

Friday 18 January 2013 – 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	
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Centre number							Candidate number				
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INSTRUCTIONS TO CANDIDATES

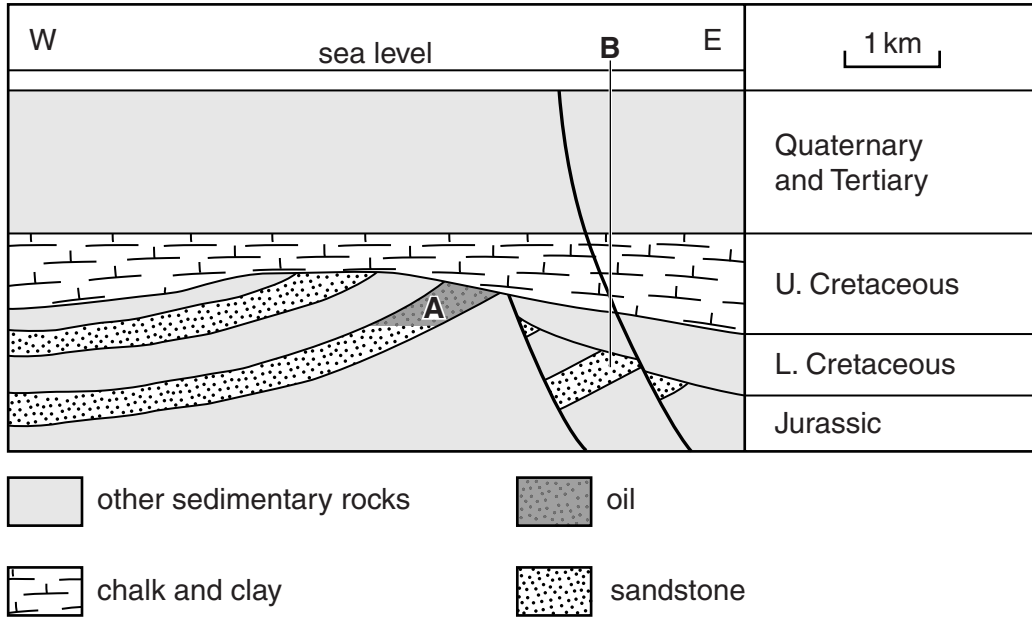
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting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

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 cross-section below shows the structure of the Brent oil field in the northern basin of the North Sea.



- (i) Name the main source rock for oil in the northern basin of the North Sea.

..... [1]

- (ii) What type of trap is shown at location **A** on the cross-section?



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

..... [1]

- (iii) Explain why oil has been trapped at this location.

.....

 [2]

- (iv) Suggest why an exploration borehole at **B** failed to locate economic quantities of oil and gas.

.....
 [1]

(b) (i) Describe how an oil well is put into production and the oil is extracted by primary recovery.

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

(ii) The most common method of secondary oil recovery is to inject water into the reservoir rock. Why is this done?

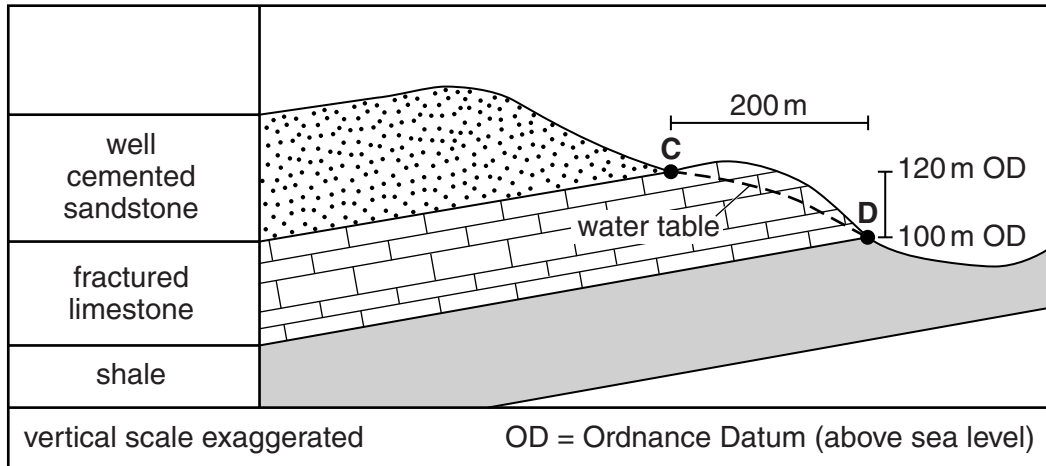
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..... [1]

(iii) Describe and explain how detergents and bacteriological techniques can be used in secondary and enhanced recovery of oil.

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..... [2]

[Total: 11]

2 The diagram below shows a cross-section through an area that is being used for water supply in south east England.



(a) The limestone is a good aquifer.

(i) Define the term *aquifer* and explain why this limestone is a good aquifer.

.....

.....

.....

..... [2]

(ii) In relation to groundwater supply, what name is given to the area on the surface between C and D?



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

..... [1]

(iii) Explain the function of this area for groundwater supply.

.....

..... [1]

(iv) Define the term *hydraulic gradient*.

.....

..... [1]

- (v) Calculate the hydraulic gradient of the water table between points **C** and **D**. Show your working.

hydraulic gradient [1]

- (b) (i) Describe and explain how extracting water from an aquifer can cause subsidence.

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

- (ii) Sea water has entered many aquifers located around the coast of Britain. Name and explain this process.

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..... [2]

- (c) Drinking water in the north west of Britain mainly comes from surface water supplies. Describe **one** advantage and **one** disadvantage of using surface water supplies for drinking water.

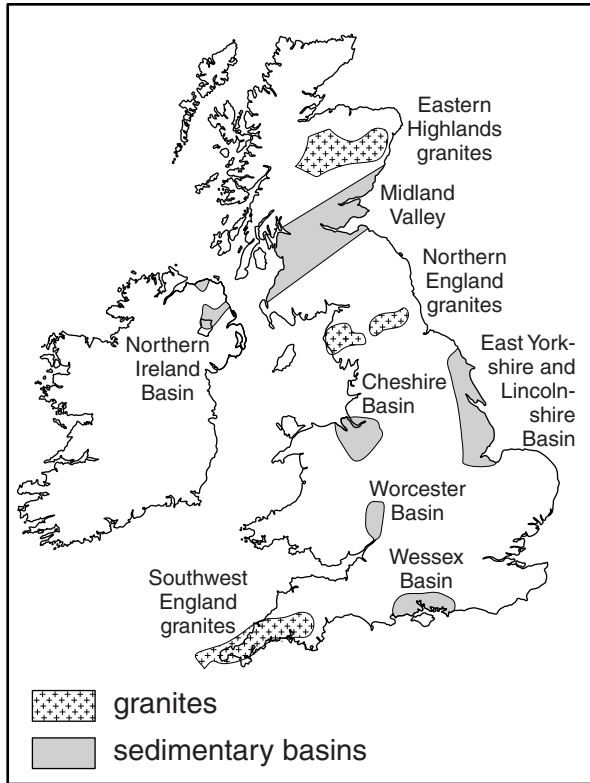
advantage
.....
disadvantage
..... [2]

- (d) Outline **one** initiative in the development of groundwater storage in rocks.

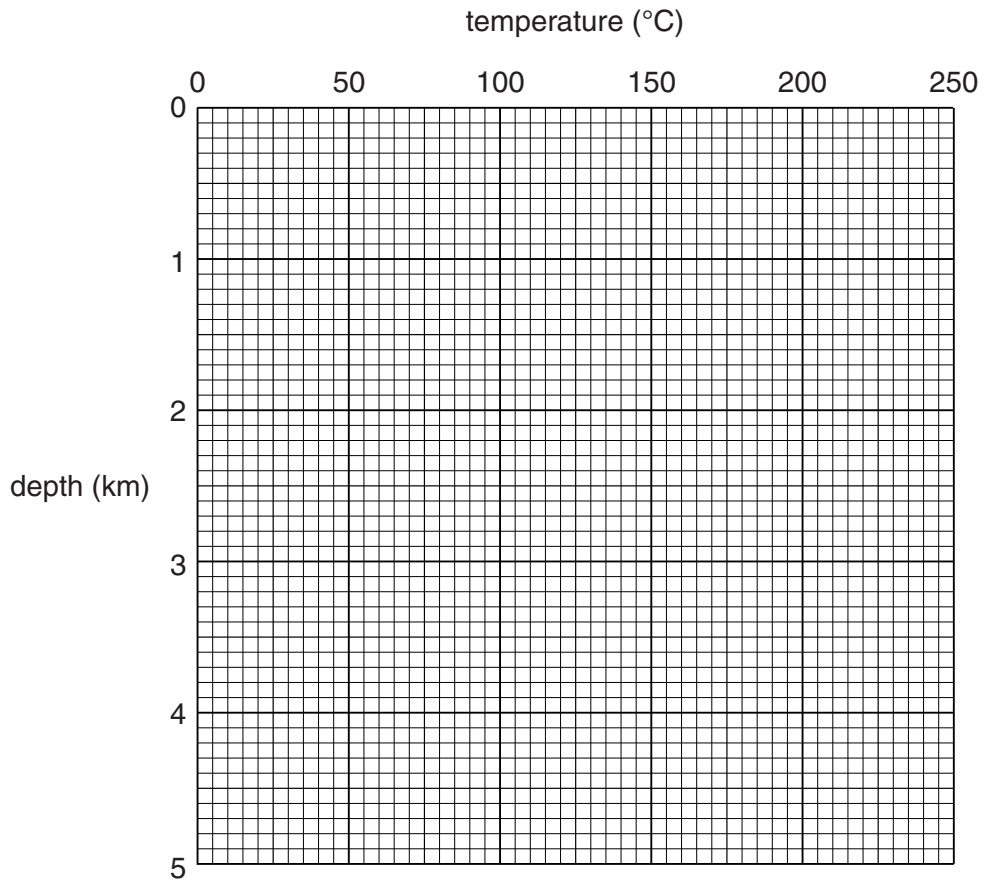
.....
..... [1]

[Total: 13]

3 The map below shows potential geothermal areas in Britain.



(a) (i) The average geothermal gradient for the granite areas is $40^{\circ}\text{C}/\text{km}$ and for the sedimentary basins is $30^{\circ}\text{C}/\text{km}$. Plot and label **two** lines to show these geothermal gradients on the grid below. Assume the surface temperature is 10°C .

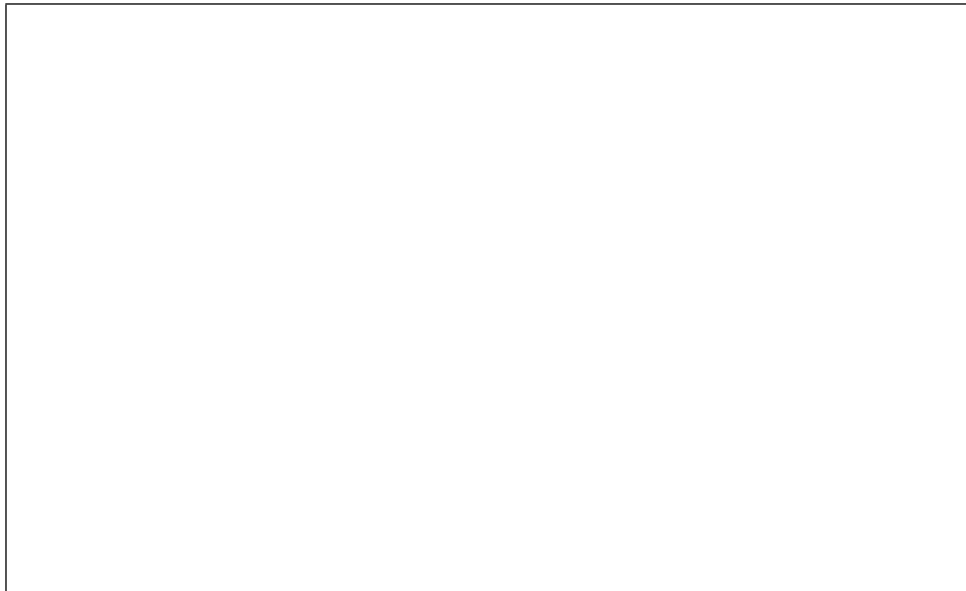


[2]

- (ii) At what depths would a temperature of 100 °C be reached in:
the granite areas
the sedimentary basins? [1]

- (iii) Explain why the geothermal gradient is higher in the granite areas.
.....
.....
.....
..... [2]

- (b) Draw a fully labelled diagram to **explain** how geothermal energy could be extracted from a hot dry rock source such as granite.



[3]

- (c) Discuss the advantages and disadvantages of extracting geothermal energy.
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..... [3]

[Total: 11]

4 (a) Below is a list of terms used in ore deposit geology.

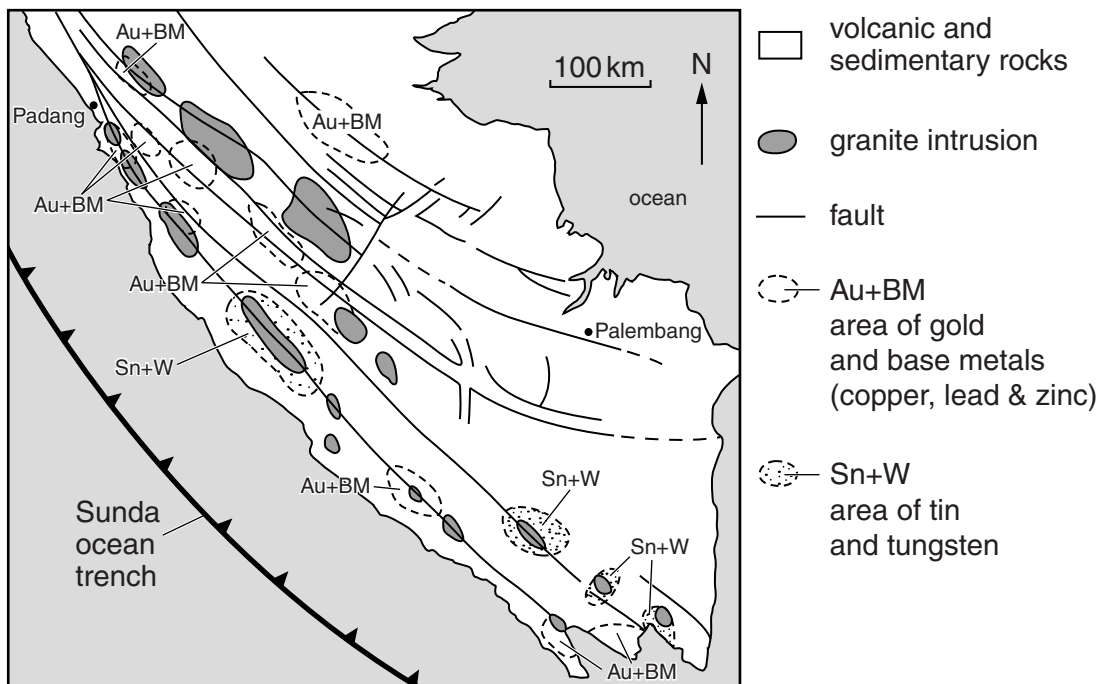
- average crustal abundance concentration factor cut-off grade
 grade reserves resource

Complete the table below by inserting the **most** suitable term to match each description.

Description	Term
the amount by which a metal is concentrated to make an ore deposit	
a useful and valuable material	
the amount of metal present in the ore	
the amount of ore that can be extracted at a profit	

[4]

(b) The map below shows the location of known metallic mineral occurrences in southern Sumatra, Indonesia.



(i) State the plate tectonic setting of Indonesia.

..... [1]

(ii) Explain why there are volcanic rocks and granite intrusions in this area of Indonesia.

.....

 [2]

(c) (i) Define the term *hydrothermal fluid*.

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

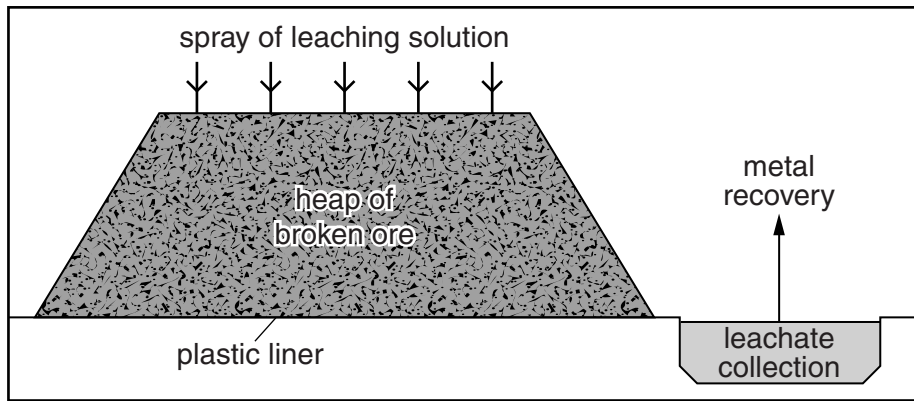
(ii) The metallic mineral occurrences in southern Sumatra are thought to be hydrothermal in origin. **Use evidence from the map** to support this hypothesis. Describe how the ore deposits could have formed.

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..... [3]

(d) The tin in southern Sumatra is also found in placer deposits. Describe and explain how placer deposits of tin form in rivers.

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..... [3]

(e) Heap leaching is one method of mineral processing. The diagram below shows how heap leaching is carried out.



(i) Describe the environmental consequences of heap leaching.

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

(ii) Describe an environmental consequence of **one** other named mineral processing technique.

mineral processing technique:
.....
..... [1]

[Total: 17]

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page. The question number(s) must be clearly shown in the margin.

A large rectangular area with a vertical line on the left side and horizontal dotted lines across the rest of the page, providing space for writing answers.



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