

Surname	Centre Number	Candidate Number
Other Names		2



GCE AS/A level

1213/01



S15-1213-01

GEOLOGY – GL3

Geology and the Human Environment

P.M. TUESDAY, 19 May 2015

1 hour 15 minutes

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

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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 travel times of tsunamis associated with the Boxing Day earthquake of 2004. **Figure 1b** is a diagram of two faults associated with this type of plate tectonic setting. **Table 1** compares the 2004 earthquake with another major earthquake in this region in 2012.

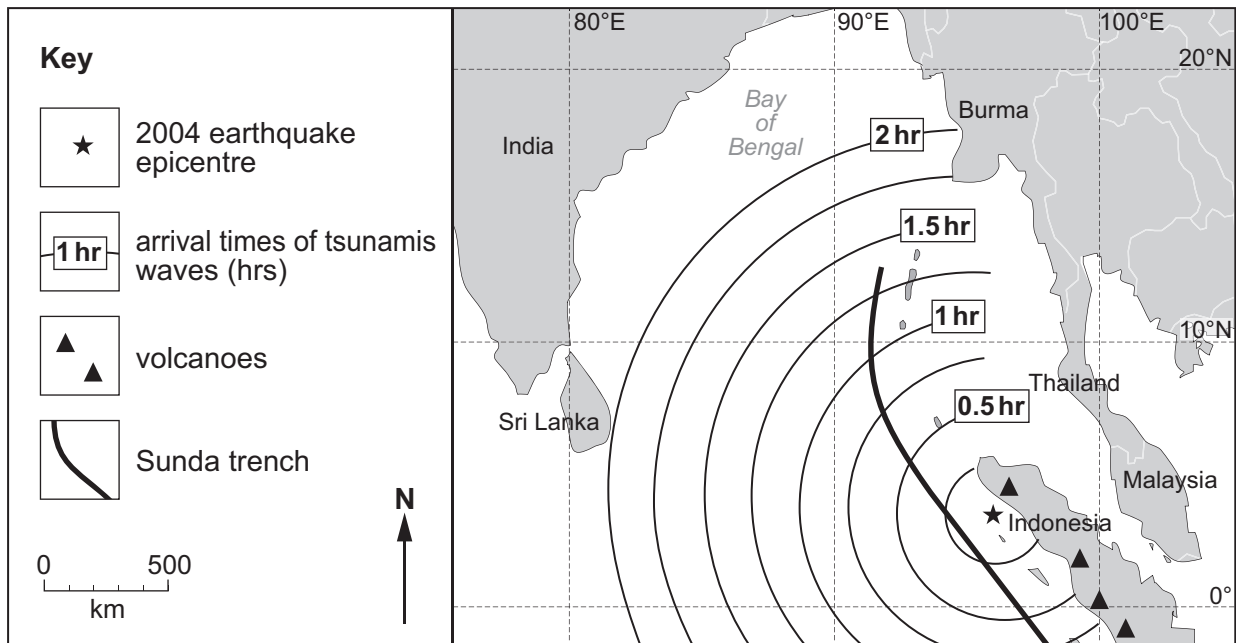


Figure 1a

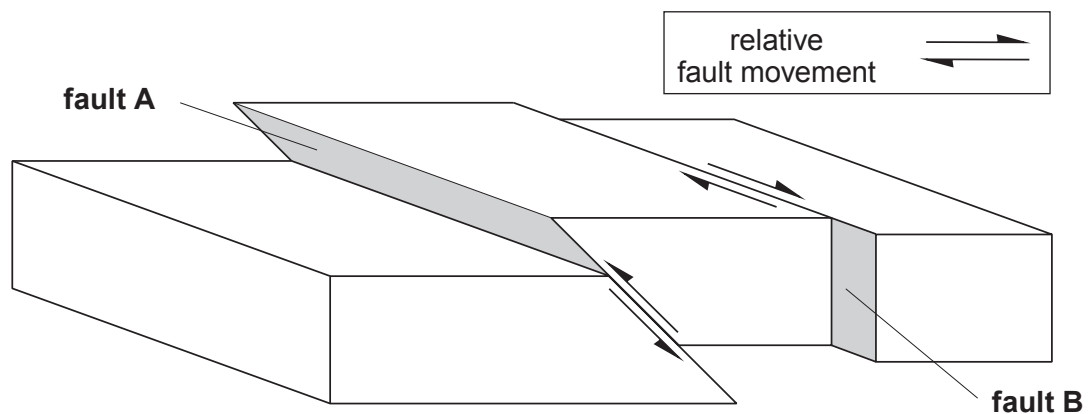


Figure 1b

Date of earthquake	Magnitude (Richter)	Depth of focus (km)	Damage and injury	Fault type responsible
Boxing Day 2004	9	30	More than 200 000 killed, widespread damage	A
11 th April 2012	8.6	33	No reported injury or damage	B

Table 1

- (a) In addition to the earthquakes, state **two** pieces of evidence from **Figure 1a** that suggests a subduction zone exists beneath Indonesia. [2]

Evidence

Evidence

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

- (i) The 2004 epicentre was 1600 km from the coast of Sri Lanka.
Calculate the speed of tsunamis waves (in km hr^{-1}) reaching the eastern coast of Sri Lanka. Show your working. [2]

..... km hr^{-1}

- (ii) The tsunamis waves crossing the Bay of Bengal were estimated to be only 30 cm high. Explain how the tsunamis waves came to be so destructive on reaching the coastline. [3]

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- (c) Refer to **Table 1** and **Figure 1b**.

- (i) State the types of fault represented by **fault A** and **fault B** in **Figure 1b**. [2]

A

B

- (ii) Explain why movement along **fault B** in 2012 failed to generate a life-threatening tsunami. [3]

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2. **Figure 2a** is a map showing contours for the groundwater surface along the side of a valley and two plumes (**A** and **B**) of shallow groundwater contamination associated with abandoned mine workings. **Figure 2b** is a geological section across the line of section **X–Y** on **Figure 2a**.

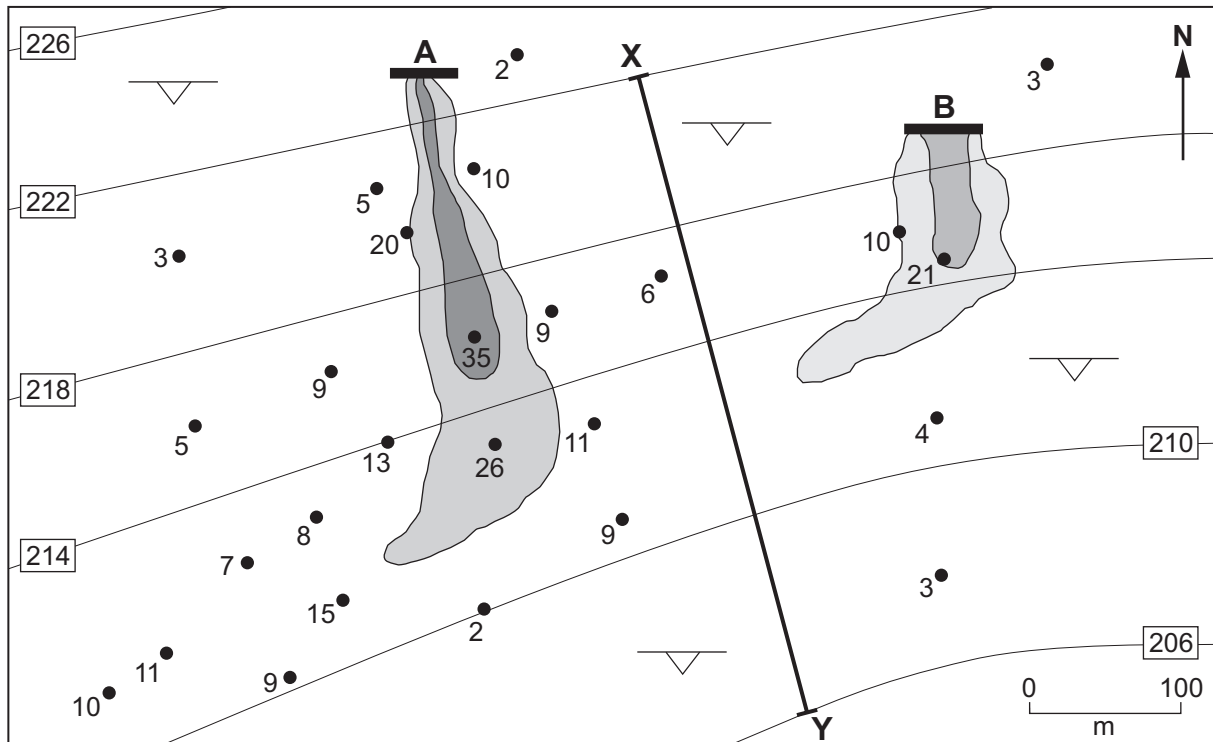


Figure 2a

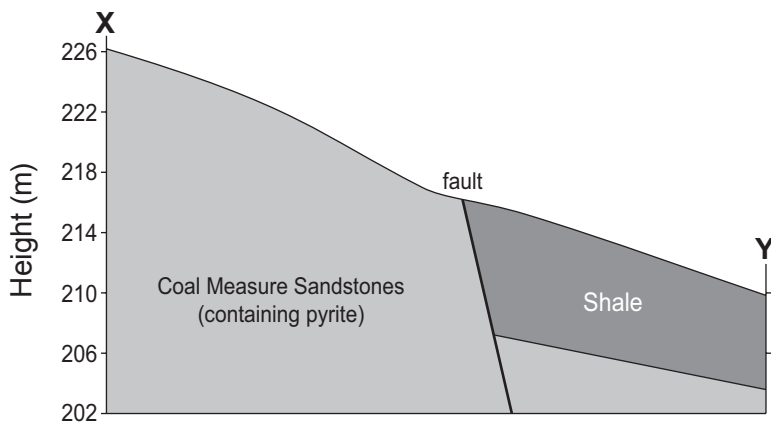


Figure 2b

Key

- groundwater surface contour (m)
- dip of beds
- contaminant measured in test wells (mg l^{-1})
- line of section
- contaminant source and plume isolines

(The isolines join points on the map of equal contamination)

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

- (a) (i) Complete the table below by stating the height of the groundwater surface and the probable direction of shallow groundwater flow at location **X** on **Figure 2a**. [2]

Location X	Height of the groundwater surface	• m
	Direction of shallow groundwater flow	•

- (ii) On **Figure 2b** mark in the top of the groundwater surface along the line of section **X** and **Y**. [1]

- (b) The structure and rock type have influenced the shape and extent of the pollution plumes.

- (i) Draw an isoline on **Figure 2a** to show where the groundwater contamination of plume **A** is 10 mg l^{-1} . [2]
- (ii) Using data from **Figures 2a** and **2b**, mark on **Figure 2a** the probable outcrop of the fault which crosses the map. [2]
- (iii) Explain how structure and rock type have influenced the shape and extent of the pollution plumes. [3]

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- (c) Using **Figure 2b** and/or your knowledge, explain why groundwater from abandoned mines is often polluted. [3]

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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 areas prone to natural geological hazards. [10]
- (b) Explain the **extent** to which **two** of the following might be used to minimise the risk from the destructive effects of natural or human hazards.
- (i) Slope stabilisation methods
 - (ii) Control of lava speed and direction
 - (iii) Engineering of domestic landfill sites [15]

OR,

4. (a) Describe **two** monitoring techniques used to assess slope instability in tunnels and cuttings. [10]
- (b) Explain how the mechanisms and triggers of mass movements (e.g. rock avalanches, landslides and debris flows) are linked to natural processes and rock properties. [15]

OR,

5. (a) Describe the factors that affect the porosity and permeability of sedimentary rocks. [10]
- (b) Explain the geological hazards that might result when engineering activities associated with the construction of a dam and reservoir fail to take account of geological factors and rock properties. [15]

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