

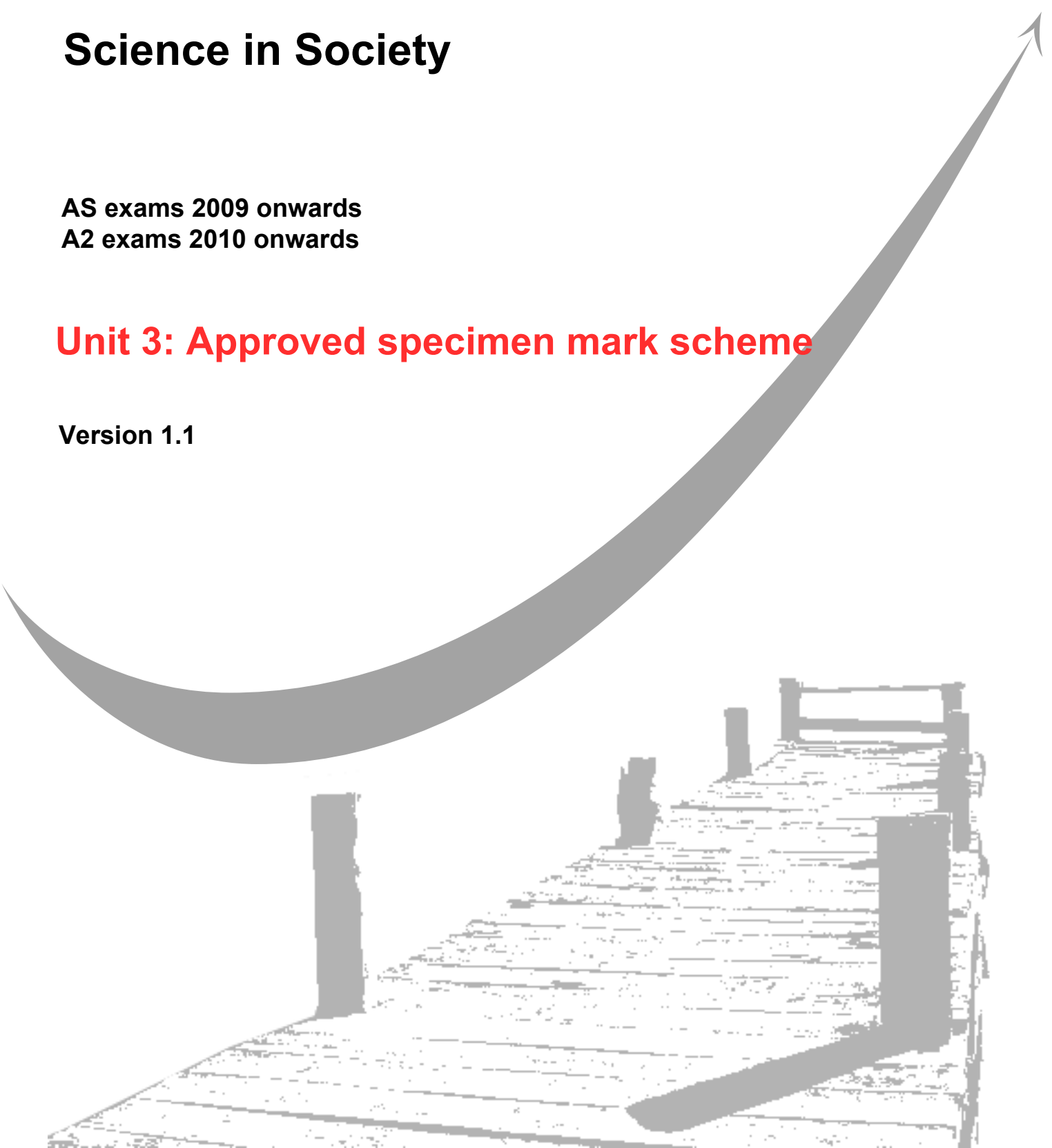
GCE
AS and A Level

Science in Society

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 3: Approved specimen mark scheme

Version 1.1





General Certificate of Education

Science in Society 2401

**SCIS3 A2 Exploring Key Scientific
Issues**

Mark Scheme

The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of the planned question papers and mark schemes in advance of the first operational exams.

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

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' 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 to download from the AQA Website: www.aqa.org.uk

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Examiners look to reward knowledge and understanding not to penalise.
Any correct response will be credited even if it does not appear in the mark scheme.

SCIS3: A2 Exploring Key Scientific Issues

SECTION A

Question 1			
(a)	<ul style="list-style-type: none"> • faster • brain stem nearer spinal cord • works even if unconscious/asleep 	<i>any 2 for 1 mark each</i>	2
(b)	<ul style="list-style-type: none"> • cortex is main site of consciousness • very few connections to cortex/connections to cortex develop over first year 	<i>for 1 mark each</i>	2
(c)	<ul style="list-style-type: none"> • repeat the experiments – look for different techniques to test for experience of pain – compare babies at different ages/ animal studies • look for an explanation consistent with current understanding – consider need to change theory – make testable predictions from new theory – test new predictions • give pain killers to babies/take steps to reduce pain inflicted – take a precautionary approach to the potential risk of real pain – monitor babies for other signs of pain <p><i>(3 marks can be awarded either for breadth, covering the three different types of response or for depth, covering one response in detail)</i></p>		3
(d)	<ul style="list-style-type: none"> • consent from parents - full information to parents/ support for parents/right to withdraw • does overall benefit of knowledge outweigh discomfort to baby – avoid burden of too much research on any individual • is it ethical to withhold painkillers for sake of research – no pain only for research purposes 	<i>any points for 1 or 2 marks each up to 3 marks</i>	3
			10

Question 2				
(a)	(i)	figure 2 <ul style="list-style-type: none"> UK/Japan lower than USA/China for same GDP figure 3 <ul style="list-style-type: none"> since 1970 GDP in UK has doubled and energy used risen by 10%/energy intensity has halved since 1970 	<i>for 1 mark each</i>	2
	(ii)	<ul style="list-style-type: none"> greater efficiency in electricity generation/greater efficiency in transport/other example less heavy industry/less manufacturing/more service sector 	<i>for 1 mark each</i>	2
(b)	(i)	<ul style="list-style-type: none"> discovery of large new gas and oil fields accounts for increases in oil and gas use 	<i>(1 mark for suggestions and reason)</i>	1
	(iii)	<ul style="list-style-type: none"> nuclear power still important thanks to development of a new generation of power stations or to finding a solution to the problem of nuclear waste developments in renewable technologies to make them more reliable plus widespread development e.g. wind, wave, solar or tidal power. 	<i>(suggestion + reason for 2)</i>	2
	(iii)	<ul style="list-style-type: none"> overall reduction of energy use as a result of implementation and enforcement of international agreements on reduction of greenhouse gas emissions 	<i>(suggestion + reason for 2)</i>	2
				9

Question 3			
(a)	<ul style="list-style-type: none"> • impulse down axon • release of serotonin into gap • take up of serotonin on other side of gap (dendrite) • new impulse up dendrite 	<i>any 3 for 1 mark each</i>	3
(b) (i)	<ul style="list-style-type: none"> • SD is a measure of the spread of results • wider range amongst men/ smaller range amongst women 	<i>any 2 for 1 mark each</i>	2
(ii)	<p>data</p> <ul style="list-style-type: none"> • differences between groups very small/1 SD overlap between all groups • women heavy users only group to show possible significant difference • ex-MDMA almost indistinguishable from control <p>study design</p> <ul style="list-style-type: none"> • sample sizes very small • no information on other variables <p>technique for measuring damage</p> <ul style="list-style-type: none"> • binding ratio may not be only measure of damage • brain scan not very accurate discriminator 	<i>1 mark each but not more than 2 from any one set of responses</i>	4
(c)	<p>inherent uncertainty in data</p> <ul style="list-style-type: none"> • many variables involved in the research • many different measures of harm/difficulty of deciding what is normal • bias in sampling always possible <p>scientific community</p> <ul style="list-style-type: none"> • negative results may not be published • scientists have to make judgements about techniques to be used • scientists prior beliefs may influence their judgement/ scientists may undertake research because they have strongly held prior views • research may be funded by those with a vested interest in particular results 	<i>any 5 for 1 mark each at least one from each set</i>	5
			14

Question 4			
(a)	diagram to show: <ul style="list-style-type: none"> • incoming radiation from the Sun warming the surface of the Earth • longer wave-length (infrared) radiation from the cooler surface of the Earth • absorbed by CO₂ in the atmosphere 	<i>3 marks</i>	3
(b)	any defensible conclusion that follow from the data supported by reference to specific evidence e.g.: <ul style="list-style-type: none"> • even with low emissions, the temperature rise by the 2020s will exceed that since the start of the 20th century • without targeted interventions to reduce emissions, there will be marked changes in the UK climate in the next 50 - 80 years - by the end of this period the concentration of carbon dioxide in the atmosphere will be close to double the pre-industrial era. <p><i>(relevant conclusion for 1, appropriate evidence related to conclusion for 1)</i></p>	<i>2 marks</i>	2
(c)	(i) <ul style="list-style-type: none"> • lifestyle change that leads to reduction of CO₂ emissions (e.g. a change that reduces use of fossil fuels for heating, or transport) • explanation of why the life-style change cuts CO₂ emissions (ii) <p>technology that either leads to a reduction of CO₂ emissions (e.g. changing from fossil fuels to renewables for generating electricity or transport)</p> <p><i>or</i></p> <p>technology change that reduces the radiation warming the surface of the Earth (e.g. reflective systems in upper atmosphere)</p> <p>explanation of why technology change cuts CO₂ emissions</p>	<i>1 mark</i> <i>1 mark</i> <i>1 mark</i> <i>1 mark</i>	2 2
(d)	they can test models by inputting data related to past climates into the models Then they compare what is known about climate change in the past and the predictions of the models	<i>1 mark</i> <i>1 mark</i>	2
(e)	positive feedback: a small change in the input (e.g. small temperature rise)... ...tends to be magnified by the system and lead to large output (e.g. die back of forests leading to substantial release of CO ₂). positive feedback has the potential to lead to runaway climate change.	<i>1 mark</i> <i>1 mark</i>	2

(f)	(i)	any one decision, e.g.: <ul style="list-style-type: none"> • where to build houses, • where to invest in forestry and various forms of agriculture • decisions about which habitats to conserve and what action to be taken to deal with changing distribution of species • whether or not to invest in new reservoirs, or to take steps to cut water use. • whether to invest in more protection or to let land be inundated 	<i>1 mark</i>	1
	(ii)	appropriate data, with justification, related to the answer in (i), such as projected sea levels, rainfall, temperatures in different seasons	<i>1 mark each for 2 marks</i>	2
				16

Question 5				
(a)		<i>s/l</i>	<i>for 1 mark</i>	1
(b)	(i)	<ul style="list-style-type: none"> • case control relies on memory/reconstruction from other information • cohort collects information before outcome known so less bias likely • wider range of possible factors can be recorded as part of study 	<i>for 1 mark each</i>	2
	(ii)	<ul style="list-style-type: none"> • smaller groups required • results obtained more quickly 	<i>any 1 for 1 mark</i>	1
(c)		<ul style="list-style-type: none"> • theory must lead to a testable prediction /in this case prediction is ‘s/s alleles make people more susceptible to long-term harm from stressful events’ • prediction tested by comparing s/s and l/l people/ observations of the incidence of depression in the two groups • no observed difference would falsify the hypothesis 	<i>for 1 mark each</i>	3

(d)	<p>points might include:</p> <ul style="list-style-type: none"> • study compared two groups with different versions of the gene • s/s gene increases risk of depression • only has an effect if exposed to several stressful life events • both versions have some risk of depression/10% risk • even with s/s and 3 stressful life events only 30% risk • only one study/ needs to be repeated 		8
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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 three levels. Marks are assigned according to level descriptors up to a maximum of 8 marks

Level of response	Mark range	Descriptors: knowledge, understanding (AO1); explanation, argument and illustration, application of ideas, synthesis, evaluation (AO2); legibility, accuracy of grammar and syntax, clarity of meaning, style, organisation and vocabulary (QWC)
Level 4	7 – 8	<p>Good response to the demands of the question: knowledge and understanding of key science explanations; knowledge and appreciation of related ideas about how science works; demonstrates overall grasp of the range and nature of issue(s); interprets and illustrates valid arguments, recognising counterclaims, coherently and convincingly to reach a reliable conclusion; fluency and accuracy of expression.</p>
Level 3	5 – 6	<p>Competent attempt at answering the question: knowledge and understanding, in context, of key science explanations and ideas about how science works; demonstrates general grasp of the range and nature of issue(s); interprets and illustrates fair arguments competently using a range of evidence with reasonable attempt at valid conclusion; accuracy of expression.</p>
Level 2	3 – 4	<p>Limited response to the demands of the question: some understanding and realisation of key science explanations and ideas about how science works; some competence and grasp of the issue(s); limited arguments and exemplification with weak conclusion; reasonable clarity of expression.</p>
Level 1	1 – 2	<p>Inadequate attempt to deal with the question: uncertain grasp, knowledge or understanding of issue(s) and/or science and ideas about how science works; lack of clarity of argument with little or no appropriate justification or exemplification; weak expression.</p>
	0	Incorrect: no response relevant to the question
		Total
		15

Question 6				
(a)	<p>one mark for each of two criteria, such as:</p> <ul style="list-style-type: none"> • whether or not the data has been peer reviewed • whether the data has been collected in a consistent way over a period of time • the experience and expertise of the people who collected the data • whether or not the people that collected the data had a vested interest in the findings 	<i>2 marks</i>	2	
(b)	(i)	the index fell by 30%	<i>1 mark</i>	1
	(ii)	no – there is no data for years before 1970 shown on the graph	<i>1 mark</i>	1
(c)		<p>explanation based on points such as:</p> <ul style="list-style-type: none"> • decline due to change in land use – conversion of habitat to farmland or other types of development • in temperate regions the conversion of natural habitat to farmland took place before 1970 and populations have stabilised. • in tropical regions the rapid population decline of many species is a result of the loss of natural habitat to cropland or pasture • tropical biodiversity is relatively high and destruction of tropical forests is having a disproportionate effect 	<i>any 2 for 1 mark each</i>	2

(d)	<p>answers might explore whether or not:</p> <ul style="list-style-type: none"> • there is accelerating pressure on natural systems • whether the consequences are predictable • whether the consequences are disastrous <p>for full marks candidates must give reasoned responses to some or all of these aspects of the statement and show whether or not they agree with the WWF statement.</p>	8 marks	8
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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 three levels. Marks are assigned according to level descriptors up to a maximum of 8 marks

Level of response	Mark range	Descriptors: knowledge, understanding (AO1); explanation, argument and illustration, application of ideas, synthesis, evaluation (AO2); legibility, accuracy of grammar and syntax, clarity of meaning, style, organisation and vocabulary (QWC)	
Level 4	7 – 8	Good response to the demands of the question: knowledge and understanding of key science explanations; knowledge and appreciation of related ideas about how science works; demonstrates overall grasp of the range and nature of issue(s); interprets and illustrates valid arguments, recognising counterclaims, coherently and convincingly to reach a reliable conclusion; fluency and accuracy of expression.	
Level 3	5 – 6	Competent attempt at answering the question: knowledge and understanding, in context, of key science explanations and ideas about how science works; demonstrates general grasp of the range and nature of issue(s); interprets and illustrates fair arguments competently using a range of evidence with reasonable attempt at valid conclusion; accuracy of expression.	
Level 2	3 – 4	Limited response to the demands of the question: some understanding and realisation of key science explanations and ideas about how science works; some competence and grasp of the issue(s); limited arguments and exemplification with weak conclusion; reasonable clarity of expression.	
Level 1	1 – 2	Inadequate attempt to deal with the question: uncertain grasp, knowledge or understanding of issue(s) and/or science and ideas about how science works; lack of clarity of argument with little or no appropriate justification or exemplification; weak expression.	
	0	Incorrect: no response relevant to the question	
		Total	14

SECTION B

Question 7			
	<p>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 three levels. Marks are assigned according to level descriptors up to a maximum of 12 marks</p> <p>Credit will be given for arguments supported by evidence drawn from HSW G – risk, and from HSW H – making decisions, related to any suitable context.</p>		12

Level of response	Mark range	Descriptors: knowledge, understanding (AO1); explanation, argument and illustration, application of ideas, synthesis, evaluation (AO2); legibility, accuracy of grammar and syntax, clarity of meaning, style, organisation and vocabulary (QWC)
Level 4	10 – 12	<p>Good response to the demands of the question: knowledge and understanding of key science explanations; knowledge and appreciation of related ideas about how science works; demonstrates overall grasp of the range and nature of issue(s); interprets and illustrates valid arguments, recognising counterclaims, coherently and convincingly to reach a reliable conclusion; fluency and accuracy of expression.</p>
Level 3	7 – 9	<p>Competent attempt at answering the question: knowledge and understanding, in context, of key science explanations and ideas about how science works; demonstrates general grasp of the range and nature of issue(s); interprets and illustrates fair arguments competently using a range of evidence with reasonable attempt at valid conclusion; accuracy of expression.</p>
Level 2	4 – 6	<p>Limited response to the demands of the question: some understanding and realisation of key science explanations and ideas about how science works; some competence and grasp of the issue(s); limited arguments and exemplification with weak conclusion; reasonable clarity of expression.</p>
Level 1	1–3	<p>Inadequate attempt to deal with the question: uncertain grasp, knowledge or understanding of issue(s) and/or science and ideas about how science works; lack of clarity of argument with little or no appropriate justification or exemplification; weak expression.</p>
	0	Incorrect: no response relevant to the question