



General Certificate of Education

Science in Society 1401

SCIS1 Exploring Key Scientific Issues

Mark Scheme

2009 examination - June series

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.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Copyright © 2009 AQA and its licensors. All rights reserved.

COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

GCE Science in Society, SCIS1, Exploring Key Scientific Issues

Question 1			
(a)	<p>(i)</p> <ul style="list-style-type: none"> prevents people drinking water fleas stops people putting affected limbs in the water source <p>(ii)</p> <ul style="list-style-type: none"> so know where disease is to concentrate resources can use (named) prevention methods puts pressure on national governments so that they feel they have to do something ensure that successes (and failures) are known about <p>(iii)</p> <ul style="list-style-type: none"> treating water is cheap no transportation/distribution costs can be done using local knowledge long development time/side effects can prevent other diseases/cholera/diarrhoea/dysentery whole families/communities helped/prevents disease over term 	<p>any 1 for 1 mark</p> <p>any 1 or 2 for 1 mark each</p> <p>any 3 for 1 mark each</p>	6
(b)	<p>yes</p> <ul style="list-style-type: none"> India has greatest GDP and has eradicated disease Ghana has high GDP and has reduced number of cases to only approx 2% of starting estimate example of high GDP and low numbers/large percentage decrease <p>no</p> <ul style="list-style-type: none"> Ethiopia has lowest GDP – fewer cases than eg Ghana which is approx 2ce GDP Nigeria/Uganda low GDP and few cases <p>additional points</p> <ul style="list-style-type: none"> no pattern – with 2 named countries could be linked to another factor – city living health infrastructure/habitat of disease Sudan reported cases have increased in number – poss reason for 	<p>any 3 for 1 mark each</p>	3
		Total	9

Question 2			
(a)	<ul style="list-style-type: none"> transferred to other named forms of energy dissipated into the car/surroundings/road etc 	any 2 for 1 mark each	2
(b)	<p>(i)</p> <ul style="list-style-type: none"> $(2150 - 1000)/1000 \times 100\% = 115\%$ range 1971: 900 – 1100, 2005: 2000 – 2200 <p>(ii)</p> <ul style="list-style-type: none"> increase in population increase in flying increase in number of cars/bigger cars industrial development of other countries/more transport of goods between countries 	any 2 for 1 mark each any 2 for 1 mark each	4
(c)	<p>high value (4500+)</p> <ul style="list-style-type: none"> business as usual/current trend continues more oil is found no political action on climate change <p>medium value (3500 – 4500)</p> <ul style="list-style-type: none"> rising prices slow growth more alternative fuels attempts to deal with climate change <p>low value (3000 – 3500)</p> <ul style="list-style-type: none"> oil runs out/too expensive to use for fuel new technologies strict climate change controls put in place <p><i>marks only if worldwide consumption of oil not transport</i></p>	any 2 for 1 mark each	2
(d)	<p>(i)</p> <ul style="list-style-type: none"> different ecosystems different types/sizes of farms different industrial processes used to produce biofuels <p>(ii)</p> <ul style="list-style-type: none"> only biodiesel made from waste products has less total environmental impact than gasoline most biodiesel produce less CO₂ than gasoline total environmental impact can depend on which country oil comes from soy grown in Brazil produces more CO₂ than gasoline biodiesel can have up to 3× more environmental impact than fossil fuel diesel 	any 1 for 1 mark any 3 for 1 mark each	4
		Total	12

Question 3			
(a)	<p>(i)</p> <ul style="list-style-type: none"> • a segment of DNA which carries information <p>(ii)</p> <ul style="list-style-type: none"> • genetic information not copied correctly • ionising radiation • chemical agent <p>(iii)</p> <ul style="list-style-type: none"> • other risk factors/contributing factors • she is one of the 15% who have gone that does not develop the disease <p>not does not have the mutated gene – this negates the answer</p> <p>(iv)</p> <ul style="list-style-type: none"> • 1 in 2 • 50% 	<p>for 1 mark</p> <p>any 1 for 1 mark</p> <p>any 1 for 1 mark</p> <p>any 1 for 1 mark</p>	4
(b)	<ul style="list-style-type: none"> • sperm donor • have no children • have children and hope for the best • adoption 	any 1 for 1 mark	1
(c)	<p>for</p> <ul style="list-style-type: none"> • freedom of choice for parents • prevention of potential unpleasant disease for child • prevents worry of not knowing if they will develop the disease • helps remove harmful mutation from population <p>against</p> <ul style="list-style-type: none"> • increase in likelihood of multiple births • expensive option • might lead to choosing embryos on other, less reasonable grounds • right to life 		6

Level	Descriptor <i>an answer will meet most of the criteria given in the level descriptor</i>	Mark range
3	<p>Good</p> <p>claims supported by an appropriate range of evidence</p> <p>good use of information or ideas about science, going beyond those given in the question</p> <p>argument well structured with minimal repetition or irrelevant points</p> <p>accurate and clear expression of ideas with only minor errors of grammar, punctuation and spelling</p>	5-6
2	<p>Modest</p> <p>claims partially supported by evidence</p> <p>good use of information or ideas about science given in the question but limited beyond this</p> <p>the argument shows some attempt at structure</p> <p>the ideas are expressed with reasonable clarity but with a few errors of grammar, punctuation and spelling</p>	3-4
1	<p>Limited</p> <p>valid points but not clearly linked to an argument structure</p> <p>limited use of information or ideas about science</p> <p>unstructured</p> <p>errors in grammar, punctuation and spelling or lack of fluency</p>	1-2
0	Incorrect or no response	0
	Total	11

Question 4			
(a)	<p>newspaper report</p> <ul style="list-style-type: none"> • may contain inaccuracies/exaggerated • does not report all details/simplified • not peer-reviewed • colloquial/imprecise language <p>research paper</p> <ul style="list-style-type: none"> • will be peer-reviewed • give full detail of method/analysis etc • written in 3rd person passive tense/use more scientific terms 	any 2 for 1 mark each	2
(b)	<ul style="list-style-type: none"> • lice living on humans or gorillas 	for 1 mark	1
(c)	<ul style="list-style-type: none"> • barrier between populations • variation between individuals of same species • some have characteristics which give them a better chance of surviving/reproducing • pass on their genes to next generation • more organisms with advantageous characteristic 	any 2 for 1 mark each	3
(d)	<p>(i)</p> <ul style="list-style-type: none"> • mean value so it is the average of a number of measurements • carried out more than one experiment • shows the largest and smallest values from experiments <p>(ii)</p> <ul style="list-style-type: none"> • shortest time: 2.1 (3.9 – 1.8) • longest time: 8.2 (10 – 1.8) 	any 1 for 1 mark	3
(e)	<p>(i)</p> <ul style="list-style-type: none"> • lice became separate species about 3.3 million years ago • long after man and gorillas shared a common ancestor <p>(ii)</p> <ul style="list-style-type: none"> • ancestor of man slept in abandoned gorilla nest • lice evolving into separate species as a result of crossing from one host to another • early man too lazy to make own bed • lice (from nest) crawled on and made themselves at home 	any 1 for 1 mark	2
		Total	11

Question 5			
(a)	(i) <ul style="list-style-type: none"> ionising radiation can remove electrons from molecules/bring about chemical changes by breaking molecules into fragments/cause mutations to DNA non-ionising radiation absorbed causing heating difference in wavelength/frequency/energy (ii) <ul style="list-style-type: none"> UV, X-rays, gamma rays 	any 2 for 1 mark each	3
(b)	<ul style="list-style-type: none"> imposed/chosen risk long term consequences hard to see mobile phones familiar/masts are unsightly benefits of handsets obvious/benefits not obvious for mast media coverage/peoples perception of danger 	any 2 for 1 mark each	2
(c)	(i) <ul style="list-style-type: none"> two groups with different treatments subject does not know who is in which group experimenter does not know who is in which group (ii) <ul style="list-style-type: none"> prevent experimenter bias/might think that it is a false condition prevent subjects making up symptoms prevents placebo effect self-selected group might expect an effect 	any 2 for 1 mark each either 1 for 1 mark	3
(d)	<ul style="list-style-type: none"> no different in symptoms between sham and real sensitive individuals experience more symptoms than control with sham and real subjects could not detect difference between sham and real results suggest that radiation from base station signals do not have an effect on health factors other than radiation involved <p><i>conclusion should be negative for 3 marks</i></p>	any 3 for 1 mark each	3
		Total	11

Question 6			
(a)	<ul style="list-style-type: none"> • mass of both objects • distance between the objects 	any 2 for 1 mark each	2
(b)	<ul style="list-style-type: none"> • orbits not to scale – outer planets too close to Sun • planets not to scale – would not be able to see the inner planets 	any 2 for 1 mark each	2
(c)	<ul style="list-style-type: none"> • explained other phenomena well • well respected scientist • assumed there was another explanation eg planet 	any 1 for 1 mark	1
(d)	(i) <ul style="list-style-type: none"> • searching for planet (ii) <ul style="list-style-type: none"> • voyager space probe – mass of Neptune • Hubble space telescope – objects in solar system 	for 1 mark any 1 for 1 mark	2
(e)	no <ul style="list-style-type: none"> • Galileo changed our view of the Earth • this is just fine tuning • theory of gravity can explain the orbits in detail • Pluto is still the same, just a name change yes <ul style="list-style-type: none"> • have only got 8 planets • there are lots more objects size of Pluto which we now know about • shows that long established scientific knowledge can change 	any 2 for 1 mark each	2
		Total	9

Question 7				
(a)	(i)	<ul style="list-style-type: none"> • A • C • F 	any 2 for 1 mark	7
	(ii)	<ul style="list-style-type: none"> • reduces the range of uncertainty/outliers have less impact on the average/increases reliability • error bars in D (small study) much larger than in H (large study) <p>not accuracy</p>	any 2 for 1 mark	
	(iii)	<p>8 year olds</p> <ul style="list-style-type: none"> • 5 of 8 studies show decrease in tooth decay • improvement from about 20% to 65% • 3 studies showed no improvement • no study showed increase in tooth decay <p>12 year olds</p> <ul style="list-style-type: none"> • fewer studies • 3 of 6 studies show decrease in tooth decay • 2 studies show increase in tooth decay • no overall trend • more research needed to be clear <p><i>needs to be specific, not generalities</i></p>	any 3 for 1 mark each	
(b)	(i)	<ul style="list-style-type: none"> • age • social class • location • ethnic origin • diet 	any 2 for 1 mark each	5
	(ii)	<ul style="list-style-type: none"> • estimates of amount of fluoride consumed 	for 1 mark	
	(iii)	<ul style="list-style-type: none"> • very rare/small numbers to study • other factors may also increase risk • cannot prove a negative • hard to determine level of exposure to fluoride 	any 2 for 1 mark each	
			Total	12

Question 8			
(a)	<p>(i)</p> <ul style="list-style-type: none"> • makes it personal/people can relate to it more/sells papers • research contains uncertainties/hard to understand <p>(ii)</p> <ul style="list-style-type: none"> • condemning them to death • new wonder drug • extend the lives of sufferers • give them valuable time with their families 	<p>any 2 for 1 mark each</p> <p>any 1 for 1 mark</p>	3
(b)	<p>(i)</p> <ul style="list-style-type: none"> • mutations in certain genes damage the normal controls on cell division • cells divide uncontrollably • dividing cells form a tumour <p>(ii)</p> <p>animals</p> <ul style="list-style-type: none"> • to test if it works on a similar disease • to find out if it is poisonous <p>humans</p> <ul style="list-style-type: none"> • find out if it is effective • see if it has side effects/work out dosage 	<p>any 2 for 1 mark each</p> <p>1 from each for 1 mark each</p>	4
(c)	<ul style="list-style-type: none"> • to reduce the risk of bias from any one group • to get opinions from lots of people/different interest groups represented • makes rulings acceptable to everyone 	<p>any 2 for 1 mark each</p>	2

(d)	<ul style="list-style-type: none"> • cost • extension to life • quality of life improvement – how bad the disease is • how it compares with other treatments • how many people might need it • age of people that it helps • side effects caused 	
Level	Descriptor <i>an answer will meet most of the criteria given in the level descriptor</i>	Mark range
3	<p>Good</p> <p>claims supported by an appropriate range of evidence</p> <p>good use of information or ideas about science, going beyond those given in the question</p> <p>argument well structured with minimal repetition or irrelevant points</p> <p>accurate and clear expression of ideas with only minor errors of grammar, punctuation and spelling</p>	5-6
2	<p>Modest</p> <p>claims partially supported by evidence</p> <p>good use of information or ideas about science given in the question but limited beyond this</p> <p>the argument shows some attempt at structure</p> <p>the ideas are expressed with reasonable clarity but with a few errors of grammar, punctuation and spelling</p>	3-4
1	<p>Limited</p> <p>valid points but not clearly linked to an argument structure</p> <p>limited use of information or ideas about science</p> <p>unstructured</p> <p>errors in grammar, punctuation and spelling or lack of fluency</p>	1-2
0	Incorrect or no response	0
	Total	15