GCE AS/A level

1213/01

GEOLOGY – GL3

Geology and the Human Environment

P.M. TUESDAY, 19 May 2015

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 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.

(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 _____

_____

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

(i) The 2004 epicentre was 1 600 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}**

1(b) (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]

1(c) Refer to TABLE 1 and FIGURE 1b opposite page 4.

(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 opposite 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 opposite is a geological section across the line of section X–Y on FIGURE 2a.

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]

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

(i) Draw an isoline on FIGURE 2a opposite page 8 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]

2(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]

END OF PAPER

FIGURE 1a

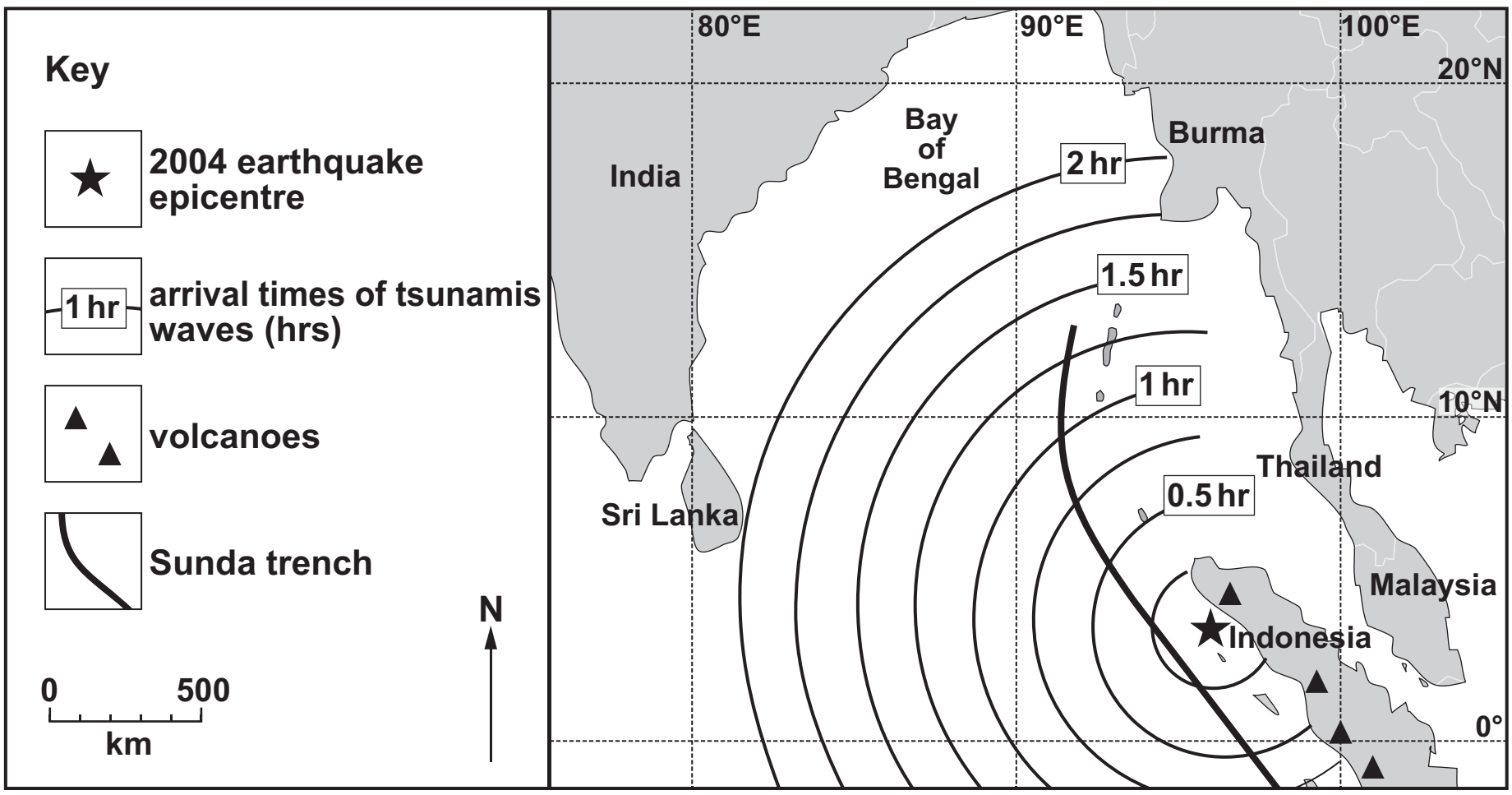

FIGURE 1b

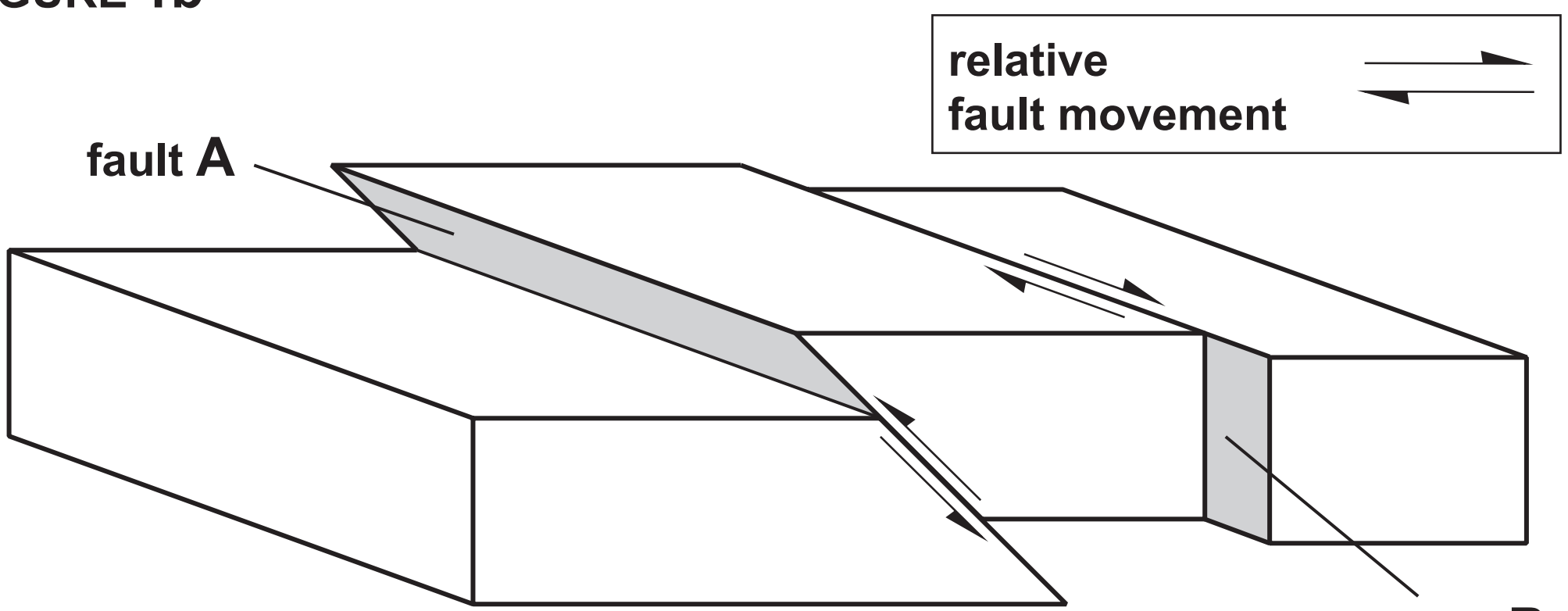

TABLE 1

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
11th April 2012	8.6	33	No reported injury or damage	B

FIGURE 2a

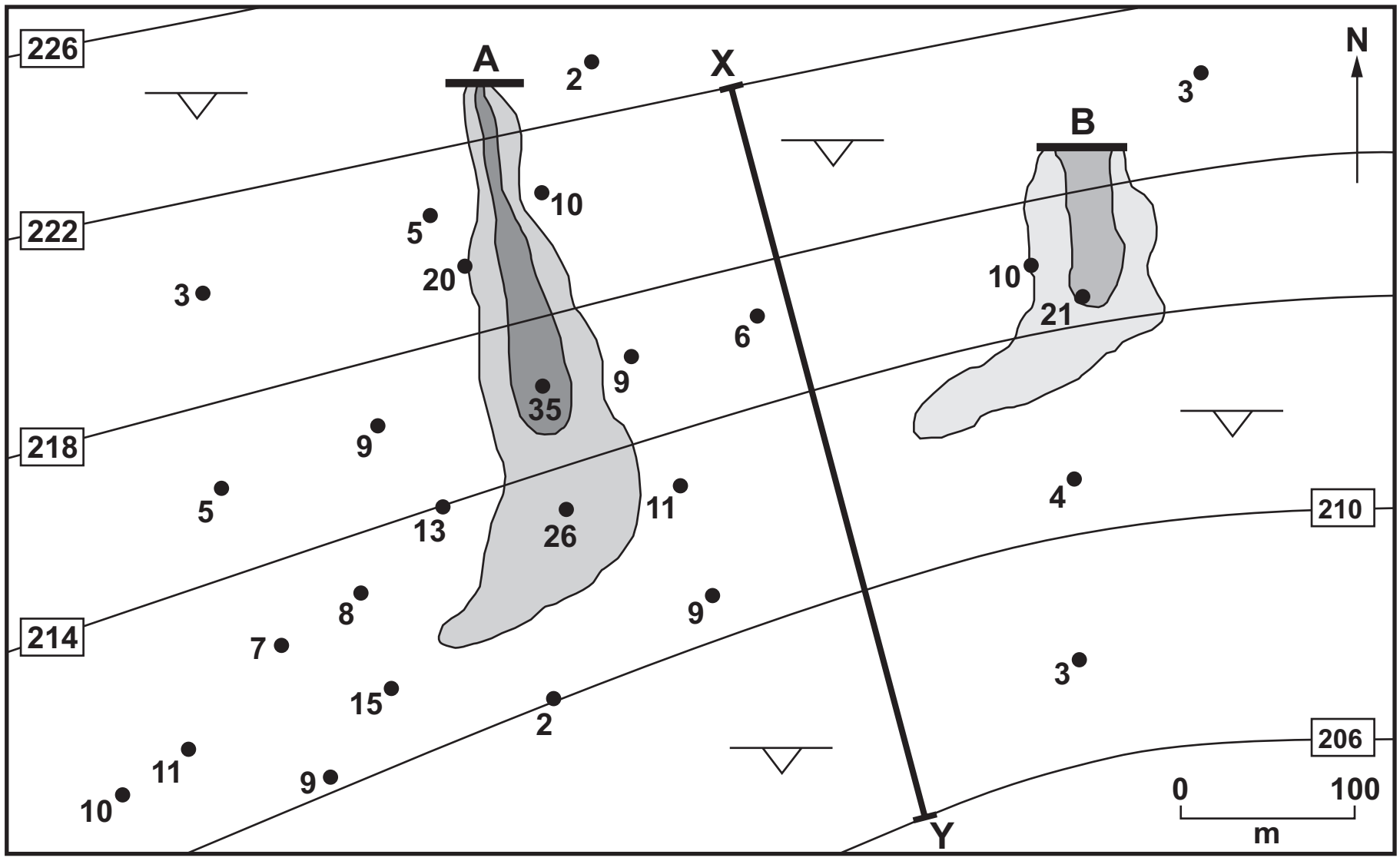

FIGURE 2b