**General Certificate of Education (A-level)
June 2013**

Science in Society   **SCIS1**

(Specification 2400)

Unit 1: Exploring key scientific issues

Final

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 events which all examiners 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 examiner understands and applies it in the same correct way. As preparation for standardisation each examiner 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, examiners encounter unusual answers which have not been raised 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 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.

Question	part	sub part	Marking Guidance	Mark	Comments
1	a		• death rate always greater in C1 than in C2 • over 6 years C2 overall decrease + C1 overall increase • <u>average</u> death rate C1 more than double C2 • range of death rates greater in clinic 1 / range 8.9% in C1 + 5.6% in C2 • both show highest death rate in 1842 • both death rates decrease between 1842 and 1845 • increase in death rate in 1846 / greater increase in death rate in clinic 1 in 1845/6 *allow correct comparison of death rates in named year(s) for 1 mark*	2	any 2 for 1 mark each
1	b	i	yes because… • death rate greater in clinic one – women in clinic one treated by male staff but • The correlation does not prove causation / example other factors involved • still deaths in clinic 2 in absence of men. *Don't penalise candidates who use 'death' instead of 'death rate' in this q.*	2	for 1 or 2 marks
1	b	ii	A • oppose - might be seen by men in street so should be embarrassed and get ill • support – at home away from men/no men present B • oppose – babies not embarrassed / don't understand / suggests another cause	2	1 mark for each statement, max 2 marks
1	c	i	• viruses • bacteria • microbes not 'germs', not 'blood', not 'body fluids', not 'pathogens'	1	any 1 for 1 mark
1	c	ii	• cadaverous particles contaminated doctors hands / doctors carried out post mortems • particles then carried to maternity ward / doctors then saw pregnant women • midwives didn't do post-mortems / midwives only do births *ignore references to general hygiene*	2	any 2 for 1 mark each

1	d		• couldn't see the particles • didn't know about bacteria or germ theory / went against other theories at the time / example of other theory / no evidence • doctors didn't like to think they were causing death • ideas of paradigm shift	2	any 2 for 1 mark each

Total: 11 Marks

2	a	i	• incomplete combustion/burning (of hydrocarbon) • not enough oxygen to react with the carbon (in fuel/hydrocarbon)	1	
2	a	ii	• the amount / mass of a pollutant • in a given <u>volume</u>	1	both for 1 mark
2	b	i	• allow for different levels of traffic • pollution levels (may) vary during day	1	any 1 for 1 mark
2	b	ii	• car driver is exposed to more pollutant than cyclist • cyclist is exposed to less pollutant that car driver	1	any 1 for 1 mark
2	b	iii	• for CO car drivers are exposed to more pollutants • for diesel soot car drivers are exposed to more pollutants • for PM2.5 car drivers are exposed to more pollutants • ultrafine particles about same for car and cyclist • in some studies cyclists exposed to more ultrafine particles than car drivers	2	any 2 for 1 mark each
2	c	i	• cyclists breathe more heavily / faster than car drivers so may breathe in more pollutants • cyclists take longer to travel a particular distance so exposed for longer *do not credit answers about drivers being protected inside the car.*	1	

			Level marked question:		
2	c	ii	<table><tr><td rowspan="2">Level</td><td>Descriptor An answer will meet most of the criteria given in the level descriptor</td><td>Mark range</td></tr><tr><td></td><td></td></tr><tr><td>3</td><td>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</td><td>5 – 6 Use of figure 2 (for max marks) Use of data in figure 3 and comparison of data. Two or more own points Well structured</td></tr><tr><td>2</td><td>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</td><td>3 – 4 use of data in figure 3 and / or simple comparison own point some structure</td></tr><tr><td>1</td><td>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</td><td>1 – 2 generalised statements about use of car / bike poor structure</td></tr><tr><td>0</td><td>Incorrect or no response</td><td>0</td></tr></table>	6	

			Points that might be included:		
			- comparison of days lost and gained (figure 3) - cycling improves general health - cycling does not contribute greatly to global warming / cars do - fewer cars will improve 'feel' of a city - relatively short distance so bike convenient - bike may be faster in some cases but not others - types of pollutant that are present (figure 2) - link between the cyclists being exposed to less pollutant concentrations than car drivers BUT still have higher relative risk from pollutants due to increased breathing or longer time exposure. - HSW ideas about risk - HSW ideas about collection of data / different places having different levels of pollution. *Incorrect use of data from figure 2 will limit candidates to L2 marks.*		

Total: 13 Marks

3	a		- look for response to glucocorticoid - in each generation / look for a pattern in family - compare different families	2	any 2 for 1 mark each
3	b	i	a section of DNA (which codes for a protein)	1	
3	b	ii	- carcinogens - <u>ionising</u> radiation - incorrect copying during replication / reproduction of gene	1	any 1 for 1 mark
3	c	i	inherit one copy of gene from each parent	1	
3	c	ii	- shows spread of values around the mean / range of data - see if data overlap / decide if results are significant *not 'reliable' unless explained with link to mean or overlap*	2	any 2 for 1 mark

| 3 | c | iii | • (find out) genetics / genetic character
• (use genetics to) decide who to prescribe to
• comparison of 2 combinations / data from 1 combination
• may prescribe anyway as still some response for all combinations | 3 | |

Total: 11 Marks

4	a		• Number of flies which land on different coloured stripes / models	1	
4	b	i	• colour of coat - number of horse flies attracted • amount of polarised light – number of horse flies	1	
4	b	ii	• polarisation of light	1	
4	c	i	• factor /threat to (that alters the reproductive success of) a species • causes change in species • suitable example given *max 1 mark if mention of 'must evolve' or deliberate change on part of the animals.* *Needs to be in context of natural selection.*	2	1 mark each
4	c	ii	• flies bite (kill) dark coloured animals more / spread disease to darker animals • (variation) stripes of particular colour might reduce bites from flies / stripy animals more likely to survive • their offspring inherit stripes / more zebras with stripes / The frequency of the gene for stripes increases *accept answers referring to white animals* *do not credit statements that refer to deliberate evolution on part of zebra*	3	any 3 for 1 mark each.

4	d		• if flies in Africa also prefer polarised light • if zebra ancestors started out with dark coats • if zebras use coats to recognise each other • if stripes make good camouflage • test with live animals • Whether the reduction in flies visiting striped models is likely to be of biological significance *credit any reasonable suggestion of research which would give additional evidence.* *allow additional mark for any mp mark for explanation or further description of research*	2	any 1 or 2 for 1 or 2 marks each

Total: 10 Marks

5	a	i	• ethical issues in encouraging violent behaviour / consumption of sugar filled drinks • experiment would measure short term effect in lab / violence long term • violence has complex factors / other reasons teens might be violent • hard to have a 'blinded' experiment / other experimental difficulties • Maybe difficult to get a large sample size who did not have any fizzy drinks *answers must refer to experiments, not the questionnaire.*	2	any 2 for 1 mark each
5	a	ii	• misremember information • social desirability / people might lie • don't want to admit to being violent • teenagers might get bored after 40 minutes	1	any 1 for 1 mark
5	b	i	• more fizzy drinks leads to more violence • true in all categories / named category • least level of violence in dating relationship / correct comparison of levels of violence. • still level of violence even in young people who have ≤1 fizzy drinks	2	any 2 for 1 mark each

5	b	ii	• very wide definition • doesn't distinguish between very violent and less violent behaviour / can't say exactly what violence might be • doesn't refer to psychological or verbal violence • doesn't include any reference to frequency • Likely to reduce/underestimate any possible effect/ difference • explanation of why results may not be valid	2	must include comment about validity/effect on results for 2 marks.
5	c		headlines are not accurate • link shown by data is a correlation • headlines say that it is a causal link • confounding variables e.g. socio-economic status • kids might be violent anyway, not due to the drink / no control data • not '1 can a day' in research • timescale / fizzy drinks in 1 week, violence over year • not all kids tested / only in Boston • lots of kids who drank weren't violent • the measure of aggression used was very wide allow additional mark for data used to support mp	4	

Total: 11 Marks

6	a	i	• virus invades healthy cells • cell produces copies of virus • cell bursts and releases viruses / cell often killed	2	
6	a	ii	• white blood cells attack virus - engulf/ingest virus • antibodies produced - bind to virus *credit correct, more detailed, descriptions of immune response to virus (e.g. killer T-cells destroying infected cell).*	2	any 1 or 2 for 1 or 2 marks each

6	a	iii	• small sample • only certain groups represented / sample should represent whole population • sample more likely to be infected (drug use) / most infected people won't be tested	2	
6	b		• surface (proteins/antigens) on virus changes • (named part of) immune system (body) no longer recognises / responds to virus	2	
6	c	i	• check for safety / side effects • test effect is same as on animals / test human response • identify suitable doses (to use in therapeutic treatment) • ethical issues of using sick people / healthy people more likely to recover	2	
6	c	ii	• testing for effectiveness / compare with placebo /double blind • test on larger sample / on medication / ages etc. • test on different ethnicities • check if it protects against strains of virus in other parts of world • follow up research over long time period *do not credit compare with other HepC vaccines (because question indicates other vaccine not available)* *max 2 marks for answers which test the vaccine on people WITH HepC*	3	any 3 for 1 mark each

Total: 13 Marks

7	a	i	irradiation
			   • emissions from radioactive substance striking and being absorbed by another object
			contamination
			   • transfer of pieces of radioactive substance onto or into another object
			
			simple comparison of effects of irradiation and comparison (for 1 mark)
				2	1 mark each

7	a	ii	• power station is imposed risk / choose activities • perceived risk is different • radiation is invisible risk so may be more worried about it / don't understand it • high profile accidents appear to increase risk • media coverage of radiation • economic / environmental cost	2	any 2 for 1 mark each.

7	a	iii	• possibility of jobs / personal gain / support local facilities • burning less fossil fuels *do not credit answers in terms of cheaper / more available electricity*	1	
7	b	i	• two groups, (one exposed to factor + one not exposed to factor) • compared <u>after a period of time</u> *ignore references to large numbers*	1	both ideas needed for the mark
7	b	ii	• very rare so very few cases likely to be seen even in large sample	1	
7	c	i	no link • all error bars go through 1 / overlap • no obvious trend with distance • would expect less likely further away but doesn't happen • occurs even where no nuclear power plant built	2	any 2 for 1 mark each

7	c	ii	• to act as a control
			   ◦ for effects of radiation
			   ◦ for effects of site / location
			• to see if 'leukaemia clusters' occur naturally / baseline of leukaemia
				2	

Total: 11 Marks

8	a		• nearest star is 4 light years away / long distance away • people would die on the journey	1	
8	b	i	• breaking up molecules into electrically charged particles • knocking electrons off atoms	1	
8	b	ii	• could cause health problems for crew • ethical issues in causing possible mutations	1	any 1 for 1 mark
8	c		• to justify use of public money / they spend a lot of money • influence public / government /other agencies to show good results • help public understand the universe / science *not peer review.*	2	

| 8 | d | | | | | 6 | |

Level	Descriptor An answer will meet most of the criteria given in the level descriptor	Mark range
3	**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** Own view given /conclusion Advantages and disadvantages for UK and ESA discussed View linked to points made Includes additional information Well-structured argument
2	**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** Own view given (or implied) Simple advantages and disadvantages discussed for UK / ESA OR only one advantage/disadvantage OR repeats points from the passages with limited additional explanation.
1	**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** one sided - clearly considers only one agency or - only disadvantages or - only advantages. Simplistic answer
0	**Incorrect or no response**	**0**

			Possible points:		
			UK policy **Advantages –** - useful for some science (e.g. observing climate/space/hubble) - earns money for country/ support economy - cheaper - useful in the shorter term **Disadvantages** – - doesn't help prepare for leaving planet - not as inspirational - can't visit other planets directly ESA **advantages –** - international cooperation / share costs / - inspires next generation of scientists/engineers - will be able to physically investigate other planet (and deal with problems that might arise during flight) **disadvantages –** - long term project limited use for observation of earth systems		