FOR OFFICIAL USE

Total

X043/201

NATIONAL QUALIFICATIONS 2010

THURSDAY, 20 MAY
1.00 PM – 3.00 PM

GEOLOGY
INTERMEDIATE 2

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Date of birth

Day Month Year

Scottish candidate number

Number of seat

1. You should attempt **all** of the questions.
2. All answers should be written in the spaces provided in this answer book and should be written clearly and legibly in ink.
3. The marks allocated to each question or part of a question are shown at the end of each question or part of a question.
4. Before leaving the examination room you must give this book to the Invigilator. If you do not, you may lose all the marks for this paper.

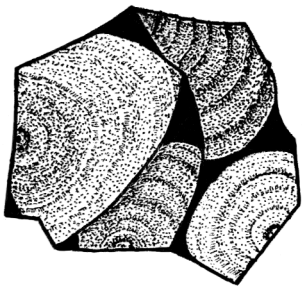
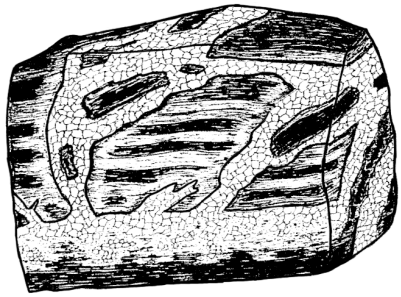
SQA ©

DO NOT WRITE IN THIS MARGIN

Marks

All questions should be attempted.

1. (*a*) Complete the table below.

Drawing of rock	*What the rock is made up of* (*minerals or other materials*)	*How the rock was formed*	*Name of rock*
	rock fragments	rapid erosion and deposition of rock fragments	conglomerate
		extremely rapid cooling of granitic magma	obsidian
	patches of quartz and feldspar in darker matrix	partial melting of gneiss	

3

DO NOT WRITE IN THIS MARGIN

Marks

1. (continued)

(*b*) Complete the table below by stating a property of each mineral that would help to distinguish between the pairs of minerals.

Minerals	*Distinguishing properties*
quartz and gypsum	Property of quartz: .... Property of gypsum: ....
galena and pyrite	Property of galena: .... Property of pyrite: ....
malachite and olivine	Property of malachite: .... Property of olivine: ....

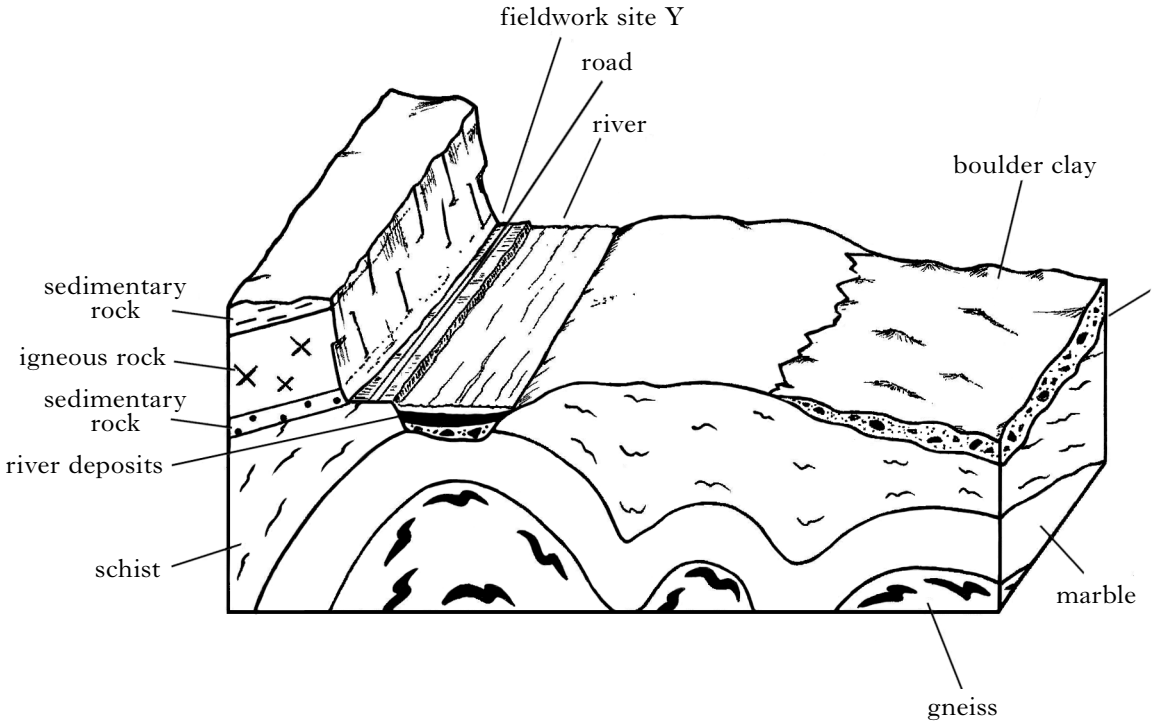
3

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks

2. Study the sketch below. It shows a river valley and its geology.



(*a*) Which **two** of the following statements are correct?

A Marble is formed by the metamorphism of siltstone.

B Boulder clay is the youngest deposit.

C Schist is a higher grade metamorphic rock than gneiss.

D The river deposits are the youngest deposits.

E X is a thrust fault.

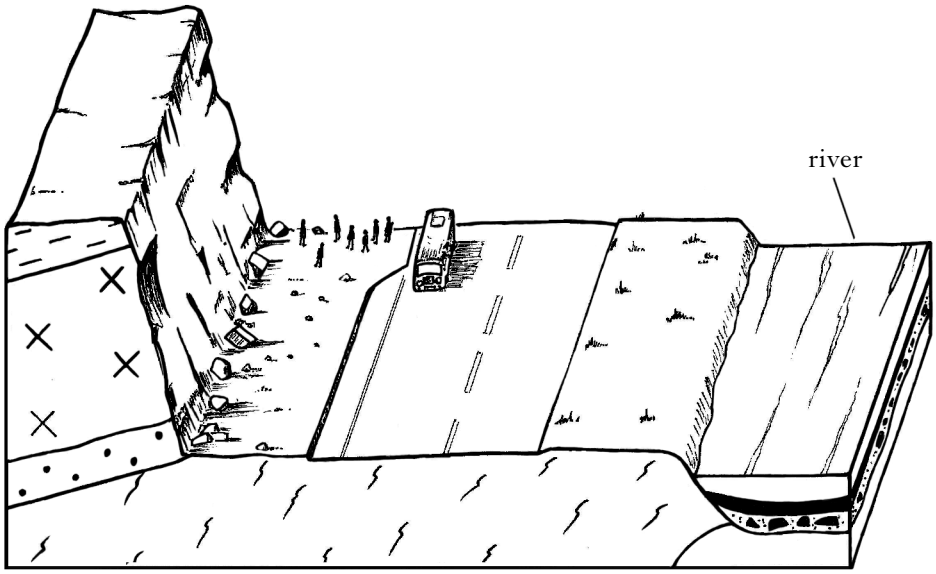
F X is an unconformity.

Give only the letters: ..... and **2**

Marks

2. (continued)

(*b*) The diagram below shows fieldwork site Y in more detail.



Describe **four** safety precautions that should be taken whilst studying the rocks at this site.

1 .....

.....

2 .....

.....

3 .....

.....

4 .....

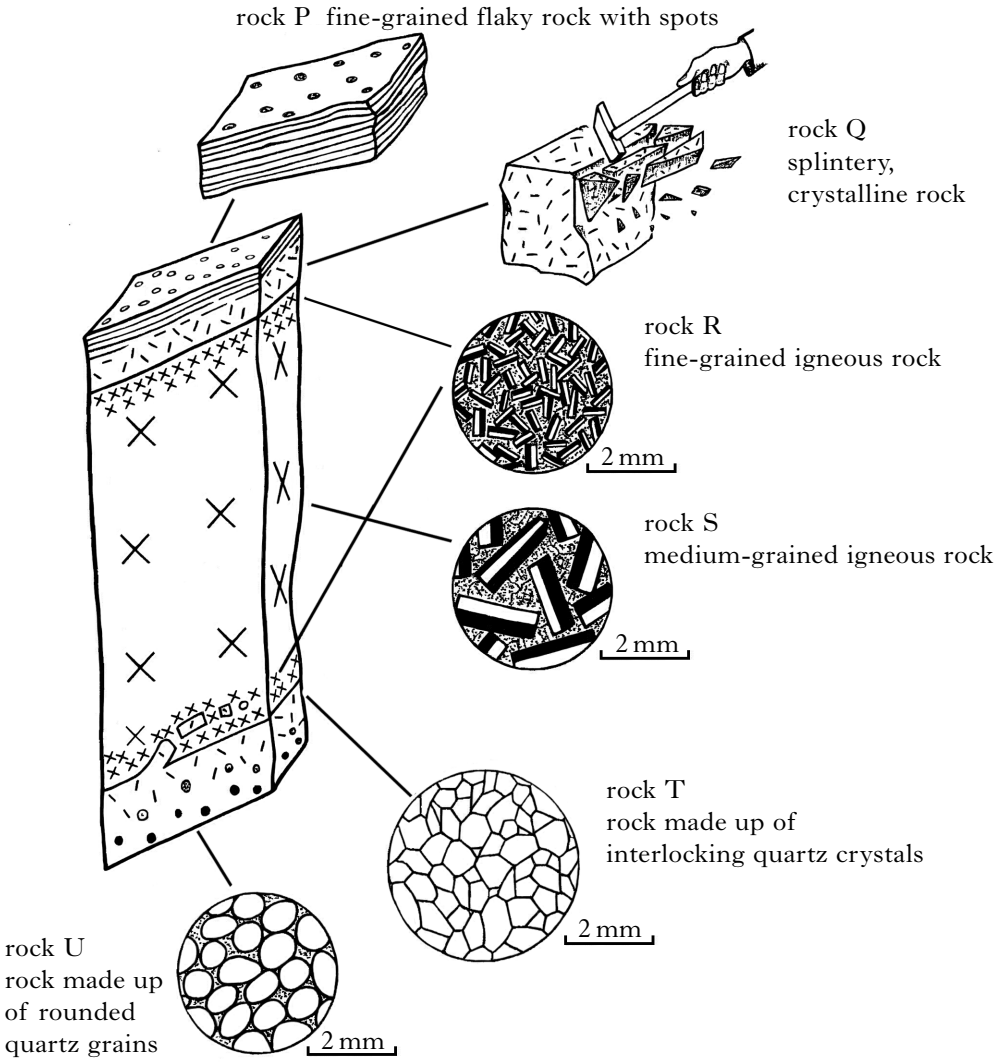
..... **2**

[Turn over

Marks

2. (continued)

(*c*) Following fieldwork at site Y, a student recorded these annotated diagrams in his notebook.



Give **two** pieces of evidence that indicate that the igneous rock layer is a sill and not a lava flow.

1 .....

.....

2 .....

..... **2**

DO NOT WRITE IN THIS MARGIN

Marks

2. (continued)

(*d*) Complete the table below.

Rock type on diagram	*Name of rock*	*How rock was formed*
P		
Q		
T		
U	Sandstone	Deposition of quartz grains followed by burial, compaction and cementation

3

(*e*) Explain why rock R is finer grained than rock S.

.....

..... **1**

[Turn over

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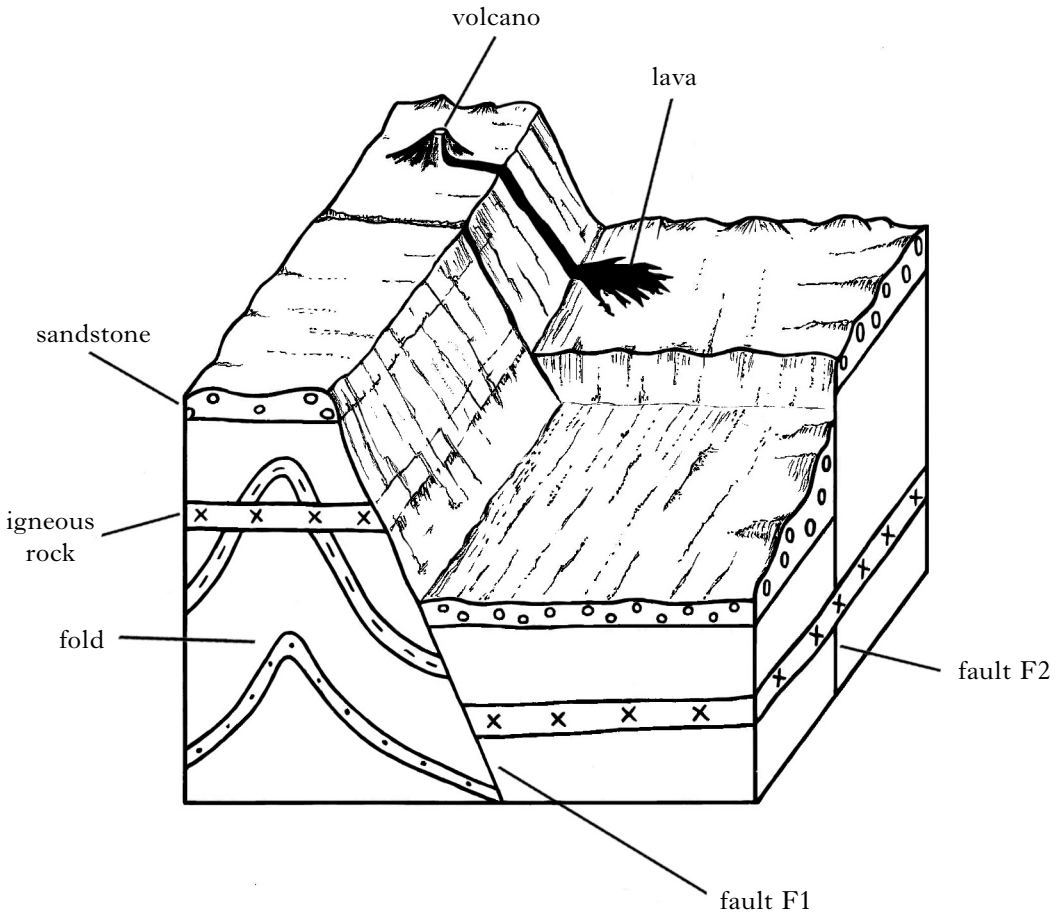
Marks

3. Study the block diagram.



(*a*) (i) What type of fold is shown on the diagram?

..... **1**

(ii) What type of fault is F1?

..... **1**

DO NOT WRITE IN THIS MARGIN

Marks

3. (continued)

(*b*) Place the following events in the correct order from oldest to youngest.

A Movement on fault F1

B Movement on fault F2

C Folding of rocks

D Intrusion of igneous rock

E Eruption of volcano

F Deposition of sandstone

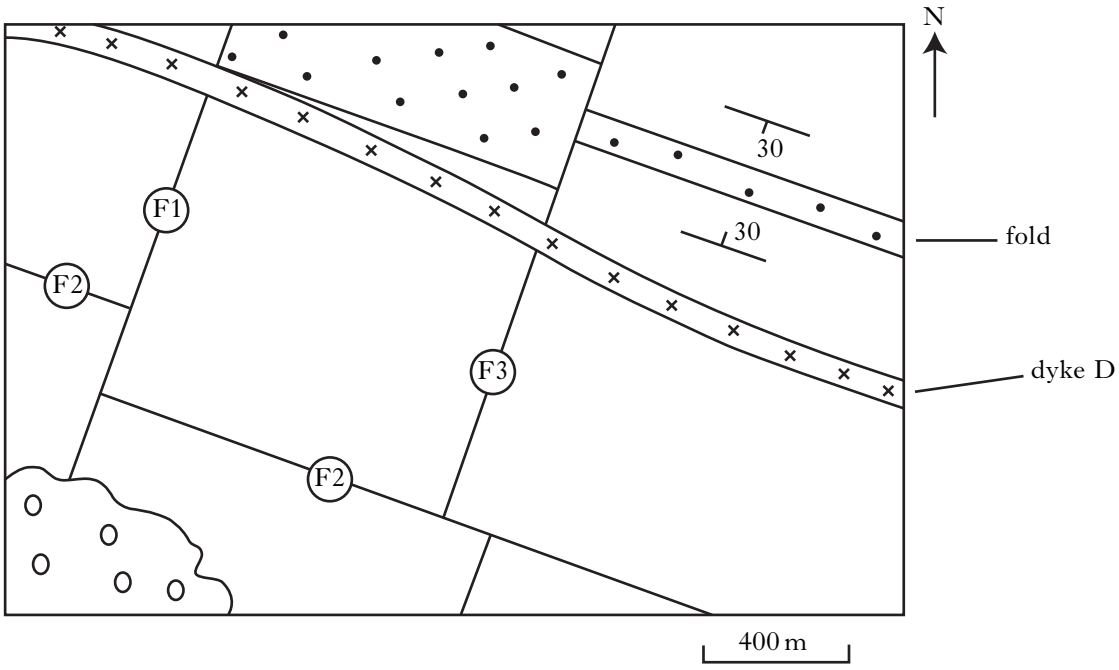
Give only the letters: ..... → ..... → ..... → ..... → ..... → .....
oldest youngest **3**

[Turn over

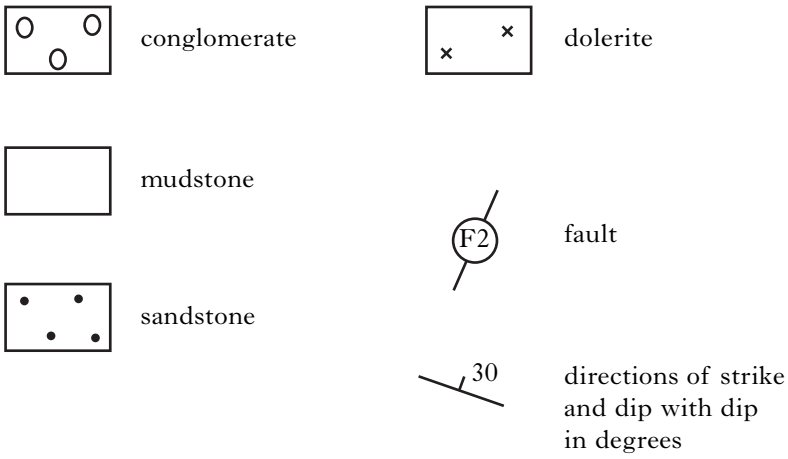
DO NOT WRITE IN THIS MARGIN

Marks

4. Study the geological map.



Key (Rocks not in order of age)



(*a*) What type of fold is shown on the map?

..... **1**

(*b*) How can you tell that the rocks on the south-east of fault F3 have been moved up relative to the rocks on the north-west side?

.....

.....

..... **1**

DO NOT WRITE IN THIS MARGIN

Marks

4. (continued)

(*c*) Explain why you cannot tell if the conglomerate is older or younger than dyke D.

.....

.....

..... **1**

(*d*) Place the following events in the correct order from oldest to youngest.

A Movement on fault F2

B Deposition of mudstone

C Movement on fault F3

D Intrusion of dyke D

E Deposition of sandstone

F Movement on fault F1

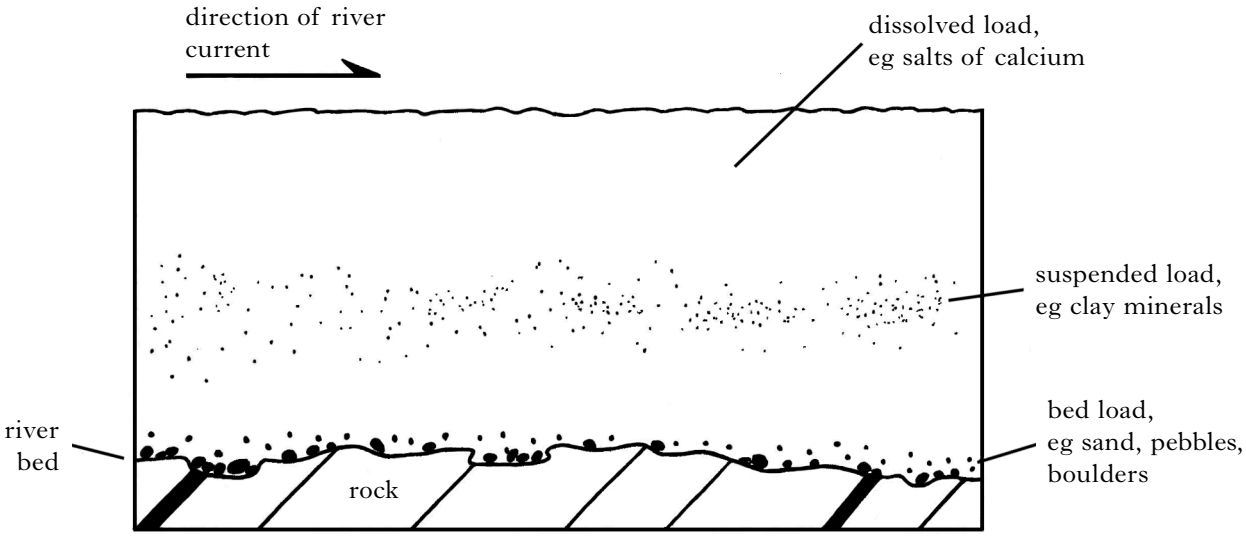
Give only the letters: ..... → ..... → ..... → ..... → ..... → **3**
oldest youngest

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks

5. The diagram shows how material is transported by a river.



(*a*) From the diagram, give **one** piece of evidence for each of the following.

Chemical weathering has taken place in the area drained by the river.

.....

.....

..... **1**

Erosion is taking place or has taken place.

.....

.....

..... **1**

Marks

5. (continued)

(*b*) The table shows current speeds at which clay, sand and pebbles are eroded and deposited.

Particle	*Minimum current speed of water needed to cause erosion* (cm/second)	*Current speed of water below which particles are deposited* (cm/second)
Clay	100·00	0·01
Sand	20·00	10·00
Pebbles	70·00	30·00

(i) Between which current speeds will sand be transported but not eroded?

..... **1**

(ii) Explain why it takes a faster current to erode clay than to erode sand.

.....

.....

..... **1**

(iii) Explain why pebbles are deposited at faster current speeds than sand.

.....

.....

..... **1**

(*c*) In the Earth's crust:

- 45% of all sedimentary rock is mudstone
- 32% is sandstone
- 22% is limestone.

What is the percentage occurrence of all other types of sedimentary rock (salt deposits, coal, etc)?

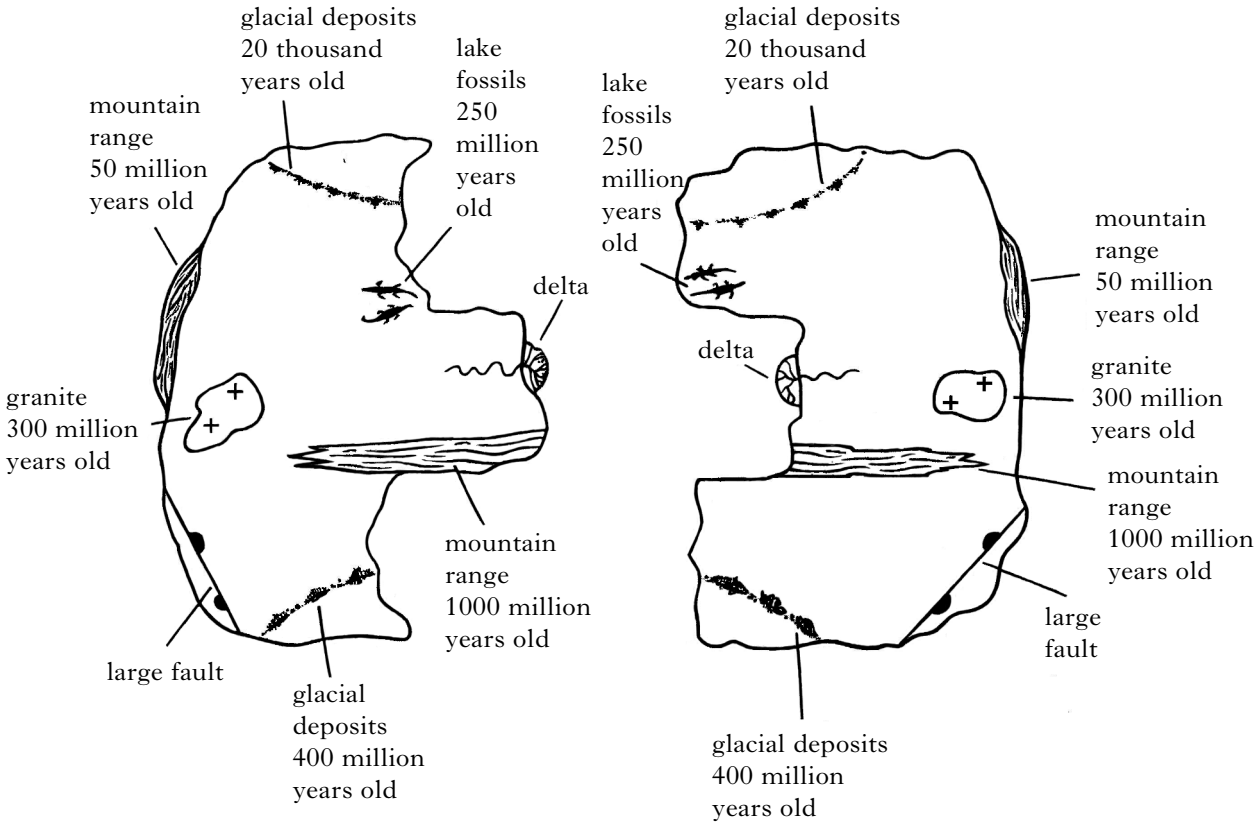
..... **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks

6. Study the maps of the continents.



(*a*) Give **four** pieces of evidence which suggest that the continents were once joined.

1 .....

.....

2 .....

.....

3 .....

.....

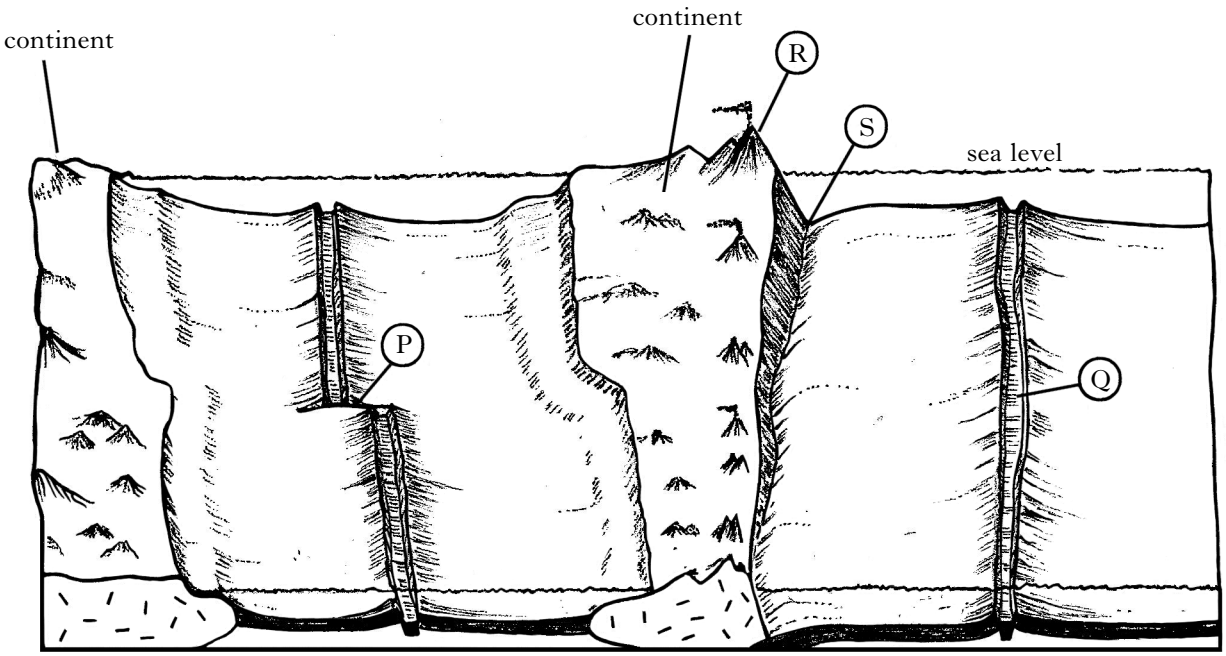
4 .....

..... **3**

Marks

6. (continued)

The diagram shows lithospheric plates.

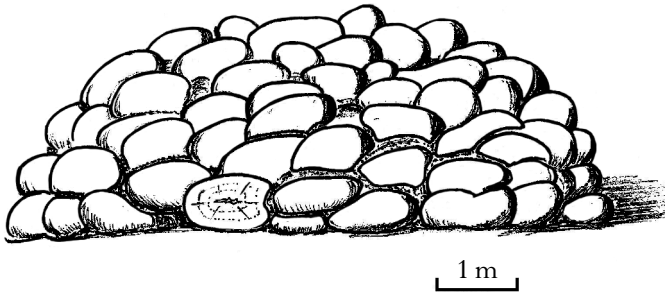


(*b*) (i) How many plates are shown on the diagram?

..... **1**

(ii) On each plate draw an arrow to show the direction of plate movement. **2**

(*c*) The diagram shows a type of lava.



At which position on the diagram (P, Q, R or S) would this type of lava be found?

Position: **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks

6. (continued)

(*d*) (i) Which position on the diagram (P, Q, R or S) shows a transform fault?

Position: .....

1

(ii) How does movement on a tear fault differ from movement on a transform fault? **Two** diagrams must be used in your answer.

Tear fault diagram

Transform fault diagram

2

DO NOT WRITE IN THIS MARGIN

Marks

6. (continued)

(*e*) The table shows how ocean depth changes with age, away from an oceanic ridge.

Age of oceanic crust (million years)	*Depth of ocean* (m)	*Change in depth over the previous 50 million years* (m)	*Temperature of crustal rocks*
0	2300		High
50	5000	2700	
100	5900		
150	6100		
200	6150		Low

(i) Complete the table to show the change in depth over the remaining 50 million year intervals. **1**

(ii) Describe the relationship between age and depth of the oceanic crust as shown in the table.

.....

.....

..... **2**

(iii) Using information given in the table, give a reason to explain why the depth of the ocean changes.

.....

.....

..... **1**

(iv) Predict a possible depth for oceanic crust that is 250 million years old.

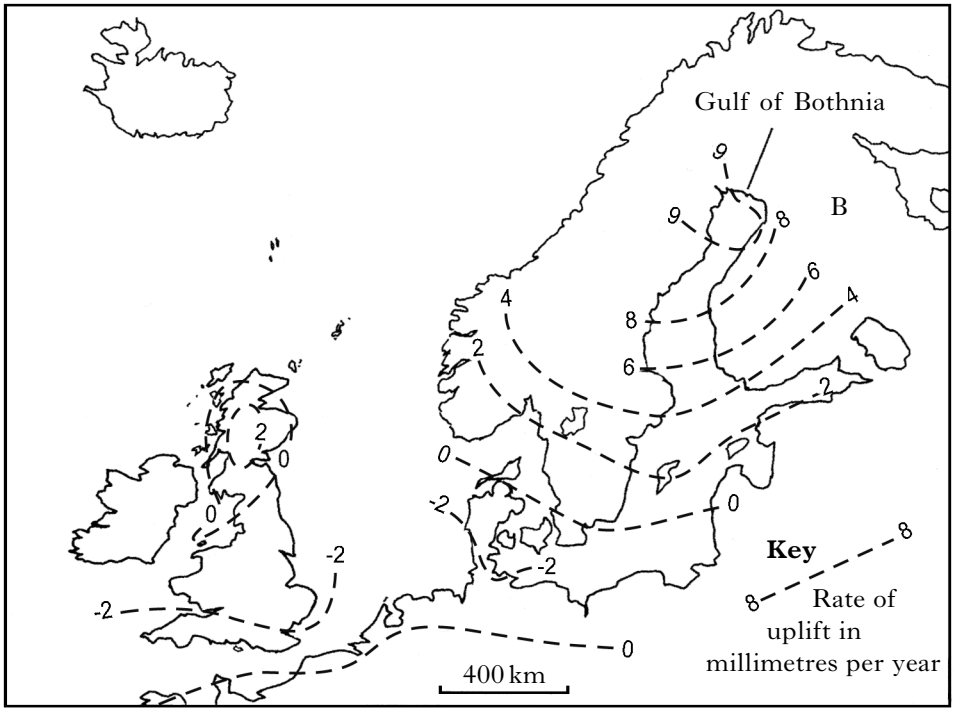
..... metres **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks

7. The map shows the rate of isostatic uplift for part of north-west Europe.



(*a*) Explain why isostatic uplift is taking place around the Gulf of Bothnia.

.....

.....

.....

..... **2**

(*b*) Suggest why the rate of uplift is faster in the Gulf of Bothnia than in Scotland.

.....

..... **1**

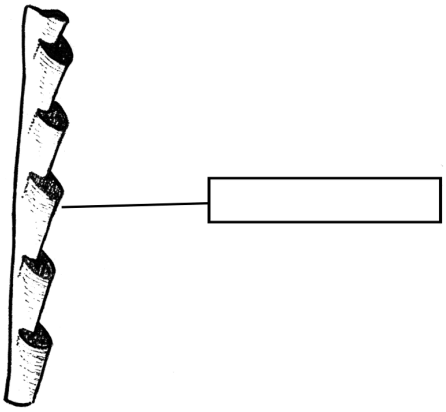
(*c*) What information on the map indicates that southern England is sinking rather than rising?

..... **1**

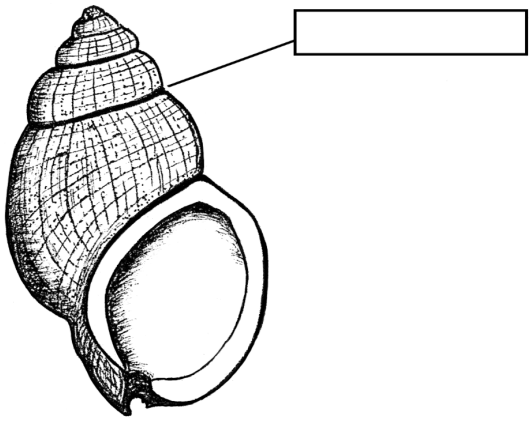
8. (*a*) (i) Name the parts of the fossils.

Marks

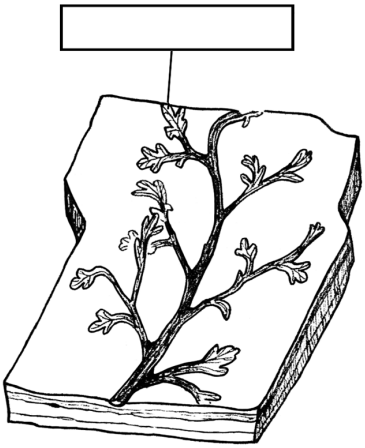
Fossil P



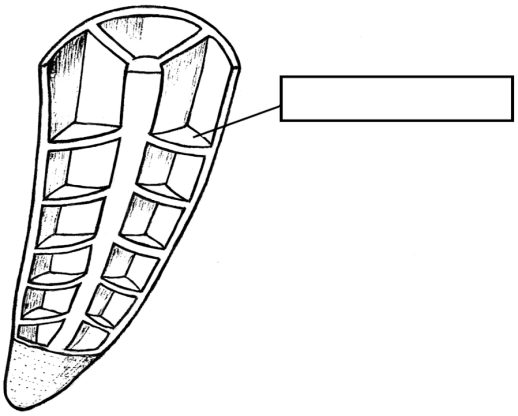
Fossil Q



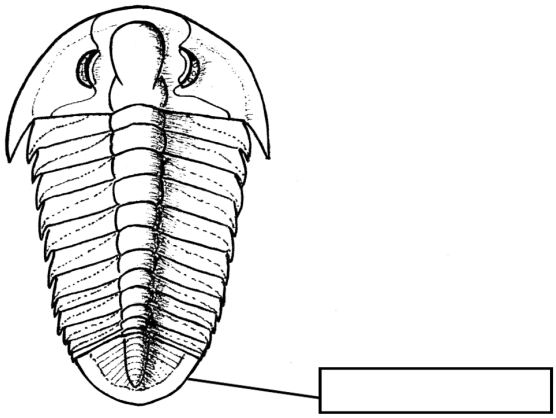
Fossil R



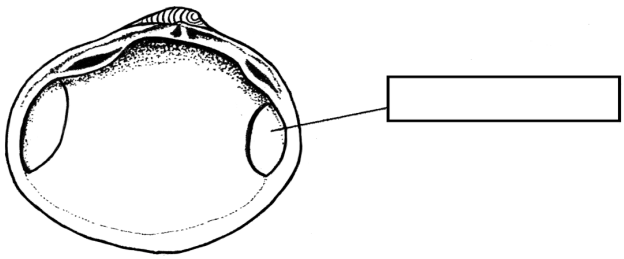
Fossil S



Fossil T



Fossil U



3

(ii) Name fossils P, Q, R, S, T and U.

Name of fossil P .....

Name of fossil Q .....

Name of fossil R .....

Name of fossil S .....

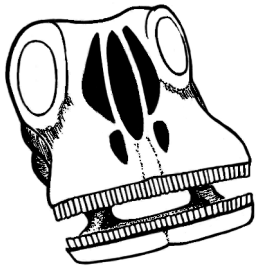
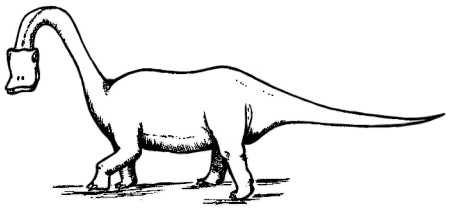
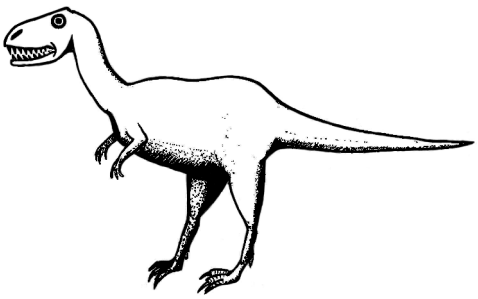
Name of fossil T .....

Name of fossil U **3**

Marks

8. (continued)

(*b*) Complete the table by saying how each animal lived and give a reason for each answer.

Animal	*How the animal lived with reason*
 	How animal lived: Reason:
 	How animal lived: Reason:

2

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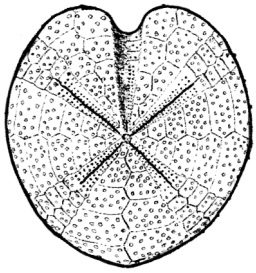
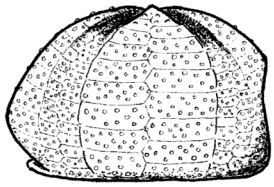
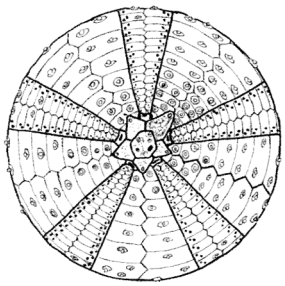
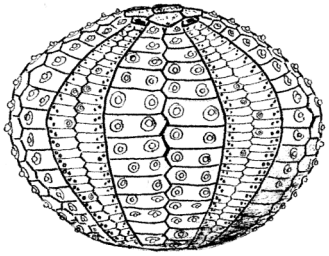
Marks

8. (*b*) (continued)

Animal	*How the animal lived with reason*
 	How animal lived: Reason:
 	How animal lived: Reason:

2

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks

8. (continued)

(*c*) Why are zone fossils useful?

.....

..... **1**

(*d*) Give **two** properties of good zone fossils.

1 .....

2 ..... **2**

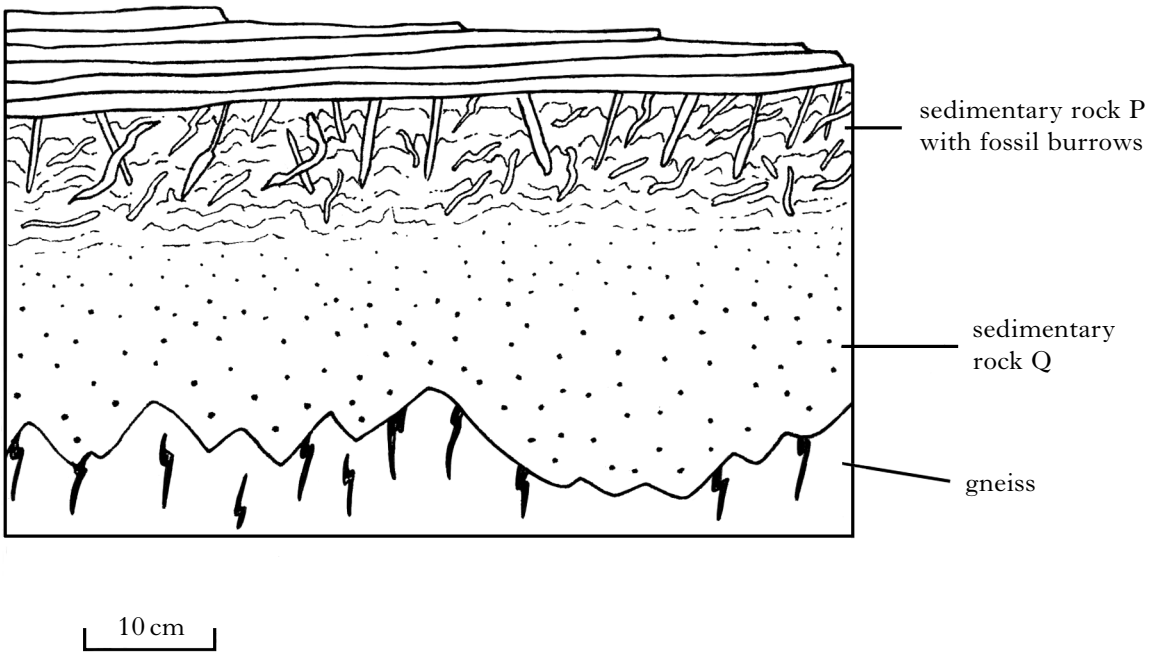
(*e*) Name **two** fossils used in zoning.

1 .....

2 ..... **1**

[Turn over for Question 9 on *Page twenty-four*

9. The diagram shows rocks in a quarry.



A student on a field trip to the quarry collected four bivalves from rock P and four from rock Q. After the student slipped on a rock, the eight became mixed up. On returning to the lab, the student labelled the bivalves A to H and measured their lengths and their widths.

The lengths and widths of all the bivalves are given in the table.

Label	*Length of bivalve* (cm)	*Width of bivalve* (cm)
A	1·6	1·0
B	3·5	0·3
C	5·8	0·5
D	4·8	3·0
E	7·0	0·6
F	3·2	2·0
G	4·0	2·5
H	2·3	0·2

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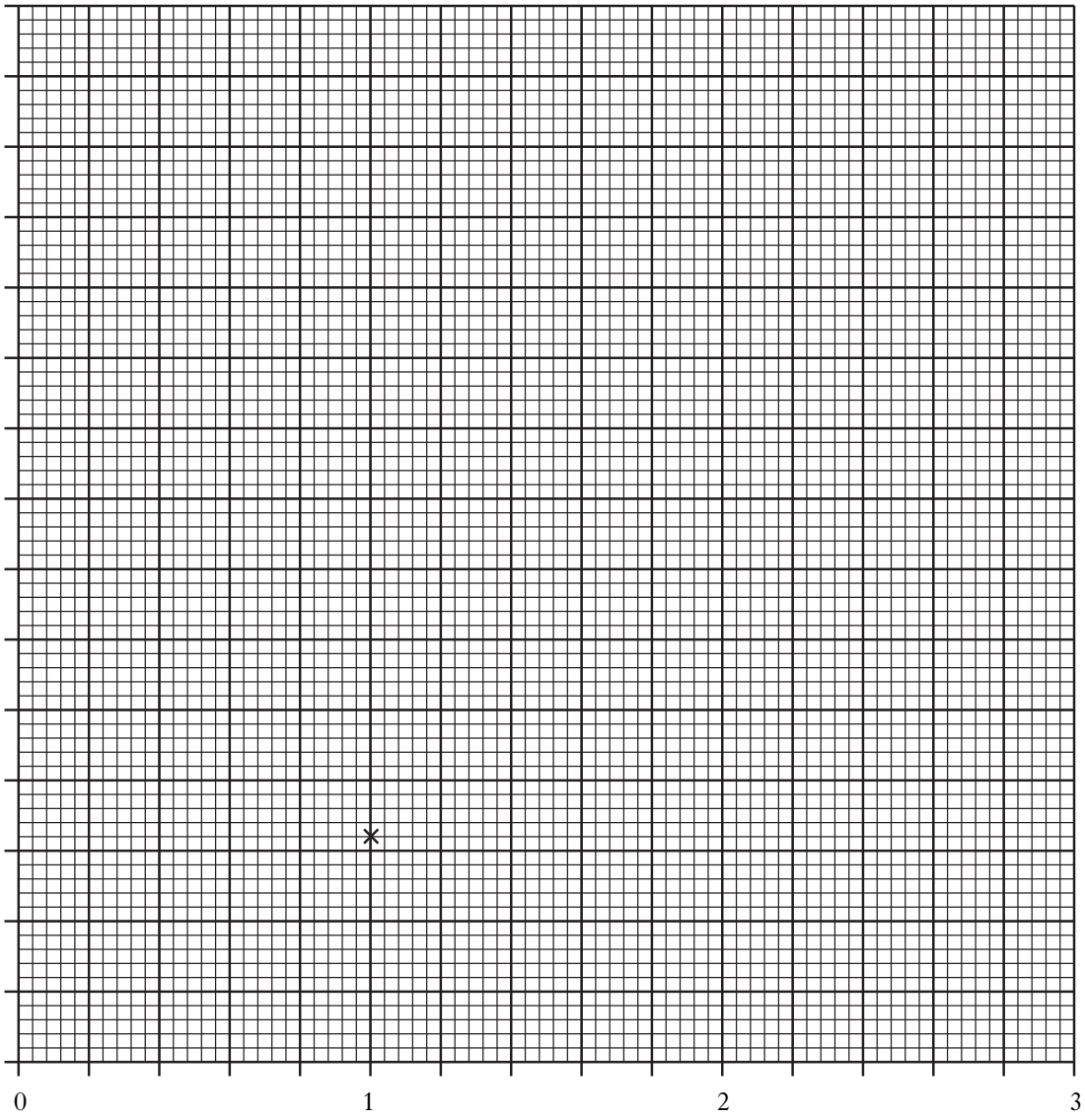
Marks

9. (continued)

(*a*) On the graph paper below, plot length against width for each bivalve. The plot for bivalve A has been done for you.



2

(*b*) (i) The bivalves seem to fall into two groups, one which came from rock P and the other from rock Q.

On the graph, label the bivalves belonging to rock P. **1**

(ii) Give a reason for your choice.

Reason: .....

.....

..... **1**

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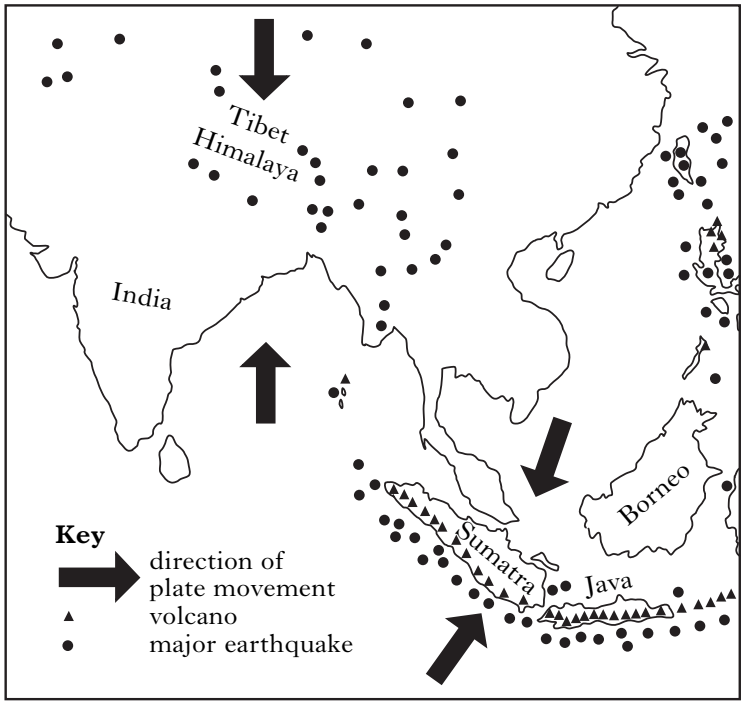
Marks

10. Study the seismic hazard map of south Asia.



(*a*) **With the aid of a diagram**, explain why earthquakes **and** volcanoes are common in the Sumatra-Java area shown on the map.

2

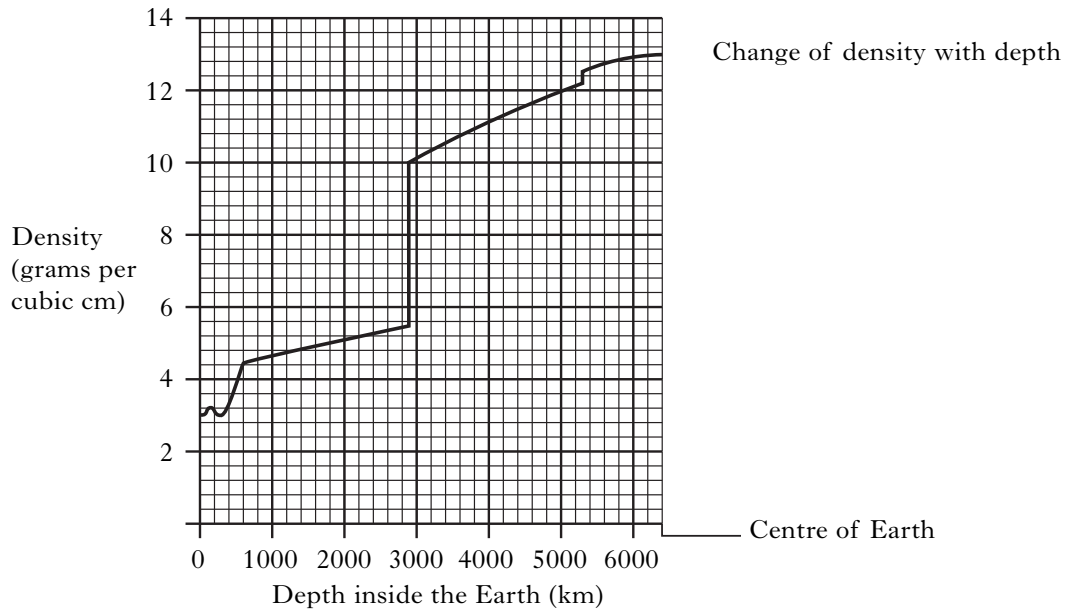
(*b*) Suggest why there are no active volcanoes in Tibet.

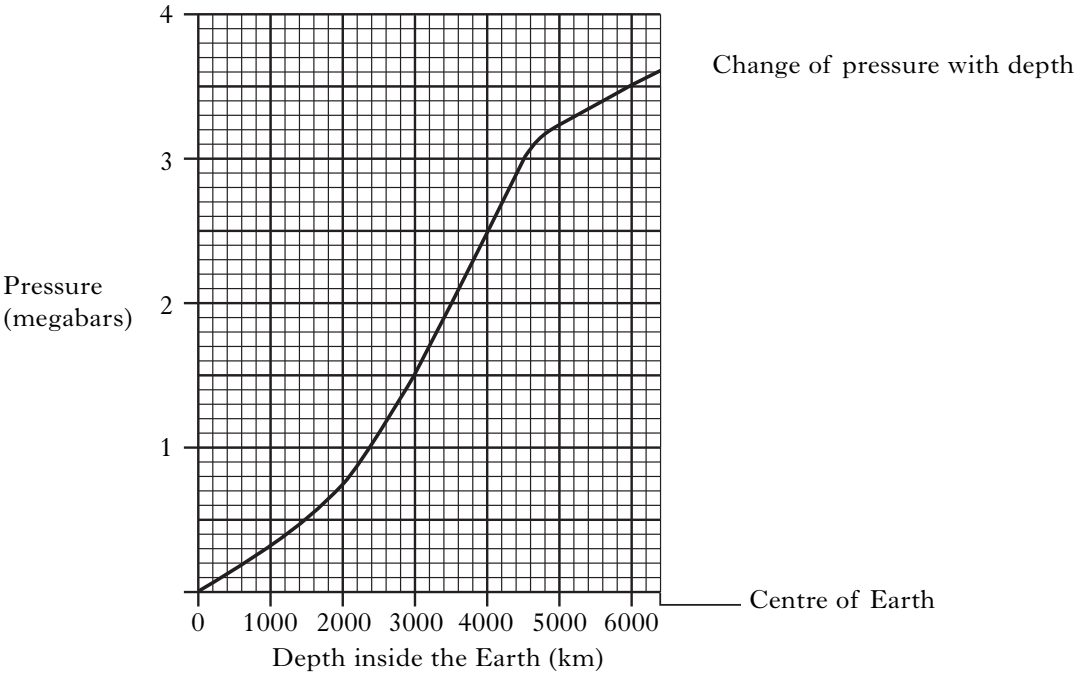
.....

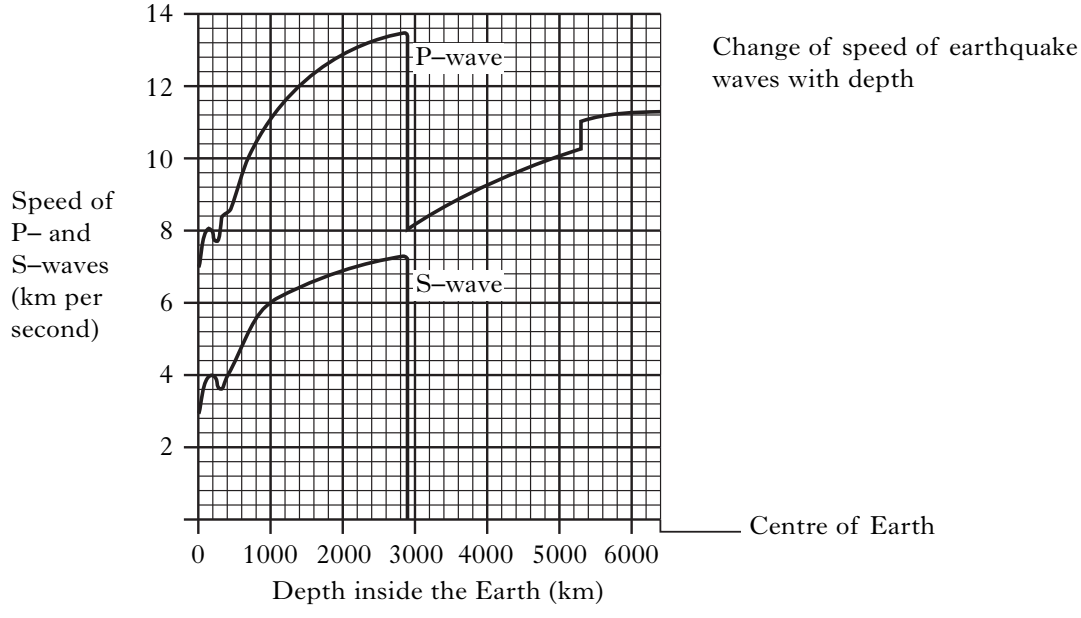
.....

..... **1**

(*c*) The graphs give information on earthquake waves and on changing conditions inside the Earth.







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Marks

10. (*c*) (continued)

(i) Explain why density changes suddenly at a depth of 2900 km.

.....

.....

..... **1**

(ii) Explain why S–waves stop at a depth of 2900 km.

.....

.....

..... **1**

(*d*) (i) By how many times does the density of the Earth increase from its surface to the centre?

You must show your working.

Answer: ..... times **2**

(ii) From the graphs, which **three** statements are correct?

A The speed of P–waves sometimes decreases as depth increases.

B To a depth of 2900 km, P–waves travel at about twice the speed of S–waves.

C The average density of the Earth is about 13 g/cm^3.

D The speed of P–waves increases in the same way that density increases.

E Pressure always increases as depth increases.

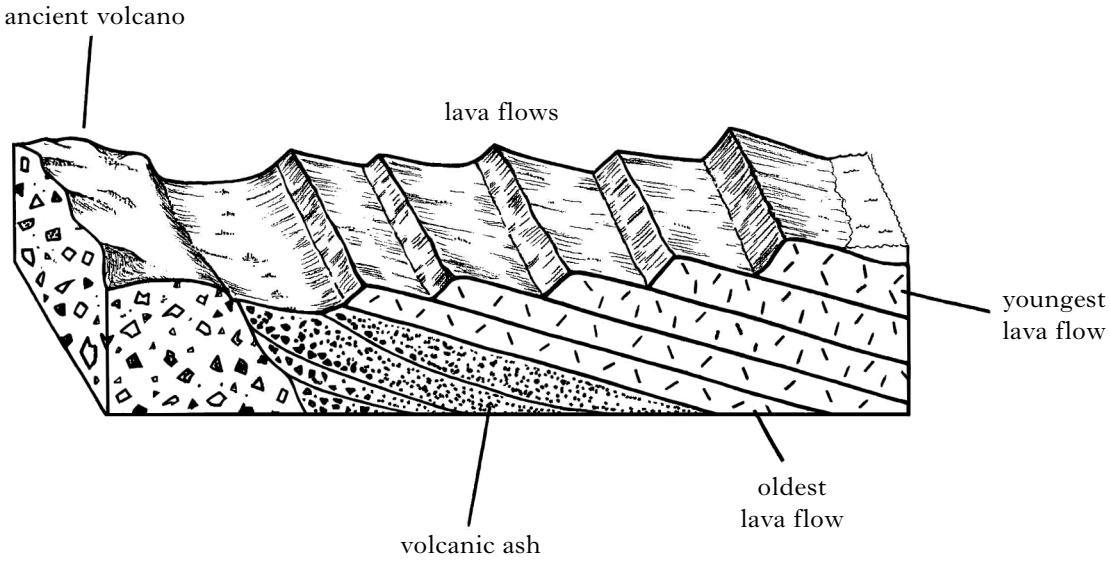
F The change of S–wave speed is caused by pressure change inside the Earth.

Give only the letters: ..... , ... and **2**

[Turn over

Marks

11. The diagram below shows the remains of an old volcano and five lava flows.



The table below shows the percentage by volume of the main minerals found in the five different lava flows.

Age of lava (millions of years)	*Percentage (%) by volume of the main minerals*			
	Quartz	*Feldspar*	*Amphibole*	*Pyroxene*
1	35·0	60·0	0·0	0·0
2	31·0	59·0	10·0	0·0
3	25·0	55·0	10·0	10·0
4	6·5	52·0	26·0	13·0
5	0·0	50·0	10·0	35·0

(*a*) What is the ratio of the four main minerals in the 4 million-year-old lava? Quartz has been given the value of 1.

Quartz 1 : Feldspar ..... : Amphibole ..... : Pyroxene **1**

(*b*) Is the 4 million-year-old lava acidic, intermediate, or basic?

..... **1**

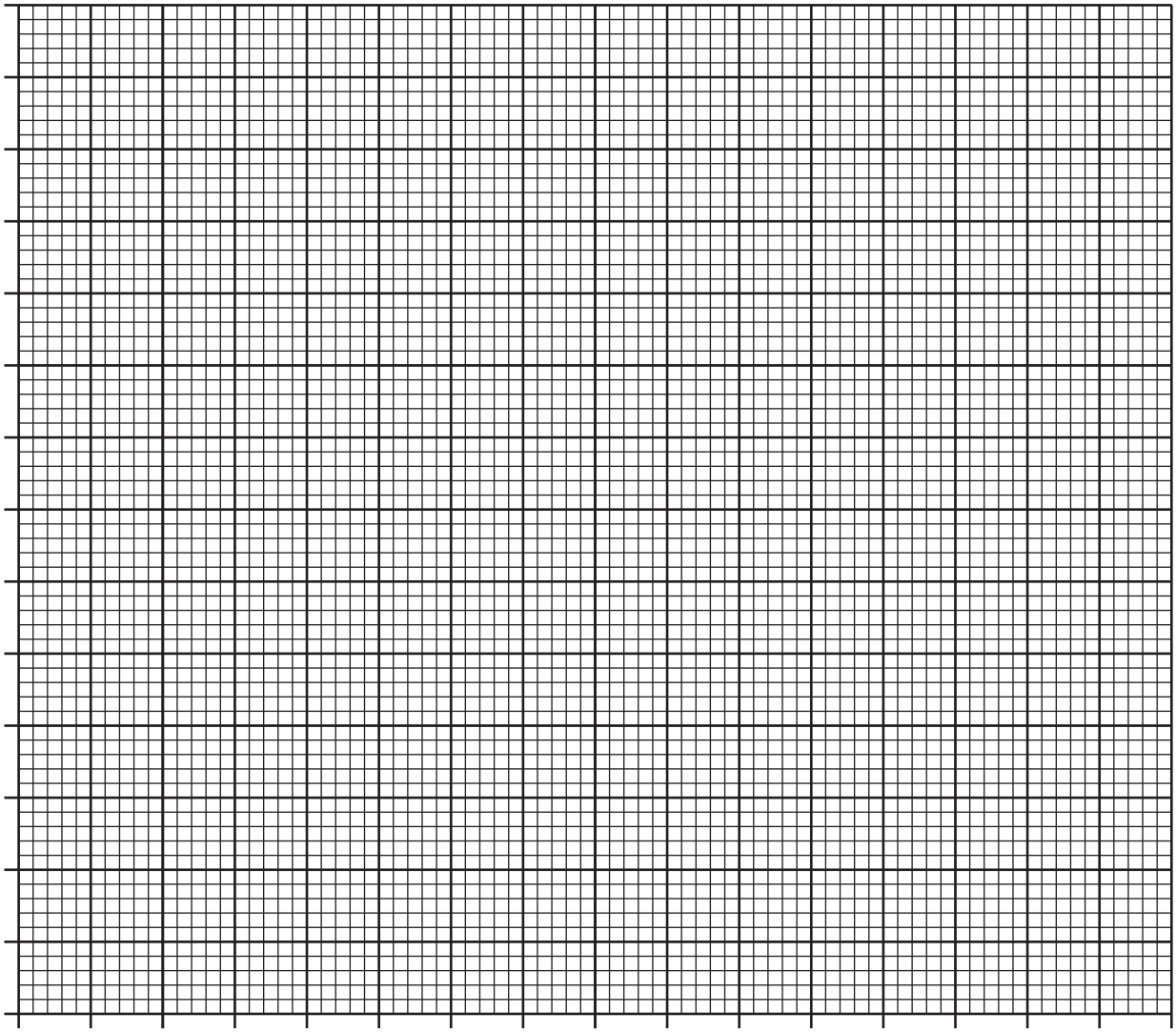
11. (continued)

Marks

(*c*) On the graph paper below:

(i) draw a line graph to show how the percentage of quartz in the lava changes with the age of the lavas. **Label this line quartz.**

(ii) draw a second line to show how the percentage of pyroxene in the lava changes with the age of the lavas. **Label this line pyroxene.** **3**



(*d*) (i) Describe the relationship shown on the graph between the age of the lavas and their quartz content.

.....

..... **1**

(ii) Describe the relationship shown on the graph between the age of the lavas and their pyroxene content.

.....

..... **1**

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Marks

11. (continued)

(*e*) Circle the correct alternative in the sentences below. Give a reason for each of your answers.

One million-year-old lava is **darker/lighter** in colour than 5 million-year-old lava.

Reason: .....

..... **1**

One million-year-old lava is **more dense/less dense** than 5 million-year-old lava.

Reason: .....

..... **1**

(*f*) One indicator of a lava's viscosity is its aspect index.

$$\text{Aspect index} = \frac{\text{Thickness of flow (metres)}}{\text{Area covered (km}^2\text{)}}$$

(i) By using the formula above, complete the table below for the youngest and oldest lavas from this volcano.

Age of lava flow (millions of years)	*Thickness* (m)	*Area* (km^2)	*Aspect index*
1	8·0	10·0	
5		10·0	0·5

2

(ii) Explain why the 1 million-year-old lava and the 5 million-year-old lava have different viscosities.

.....

..... **1**

[Turn over for Question 12 on *Page thirty-four*

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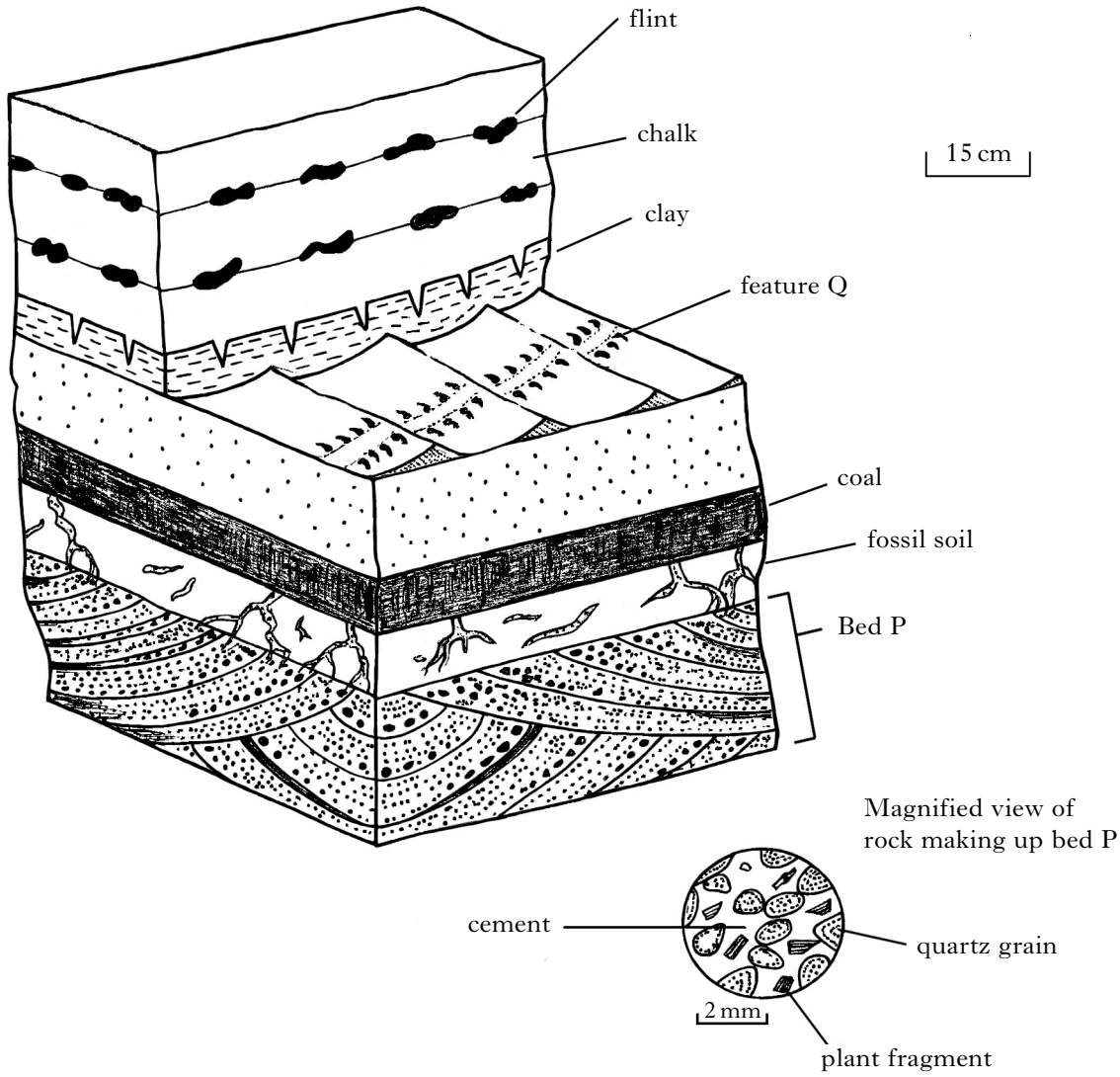
Marks

12. Study the diagram below which shows part of a cliff face.



(*a*) How has feature Q been formed?

.....

..... **1**

(*b*) What feature suggests that the flints were formed after the chalk?

.....

..... **1**

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Marks

12. (continued)

(*c*) Give **two** pieces of evidence that suggest that bed P was deposited in a delta and not in a desert environment.

1 .....

.....

2 .....

..... **2**

[*END OF QUESTION PAPER*]

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