikely to be influential because • probably won't have another child just because Beck's have. • other reasons for having children more important • not enough information in the article	2	any 2 for 1 mark each

B16	L4 answers will be • clearly organised /structured • include detailed information on all three points • include references/examples from sources about population. • May also include examples from other areas of spec L3 answers • organised • include info on all three points • general reference to population models / example of other models L2 answers • some aspects of information limited • refers to example of models L1 answer • limited or missing information • no link to examples Answer could include: • simple explanation of what a computer model is o mathematical equations linking key variables (fertility, mortality etc) o makes assumptions about how variables affect each other o simplified version of reality o tested against reality • reasons why computer models are used o make predictions / projections about future changes o can't carry out experiments in some cases o influence policy / government • explanation of the limitations of computer models o sensitivity to starting conditions o may not have accurate starting data o don't know all the factors involved o can't take rapid / unexpected changes into account o not as 'trustworthy' as directly measured values	12	

B17	L4 • discussion about relative importance • discusses in detail population **and** consumption • mentions inequality • links to sustainability made • counterarguments used • (implicit) references to sources / examples from spec • conclusion given L3 • mentions (or implies) inequality • discusses population and consumption • attempts to link sustainability • examples given • conclusion L2 • discusses population and/or consumption • ignores inequality • sustainability mentioned • simplistic or no conclusion L1 • discusses population OR consumption • ignores inequality ideas expect to see in answer • deal with population o increasing number of people o example of how fast it is increasing o examples of numbers from source B o each additional person increases e.g. greenhouse gases o more people – less space for biodiversity o ethical issues	12	

	• deal with consumption o countries which are most unsustainable may not have biggest population o need to reduce population of developing country a lot more than rich country to get same reduction in resource use. o ideas of fairness / ethics in reducing developed world consumption • technological solutions o contraception / education • Quality of argument – conclusion follows the arguments and evidence used. Source C – positive, technological solutions, no limitations Source D – focus on consumption Source E – technology is solution Source F – in favour of population control		

B16 + B17

level of response	Descriptors:	mark range
good level 4	• 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, includes counter-argument; • fluency and accuracy of expression, with only minor errors of grammar, punctuation or spelling.	**10-12**
competent level 3	• 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	**7-9**
limited level 2	• 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	**4-6**
inadequate level 1	• exposition of science explanation confused • use of ideas about how science works absent or wrong • appears not to understand the issue; • cannot interpret the argument presented • argument presented as just a claim with no structure or evidence • expression unclear with serious errors of grammar punctuation or spelling	**1-3**
0	**incorrect or no response**	**0**
	Total	**12**