

Version 1.0: 0810



**General Certificate of Education
June 2010**

SCIENCE IN SOCIETY

SCIS1

Unit 1 Exploring Key Scientific Issues

Mark Scheme

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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1	a	i	<ul style="list-style-type: none"> Substances produced by immune system/white blood cell which bind/kill bacteria/virus 	1	
	a	ii	<ul style="list-style-type: none"> Antibodies produced by pathogen infection Having antibodies means you have been infected in the past Ignore 'increases effectiveness/speed of response' type answers	2	Any 2 for 2 marks
	a	iii	<ul style="list-style-type: none"> 10 -14 very low rate of infection 14-23 increases steadily 23+ infection decreases with age / fluctuates If graph misread, candidates can get max 2 marks.	3	Any 3 for 1 mark each
	b	i	<ul style="list-style-type: none"> Dead/weakened version of virus injected Immune system produces antibodies On re-infection immune system produces antibodies / recognises virus Disease fought more quickly / effectively in future 	3	Any 3 for 1 mark each
	b	ii	Range: Under 14 years Reason: <ul style="list-style-type: none"> Very few HPV infections under this age Before girls are sexually active 	2	1 mark for range, 1 mark for reason

Total Mark: 11

2	a	i	Hydrocarbon + oxygen → Water + Carbon Dioxide (+ CO) (Or equivalent)	2	1 mark for each side of the equation
	a	ii	Sulfur dioxide <ul style="list-style-type: none"> Diesel/fuel contains sulfur impurity High temp of engine Reaction between oxygen and sulfur Carbon Monoxide <ul style="list-style-type: none"> Incomplete combustion Not enough oxygen (to form carbon dioxide) Nitrogen oxides <ul style="list-style-type: none"> Reaction between nitrogen and oxygen from air High temp of engine 	2	No mark for choice of pollutant
	a	iii	Amount / mass (of pollutant) in a given volume (of air) Do not credit 'Area', 'milligrams per metre cubed'	1	
	a	iv	<ul style="list-style-type: none"> May be errors in a single measurement of data More reliable/better estimate Air quality varies / example of variation 	2	any 2 for 1 mark each
	b	i	<ul style="list-style-type: none"> Fewer cars / less fuel Less pollutants produced (per person / per journey) 	2	any 2 for 1 mark each

2	b	ii	<p>Yes</p> <ul style="list-style-type: none"> • Balance needs of few with the benefits to all • Needs to be large scale / needs to be government (not individual) response • Example(s) of improvement of quality of life • Example(s) of improvement of health • Financial savings on health care • Detailed example of alternative transport option 	4	<p>Can gain credit from both 'yes' and 'no' if balancing argument, but not contradictory</p> <p>1 mark for each example of improvement described</p>
			<p>No</p> <ul style="list-style-type: none"> • Should be a personal choice not imposed • Government should encourage alternatives / example • Realistic example(s) of problem with alternative transport option • Could prevent important / essential trips <p><i>Don't credit 'you should be allowed to do what you like as long as it isn't harming anyone' or words to that effect</i> <i>Don't credit vague statements about 'good for environment'</i></p>		

Total Mark: 13

3	a	i	<ul style="list-style-type: none"> • A control / description of control • To see if the treatment/injection affected normal mice (safety) 	2	any 2 for 1 mark each
	a	ii	<ul style="list-style-type: none"> • Researchers didn't know which treatment the mice got • Researchers didn't know which type of mice they were testing 	2	any 2 for 1 mark each
	b		<ul style="list-style-type: none"> • Comparison of results from both groups of mice to support opinion • Small number of mice tested • More info on tests needed / still some delay seen 	2	1 st mp for 2 marks Other mp for 1 each
	c	i	<ul style="list-style-type: none"> • Short generation / gestation time / cheaper • Unethical to test on humans • Similar disease characteristics / body organs 	2	any 2 for 1 mark each
	c	ii	<ul style="list-style-type: none"> • What is the mechanism that leads to the improvement? • Is the effect the same in humans? • Are the improvements long term? • Are there any side effects in mice/humans? <p>Any other suitable research question</p>	2	any 2 for 1 mark each do not credit questions about cost
	d		<ul style="list-style-type: none"> • Healthy / normal / unstressed mice • Results valid/ reliable / not affected by condition of mice 	2	Need to have both ideas for 2 marks

Total Mark: 12

4	a	i	<ul style="list-style-type: none"> • (IR has longer) wavelength • (IR has lower) frequency • Energy • IR doesn't affect human eyes 	1	any 1 for 1 mark
	a	ii	<ul style="list-style-type: none"> • Stars are very far away • Galaxy very big • Huge numbers (e.g. km) otherwise 	1	any 1 for 1 mark
	b	i	Below 1.7 <ul style="list-style-type: none"> • Poor agreement between the theory and model • Points are not near curve Between 1.7 and 2.4 <ul style="list-style-type: none"> • Better agreement • Most points / error bars lie on curve General <ul style="list-style-type: none"> • Gives example of anomaly (e.g. 1.99 and 2.45) • More / different molecules need to be added in 	3	Any 3 for 1 mark each
	b	ii	<ul style="list-style-type: none"> • Can change molecules included quickly • Easy to see the outcomes • Can make predictions • Can compare experimental data with theory • Can't go to planets to make measurements 	2	Any 2 for 1 mark each
	b	iii	<ul style="list-style-type: none"> • Respiration • Photosynthesis • CO₂ role in climate • Both gases indicate possibility of correct conditions for life / comparison with earth <i>'Intelligent' is neutral</i> <i>Don't credit incorrect science e.g. 'humans use CO₂ in respiration'</i> <i>Don't credit 'need oxygen to breathe'</i>	4	Any 4 for 1 mark each

Total Mark: 11

5	a	i	<ul style="list-style-type: none"> • Choose group with disease and a similar control group • Compare number of cases in both groups after a (long) time period • <i>Don't credit descriptions of clinical trials or tests</i>	2	Any 2 for 1 mark each
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5	a	ii	<p>Running since 1992</p> <ul style="list-style-type: none"> • Slow-developing diseases can be studied / can detect trends • <p>Half a million participants</p> <ul style="list-style-type: none"> • Rare diseases likely to be present • Results can be more reliable/significant • Lot of data available <p>10 European countries</p> <ul style="list-style-type: none"> • Can compare lifestyle factors involved / different ways of living / different diet/different ethnic groups 	3	1 for each feature for 1 mark each
	b		<ul style="list-style-type: none"> • $14723/359387 \times 100\% = 4.0966979885$ • 4.1 % (accept 4% or more than 1dp) 	1	Any 1 for 1 mark
	c	i	<ul style="list-style-type: none"> • Other factors will affect life expectancy • Specific example and possible effect 	1	Any 1 for 1 mark
	c	ii	<ul style="list-style-type: none"> • V/U shaped curve • Touching 1 between 23.5 and 25 <p><i>Should not go under line at 1</i></p>	2	
	d	i	<ul style="list-style-type: none"> • Value 114 cm • Range: 111 – (117-118) cm 	2	1 mark for value, 1 mark for range
	d	ii	<ul style="list-style-type: none"> • Women have different body shape compared to men • Way men put on fat is different – tends to be round their waists 	1	

Total Mark: 12

6	a	i	<ul style="list-style-type: none"> • Embryo stem cells not differentiated • Adult stem cells are partially differentiated – can form limited number of cell types 	1	Any 1 for 1 mark
	a	ii	<ul style="list-style-type: none"> • Some people believe life begins at conception • Kill embryo / 'living' organism • Other example of religious / ethical belief 	2	Any 2 for 1 mark each

6	a	i	<ul style="list-style-type: none"> • Clinical trials show if treatment leads to ‘cure’ / improvement • Take account of placebo effect • Safety of treatment • Side effects • Description of testing process (in vivo, in vitro, phase I,II and III clinical trials) and importance of each stage • Replication of results 	6	<p>Use QWC 6 mark grid</p> <p>Cost and regulatory bodies being sued are not credit-worthy</p> <p>L3: recognizes clinical trial process AND links to article OR Gives examples /additional information</p> <p>L2: describes some of clinical trial ideas OR links to article Other ideas included</p> <p>L1: simplistic descriptions, limited information</p>	
			<p>Good Claims supported by an appropriate range of evidence. Good use of information or ideas about science, going beyond those given in the question. Argument well structured with minimal repetition or irrelevant points. Accurate and clear expression of ideas with only minor errors of grammar, punctuation and spelling.</p>			5 – 6
			<p>Modest Claims partially supported by evidence. Good use of information or ideas about science given in the question but limited beyond this. The argument shows some attempt at structure. The ideas are expressed with reasonable clarity but with a few errors of grammar, punctuation and spelling.</p>			3 – 4
			<p>Limited 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.</p>			1 – 2
			<p>Incorrect or no response</p>			0

Total Mark: 9

7	a	i	<ul style="list-style-type: none"> • 220 mya • 3 fossils found in china • Presence of marine fossils • Complete lower shell over belly • Incomplete upper shell 	1	Any 1 for 1 mark
	a	ii	<ul style="list-style-type: none"> • Shell formed from below as extensions of the backbone and ribs • The three turtles were aquatic animals • The lower shell may have protected them from predators below as they swam 	1	Any 1 for 1 mark
	a	iii	<ul style="list-style-type: none"> • Lower shell protecting body (supports 2nd hypothesis/rules out 1st) 	1	Any 1 for 1 mark
	a	iv	<ul style="list-style-type: none"> • The turtles were aquatic animals • Shell protects from predators attacking from below • Transitional fossils • How the shell evolved 	1	Any 1 for 1 mark

7	b	<ul style="list-style-type: none"> • Natural selection seen elsewhere / specific example • Genetic information can be used • Some fossils which act as 'missing links' found / evidence in fossils that we do have • Well established / most likely / most logical / lots of evidence 	2	Any 2 for 1 mark each
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Total Mark: 6

8	a	i	<ul style="list-style-type: none"> • Allow it to cool down • Allow decay of radioisotopes with <u>short</u> half-life <p><i>Ignore references to turning into a solid</i></p>	1	
	a	ii	<ul style="list-style-type: none"> • Easier to transport / handle • Reduces the risk of leaks/contamination of surroundings <p><i>Ignore 'takes up less space'</i></p>	2	Any 2 for 1 mark each
	b	i	<ul style="list-style-type: none"> • Risk (of accident) due to transporting waste round country • Radioactive material could dissolve in water / contamination of ground water • Any problems concentrated in one area of country 	2	Any 2 for 1 mark each
	b	ii	<ul style="list-style-type: none"> • Risk of contamination from radioactive materials • Risk to workers who would have to handle it every day 	1	Any 1 for 1 mark
	c		<ul style="list-style-type: none"> • People more willing to accept risk they have chosen / less willing to accept imposed risk • Community more enthusiastic / able to see balance of cost & benefits to themselves • Councils know available land / reduce searching time / cost 	2	Any 2 for 1 mark each

8	d	Headline – linked to article Article <ul style="list-style-type: none"> • Types of waste – half-life / activity • Why storage required • How storage could be arranged • Possible risks and benefits to community– specific examples • Voluntary process • Right to withdraw 		7 (6+1)	Use QWC 6 mark grid L3: Both science AND social issues mentioned L2 ONLY science OR social issues L1: Over-sensational with incorrect science. Few facts
		Good Claims supported by an appropriate range of evidence. Good use of information or ideas about science, going beyond those given in the question. Argument well structured with minimal repetition or irrelevant points. Accurate and clear expression of ideas with only minor errors of grammar, punctuation and spelling.	5 – 6		
		Modest Claims partially supported by evidence. Good use of information or ideas about science given in the question but limited beyond this. The argument shows some attempt at structure. The ideas are expressed with reasonable clarity but with a few errors of grammar, punctuation and spelling.	3 – 4		
		Limited 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		
		Incorrect or no response	0		

Total Mark: 15