

FOR OFFICIAL USE

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Total

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X043/11/01

NATIONAL
QUALIFICATIONS
2012

THURSDAY, 3 MAY
9.00 AM – 11.00 AM

GEOLOGY
INTERMEDIATE 2

Fill in these boxes and read what is printed below.

Full name of centre

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Town

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Forename(s)

--

Surname

--

Date of birth

Day Month Year

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Scottish candidate number

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Number of seat

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- 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. (a) Use eight of the mineral names from the word box to complete the table below.

amphibole : barite : cassiterite : chalcopyrite : fluorite : galena : haematite :
olivine : sphalerite : talc

<i>Mineral properties</i>	<i>Name of mineral</i>
Grey colour. Metallic lustre. Ore of lead.	
Glassy green colour. No cleavage. Hardness 6½.	
Brassy yellow colour often with multi-coloured tarnish. Ore of copper.	
Black or green-black colour. Two planes of cleavage at 60°. Hardness 5½.	
White or pale colour. One perfect cleavage. Hardness 1.	
White or pale colour. Three planes of cleavage. Feels very heavy in the hand—relative density 4½.	
Red-brown colour. Streak red-brown. Often forms kidney-shaped or rounded lumpy masses. Ore of iron.	
Brown glassy mineral. Six planes of cleavage. Ore of zinc.	

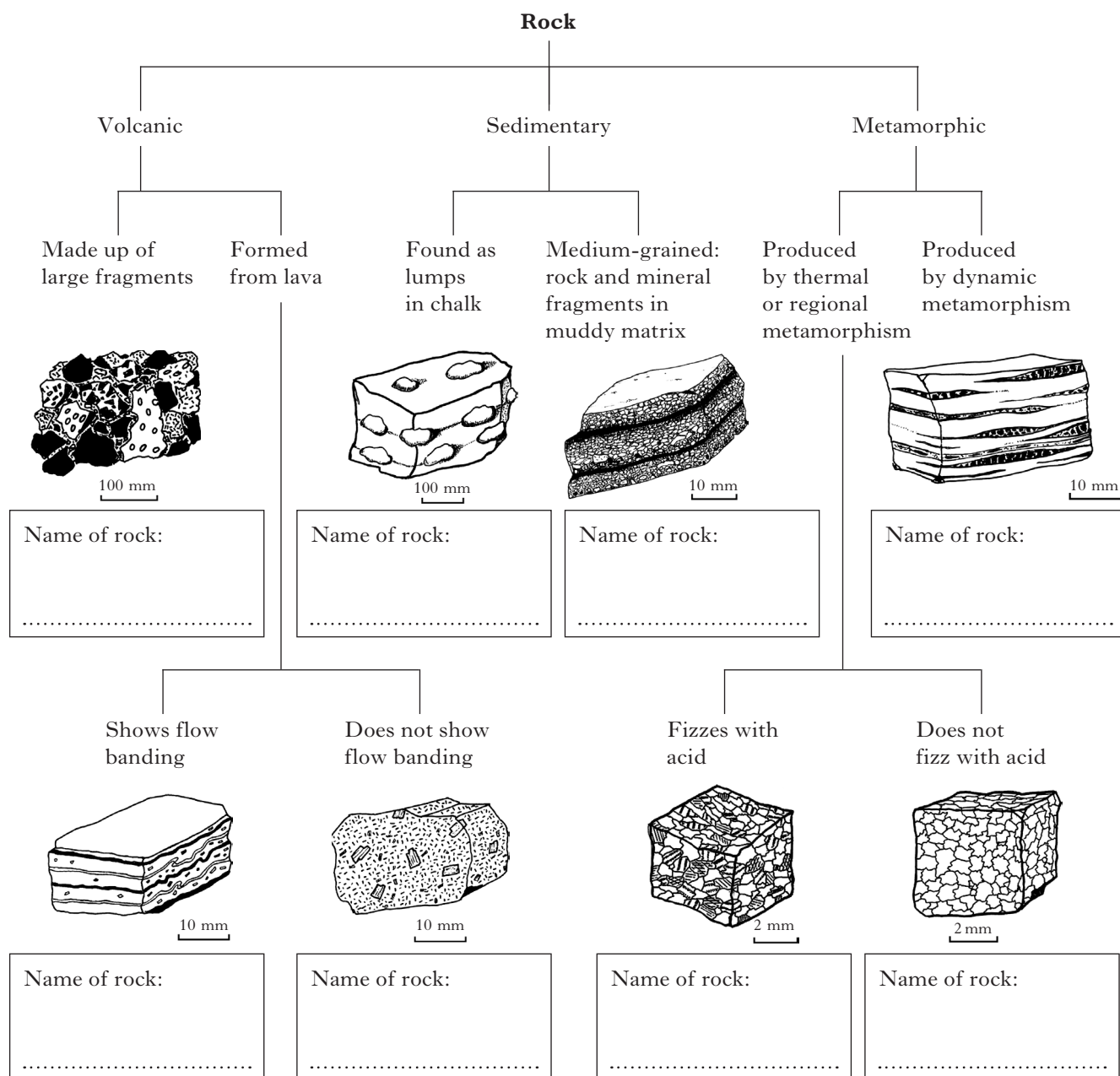
4

1. (continued)

Marks

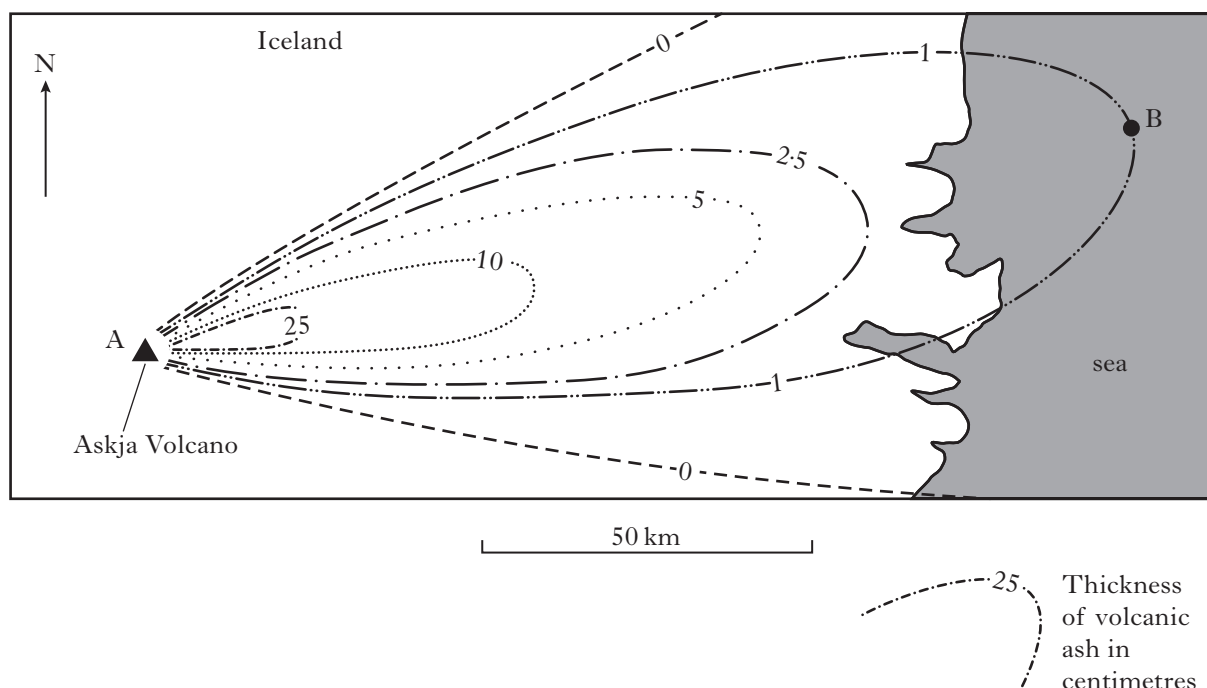
(b) Use eight of the rock names from the word box to complete the key below.

agglomerate : andesite : flint : greywacke : limestone : marble : metaquartzite :
 mylonite : rhyolite : slate



Marks

2. The map and table below show information about ash that fell when Askja volcano erupted in Iceland in 1975.



<i>Distance from volcano along line A–B (km)</i>	<i>Thickness of ash (cm)</i>	<i>Maximum diameter of ash particles (cm)</i>
10	100	40
25	25	13
60	10	0.3
100	4	0.1
150	1	0.001

- (a) Explain why the area of ash fall has a long narrow shape.

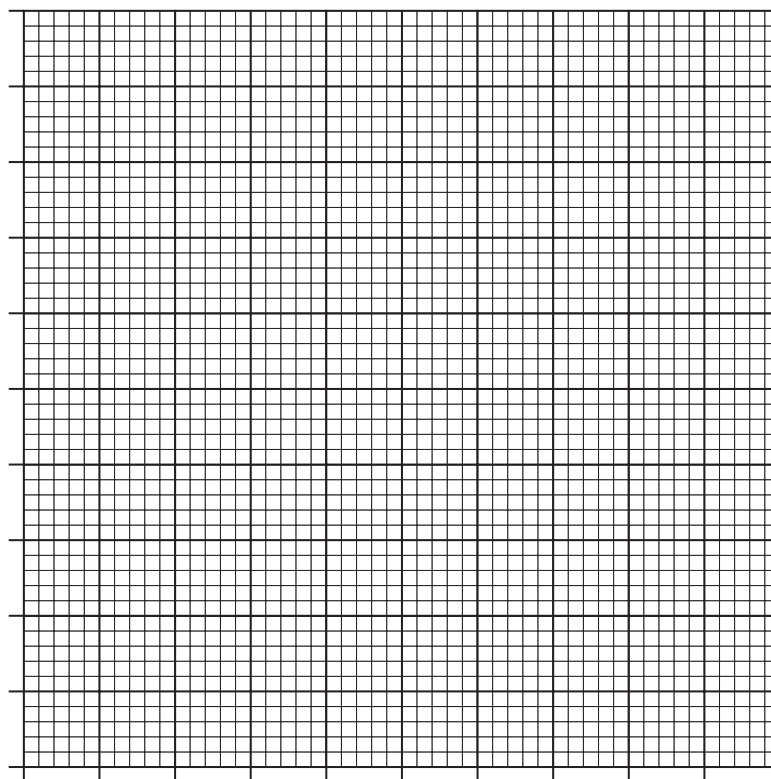
.....
.....

1

2. (continued)

Marks

- (b) Using the information in the table, draw a line graph to show how **thickness of ash** changes with **distance** from the volcano. Use appropriate scales to fill most of the graph paper.



3

- (c) Describe **two** features of the relationship between the thickness of ash and distance from the volcano.

1

.....

2

.....

2

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

A All the ash fell on Iceland.

B The largest fragment thrown out by the volcano had a diameter of 40 cm.

C The thickest ash fall was more than 100 cm thick.

D At any distance from the volcano, the particles are all the same size.

E The smaller the ash particles the greater the area they covered.

F The rate of change in size of particle from west to east is the same as that from north to south.

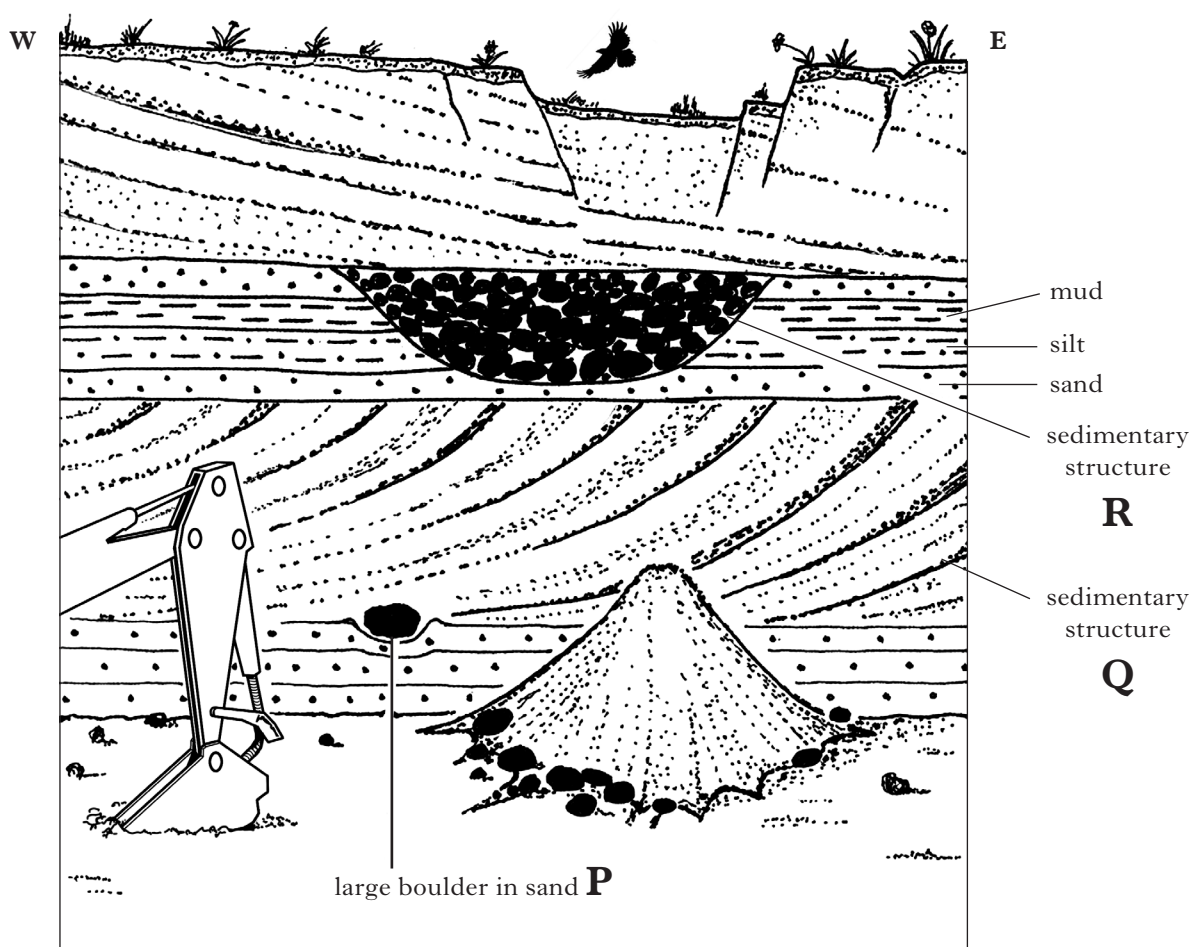
Give only the letters: and

2

Marks

3. Diagram 1 below shows part of a sand quarry visited during a field trip. The sediment was deposited over many years by meltwater flowing from a glacier.

Diagram 1



- (a) Describe **four** safety precautions you would take when visiting this quarry.

.....

.....

.....

.....

2

- (b) Name the sedimentary structure Q.

.....

1

- (c) Name the sedimentary structure R.

.....

.....

1

3. (continued)

Marks

- (d) How can you tell that the strength of the meltwater flow has changed over time?

.....

.....

1

- (e) Explain how you can tell that the direction of the meltwater flow has changed over time.

.....

.....

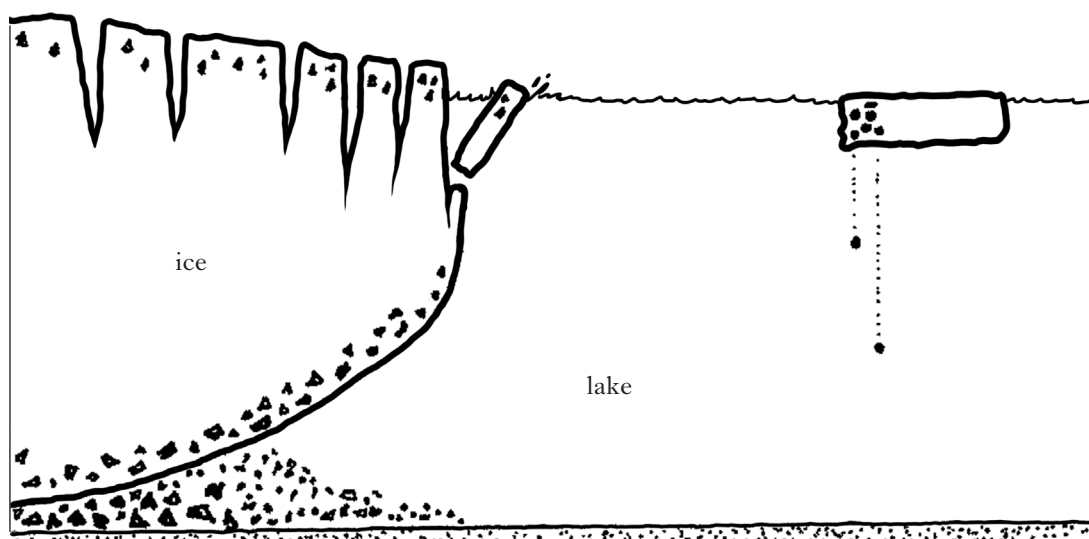
.....

.....

1

- (f) Diagram 2 below shows a melting glacier.

Diagram 2



Use the information in Diagram 2 above to account for the presence of the large boulder (labelled P) found in the sand quarry shown on Diagram 1.

.....

.....

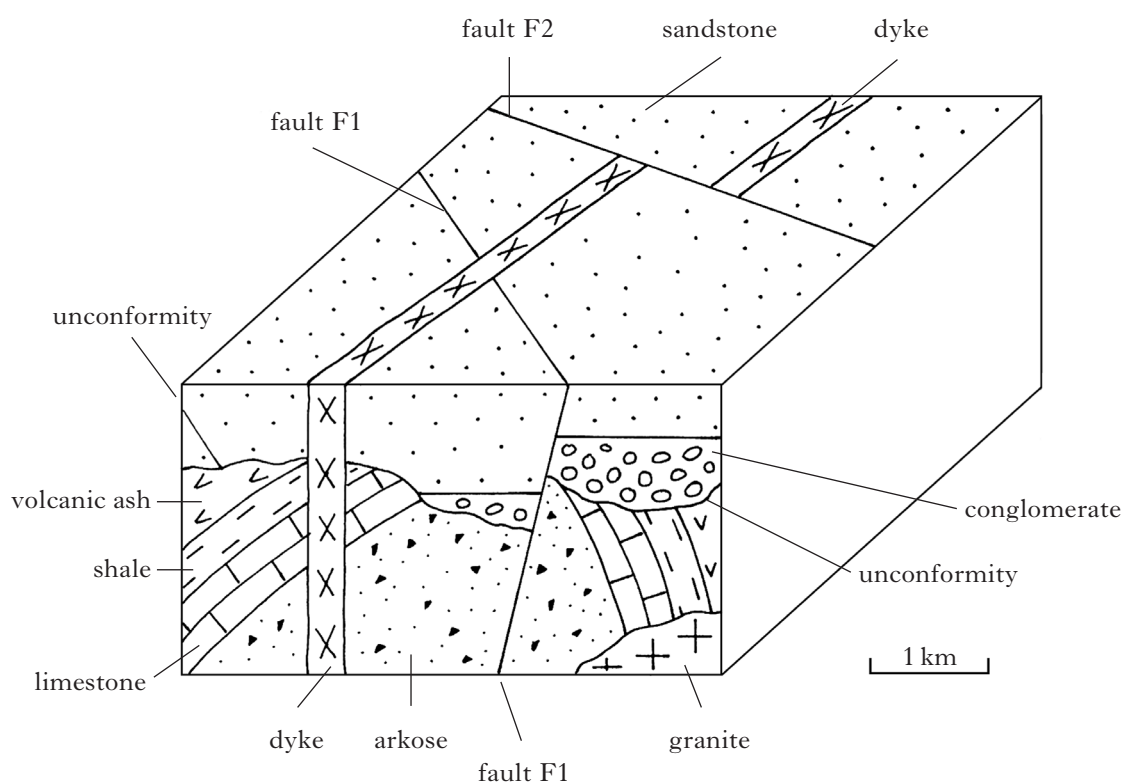
.....

1

[Turn over]

Marks

4. Study the block diagram below.



(a) Complete the blank face of the block diagram.

4

(b) What types of fault are F1 and F2?

F1

F2

2

(c) What type of fold is formed by the limestone and shale?

.....

1

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

A Deposition of limestone

B Formation of unconformity

C Movement on fault F1

D Movement on fault F2

E Intrusion of dyke

F Folding of shale

Give only the letters: → → → → →
oldest youngest

3

4. (continued)*Marks*

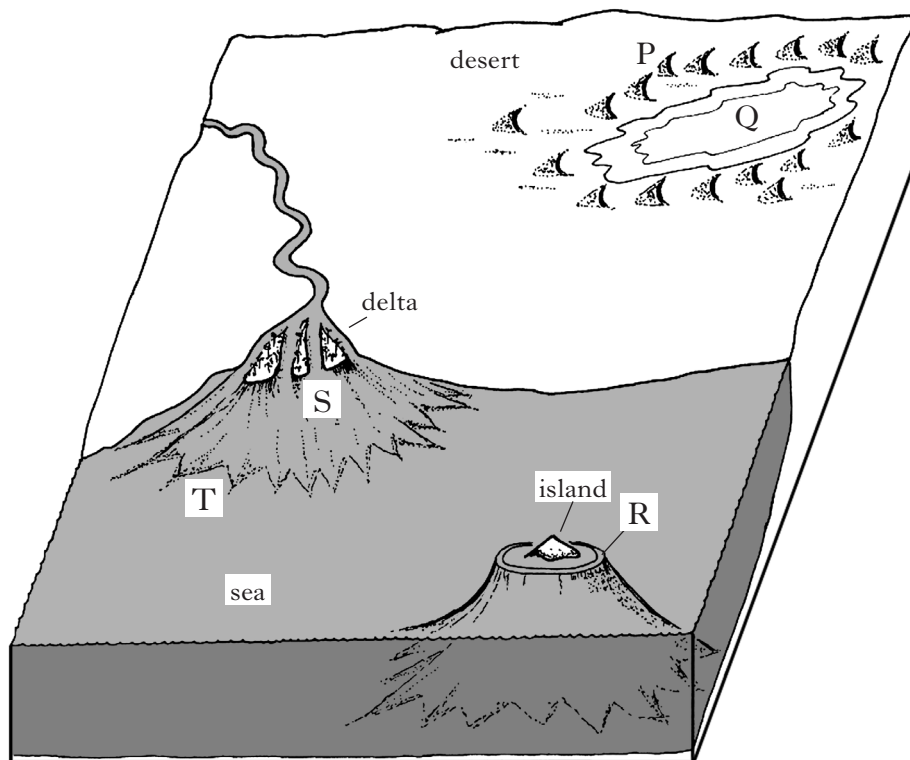
(e) Which **one** of the following statements is correct?

- A Columnar joints are formed when an igneous rock heats up and expands.
- B Sheet joints are formed when the weight of rock above a batholith is reduced allowing the batholith to expand and crack.
- C Mud cracks are a honeycombed pattern of cracks produced when mud dries out and expands.
- D Vertical cracks (joints) within limestone beds are a result of frost shattering.

Give only the letter:

1**[Turn over**

5. The sketch below shows a variety of depositional environments.

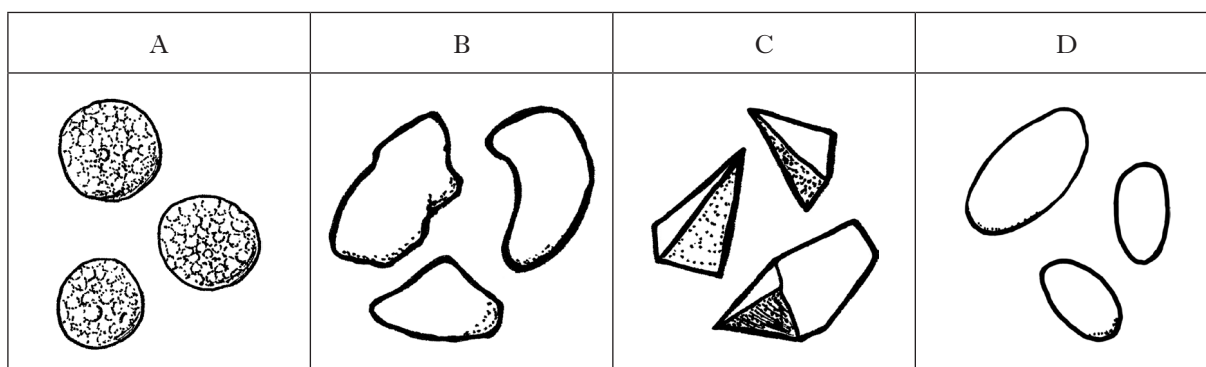


- (a) Match the sedimentary rock in the table below with its likely environment of deposition. Choose from environments P, Q, R, S or T.

<i>Sedimentary Rock</i>	<i>Environment of Deposition</i>
Salt deposits	
Mudstone	
Coral limestone	
Coal	
Sandstone	

2

- (b) Which diagram below shows the type of sand grain formed in a desert environment?



Give only the letter:

1

5. (continued)

Marks

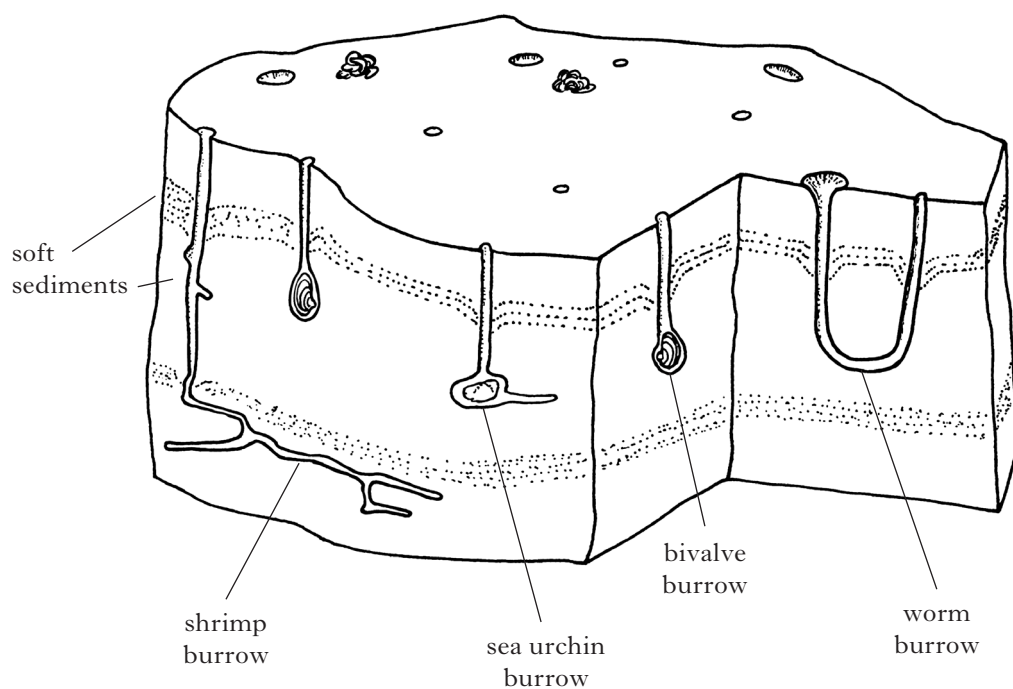
- (c) Describe the process by which a coral atoll is formed. Diagrams must be used in your answer.

3

5. (continued)

Marks

(d) The diagram below shows part of a sea floor.



- (i) As more sediment is added to the sea floor converting the older sediment to rock, what will happen to the shape of the burrows?

1

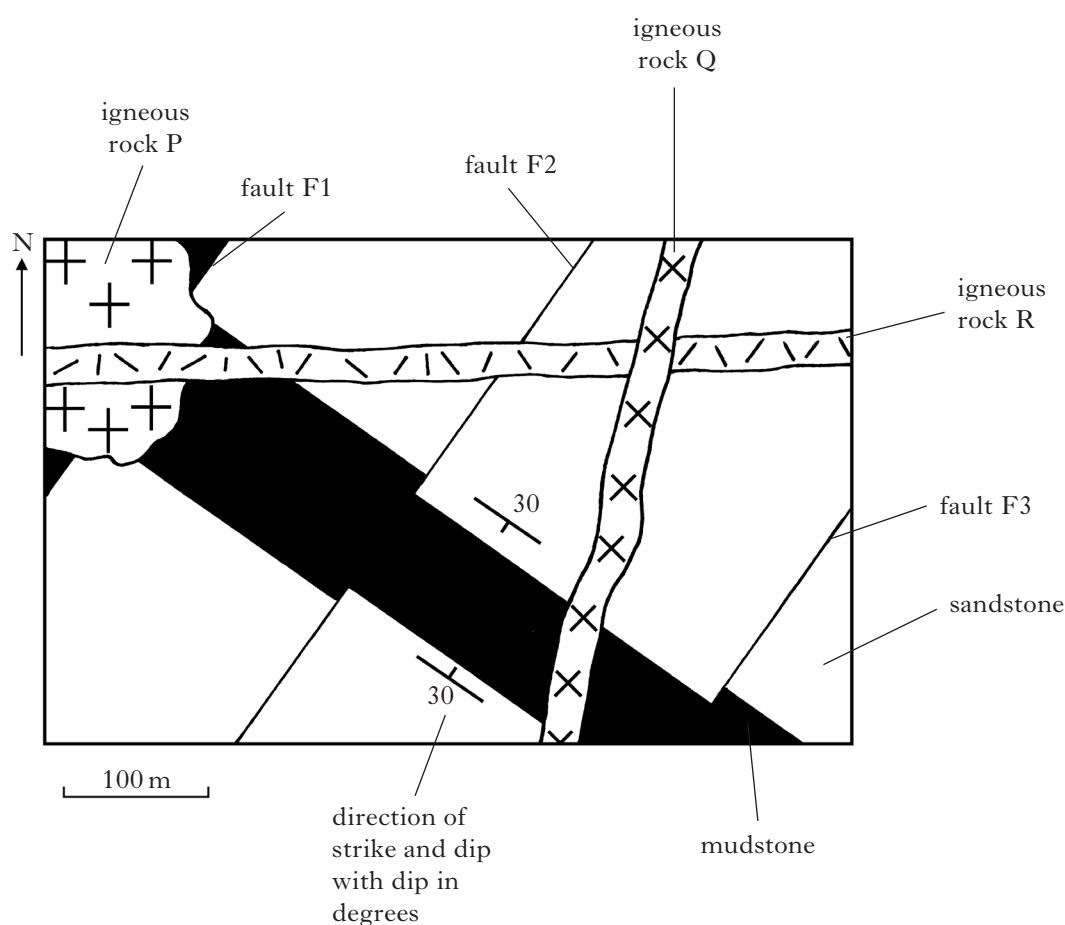
- (ii) Explain why the bivalves and sea urchins are more likely to be preserved than worms.

1

[Turn over for Question 6 on *Page fourteen*

Marks

6. Study the geological map given below.



- (a) Name the type of fold shown on the map. Give a reason for your answer.

Type of fold:

Reason:

2

- (b) Use a protractor to measure the strike direction (in degrees) of the mudstone.

Strike of mudstone:

1

- (c) On which side of fault F2 have the rocks been moved down? Give a reason for your answer.

Side moved down:

Reason:

2

6. (continued)*Marks*

- (d) What type of intrusion is formed by igneous rock P?

..... **1**

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

A Formation of igneous rock Q

B Deposition of mudstone

C Movement on fault F1

D Formation of igneous rock P

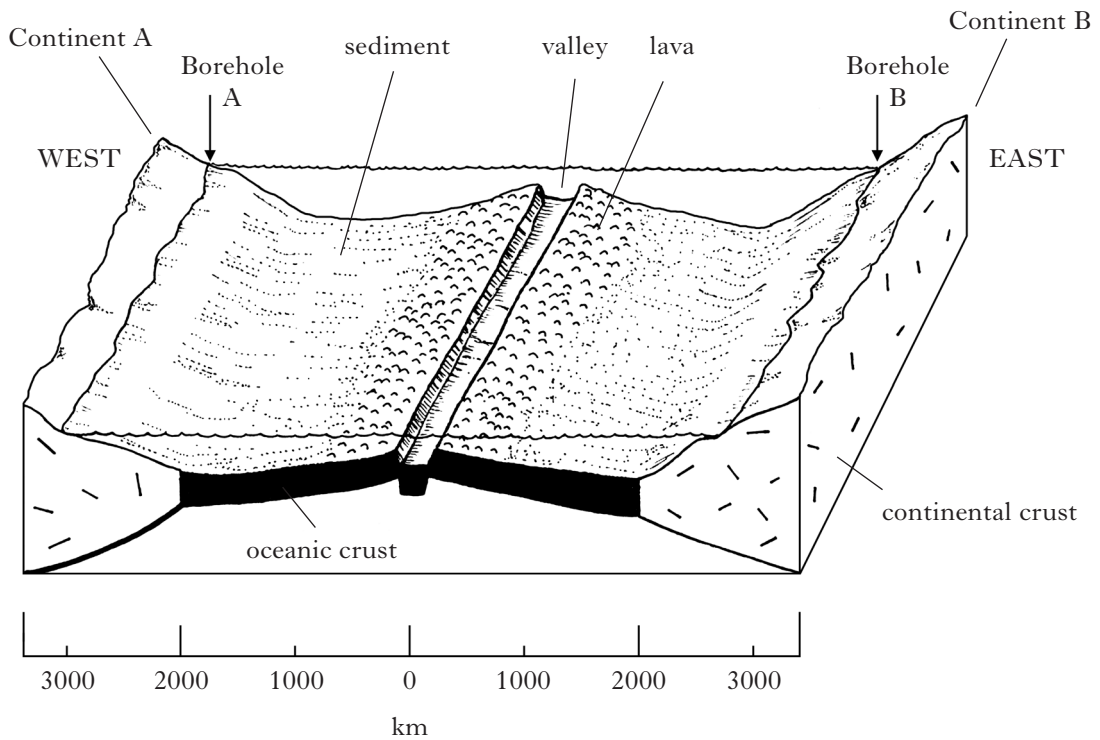
E Folding of rocks

F Formation of igneous rock R

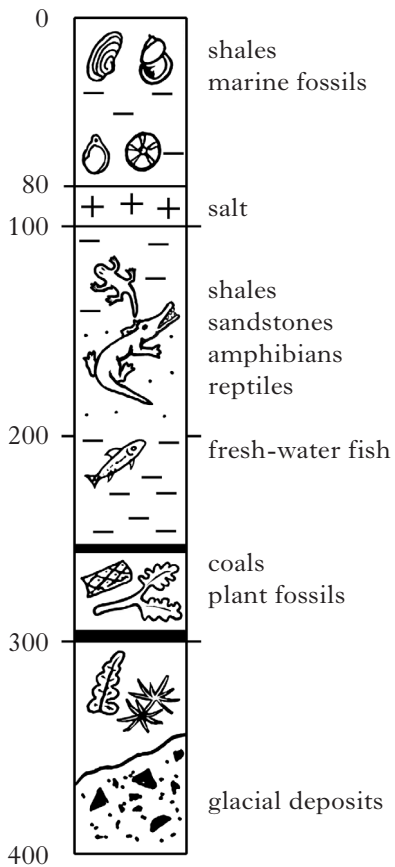
Give only the letters: → → → → → **3**
oldest youngest

[Turn over

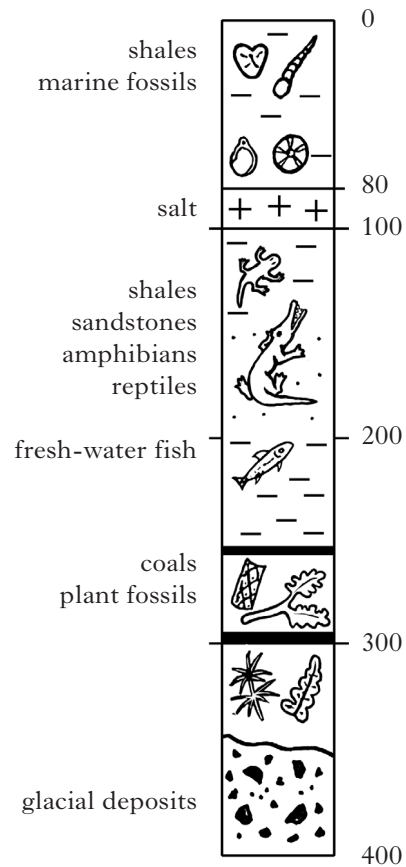
7. The diagram below shows an ocean floor separating two continents A and B. The locations of two boreholes are also shown. The borehole data is displayed underneath.



**Sedimentary rocks
at Borehole A**



**Sedimentary rocks
at Borehole B**



Millions
of years
ago

7. (continued)*Marks*

- (a) Name the type of valley shown.

.....

1

- (b) Name the type of lava shown.

.....

1

- (c) The continents separated 80 million years ago.

Using the scale, calculate the speed at which continents A and B have moved apart over this time. Give your answer in km per million years.

Space for calculation

..... km/million years

2

- (d) Using the borehole data, provide evidence that supports the idea that the joined continents drifted from polar to equatorial and then desert latitudes before separating.

.....

.....

.....

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.....

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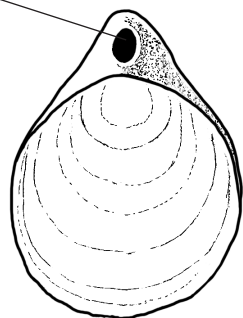
3**[Turn over**

Marks

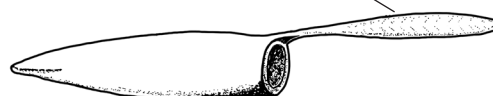
8. (a) Name the parts of the fossils indicated below. Select your answers from the word box.

columella : foramen : guard : pro-ostracum : pygidium : spine : stipe : test :
theca : thorax

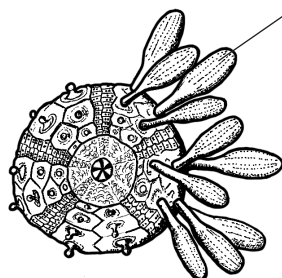
Fossil P



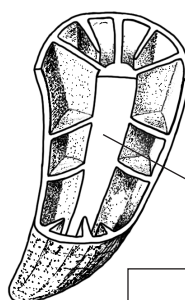
Fossil Q



Fossil R



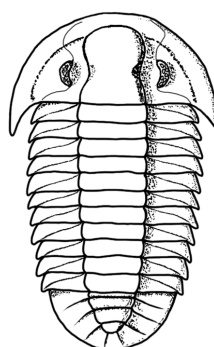
Fossil S



Fossil T



Fossil U



8. (continued)

Marks

(b) Name the fossils P–U.

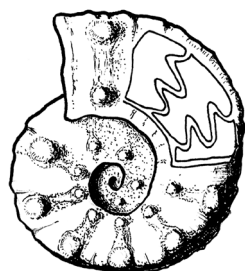
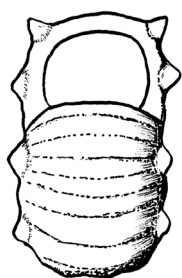
P Q

R S

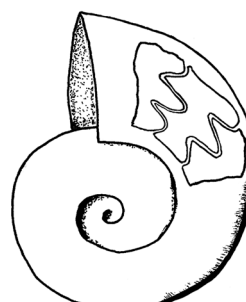
T U 3

(c) The diagram below shows two species of ammonite.

Species A



Species B



(i) Which species would probably be the faster swimmer?

.....

Explain your answer:

.....

..... 1

(ii) Give **two** reasons why species A could probably live in deeper water than species B.

Reason 1:

.....

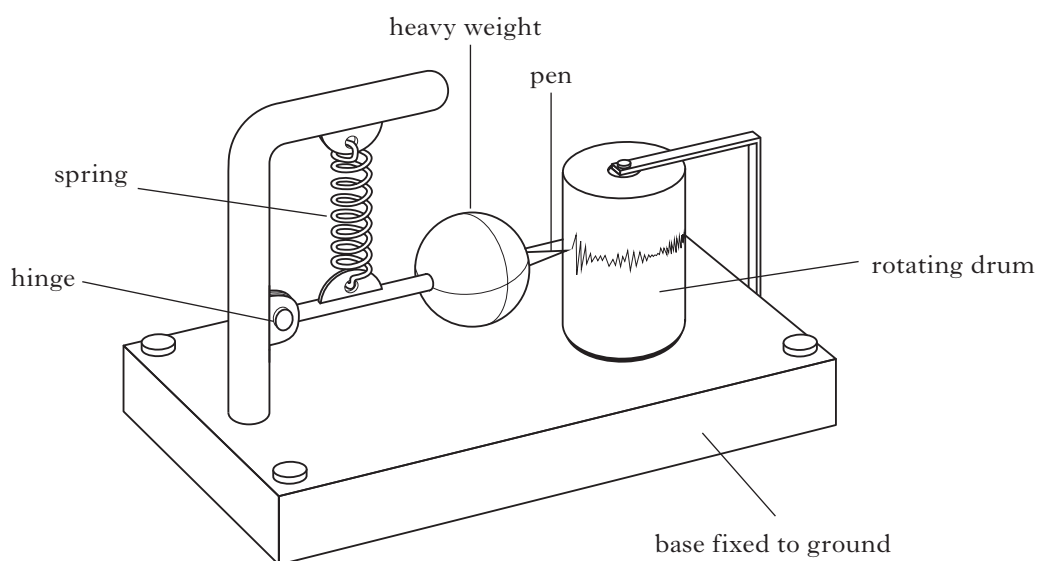
Reason 2:

..... 2

[Turn over]

Marks

9. Name the instrument drawn below and explain how it works to make a recording of an earthquake.



(a) Name: 1

How it works:

.....

.....

..... 2

(b) What is the focus of an earthquake?

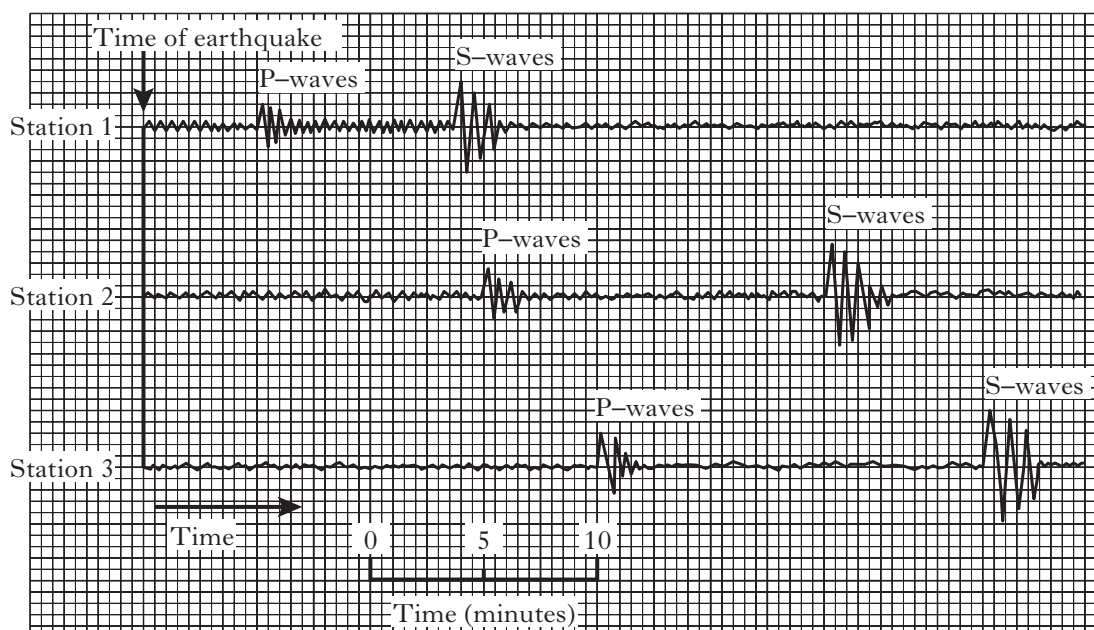
.....

..... 1

9. (continued)

Marks

- (c) The diagram below shows the P- and S-wave arrival times for an earthquake as recorded at three stations.



Calculate the time interval between the arrival of P-waves and S-waves at **station 3**.

Space for calculation

Answer: minutes **1**

- (d) The distance that a recording station is from an epicentre can be calculated using the formula:

$$\text{Distance from epicentre (km)} = 8.65 \times \text{Time difference between the arrival of P- and S-waves (seconds)}$$

Use this formula to complete the blanks in the table below that gives information concerning stations 1 and 2. Round off your answers to the nearest whole number.

Station	Time difference (s)	Distance from epicentre (km)
1		4500
2	900	

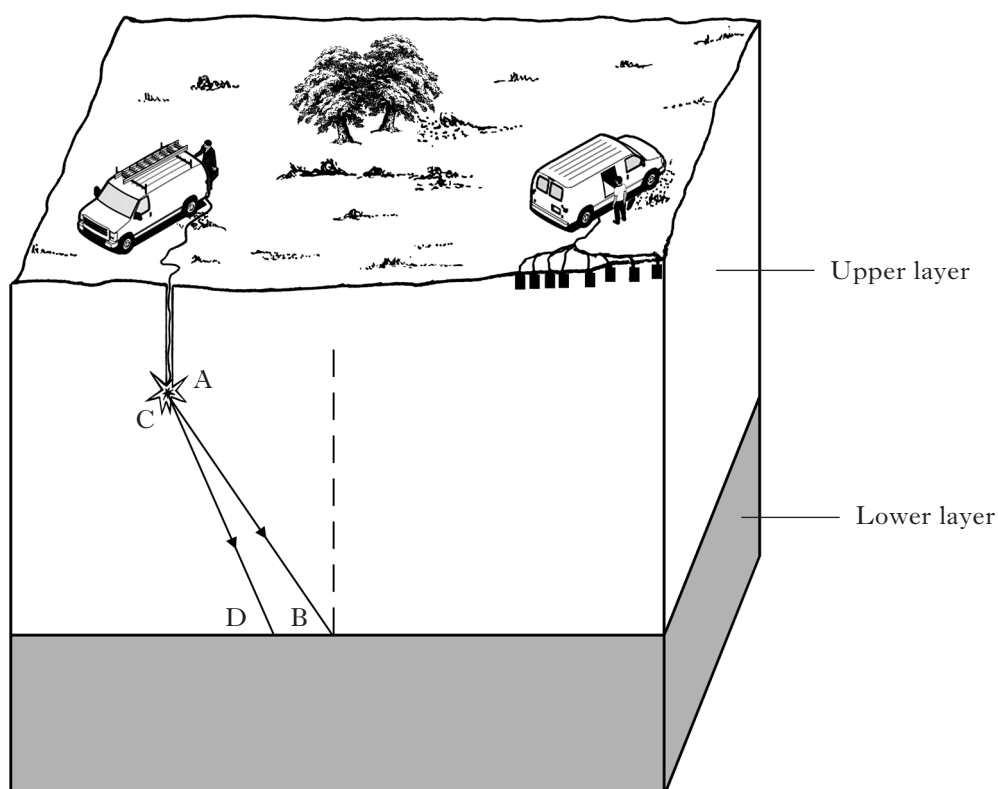
2

[Turn over]

9. (continued)

Marks

- (e) During a prospecting survey, dynamite was exploded underground to produce shock waves, some of which were detected by a recording vehicle.



On the diagram continue:

- (i) line A–B to show a reflected shock wave;
 - (ii) line C–D to show a refracted shock wave as the wave enters the lower layer.
- (f) Which **two** statements correctly describe the internal structure of the Earth?
- A The Earth has a liquid metal inner core.
 - B The Earth's crust is thicker than the mantle.
 - C The Earth's crust is made of peridotite.
 - D The Earth has a molten nickel and iron outer core.
 - E P–waves and S–waves travel at the same speed through the outer core.
 - F The Moho is a major discontinuity between the crust and the mantle.

Give only the letters: and

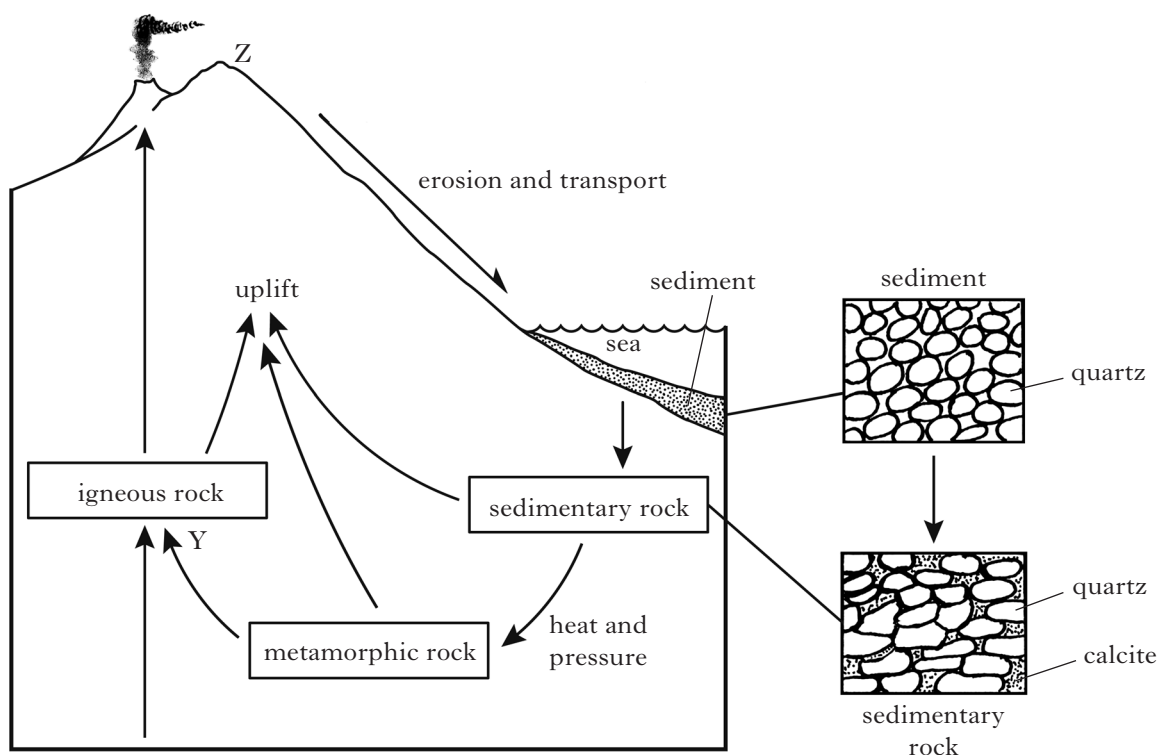
2

2

[Turn over for Question 10 on *Page twenty-four*

Marks

10. Study the diagram below which shows the rock cycle.



(a) What is happening to the sediment to change it into sedimentary rock?

.....
.....

1

(b) What is happening at location Y to change the metamorphic rocks into igneous rocks?

.....

1

(c) What happens to the surface rocks at Z before they are eroded and transported downslope?

.....

1

10. (continued)*Marks*

(d) The table below gives the height of a mountain over a 75 million year period.

<i>Time</i> (millions of years ago)	<i>Height of mountain</i> (km)
0	0·16
15	0·32
30	0·63
45	1·25
60	2·50
75	5·00

(i) Predict the height of the mountain in 30 million years time.

..... km

1

(ii) Apart from erosion, name another factor which may affect the rate of height reduction over a long period of time.

.....

1

(iii) Calculate the percentage change in the height of the mountain between 60 and 30 million years ago.

Space for calculation

..... %

1

(iv) Express as a simple whole number ratio the height of the mountain at 75, 60 and 45 million years ago.

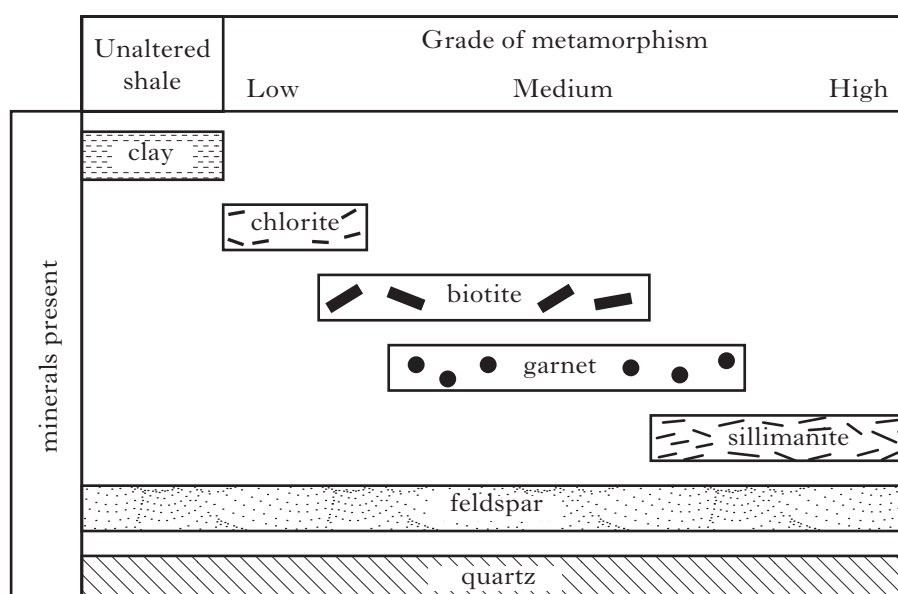
Space for calculation

75 million : 60 million : 45 million

1**[Turn over]**

Marks

11. The diagram below shows minerals found in shale as it undergoes regional metamorphism.



- (a) Which mineral appears **after** the first low grade metamorphic mineral has disappeared?

..... 1

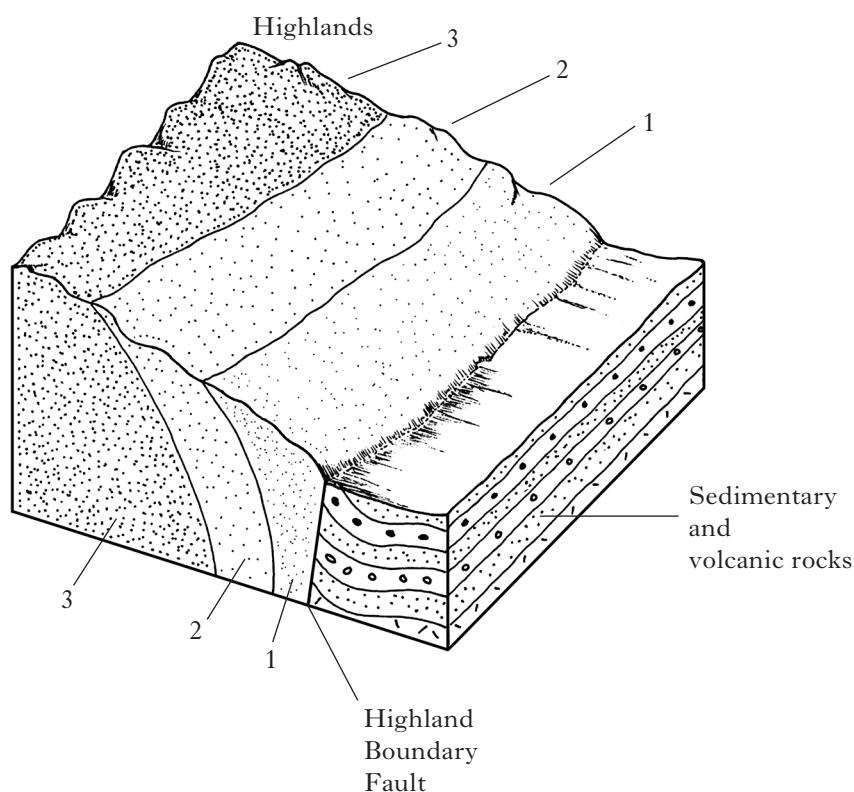
- (b) Explain why quartz cannot be used to define a metamorphic grade.

.....
..... 1

11. (continued)

Marks

(c) The diagram below shows zones of metamorphism as found in the Scottish Highlands.



Name the metamorphic mineral that defines the metamorphic grade within each of the zones 2 and 3. Zone 1 has been completed for you.

Zone 1 chlorite

Zone 2

Zone 3

2

(d) Which sequence of rock types is formed when shale undergoes increasing grades of regional metamorphism?

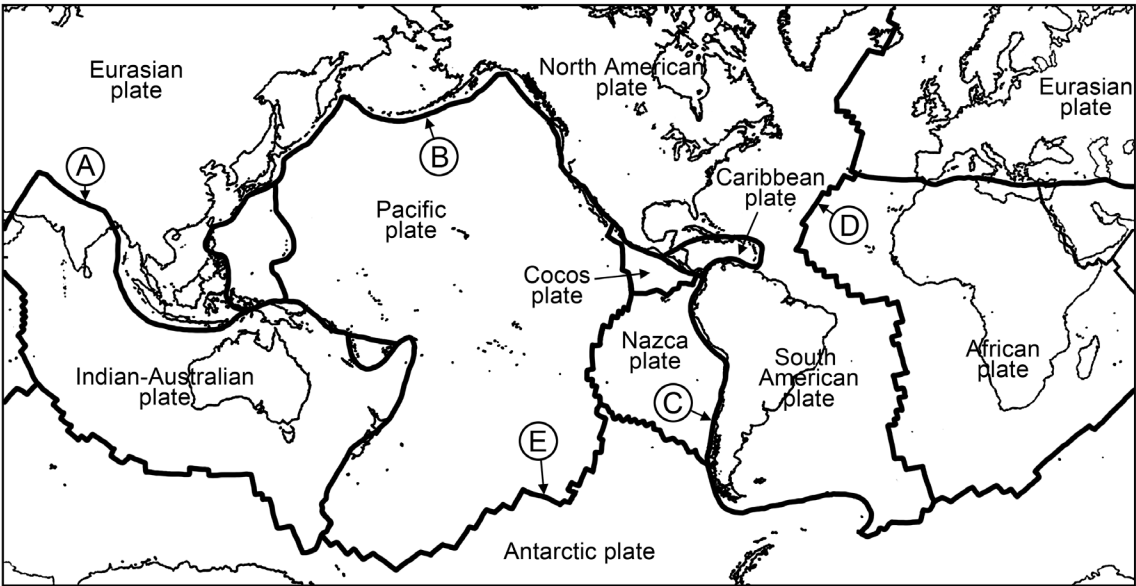
- A shale → gneiss → migmatite → schist → slate
- B shale → slate → gneiss → schist → migmatite
- C shale → slate → schist → gneiss → migmatite
- D shale → migmatite → gneiss → schist → slate

Give only the letter:

1

[Turn over]

12. Five types of plate boundary, labelled A, B, C, D and E, are shown on the world map below.

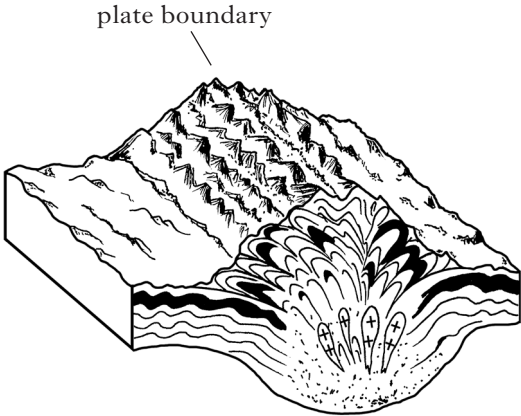
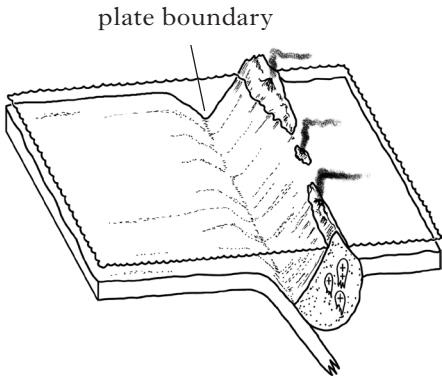


Complete the table below which is continued onto the next page.

<i>Drawing of plate boundary</i>	<i>Type of plate boundary</i> <i>Choose from</i> <i>conservative,</i> <i>constructive,</i> <i>destructive</i>	<i>Location on</i> <i>world map</i> <i>Choose a</i> <i>location</i> <i>from A–E</i>

12. (continued)

Marks

<i>Drawing of plate boundary</i>	<i>Type of plate boundary</i> <i>Choose from</i> <i>conservative,</i> <i>constructive,</i> <i>destructive</i>	<i>Location on</i> <i>world map</i> <i>Choose a</i> <i>location</i> <i>from A–E</i>
		
		
	destructive	C

5

[END OF QUESTION PAPER]

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X043/12/11

NATIONAL
QUALIFICATIONS
2012

THURSDAY, 3 MAY
9.00 AM – 11.30 AM

**GEOLOGY
HIGHER**
Worksheet for Question 14

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Date of birth

Day Month Year

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Scottish candidate number

--	--	--	--	--	--	--	--	--	--

Number of seat

To be inserted inside the front cover of the candidate's answer book and returned with it.



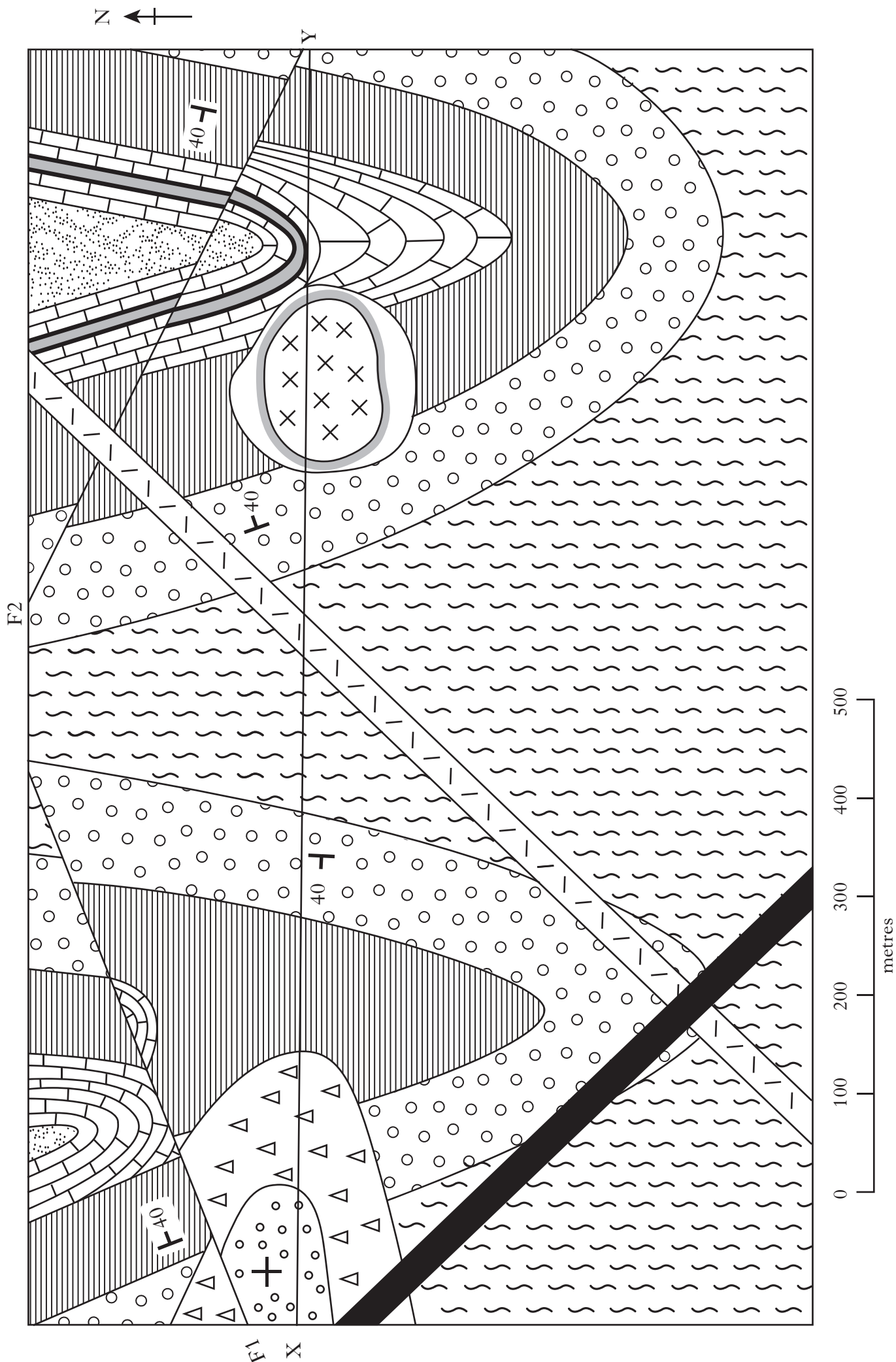
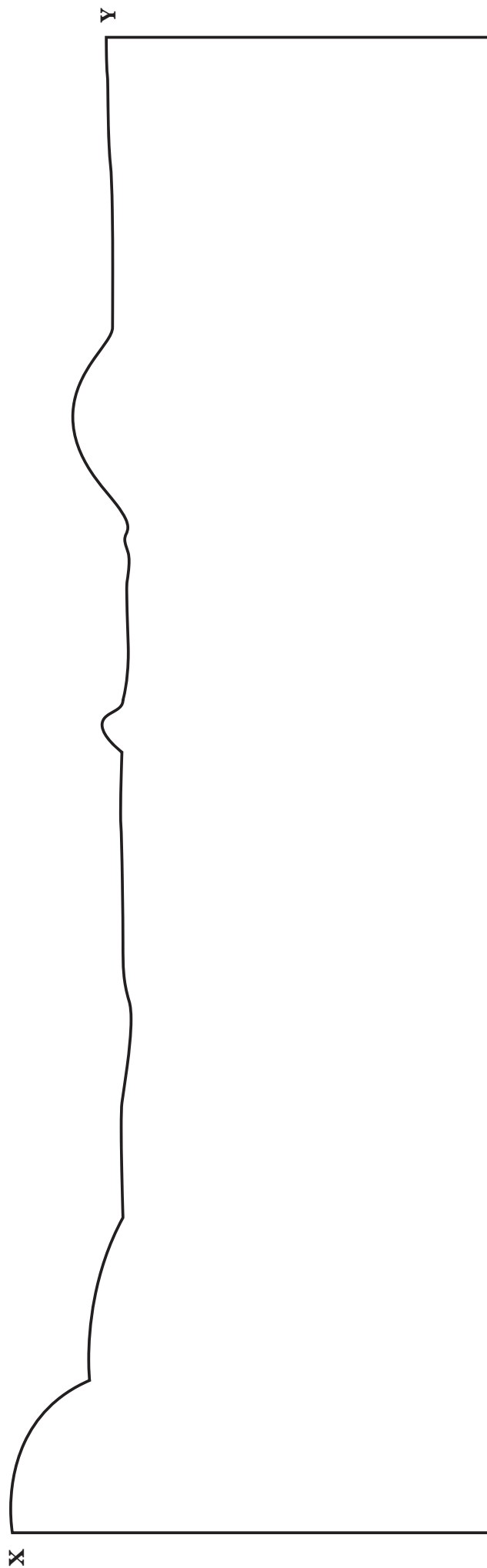
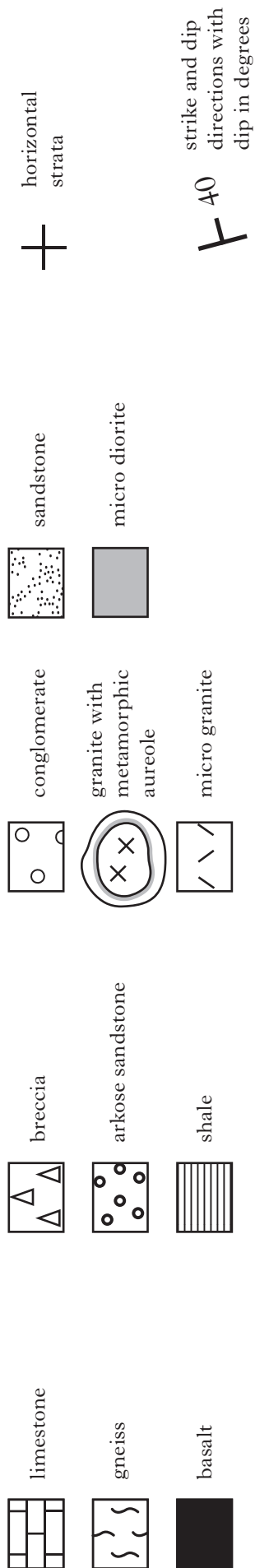


Figure Q14(e)

Key (Rocks not in order of age)



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