



General Certificate of Education  
Advanced Level Examination  
June 2014

## Science in Society

## SCIS4

### Unit 4 Case Study

Monday 23 June 2014 9.00 am to 10.30 am

**For this paper you must have:**

- an AQA 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 **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 shale gas and hydraulic fracturing (fracking) (copy provided earlier) and additional material **Source F** provided with the 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 Source Material.

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**Section A**

Answer **all** of the questions.

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**Source B**

**0 1** After the Blackpool earthquakes (described in **Source A**) the Department of Energy and Climate Change asked three experts to make an assessment of the risks due to fracking. These experts were not employed by the government or the fracking company.

Suggest why it is important to have an independent assessment of the risks.

**[2 marks]**

**0 2** The author of **Source B** identifies areas of concern relating to the use of fracking. One of these areas of concern is the increased risk of earthquakes during fracking.

Choose **one** other area of concern and summarise what the author of **Source B** thinks the issues are.

**[2 marks]**

**Source C**

The author of **Source C** opposes fracking.

**0 3** **Source C** also identifies arguments which can be used to support the development of fracking.

According to the author of **Source C**, what are the main reasons to support fracking?

**[2 marks]**

**0 4** The author of **Source C** is a journalist. He strengthens the force of his arguments with words and phrases designed to influence the feelings and attitudes of his readers.

Identify **two** examples of the author's use of language to strengthen the force of his arguments and explain how each example might influence readers' opinions.

**[4 marks]**

**Source B and Source C**

**0 5** The authors of **Source B** and **Source C** both suggest that fracking is more acceptable to the public in the US than it will be in the UK.

Discuss possible reasons, given in **Source B** and **Source C**, for this difference.

**[4 marks]**

**Source D**

**0 6** What is meant by the phrase **low carbon economy**? [2 marks]

**0 7** What is meant by the phrase **potent greenhouse gas**? [2 marks]

**Source D and Source E**

**0 8** In **Source D**, Mr Davey said 'My decision is based on the evidence.'

Identify **four** examples from **Source D** and **Source E** that show the range of evidence, and other factors, that Mr Davey might take into account when making a policy decision about fracking.

[4 marks]

**0 9** Regulation of shale gas extraction by fracking is mentioned in most of the recommendations in **Source E**.  
With the help of the Summary and the Recommendations sections, explain why regulators are needed to control fracking. [2 marks]

The Summary and Recommendations 6 and 7 of **Source E** refer to risk and risk management.

**1 0** Explain what is meant by the term **risk**. [2 marks]

**1 1** Explain why it is difficult to assess the risk of a new technology such as fracking. [2 marks]

**1 2** Explain why the principle of 'As Low As Reasonably Practicable' (ALARP) is used in risk management. [4 marks]

**Source F**

**1 3** How does **Source F** provide evidence of collaboration in science? [2 marks]

**1 4** The research paper in **Source F** was reviewed by two other scientists before publication. Explain why peer review is important in science. [2 marks]

Turn over ▶

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**Section B**

Answer **both** questions.

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1	5
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Write an article about the importance of reducing greenhouse gases and how fracking could affect the emission of greenhouse gases in the UK.

You may find **Source C** and sections 1.3 and 8.2 of **Source E** useful in your answer.

**[12 marks]**

1	6
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Do you think that the risks of fracking are justified in the UK?

Explain your answer using information from the sources, as well as knowledge from your study of Science in Society, to support your argument.

**[12 marks]**

**END OF QUESTIONS**

**Source F:** Abstract from a research paper.



Contents lists available at SciVerse ScienceDirect

## Marine and Petroleum Geology

journal homepage: [www.elsevier.com/locate/marpetgeo](http://www.elsevier.com/locate/marpetgeo)



### Hydraulic fractures: How far can they go?

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#### ABSTRACT

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##### Keywords:

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The maximum reported height of an upward propagating hydraulic fracture from several thousand fracturing operations in the Marcellus, Barnett, Woodford, Eagle Ford and Niobrara shale (USA) is ~588 m.

Of the 1170 natural hydraulic fracture pipes imaged with three-dimensional seismic data offshore of West Africa and mid-Norway it is ~1106 m. Based on these empirical data, the probability of a stimulated and natural hydraulic fracture extending vertically >350 m is ~1% and ~33% respectively. Constraining the probability of stimulating unusually tall hydraulic fractures in sedimentary rocks is extremely important as an evidence base for decisions on the safe vertical separation between the depth of stimulation and rock strata not intended for penetration.

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**END OF SOURCE F**

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