Candidate Name	Centre Number	Candidate Number
		2

GCE AS/A level

1213/01

GEOLOGY - GL3
GEOLOGY AND THE HUMAN ENVIRONMENT

A.M. THURSDAY, 19 May 2011

1¼ hours

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

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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.

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SECTION A

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

1. **Figure 1a** is a map showing the location of the San Onofre nuclear power plant, Southern California. **Figure 1b** shows a section of the Cristianitos Fault exposed in a sea cliff south east of the nuclear power plant.

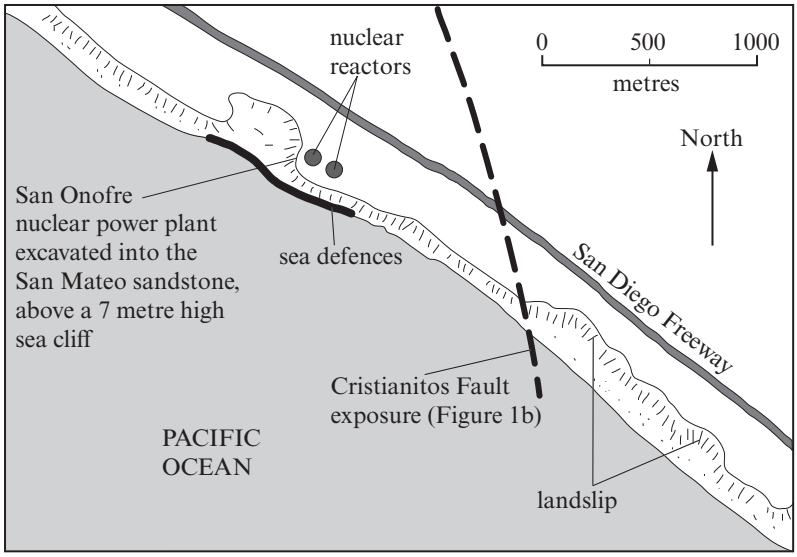

Figure 1a

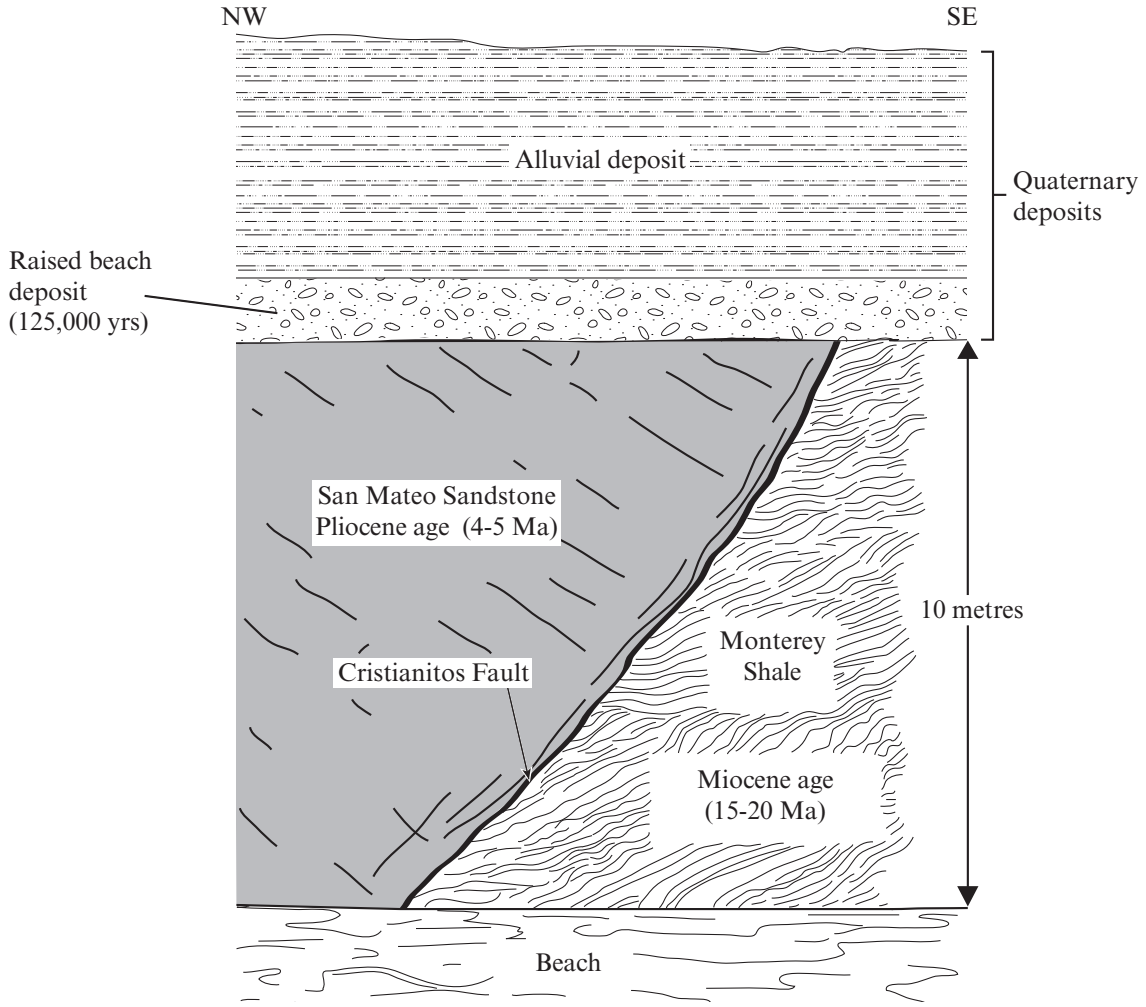

Figure 1b

(1213-01) Source: Geology Underfoot In Southern California; Sharp & Glazner (Mountain Press), 1993

(a) Refer to **Figure 1a**.

(i) State the shortest distance from the nuclear plant reactors to the Cristianitos Fault. [1]

.....

(ii) Explain why distance to the Cristianitos Fault was carefully considered when designing the nuclear plant. [1]

.....

(b) Refer to **Figure 1b**.

(i) Previous movement on the Cristianitos Fault was dip-slip (vertical). Using the data, state the fault type represented by the Cristianitos Fault. Give the **evidence** for your answer. [3]

Type of fault .....

Evidence .....

.....

(ii) Suggest an age range (maximum and minimum age) for the last movement on the Cristianitos Fault. Describe the evidence used to obtain your answer. [3]

Max age: After ..... *Minimum age: Before* .....

Evidence .....

.....

(c) Only faults that have moved in the last 35,000 years are considered to be *active*. From the evidence, assess the likelihood that the San Onofre nuclear power plant might be in danger from movement on the Cristianitos Fault. [2]

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(d) With reference to **Figure 1a**, and/or your knowledge, discuss what other **geological** hazards might put the San Onofre nuclear plant at risk. [3]

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Total 13 marks

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2. **Figure 2** is a diagrammatic representation of a north-facing road cutting showing a range of instruments used to monitor the slope for potential failure and some methods used to improve slope stability.

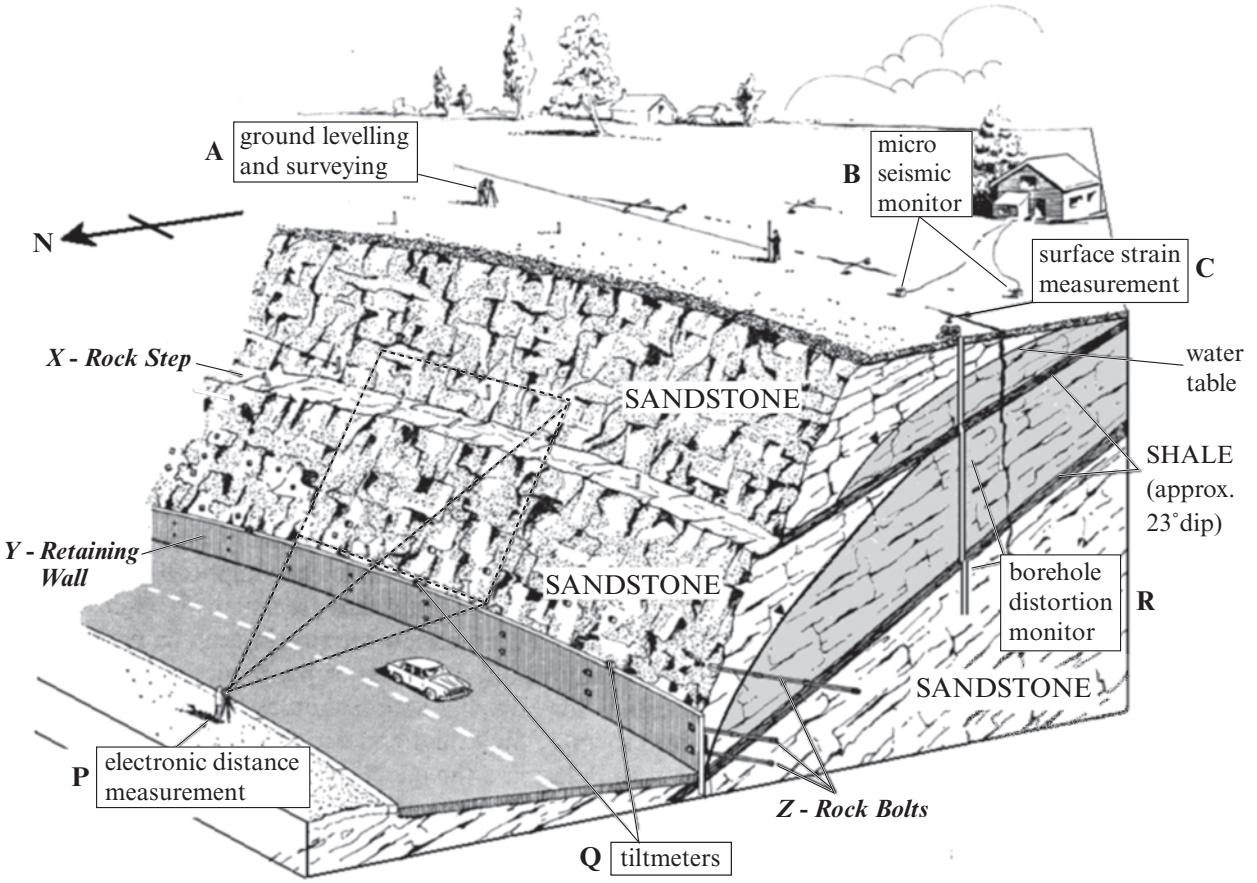

Figure 2

Source: Quarterly Journal of Engineering Geology and Hydrogeology; Franklin & Denton, Aug 1973, p260.

Refer to **Figure 2**.

(a) Explain why the potential failure of the slope might be predicted from the **geological** factors identified in the road cutting. [3]

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(b) With reference to the monitoring techniques in **Figure 2**, choose

(1) **one** of the monitoring techniques labelled **A**, **B or C**,

and

(2) **one** of the monitoring techniques labelled **P**, **Q or R**.

For **each** chosen technique, outline the method and suggest what changes might be observed that may help predict a sudden rock failure. [4]

(1) *Chosen technique* (**A**, **B** or **C**) ☐

.....

.....

.....

(2) *Chosen technique* (**P**, **Q** or **R**) ☐

.....

.....

.....

(c) Choose **one** of the following methods used in **Figure 2** to stabilise the road cutting slope, and explain its suitability for this purpose:

X - Rock Step
Y - Retaining Wall
Z - Rock Bolts [2]

Chosen technique (**X**, **Y** or **Z**) ☐

.....

.....

.....

(d) Explain how changes in groundwater, during a period of prolonged rainfall, may reduce the stability of the road cutting slope. [3]

.....

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.....

Total 12 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 the geological factors which control the pathways that landfill pollutants (leachate and gas) will take in the event of their leakage from a landfill site. [15]

(b) Explain the measures needed to change an abandoned sandstone quarry into a landfill site and to reduce the dangers from decomposing domestic waste. [10]

OR,

4. *(a)* Describe

(i) **two** potential benefits,

(ii) **two** potential hazards,

of living in an active volcanic region dominated by frequent **basaltic** eruptions. [15]

(b) Using case studies, discuss the effectiveness of the measures used to minimise loss of life and damage to property in volcanically active areas. [10]

OR,

5. *(a)* Describe how ground subsidence may be related to the extraction of

(i) rock and minerals,

(ii) water. [15]

(b) Explain how the extraction of rock, minerals and water may result in the pollution of surface water and groundwater. [10]

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Turn over.

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Turn over.

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