AQA

A-LEVEL
Science in Society
SCIS4 Case Study of a Scientific Issue
Mark scheme

2400
June 2015

Version/Stage: Final

Mark schemes are prepared by the Lead Assessment Writer 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 associates 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 associate understands and applies it in the same correct way. As preparation for standardisation each associate 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, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

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.

Further copies of this mark scheme are available from aqa.org.uk

Question	Answers	Additional Comments/Guidance	Mark	ID details
1	o open wounds more likely to be infected o untreatable / fatal infection o safer to not have minor operation rather than risk incurable infection / cost-benefit of op		2	
2	• Compares antibiotic resistance with other serious threats 　o terrorism 　o global warming • uses strong metaphors 　o apocalyptic 　o ticking time-bomb	Allow 1 example with detailed explanation	2	
3	o antibiotics are only used for short-term treatment so don't make much money / more money from chronic conditions o people expect cheap antibiotics o clinical trials are expensive o patent may run out before development investment paid off		2	
4	o other companies have to pay to make medicine / can't create similar medicines o longer time to make money from the drugs / develop drugs • monopoly allows higher price to be charged		2	

| 5 | **Advantages**
○ medicine come to market quicker
○ easier to get license to sell medicines
○ reduced costs for companies / more incentive to invest in antibiotics
○ fewer people required for tests
• people may have died anyway

Disadvantages
• dangerous for trial patients
• Might miss rarer side effects / underestimate side effects
• Small sample size so anomalies might affect results / less representative sample
• might underestimate effectiveness / dosage might be incorrect | 2 marks for advantages, 2 marks for disadvantages

Not:time needed to identify bacteria (quote from article) | 4 | |

| 6 | • MPs have to decide on science issues
• (therefore) MPs need background information from experts
• information should not be biased by <u>politics / vested interests</u> | | 2 | |

| 7 | ○ mobile population of people/animals/food - disease spreads easily
○ large cost of response required - poorer countries require support
• companies are transnational / global markets – needs same legislation in all countries
• one country response ineffective / AR could spread from other countries - important to share strategies | Any 1 or 2 for 1 or 2 marks each | 2 | |

8	• current strategy not working • government only gives general advice / suggestions • profit more important to farmers / not much incentive to reduce • would improve animal living conditions • provide targets / monitoring • legislation works in EU countries – example of data • legislation would force change / ensure commitment.	Answer needs to focus on legislation	4	
9	• reach a wider audience / raise awareness • influence public opinion • influence government policy • gaining (financial) support for organization • countering vested interests		2	
10	Differences in experimental conditions / animal age, etc ○ Can't easily compare the results between experiments Lack of understanding of mechanism ○ Don't know why the additives are having the effect ○ harder to control variables / plan experiment Complexity of the gut / microbiota • small part of GI studied / not representative of whole gut Interaction between different products used • hard to assign effect to individual product		4	
11	○ phage inject DNA bacterial cell ○ use copying mechanism of cell to produce copies of the virus ○ kill host cell / burst out to infect more bacteria ○ if few (no) bacteria present then phage cannot reproduce and multiply.	3 marks for virus reproduction 1 mark for why the phage die out without salmonella in the gut.	4	

12	- brief description of vaccination - vaccinated animals <u>less likely</u> to contract disease / fewer infections (therefore) need fewer antibiotics to treat ill animals		2	
13	- what harm bacteria does to infected people - infectivity - what the bacteria is and how it is transmitted - compare to other countries / previous episodes - effect of cooking on bacteria		2	
14	Yes – - mild disease in people - bacteria destroyed by cooking - mainly people who work with poultry likely to catch disease / rarely causes illness No – - possibility of poor cooking / contamination at homes - possibility of resistant genes 'transferring' to human bacteria - precautionary principle		2	
Total			**36**	

question	answers	extra information	mark
15			12

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.

0 marks	Level 1 (1–3 marks)	Level 2 (4–6 marks)	Level 3 (7–9 marks)	Level 4 (10-12 marks)

examples of the points made in the response

A: Biology
(i) Selection pressure
- natural variation in bacteria / random mutation in population
- Antibiotics kill most bacteria
- Resistant bacteria survive – increase in AR

(ii) Horizontal gene transfer (source C)
- Resistant genes shared between different (strains of) bacteria

(iii) Effect of mutations (Box 1, source C)
  - o Cell wall changes,
  - o Pumps to remove antibiotic
  - o Enzymes that destroy bacteria.

B: Practices encouraging spread of AR
- Human
  - o Incorrect prescription of antibiotics by doctors
  - o Self-prescription in e.g. India
  - o Poor sanitation / sewage
  - o Waste from factories
- Animals
  - o Use as growth promoters
  - o Factory farming needs more antibiotics
  - o Aquaculture
  - o Animal excretion

C: Appropriate for audience and well structured

extra information

Level 4
A: (i) and (ii) / (iii)
B: Human and animal + examples from sources
C: appropriate language and well structured

Level 3
A: (i) or (ii) / (iii)
B: Human and animal + standard examples
C: appropriate language and structured

Level 2
A: (i) or (ii) / (iii) with some errors of terminology
B: Human or animal + standard examples
C: some attempt at structure

Level 1
A: reference to (i) with some errors of science
B: reference to Human or animal with little explanation
C: poor structure

Max L2 if only B

question	answers	extra information	mark
16			12

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 4 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–3 marks)	Level 2 (4–6 marks)	Level 3 (7–9 marks)	Level 4 (10-12 marks)
	examples of the points made in the response ***A: Description of catastrophe*** • Untreatable infections • increase in food poisoning / UTI / blood poisoning (Source D) • financial cost to UK • reduced supply of food (i.e. meat) • global spread of AR ***B: Risks and remedies*** (i) Risks Few new antibiotics / no financial incentive Widespread use in animals / No incentive for farmers to change AR spreading through foodchain Poor hygiene / waste issues Over prescription (ii) Remedies changes in trials / patents to encourage development (source B) alternative technologies (feeds) developing (source E) legislation can reduce use (source D) Some bacteria don't cause problems (source F) ***C: likelihood of decision making / politics affecting spread*** Need international agreement / cooperation Some countries leading the way to show it's possible Pressure (in UK) from Chief medical officer and Chief vet People unlikely to change because we can't see the danger / antibiotics work for now. Link to other issues			**extra information** **Level 4** A Detailed Description of possible catastrophe(s) B Identifies risks (Bi) and (appropriate) remedies (Bii) (x2) C Identifies decision making Opinion justified by evidence given **Level 3** A Description of possible catastrophe(s) 3 points from B and C Opinion justified by evidence given **Level 2** A Description of possible catastrophe B 2 points from B and C Opinion given **Level 1** A a catastrophe mentioned mention of risk / remedy / opinion