FOR OFFICIAL USE

Total

X043/201

NATIONAL QUALIFICATIONS 2007

THURSDAY, 24 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.

All questions should be attempted.

Marks

1. Use **seven** names from the word box to complete the table.

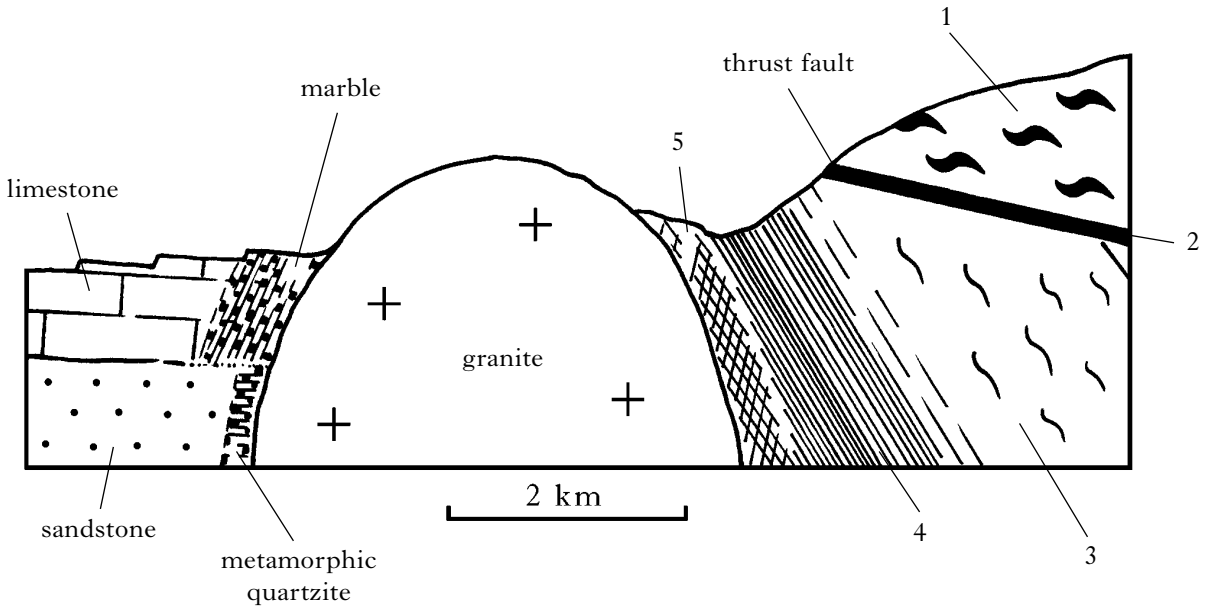
barite, calcite, cassiterite, feldspar, galena, garnet, malachite, olivine, quartz, sphalerite.

Properties of mineral				*Name of mineral*
Colour	*Hardness*	*Density* (grams per cubic centimetre)	*Other properties*	
green	3½–4	4	Reacts with acid Ore of copper	
red, brown or green	6–7½	4	Rounded crystals Found in metamorphic rocks	
brown or black	6–7	7	Ore of tin	
brown or black	3½–4	4	Ore of zinc	
green	6½–7	3·8	Found in rocks such as peridotite and gabbro	
pink, grey or white	6–6½	2·7	Found in rocks such as granite and gabbro	
usually white	3	4·5	Feels heavy in the hand	

7

Marks

2. The diagram shows rocks at the edge of a mountain range.



(*a*) Complete the table.

Rock type on diagram	*Description of rock*	*Name of rock*	*How rock was formed*
1		gneiss	
2	Fine-grained Finely banded or streaky		
3			Medium grade regional metamorphism
4			Low grade regional metamorphism
5		hornfels	

5

(*b*) Explain why the zone of marble is wider than the zone of metamorphic quartzite.

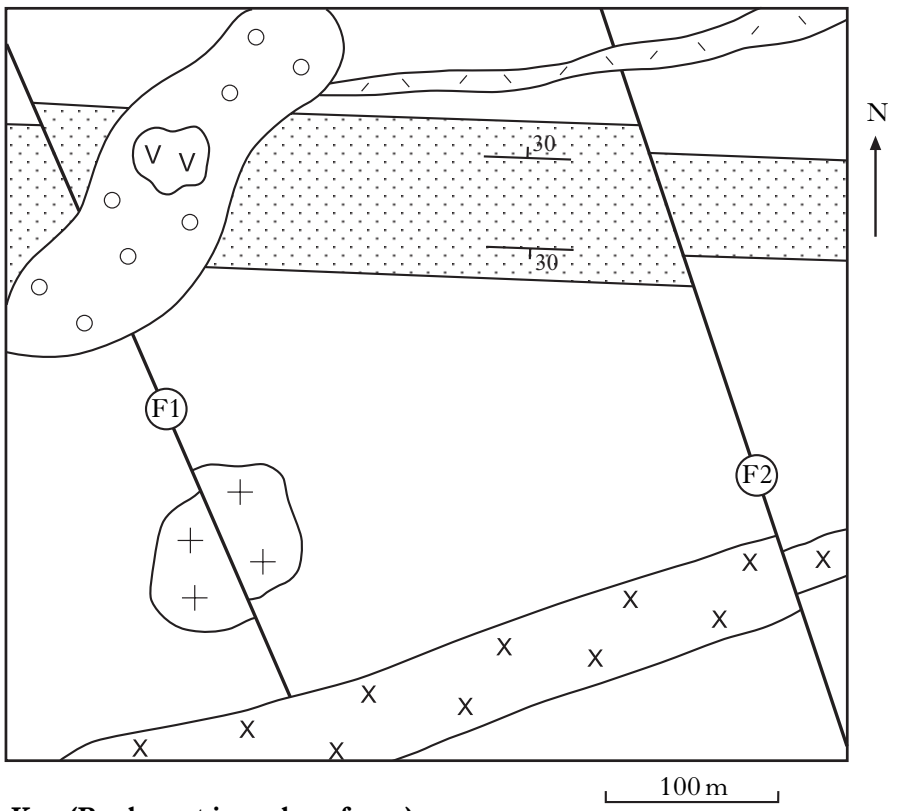
.....

.....

..... **1**

Marks

3. Study the geological map.



Key (Rocks not in order of age)

conglomerate	gabbro	dolerite
granite	agglomerate	sandstone
mudstone	fault	directions of strike and dip with dip in degrees

(*a*) (i) Name the oldest rock on the map.

..... **1**

(ii) Name the youngest rock on the map.

..... **1**

Marks

3. (continued)

(*b*) On which side of fault F2 have the rocks moved up? Give a reason for your answer.

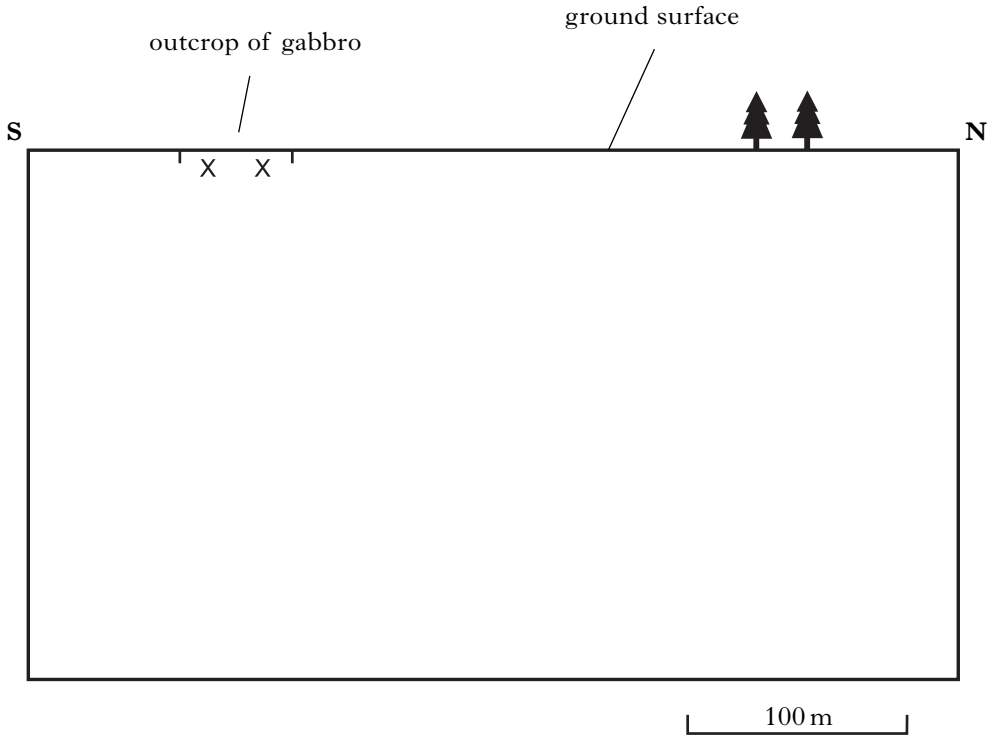
Side moved up .....

Reason .....

.....

..... **2**

(*c*) On the diagram below, show the shape of the gabbro intrusion.



1

[Turn over

Marks

3. (continued)

(*d*) How can you tell that the conglomerate lies above a surface of unconformity?

.....

.....

..... **1**

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

A Intrusion of dolerite

B Movement on fault F2

C Intrusion of granite

D Deposition of conglomerate

E Movement on fault F1

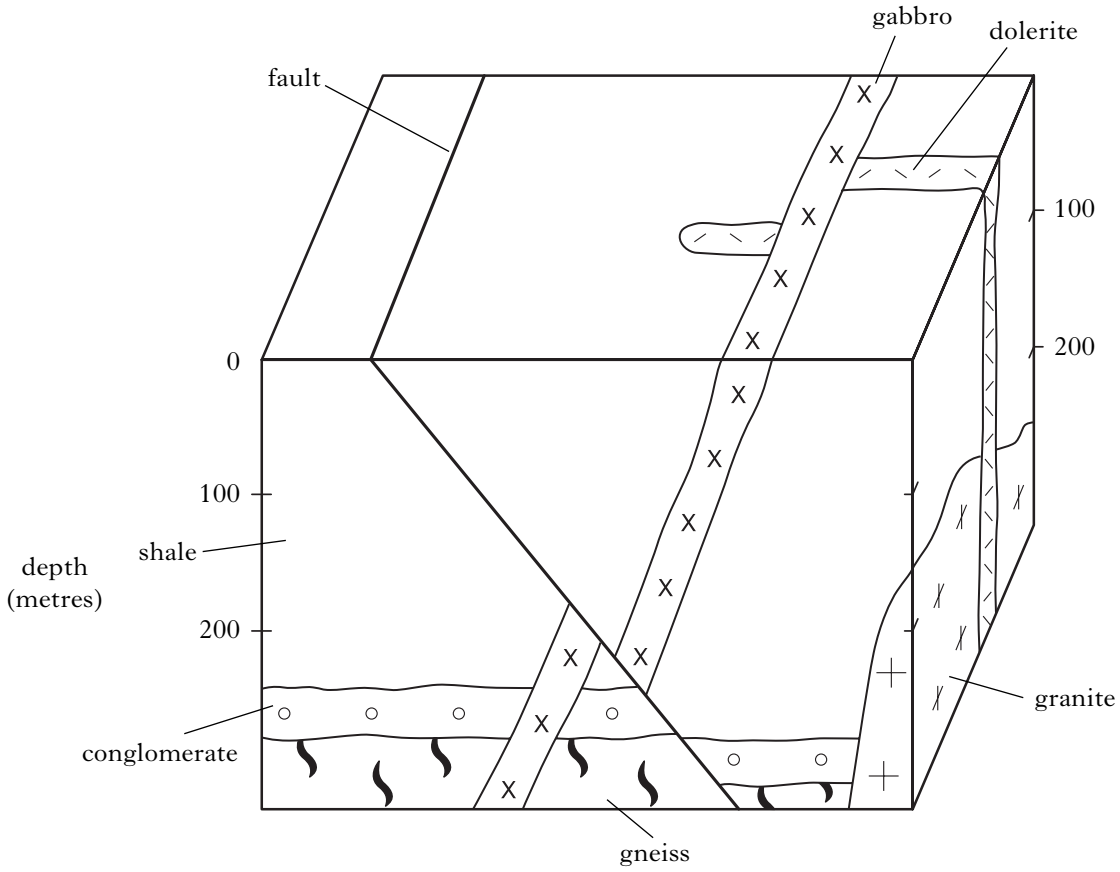
F Intrusion of gabbro

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

[Turn over for Question 4 on *Page eight*

Marks

4. Study the block diagram.



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

A Intrusion of gabbro

B Intrusion of dolerite

C Formation of gneiss

D Deposition of conglomerate

E Movement on fault

F Intrusion of granite

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

DO NOT WRITE IN THIS MARGIN

Marks

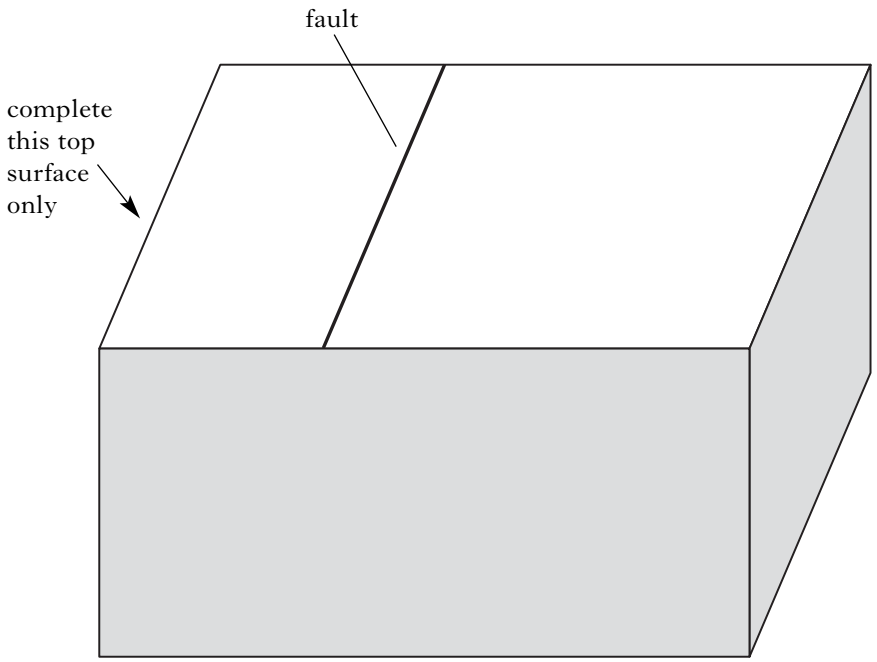
4. (continued)

(*b*) (i) On the block diagram, draw in the position of an unmarked fault. **1**

(ii) What type of fault have you drawn in?

..... **1**

(*c*) On the top of the block diagram below, show the surface of the area after 100 metres of rock have been removed by erosion.



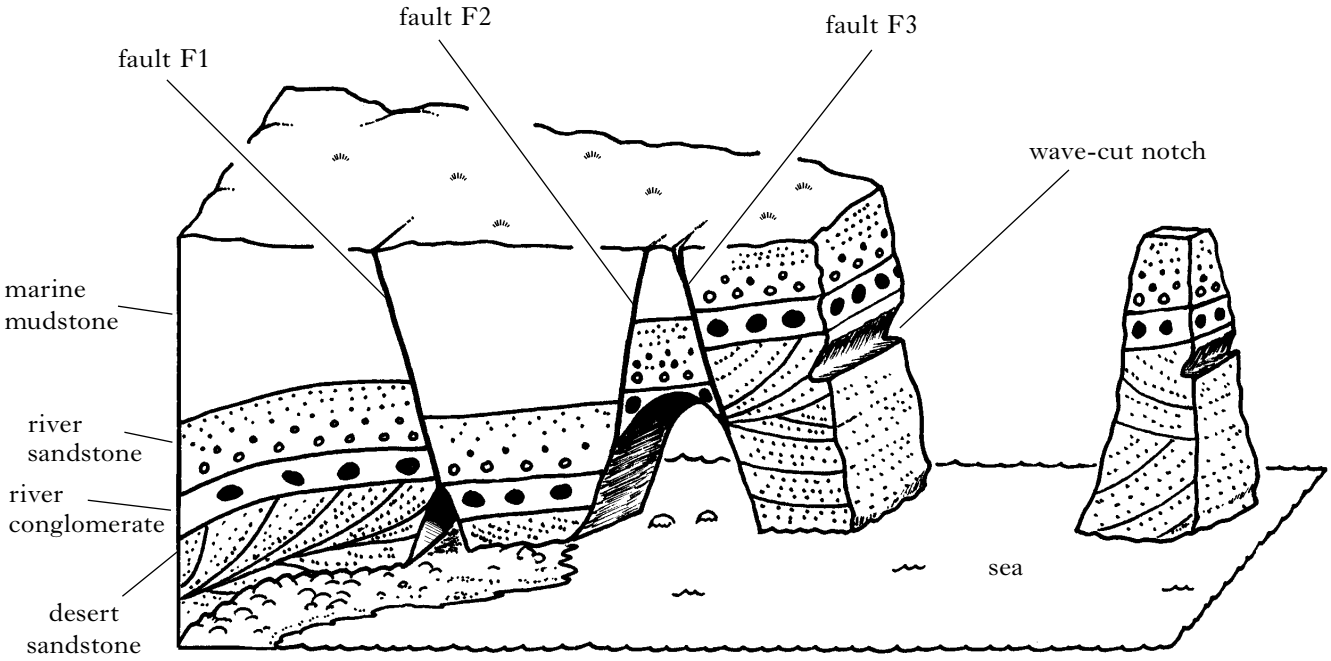
2

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks

5. The diagram shows a coastal area in Scotland.



(*a*) (i) What type of fault is F1?

..... **1**

(ii) What type of fault is F3?

..... **1**

(*b*) Describe the history of the rocks and other features in the diagram.

.....

.....

.....

.....

.....

.....

.....

..... **4**

DO NOT WRITE IN THIS MARGIN

Marks

5. (continued)

(*c*) (i) Describe **four** safety measures you would take when making a field trip to the area shown in the diagram.

1 .....

.....

2 .....

.....

3 .....

.....

4 .....

..... **2**

(ii) Explain why rock falls would be more common in some parts of the area than in other parts.

.....

.....

..... **1**

(*d*) Explain why there is a wave-cut notch well above the present level of the sea.

.....

.....

.....

.....

.....

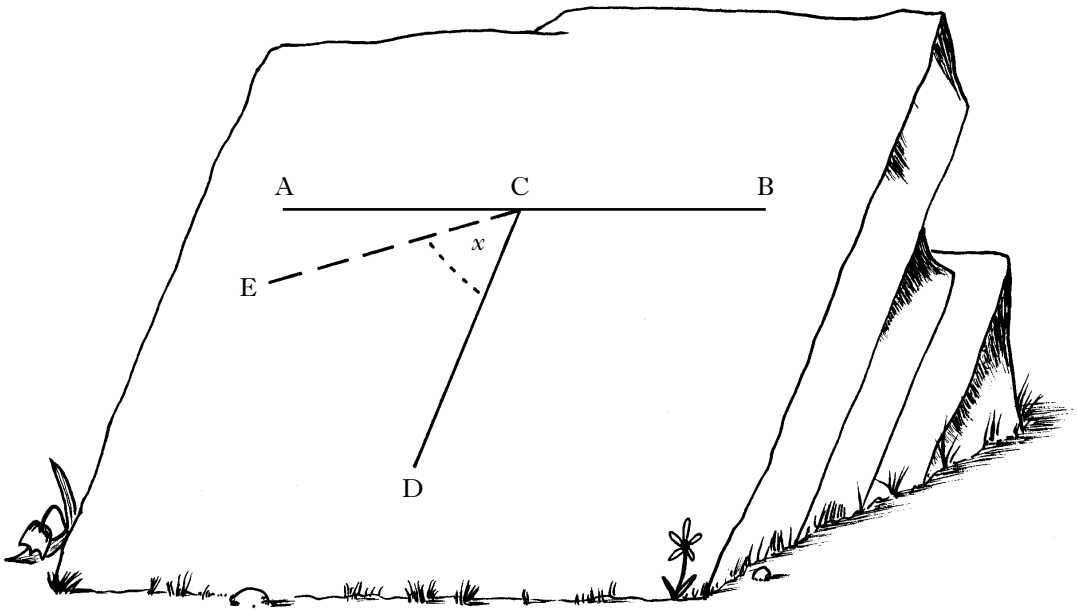
..... **2**

[Turn over

Marks

5. (continued)

(*e*) The diagram shows the surface of a bed of sandstone. Lines AB and CE are horizontal. Line CD is at right angles to line AB.



(i) What name is given to direction AB?

..... **1**

(ii) What name is given to angle *x*?

..... **1**

(iii) What instrument would you use to measure direction AB?

..... **1**

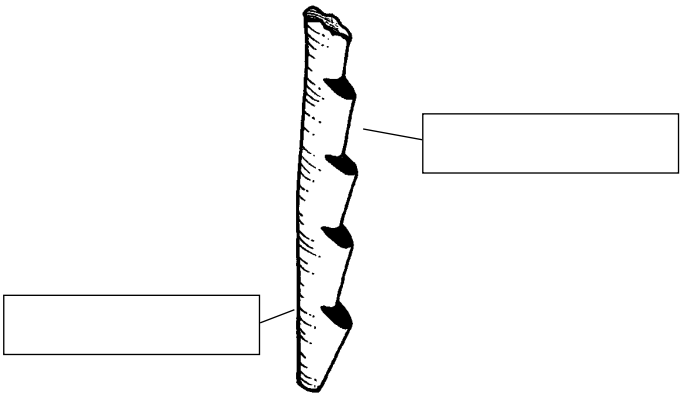
(iv) What instrument would you use to measure angle *x*?

..... **1**

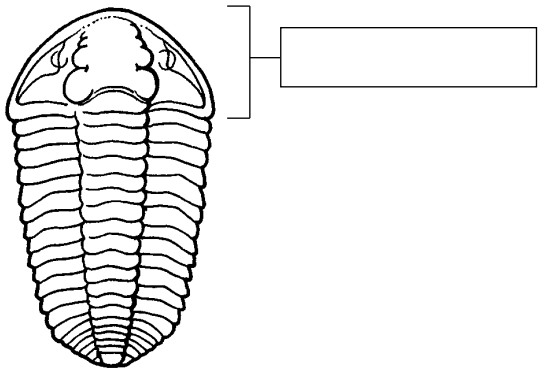
6. (*a*) Name the parts of the fossils P, Q, R and S.

Marks

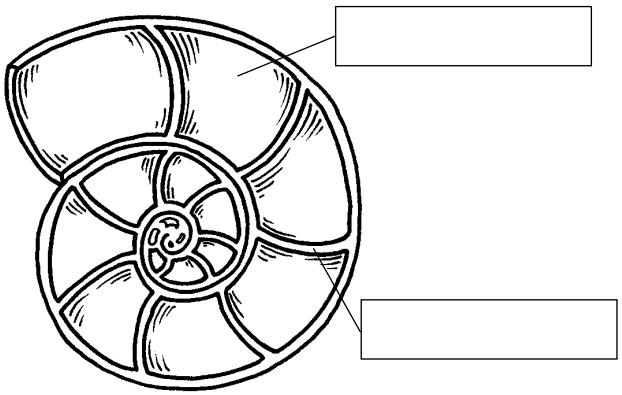
Fossil P



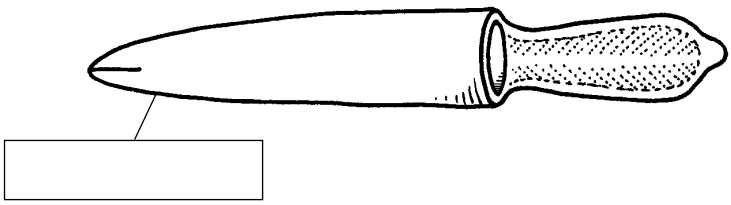
Fossil Q



Fossil R



Fossil S



3

(*b*) Name fossils P, Q, R and S.

Name of fossil P .....

Name of fossil Q .....

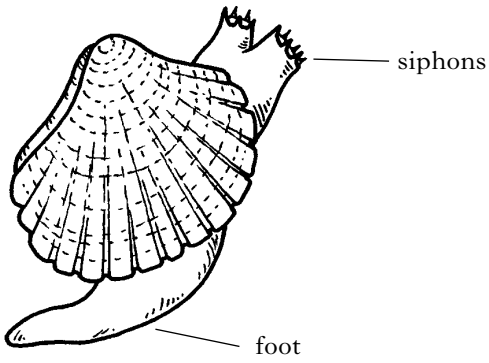
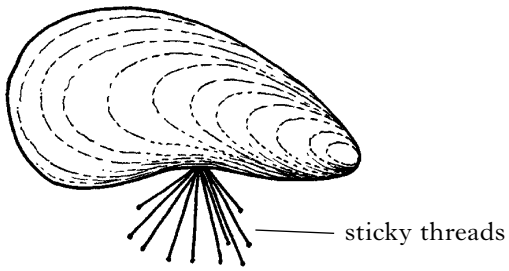
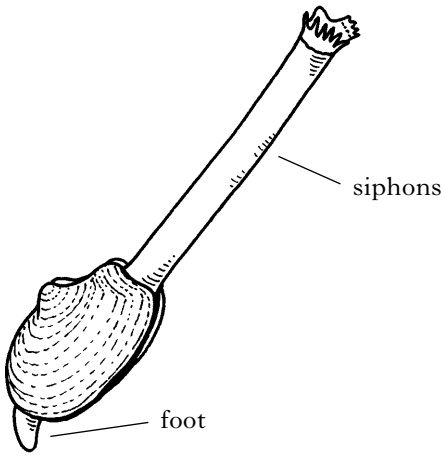
Name of fossil R .....

Name of fossil S **4**

Marks

6. (continued)

(*c*) Complete the table to say how each bivalve lives.

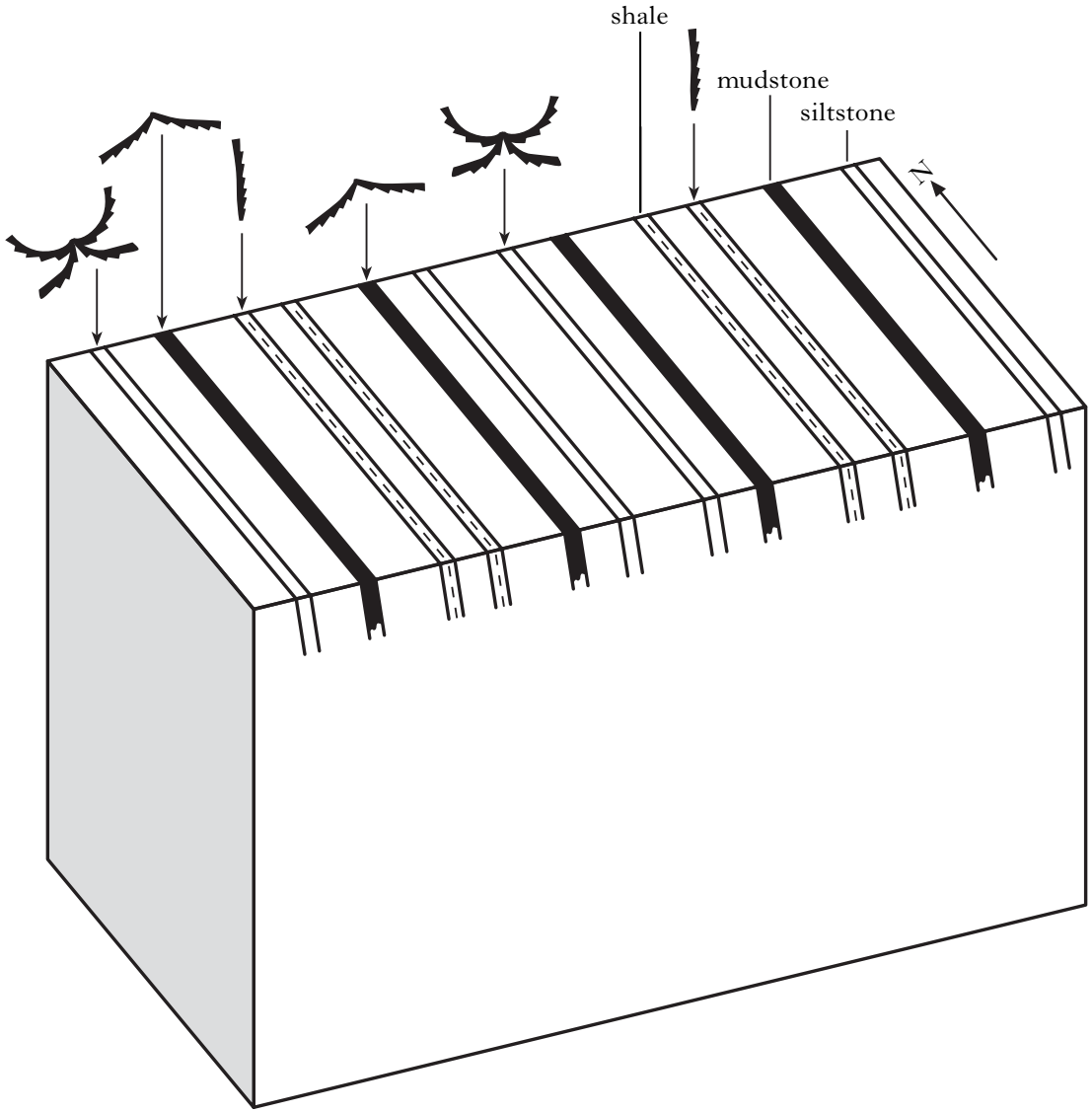
Bivalve	*How the bivalve lives*
	
	
	

3

Marks

6. (continued)

(*d*) The top of the diagram shows an outcrop pattern of three sedimentary layers with their fossils.



(i) From the outcrop pattern, how can you tell that the rocks have been folded?

.....

..... **1**

(ii) Name the oldest rock. Give a reason for your answer.

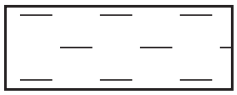
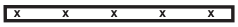
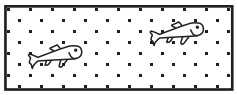
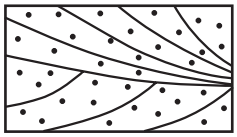
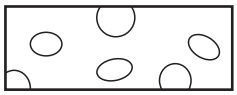
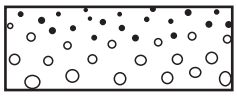
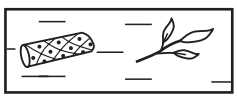
Name of oldest rock .....

Reason .....

..... **1**

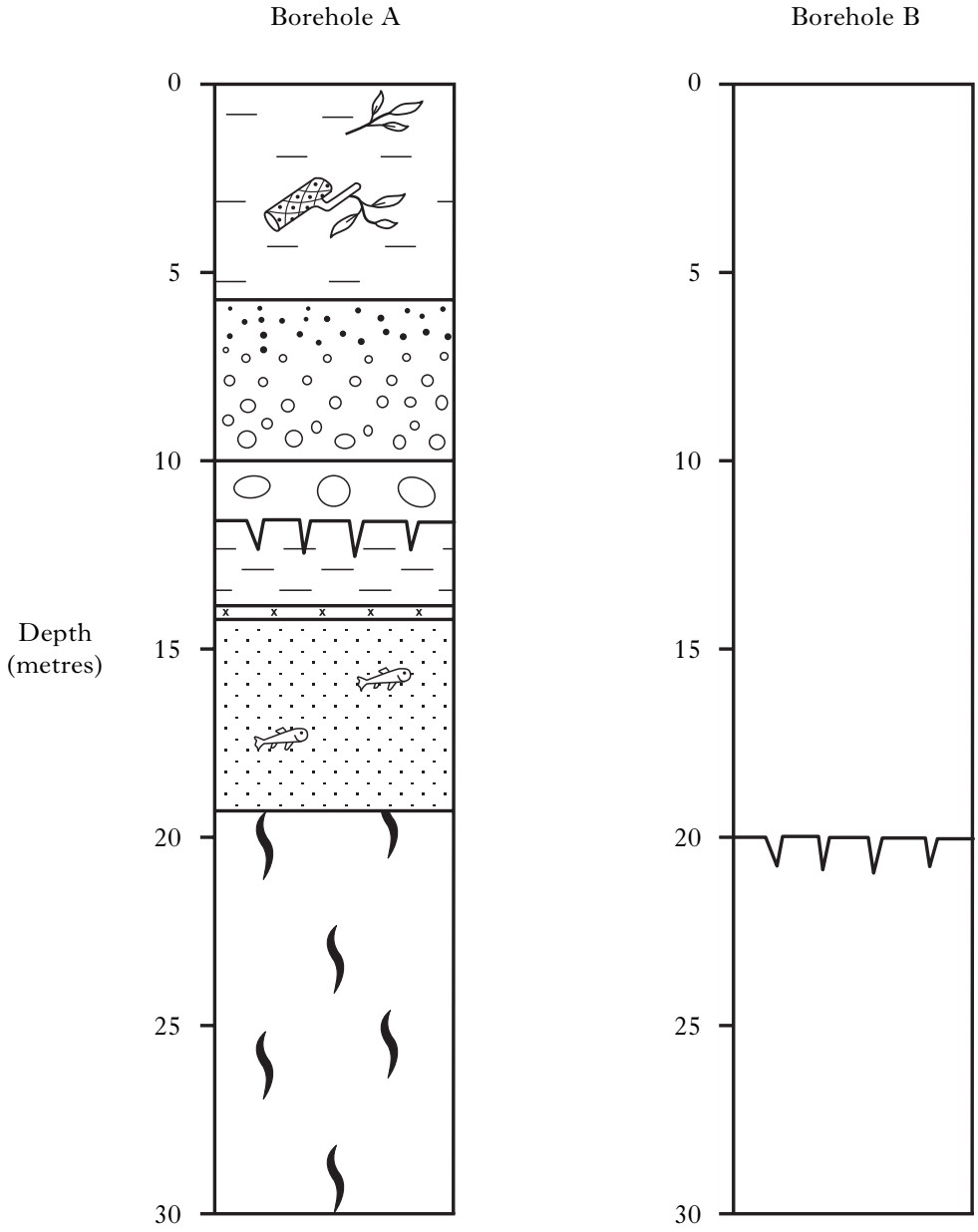
(iii) Complete the south face of the diagram to show the folds. **2**

7. (*a*) Use the description of rocks in Borehole B and the key to complete Borehole B.

Description of rocks in Borehole B	*Key*	
Mudcracks are found at a depth of 20 metres. The mudstone under the mudcracks is 5 metres thick.	mudcracks	
There is a salt crust under the mudstone. Under the salt crust is 3 metres of siltstone with fossil fish.	mudstone	
	salt crust	
	siltstone with fish fossils	
There is gneiss under the siltstone.	gneiss	
Above the mudcracks there is a sandstone bed which is 8 metres thick. The sandstone shows large-scale cross-bedding.	sandstone with cross-bedding	
Above the sandstone is 4 metres of conglomerate.	conglomerate	
Above the conglomerate is 2 metres of sandstone which shows graded bedding.	sandstone with graded bedding	
Above this sandstone is mudstone with plant fossils.	mudstone with plant fossils	

Marks

7. (*a*) (continued)



4

(*b*) Draw lines between the boreholes to match up (correlate) the sequences of rocks. **2**

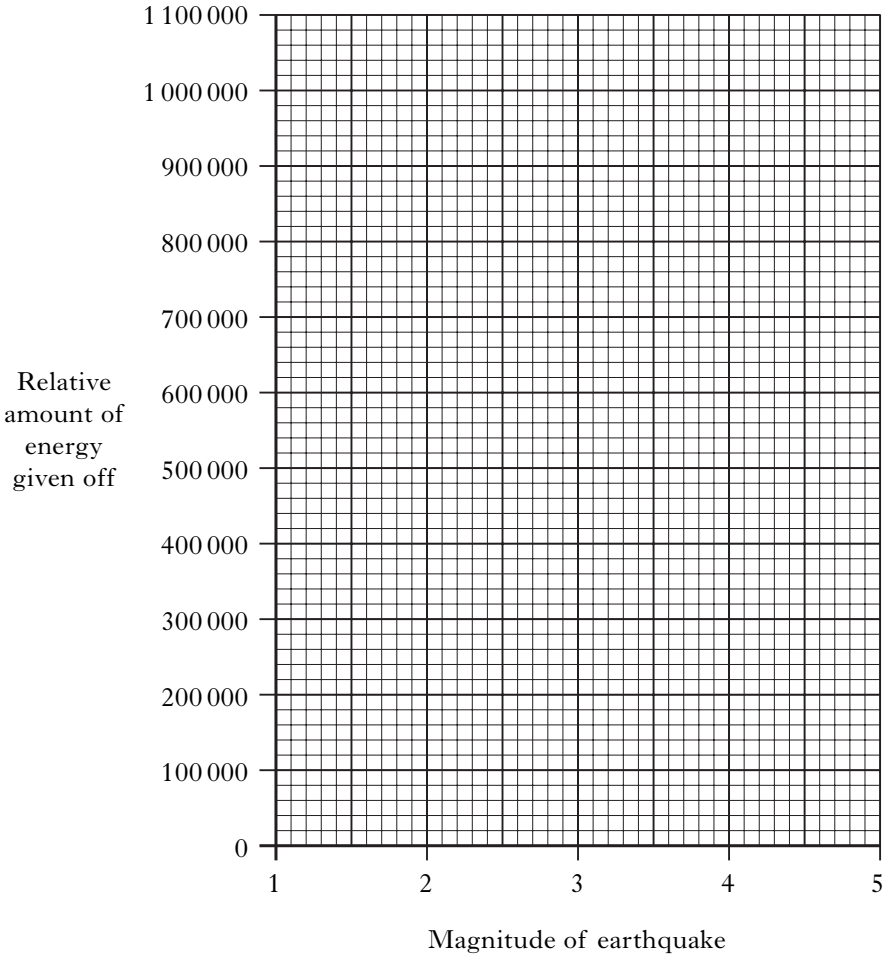
[Turn over

Marks

8. The table shows how the energy given off by an earthquake changes as earthquake magnitude increases.

Earthquake magnitude	*Relative amount of energy given off*
1	1
2	32
3	1024
4	32 768
5	1 048 576

(*a*) (i) On the graph paper below, draw a line graph of relative amount of energy given off against earthquake magnitude.



2

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Marks

8. (*a*) (continued)

(ii) Describe the general relationship shown by the graph.

.....

..... **1**

(iii) What is the relative amount of energy of an earthquake of magnitude 6?

..... **1**

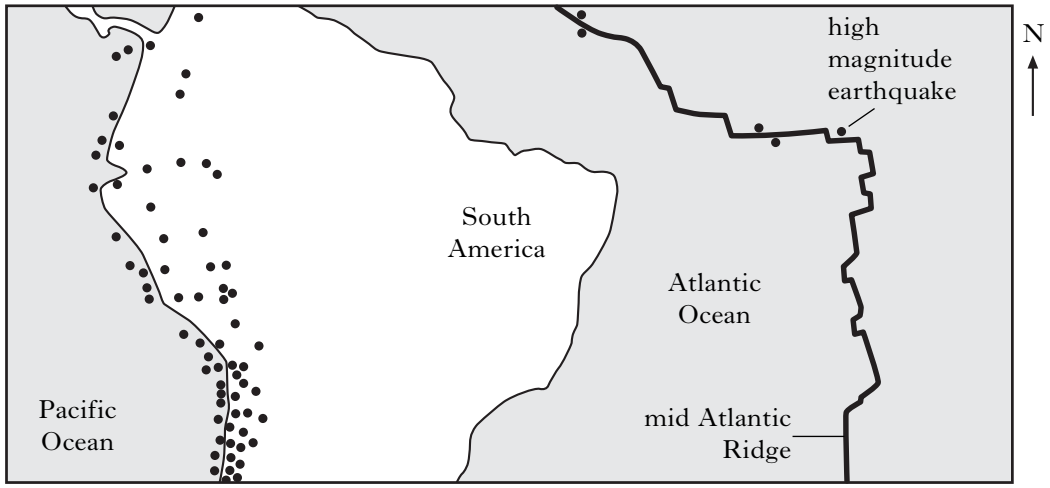
Space for working:

[Turn over

Marks

8. (continued)

(*b*) The map shows the distribution of high magnitude earthquakes for parts of the Pacific Ocean, South America and the Atlantic Ocean.



(i) On the map, draw arrows to show the directions of plate movement. **2**

(ii) Account for the following observations:

1 There are many earthquakes of high magnitude along the western side of South America.

.....

.....

..... **1**

2 There are no earthquakes of high magnitude along the eastern coast of South America.

.....

.....

..... **1**

3 There are few earthquakes of high magnitude along the Mid Atlantic Ridge.

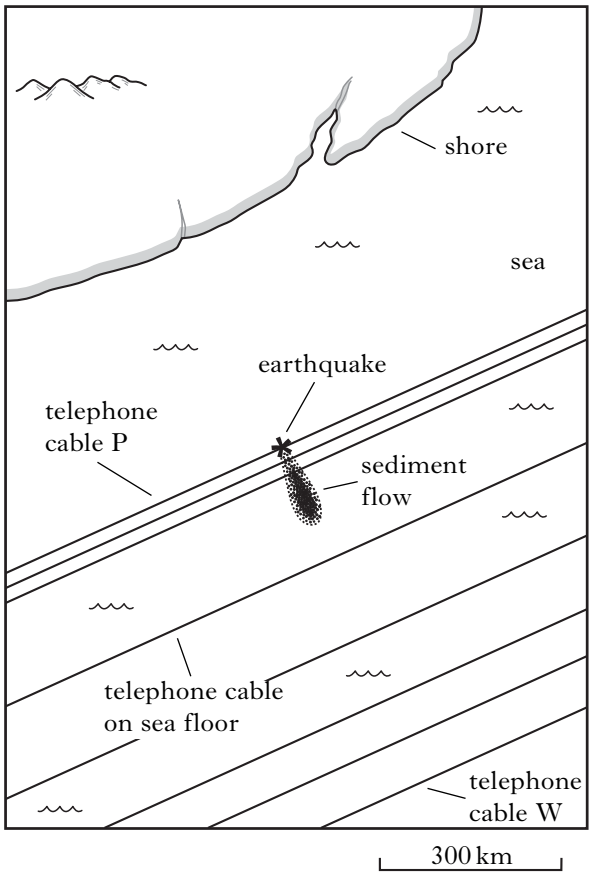
.....

.....

..... **1**

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

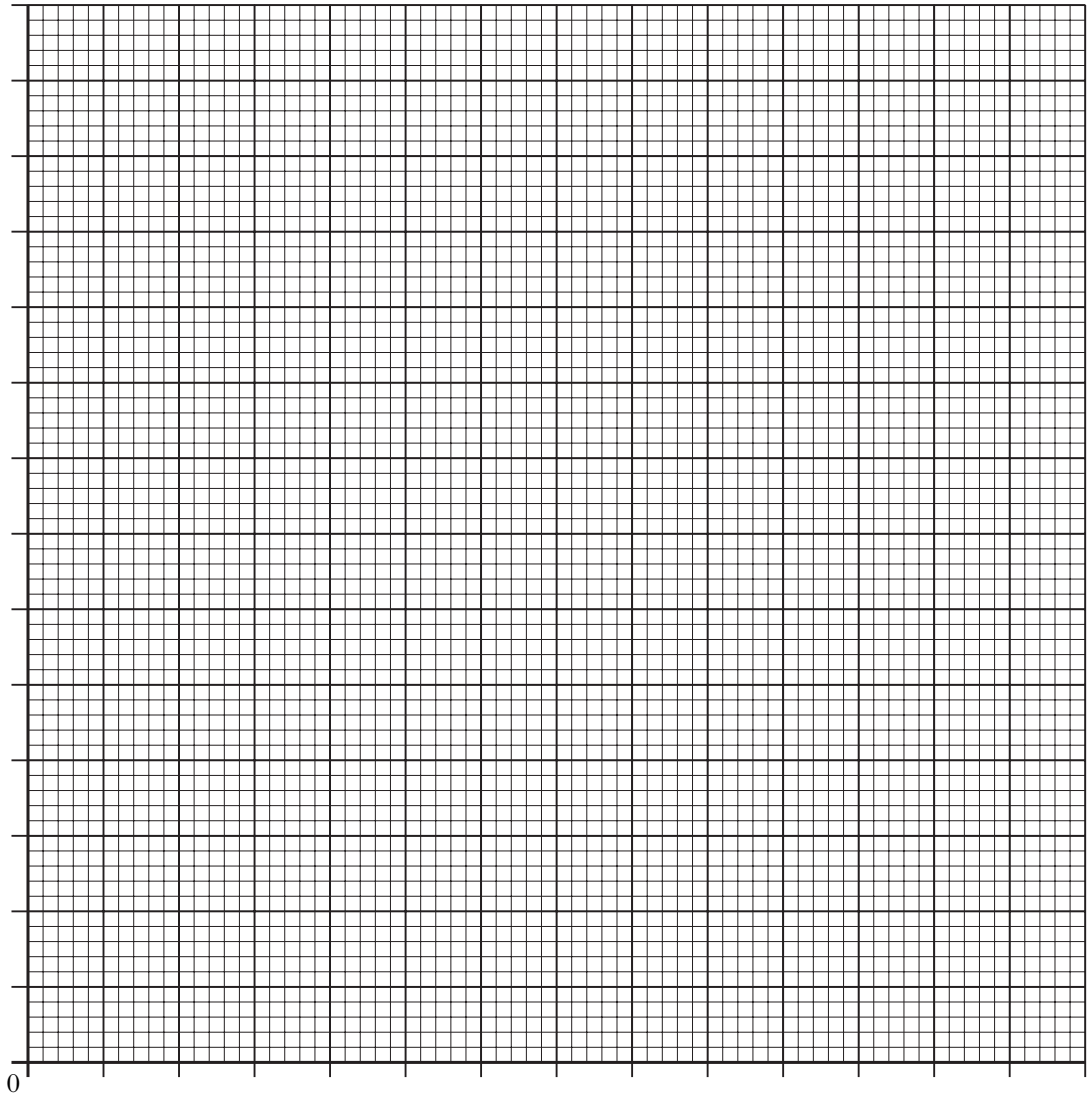
9. Study the map. An earthquake 380 km from the shore cuts telephone cable P and sets off a flow of sediment which cuts other cables at the times shown in the table.



Telephone cable	*Distance from shore* (km)	*Time of break after earthquake* (hours)
P	380	0·0
Q	400	2·0
R	420	3·0
S	580	7·5
T	720	11·0
U	830	13·8
V	900	16·1
W	980	24·1

9. (continued) *Marks*

(*a*) (i) On the graph paper below, draw a graph of time of cable break against distance from shore.



3

(ii) Describe the way in which the speed of the sediment flow changes between cables P and W.

.....

.....

.....

..... **2**

Marks

9. (*a*) (continued)

(iii) How would you expect the slope of the sea floor to change between cables P and W?

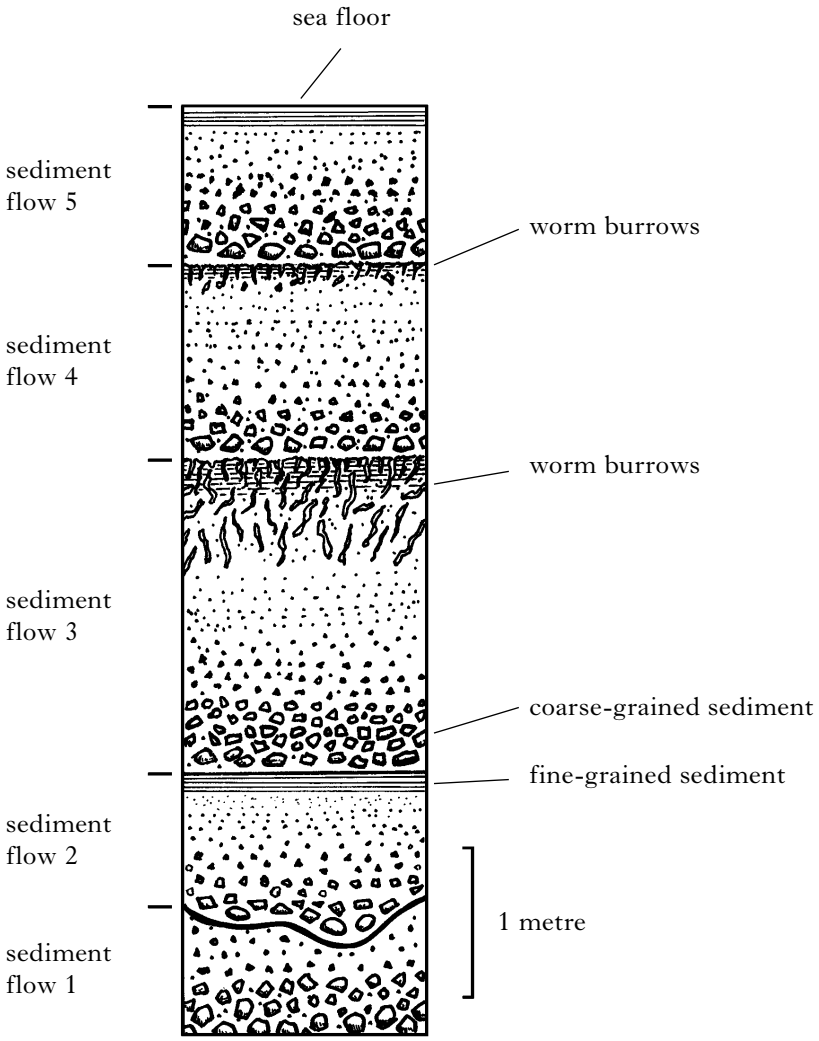
.....

.....

.....

..... **2**

(*b*) The diagram shows a core taken from the sea floor close to cable W after the sediment flow had stopped moving.



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Marks

9. (*b*) (continued)

(i) What type of bedding is shown by sediment flow 5? Explain how this type of bedding has been formed.

Type of bedding .....

How formed .....

.....

.....

..... **3**

(ii) What evidence from the diagram suggests that sediment flows may erode as well as deposit?

.....

..... **1**

(iii) What evidence from the diagram suggests that time intervals between the sediment flows have varied?

.....

..... **1**

(iv) Give **one** reason to explain why the deposits left by the sediment flows are of different thicknesses.

.....

.....

..... **1**

[Turn over

Marks

10. The table gives the speeds at which crystals of diameter 2 mm sink through basaltic magma.

Crystal	*Density of crystal* (grams per cubic centimetre)	*Speed of sinking* (metres per year)
Feldspar	2·7	23
Pyroxene	3·3	160
Olivine	3·7	256
Magnetite	4·9	535

(*a*) What general relationship is shown by the table?

.....

..... **1**

(*b*) (i) How long would it take for a feldspar crystal to sink through 100 metres of magma?

..... **1**

Space for working:

(ii) How long would it take for a magnetite crystal to sink through 100 metres of magma?

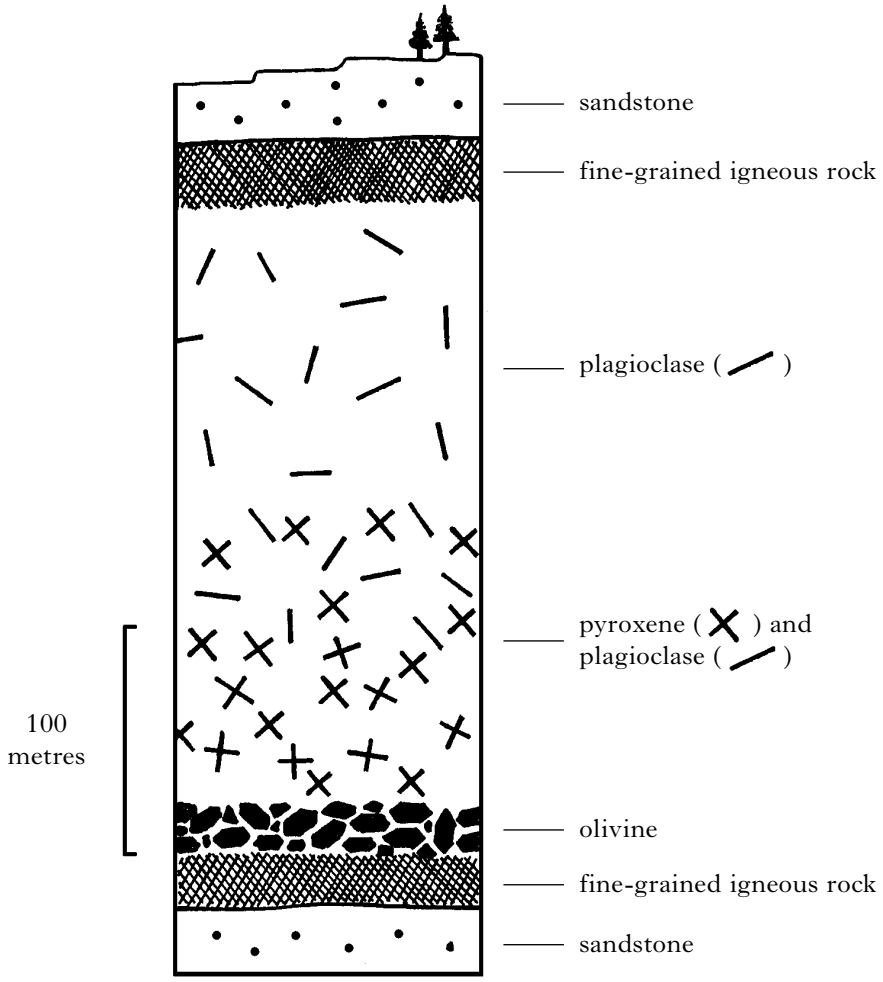
..... **1**

Space for working:

10. (continued)

Marks

(*c*) The diagram shows a section through a sill.



Describe **three** processes which have operated to form the layering inside the sill.

Process 1 .....

.....

.....

Process 2 .....

.....

.....

Process 3 .....

.....

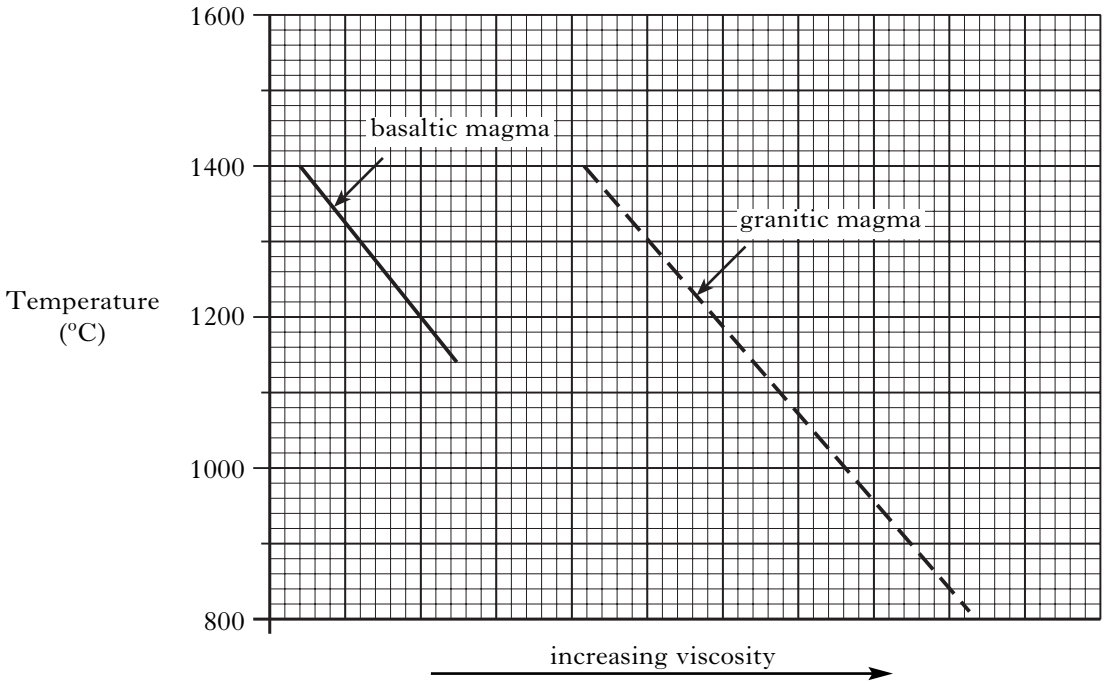
..... **3**

[Turn over for Questions 10(*d*) and (*e*) on *Page twenty-eight*

Marks

10. (continued)

(*d*) The graph shows how the viscosities of magmas change with temperature.



Describe the general relationships shown by the graph.

.....

.....

.....

..... **2**

(*e*) Which **one** statement is correct?

A You would expect granite intrusions to consist of layers of minerals which have sunk from the magma.

B Magnetite would sink more slowly through granitic magma than through basaltic magma.

C Granitic magma will flow from volcanoes more easily than basaltic magma.

D Quartz crystals have a density of 2·7 grams per cubic centimetre. You would expect them to sink through granitic magma at a speed of 23 metres per year.

Give only the letter: **1**

[*END OF QUESTION PAPER*]