Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1213/01

GEOLOGY - GL3
GEOLOGY AND THE HUMAN ENVIRONMENT

A.M. THURSDAY, 19 January 2012

1¼ hours

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

1213
010001

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 hazard map showing past and potential volcanic hazards for the Greek island of Nisyros. **Figure 1b** shows the change in mean wind direction and speed with height for Nisyros.

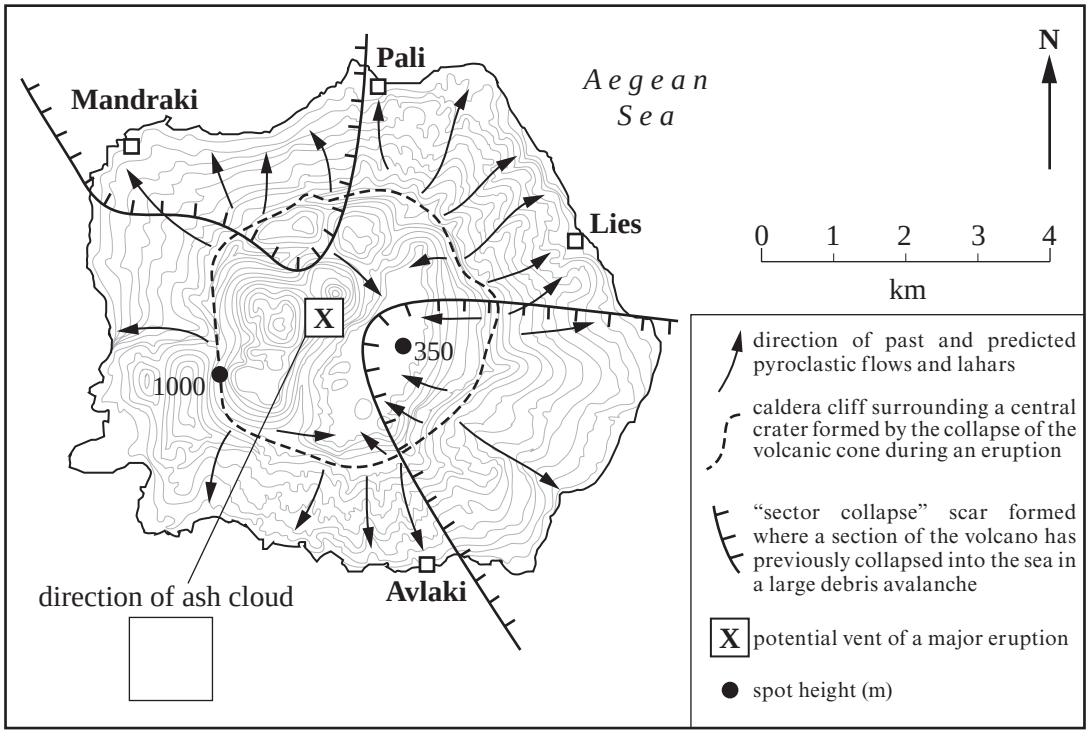

Figure 1a

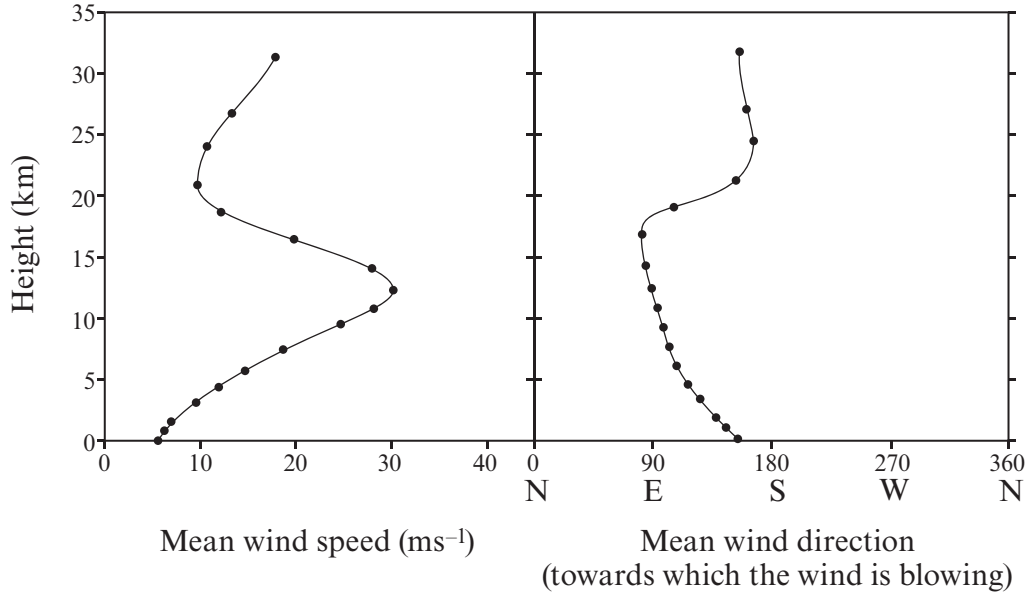

Figure 1b

Source: Adapted from Principe *et al.*, (2005) in Mémoires de Géologie (Lausanne) No.44

Refer to **Figure 1a**.

(a) Describe the evidence that past eruptions on Nisyros have been explosive. [2]

.....

.....

.....

(b) Describe and explain the predicted direction of pyroclastic flows and lahars. [2]

.....

.....

.....

(c) Using the data in **Figure 1b**:

(i) State the mean wind speed on Nisyros at a height of 6 km. [1]

..... ms^{-1}

(ii) Explain why the ash from a large eruption (with an ash column >12 km high) is likely to travel further than the ash cloud from a smaller eruption. [2]

.....

.....

.....

(iii) Draw an arrow in the box in **Figure 1a** to show the most likely direction towards which a 12 km ash cloud would be blown following a large volcanic eruption at location **X**. [1]

(d) Most house roofs on Nisyros are flat and used to collect and store rainwater. Explain how this house design increases the risk to life and property during an eruption. [2]

.....

.....

.....

(e) Explain how debris avalanches caused by the large-scale sector collapse of the volcano sides might trigger **additional** hazards for the inhabitants of Nisyros. [3]

.....

.....

.....

Total 13 marks

Turn over.

Examiner only

2. **Figure 2a** is a geological section through the Mam Tor landslide, Derbyshire.
Figure 2b shows the change in height of a fixed monitoring station (**P**) on the landslide together with changes in winter rainfall between 1991 and 2002.

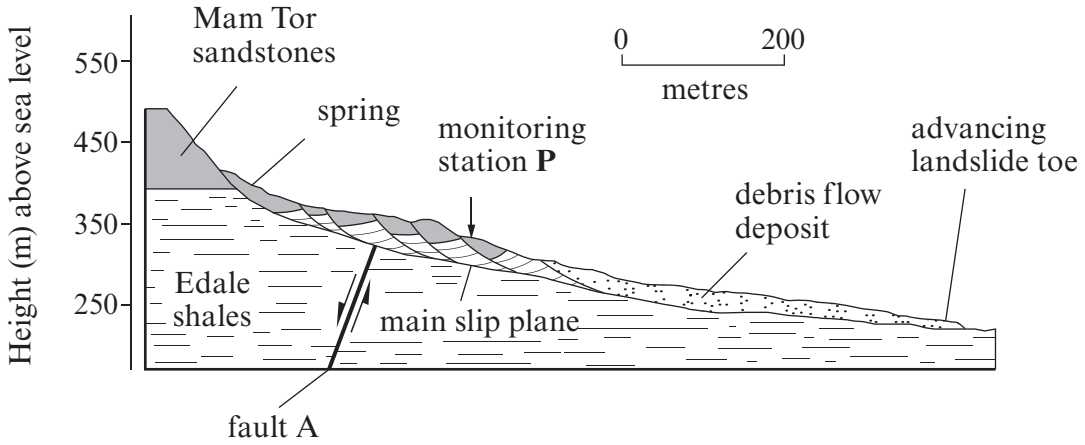

Figure 2a

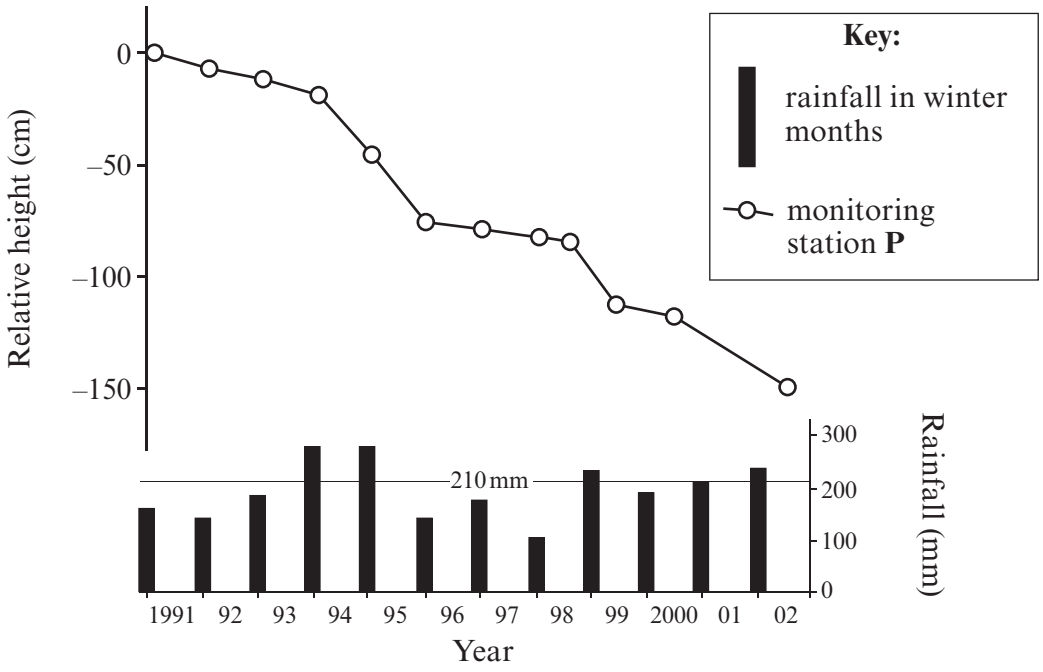

Figure 2b

Source: Adapted from Journal of Geol Soc; Rutter, Arkwright, Holloway & Waghorn, Vol 160, 2003

(a) State the type of fault represented by fault **A** in **Figure 2a**. Explain your answer. [2]

Fault type .....

Explanation .....

.....

(b) (i) Calculate the rate of change in height of monitoring station **P** (in cm yr^{-1}) for the two years from the **start** of 1994 to the **start** of 1996. Show your working. [2]

..... cm yr^{-1}

(ii) Describe the correlation between the rates of change in height of monitoring station **P** during years when the winter rainfall is above 210 mm, compared to the years when it is below the 210 mm level. [2]

.....

.....

.....

(c) Using the data in **Figure 2a** and **Figure 2b**, explain **two** possible mechanisms or triggers for the movement on the Mam Tor landslide. [4]

1. .....

.....

.....

2. .....

.....

.....

(d) The height data in **Figure 2b** were obtained from a ground levelling survey. Describe **one** additional technique that might be used to monitor the Mam Tor landslide. [2]

.....

.....

.....

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 factors that affect the level of intensity of an earthquake measured on the modified Mercalli scale. [10]

(b) Explain how **two** of the following may be used to predict a major earthquake.

(i) Electrical resistivity
(ii) Earthquake lights
(iii) Seismic activity [15]

OR,

4. *(a)* Describe the geological hazards that may result when engineering activities associated with a major construction project interfere with natural processes in coastal areas. [10]

(b) Explain the geological factors that need to be considered when selecting a suitable site for a dam and associated reservoir. [15]

OR,

5. *(a)* Account for the presence of high concentrations of radon gas in buildings in some areas of the UK. [10]

(b) Explain how the foundations of large structures can be affected by:

- unstable patterns of geological structures (e.g. bedding, jointing, faulting, cleavage); and
- depth to the water table and rockhead. [15]

Examiner only

Turn over.

Examiner only

Examiner only

Turn over.

Examiner only