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| Centre number | | | | | | Candidate number | | | | |
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
ADVANCED SUBSIDIARY GCE**

F792

GEOLOGY

Rocks – Processes and Products

WEDNESDAY 19 JANUARY 2011: Morning

DURATION: 1 hour 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Ruler (cm/mm)

Protractor


Electronic calculator

READ INSTRUCTIONS OVERLEAF

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. Pencil may be used for graphs and diagrams only.
- 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.
- Answer ALL the questions.

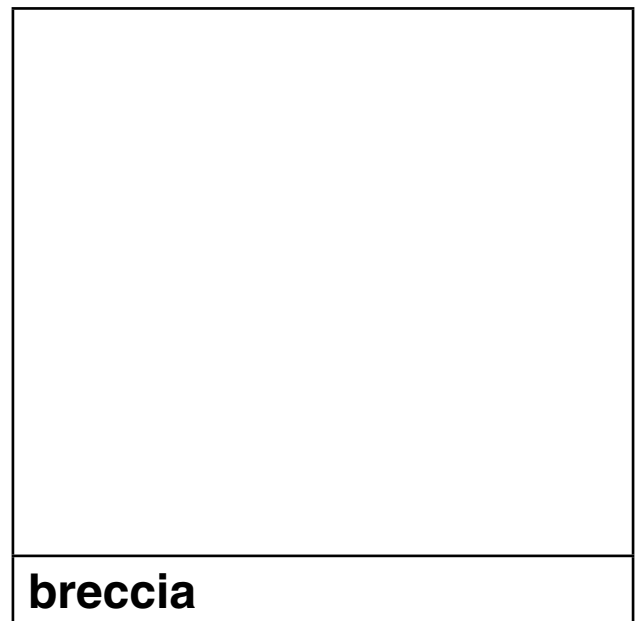
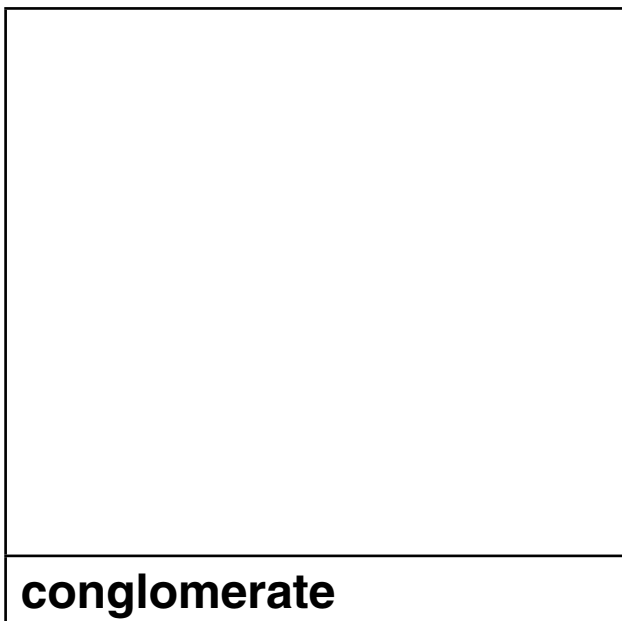
INFORMATION FOR CANDIDATES

- 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 100.
-  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.

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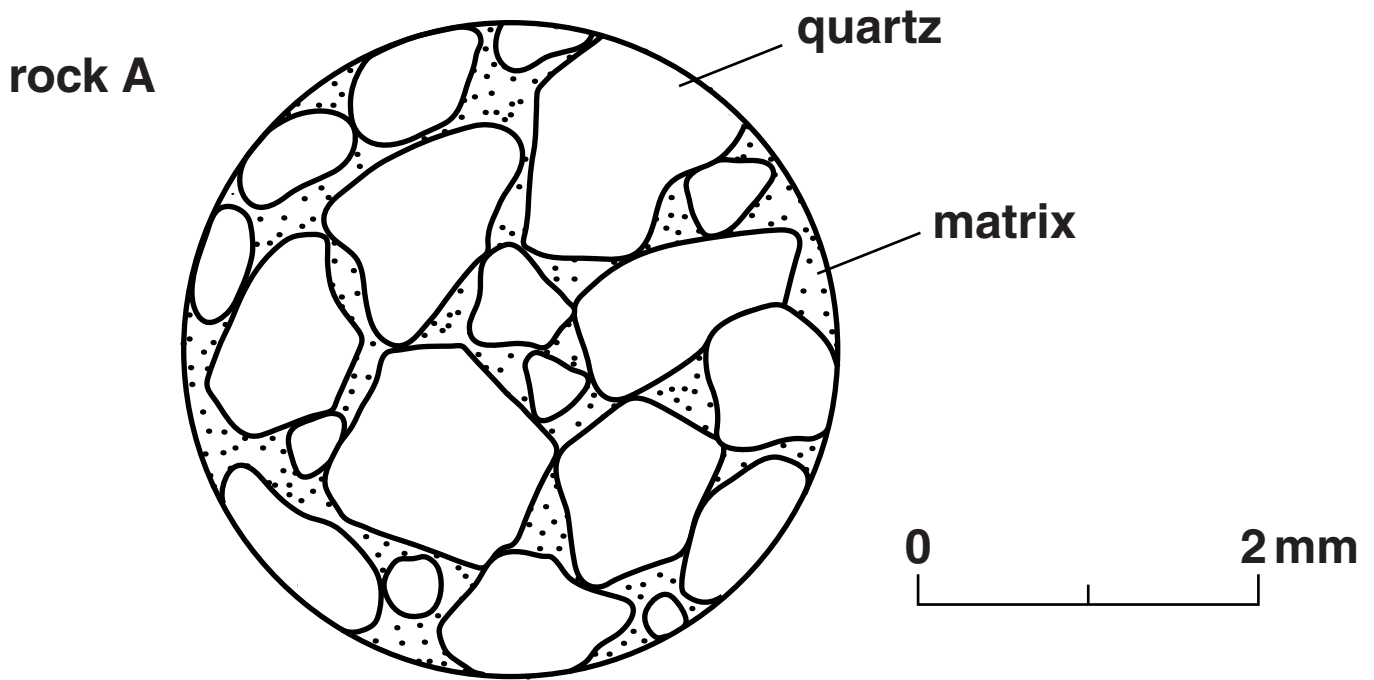
Answer ALL the questions.

- 1 (a) Describe clearly the differences between a conglomerate and a breccia. You should give an indication of the relative sizes of the particles involved. You may use two diagrams to help you make your description. Add a scale to both your diagrams.**



[2]

(b) The thin section diagram below shows sedimentary rock A.



(i) Explain the terms:

sedimentary rock _____

matrix. _____

[2]

(ii) Name and describe sedimentary rock A, shown above, using technical terms.

name _____

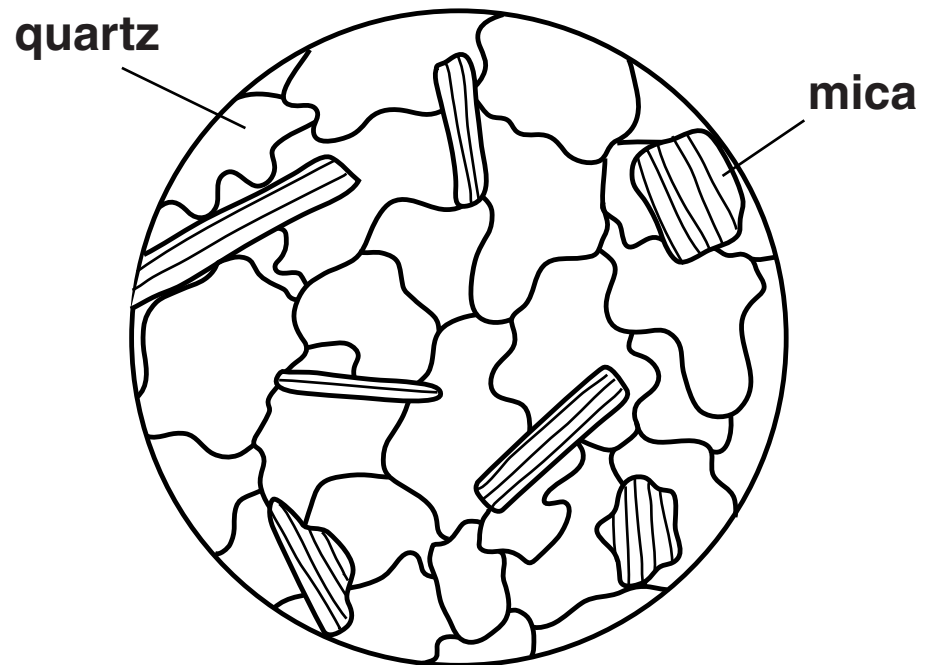
grain size _____

grain shape _____

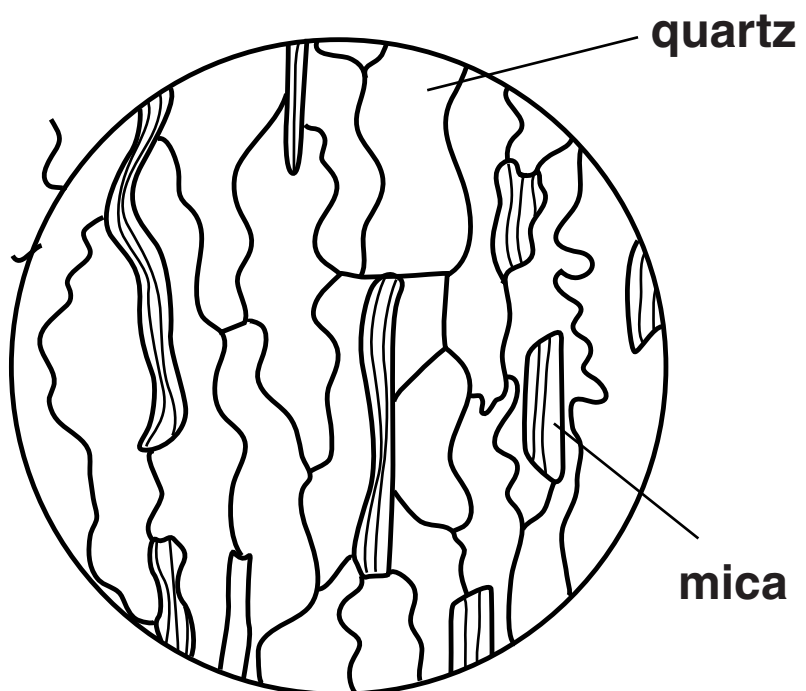
sorting _____ [3]

(c) The thin section diagrams below show metamorphic rocks that have formed from the sedimentary parent rock A.

rock B



rock C

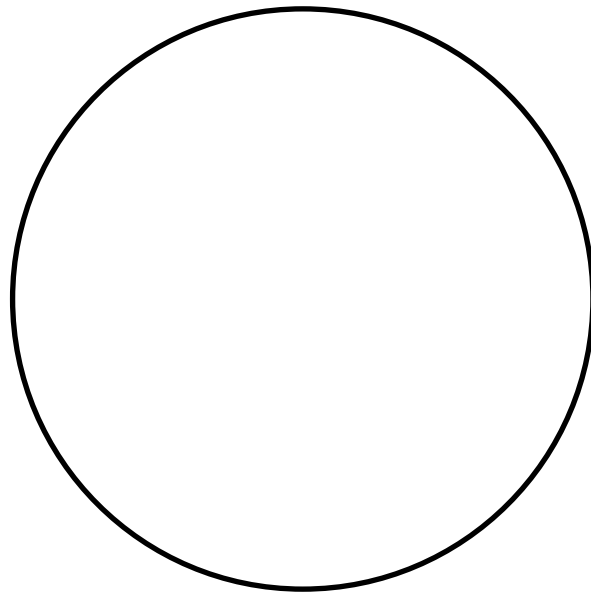
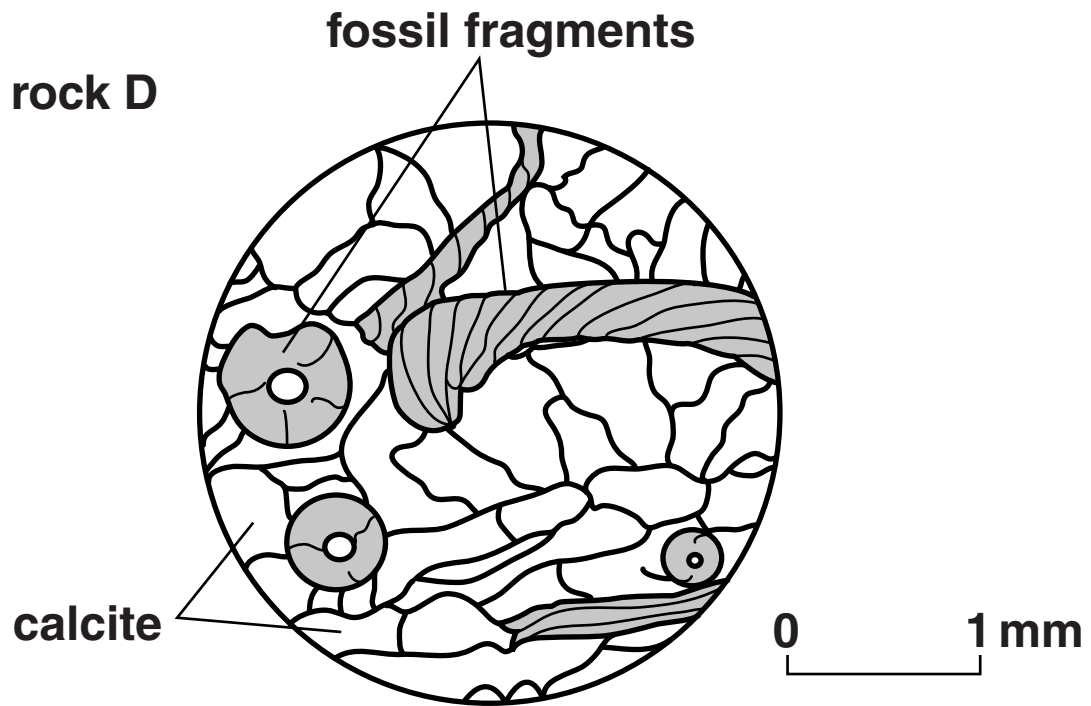


Complete the table below to identify the type of metamorphism and the pressure conditions under which rocks B and C developed from parent rock A.

| | ROCK B | ROCK C |
|-----------------------------|---------------|---------------|
| type of metamorphism | | |
| pressure | | |

[3]

(d) Rock D is a sedimentary rock.



- (i) Identify and describe rock D using technical terms.**

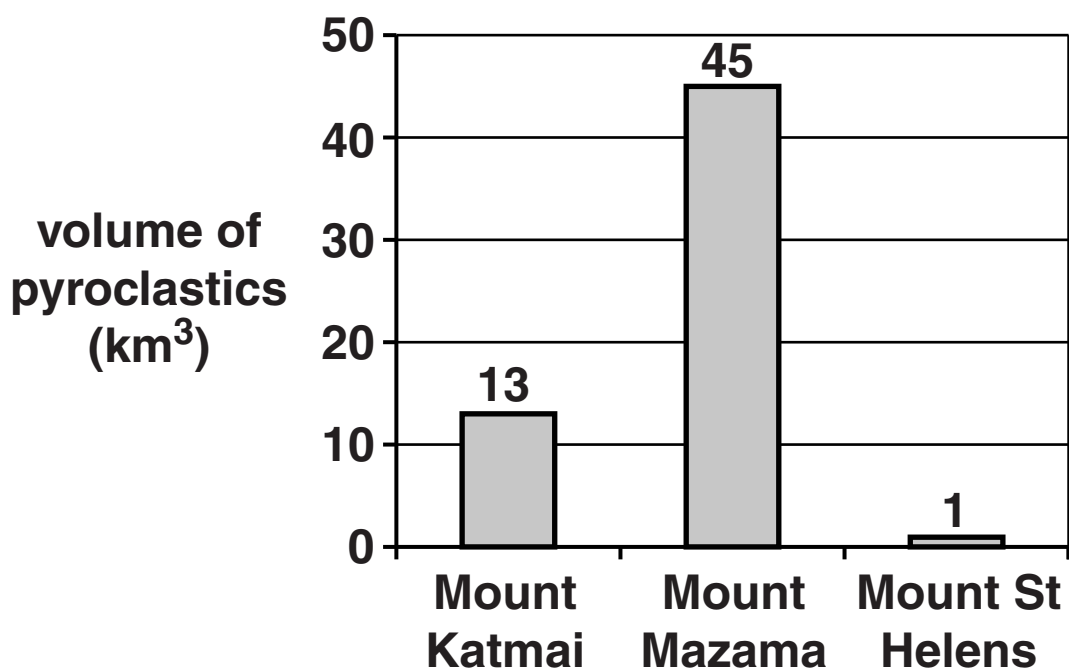
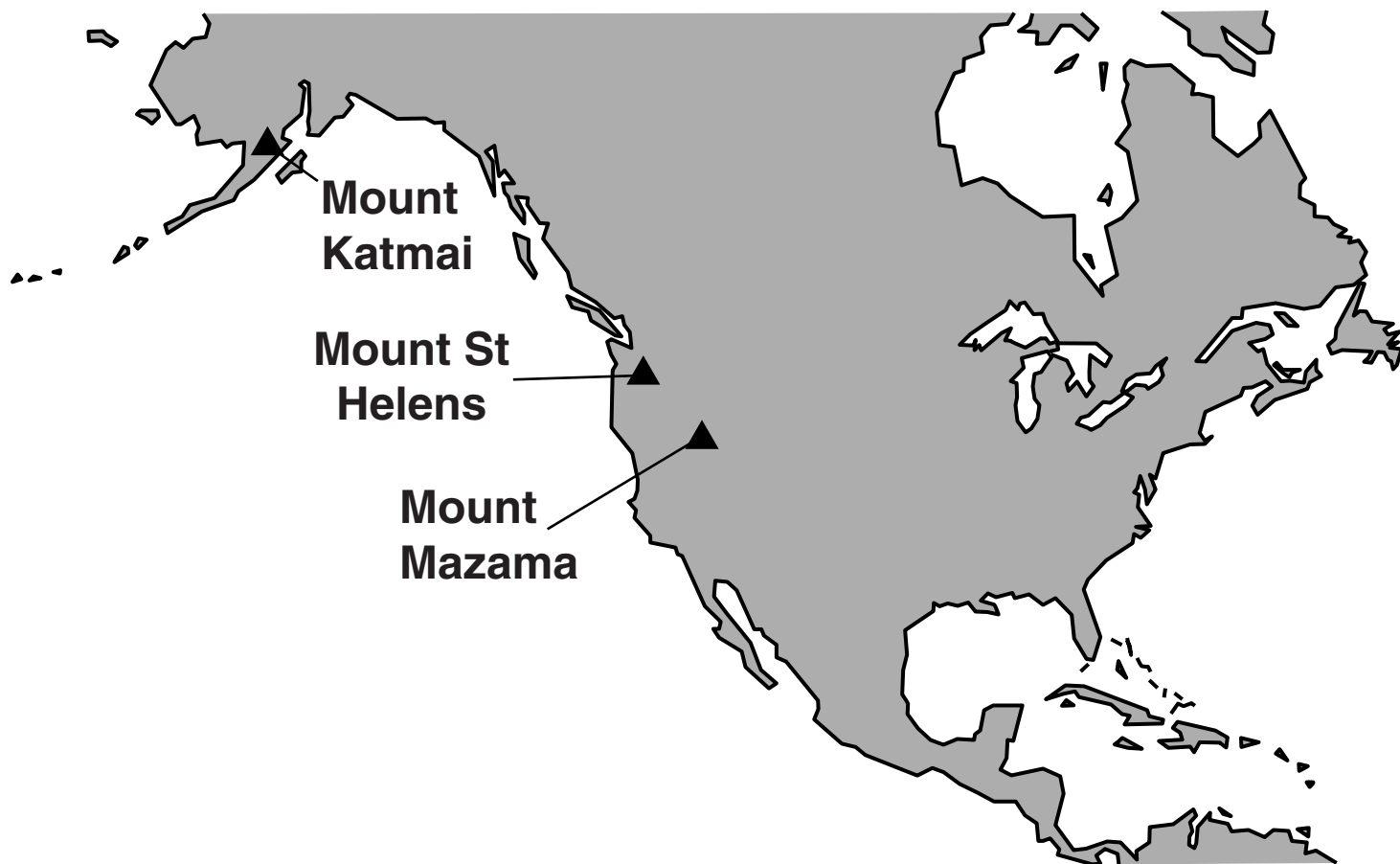
identification _____

description _____ **[2]**

- (ii) In the circle on page 8, draw and label the metamorphic rock that will form from parent rock D. You may write a clear description as an alternative to drawing the diagram. [2]**

[Total: 14]

2 The map below shows the location of three volcanoes in North America. Bar charts show the volume of pyroclastics that were produced the last time each volcano erupted.



(a) (i) Circle a volcanic island arc. [1]

(ii) Which of the three eruptions shown was the most violent? Explain your answer.

volcano _____

_____ [2]

(b) (i) The 1912 eruption of Mount Katmai generated lava with a silica content of 69%. Name the rock produced.

_____ [1]

(ii) Describe the pyroclastic products that the eruption of Mount Katmai may also have produced.

_____ [3]

(c) The isopachyte map on the opposite page shows the thickness and pattern of ash fall around Mount St Helens, produced by the 1980 eruption.

(i) What is the maximum distance from the volcano where the ash fall would have been 20 mm thick?

distance _____ km [1]

(ii) Describe and explain the pattern of ash fall around Mount St Helens produced by the 1980 eruption.

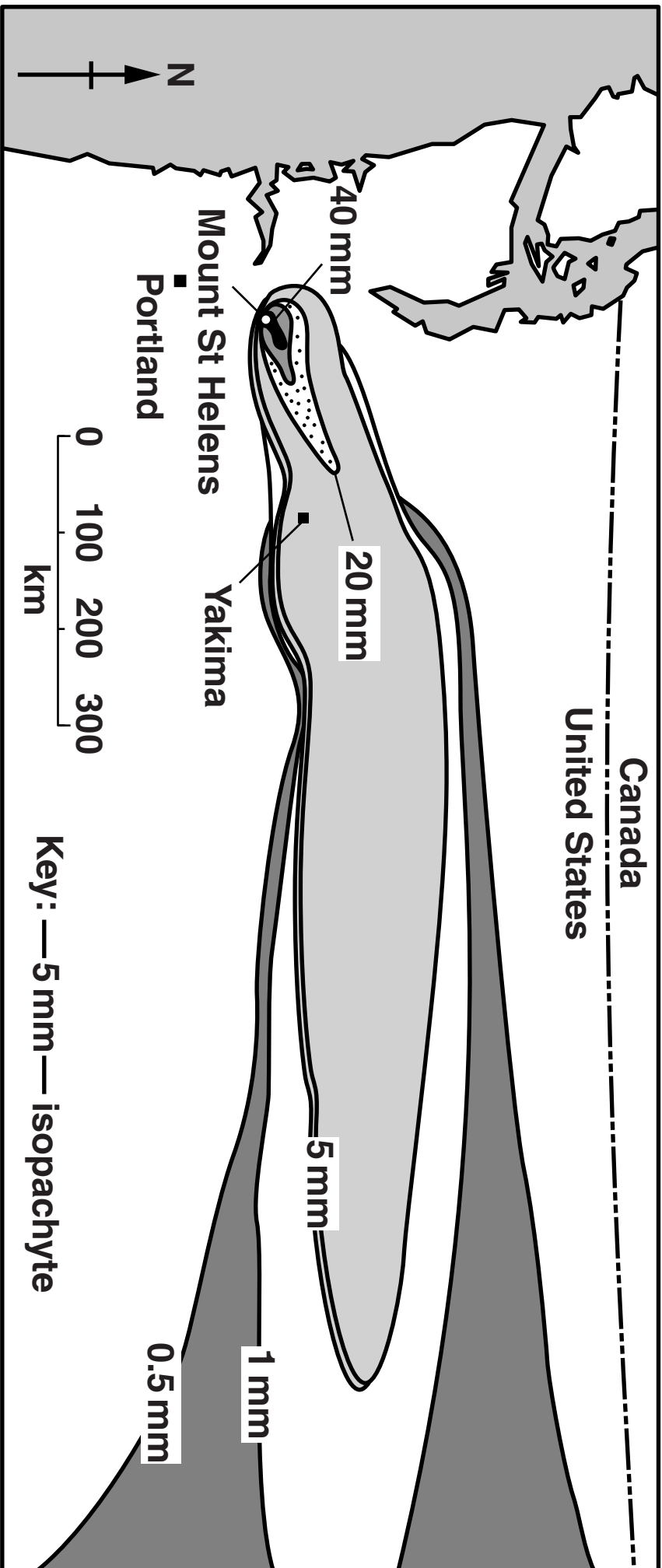
_____ [2]

(iii) Why were the residents of Portland 'lucky' on this occasion compared to Yakima?

_____ [1]

(iv) Describe where you would expect the coarsest pyroclastic particles to be found.

_____ [1]



(v) Mount St Helens is being regularly monitored. Describe TWO monitoring methods and how they may give warning of a new eruption.

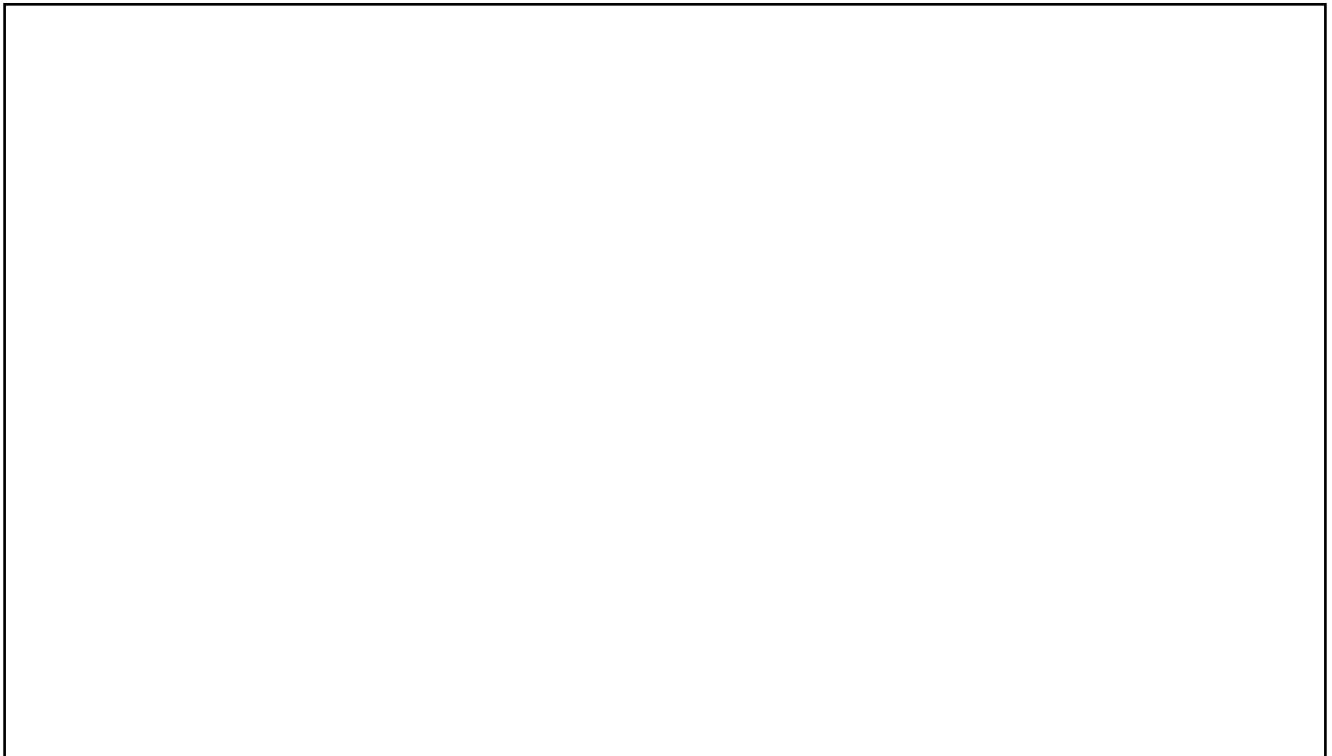
1 _____

2 _____

_____ **[4]**

(d) Draw a labelled cross section diagram to show a caldera.

(i) Describe clearly the structure of a caldera. You may use a labelled cross section diagram to help you make your description.



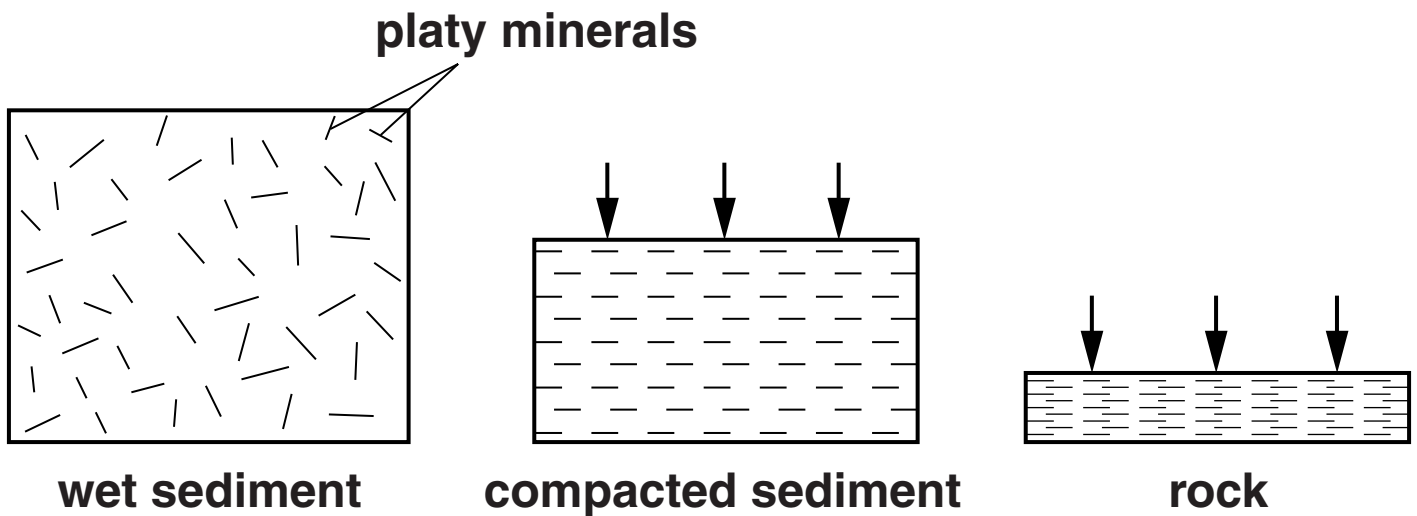
[2]

(ii) List the stages of volcanic activity that formed the caldera.

[2]

[Total: 20]

3 (a) The diagrams below show the diagenesis of a muddy sediment.



(i) Suggest a suitable platy mineral.

_____ [1]

(ii) What substance is lost from the sediment as it is compacted?

_____ [1]

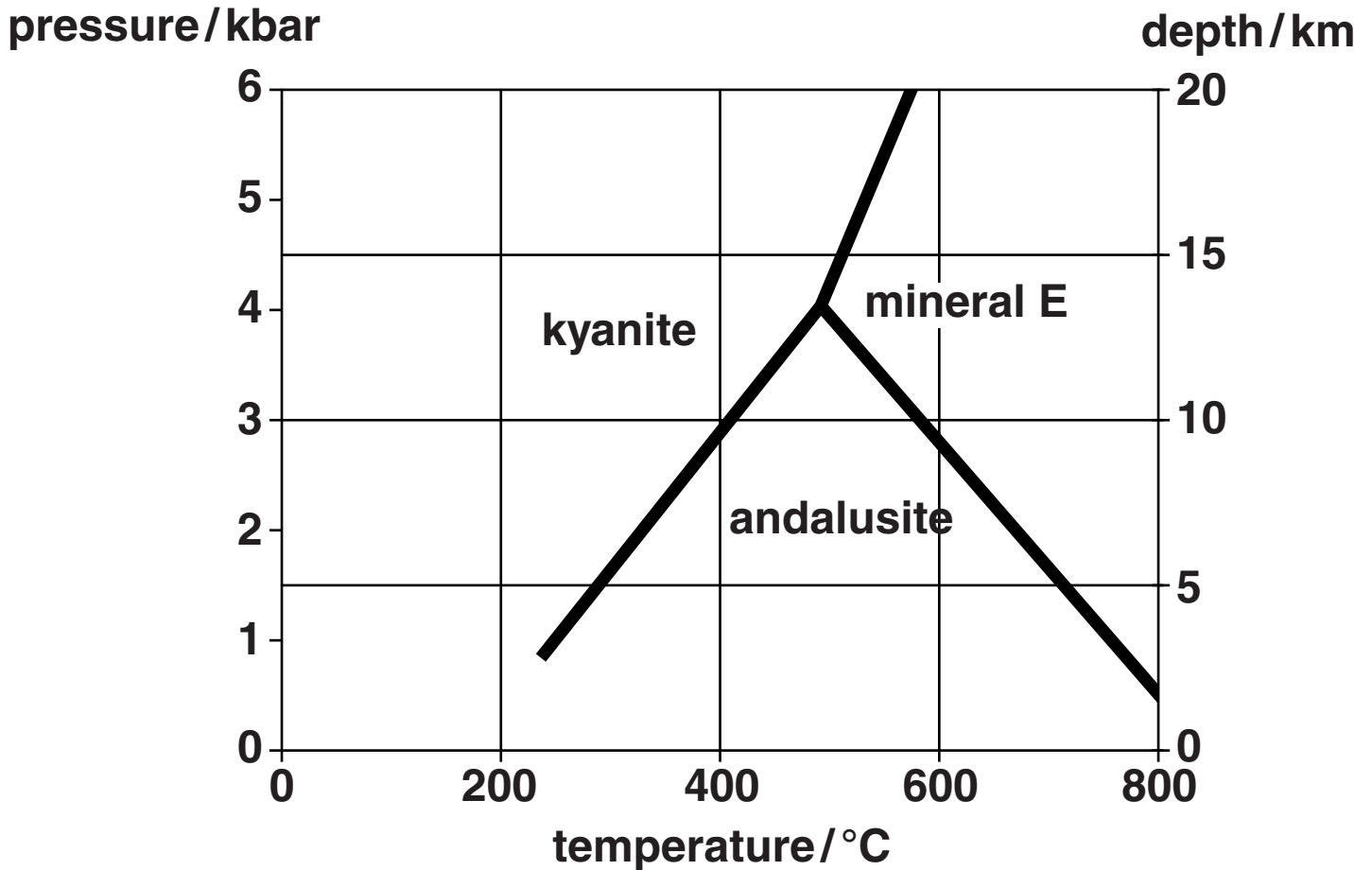
(iii) Identify the rock that is produced after diagenesis is complete.

_____ [1]

(iv) Describe the process, shown in these diagrams, that formed the rock.

[3]

(b) The pressure and temperature graph below shows the stability fields of a group of minerals whose chemical composition is Al_2SiO_5 .



(i) Name mineral E.

_____ [1]

(ii) State the temperature and pressure of formation, if these minerals all exist in the same rock.

temperature _____ $^{\circ}C$ pressure

_____ kbar [1]

(iii) **ON THE GRAPH, draw a line, starting from the origin, representing a temperature gradient of 35 °C/km.** [1]

(iv) **Use the graph to identify the minerals which are likely to form where the temperature gradient is 35 °C/km.**

_____ and _____ [1]

(v) **Name the likely rock types that these minerals, shown on the graph, will be found in. Explain your answer.**

rock types _____

and _____

explanation _____

_____ [2]

(c) **Shade on the pressure temperature graph where diagenesis occurs.** [1]

(d) Complete the table of metamorphic terms below by writing the correct number from the list in each of the spaces.

| METAMORPHIC TERM | DEFINITION |
|-------------------------|---|
| index mineral | |
| | a line on a map joining points of equal metamorphic grade |
| | a measure of the intensity of metamorphism |
| polymorph | |

LIST

| | |
|----------|--|
| 1 | metamorphic grade |
| 2 | metamorphic zone |
| 3 | a mineral stable under a specific temperature and pressure range |
| 4 | isograd |
| 5 | a mineral that has the same composition but occurs in different crystal forms |
| 6 | a mineral that has grown after the groundmass has developed |

[4]

[Total: 17]

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4 The density of magma is important to the method of intrusion.

The data in the table below was obtained in the laboratory by experimentally melting rocks.

| | density of magma at 1250°C (g/cm³) | density of rock at surface temperature (g/cm³) |
|----------------|--|--|
| granite | 2.1 | 2.3 |
| diorite | 2.2 | 2.6 |
| gabbro | 2.7 | 2.8 |

(a) (i) Plot the bar graph for diorite and gabbro. Granite has already been plotted. [2]

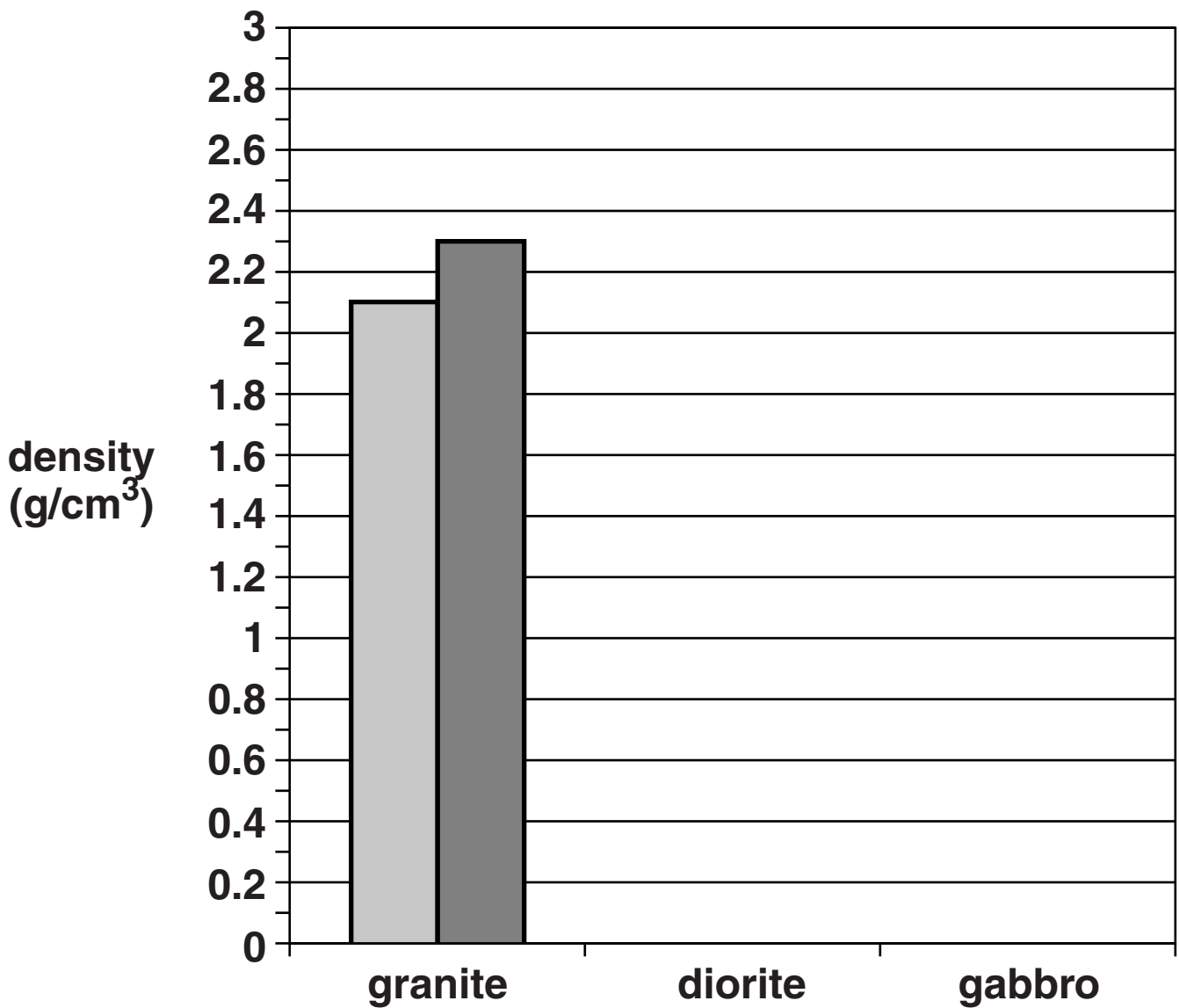
Key:



density at 1250 °C



density at surface temperature



(ii) Which magma is most likely to rise up through the crust?

_____ [1]

(iii) Explain why the density is lower at 1250 °C than at the surface temperature.

_____ [1]

(iv) The density data measured at surface temperature in the laboratory is accurate but the data for 1250 °C may not be very accurate. Explain what other variable will affect the data.

_____ [1]

(b) Complete the tables below for granite and gabbro to show:

- the silica percentage
- the mineral content. K feldspar has been completed.

| | GRANITE | GABBRO |
|----------------------------------|----------------|---------------|
| (i) silica percentage (%) | | |

[1]

| | | |
|-------------------------------------|---|--|
| (ii) augite | | |
| Ca rich plagioclase feldspar | | |
| K feldspar | ✓ | |
| Na rich plagioclase feldspar | | |
| quartz | | |

[3]

(iii) State one characteristic textural feature that both these rocks have in common.

_____ **[1]**

- (c) (i) Name the type of major intrusion formed when silicic magma crystallises in the crust.**

_____ [1]

- (ii) The average density for sedimentary rocks in the crust is about 2.5 gm/cm^3 . Describe clearly how the silicic magma rises through the continental crust. Use the terms STOPPING and ASSIMILATION in your answer. You may include a diagram in your answer.**



_____ [4]

[Total: 15]

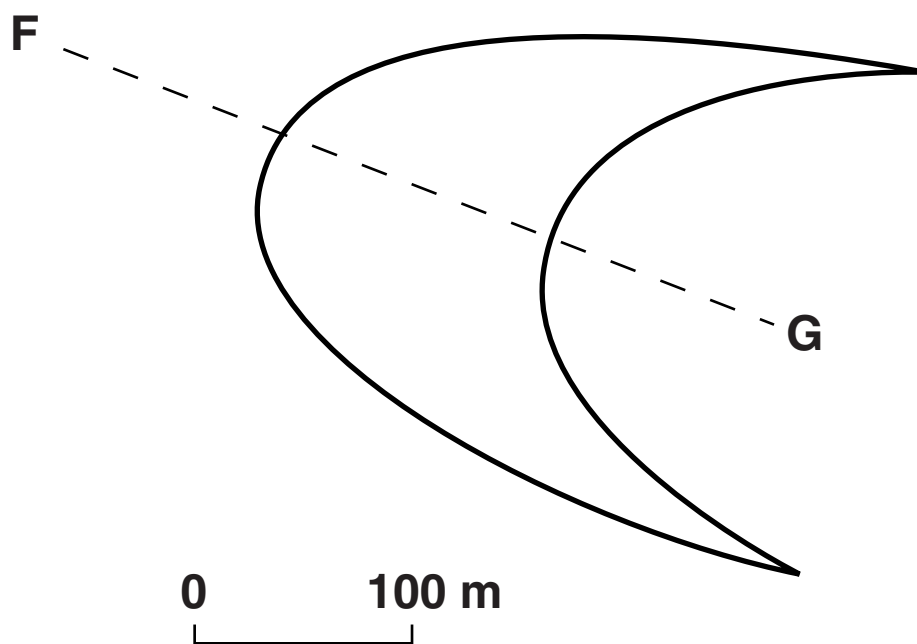
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5 Deposition in hot deserts occurs in several very different environments.

(a) Describe how flash floods can form poorly sorted conglomerates in deserts.

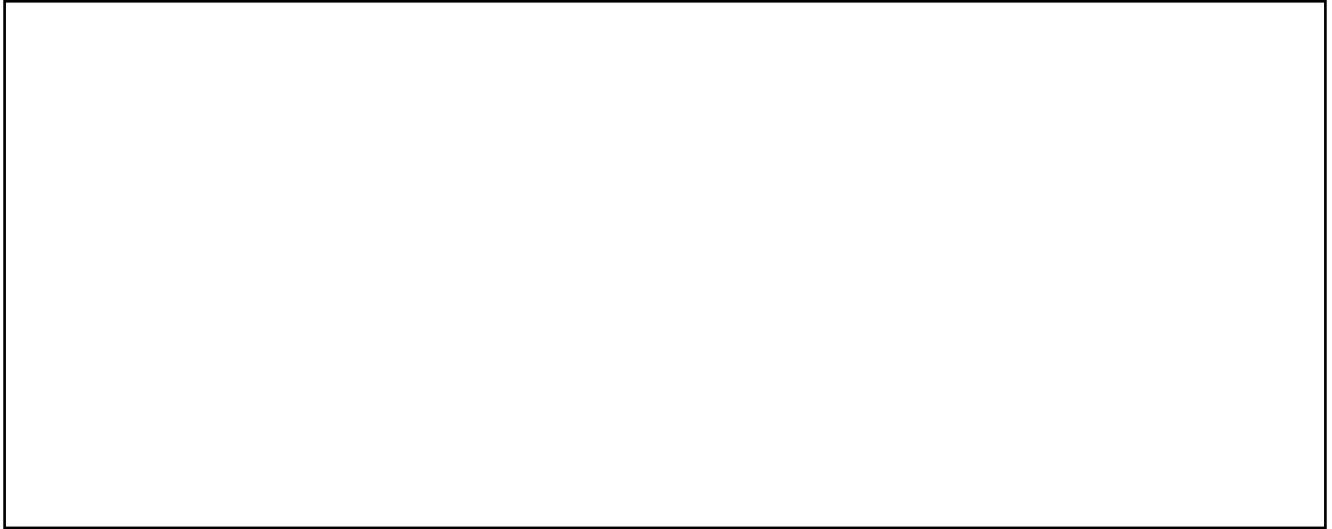
[2]

(b) Sandstones form in dunes in the desert. The diagram below shows a plan view of a dune.



(i) Label on the diagram above, the direction of the prevailing wind. **[1]**

- (ii) Draw a cross section between F and G, showing as accurately as possible the angles of slopes of the dune.**

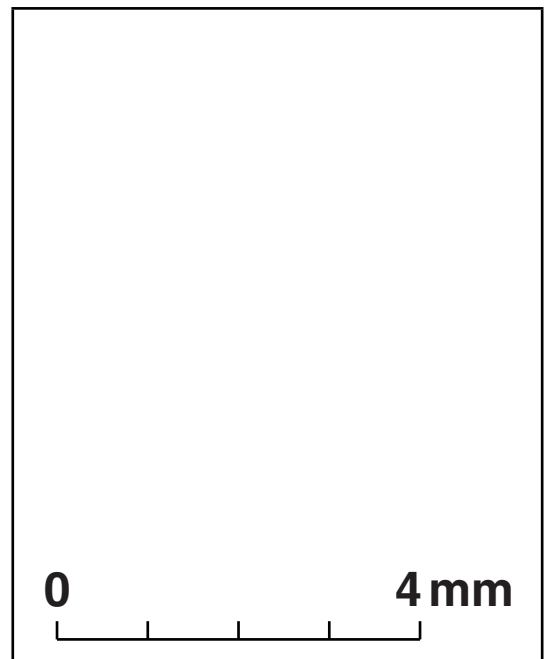


[1]

- (iii) On your cross section, show the internal stratification of the dune.**

[1]

- (iv) List and describe the characteristics of a sandstone that forms in a dune. You may use a diagram to help you make your description.**



[4]

(c) Evaporites form in playa lakes in the centre of desert drainage basins.

(i) Explain where the salts that form the evaporites come from.

[2]

(ii) State the sequence of evaporites that forms in a playa lake.

first to form _____

last to form _____ [2]

(d) Describe the climatic conditions in which desert sediments form.

[1]

[Total: 14]

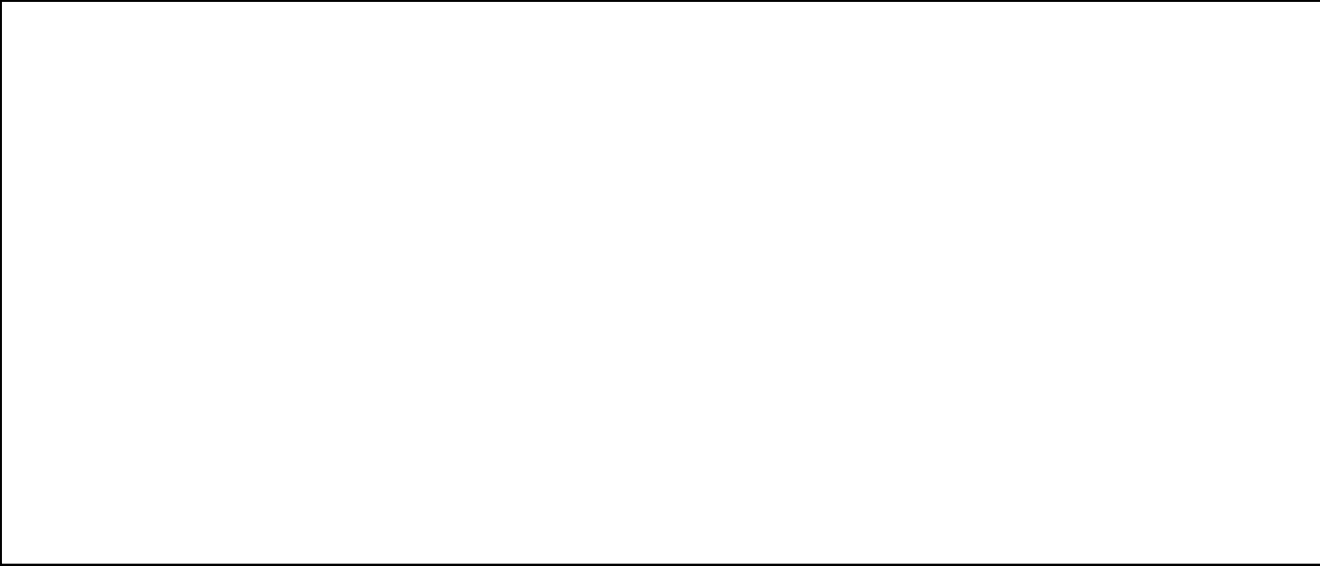
6 Describe clearly the formation of desiccation cracks, salt pseudomorphs, graded bedding and ripple marks. You may use labelled diagrams to help you make your descriptions.



In your answer you should make clear how the sedimentary structures form in different environments.

desiccation cracks

salt pseudomorphs



graded bedding



ripple marks

[10]

[Total: 10]

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