Version 1.0

General Certificate of Education (A-level)
June 2012

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.

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<table>
<tr><th>Question</th><th>Part</th><th>Sub Part</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>1</td><td>a</td><td>i</td><td>Genetic abnormalities / named example
Injury

do not allow “other non-infectious diseases”
do not allow “diarrhoea”</td><td>1</td><td>both for 1 mark</td></tr>
<tr><td>1</td><td>a</td><td>ii</td><td>For given disease
• appropriate method of prevention
• explain how spread of infectious agent is reduced

<table><tr><th>Disease</th><th>allow method</th></tr><tr><td>Diarrhoea</td><td>Clean water</td></tr><tr><td>Pneumonia</td><td>Good hand hygiene</td></tr><tr><td>Measles</td><td>Vaccination, allow isolation</td></tr><tr><td>Meningitis</td><td>Vaccination, isolation (must be to prevent skin or close contact)</td></tr><tr><td>Whooping cough</td><td>Vaccination, good hand hygiene</td></tr><tr><td>AIDS</td><td>Use of condoms</td></tr><tr><td>Malaria</td><td>Bed nets, removing stagnant water sources
Do not allow vaccination</td></tr></table></td><td>2</td><td>1 mark for prevention method, 1 mark for why it works</td></tr>
<tr><td>1</td><td>a</td><td>iii</td><td>• AIDS virus mutates rapidly
• affects the immune system so hard to deal with
• haven’t obtained weakened(inactive) virus

do not allow ‘not done enough research’</td><td>1</td><td>any 1 for 1 mark</td></tr>
<tr><td>1</td><td>b</td><td>i</td><td>• can’t afford to pay for medical care / poorer medical systems
• poorer sewage / water treatment systems
• disease spreads more easily in crowded areas</td><td>1</td><td>any 1 for 1 mark each</td></tr>
</table>

1	b	ii	• comparison of populations • relative risk of death(ratio / percentages) greater in Nigeria (or vice versa) • intervention in small population may be easier / fewer people to treat	**2**	any 2 for 1 mark
1	c	i	• civil unrest / war / disaster • large population • poor records kept • not all deaths recorded officially/no central register	**1**	any 1 for 1 mark
1	c	ii	• suitable calculation (e.g. 7.7 is less than 50%, need reduction to 4.1 million) • reasonable comparison of time scales • Cost / recession / other reasons *(check numbers used in calculation – may use 2008 values from fig.1 which doesn't include neonates and is smaller than 2010 figures. Allow ecf)*	**2**	any 2 for 1 mark
1	d		• show that there was no bias • results not influenced by non-scientists	**1**	any 1 for 1 mark
2	a	i	A • air quality linked to industrial pollution would expect it to increase as industry increased. • Less polluting industry would lead to decrease in App. B • clean air acts improve air quality – reduced app • improved air quality – followed by drop in app	**1**	any 1 for 1 mark
2	a	ii	A • Decrease in app. could be due to other factor linked to industrial revolution • correlation does not prove a causal link B • decades time delay between legislation and drop in app /not a quick process as given in hypothesis. • correlation does not prove a causal link	**1**	any 1 for 1 mark
2	b	i	• to compare results • identify effect due to air pollution / rule out effects due to chance	**1**	any 1 for 1 mark

2	b	ii	• accounts for other factors e.g. smoking, health • smaller number of participants / costs less / saves time / easier • simpler to identify control *don't credit 'accurate', 'fair', 'reliable' on their own*	**1**	any 1 for 1 mark

2	c	i	General • range / overlap of data large so conclusions will be uncertain • older patients show high ranges so hard to make conclusions • fewer older patients in study, so app might not affect them as much • OR values for 5 day is greater than those for same day Ozone • Increased risk of App if higher ozone in previous 5 days • for 35-64+ age decreased risk of app if higher ozone on same day • 18-35 show higher risk on same day or 5-day Sulfur dioxide • increasing age – increased risk of App • Increased risk of App if higher sulfur dioxide in previous 5 days • only 35-64yr olds show a significant association with increased app with inc. sulphur dioxide levels *other correct numerically based conclusions should be credited - you will need to check data and see if the conclusion given is reasonable.*	**3**	any 3 for 1 mark each

2	c	ii	• carry out further studies in different areas / countries • study effect of different pollutants • use a different method of measuring air pollution and appendicitis *not 'repeat test' or 'more people'*	**2**	any 2 for 1 mark

2	c	iii	• identify a mechanism to explain how air pollution increases appendicitis	**1**	any 1 for 1 mark

3	a		• different elements bonded together (in a specific ratio) *not 'chemicals', 'molecules', 'mixture'*	**1**	any 1 for 1 mark

3	b	i	• conditions same for each fish / same dose for each fish • pieces of root may have different concentrations of rotenone • control for other chemicals in the root *not 'accurate', 'reliable' without explanation. Not just 'know the concentration'*	**1**	any 1 for 1 mark
3	b	ii	• As length of fish increases so does swimming time / positive correlation • weak correlation / large scatter in data / specific data given	**2**	any 2 for 1 mark
3	c	i	• results show average of a number of fish • show the range of swimming times for different fish • significant differences between samples can be seen if error bars don't overlap • shows spread about the mean *not 'accuracy' or 'real result'. Answer must recognise that these are the results from lots of fish and are an average.*	**1**	any 1 for 1 mark
3	c	ii	Yes • fish exposed to rotenone (area 1 and 2) swim longer than fish not exposed (area 3 and 4) • error bars don't overlap for different conditions BUT: • error bars of 3&4 don't overlap / error bars for 1&2 do overlap	**2**	any 2 for 1 mark
3	d		• bigger fish / better swimmers / variation • survive to breed • genes passed on *don't credit deliberate or conscious adaptation on part of the fish, or incorrect use of genetics*	**3**	any 3 for 1 mark each
4	a	i	• some chemicals / carcinogens • ionising radiation • errors in copying during cell division	**1**	any 1 for 1 mark
4	a	ii	• middle of range of ages that CF sufferers • will survive to / age of death	**2**	any 2 for 1 mark each

4	b	i	• need both copies of recessive alleles • carriers only have one copy of defective allele • carriers have a dominant allele which masks recessive allele *allow gene instead of allele*	**2**	any 2 for 1 mark each
4	b	ii	• 1 in 4 / 25% • correct explanation / diagram of recessive genetic cross	**2**	
4	c		• no history of CF in family • don't think they need it • wouldn't stop them having children / wouldn't care if child had CF • don't want to know - (before they get pregnant / affect decision to have child) • ethical objections / religious objection to genetic screening (of parents) • don't want children • currently no cure so no reason to be tested *do **not** credit references to embryo screening. Answer MUST be in terms of screening of adults before they have children.*	**2**	any 2 for 1 or 2 marks
4	d		• decrease in CF greater in eastern region • more people tested in eastern region • spread of data / strength of correlation • knowing status affects decisions about pregnancies	**3**	any 3 for 1 mark
5	a		• double blind trial / description of db trial / use of controls • both treatments might have placebo effect / compare with current treatment • compare placebo with treatment and treat data to remove effect of placebo	**2**	any 2 for 1 mark
5	b	i	• (In both cases)mean pain intensity decreases after painkiller • mean pain intensity drops more quickly for group A • group B (generally) have slightly more reported pain after painkiller • after 3h error bars overlap so results very similar *for full marks should compare group A and group B*	**2**	any 2 for 1 mark

5	b	ii	No • levels of pain drop even with in group B • may take longer to provide same mean level pain relief but still pain reduction	**1**	any 1 for 1 mark

5	c	i	• some conditions not easily treatable / suitable example (e.g. back pain) • some conditions psychological • no other treatment available *do not credit 'to see if the illness is real'*	**1**	any 1 for 1 mark

5	c	ii	• not effective on virus' • could lead to increased antibiotic resistance in bacteria • may cause side effects (due to killing 'good' bacteria) *don't credit references to 'virus becoming resistant to antibiotics', or 'virus/bacteria/disease becoming immune'*	**2**	any 2 for 1 mark each

5	d		medical issues could include • side effects / lack of side effects from placebo • antibiotic resistance • might miss a treatable disease • encourages confidence in GP • sometimes placebo does work especially in pain based illnesses ethical issues could include • people should be able to trust doctors • doctor could be seen as indirectly lying to patient • acceptable as patient has been told that it isn't the usual use of the drug but might help, which is true • telling patient that they're getting a placebo might negate the benefit of it • wasting money on ineffective medicines *Ignore references to doctors knowingly using placebo INSTEAD of a treatment or as a cost cutting measure.*	**6**	level 3 – includes at least 3 reasons covering both medical and ethical issues. Explanation of each given. level 2 – includes 1 medical *and 1* ethical. Limited explanation. Repeats. level 1 – simplistic *and/or* only medical or ethical. Or arguments about using placebo instead of drugs that drugs which will work to save money or just to try them out.

			<table><tr><th>Level</th><th>Descriptor An answer will meet most of the criteria given in the level descriptor</th><th>Mark range</th></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</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</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</td></tr><tr><td>0</td><td>Incorrect or no response</td><td>0</td></tr></table>		

6	a	i	• X-ray, beta, gamma	**1**	any 1 for 1 mark

6	a	ii	• radiation irradiate the cancerous (diseased) cells in the body • radiation kills the cancerous cells *do not credit diagnosis methods*	**1**	any 1 for 1 mark

6	a	iii	• activity is number of decays per second / link with half-life • different types of radiation interact differently with body / ionise different amounts • alpha most ionising / gamma least ionising	**2**	any 2 for 1 mark each
6	b	i	• increased understanding of danger of radiation / more research • saw long term damage /took long time for cancers to develop • improved technology	**1**	any 1 for 1 mark
6	b	ii	• use of protective clothing / example of clothing • design of room / use of lead glass in booth • design of equipment used to deliver radiation / example • minimise staff exposure time / leave room during treatment *not 'monitor levels', 'wear radiation badge'*	**2**	any 2 for 1 mark
6	b	iii	• background radiation / always be some level of radiation	**1**	any 1 for 1 mark
6	b	iv	• couldn't do their job if level too low / will be exposed to higher levels • benefit to society • chosen risk / part of their job • still at a 'safe' level / protective measures	**2**	any 2 for 1 mark
7	a	i	• planets have nearly circular orbit / meteoroids have highly elliptical *not 'orbit time','speed'*	**1**	any 1 for 1 mark
7	b		• know what conditions were like when Earth formed • compare with how earth is now • estimate age of the earth *do not credit references to age of universe, or conditions at the big bang.*	**1**	any 1 for 1 mark
7	c	i	• different numbers of neutrons	**1**	for 1 mark
7	c	ii	change in nucleus leading to emission of ionising radiation	**1**	for 1 mark

7	c	iii	• 2 half-lives (or equivalent shown) • 1408 million years *correct half-life but wrong method gets 1 mark* *wrong half-life but correct method gets 1 mark*	**2**	any 2 for 1 mark
7	c	iv	• reduction much less than half – 1408 is less than the half-life *credit answers that compare half-life of U-235 with answer for ciii. Allow ECF*	**1**	for 1 mark
7	c	v	• Pb formed from decay of U • Pb-207 formed more quickly / U-238 decays faster • ratio will change as proportion of Pb 207 increases *(don't credit references to decay of Pb – it is stable)*	**2**	any 2 for 1 mark
7	d		• can compare results / calculate average • increases confidence in the results (age) found *not 'accuracy', not 'reliability' without explanation*	**1**	any 1 for 1 mark
8	a		• mutations in genes / damage cell control mechanisms • cells divide uncontrollably	**2**	any 2 for 1 mark
8	b		• reliant on memory of volunteers • volunteers with a strong interest in health	**1**	any 1 for 1 mark
8	c	i	• many different factors involved / variation in diet, lifestyle etc. • lots of different types of cancers • relatively small incidence of each type of cancer • cancer may not occur in small sample • makes correlation between diet and cancer clearer / limits effects of anomalies on data	**2**	any 2 for 1 mark
8	c	ii	• find out about lifestyle of <u>group</u> of people • watch <u>over time</u> to see who develops disease • look at common factors linking people with the disease	**2**	any 2 for 1 mark

<table>
<tr>
<td>8</td>
<td>d</td>
<td></td>
<td>
Additional information not in passage

general health benefits e.g.

diabetes,
reduced obesity,
increased fibre

decreased cost to government/NHS with less cancer
government may be seen to be ‘changing mind’
little risk in eating extra fruit or veg

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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</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</td></tr>
<tr><td>0</td><td>Incorrect or no response</td><td>0</td></tr>
</table>
</td>
<td>6</td>
<td>L3 Use info from passage and additional info OR well explained/detailed additional information

L2 info from passage in good format and/or simple additional information

L1 general statements or copied directly from the passage.</td>
</tr>
</table>