

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 28 January 2011
Morning

Duration: 1 hour




Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

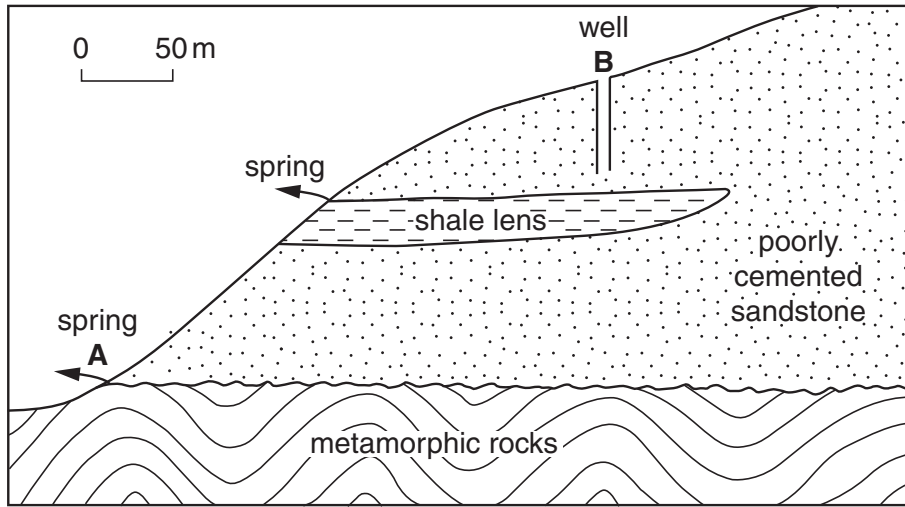
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Answer **all** the questions.
- 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 The area shown in the cross section below is used for water supply.



(a) Define the term *water table*.

.....
 [1]

(b) (i) Explain why a spring occurs at location **A**.

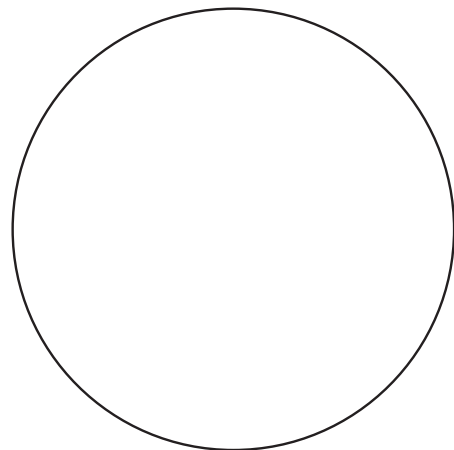
.....

 [2]

(ii) Draw and label on the cross section above the likely position of the water table that feeds the spring at **A**. [1]

(c) With the help of a fully labelled thin section diagram of the sandstone, explain why it produces groundwater that is suitable for drinking.

.....



[3]

(d) Groundwater is abstracted from the aquifer using a well at location **B**.

(i) What name is given to this type of aquifer?



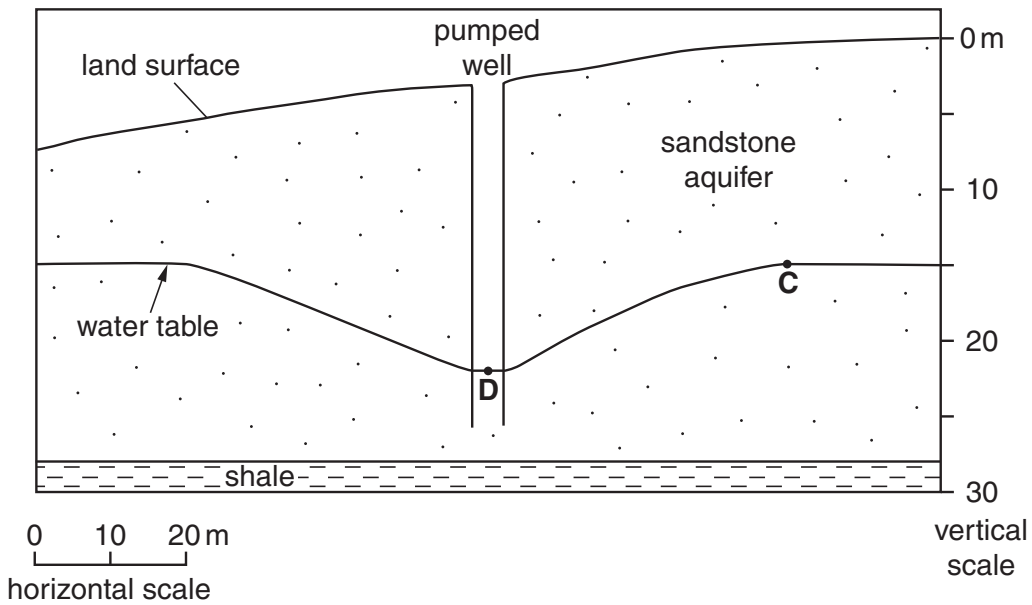
In your answer, you should use the appropriate technical term, spelled correctly.

..... [1]

(ii) What would happen if the well cut through the shale lens?

.....
 [1]

(e) The diagram below shows an enlarged view of the well at **B**.



(i) Determine the amount of draw down between points **C** and **D**.

draw down m [1]

(ii) Calculate the hydraulic gradient between points **C** and **D**. Show your working.

hydraulic gradient [2]

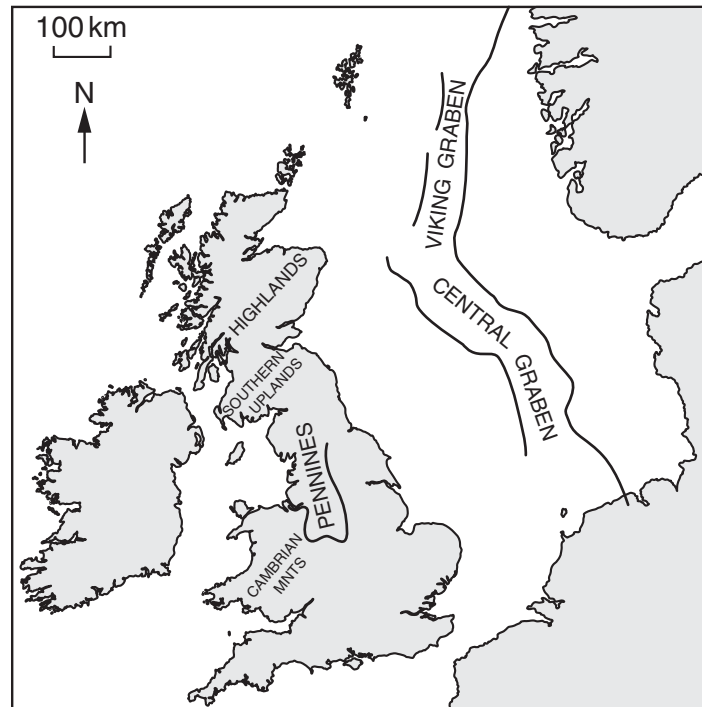
(iii) Explain how this gradient relates to the shape of the water table shown on the diagram.

.....

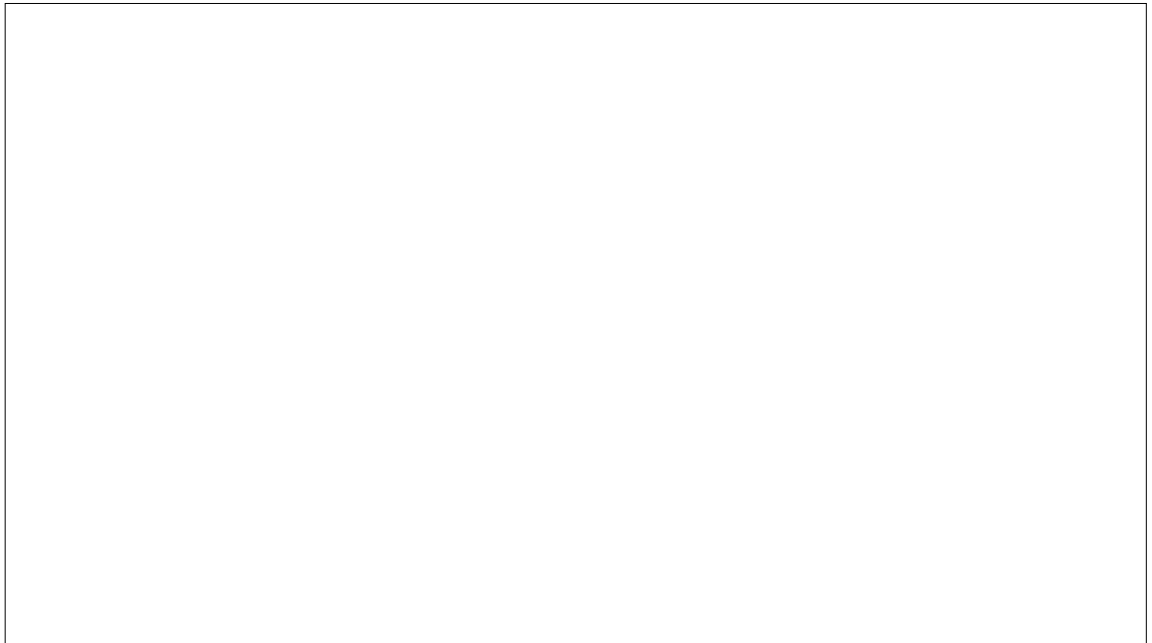
 [2]

[Total: 14]
 Turn over

2 The map below shows the British Isles and its surrounding area.



- (a) (i) Shade and label an area on the map where economic quantities of oil or gas have been found **offshore**. [1]
- (ii) The Ekofisk oil field is an anticline trap. The source rock is Kimmeridge Clay, the reservoir rock is fractured chalk and the cap rock is clay. Draw a fully labelled cross section diagram to show the likely structure of the Ekofisk trap.



[3]

(iii) Describe how oil formed in the Kimmeridge Clay source rock.

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

(iv) Name the process by which the oil moved from the Kimmeridge Clay source rock to the fractured chalk reservoir rock.



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

..... [1]

(b) Describe **one** environmental problem which might result from offshore extraction of oil and gas.

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

(c) Britain imports gas from abroad. Underground gas storage facilities have been developed to store the gas within rocks until it is needed.

(i) Name and describe **one** type of underground gas storage facility.

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

(ii) Suggest **one** safety problem that could result from underground gas storage.

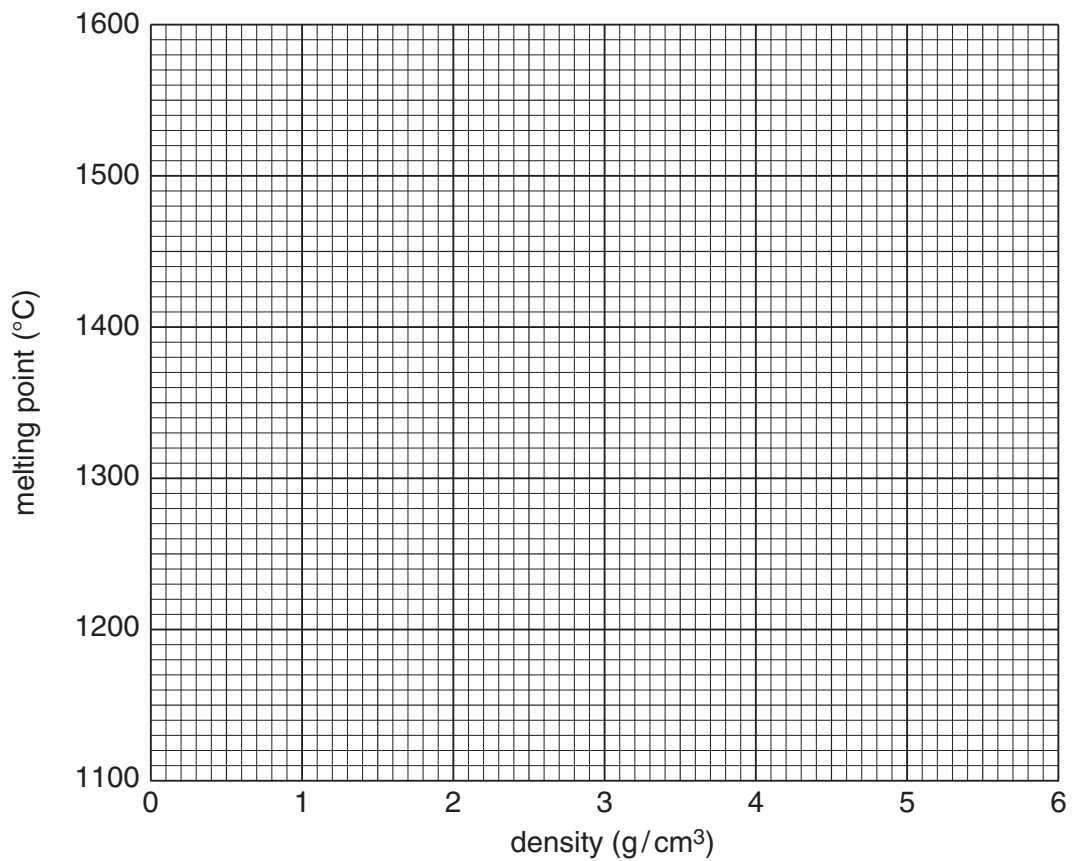
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..... [1]

[Total: 12]

3 The table below shows some of the properties of minerals found in mafic magma.

mineral	composition	density (g/cm ³)	melting point (°C)
augite	Ca, Mg, Fe rich aluminium silicate	3.3	1150
chromite	Fe, Cr oxide	4.6	1500
magnetite	Fe oxide	5.2	1600
olivine	Fe, Mg silicate	3.4	1450
plagioclase	Na, Ca rich aluminium silicate	2.7	1100

(a) (i) Use the data from the table to plot a scatter graph of density against melting point for the minerals.



[2]

(ii) Explain how the data relates to the formation of economic metallic mineral deposits in mafic igneous intrusions.

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

(iii) Analyse the data in the table and on your graph to suggest a relationship between mineral composition, density and melting point.

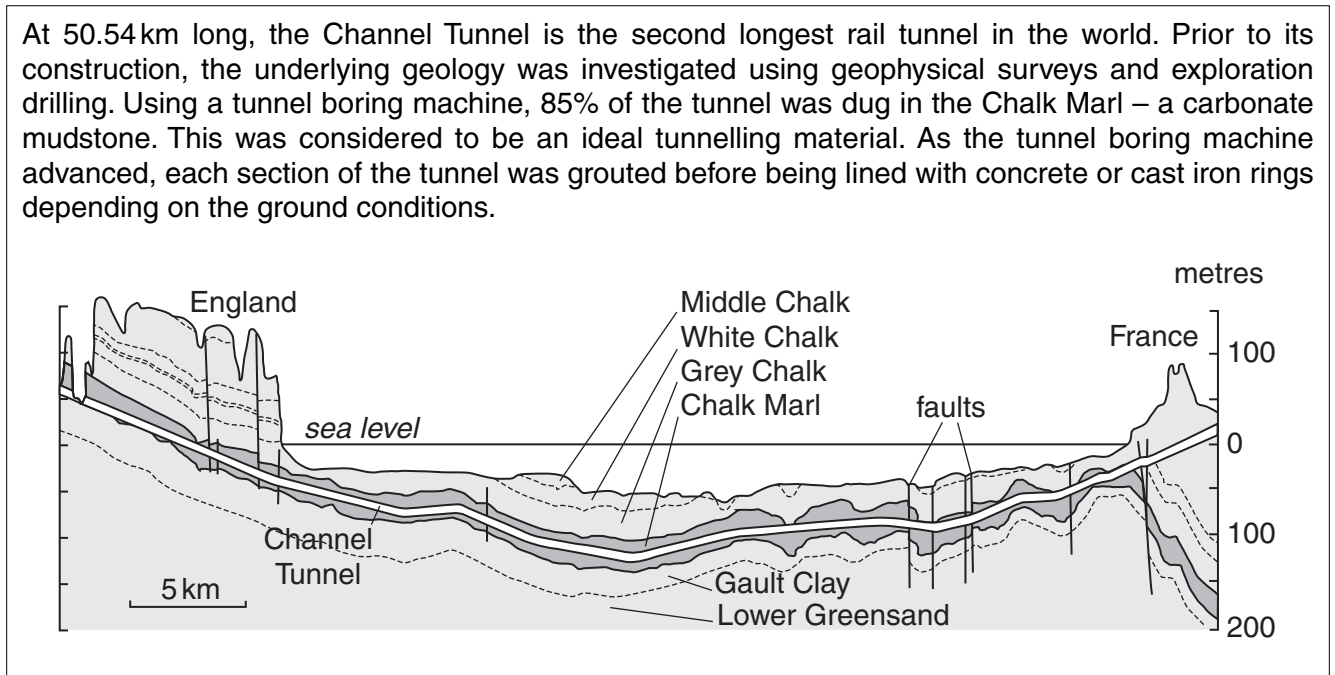
.....
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..... [3]

(b) Name and describe a geophysical exploration technique that could be used to find ore deposits of magnetite.

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

[Total: 10]

- 4 (a) Read the article about the construction of the Channel Tunnel and study the geological cross section below.



- (i) Why was it necessary to obtain **both** geophysical and borehole information prior to construction of the tunnel?

.....

 [2]

- (ii) Explain why the Chalk Marl was considered to be an ideal tunnelling material.

.....

 [2]

- (iii) Name the major fold structure shown in the cross section diagram.

..... [1]

- (iv) What advantage did this fold structure give to the route of the tunnel?

.....
 [1]

(v) Describe **two** problems the faults could have caused.

.....

 [2]

(vi) Describe the process of grouting and explain its purpose.

.....

 [3]

(b) Most of the aggregate used in the construction of the British side of the Channel Tunnel came from Glensanda super-quarry located on the west coast of Scotland. Give **one** argument for and **one** argument against the development of coastal super-quarries.

for

.....

against.....

..... [2]

(c) Match each of the geological materials, **1** to **5**, with their **most** likely product, **E** to **J**, in the tables below.

	geological materials
1	blocks of limestone
2	clay
3	crushed chalk
4	crushed dolerite
5	gravel

	products
E	brick
F	building stone
G	cement
H	concrete
J	roadstone

1 2 3

4 5

[3]

[Total: 16]

Turn over

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