A-LEVEL

Science in Society

SCIS3 Exploring Key Scientific Issues
Mark scheme

2400
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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	Mark
1(a)(i)	first years of life		1
1(b)(i)	C		1
1(b)(ii)	• other variable may cause effect/score improving over time before sleep • there is no control/nothing to compare with		2
1(c)(i)	at least 4 correct entries, label or value Labels: X-dendrites known not to ...., Group 2 (sleep deprived) Values: 2.3, 9.3, 4.7	all values ± 0.3	4
1(c)(ii)	• new synapses <u>specific</u> to L-dendrites / to skill learned • more of these specific <u>synapses</u> formed during sleep • no external stimulation during sleep • correlates with better performance	point plus data to support it 2 marks	3
1(d)	• research in mice/ may not apply to humans • only one study • skill learning not same as episodic memory • sleep may also have other role in memory • second correct in that research does suggest mechanism/ wrong because only 'suggest' not 'discover' • second correct in that sleep does have a role in memory	point plus data to support it 2 marks	4
Total			**15**

2(a)(i)	negative correlation weak / r = - 0.263	must have negative in word or sign for 2 marks	2
2(a)(ii)	1.5%		1
2(a)(iii)	r value in 3B greater/ give r values	sign not necessary	1
2(b)	• agreement with others <u>increases</u> trust/ <u>acceptance</u> of their results • differences may show they have made <u>new discovery</u> • disagreement may indicate errors • to suggest reasons for differences	no marks for repeat of Q 'agree and disagree'	2
2(c)	Yes supports mechanism • small hippocampus correlates with <u>both</u> behaviour problems and cumulative stress (2 marks or 0) No • weak correlations/spread of results - some with small hippocampus show no behaviour problems / some children with high stress have large hippocampus (1 or 2 marks) • some other factor also involved/ possibility of causation in other direction		4
2(d)	examples of points Advantages • supports good parenting	use 3 level marking L3 - include advantages and	6

	• encourages provision of support where needed • supports removal of child in extreme cases • raises awareness of the importance of early life experiences Disadvantages • information has to be simplified - should be qualified • the evidence is not as strong as quotes suggest - examples (for up to 3 marks) • emphasises extremes, may make parents anxious • may encourage over-reaction by child protection agencies	disadvantages 3 points, well explained L2 - include advantages and disadvantages 2 points, well explained or 3 with limited explanation L2 - only one side or only points quoted from question	
Total			**16**

3(a)(i)	• interaction between many variables • examples such as radiation and cloud/ice cover (for 1 or 2) • different models may use different equations/relationships / different variables may be included • positive and negative feedbacks • different estimates of <u>initial</u> values of variables		3
3(a)(ii)	shows level of agreement makes range of possibilities clearer		1
3(a)(iii)	• <u>increase</u> in polar regions/higher latitudes • increase at equator • <u>decrease</u> tropics/mid-latitudes • least changes around 30N or S	Insist on increase or decrease, or values. Penalise once only	2
3(a)(iv)	• more evaporation/ more water vapour in air • more condensation <u>in cooler regions</u> • example of changes in climate features e.g. change in wind patterns/ocean currents/sea temperature		2
3(b)(i)	• increasing awareness/concern about CC • rising population makes food yields / food costs important • new technologies help research/ an example such as GM	One point plus explanation gets 2 Note Q about <u>increase</u> in research,	2

	• market pressures to adapt to new conditions	not purpose of research	
3(b)(ii)	• more relevant choices of research topic • benefit of their local knowledge to the research • more local scientists to train future researchers • results more likely to be trusted/acted on	One point plus explanation gets 2	2
3(c)(i)	• 40/50% of them are very close together • skewed distribution/a few results much lower than the rest		1
3(c)(ii)	• falling yield • wide spread of results • temperate more affected than tropical		2
3(c)(iii)	wide range of possible answers including: • action on greenhouse gases - example of political action/ choice of fuel • reduce meat consumption - to make grain available for humans • reduce wealth inequality - to allow equal access to food • GM crops - may be more tolerant of changed climate • improve irrigation technology - to increase productivity of land/to increase area under irrigation	Two policies for 1 or 2 marks each population control or reduce food waste each for 1 mark max.	4
Total			**19**

4(a)(i)	60 GW (58-60)		1
4(a)(ii)	• unused capacity 18 GW • 18 (17-20) x 100/60 /30%		2
4(b)	• higher proportion of wind and solar • solar never available at night/limited in winter/wind may not blow/ less reliable		2
4(c)	why store wind • wind renewable/no GG /minimal cost OR mismatch between supply and demand why not store gas • gas costs money/ produces GG OR can be switched on on demand	only give GG mark once	2
4(d)	Advantage of current plan • spare capacity relies mainly on proven technology/ storage unproven/ needs research	Max. 3 marks for either advantages or disadvantages	4

	• very large storage needed to cover extreme events • relative costs of storage and spare capacity unknown Disadvantages of current plan • fossil fuels needed for spare capacity - coal 14GW/ gas 25 • much higher overall proportion of electricity from renewables possible - 58W • some renewable generation wasted • cost of unused spare capacity - up from 30GW to 73GW	2 marks for a point plus supporting data	
Total			**11**

5(a)	• elk population grew • they ate too many young trees / no replacement as old trees died off		2
5(b)	Yes • all data consistent with theory • aspen trees taller • more cottonwood trees • elk population stabilised at a lower level But • only data on 4 species • no information on number of aspen trees • wolf population may not be stable /only short time • data may not be representative of whole area	must have some caveat for 4 marks	4
5(c)	• do not agree with prediction • removal of elk browsing does not restore willow growth • data show beavers also important in ecosystem • suggest more complex interaction • only one study		3

5(d)	Advantage • debate stimulates research/ action on issue • important that others criticise and repeat work/ integrate both theories • public can follow how scientific ideas develop Disadvantage • hard for public to know what to believe • can undermine confidence in science • risk of policy change / action before full understanding • can exaggerate differences/ simplify issues	Max 2 marks for advantage and max. 2 marks for disadvantage One point plus explanation gets 2	4
5(e)	Yes • <u>specific</u> suggestion for preliminary research on effectiveness • more trees good for climate • restoration of native forest good for other wildlife • increased biodiversity more stable No • danger of wolves/ risk assessment needed • unpredictable effect on ecosystem • Scotland more densely populated than Yellowstone • alternative ways of reducing deer population	One point plus explanation gets 2	4
Total			**17**

Question	Answer	Additional Comments	Mark
6	**4 level marking** **examples of the points made in the response in 3 sections - risk, ethics, cost benefit** Risk • need to protect all members of society • to prevent short term financial gain over-riding safety • need for monitoring to ensure regulations complied with • uncertain outcomes of new technologies Ethical principles • creation of laws allows public	Q asks for justification of regulation so need not include anti-regulation points, though these would be credited. L4 At least four points from two sections supported by appropriate examples L3 At least three points from two sections supported by appropriate examples L2 At least three points but without appropriate examples or fewer points with examples	12

	discussion of issues • balance interests of subjects and those of scientific research Cost benefit • outside regulator needs to compare costs and potential benefits . • those committed to the research or application less able to do this	L1 Only one or two points with limited explanation or example.	

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.

0 marks	**Level 1 (1–3 marks)**	**Level 2 (4–6 marks)**	**Level 3 (7–9 marks)**	**Level 4 (10–12 marks)**
	• 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	• 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	• 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,	• 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.

			punctuation or spelling	