A-LEVEL
SCIENCE IN SOCIETY

SCIS3 Exploring Key Scientific Issues
Mark scheme

June 2014

Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer 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 associates 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 associate understands and applies it in the same correct way. As preparation for standardisation each associate 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, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' 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.

Further copies of this Mark Scheme are available from aqa.org.uk

Question	Answers	Additional Comments/ Guidance	Mark	ID details
1a	• neurotransmitter transmits impulses across synapse • if more neurotransmitter then more impulses/stronger response from neuron/more neuron activity		2	
1b	• neuron activity requires energy • blood flow increases to supply energy/glucose/oxygen needed	any 1	1	
1ci	• reduction in CBF correlates with more intense subjective effect/ negative correlation • moderate correlation/ weak correlation/ considerable scatter	Allow 'anomalies' for 2nd mark no mark for 'strong correlation'	2	1cii
1cii	• strong subjective effect with reduced CBF • hypothesis A would predict increased CBF	ignore implied causation in answers to this question	2	
1d	• this new explanation will need to be tested/falsified • new hypothesis can lead to new research direction/stimulates research/ new predictions • change of direction may lead to new discoveries/ new established explanation	no marks for repeat of question 'advances scientific understanding'	2	

1e	• risk of using psilocybin/ side effects? • fully <u>informed</u> consent? • is after care available if there are any problems? • are those with history of mental illness/ other health problems excluded? • do subjects have freedom to withdraw at any time? • are there legal guarantees that they will not be prosecuted for use of illegal substance? • is research likely to produce real benefit (either health or knowledge)/has a harm-benefit analysis been done? • is it essential to use humans ? •		2	
1f	Argument might include some of following points Yes • public funds should be used for the benefit of, society • choice does need to reflect public opinion / be accountable to society • need to balance with other demands for government funds No • must not be influenced by politicians' prior beliefs/ incomplete evidence/ media hysteria • scientists may be best judges of value of research topic • politicians want results in short time span, research requires longer • role of pressure groups in influencing decision-making • unintended consequences example	a good example of any point for a second mark Note this is **not** a question about whether or not the Government should support the research. Politics could mean either government or public	4	
Total			15	

2ai	• MZ have same genotype • <u>difference</u> between MZ & DZ shows effect of genes		2	2aii
2aii	• variation in genotype same as for DZ twins • but environment may not be as similar • 0.5 – 0.2	correct value allowed even if reason wrong	2	2ai
2bi	• many genes involved in dyslexia • each gene has only small effect//0.5% effect • environmental factors also • need for/ difficulty of finding very large samples • genome very large to search • samples from different populations may show different genes • different definitions of dyslexia	need for **two** distinct reasons	2	
2bii	• no one gene/ each gene has small effect • no causative mechanism known • environment /other factors • limited agreement between researchers	Need for two distinct reasons	2	
2ci	two genes gives 3 ways of pairing up		1	
2cii	• G allele/ GG may reduce ability • no overlap with AA • GA effect less clear / overlap of error bars • GG smallest sample/ longest error bar	must have some comment on data for 2 marks	2	

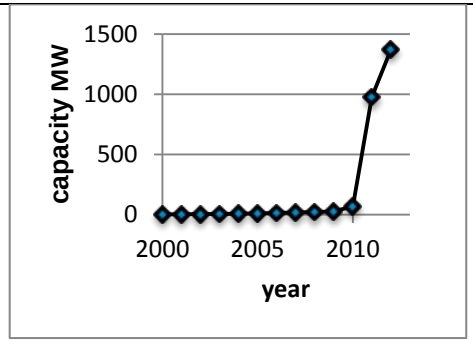
2d	causative mechanism • thicker bundles of axons could make links easier/quicker - reading requires links between brain regions • KIAA may cause thinner bundles of axons – KIAA correlates with poor reading ability caveats • KIAA shows only small correlation - Work on axon thickness only one group • other genes also involved - Other factors may influence dyslexia	each for 1 or 2 marks Max 3 marks for plausibility of the mechanism Max 2 marks for caveats	4	
Total			15	

3ai	• combustion • reaction with oxygen		1	
3aii	4 (gigatonnes)		1	
3bi	• photosynthesis /reaction between CO_2 and water	0 if respiration AND photosynthesis stated	1	bii
3bii	storage as carbohydrates/ named carbohydrate/ in structure of tree	allow bark or leaves but not sap or cells	1	bi
3ci	• poor need land for food/ <u>increasing population</u> need land for housing • business wants land for soya/cattle • value of timber/ timber for fuel • mining/ roads •	no marks for medicines or for housing alone	2	

3cii	• changing land use will increase emissions • fewer trees will mean less removed by photosynthesis/tree growth • more released from vegetation and soil	Allow 1 mark for "overall increase in CO_2" if no other marks gained question is about movements of carbon	2	
3d	• other methods can only record current change • modelling can predict future • can study the effects of different variables separately or together • can consider the whole area /visits only study tiny proportion/no need to visit	no marks for cheaper/quicker/easier unless reason explained	2	
3ei	• models make different assumptions about relationships between variables • starting data different		2	
3eii	• positive correlation between temperature and death of trees • main effect above $1/2^0$C • at 5^0C die-back is between 40 and 90% / <u>may</u> be up to 90%/ a comparison between models • increasing rate above 2 ^{0}C temperature rise	no mark for Model 1 data given as fact	2	
3f	• dead trees increase CO_2 in atmosphere/ increase global temperature - rise in temperature leads to <u>more</u> trees dying	must show feedback, not just one part of system (so usually 2 or 0) but give 1 mark for general explanation of positive feedback	2	

3g	Any reasonable suggestion accepted. Below are examples lifestyle/ individual • some uses (e.g. air travel) require fossil fuels; no renewable alternative • rising standard of living tends to require larger per capita fuel consumption • growing population in some countries requires more energy Economic • FF cheaper than renewables • industrialisation/development requires cheap fuel • renewables require high initial investment • some industries have high fuel requirements • economic competition between countries for growth Political • countries reluctant to change if their emissions much lower than other countries • vested interests /oil companies/climate sceptics have great political power in some countries • no political advantage in forcing people to change standard of living	Max. 2 for individual lifestyle changes No marks for different population size in different countries	4	

Total			20

4ai	• y-axis axis labelled • shape horizontal till 2010 near vertical thereafter	 allow either title 'capacity' or MW values but no marks for 'capacity' if scale really wrong	2	
4aii	• graph easier/quicker to see trend • graph loses detail in early phase/table makes detail clearer • changes in rate more obvious in graph	credit appropriate answer if they use log scale in (i) Max 1 if only advantage of graph with no comparison	2	
4bi	15%		1	
4bii	reflected /heat	ignore 'sound' no marks for 'lost to atmosphere' without explanation	1	
4c	use 3 level marking Examples of points to be made advantages e.g. • no CO_2 • no dependence on imports • reliable technology • local generation means less transmission lines disadvantages e.g. • erratic supply	5-6 must have good argument with 2-3 pieces of evidence and at least one counter argument. 3-4 an argument with limited evidence or a good set of points 1-2 no argument, only one or two points made	6	

	• supply does not match time of maximum demand • more expensive than other technologies • low efficiency other factors used in decision making • reducing CO_2 as priority • long-term subsidy not viable • if subsidy increased demand it would reduce cost/stimulate research			
Total			12	

5a	• fewer bees = fewer berries • fewer berries = fewer small birds/mammals • fewer small birds = fewer predators/ example •	other valid points accepted 1 mark for general explanation of food chain	3	
5bi	difference unlikely to be due to chance		1	
5bii	No • fewer queens per colony relative to control • low dose (nearly) as harmful as high • data comparing low dose to control • less chance of new colonies next year	0 if they 'yes data support claim'	2	
5c	• no difference for first 7 days • control has more workers at end /any time after 16 days • control increasing at a greater rate • A + B <u>may</u> have greater effect • can't distinguish between pesticides/ error bars overlap	only give mark for difference between A and B or A+B and others if qualified by <u>may</u> be difference	2	

5d	• study over longer period – differences only show after 10 days • study queens as well as workers – failure to produce queens not shown by individual deaths • study combinations of insecticides – effect may be different over long time period	any 2 points for 1 or 2 marks	4	
5e	• economic benefit of pesticides/impact on crop yield • benefit of bees • public opinion • quality of the research/reputation of journal or researcher • comparison with other research reports/need for more research • influence of vested interests, farmers/ pesticide manufacturers • respect for nature/ overall impact on ecosystem • is an alternative pesticide available?		4	
Total			16	

Question	answers	extra information	mark
6			

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 4 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–3 marks)	Level 2 (4-6 marks)	Level 3 (7-9 marks)	Level 4 (10-12 marks)

examples of the points made in the response

points might include and should be supported by appropriate examples

benefits

1. value of information – important issues – need to be understandable - essential in a democracy
2. agenda - able to raise issues of public concern – new technologies may involve new issues
3. opinion - debate on different opinions important in democracy - all groups' views need airing – information to help people form opinions
4. How science works – can help explain issues, such as risk

Disadvantages

1. information - can be biased or over-simplified to get audience – sensational - their main aim is sales
2. agenda - media can be co-opted by powerful groups – agenda based on biased information
3. opinion can be seriously distorted by scare tactics - not all groups have equal access to mainstream media
4. How Science Works - may give false impression - poor communication of risk

extra information

level 4

- well structured argument
- at least 4 points from mark scheme or others
- points need to be explained
- must include at least one from each of benefit and disadvantage
- must include appropriate examples

Level 3

- some argument
- at least 3 points from mark scheme or others
- must include at least one from each of benefit and disadvantage
- must include appropriate examples for 2 of the points

Level 2

- at least 2 points from mark scheme or others
- may be one sided
- may not include appropriate or well explained

	examples • or may describe cases unrelated to points Level 1 • only 1 point from mark scheme or others • or very general comments • limited or inappropriate examples • may be one-sided

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 four levels. Marks are assigned according to level descriptors. Candidates would be expected to achieve at least 3 of the 6 descriptors to be awarded marks at that level. Not all descriptors are relevant to each answer.
The marks awarded within the range depend on the extent to which candidates have met the criteria for that range and also on guidance relevant to the specific question

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;	**7-9**

	• accuracy of expression, with some errors of grammar, punctuation or spelling	
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**