

Candidate Name	Centre Number	Candidate Number
		2



**GCE AS/A level**

1213/01

**GEOLOGY - GL3  
GEOLOGY AND THE HUMAN  
ENVIRONMENT**

P.M. WEDNESDAY, 12 January 2011

1¼ hours

			<b>Examiner only</b>
<b>Section A</b>	1.	12	
	2.	13	
<b>Section B</b>	3.	25	
	4.		
	5.		
<b>Total</b>		<b>50</b>	

**ADDITIONAL MATERIALS**

In addition to this examination paper, you may require a calculator.

**INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions from Section A and **one** from Section B.

Write your answers in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

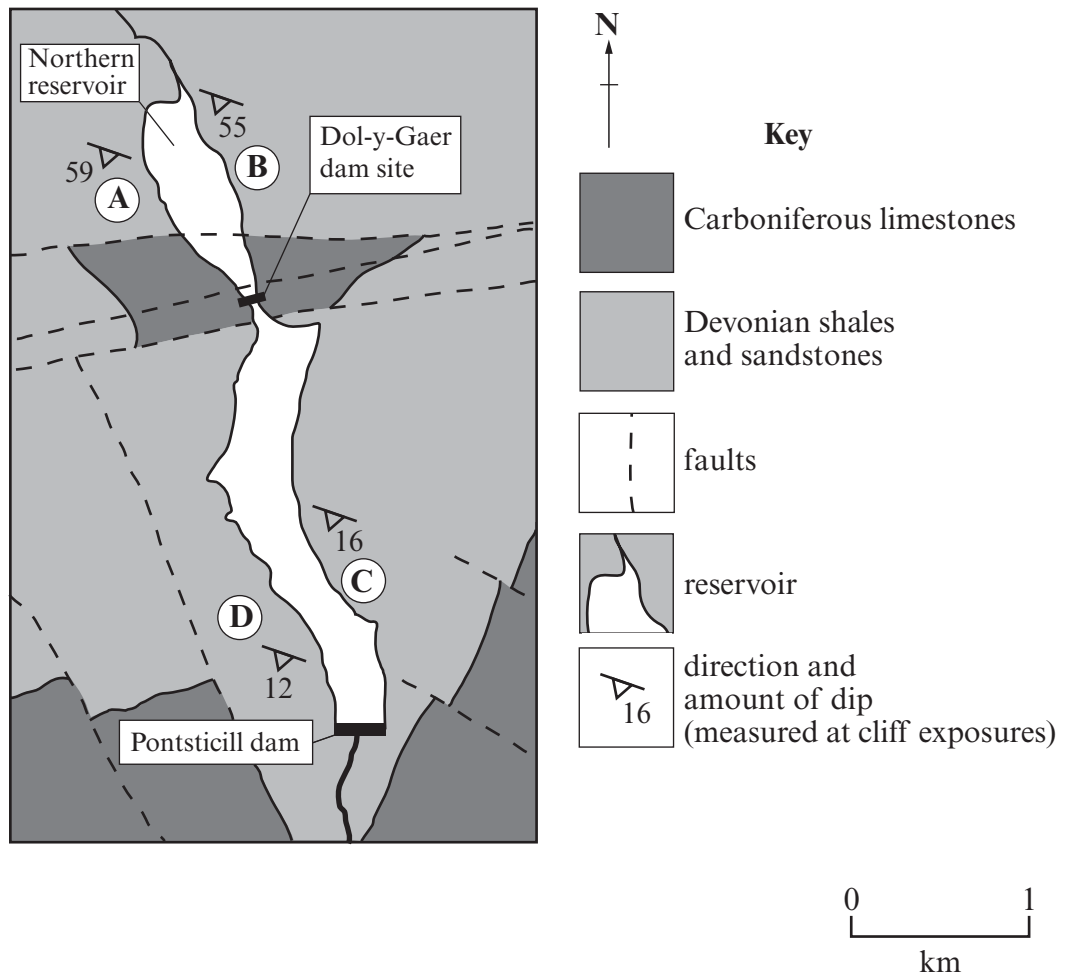
The number of marks is given in brackets at the end of each question or part-question.

Candidates are reminded that marking will take into account the use of examples and the quality of communication used in answers, especially in the structured essay.

## SECTION A

Answer **both** questions 1 and 2 on the lines provided in the questions.

1. **Figure 1a** is a simplified geological map of the Dol-y-Gaer and Pontsticill dam and reservoir system situated in a steep-sided valley in South Wales.



**Figure 1a**

Refer to **Figure 1a**.

- (a) Give **one geological** reason why Dol-y-Gaer was a favourable site for the construction of a dam. Explain your answer. [2]

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(b) After construction, the northern reservoir suffered serious leakage beneath the Dol-y-Gaer dam.

(i) Explain why leakage beneath the Dol-y-Gaer dam might have been predicted from the geology of the dam site. [3]

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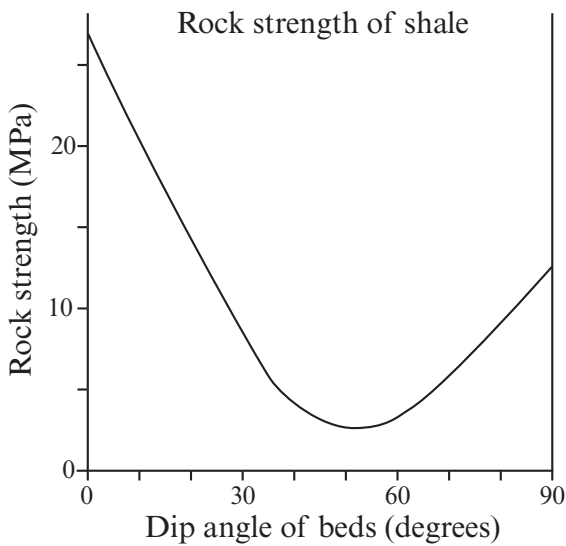
(ii) Explain how continued leakage may affect the stability of the dam over time. [2]

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(c) **Figure 1b** shows how the rock strength of shale varies with the dip angle of the beds.



Rock strength (MPa)	Dip angle of beds (degrees)
20	•
•	82

**Table 1**

**Figure 1b**

Use **Figure 1b** to complete **Table 1** above. [2]

(d) Using **Figure 1a** and **Figure 1b**, state which location on **Figure 1a** (A-D) is most likely to result in ground instability in the shale. Explain your answer. [3]

Location (A, B, C or D)

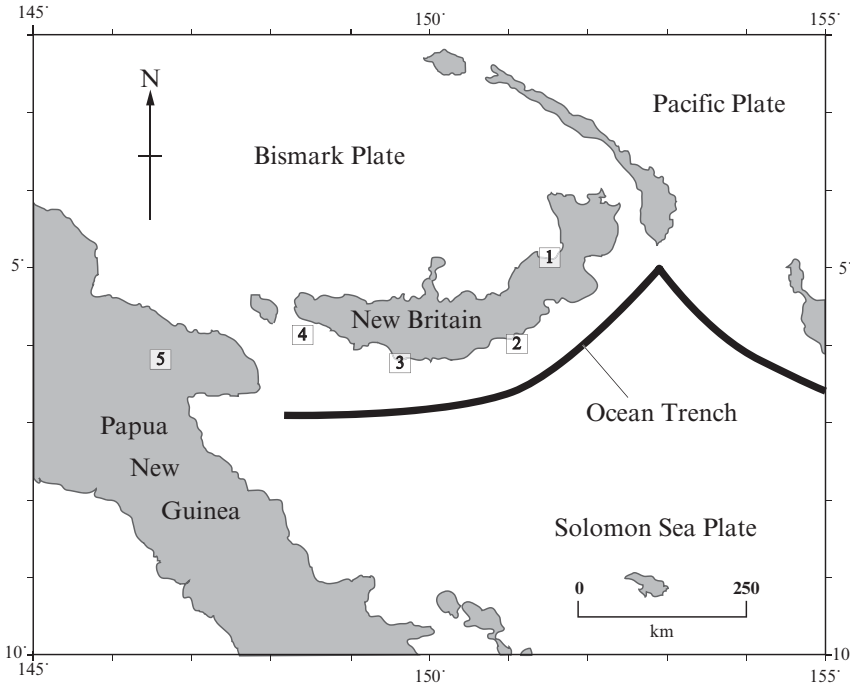
Explanation

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2. **Figure 2** gives the tectonic setting of Papua New Guinea and New Britain showing the location of earthquake epicentres (> magnitude 4.5) between 28 May and 4 June 2009. **Tables 2a** and **2b** give further data on these earthquake events.



Epicentre location	Date	Magnitude (Richter)	Depth (km)
1	28 May	5.1	48.9
2	29 May	5.0	47.5
3	30 May	5.2	45.0
4	2 June	4.8	40.0
5	4 June	5.3	53.6

**Table 2a**

**Figure 2**

*Earthquakes*

Tectonic earthquakes result from stress release along a fault zone. Scientists suggest that one earthquake may be responsible for triggering the next in a series of earthquake events along a plate boundary. Volcanic earthquakes are often associated with rising magma.

**Table 2b**

(a) Refer to **Figure 2**.

(i) Explain what is meant by an earthquake *epicentre*. [2]

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(ii) Explain why earthquakes occur at depth in this tectonic setting. [3]

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Refer to **Figure 2** and **Tables 2a** and **2b**.

- (b) (i) Describe the **evidence** from these data that might support the theory that each earthquake triggered the next one in this series of earthquake events. [2]

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- (ii) Explain **how** each earthquake might have been responsible for triggering the next during this series of earthquake events. [2]

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- (c) Earthquakes of this magnitude have been known to cause serious damage in this area.

**With reference to Table 2a**, suggest a reason why none of these earthquakes resulted in serious damage. Explain your answer. [2]

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- (d) There are many active volcanoes in this area. From your knowledge, describe how the characteristics of volcanic earthquakes (e.g. number, size, depth, type etc.) might differ from the tectonic earthquakes referred to in **Table 2b**. [2]

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**Total 13 marks**

**SECTION B**

Answer **one** question from this section on the following pages.

*The marks you will be awarded in your essay take into account:  
evidence of geological knowledge and understanding;  
the use of geological examples;  
legibility, accuracy of spelling, punctuation and grammar;  
the selection of an appropriate form and style of writing;  
the organisation of material, and use of geological vocabulary.*

**EITHER,**

3. (a) Describe **two** changes in ground properties that may be used in earthquake prediction. Explain why these changes occur. [10]
- (b) Explain how the risk of damage to property and loss of life associated with a major earthquake may be managed and controlled. [15]

**OR,**

4. (a) Describe how sites of potential slope failure can be monitored. [10]
- (b) Explain how engineering solutions may be effective in the management or control of mass movements. [15]

**OR,**

5. (a) Describe the properties of aquifers that enable groundwater to flow and be stored. [10]
- (b) Explain how the overuse of aquifers may result in geologically related hazards or problems. [15]

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