



General Certificate of Education  
Advanced Level Examination  
June 2011

## Science in Society

## SCIS4

### Unit 4 Case Study

Friday 17 June 2011

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.
- 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 5 of this booklet.
- The maximum mark for this paper is 60 (36 marks for Section A, 24 marks for Section B).
- You may use a calculator.
- You will be marked on your ability to:
  - use good English
  - organise information clearly
  - use specialist vocabulary where appropriate.

**Advice**

- Section A: Questions testing your appreciation and understanding of the Case Study Source Material on the subject of DNA and human rights (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.

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**Section A**

Answer **all** of the questions.

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**Source A** describes how DNA fingerprinting is carried out.

**0 1** **Source A** refers to “junk” DNA... Give **two** differences between junk DNA and an ‘essential gene’. (2 marks)

**0 2** Suggest why random variations in junk DNA are relatively common. (2 marks)

**Source B** and **Source C** both mention the need to balance the needs of individuals and society.

**0 3** **Source B** argues that protecting people from potential criminals is more important than protecting the privacy of individuals. Identify **two** key points from **Source B** that support this point of view. (2 marks)

**0 4** **Source C** argues that protecting privacy is more important. Identify **two** key points from **Source C** that support this point of view. (2 marks)

Questions 5 and 6 are about **Source D**.

**0 5** The scientists who wrote this letter believe that it is important to give researchers access to the NDIS database. From paragraphs 3 and 4 identify **two** of the investigations they would like to carry out and suggest why these might be useful. (4 marks)

In paragraph 6, **Source D** says ‘Law enforcement should honor the norms of science’. The ‘norms of science’ are the principles and ideas that underlie how scientists work.

**0 6** Describe two ‘norms of science’ and explain how crime laboratories would benefit from using them. (4 marks)

**Source E** describes how different family relations will match different proportions of DNA

**0 7** Using paragraphs 17 and 18 from **Source E** to help you, briefly explain how this leads to a different frequency of DNA fingerprint matches between father and child compared with those obtained for unrelated people. (4 marks)

**0 8** How could the use of ‘familial searching’ described in **Source E** lead to the potential conviction of a person based on the DNA of a family member? (4 marks)

According to **Source E** the US National DNA Index System looks for matches in 13 areas of short tandem repeats (STRs) of DNA. By comparison the UK DNA database looks for matches in 10 STRs of DNA.

- 0 9** Why do you think that it is considered acceptable to use fewer STR matches in the UK DNA database? You may find paragraphs 19 and 20 from **Source E** useful to help you answer this question. (2 marks)

In paragraph 27, **Source E** says 'Algorithms could be created easily to look for both parent-child and sibling-sibling matches.' One such algorithm was patented by a professor carrying out research at a US university.

- 1 0** Why might scientists in a university want to publish research findings in the form of patents instead of in a peer-reviewed journal? (2 marks)

**Source F** reports a speech by Sir Alec Jeffrey to the Commons Home Affairs Select Committee. It was published in *The Daily Mail* newspaper.

- 1 1** Using **Source F**, identify **two** quotes which highlight **two** of Sir Alec's concerns about the DNA database. (2 marks)

- 1 2** Is the title used by *The Daily Mail* in **Source F** justified by the information in the article? Explain your answer. (2 marks)

- 1 3** The Commons Home Affairs Select Committee is made up of MPs from the three largest parties whose task is to examine administration and policy of the Home Office. They take evidence from many different groups.

What factors, other than the details of the science, might the committee take into account when making recommendations on scientific issues such as the use of DNA fingerprinting? (4 marks)

**Turn over for the next question**

**Turn over ►**

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**Section B**

Answer **both** questions.

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DNA information is used in a number of court cases. Write a summary of the science behind 'DNA fingerprinting' suitable for a juror who was going to be on the jury of such a case.

You should include information about:

- genes and DNA
- creating a DNA fingerprint
- matching a sample of crime scene DNA with a suspect's DNA.
- the limitations of DNA information.

You may wish to include diagram(s) to help your explanation. You may find **Source A**, **Source D** and paragraphs 6 to 11 of **Source E** useful.

(12 marks)

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It has been suggested that the DNA database would be most effective if all members of society were included on it. They would not need to have been suspected or convicted of any crime or other offence.

Do you think that the UK should introduce such a universal DNA database?

You should draw on what you have read in **Sources A – F**, as well as your own knowledge and understanding, to explain your argument and justify your opinion.

(12 marks)

**END OF QUESTIONS**

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**Source F**

Adapted from an article by Colin Fernandez, *The Daily Mail*, 4 February 2010

**DNA database ‘is causing suicides’, MPs are warned**

Keeping profiles of the innocent on the DNA database causes immense distress and has even led to suicide, the pioneer of fingerprinting technology warned MPs yesterday.

Sir Alec Jeffreys, who invented the use of DNA to fight crime, said storing these records could lead to ‘an unfair presumption of guilt’.

The DNA database for England and Wales holds over five million profiles with around one million having no criminal conviction. Sir Alec told the Commons Home Affairs Select Committee he had been frequently contacted by innocent people on the database to say how distressed they were and he called for their records to be removed immediately.

In July 2008, Robert Chong, 41, committed suicide because of the ‘shame’ of being put on the database after he was falsely accused of exposing himself to a woman, he said. A cursory check of CCTV tapes would have demonstrated his innocence. His only interaction with the woman had been when she swore at him on the station concourse. Mr Chong later became withdrawn and told his mother: ‘I’m on the criminal database now, I have got a record,’ before killing himself in July 2008.

Sir Alec said: ‘I want the balance to be struck. I have not heard anything about the rights of the innocent victim, and the distress at being branded a criminal. Innocent people on the database are being used inefficiently to solve future crimes – and that goes against their civil rights.’

‘If you took one million profiles off the database and replaced them with one million randomly selected profiles, would detections rise?’

The European Court of Human Rights has ruled that holding the profiles of innocent people indefinitely was disproportionate and a breach of privacy rights. The Government proposes to hold innocent profiles for six years, but Sir Alec believes this is excessive.

He said: ‘I want to get rid of the DNA of innocent people [from the database] it is as simple as that.’

The DNA database had developed ‘sinister mission creep’ which ‘had taken it away from being a crime fighting tool to one that threatens to undermine public confidence’ he said since it was set up.

The police can take a DNA sample from anyone arrested for a recordable offence.

Last month a Home Office minister revealed that just 377 profiles were deleted in 2009 from the national DNA database after appeals to police chiefs.

**END OF SOURCE F**

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Source F [www.dailymail.co.uk](http://www.dailymail.co.uk), 4 February 2010.

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