



General Certificate of Education
Advanced Level Examination
June 2010

Science in Society

SCIS4

Unit 4 Case Study

Monday 21 June 2010 1.30 pm to 3.00 pm

For this paper you must have:

- a 12-page answer book
- a copy of Pre-released source material (Sources A-E).

Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen.
- Write the information required on the front of your answer book. The **Examining Body** for this paper is AQA. The **Paper Reference** is SCIS4.
- Answer all questions in Section A and Section B.
- Write your answers in continuous prose.
- Use your own words, rather than simply repeating those used in the sources, to show your understanding of the points being made.

Information

- The additional source material (Source F) is printed on page 7 of this booklet.
- The marks for questions are shown in brackets.
- You may use a calculator.
- The maximum mark for this paper is 60. (36 marks for Section A, 24 marks for Section B)
- You will be marked on your ability to:
 - use good English
 - organise information clearly
 - use specialist vocabulary where appropriate.

Advice

- Section A: Questions on your appreciation and understanding of the Case Study Source Material on the subject of GM crops and food supply (copy provided earlier) and additional material Source F provided with this paper.
- Section B: Questions that ask you to demonstrate your ability to construct an appropriate explanation for a given audience, and seek your argued opinion on an issue raised by the case study material.

Section A

Answer **all** of the questions.

Source A is about the urgent need to ensure that everyone in Africa has enough food.

0 1 David King and Robert Watson agree that there is a problem. Explain how they disagree on the cause of the problem and the best way to solve it. *(4 marks)*

0 2 What additional issues are raised in **Source F** that are not considered in **Source A**? *(3 marks)*

Source D covers a wide range of factors that might influence the value of GM maize as a way of boosting food supply in Africa.

0 3 Select **two** pieces of evidence from **Source D** that might be used to support David King's argument in **Source A**. *(2 marks)*

0 4 Select **two** pieces of evidence from **Source D** that might be used to support Robert Watson's argument in **Source A**. *(2 marks)*

In **Source F**, Greenpeace is arguing against genetically modified crops, GMOs. The authors of the article make several claims to support their argument.

0 5 Identify **two** claims that are (or could be) supported by the results of scientific experiments. *(2 marks)*

0 6 Identify **two** claims that cannot be tested scientifically. *(2 marks)*

Scientists may publish their work in scientific papers like **Source E**, or in the form of a patent, as referred to in **Sources C** and **F**.

0 7 Explain why much of the research on new GM plants is published as patents. (2 marks)

0 8 A search, eighteen months after the publication of **Source E**, indicated that this article had been referenced by other scientists in 50 further papers.

Why is it important to scientists that their work is referenced by other scientists?
(2 marks)

Refer to the second heading in **Source D** on **page 8** of the case study material, that starts 'Insect-resistant African maize....'

0 9 What do you understand by the term *expressing* in the phrase '*expressing* one of the...Bt Cry genes'? (1 mark)

1 0 What do you understand by the term *coding* in the phrase '*genes coding* fortoxins'? (1 mark)

1 1 **Source E** (**page 10** of the case study material) refers to lepidopteran resistant GM maize.
Explain how this maize has been made lepidopteran resistant. (2 marks)

Questions 12-18 are about **Source E**.

1 2 Outline your understanding of the term 'statistically significant differences' (**page 13**, last paragraph of the case study material). (1 mark)

1 3 The authors admit there are deficiencies in some of the data they analysed.
Give **two** such deficiencies mentioned in the paper. (2 marks)

The title of this paper is, "A Meta-Analysis of Effects of Bt Cotton and Maize on Nontarget Invertebrates"

1 4 What do you understand by the term *meta-analysis*? (1 mark)

1 5 Give **one** advantage of carrying out a meta-analysis. (1 mark)

1 6 The experiments reported in **Source E** use two different sets of conditions as controls.
Identify these two conditions. (2 marks)

Turn over ►

In the introduction to **Source E** the authors say “One reason for the unrelenting controversy is that disagreements about new technologies often have little to do with scientific uncertainty but instead arise from differing personal values and differing levels of *trust in public institutions*”.

1	7
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 What role do *public institutions* play in the management of risk during the introduction of a new technology? (3 marks)

1	8
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 Suggest why some people might lack *trust* in these *public institutions*. (3 marks)

Section B

Answer both questions.

1	9
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Source C was taken from the Science Museum website in March 2009.

Imagine that you are part of a team producing the website. You have been asked to explain:

- what it means to adopt a precautionary approach
- the role of cost-benefit analysis in decision-making
- how a regulatory agency might apply these principles in the case of GM crops.

Write in a style similar to **Source C**, explaining these three different approaches to managing risk.

You may find **Source B**, the final section of **Source D**, and the discussion section of **Source E** particularly useful. *(12 marks)*

2	0
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The British Government, as part of its aid to developing countries, supports publicly-funded research into new GM crops. This includes research into forms of Bt maize that might increase yields for poor farmers in Africa.

Drawing on all that you have read in **Sources A–F**, discuss whether, as a voter and potential taxpayer, you would support or oppose this particular use of overseas aid money. *(12 marks)*

END OF QUESTIONS

There are no questions printed on this page

SOURCE F

Source: Greenpeace International, published online © Greenpeace

Say no to genetic engineering¹

While scientific progress on molecular biology has a great potential to increase our understanding of nature and provide new medical tools, it should not be used as justification to turn the environment into a giant genetic experiment by commercial interests. The biodiversity and environmental integrity of the world's food supply is too important to our survival to be put at risk.

Genetic engineering enables scientists to create plants, animals and micro-organisms by manipulating genes in a way that does not occur naturally.

These genetically modified organisms (GMO) can spread through nature and interbreed with natural organisms, thereby contaminating non 'GE' environments and future generations in an unforeseeable and uncontrollable way.

Their release is 'genetic pollution' and is a major threat because GMOs cannot be recalled once released into the environment.

Because of commercial interests, the public is being denied the right to know about GE ingredients in the food chain, and therefore losing the right to avoid them despite the presence of labelling laws in certain countries.

Biological diversity must be protected and respected as the global heritage of humankind, and one of our world's fundamental keys to survival. Governments are attempting to address the threat of GE with international regulations such as the Biosafety Protocol.

We believe:

GMOs should not be released into the environment as there is not adequate scientific understanding of their impact on the environment and human health.

We advocate immediate interim measures such as labelling of GE ingredients, and the segregation of genetically engineered crops and seeds from conventional ones.

We also oppose all patents on plants, animals and humans, as well as patents on their genes. Life is not an industrial commodity. When we force life forms and our world's food supply to conform to human economic models rather than their natural ones, we do so at our own peril.

¹genetic engineering, GE, means the same as genetic modification, GM.

There are no questions printed on this page