Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1213/01

GEOLOGY – GL3
Geology and the Human Environment

A.M. FRIDAY, 16 May 2014

1 hour 15 minutes

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

1213
010001

ADDITIONAL MATERIALS

In addition to this examination paper, you will need 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 map showing the epicentres of Mexican earthquakes leading up to the 8.1 magnitude earthquake of 19 September 1985. **Figures 1b** and **1c** show data on damage related to the 1985 Mexican earthquake.

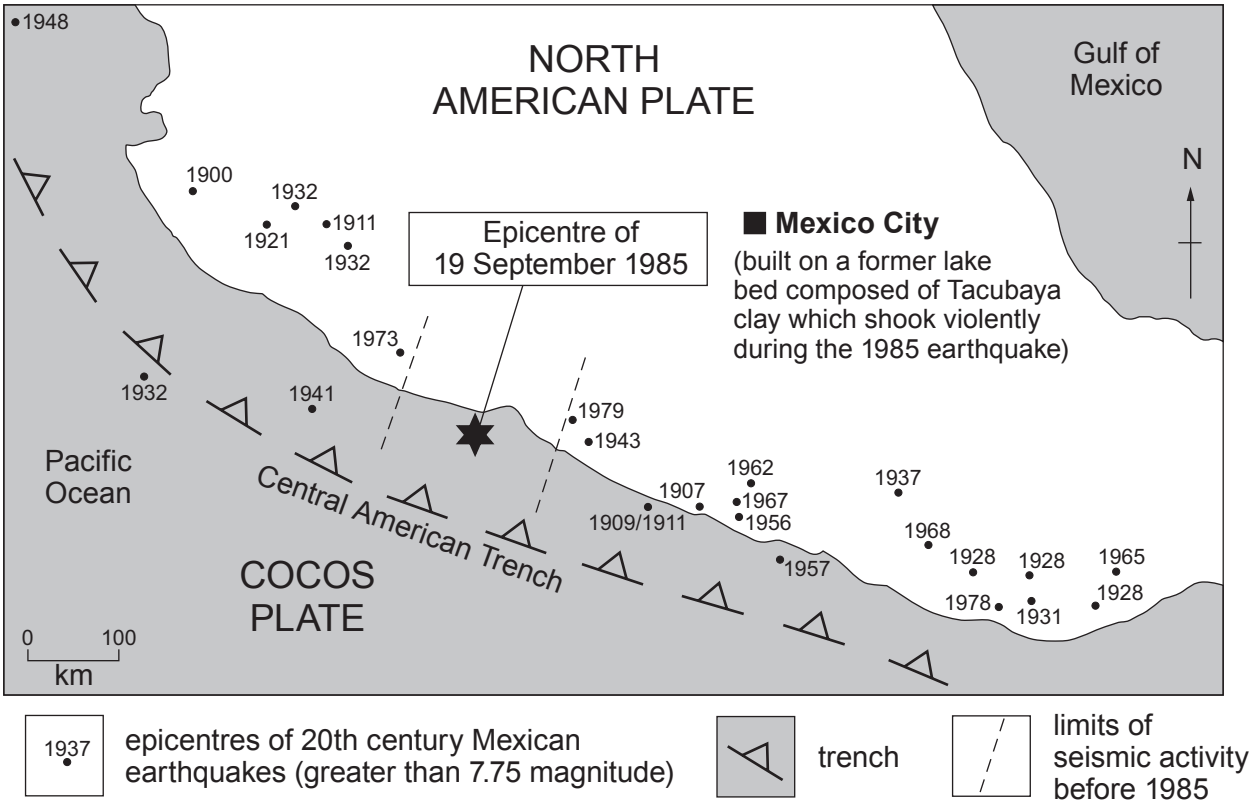

Figure 1a

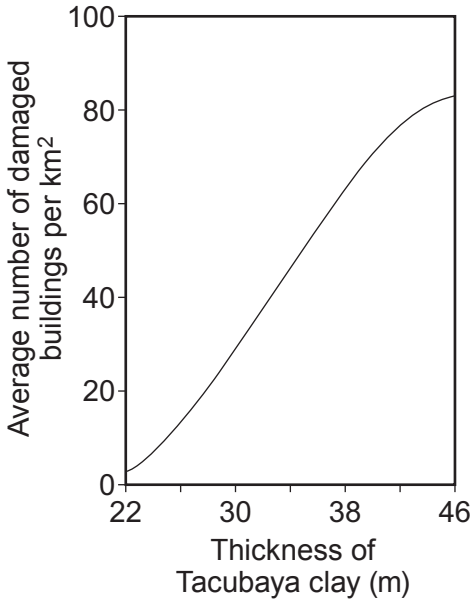

Figure 1b

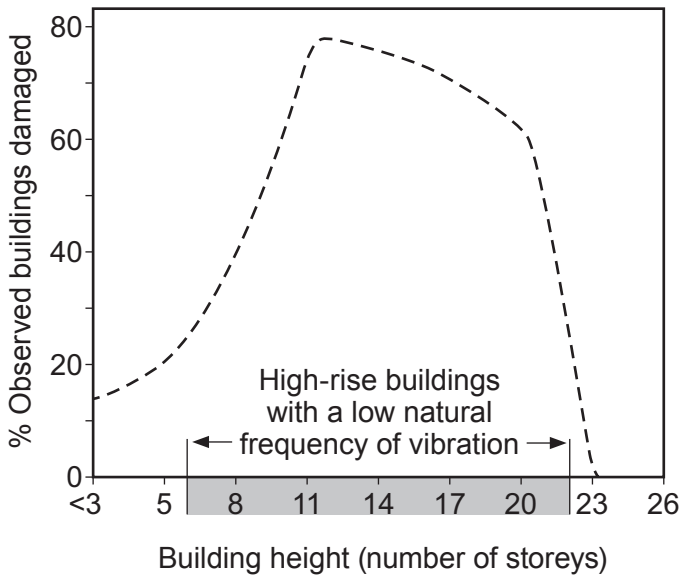

Figure 1c

Examiner only

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

(i) Explain why earthquakes are frequent in the region shown on **Figure 1a**. [2]

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(ii) Explain why the 1985 earthquake might have been predicted to occur in the area where it did. [2]

.....

.....

.....

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

(i) Describe the relationship between the thickness of the Tacubaya clay and damage to buildings in Mexico City. [2]

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(ii) Explain why the damage caused by the earthquake varied with the thickness of the clay. [2]

.....

.....

.....

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

(i) State between which two building heights (number of storeys) more than 25% of buildings were damaged. [2]

Range from ..... to ..... storeys

(ii) Explain why buildings outside this range were less likely to be damaged by this earthquake. [2]

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Examiner only

2. **Figure 2a** is a section through an aquifer and confining beds.

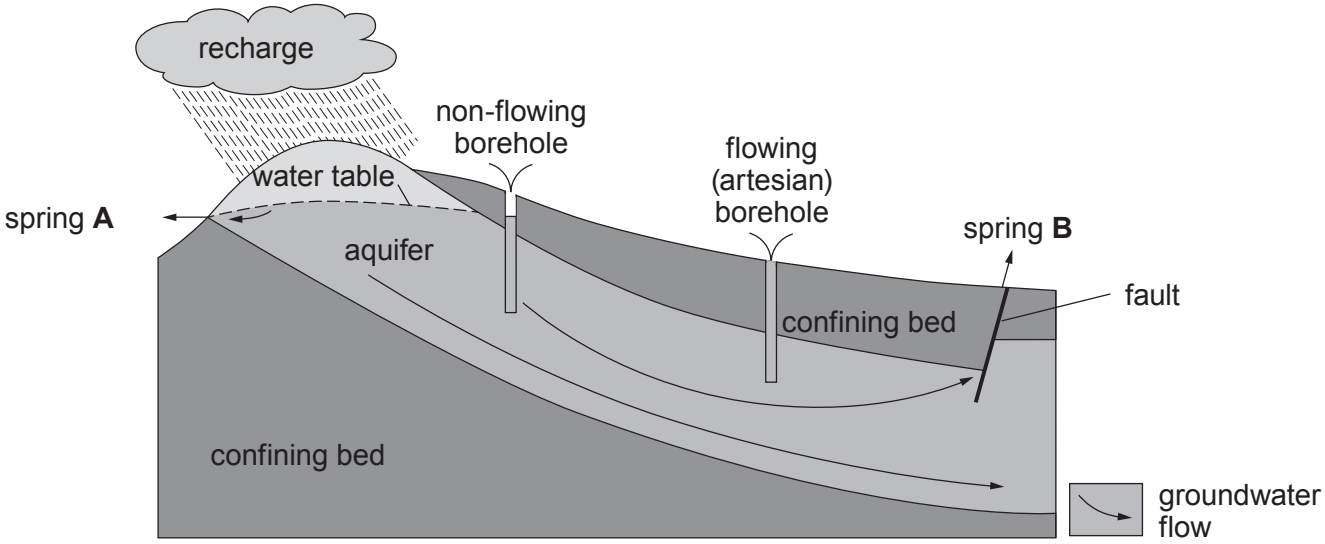

Figure 2a

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

(i) Explain why springs occur at locations **A** and **B**. [3]

A .....

.....

B .....

.....

(ii) Explain how overpumping from the non-flowing borehole might interfere with the hydrological system. [3]

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Examiner only

Porosity depends upon a number of sedimentary characteristics. **Figure 2b** shows three sediment models (**A**, **B** and **C**) representing the packing of spherical grains of different sizes.

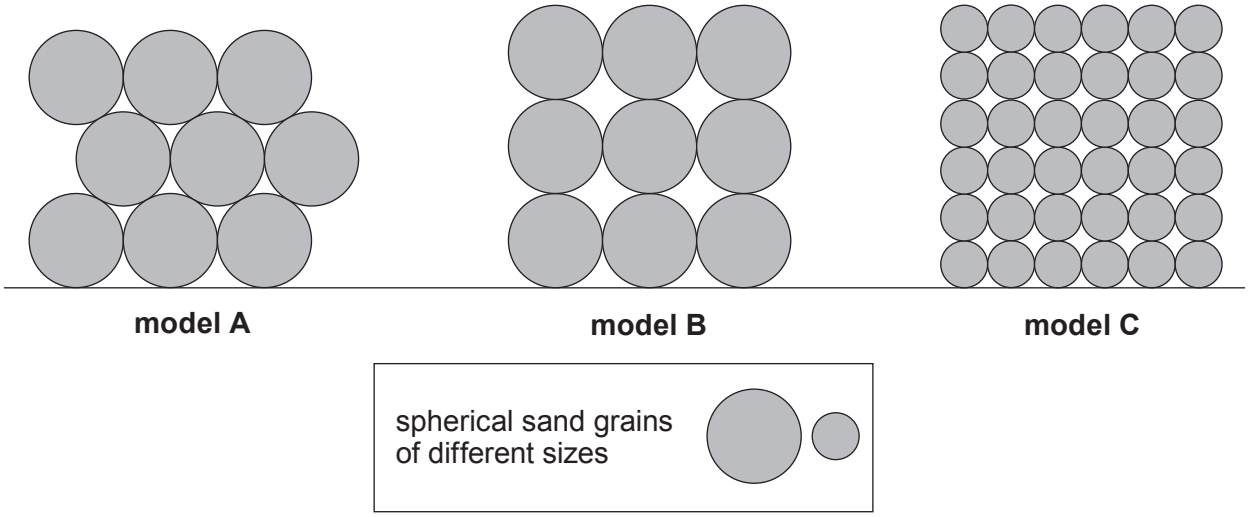

Figure 2b

(b) (i) With reference to **Figure 2b**, complete **Table 2** by describing the effect on porosity of differences in *packing* and *grain size* in the following pairs:

- *packing* in models **A** and **B**
- *grain size* in models **B** and **C** [2]

Sedimentary characteristic	Models compared	Effect on porosity
packing	model **A** and model **B**	•
grain size	model **B** and model **C**	•

Table 2

(ii) State **one** *additional* sedimentary characteristic that would influence porosity in sediments. For your chosen characteristic explain how it would effect porosity. [2]

Sedimentary characteristic .....

Explanation .....

.....

QUESTION 2 CONTINUES ON PAGE 6

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(c) Using **Figure 2b and your knowledge**, explain how overuse of an aquifer can lead to surface subsidence. [3]

.....

.....

.....

.....

13

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 risk of damage to property or loss of life in coastal areas prone to tsunamis. [10]

(b) Explain how **two** of the following might be used effectively to minimise the risk from the destructive effects of natural geological hazards.

(i) Controlled stress relief along faults
(ii) Slope monitoring techniques
(iii) Indicators of magma movement [15]

OR,

4. *(a)* Using one or more diagrams, describe how the excavation of a roadway cutting or tunnel in an area of dipping sandstones and shale might lead to slope instability or tunnel collapse. [10]

(b) Explain how slopes prone to mass movement might be stabilised. [15]

OR,

5. *(a)* Describe how the different hazards associated with volcanoes **and** earthquakes might give rise to similar types of risk. [10]

(b) Explain the geological factors that might be investigated when developing a hazard map for an active island volcano. [15]

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END OF PAPER

Acknowledgements:

Figure 1a – *Degg et al. – Teaching Geology, Vol 13, No.4 1988*

Figure 2a – *"Groundwater – our hidden asset" (UK Groundwater Forum)*