



General Certificate of Education
Advanced Level Examination
January 2010

General Studies (Specification A)

GENA4

Unit 4 A2 Science and Society

Tuesday 2 February 2010 9.00 am to 11.00 am

For this paper you must have:

- a copy of the Pre-release Case Study Source Material (enclosed)
- a 12-page answer book.

Time allowed

- 2 hours

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 GENA4.
- Answer **five** questions. Answer **all** questions in Section A and **one** question from Section B.
- Use your own words, rather than simply repeating those used in the sources, to show your understanding of the points being made.

Information

- The maximum mark for this paper is 70 (45 for Section A and 25 for Section B).
- This paper consists of **two** sections.
Section A contains four compulsory questions based on the pre-release Case Study Source Material provided earlier and the new source provided in this examination paper (a new copy of the pre-release material is provided as an insert to this question paper).
Section B contains four alternative essay questions based on Science and Society.
- Write your answers in continuous prose as if you are addressing the intelligent general reader. You will be marked on your ability to use good English, to organise information clearly and to use specialist vocabulary where appropriate.
- Where appropriate use examples to illustrate your answer.

SECTION A

Answer **Questions 1 to 4** using pre-release **Sources A to E** and new **Source F** provided below.

The total for this section is 45 marks.

SOURCE F

Nuclear waste could power Britain

A plan by the nuclear industry to build a £1bn fuel processing plant at Sellafield is being backed by the government's chief scientist. The plant would turn the UK's 60 000 tonnes of high-level nuclear waste into reactor fuel that will provide 60% of this country's electricity until 2060, it is claimed. 'We can bury our reactor waste or we can treat it and then use it as free fuel for life,' said the cabinet's chief scientific adviser, Sir David King. 'It's a no brainer.'

But the plan is controversial. A report by the Nuclear Decommissioning Authority, which operates the Cumbrian plant and backs the plan, acknowledges that the move could have 'downside' economic costs, although it stresses that it has many benefits. In addition, green groups say the move would lead to the creation of a 'plutonium economy' in Britain that would see large quantities of nuclear fuel being transported across the country.

The reprocessing plant would cost several billion pounds. According to Roger Higman of Friends of the Earth, 'There is no economic justification for the plan. It would just be another massive subsidy for the nuclear industry. We should invest in renewables'.

But this criticism is firmly rejected by King. He has already helped persuade the government to back a new UK reactor construction programme due to be approved in the New Year. 'A UK citizen is responsible for emitting 11 tonnes of carbon a year on average,' he said. 'In France the figure is 6 tonnes – because France relies on nuclear power, which produces virtually no carbon dioxide.'

But building new reactors is controversial. Apart from the high construction costs, analysts say uranium could become scarce and expensive, with supplies from Canadian and Australian mines drying up in the next 20 years. Reactors would then have no fuel.

This prospect is dismissed by King. 'We have a massive reserve of high-grade plutonium and uranium in Sellafield's nuclear waste,' he said. That stockpile – generated by Britain's reactors since the 1950s – contains 6 tonnes of plutonium and about 60 of uranium, however, it is mixed up with other radioactive reactor by-products.

To make nuclear fuel from this waste, its plutonium and uranium would have to be extracted, a task that can be achieved using Sellafield's Thorp reprocessing plant, though it will require a £1bn refurbishment to achieve this, said King. Alternatively, a new reprocessing plant will have to be built.

Then the plutonium and uranium will have to be turned into a fuel called mox, or mixed oxide. A plant to make mox could cost a further £1bn, or Sellafield's existing mox plant could be refurbished at a similar cost. Once these two plants – Thorp and mox – are ready, the 60 000 tonnes of nuclear waste, the leftovers of fuel production work and other radioactive material that has accumulated from Britain's nuclear energy programme, could be processed.

The resulting fuel rods and pellets could then be burned in nuclear reactors over the next few decades. In turn, the waste could be burned in a new generation of power plants called fast breeder reactors. Under this scheme, Britain would be near self-sufficient in nuclear fuel for the rest of the century. However, any decision on such a programme is a matter for the government.

Source: Adapted from ROBIN MCKIE, 'Nuclear waste could power Britain', *The Observer*, 23 December 2007

- 1 How far do the data and other information in **Source A** support the claim that building more nuclear power plants is an essential part of Britain's energy policy for the 21st century?
(11 marks)

- 2 Using information from **Sources B** and **C** examine the difficulties of extending Britain's capacity to produce more nuclear power.
(12 marks)

- 3 Using evidence from **Source D** and your own knowledge assess the likelihood of the use of nuclear weapons in the future.
(11 marks)

- 4 Using information from **Sources E** and **F** and your own knowledge, discuss the issues surrounding the disposal of nuclear waste in Britain.
(11 marks)

Turn over for Section B

Turn over ►

SECTION B

Answer **one** question from **5** to **8**.

There are 25 marks for each question.

Where appropriate use examples to illustrate your answer.

EITHER

- 5** ‘Unlike governments, pressure groups such as Friends of the Earth and Greenpeace are not representative, nor are they responsible to anyone. Often they are little more than trouble makers.’

To what extent do you agree with this statement?

Discuss the difficulties in reaching general agreement about policies to protect the environment.

OR

- 6** ‘Societies cannot advance without the research and development undertaken by scientists and technologists. Unfortunately, the effects of their work are not always positive.’

Explain why the results of the work of scientists and technologists may not always be considered positive.

Discuss the difficulties that scientists and technologists face in demonstrating that they are exercising moral responsibility.

OR

- 7** ‘The future lies in a better educated and better trained workforce and a concentration of resources and investment in more prosperous parts of the United Kingdom.’

Examine what might be meant by a ‘better educated and better trained workforce’.

Discuss the idea of concentrating resources and investment in more prosperous parts of the United Kingdom.

OR

- 8** ‘The days when an individual country could determine its own energy policies have gone. The future lies in co-operation between countries, rather than competition and rivalry.’

Explain why co-operation between countries might be necessary for the successful development of energy policies.

Discuss the difficulties involved in securing international co-operation rather than competition and rivalry.

END OF QUESTIONS