OXFORD CAMBRIDGE AND RSA EXAMINATIONS

AS GCE

F791/01

GEOLOGY

Global Tectonics

TUESDAY 13 MAY 2014: Morning

DURATION: 1 hour

plus your additional time allowance

MODIFIED ENLARGED 24pt

Candidate forename		Candidate surname	

Centre number						Candidate number				

Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Ruler (cm/mm)
Protractor

READ INSTRUCTIONS OVERLEAF

DC (CW/SW) 3974184963 98713

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.

Use black ink. HB pencil may be used for graphs and diagrams only.

Answer ALL the questions.

Read each question carefully. Make sure you know what you have to do before starting your answer.

Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is 60.

Where you see this icon you will be awarded a mark for the quality of written communication in your answer.

You may use an electronic calculator.

You are advised to show all the steps in any calculations.

Any blank pages are indicated.

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Answer ALL the questions.

1 (a) Name the method of dating that is used to determine the age of the Earth.

_____ **[1]**

(b) Seismic wave velocity can be used to help determine the nature and depth of the Earth's layers. The graph opposite shows the changes in velocity of P waves as they travel through the Earth.

(i) The data table shows changes in velocity of S waves. Plot the S wave velocity data on the axes opposite and draw the line graph. [3]

S wave velocity (km/s)	3.0	5.0	4.0	5.0	7.0	0.0	0.0	4.0	4.5
Depth (km)	0	100	150	250	2900	2900	5100	5100	6371

(ii) On the graph on page 5, accurately label the position of the Gutenberg discontinuity with an arrow. [1]

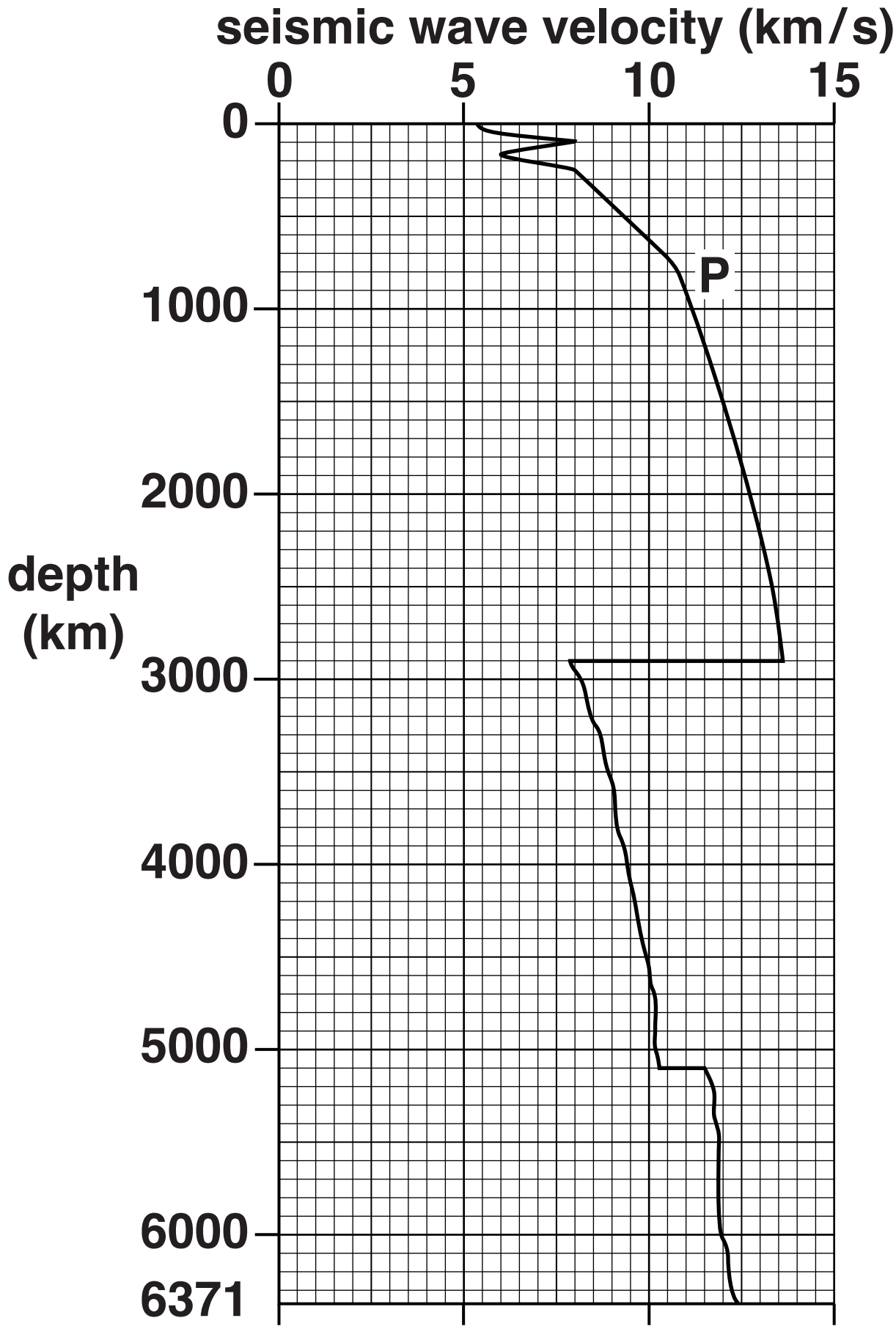
(iii) Describe and explain the P wave velocity changes between 100 km and 250 km.

_____

_____

_____

_____ **[2]**


seismic wave velocity (km/s)
0
5
10
15
0
1000
2000
3000
4000
5000
6000
6371
depth (km)
P

(iv) Describe and explain the S wave velocity changes between 2900 km and 6371 km.

_____

_____

_____

_____ [2]

(c) (i) The table below shows the approximate chemical composition of different layers of the Earth. The full chemical composition of each layer is not given. The layers include:

continental crust core

mantle oceanic crust

Use the data in the table to identify each layer from the list above and write the correct answer in each box.

Percentage composition						
SiO_2	Al_2O_3	Fe_2O_3	MgO	Ni	S	Layer
43	3	8	40	0.3	0	
50	15	10	8	0	0	
0	0	90	0	10	0	
70	15	3	1	0	0	

[2]

(ii) State the indirect evidence used to infer the composition of the core.

_____ [1]

[TOTAL: 12]

2 (a) The list and table below contain earthquake terms and definitions.

Complete the boxes in the table by matching each term in the list to its correct definition.

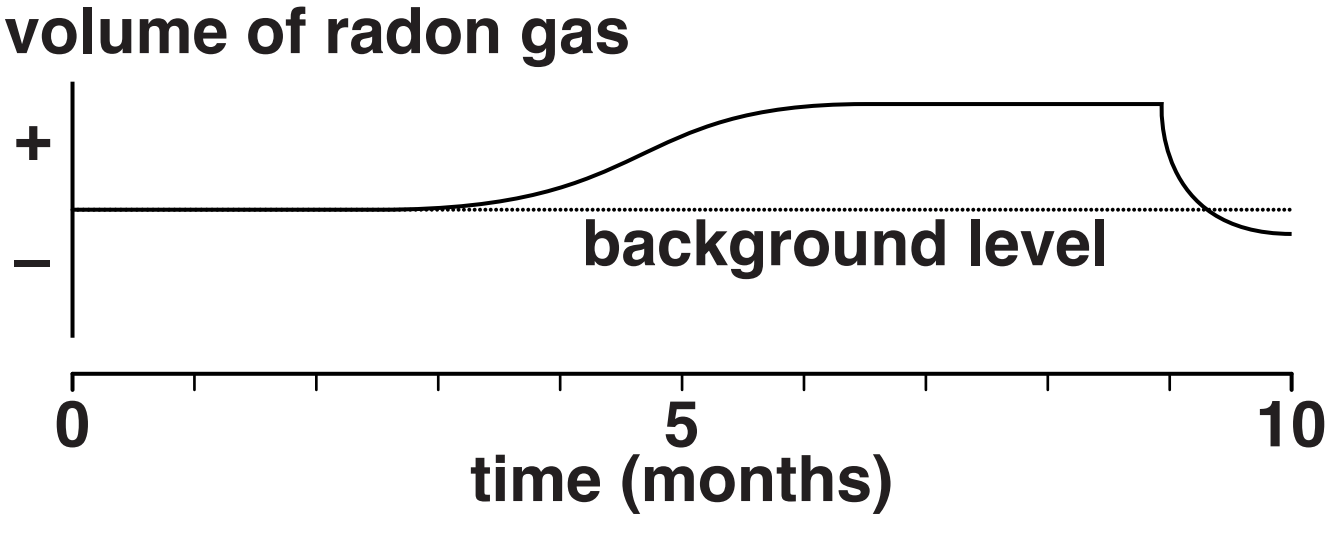
epicentre focus intensity

magnitude seismometer seismogram

[4]

Definition	Term
the instrument used to detect and record ground motion	
the point on the Earth's surface vertically above the point where the earthquake originates	
the trace or record of the earthquake	
the point where the earthquake originates	
a measure of the surface damage caused by the earthquake	
a measure of the amount of energy released by an earthquake	

(b) The volume of radon gas emitted from rocks may help to predict an earthquake.
The graph shows changes in the volume of radon gas emitted from rocks over a 10 month period.



(i) Indicate with an arrow, the possible time when an earthquake occurred. [1]

(ii) Describe and explain why the volumes of radon gas may vary in the period leading up to an earthquake.

_____

_____

_____

_____ [2]

(c) Changes in ground level may also indicate that an earthquake is about to happen.
Describe a method that could be used for measuring changes in ground level.

_____

_____

_____ [1]

(d) Recent research has shown that different sections of the San Andreas Fault system move at different rates. Data from the last ten years are shown in the table.

Section of the San Andreas Fault	Average rate of movement (mm/year)
Smith Ranch	22.1
Dixon's Bluff	0.0
Mee Ranch	26.5
Slack Canyon	23.9

(i) Use a technical term to describe the type of faulting on the San Andreas Fault.

_____ [1]

(ii) **Along some sections of the San Andreas Fault there has been no movement in the last ten years.**

Explain why there are differences in the rate of movement along the fault.

_____

_____

_____

_____

_____ **[2]**

(iii) **Use the data in the table to name the section of the San Andreas Fault where an earthquake is most likely to occur next.**

_____ **[1]**

(e) Explain how earthquakes occur when stress stored in rocks is released.

_____

_____

_____

_____

_____

_____ **[2]**

(f) **Describe why earthquake damage is greater in areas of unconsolidated sand than in areas of consolidated sandstone.**

_____

_____

_____

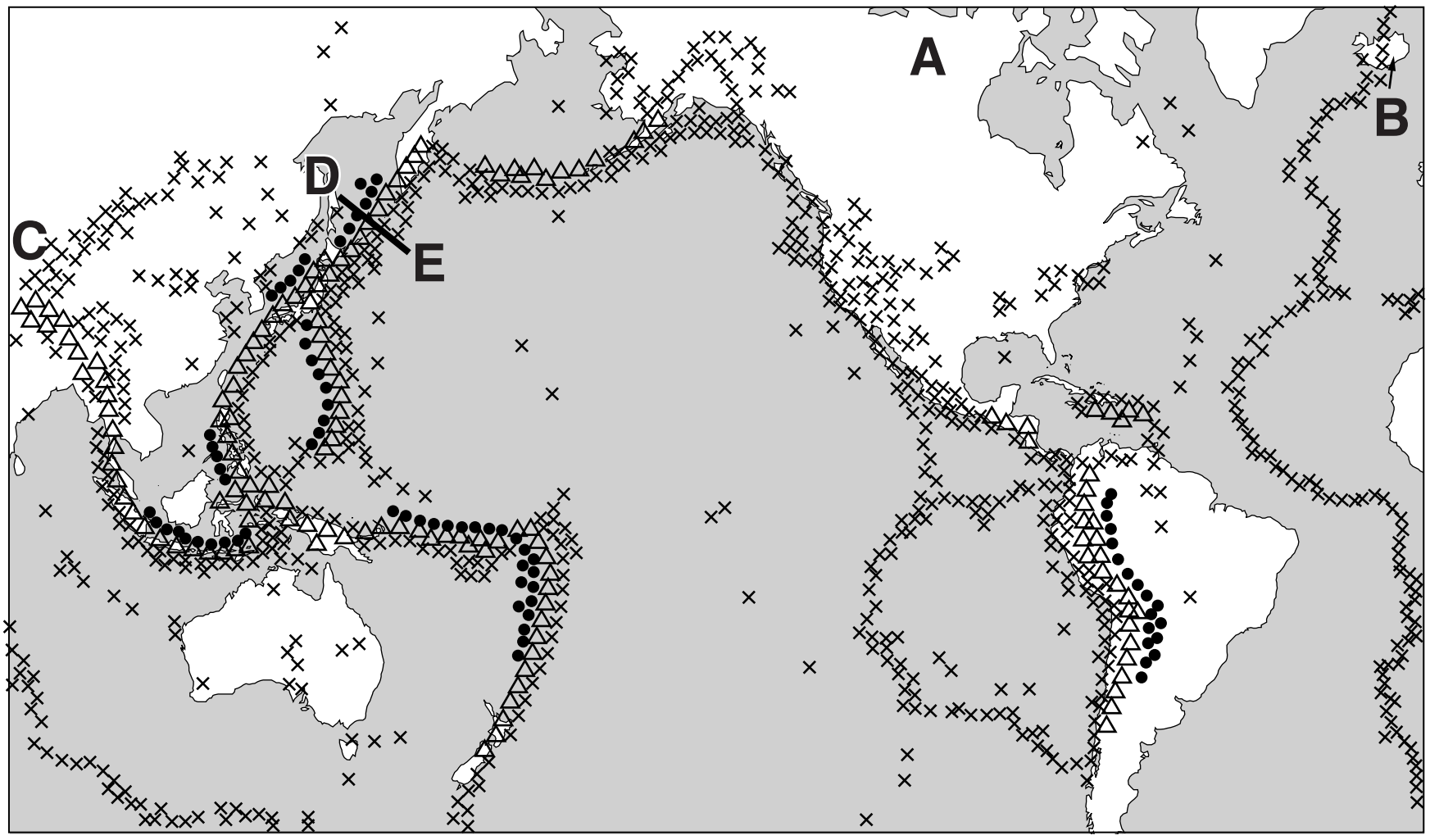
_____

_____ **[2]**

[TOTAL: 16]

3 The map below shows the distribution of shallow, intermediate and deep earthquakes.

KEY
• deep earthquakes
△ intermediate earthquakes
× shallow earthquakes



(a) The region in northern Canada labelled A is aseismic.

(i) What technical term is given to an aseismic area with predominantly Precambrian rocks?

In your answer, you should use the appropriate technical term, spelled correctly.

_____ [1]

(ii) Explain why earthquakes are very rare in area A.

_____

_____ [1]

(b) (i) Explain why only shallow earthquakes occur in Iceland (B on the map).

_____

_____

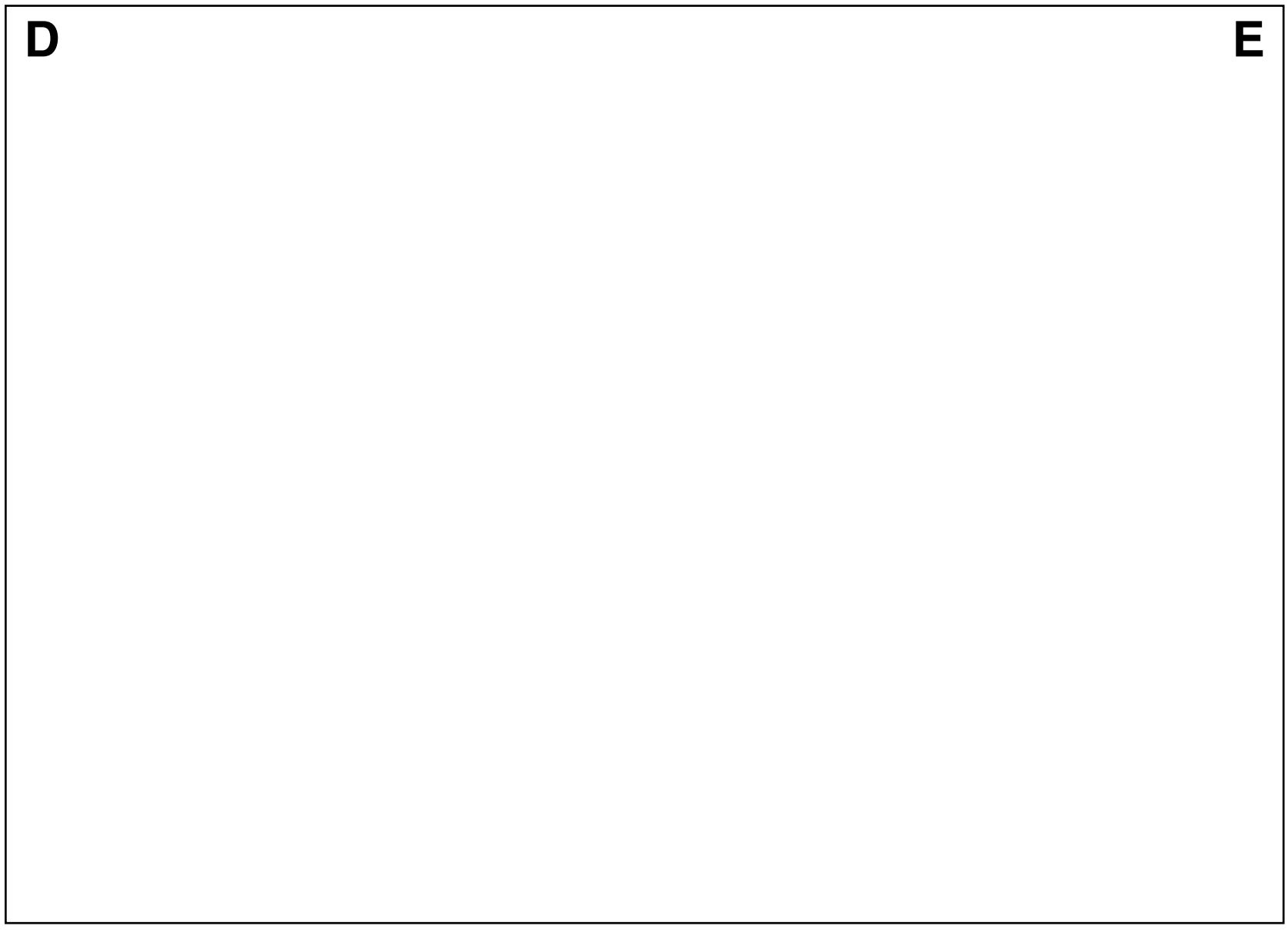
_____ **[1]**

(ii) Describe ONE process that could cause shallow earthquakes beneath the Himalayas (C on map).

_____

_____ **[1]**

(iii) **Describe and explain clearly the pattern of earthquakes in the Japan area along the line D – E on the map. You may use a labelled cross-sectional diagram to help you make your description.**



_____ [3]

(c) (i) **Label the Nazca plate with an N on the map.** [1]

(ii) **Circle a volcanic island arc on the map.** [1]

(iii) **Name the tectonic plate at C.**

_____ [1]

[TOTAL: 10]

4 (a) Describe the difference between faults and joints in rocks.

_____

_____ [1]

(b) (i) Explain clearly how cooling joints form in igneous rocks. You may draw a labelled diagram to help you make your explanation.

_____

_____

_____ [2]

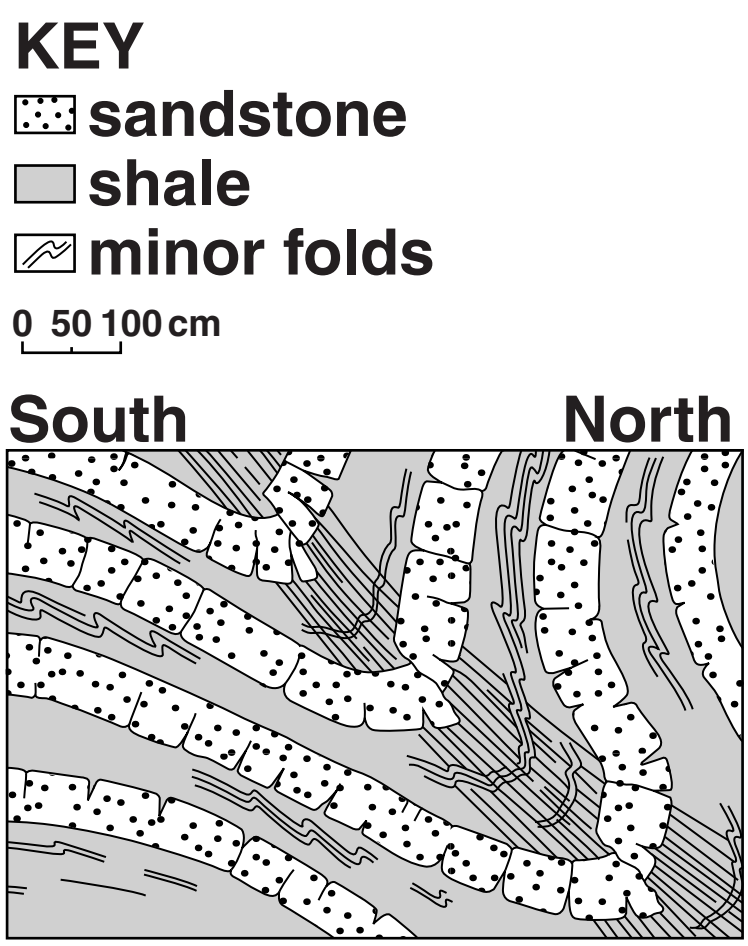
(ii) **Explain clearly how unloading joints form in batholiths. You may draw a labelled diagram to help you make your explanation.**

[2]

(c) The cross-section shows a field sketch of some folded rocks.

(i) Label the following on the sketch:

a bedding plane
a cleavage plane
a joint.



[3]

(ii) Which one of the rock types shown on the diagram is incompetent? Explain your answer using evidence from the diagram.

_____ [1]

(iii) Draw and label the axial plane on the sketch. [1]

(iv) **Fully describe the fold and fault structures using technical terms and measurements.**

fold _____

_____

_____

_____

fault _____

_____ **[3]**

(v) **State the type and direction of force that formed the fold and fault.**

In your answer, you should use the appropriate technical term, spelled correctly.

type of force _____

direction _____ **[1]**

[TOTAL: 14]

5 Satellites provide evidence for sea floor spreading by showing that points on different continents may move apart.

Describe and explain four OTHER pieces of evidence for the process of sea floor spreading.

You may use diagrams in your answer. [8]

[TOTAL: 8]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.

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