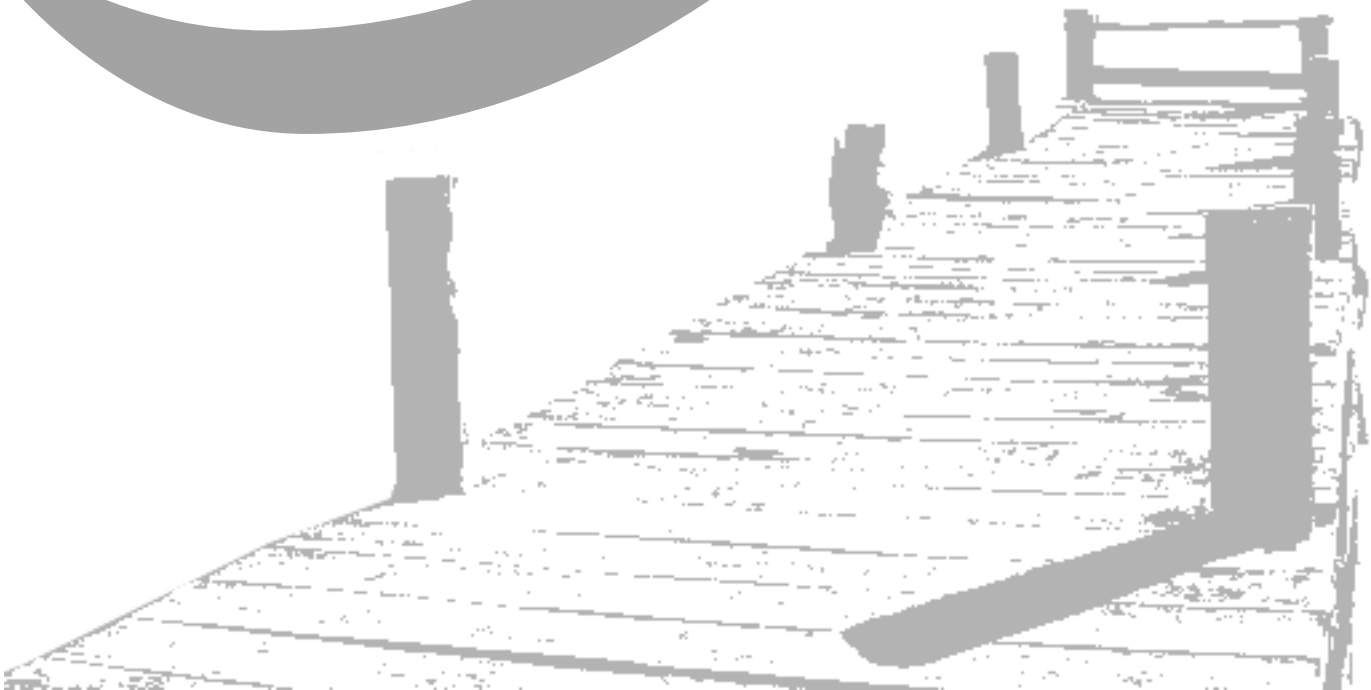
GCE
AS and A Level

Science in Society

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 1: Approved specimen mark scheme

Version 1.1



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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Science in Society 1401

SCIS1 AS 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 theplanned 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.

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Dr Michael Cresswell Director General

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.

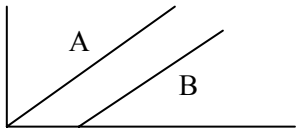
SCIS1: AS Exploring Key Scientific Issues

Question 1				
(a)		• microbe/bacterium/virus/germ - reproduce in body/ transmitted to new person	*for 1 or 2 marks*	**2**
(b)	(i)	• mainly low/below 200 000 • variable/declining until 1988 • 1990s much higher	*any 2 for 1 mark each*	**2**
	(ii)	• 100 000 cases /6% death rate (5% - 10%) • 6000 deaths (5000 – 10 000)	*for 1 mark each*	**2**
	(iii)	• yes – death rate consistently low since 1970 • no – death rate falling before 1970	*any 1 for 2 marks*	**2**
	(iv)	• cholera transmitted in water - untreated water used/no water treatment plants/poor sewage treatment • very limited health care/ public health services – diagnosis/isolation of cases less likely	*any 1 for 1 or 2 marks*	**2**
			Total	**10**

Question 2				
(a)	(i)	• damage to DNA/gene/chromosomes • mutation causes cancer/uncontrolled proliferation	*for 1 mark each*	**2**
	(ii)	• gamma/β rays emitted/ ionising radiation • risk of cancer proportional to dose/short exposure minimises **risk** (must have some sense of risk ∝ time) • growing children particularly vulnerable to **radiation damage** **no mark for repeat of (i)**	*any 2 for 1 mark each*	**2**
	(iii)	• half life of 8 days/short half-life • radiation emitted reduced by factor of about 4/to safe level **not zero emission**	*for 1 or 2 marks*	**2**
	(iv)	• thyroid cancer is life-threatening • therefore benefit of treatment outweighs future risk • benefit of visit is not compensation for future risk to a visitor	*any one for 1 mark each*	**2**
			Total	**8**

Question 3				
(a)	(i)	• 3 ± • 1.5 (1.5 – 2) percent	*for 1 mark each*	**2**
	(ii)	• error in equipment/random/systematic errors • constantly changing value/depends on location of equipment	*for 1 mark each*	**2**
(b)	(i)	• 1000 × 100/2400 • 42%	*any 1for 1 mark*	**3**
	(ii)	• hydrogen + oxygen • → water	*for 1 mark each*	
(c)		examples of the factors that might be included cost • hydrogen is currently the most expensive • cost of ill-health should be included in comparing costs **no marks** for vague 'too expensive' or 'very expensive' greenhouse gases • local pollution reduction must not be at cost of more greenhouse gases • hydrogen could be made using renewable fuel • electric vehicles powered by renewable fuel might be better technology • new technologies like hydrogen will take a long time to implement • change in infrastructure needed for hydrogen • use of current technologies like catalytic converters		**6**

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. The mark should be awarded on the basis of the overall level of the candidate's response in relation to the following general descriptors for each level. An answer will meet most of the criteria given in the level descriptor			
level of response	**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)	**mark range**	**Level guidance for this question**
good - level 3	claims supported by an appropriate range of evidence; good use of information or ideas about science, going beyond those given in the question, demonstrating knowledge and understanding; use of specialist vocabulary for science and for how science works; argument well structured with minimal repetition or irrelevant points; accurate and clear expression of ideas with legible text and only minor errors of grammar, punctuation and spelling	**5-6**	guidelines for allocation to each level, that are specific to the question, are developed as part of the standardisation process
modest - level 2	claims partially supported by evidence good use of information or ideas about science given in the question but showing limited knowledge beyond this; argument shows some attempt at structure; ideas are expressed with reasonable clarity but with a few errors of grammar, punctuation and spelling	**3-4**	
limited - level 1	valid points but not clearly linked to an argument structure; limited use of information or ideas about science; unstructured; errors in grammar, punctuation and spelling or lack of fluency	**1-2**	
0	incorrect or no response	**0**	
		Total	**13**

Question 4				
(a)	(i)	• some species may have different responses to humans • same response in several species increases confidence	*for 1 mark each*	**2**
	(ii)	• not at **doses** in drinking water • animals only got cancer when they received doses 10 000 times higher	*for 1 mark each*	**2**
(b)	(i)	• study of pattern of incidence of a disease • data from large population samples • looking for correlations between disease and lifestyle variables	*any 2 for 1 mark each*	**2**
	(ii)	• 3 extra cases	*for 1 mark*	**1**
	(iii)	• correlation does not prove cause • other variable may cause the effect • poor agreement with other studies • population with untreated water may be unusual in other ways	*any 2 for 1 mark each*	**2**
(c)			*for 1 mark each*	**2**
(d)		• much greater risk from water borne disease • cholera/other example • other water treatments much more expensive • risk very low/3 extra cases in 100 000/risk not proven	*any 3 for 1 mark each*	**3**
			Total	**14**

Question 5			
(a)	• cells that can divide indefinitely/ cells in early embryo • cells are undifferentiated/not specialised/cells that can develop into any type of specialised cell	*any for 1 mark*	**1**
(b)	• repeat in other species • really restores sight? /does more than allow to react to bright light • safety/check for side effects • find source of suitable precursor cells	*any 2 for 1 mark each*	**2**
(c) (i)	• it may reflect their motivation • to influence funding decisions in their favour • to gain publicity	*any 2 for 1 mark each*	**2**
(ii)	• is it reported in peer reviewed journal • what is the reputation of the scientists who did it?	*any 2 for 1 mark each*	**2**
(d)	• embryonic precursor cells – against all research on potential humans/any example of ethical conditions on embryo use • scientists' ethical code – does research meet requirements of the code, particularly 'respect for life' • clinical trial ethics – treatment of subjects/an example such as right to information	*any 2 for 1 or 2 marks each*	**4**
		Total	**11**

Question 6				
(a)		• universe started from single point • release of energy/explosion (but not for explosion of pre-existing matter) • continuing expansion • matter formed later	*any 2 for 1 mark each*	**2**
(b)	(i)	• Hubble's measurements/speed of galaxies • background radiation	*any 1 for 1 mark*	**1**
	(ii)	• further away a galaxy the faster it is moving	*for 1 mark*	**1**
	(iii)	• Big Bang theory • general relativity • steady state theory	*for 1 mark*	**1**
	(iv)	• any other example from (iii)	*for 1 mark*	**1**
	(v)	• use of Big Bang theory to predict existence of background radiation	*for 1 mark*	**1**
	(vi)	• the background radiation predicted by Big Bang	*for 1 mark*	**1**
	(vii)	• Einstein believed the universe was stable and modified his equations • any scientist in 1950s who believed in steady state must imply a scientist not a theory	*any 1 for 1 mark*	**1**
			Total	**9**

Question 7			
(a)	• Neanderthal & erectus	*both for 1 mark*	**1**
(b)	• more recent species show increasing brain size • **extinction of** smaller brain size/**less** adapted species • **better** adapted/ more intelligent more likely to survive • able to pass on advantageous characteristics • advantages may be language/tool making • example of exception (Neanderthal or chimpanzee)	*any 4 for 1 mark each*	**4**

(c)	(i)	• fossil record consistent with evolution / no contradictory evidence • detail of supporting evidence e.g. DNA, carbon dating • good evidence for evolution of non-human species **no marks** for general similarity to chimps	*any 2 for 1 mark each*	**2**
	(ii)	• difficulty of imaging long timescale • we seem to be different from animals/ common ancestor with chimpanzees seems improbable/ only humans have language/self awareness/ moral sense/developed intelligence/technology **not** 'superior' or 'advanced' unless explained • religious books such as Bible describe creation/ evolution breaks special relationship with God/ some people consider humans superior	*any 2 for 1 mark each*	**2**
			Total	**9**

Question 8				
(a)		• A – genes/chromosomes • B – embryo implanted	*for 1 mark each*	**2**
(b)	(i)	• egg from donor	*for 1 mark each*	**2**
	(ii)	• immune match/tissue typing		
(c)		• US allows parent to make the decision/does not regulate • UK very strict regulation/prevents some applications	*for one mark each*	**2**
(d)		• ethical means relating to right and wrong/depends on values • ethical involves the use of principles • ethical involves debate and reasoning • biological involves the use of predictions from theory • biological involves experiment and observation • biological consequences are whether the process works • ethical consequences are those that affect emotional and social well-being	*any 4 for 1 mark each*	**4**
(e)		the sort of points that might be made in support of an argument here are in favour of regulation • the rights of the child • parents' wishes not always in child's interests/an example • protects against exploitation by those providing services		

	• protects against experimentation • sex selection affects whole society • prevents any trend towards 'designer babies' • regulation ensures counselling is used against regulation • regulation unfair on those who have health or fertility problems • encourages development of new treatments • government should not interfere in family • parents should have responsibility		

(e)

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0	incorrect or no response	**0**	
		Total	**16**