



GCE AS/A Level – LEGACY

1213/01

GEOLOGY – GL3

Geology and the Human Environment

FRIDAY, 18 May 2018 – AFTERNOON

1 hour 15 minutes plus your additional time allowance

Surname _____

Other Names _____

Centre Number _____

Candidate Number 2 _____

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
Section A		
1.	12	
2.	13	
Section B		
3.	25	
4.		
5.		
Total	50	

ADDITIONAL MATERIALS

A calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

Answer ALL questions from Section A and ONE from Section B.

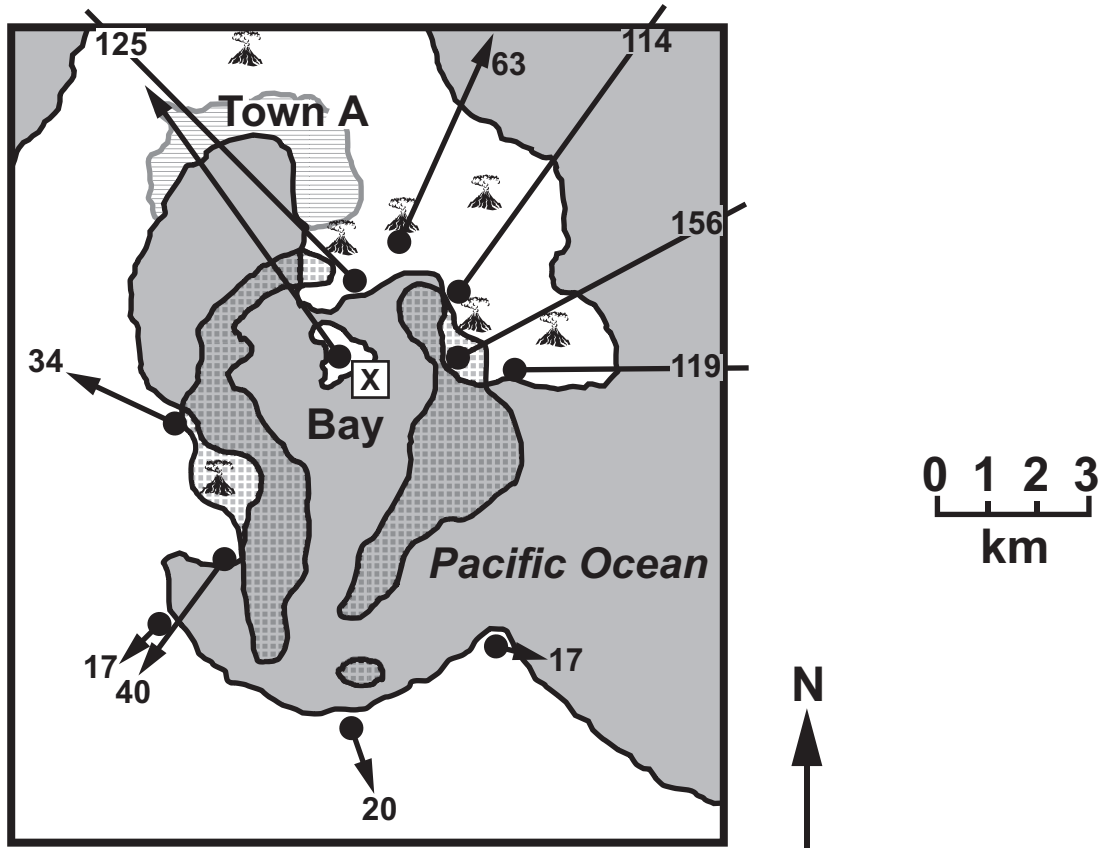
Write your answers in the spaces provided in this booklet.

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.

FIGURE 1



Key

-  Zone of earthquake epicentres
-  Active volcanic vent
-  Location X
-  Amount and direction of tilt (mm km^{-1})

Arrow length proportional to amount of tilt
 $1 \text{ mm} = 2 \text{ mm km}^{-1}$

SECTION A

Answer BOTH questions 1 and 2 on the lines provided in the questions.

- 1. FIGURE 1 opposite shows data collected during monitoring of a caldera (a large, basin shaped volcanic depression) between 1977 and 1984.**

Refer to FIGURE 1.

- (a) (i) Describe the distribution of earthquake epicentres associated with the caldera. [2]**

1(a) (ii) Explain why TOWN A might be at risk from tsunami hazards. [3]

- 1(b) (i) Complete the table below by measuring the amount and direction of tilt recorded at location **X** on **FIGURE 1**. [2]

Tiltmeter location	Amount of tilt (mm km^{-1})	Direction of tilt
Location X		

- (ii) Describe the general pattern of tilt on **FIGURE 1**. [2]

1(c) With reference to evidence from FIGURE 1, explain why the region shown on the map was considered to be at risk from a major volcanic event between 1977 and 1984. [3]

FIGURE 2a

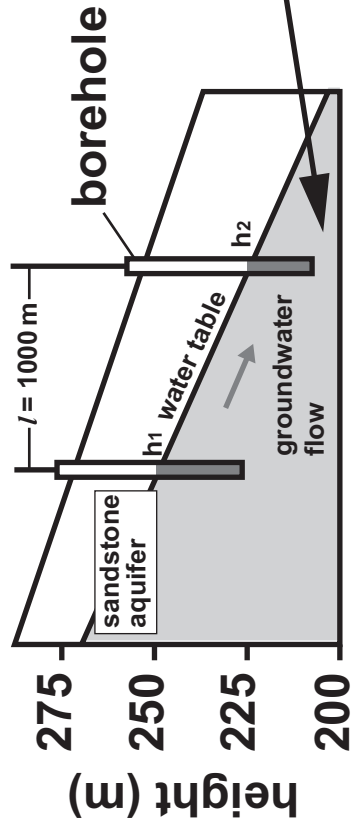
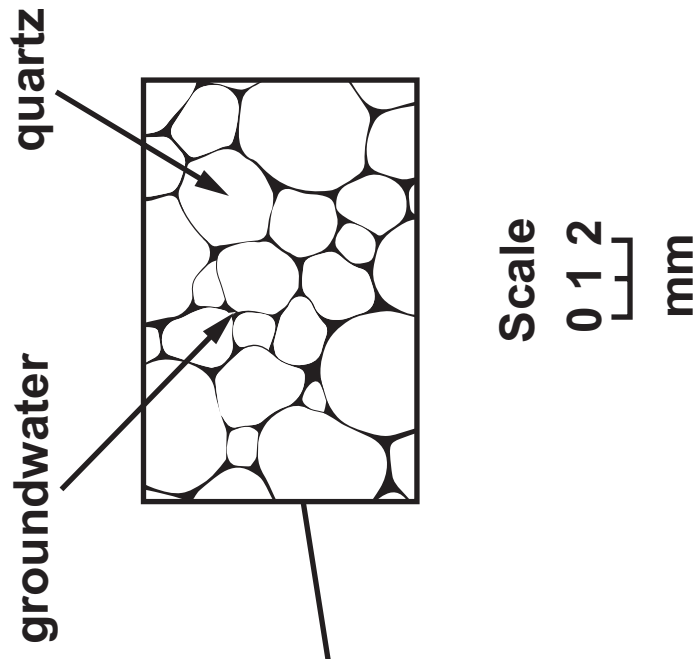


FIGURE 2b



2. **FIGURE 2a** opposite is a section through a sandstone aquifer from which boreholes extract groundwater. **FIGURE 2b** opposite shows the texture of the sandstone in the aquifer.

Refer to **FIGURE 2a** and **FIGURE 2b**.

- (a) (i) Calculate the velocity of groundwater flow between the two boreholes in **FIGURE 2a** using the formula:

$$V = K \frac{h_1 - h_2}{l}$$

where

V = velocity of groundwater flow in metres per day
(m d^{-1})

K = hydraulic conductivity (related to permeability) =
800 m d^{-1}

h_1 & h_2 = height of water table in boreholes

l = distance between boreholes

Show your working: [2]

_____ m d^{-1}

- 2(a) (ii) The velocity of groundwater flow through an aquifer partly depends upon rock texture. State ONE difference in rock TEXTURE from that seen in FIGURE 2b that would result in a DECREASE in the velocity of groundwater flow. Explain your answer.

[2]

FIGURE 2C

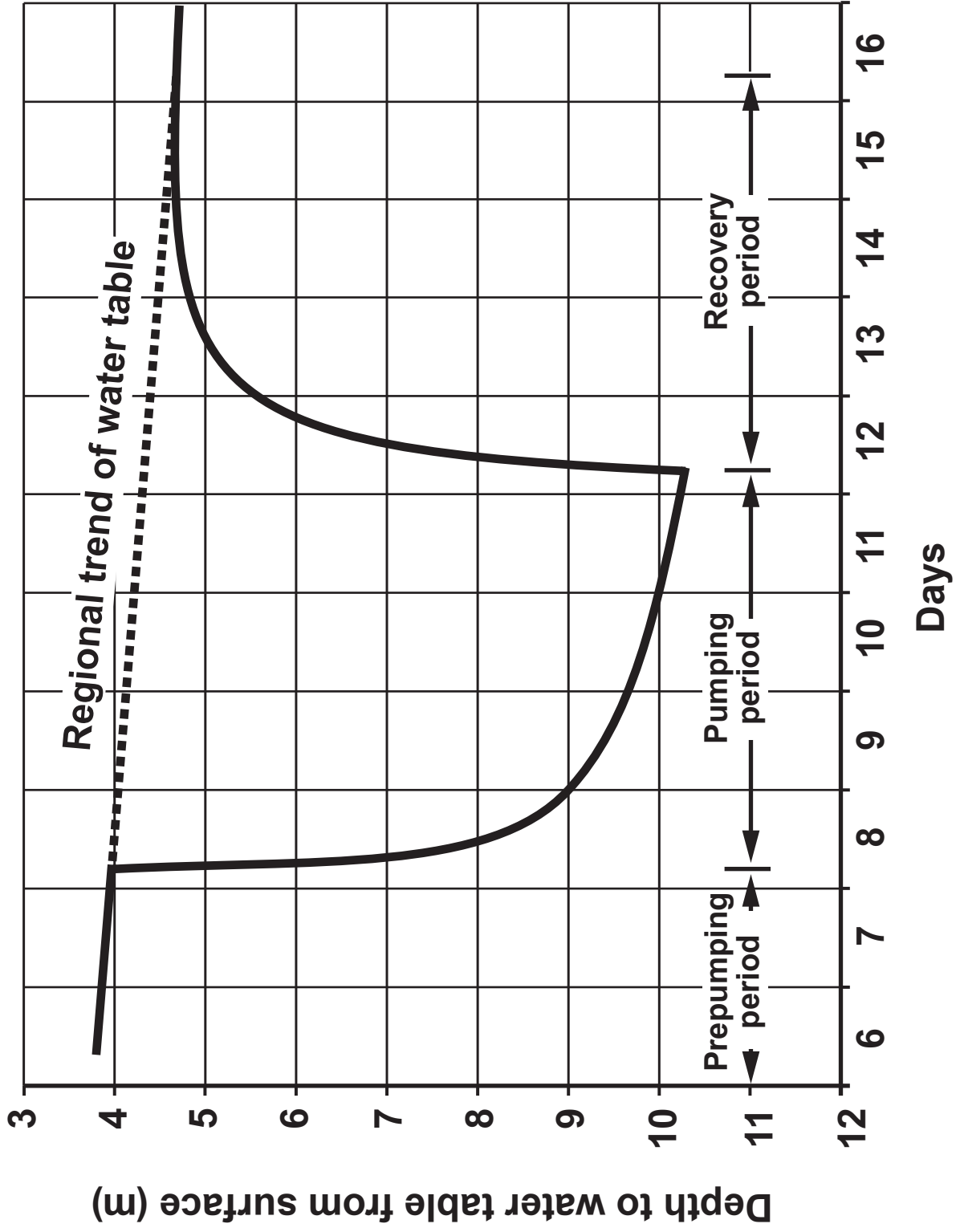


FIGURE 2c opposite is a graph of **DEPTH** to the water table from the surface measured over 10 days in a third borehole.

2(b) Refer to FIGURE 2c.

- (i) Describe and explain the changes in the depth to the water table during the pumping and recovery periods (days 8 – 16). [4]**

Describe _____

Explain _____

2(b) (ii) Suggest TWO reasons why the regional trend of the water table continues to fall, even after the recovery period. [2]

2(c) From your knowledge, explain how land subsidence can result from the long term lowering of the water table associated with pumping. [3]

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) Explain how TWO of the following factors might increase the likelihood of mass movements of rock and soil:

- slope angle and direction**
- lithology**
- weathering**
- groundwater/rainfall changes [10]**

(b) Explain how slopes at risk of mass movement might be stabilised. [15]

OR,

4(a) Describe the geological problems that may be associated with the extraction of rock or minerals. [10]

(b) Explain how the extraction of rock and minerals from a mine or quarry excavated below the natural water table may result in the pollution of surface and groundwater. [15]

OR,

5(a) Describe how engineering activities can influence the rate of coastal erosion. [10]

(b) Explain the potential risk of hazard for TWO of the following:

- building a dam on faulted limestone bedrock**
- the development of a housing estate on a former landfill site**
- bridge foundations built on former lake sediments [15]**

