AQA

A-LEVEL
Science in Society

SCIS3 Exploring Key Scientific Issues
Mark scheme

2400
June 2015

V1 Final Mark Scheme

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
1(a)(i)	in gap		1	
1(a)(ii)	arrow downwards on diagram		1	
1(a)(iii)	• neurotransmitter/serotonin needed for impulse to cross synapse • fewer serotonin molecules means fewer nerve impulses	impulse or WTTO	1	
1(b)(i)	C		1	
1(b)(ii)	C • hypothesis would predict rapid improvement • does not explain month delay in improvement B • increased Serotonin has limited effect D • hypothesis would predict that all patients would have low serotonin • weak/ no evidence for low serotonin in depressed patients before treatment • for any choice in (i) allow • causes of depression must be more complex than just level of serotonin	Allow marks for explanation if B or D chosen in (b)(i) for D allow 'not all patients have low serotonin'	2	

1(c)	**A** • negative correlation between time with depression and size of hippocampus • depression causes the hippocampus to shrink • less mental activity due to depression causes shrinking/ **B** • negative correlation between time with depression and size of hippocampus • small hippocampus causes depression • people with a small hippocampus do not recover/take longer to recover/more prone to depression	A & B in either order on paper allow depression treatment causes shrinking no marks for explanations that involve assumptions about age at death	4	
1(d)(i)	SSRI evidence A - D • C cell growth could take a month/ D no link between depression and serotonin level hippocampus evidence in (c) • improvement / shorter duration of depression if hippocampus grows		2	
1(d)(ii)	• initial idea from chance observation • stimulated research into iproniazid • low serotonin hypothesis / explanation/ hypothesis created by conjecture or imagination • explanation tested by seeing if predictions agree with evidence	mark by number of points made must include both general statements and examples Max. 4 if no examples form question.	6	

	• evidence did not agree with predictions • leads to new explanation • this also tested • new explanation must explain previous evidence • need causative mechanism • role of new technology /MRI scan			
Total			**18**	

Question	Answers	Additional Comments/Guidance	Mark	ID details
2(a)(i)	• genes do not change so quickly • takes many generations for <u>selection</u> of different mutations • environment has <u>changed</u>/ example of environmental change	any 2	2	
2(a)(ii)	• better nutrition • better education/ learning technologies • more familiarity with type of test •	any 2	2	

2(b)(i)	• CI all show overlap with 0 • gene may increase or decrease IQ within 95% probability • effect of 0.5 IQ points or less is trivial	Note: comparisons between genes A- L are irrelevant so no marks for 'error bars overlap'	2	
2(b)(ii)	• sample not representative of population • may have unusual environment /may be genetically distinct group/ other example of variable that might bias sample • outlier would have bigger impact on the mean /outlier harder to spot •	any 2	2	
2(c)(i)	• publicity may raise their reputation • publicity may help get funding • funders of research may demand it • public information/understanding of science • would encourage participation in clinical trials/research	any 2	2	
2(c)(ii)	• how big is the effect? • has it been repeated? • how was intelligence defined? • what is the status of the scientists, their institutions or the journal? • who funded the research? • what is the sample size? • was sample representative of the population? • what are the controls?/ have other variables been considered? • how accurately does the media report reflect the published	any 3	3	

	report? • has paper been peer reviewed?			
2(d)	yes • early intervention most effective • may be relevant to unusual disabilities such as autism no • improved environment already known to improve intelligence • example/explanation of effect of environment • effect of genes will always be limited • serious risk of labelling individuals • test could be used to reject individuals rather than help them/ could be used for rejection of embryo or foetus • better to spend resources on education • child cannot give informed consent • risk of false positive	consider quality of argument Max 3 if no mention of effect of environment	4	
Total			**17**	

Question	Answers	Additional Comments/Guidance	Mark	ID details
3(a)	diagram showing following: • incoming solar radiation to Earth • outgoing IR/long wave • absorption of IR/ outgoing radiation by GG • re-radiation down	must have **all 4 points** for 3 marks 3 points for 2 marks 2 points for 1 mark	3	
3(b)	• overall good agreement • often misses high and low points/smoother/an example • very good agreement 1960 - 1998	any 2	2	
3(c)(i)	• most / more energy is going into the ocean not surface/atmosphere.	note question is about changes since 1998	1	
3(c)(ii)	• instruments/technology more accurate data • more points on earth recorded • more continuous /more frequent recording • better models/better understanding of climate system/more knowledge of deep ocean	any 2	2	

3(d)	• very short period/always some natural short term variation/other periods in past of no temperature rise - example • ocean data - explanation or implications • very complex system • possible error in temperature data • other warming effects such as sea level rise / melting ice still happening • greenhouse gases are still increasing • overall increase over longer time scale	for 1 or 2 marks each can get full marks for two points well explained	4	
Total			**12**	

Question	Answers	Additional Comments/Guidance	Mark	ID details
4(a)	• Minimal relationship between energy and HDI at very low energy/below 0.5 toe • 0.5 - 1 toe rapid rise in HDI • positive correlation between energy and HDI 1- 4 toe • above 4 toe, more toe makes minimal difference to HDI	must cover at least two different ranges for full marks but allow 1 mark for overall correlation if no details given	3	

	• several outliers/example			
4(b)(i)	• life expectancy - health care requires transport/ electricity/ heating/ communication/ water treatment • education - building schools/ lighting/transport/communication • income - power for industry/transport /communication helps create jobs/ better paid jobs	Make sure answer explains how energy use raises HDI and not reverse	3	
4(b)(ii)	• 0.7 (0.3 -1) – 11.5 (7-11.5) toe	no need for precise values, acceptable answers indicated in ( )	1	
4(b)(iii)	Lower HDI country (reverse for higher) • more efficient use of energy /example such as more efficient cars • second efficiency example such as home insulation • income generated from industry with lower energy intensity general points • need to import fuel forces economy/ have fuel so waste • climate may influence need for heating • use of energy for factors that do not affect HDI	any 2	2	

4(c)	Low HDI countries • poorer countries want to raise their standard of living - need to use cheap fossil fuel to industrialise • renewable fuels more expensive than fossil - richer countries should pay • they believe that richer countries should cut back as their use is so much higher - data from Fig. 6 • at top HDI extra energy use raises HDI very little - data from Fig.6 • richer countries reluctant to cut back on standard of living - example e.g. air travel	all points worth 2 marks if suitable example; a relevant country or an energy use	4	
Total			**13**	

Question	Answers	Additional Comments/Guidance	Mark	ID details
5(a)(i)	• predator /eat other animals/insects • which have fed on plants/ get energy from other animals/		2	

	smaller numbers than animals lower in food chain			
5(a)(ii)	• variety of species • genetic diversity of species/complexity of food web • variety of different habitats	any 2	2	
5(b)(i)	• loss of hedges – no breeding sites • monoculture – less variety of food/habitat • pesticides – loss of insect food • herbicides – loss of plant food	any 1 for 1 or 2 marks	2	
5(b)(ii)	• after 1986/7 rate of decline has slowed • no restoration towards 1970 levels/still declining	any 2 must relate to farmland birds	2	
5(c)(i)	• difficulty in finding matched pairs of farms/ squares chosen may not be representative sample • problem of observer consistency/ birds move so hard to count • need for correct identification of species • numbers affected by weather/ time of day/time of year • need to repeat	any 2 allow: extent of farmer compliance/ other factors may change over 10 year period/ presence of predators	2	
5(c)(ii)	• population still declining/AES not working for skylarks	any 2	2	

	• rate of decline has decreased slightly from all options /very small effect • no/very little difference between 3 options/ valid comparison between any two options			

5(d)			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 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
for **ethical arguments** • ethical obligation to wild species • effect on wider ecosystem if bird species lost • will soon be too late/extinction • **tourist arguments** • pleasure from birds/natural countryside • **farming and effectiveness issues** • has small impact • to keep food cheaper/ support farm incomes • encourage good practice • no need for high productivity if less meat eaten as less grain needed **against** **farming and effectiveness of AES** • current AES apparently not very effective for birds • farmers should do it without payment as other industries have to • growing human population means we cannot afford any loss of			**extra information** Level 3 - well explained points from **3** different argument categories, or more issues just named must include both for and against Level 2 - points from 2 or 3 different argument categories depending on quality Level 1- points from 1 or 2 categories with limited explanation

productivity • **other conservation options** • organic farming /nature reserves may be a better use of money spent on conservation **other needs for government funds** • <u>example</u>	

Total			**18**

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 (6-8 marks)**	**Level 4 (9-12 marks)**
examples of the points made in the response For each example there are **3 factors** to discuss 1. discussion of true and perceived risk 2. reasons for wrong estimate such as reasons for over-estimate below or opposite unfamiliar activities imposed risk unseen or delayed risk media stimulated scares 3. decision-making arising from public perception public or personal				**extra information** **L4** examples from each side, to include all three factors for both over and under-estimate, more than one reason from 2, at least one public decision-making from 3 two examples are adequate if all points covered **L3** examples from each side, to include at least two factors for both over and under-estimate,

examples of decision making affected by over-estimate GMO nuclear power nuclear fuel disposal mobile phone masts mobile phones **examples** of decision making affected by under-estimate air pollution climate change diet-related illness	more than one reason from 2, at least one public decision-making from 3 two examples are adequate if all points covered **L2** examples from each side, but coverage of each limited to one or two factors **L1** only one suitable example with limited coverage of factors

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;	10-12

	• 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.	
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**