WJEC CBAC

GCE AS/A level

1213/01

# GEOLOGY – GL3

## Geology and the Human Environment

**A.M. FRIDAY, 16 May 2014**

**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

**In addition to this examination paper, you will need 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.**

## SECTION A

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

**1. FIGURE 1a opposite 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 opposite show data on damage related to the 1985 Mexican earthquake.**

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

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

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

**1(b) Refer to FIGURE 1b opposite page 4.**

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

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

**1(c) Refer to FIGURE 1c opposite page 4.**

**(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]**

_____

_____

_____

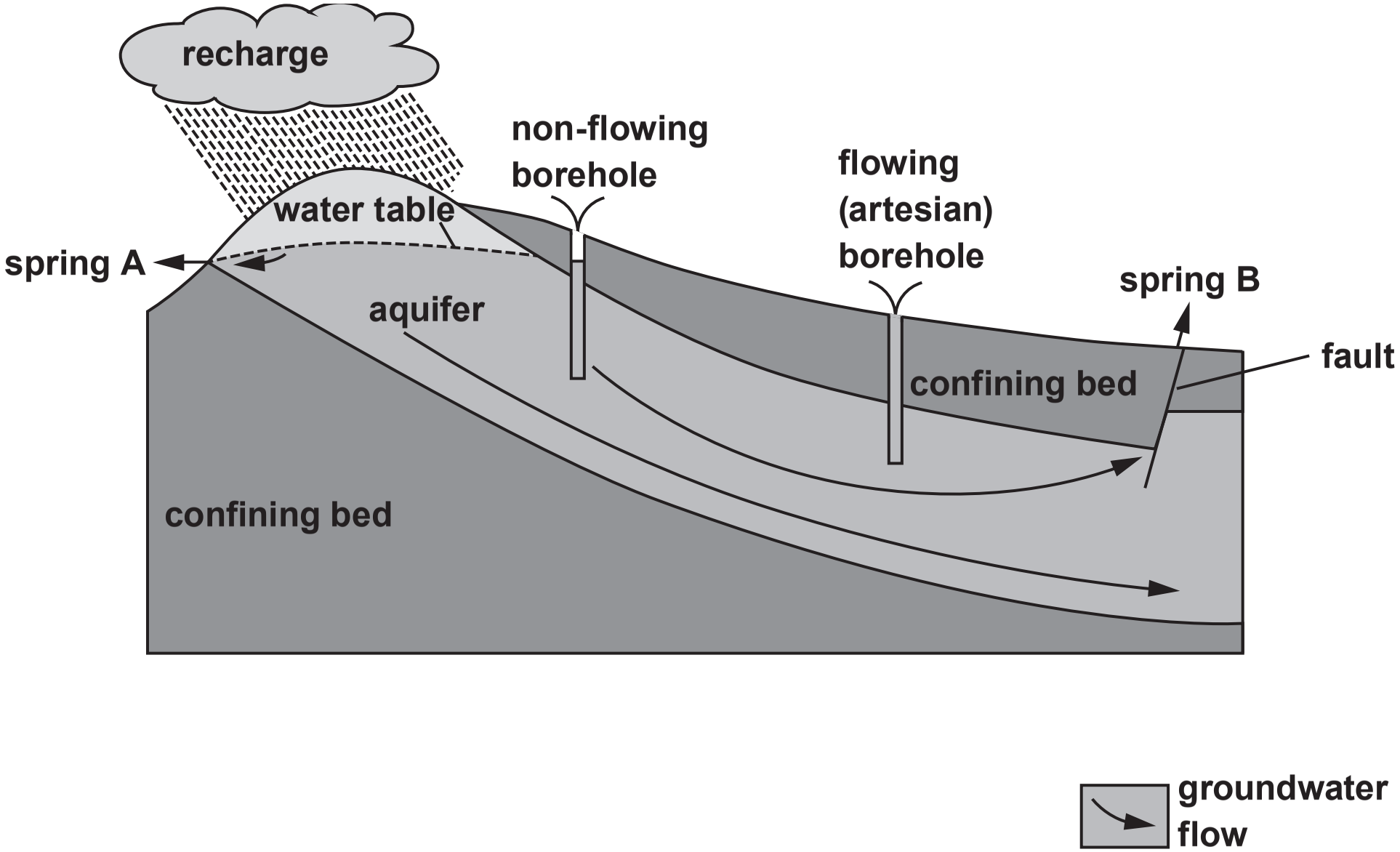
_____

_____

_____

| |
|---|
| 12 |

FIGURE 2a


recharge
non-flowing
borehole
flowing
(artesian)
borehole
water table
spring A
spring B
aquifer
fault
confining bed
confining bed
groundwater
flow

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

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

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

**A** _____

_____

_____

_____

**B** _____

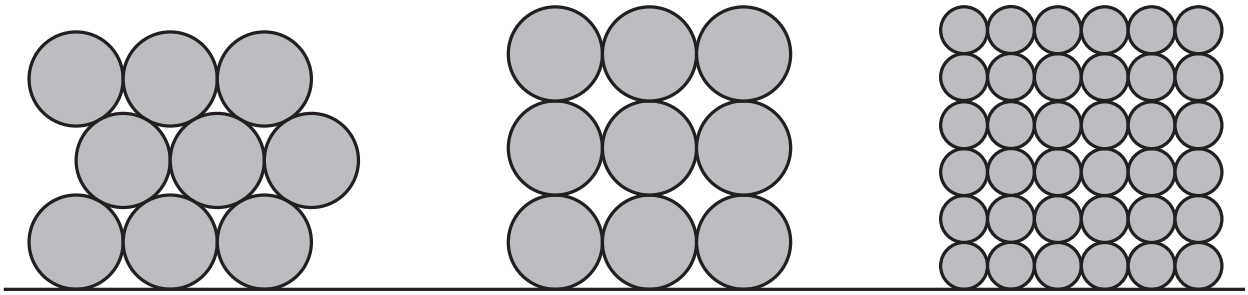
_____

_____

_____

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

**FIGURE 2b**



**model A** **model B** **model C**

**spherical sand grains of different sizes**

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

**2(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]**

**TABLE 2**

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

**2(b) (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 12**

**2(c) Using FIGURE 2b opposite page 10 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]**

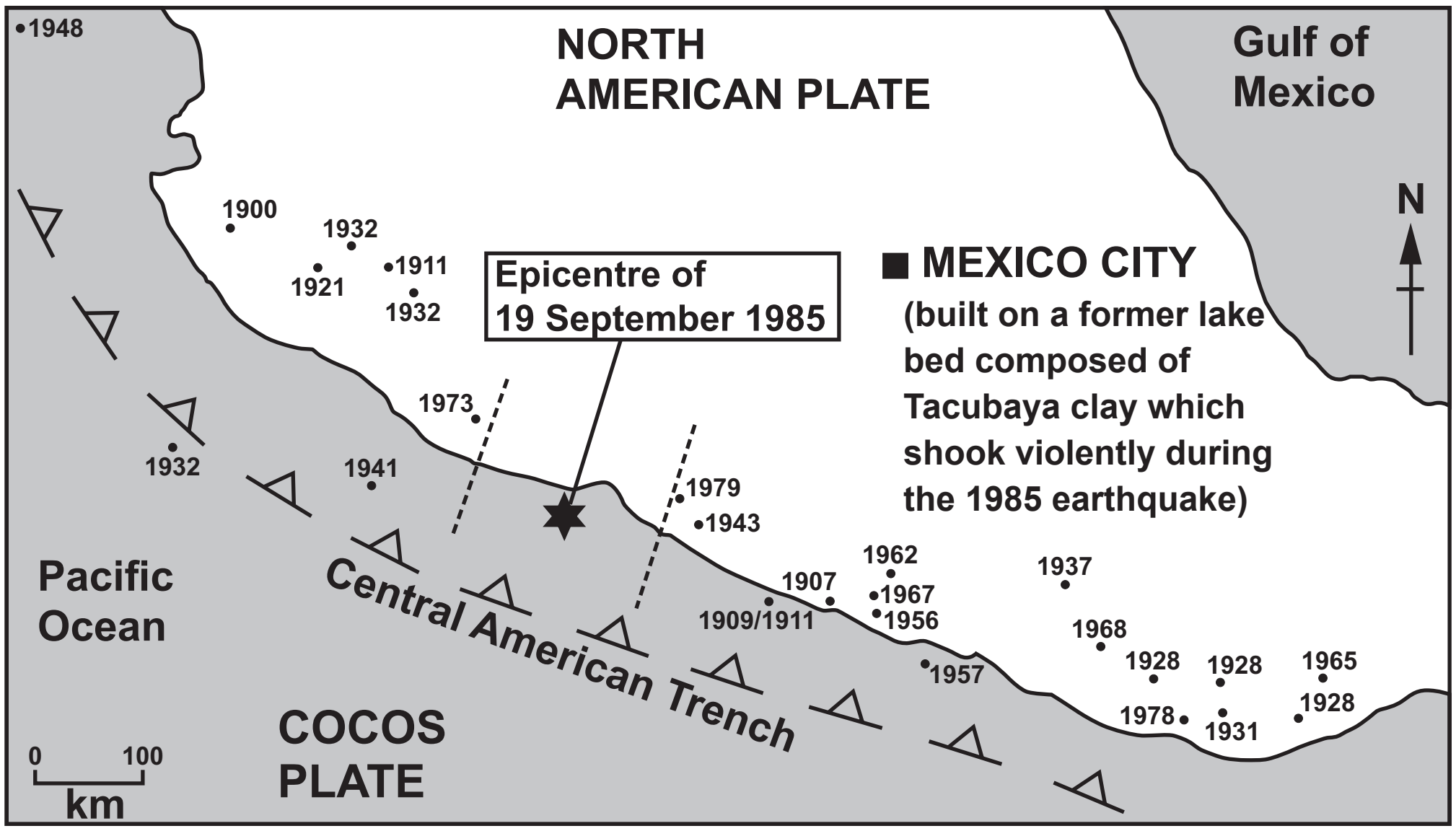
**END OF PAPER**

**ACKNOWLEDGEMENTS:**

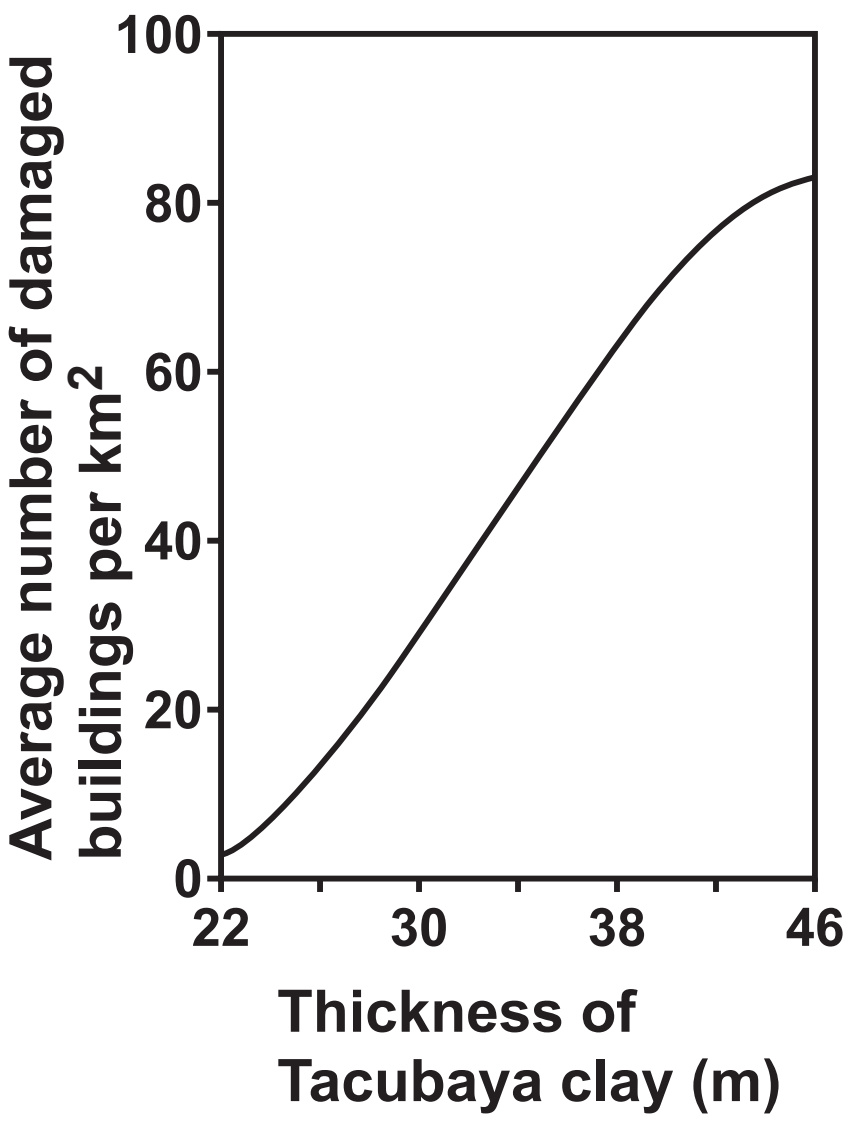
**FIGURE 1a – Degg et al. – Teaching Geology, Vol 13, No.4 1988**

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

## FIGURE 1a




## FIGURE 1b




## FIGURE 1c