



**ADVANCED GCE**  
**GEOLOGY**  
 Environmental Geology

**F794**

Candidates answer on the Question Paper

**OCR Supplied Materials:**  
 None

**Other Materials Required:**

- Electronic calculator
- Ruler (cm/mm)

**Friday 29 January 2010**  
**Morning**

**Duration: 1 hour**



Candidate Forename		Candidate Surname	
--------------------	--	-------------------	--

Centre Number						Candidate Number				
---------------	--	--	--	--	--	------------------	--	--	--	--

**INSTRUCTIONS TO CANDIDATES**

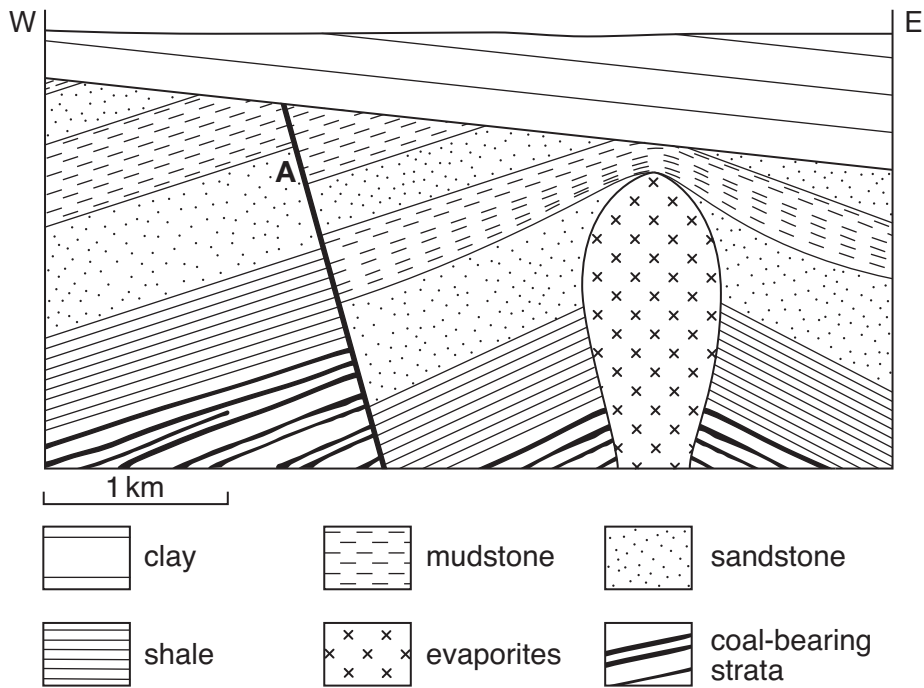
- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

- 1 (a) The geological cross section below was drawn from the results of a detailed geophysical survey of an area where hydrocarbons are thought to be trapped.



(i) State the type of fault shown on the cross section.  
 ..... [1]

(ii) A fault trap has been located at **A** on the cross section. Give **two** reasons why hydrocarbons are likely to be found at this location.  
 .....  
 .....  
 .....  
 ..... [2]

(iii) Explain why this trap is likely to contain only natural gas.  
 .....  
 ..... [1]

(iv) Clearly label on the cross section with letters **B** and **C** the positions of **two** other types of hydrocarbon trap. [2]

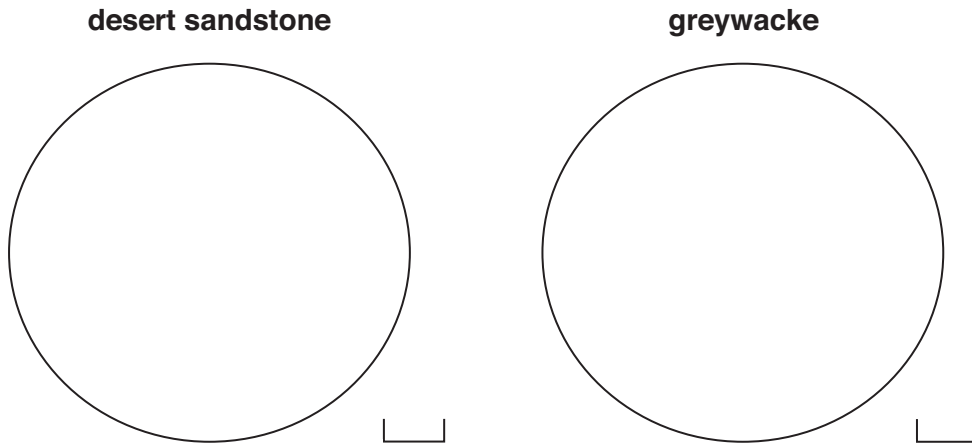
(v) Name the types of traps you have marked at **B** and **C**.

*In your answer, you should use appropriate technical terms, spelled correctly.*

**B** ..... **C** ..... [2]



- (b) (i) Draw labelled thin section diagrams to compare the textures of a poorly cemented desert sandstone and a greywacke. Add a scale.



- (ii) Assess the two rock types you have drawn to suggest their suitability as reservoir rocks for oil and natural gas. Give reasons for your answer.

.....  
.....  
.....  
..... [2]

- (c) The Athabasca tar sands of northern Canada are a source of unconventional petroleum. They are estimated to contain 1 700 billion barrels of oil with recoverable reserves calculated to be 173 billion barrels.

- (i) Define the term *reserves*.

.....  
..... [1]

- (ii) Calculate the recoverable reserves of oil in the Athabasca tar sands as a percentage of the total oil present. Give your answer to the nearest whole number.

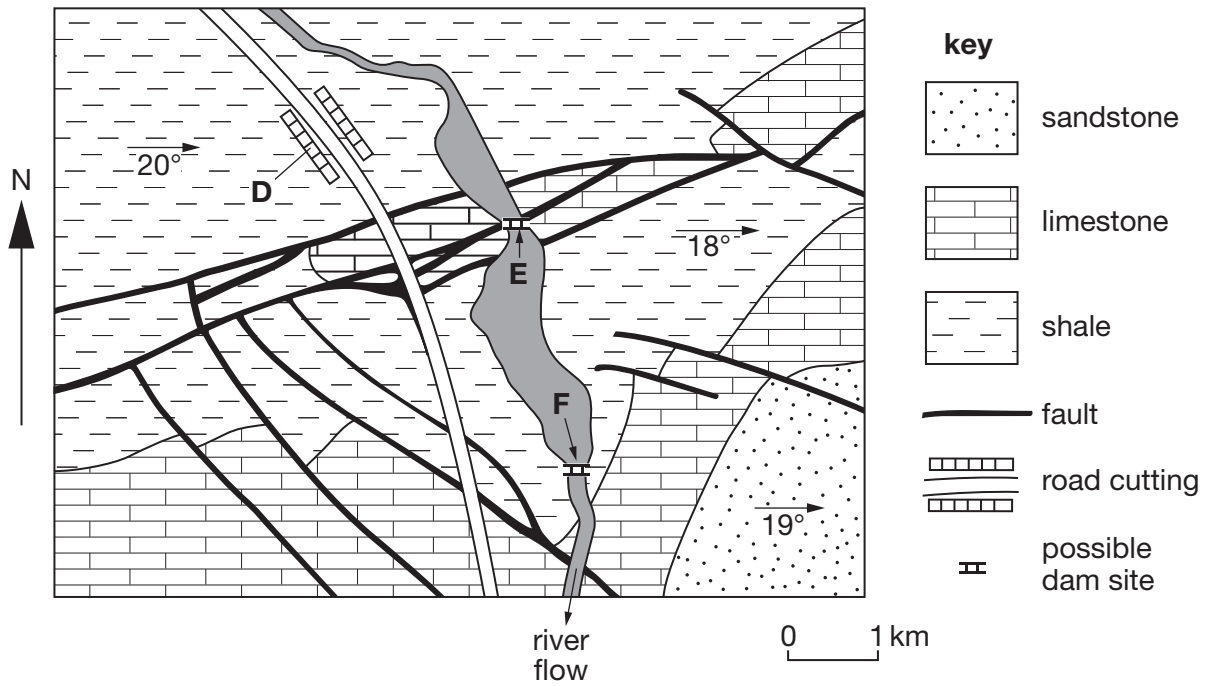
..... % [1]

- (d) Explain why petroleum from unconventional sources is unlikely to be able to completely make up any shortfall in oil and natural gas production.

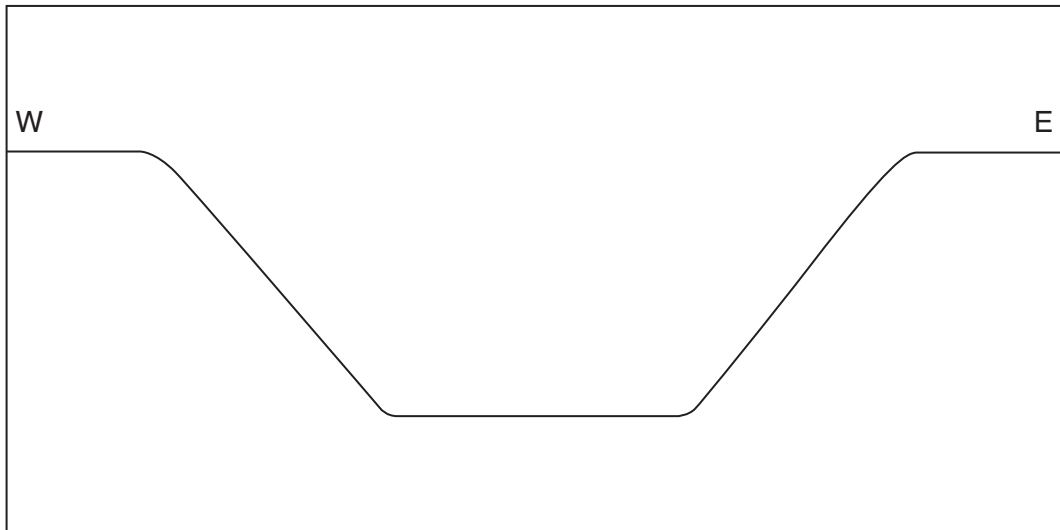
.....  
.....  
.....  
..... [2]

[Total: 17]

2 Study the geological map below.



- (a) There is a road cutting at site **D** shown on the map above.
- (i) The beds on the western side dip towards the road cutting. Complete and label the diagram below to show the geological problem that may occur.



[2]

- (ii) Explain **one** reason why this problem will be worse if the rocks forming the sides of the road cutting are deeply weathered.

.....

..... [1]

(b) Sites **E** and **F** shown on the map are two possible locations for the construction of a dam and reservoir for water supply.

(i) Use the geological information on the map to evaluate which site, **E** or **F**, would be the best choice for the proposed dam and reservoir. Explain your answer.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) The proposed dam will be constructed of concrete. Describe the geological materials used in the manufacture of concrete.

.....

.....

.....

..... [2]

(c) Ground improvement methods can be used to stabilise rocks and prevent leakage of water. Using the list below, complete the table by inserting the **most** suitable ground improvement method for each application.

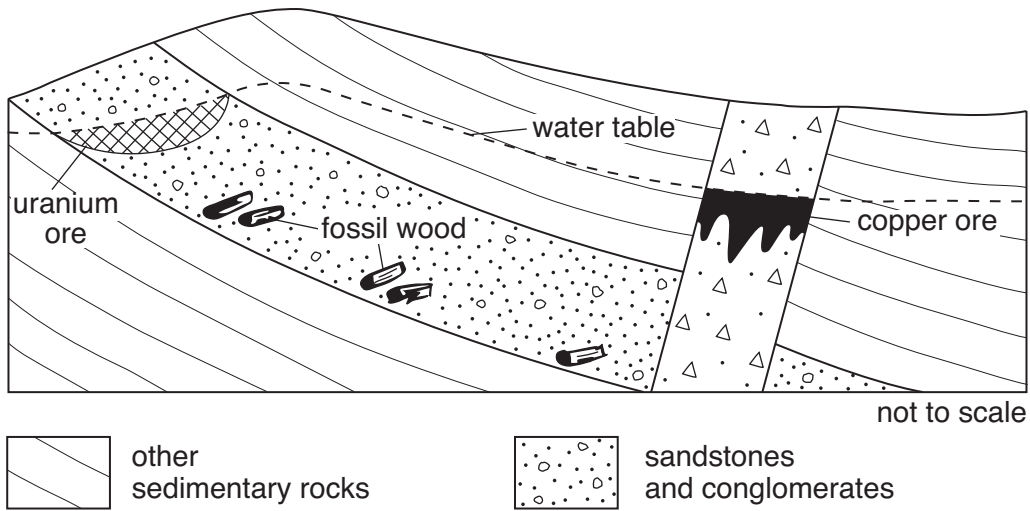
- cut off curtain    gabions    rock bolts    shotcrete    slope modification**

ground improvement method	application
	pin loose blocks of competent rock to the sound rock behind, to prevent rock falls
	protect the surface of the sides of a road cutting from weathering and reduce permeability
	give lateral toe support to the sides of a road cutting through shale
	impermeable barrier to prevent leakage of water under a dam

[4]

[Total: 12]

3 The diagram below shows a geological cross section through an area where there are ore deposits of copper and uranium located below the water table.



(a) (i) Describe and explain how secondary enrichment of copper occurs below the water table.

.....  
 .....  
 .....  
 .....  
 ..... [3]

(ii) Why is secondary enrichment important to the economics of a copper mining operation?

.....  
 ..... [1]

(b) (i) Describe and explain how uranium deposits form in sandstones and conglomerates.

.....  
 .....  
 .....  
 ..... [2]

(ii) What is the significance of the fossil wood in the sandstone and conglomerate unit?

.....  
 ..... [1]

(c) Describe how underground mining of metals can affect groundwater quality.

.....  
.....  
.....  
..... [2]

(d) Uranium is used as the energy source in nuclear power stations.

(i) Give **one** reason why the disposal of nuclear waste can cause problems.

.....  
..... [1]

(ii) Outline the key requirements for safe storage of nuclear waste in an underground repository in rocks.

.....  
.....  
.....  
.....  
.....  
..... [3]

[Total: 13]

- 4 (a) Describe the climatic and environmental conditions required for the formation of peat and coal.

.....

.....

.....

.....

.....

.....

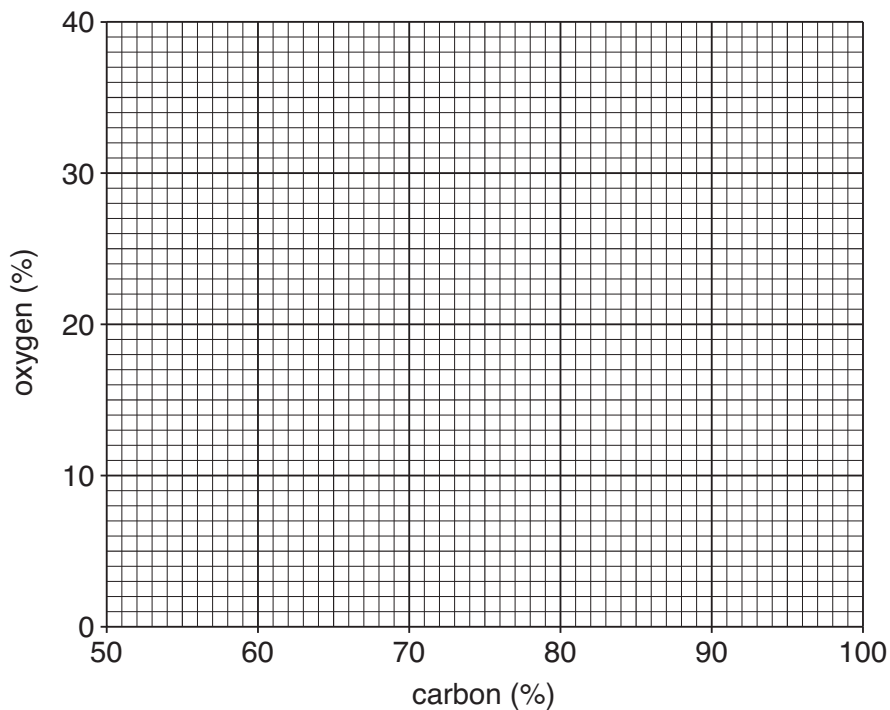
.....

..... [3]

- (b) The data in the table shows the changes in carbon and oxygen content with rank.

rank	carbon (%)	oxygen (%)
peat	52	31
lignite	66	21
bituminous coal	83	9
anthracite	93	3

- (i) Plot a line graph of the data on the grid below.



[2]





(ii) Describe and explain the process responsible for these changes in composition.

*In your answer, you should use appropriate technical terms, spelled correctly.*

.....  
.....  
.....  
..... [2]

(iii) Why is anthracite more valuable than lignite?

.....  
..... [1]

(c) Explain why:

(i) coal is an example of a non-renewable energy resource.

.....  
..... [1]

(ii) geothermal energy is an example of a renewable energy resource.

.....  
..... [1]

**[Total: 10]**





**PLEASE DO NOT WRITE ON THIS PAGE**



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.