

Candidate Name	Centre Number	Candidate Number
		2



GCE AS/A level

453/01

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

P.M. WEDNESDAY, 20 May 2009

1¼ hours

For Examiner's Use only.

Section A	1	
	2	
Section B	3	
	4	
	5	
Total	50	

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

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

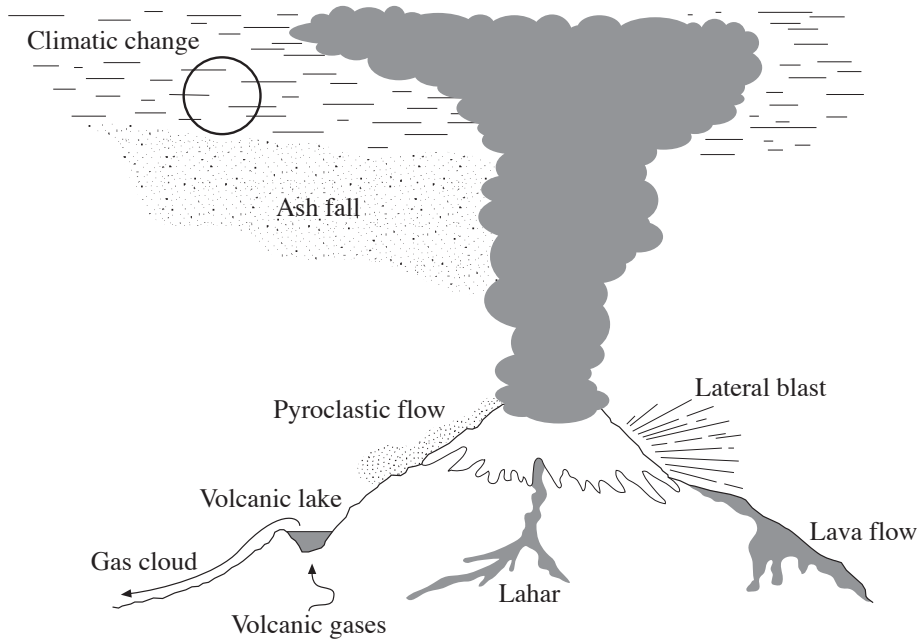
The number of marks is given in brackets at the end of each question or part-question.

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 1** illustrates some potentially lethal volcanic hazards. **Table 1** lists the fatalities and property damage of four different volcanic events (A – D).



Adapted from “Apocalypse”, Bill McGuire

Figure 1

<i>Volcanic event</i>	A	B	C	D
<i>Fatalities and property damage</i>	300 bodies with crush injuries recovered from collapsed buildings.	22,000 bodies buried chaotically in a fine mud with many large rock clasts. Most buildings destroyed along with communications.	29,000 bodies buried in fine ash. Curled up suggesting intense heat and suffocation. Boats moored in the bay destroyed.	1700 bodies as though asleep with no apparent signs of death, although some skin burns noted. All animals, including insects, dead. No damage to buildings.
<i>Volcanic hazard</i>	• Ash Fall	•	•	•

Table 1

- (a) Complete **Table 1** by identifying the volcanic hazard in **Figure 1** most likely to cause the observed fatalities and property damage. You may only use each hazard once. [3]
- (b) Choose **two** of the volcanic events (**A—D**) in **Table 1**. Explain how the volcanic event caused the observed fatalities and property damage. [6]

Volcanic event 1 (A, B, C or D)

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Volcanic event 2 (A, B, C or D)

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- (c) With reference to **one** of the hazards named in **Figure 1**, explain how fatalities and property damage might be reduced by effective hazard management. [3]

Name of hazard

Explanation

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Total 12 marks

Turn over.

2. **Figure 2a** shows the effects of the partial collapse of abandoned mine workings on ground subsidence.

Figure 2b is a partly completed graph showing the variations in strength of the rock strata beneath location A on **Figure 2a**.

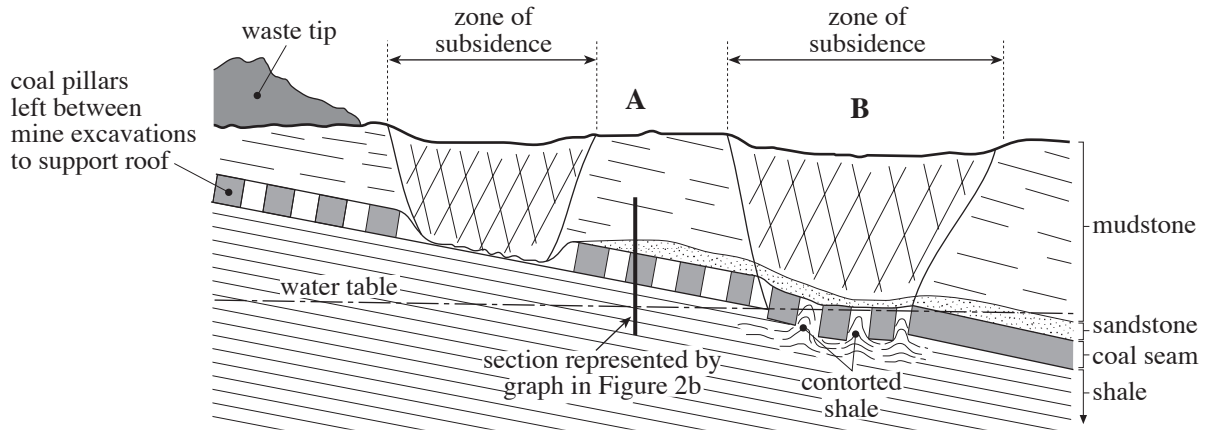


Figure 2a

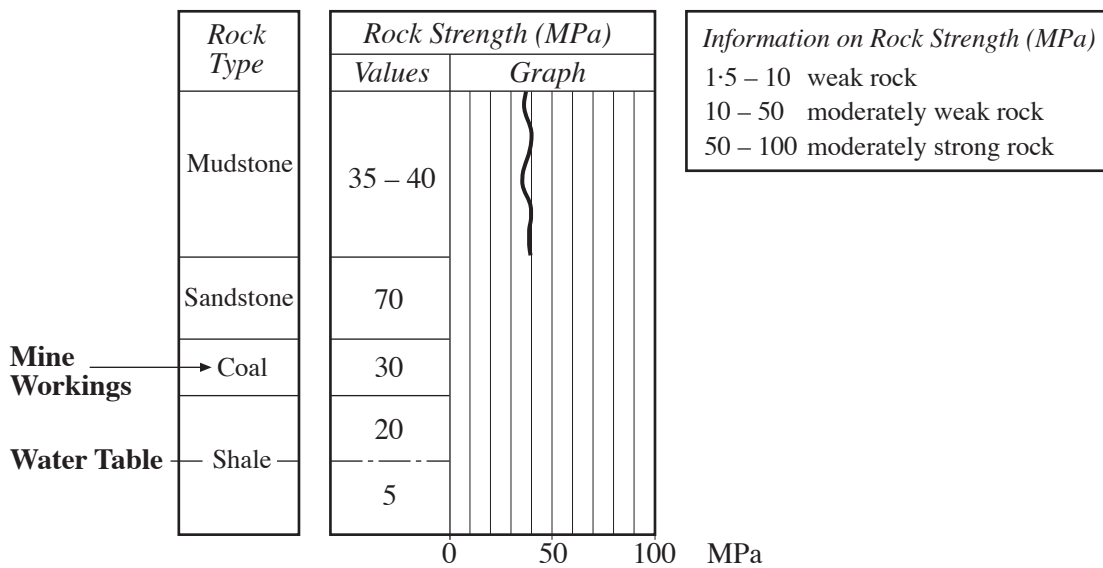


Figure 2b

- (a) (i) Complete the graph (**Figure 2b**) to show how rock strength changes with rock type above and below the mine workings. [2]
- (ii) With reference to **Figure 2b**, describe and explain the sudden change in rock strength within the shale. [3]

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- (b) With reference to **Figures 2a** and **2b**, give a geological explanation for **either** the lack of subsidence at location **A**, **or** the subsidence at location **B**. [3]

Location chosen

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- (c) Using your knowledge, describe the geological hazards, other than subsidence, often associated with abandoned mine workings. [5]

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(Total 13 marks)

SECTION B

Answer one question from this section on the following pages.

You are advised to make use of examples where possible in your answer.

EITHER,

3. (a) Describe the difference between the magnitude and intensity of an earthquake and the scales used in their measurement. [10]
- (b) With reference to one or more case studies, explain the use of **two** of the following methods used to predict earthquakes:
- (i) electrical resistivity;
 - (ii) radon gas emissions;
 - (iii) the presence of earthquake lights;
 - (iv) seismic activity. [15]

OR,

4. (a) Using one or more diagrams, describe how the excavation of a roadway cutting in an area of dipping sandstone and shale strata might lead to slope instability. [10]
- (b) Explain how slope instability might be overcome by good engineering practice. [15]

OR,

5. (a) Describe, giving reasons, the geological factors that need to be considered in the disposal of highly toxic and/or radioactive waste compared with the disposal of domestic waste. [15]
- (b) With specific reference to one actual (or potential) landfill or underground site, analyse the suitability of the site for the type of waste disposed. [10]

