

Tuesday 6 June 2017 – Afternoon

A2 GCE GEOLOGY

F794/01 Environmental Geology

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour




| | | | | | | | | | | |
|-----------------------|--|----------------------|--|--|--|------------------|--|--|--|--|
| Candidate forename | | Candidate surname | | | | | | | | |
| Centre number | | | | | | Candidate number | | | | |

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

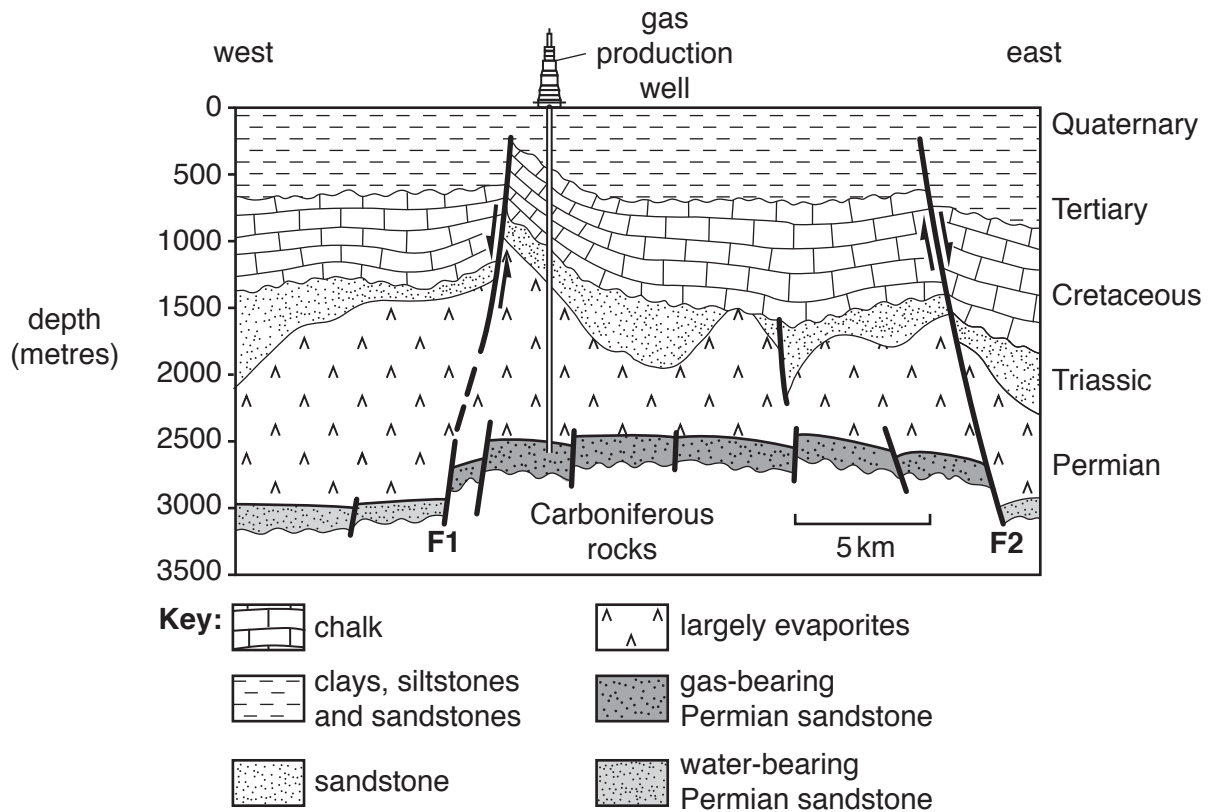
INFORMATION FOR CANDIDATES

- 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 **16** pages. Any blank pages are indicated.

Answer **all** the questions.

- 1 The Groningen gas field in the southern North Sea supplies 15.1% of the UK's imported natural gas.

(a) The cross-section diagram below shows the geology of the Groningen gas field.



- (i) The gas is found in Permian desert sandstones. State the term used for a rock that stores gas or oil.



In your answer, you should use the appropriate technical term, spelled correctly.

..... [1]

- (ii) Describe and explain the properties of a desert sandstone that allow it to store and yield economic quantities of gas.

..... [2]

- (iii) The majority of the gas is trapped between faults **F1** and **F2**. Identify the type of fault structure between these two faults and explain why gas is found at this location.

.....

.....

.....

.....

.....

.....

..... [3]

- (b) (i) Describe methods that could be used to extract gas from the production well shown on the cross-section diagram.

.....

.....

.....

..... [2]

- (ii) The Groningen field has reserves of 780 000 million m³ of gas. Monthly gas production is 4090 million m³. Calculate how many years the reserves will last at the current rate of production. Give your answer to **one** decimal place.

..... years [1]

- (c) Gas is transported from the Groningen field to Britain by submarine pipeline. Describe **one** technological and **one** safety issue of transporting gas by submarine pipeline.

.....

.....

.....

..... [2]

- (d) Underground gas storage facilities have been developed in Britain to store gas within rocks until it is needed. Name and describe **one** type of underground gas storage facility in rock.

.....

.....

.....

..... [2]

[Total: 13]

Turn over

- 2 (a) (i) Describe how residual deposits of bauxite form as a result of chemical weathering.

.....

.....

.....

.....

..... [2]

- (ii) Name and explain **two** factors that control the rate of chemical weathering and the formation of residual deposits.

.....

.....

.....

..... [2]

- (b) (i) Describe and explain **one** physical and **one** chemical property of diamond that allow it to be concentrated in placer deposits.

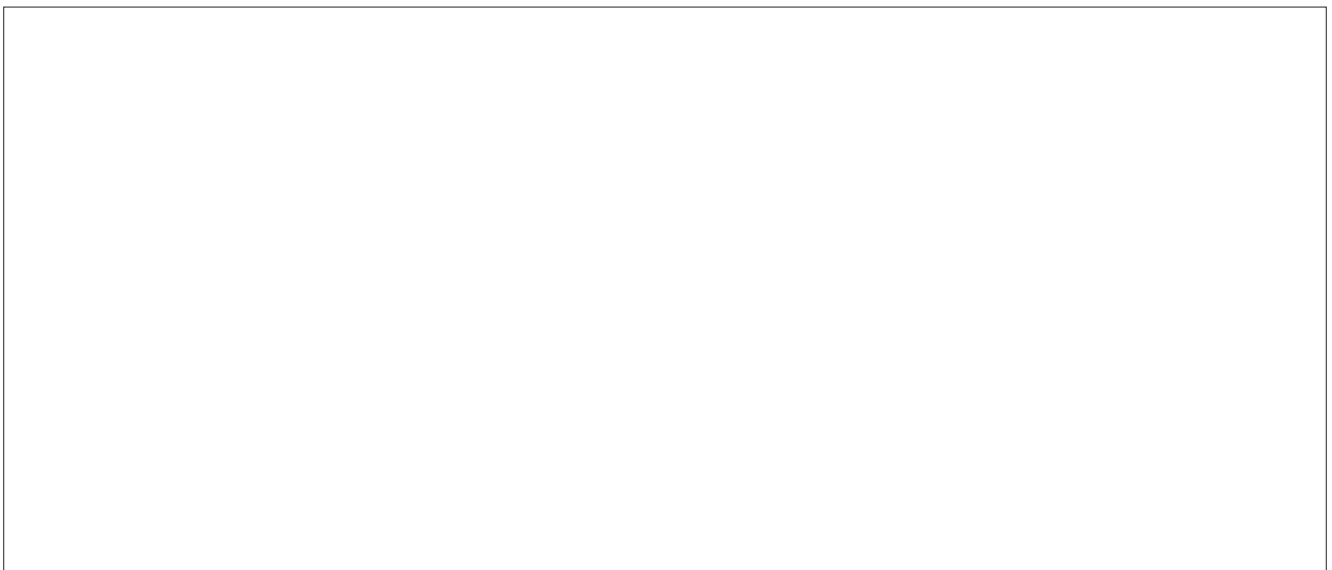
.....

.....

.....

..... [2]

- (ii) Draw a labelled cross-section diagram to show how placer deposits can form on beaches.



[2]

- (iii) Name and describe a mining method that could be used to extract a placer deposit at the surface.

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

- (iv) Explain **one** advantage and **one** disadvantage of mining placer deposits at the surface compared to mining underground ore deposits.

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

- (c) Explain how mining metallic mineral ores can result in the environmental problem of acid mine drainage water.

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

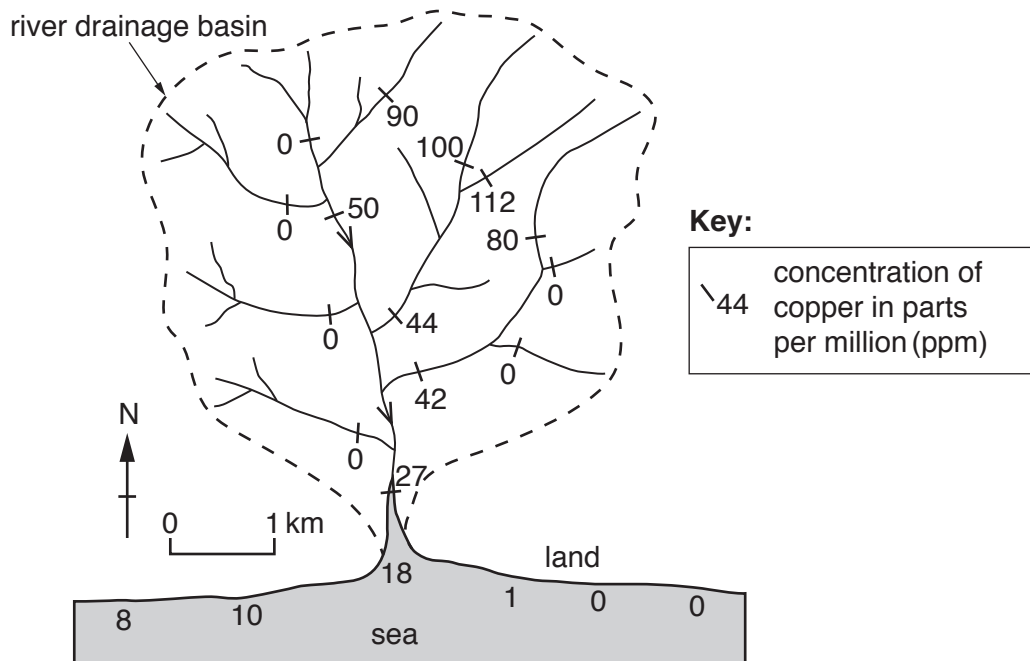
- (d) Mineral processing also has environmental consequences. Describe the environmental consequences of **two** named mineral processing operations.

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

[Total: 16]

- 3 Geochemical surveys can be used to explore for metallic mineral deposits and to identify environmental problems.

- (a) A stream sediment survey was carried out in an area to explore for copper ore deposits. The results of chemical analyses for copper are plotted on the map below. Values above 70 parts per million copper are significant.



- (i) In geochemical exploration, what name is given to a concentration of metal above its normal background value?



In your answer, you should use the appropriate technical term, spelled correctly.

..... [1]

- (ii) On the map above, shade the area where an economic copper ore deposit is most likely to be found. [1]

- (iii) Explain why the copper values in the stream sediments decrease downstream.

..... [1]

- (iv) Describe and explain the variation in copper values in the sediments along the coast.

..... [2]

(b) Geochemical surveys have detected radon at the surface above granite rocks.

(i) Explain how radon is produced from granite.

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

(ii) Explain why radon is considered to be a hazard.

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

(iii) Assess how the risk from radon at the surface would differ if recent superficial deposits overlying the granite were sand and gravel rather than clay. Explain your answer.

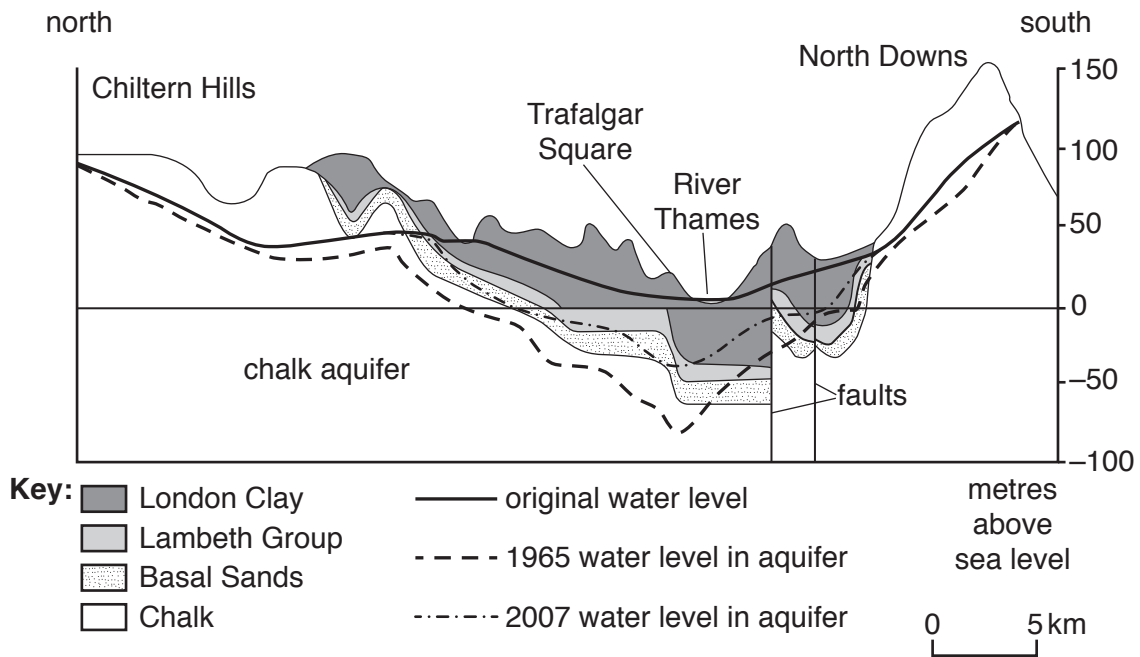
.....
.....
.....
..... [2]

[Total: 10]

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

- 4 The diagram below shows a cross-section through the London Basin chalk aquifer.



- (a) (i) What difference would there be in the chalk rock above and below the water table in the aquifer?

..... [1]

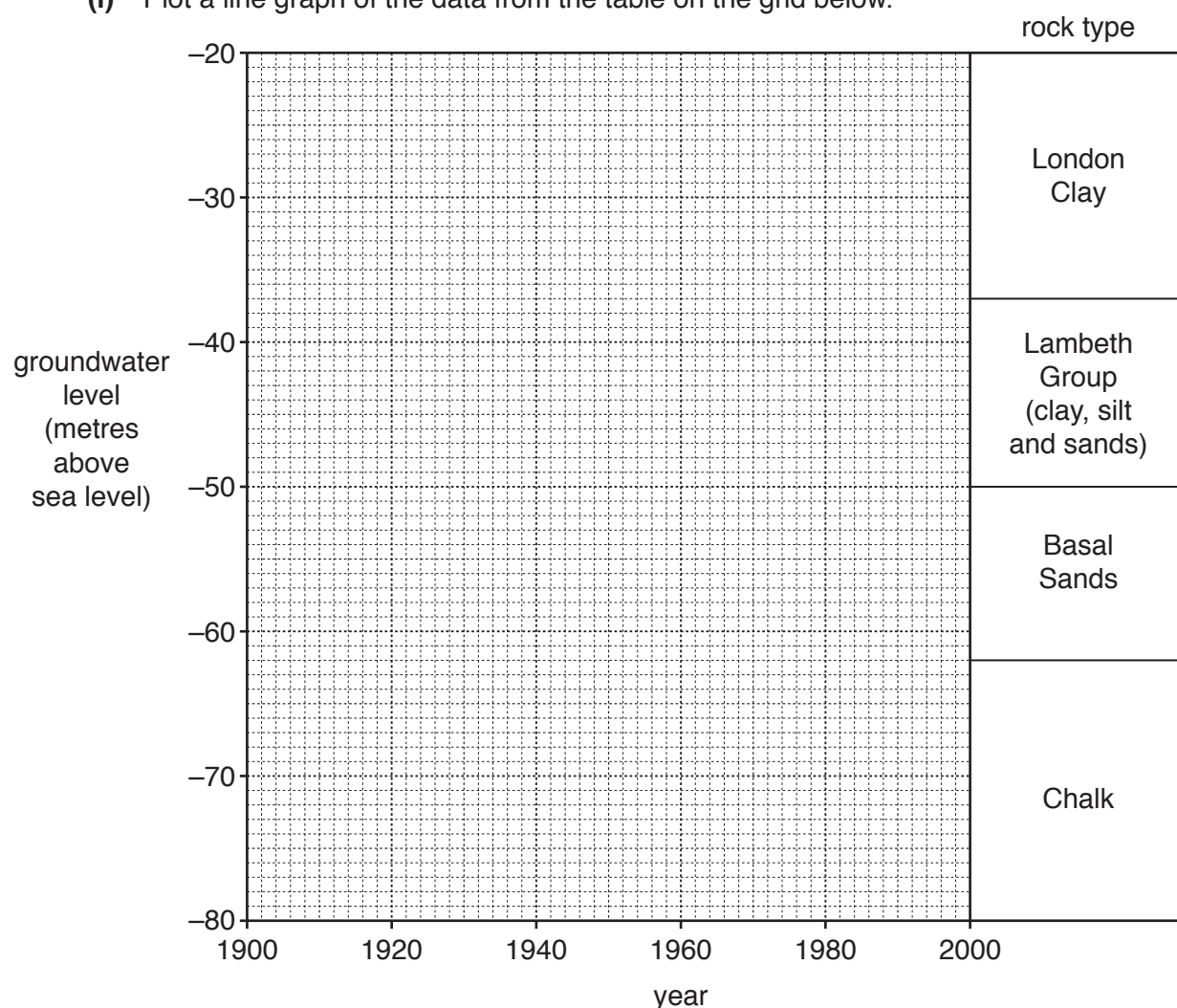
- (ii) Water fountains were installed in Trafalgar Square in central London in 1843. Explain why water in the fountains initially flowed naturally without the need for pumping.

..... [1]

- (b) The Trafalgar Square borehole is one of a number of boreholes used to monitor groundwater levels within the London Basin. The table below shows groundwater levels measured in the Trafalgar Square borehole from 1900 to 2000.

| Year | Groundwater level (metres above sea level) |
|------|---|
| 1900 | −47 |
| 1910 | −58 |
| 1920 | −64 |
| 1930 | −70 |
| 1940 | −75 |
| 1950 | −80 |
| 1960 | −78 |
| 1970 | −80 |
| 1980 | −65 |
| 1990 | −56 |
| 2000 | −34 |

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



[2]

- (ii) During which decades was the water level in the Trafalgar Square borehole more than 75 metres below sea level for some of the time?

.....
 [1]

- (iii) Describe and explain the problem that occurred to the land surface during this time period.

.....

 [2]

- (iv) What affect could this problem have on the water storage capacity of the chalk aquifer? Explain your answer.

.....

 [2]

- (c) Most of London's water supply now comes from surface water sources. Groundwater levels under London have risen to such an extent that parts of the London Clay have become saturated.

- (i) Explain why clay can become saturated with water.

.....
 [1]

- (ii) Suggest **one** problem that could affect the buildings or infrastructure of London if groundwater levels continue to rise.

.....
 [1]

- (d) Describe **one** advantage and **one** disadvantage of using surface water rather than groundwater sources for drinking water supplies.

.....

.....

.....

..... [2]

[Total: 13]

- 5 Geological materials are used for building and construction. Describe and explain the characteristics of named geological materials that make them suitable for the following uses:
- building stone
 - bricks
 - cement and concrete.

[8]

[Total: 8]

[illegible]

Oxford Cambridge and RSA

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 and is freely available to download from our public website (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.