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General Certificate of Education
June 2010

SCIENCE IN SOCIETY SCIS3

Unit 3 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		• (Dopamine) transmits signals at neurons/synapse, • Prevent uptake/binding, • Message not transmitted (as effectively) *Ignore 'brain', ignore 'blocking dopamine'*	**2**	Any 2 for 1 mark each
	b		Social: • Stigma attached to mental illness, • Patient seen as mad, • Could lead to further social ostracism/ alienation from family, • Loss of job, • Patient may not know there is a problem Medical: • Range of symptoms/ only show some of symptoms / symptoms change with time • Could be a different disease / symptom overlap / example • If patient is paranoid may not go to doctor • Easier to see physical symptoms / example	**2**	Any 2 for 1 mark each
	c	i	• Majority / all but 1 study show that people who have used cannabis more likely to have psychotic symptoms, • 1 study shows normal people more likely to have psychotic symptoms, • (Studies which show largest odds ratio) have largest range/error bars / accuracy	**2**	Any 2 for 1 mark each
	c	ii	• Unethical to carry out clinical study to induce possible illness, • Illegal to use cannabis - difficult to get permission to carry out study, • Allows comparison of two different <u>groups</u> of people/compare people who have already taken the drug • Hard to do a blind test using cannabis (due to effects)	**2**	1 mark or (1+1) mark for each bp
	d		• Don't know what causes psychosis/schizophrenia – could be any of the factors, • May be a genetic or social link / multifactoral • Remove chance of other factors influencing results • People might take cannabis to cope with psychosis / reverse link, • Want cohorts to be as similar as possible for comparison	**2**	Any 2 for 1 mark each

1	e		Yes: • 6 studies show link between cannabis use and psychosis, • Some studies used large number of people, • Better to take a cautious position, • May be low risk – but consequences could be severe, • Government should make sure that young people know the risks No: • 1 study suggests more likely to suffer psychosis if don't use cannabis, • The range of data is large for some of the studies, • Cohort studies can't show that cannabis use causes psychosis – could be another underlying cause, • More research is needed to try find mechanism	**4**	1 mark or (1+1) mark for each bp. Can gain marks from both 'yes' and 'no'

Total Mark: 14

2	a	i	• Overall increase from about 1.7% in 1990 up to 5% in 2007 (3.3%) • Hydroelectric power has decreased / no overall trend / now less than wwsb • Wind, wave, solar and biofuels have increased significantly from less than 0.3% in 1990 to over 3.5% in 2007 (3.2%) • Describe shape of 'all renewables' with correct numbers	**2**	Any 2 for 1 mark each
	a	ii	• Government legislation / renewables obligation • Limited number of suitable sites for e.g. hydroelectricity in UK, • Long time to build hydroelectric, • Potential opposition / NIMBY • Wind turbines relatively quick to build • Improved technology/efficiency • Increased awareness/fear of global warming • Peak oil	**2**	Any 2 for 1 mark each
	a	iii	• To reduce amount of fossil fuels burnt • increase fuel security/so don't rely on other countries • To reduce the amount of CO_2 released into the atmosphere/reduce global warming • Part of the international agreement to reduce levels of CO_2 in atmosphere. • Force elec.gen companies to change	**1**	Any 1 for 1 mark

2	a	iv	• Short timescale • Research still needed to improve efficiency of some renewable sources • Higher cost / renewables still cost more than fossil fuels / economic downturn • To counter public opposition • Achievable / realistic target • May increase nuclear power	**3**	Up to 3 for 1 or (1+1) marks
	a	v	Likely • Percentage of renewables increased over last 4 years • More research being carried out / technology becoming cheaper • Projects/sites being suggested/planned e.g. Severn barrage Unlikely • Compare gradients – target is increasing, but increase of renewables has slowed since approx 2005 • High cost of renewables will slow down production / limit to speed of production *must refer to graph for 2 marks*	**2**	(1+1) marks Students can give points for both sides
	b		Costs: • Possible risk to wildlife / bats / birds / habitats • MOD opposition • Need to connect to national grid / infrastructure required • Unsightly pylons/ visual impact / noise / NIMBY Benefits • Helps meet national/international legislation • Possible increased employment in area • Income from sale/lease of land/electricity generation • Risk comparison (with e.g. nuclear) • Reduction in greenhouse gas emissions overall (benefit to country as a whole)	**6**	Any 6 for 1 mark each

Total Mark: 16

3	a	i	• Blood flow • Electrical activity • Change in energy demand	**2**	Any 2 for 1 mark each
	a	ii	• Some areas of brain control unconscious functions such as breathing, heart beat etc, • Not known which areas of brain are involved in some higher functions, • Consciousness is not clearly understood, • Individual brains are different/ actions may activate slightly different areas of brain in different people	**2**	Any 2 for 1 mark each or any 1 for (1+1) marks

3	b		• Brain activation in unconscious people same as in the healthy volunteers • Male and female respond in the same way • Young people respond in the same way as old people • Same activation to tasks (in different people) • Subjects can understand the instructions	**2**	Any 2 for 1 mark each
	c		Scientific • More research needed • To see if it applies to women / different ages / not healthy • Repeats needed on (injured) people with lower motor skills Practical: • Not many patients to test on – need to develop expertise/technique • fMRI expensive to do. • Difficult to 'prove' a negative –the patient may not want to co-operate. • Level of consciousness could change with time as patient recovered, • May need to repeatedly test patient. • Patient may be deaf / foreign / on drugs / distracted / doesn't understand	**4**	any bp for 1 mark or (1+1) marks

Total Mark: 10

4	a	i	• Each woman will get two copies of each gene from parents – these could be the same (val / val and met / met) or different (val / met) • Genetic diagram to show possible genotypes	**2**	Any 1 for 1 or 2 marks
	a	ii	• Large difference between met/met and other two – give numbers to support this • Difference between val / val and val / met small – confidence bars overlap so relative response could be the same	**2**	Any 1 or 2 for 1 or 2 marks each
	b		• Genes and environment linked / genes switched on or off by lifestyle • Single gene is only part of mechanism • Only a few diseases caused by single gene / multifactorial • Genes could give predisposition to a trait – may only develop due to past history	**4**	1 or (1+1) mark for each bp

4	c		• Nothing in press-release about being scared or finding horror funny • Research looked at startle, not scaredness • Research only on women • More than one gene involved / multifactorial • Mechanism not clear / correlation not cause • Research didn't use horror films / pictures used • Horrors fans less anxious • "Could" jump / "might" react (i.e. not necessarily a 1:1 causative link)	**4**	1 or (1+1) mark for each bp

Total Mark: 12

5	a	i	• Methane • NOx/ SOx - **not** Carbon Monoxide • Halocarbons/CFCs • Water vapour • Ozone	**1**	Any 1 for 1 mark
	a	ii	• Can interpret data in different ways, • Different computer models include different factors, • Results can depend on the assumptions built in, • Models sensitive to initial conditions. • Can make comparisons between them • Increases confidence where predictions overlap	**2**	Any 2 for 1 mark each
	a	iii	• CO_2 more easily measurable • CO_2 can be directly affected by legislation/government action • Temp rise may be affected by other factors • Small increase in mean temp could represent very large increase in some areas	**2**	Any 2 for 1 mark each
	b	i	• Plants carry out photosynthesis, • Photosynthesis requires carbon dioxide, • Carbon goes into organic matter for growth and storage, • If biomass doesn't break down, or isn't used* then the carbon will not re-enter the carbon cycle Accept "not burnt" *For 2 marks must include mp4 or wtte*	**2**	Any 2 for 1 mark each
	b	ii	• How is food chain/biodiversity affected, • How much CO_2 is removed, • What happens to soil fertility if crop waste is removed, • How long is CO_2 stored for • Effect of pollution at sea bed	**2**	1 or (1+1) mark

5	b	iii	Advantages • Can continue to use fossil fuels for energy • Reduces need for immediate change in lifestyle • Take out more CO_2 than added / reduce amount in air Disadvantages • No incentive to change – fossil fuels will still run out • Research still at early stages / time to implement • Could have unexpected effect on ecosphere *Must contain both sides to get full marks*	**4**	(1+1) marks Must contain both sides to get full marks

Total Mark: 13

6	a		• Couldn't see the animals leaving scats • Scats could look same / be disturbed • Reproducible results / easier than other counting methods	**2**	Any 2 for 1 mark each
	b	i	Reasonable • If know, on average, how many scats an individual animal will leave • More animals - more scats will be left Unreasonable • Some species may leave lots of small scats / few big scats – can't compare them • Might not find all the scats • Some scats could be miscounted if disturbed	**2**	Any 2 for 1 mark each
	b	ii	• Shows the spread of the data around the mean value • Gives variation / range in the data	**1**	Any 1 for 1 mark
	b	iii	• Fewer coyotes where there are people – different food/disturbed habitat	**2**	2 marks
	c		• Movement of predators out of area • Damage to habitats / plant life • Prey increase due to reduction in native species – reduction of plant life • Prey decrease due to increase in non-native species – increase of plant life • Change behaviour of native species • Introduction of other non-native species *Must mention both plants and animals for 3 marks*	**3**	Up to 3 mp for 1 or (1+1) marks

6	d		Yes • Shows recreation has an effect on numbers • Change in one species will affect others • Provides initial research / suggests precaution No • Small number of species • Need to repeat work in different types of protected areas • Would depend on what the area was / one ecosystem might be more robust than another • Might have missed some of the scats • Native animals more likely to be out of sight / overestimated non-native species.	**3**	1 mark or (1+1) mark for each bp

Total Mark: 13

7	d		Should make reference to HSW 3.5.1 C – Developing and testing scientific explanations HSW 3.5.2 E – The scientific community HSW 3.5.3 F– relationships between science and society Should give examples of the use of peer review and development of ideas – e.g. climate change (IPCC), MMR, radiation, neuroscience Could also look at examples where scientists have cheated – and been found out Examples of why scientists might not be objective		

Level of response	**descriptors:**	**mark range**
good level 4	• includes peer review AND objectivity • more than one example of science explanations relevant to the issue – with detail; • appropriate and effective use of the relevant ideas about how science works; • good overall grasp of the range and nature of the issue(s); • writes well structured argument using a range of evidence • fluency and accuracy of expression, with only minor errors of grammar, punctuation or spelling.	**10-12**

7	d			**12**	

competent level 3	• includes peer review AND objectivity • an example of science explanations relevant to the issue – with some detail; • use of some relevant ideas about how science works; • general grasp of the range and nature of issue(s); • writes structured argument using some evidence • accuracy of expression, with some errors of grammar punctuation or spelling	**7-9**
limited level 2	• includes peer review OR objectivity • an example given of science explanation - minimal or inaccurate • minimal use of ideas about how science works; • grasp of some features of the issue(s); • arguments presented but with weak structure and/or minimal evidence • accuracy of expression, but with serious errors of grammar punctuation or spelling	**4-6**
inadequate level 1	• only peer review OR objectivity • no example or example of science explanation confused • use of ideas about how science works absent or wrong • appears not to understand the issue; • argument presented as just a claim with no structure or evidence • expression unclear with serious errors of grammar punctuation or spelling	**1-3**
0	**incorrect or no response**	**0**
	Total	**12**

Total Mark: 12