

<b>Candidate forename</b>		<b>Candidate surname</b>	
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<b>Centre number</b>						<b>Candidate number</b>				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
ADVANCED GCE**

**F794**

**GEOLOGY**

**Environmental Geology**

**FRIDAY 10 JUNE 2011: Afternoon**

**DURATION: 1 hour**

**SUITABLE FOR VISUALLY IMPAIRED CANDIDATES**

**Candidates answer on the question paper.**

**OCR SUPPLIED MATERIALS:**

**Loose sheet for question 1**

**OTHER MATERIALS REQUIRED:**

**Electronic calculator**


**Ruler (cm/mm)**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes on the first page. 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 page at the end of this booklet. The question number(s) must be clearly shown.
- Answer ALL the questions.

## **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.

**Answer ALL the questions.**

**1 (a) Most of the coal found in the British Isles is of Carboniferous age.**

**(i) State the climate type Britain experienced during the Carboniferous Period.**

\_\_\_\_\_ [1]

**(ii) Describe how the Carboniferous Coal Measures formed.**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3]

**(b) Study the geological cross section of northern England on the loose sheet.**

**(i) State the relationship between the Permo-Triassic rocks and the Carboniferous Coal Measures in Yorkshire.**



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

\_\_\_\_\_ [1]

**(ii) Explain why there are no Coal Measure rocks in the Pennines.**

\_\_\_\_\_  
\_\_\_\_\_ [1]

**(c) Accurately mark on the surface of the cross section using labelled arrows and the letter given:**

- **a location where opencast coal mining is possible – B**
- **a location where mining could take place from a concealed coalfield – C.** [2]

**(d) Using evidence from the cross section, suggest TWO reasons why the Lancashire coalfield is a difficult area for coal mining.**

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**[2]**

**(e) (i) Describe how coal is mined by opencast methods.**

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**[3]**

**(ii) Explain why opencast coal mining is cheaper than underground mining.**

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**[1]**

**[Total: 14]**

2 (a) Describe the characteristics of a source rock for oil.

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[2]

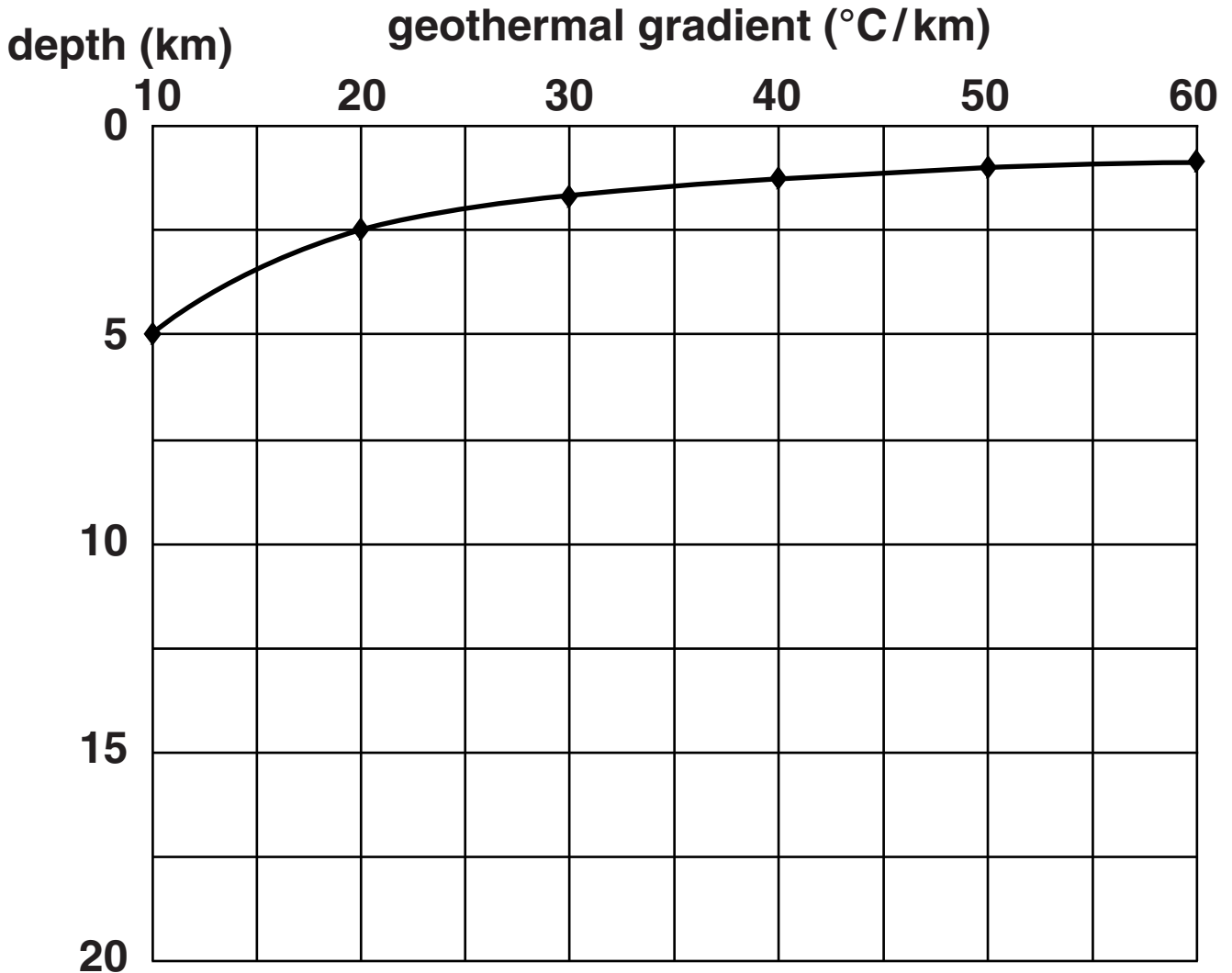
(b) Crude oil forms between temperatures of 50 °C and 200 °C.

(i) The table below shows the depths at which 50 °C is reached under different geothermal gradients. Complete the table to show the depths at which 200 °C is reached for the geothermal gradients shown.

<b>GEOHERMAL GRADIENT (°C/km)</b>	<b>DEPTH AT WHICH 50 °C IS REACHED (km)</b>	<b>DEPTH AT WHICH 200 °C IS REACHED (km)</b>
10	5.00	
20	2.50	
30	1.67	
40	1.25	
50	1.00	
60	0.83	

[2]

(ii) The depths at which 50 °C is reached under different geothermal gradients have been plotted on the graph below. Use the data you have calculated to plot a line graph for the depths at which 200 °C is reached.



[2]

(iii) State the depths between which crude oil will form under a geothermal gradient of 25 °C/km.

\_\_\_\_\_ [1]

**(iv) What happens to crude oil when the temperature exceeds 200 °C?**

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[1]

**(c) Explain why oil is usually found in traps closer to the surface than the source rocks.**

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[2]



**(d) Describe clearly how a fault trap and a salt dome trap can each contain oil. You may use diagrams to help you make your description.**

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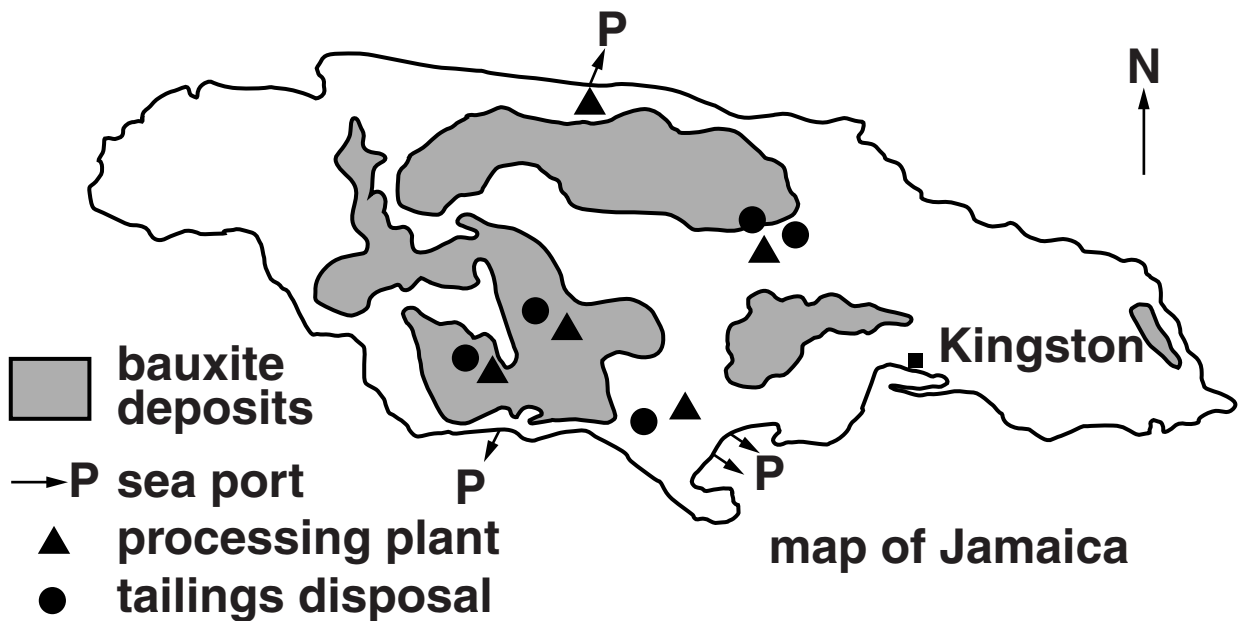
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**[3]**

**[Total: 13]**

**3 Read the article about bauxite mining in Jamaica and study the map below.**

**Bauxite mining is Jamaica's second largest industry. Jamaica's bauxite reserves are estimated to be 1,800 million tonnes and annual production is 10 million tonnes. The bauxite is found very close to the surface in numerous, small residual deposits spread out over a large area. The average grade of the deposits is 45% alumina – a concentration factor of 5.5. The bauxite mining companies claim they are doing everything they can to minimise the environmental effects of their activities but some environmental groups disagree. The main problem is the disposal of fine-grained waste known as tailings.**



**(a) (i) Define the term reserves.**

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[1]

- (ii) Use the information in the article to calculate how many years Jamaica's bauxite will last at current rates of production.**

\_\_\_\_\_ years [1]

- (iii) Explain the difference between the terms grade and concentration factor.**

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\_\_\_\_\_ [2]

- (iv) Explain why mining bauxite in Jamaica has such a large impact on the environment.**

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\_\_\_\_\_ [1]

- (v) Suggest why the disposal of fine-grained bauxite tailings is a big problem.**

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\_\_\_\_\_ [1]

**(b) Discuss why Jamaica's bauxite reserves are likely to change in the future.**

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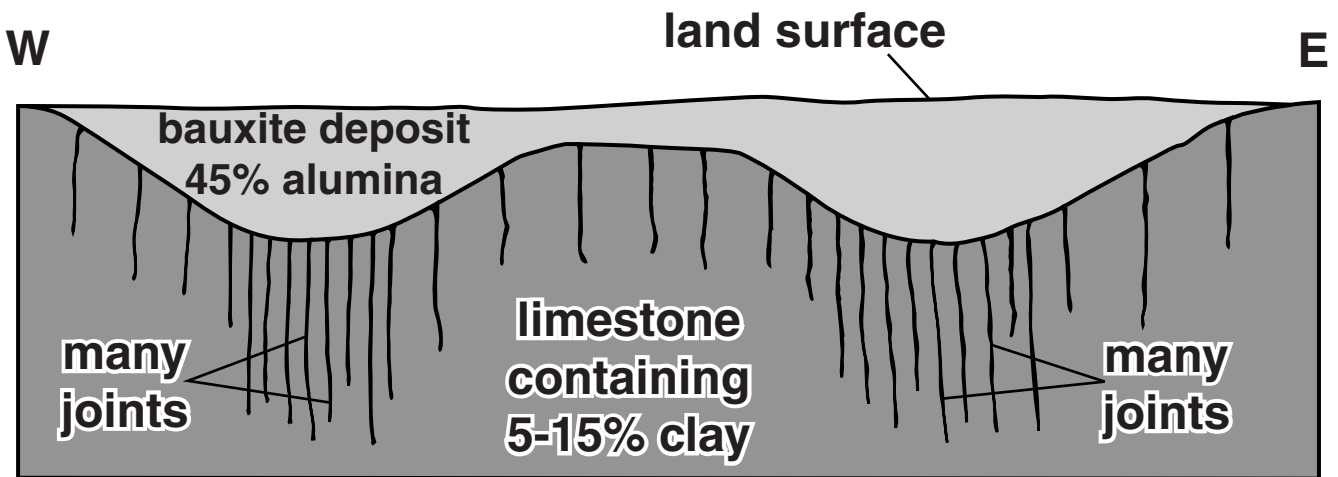
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[2]

**(c) The geological cross section below is through one bauxite deposit in Jamaica.**



**(i) Describe how the residual deposit of bauxite formed.**

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[3]

**(ii) Use ALL the information shown on the diagram to explain how variations in the limestone affected the bauxite formation.**

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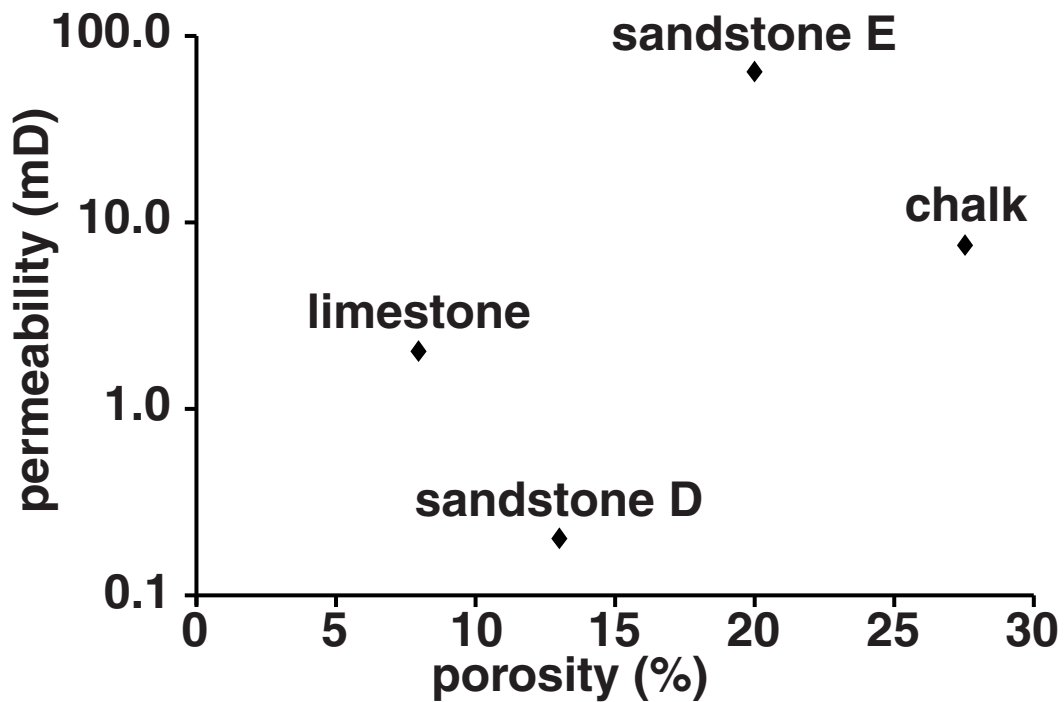
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**[2]**

**[Total: 13]**

- 4 (a) The graph below shows the relationship between porosity and permeability for a chalk, a limestone and sandstones D and E.



- (i) Which rock has the highest porosity?

\_\_\_\_\_ [1]

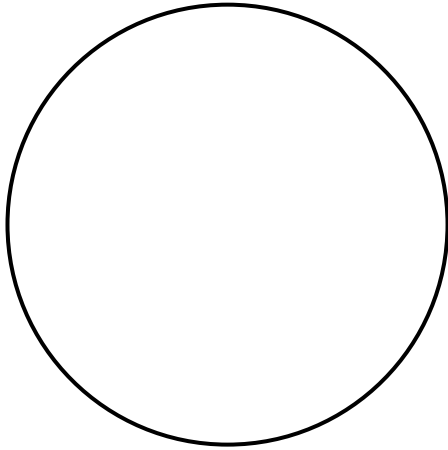
- (ii) Which rock has the highest permeability?

\_\_\_\_\_ [1]

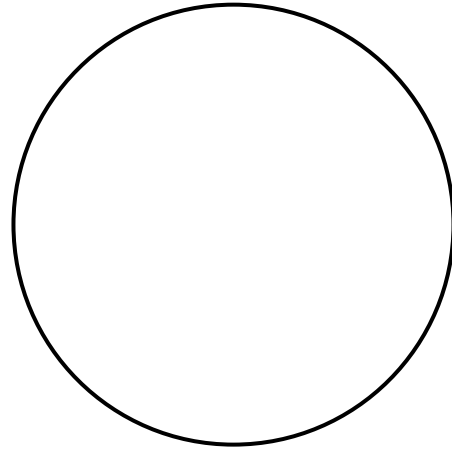
- (iii) Mark the likely position of an unjointed granite on the graph above. [1]

- (iv) Describe what could have caused the differences in porosity and permeability between sandstones D and E. You may draw diagrams to help explain your answer.

sandstone D



sandstone E



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[4]

- (v) If a well was dug into each of the four rocks shown on the graph, which is likely to produce water at the fastest rate?

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[1]

**(b) Describe and explain the effect that pumping water from a well will have on the water table.**



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

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**[2]**

**(c) Explain how groundwater resources can be both renewable and sustainable if carefully developed and used.**

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**[2]**

**[Total: 12]**



**5 Describe the geological factors of importance affecting the disposal of waste in landfill sites. You may use diagrams to illustrate your answer.**

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**[8]**

**[Total: 8]**

**END OF QUESTION PAPER**

## ADDITIONAL PAGE

**If additional space is required, you should use the lined page below. The question number(s) must be shown clearly.**

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