

Candidate forename						Candidate surname					
Centre number						Candidate number					

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE
F792
GEOLOGY

Rocks – Processes and Products

WEDNESDAY 23 MAY 2012: Morning
DURATION: 1 hour 45 minutes
plus your additional time allowance

MODIFIED ENLARGED

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. 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 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 steps in any calculations.

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Answer ALL the questions.

- 1 (a) Complete the table below to distinguish between igneous, metamorphic and sedimentary rocks. Put a tick in the correct column(s) to indicate which feature is present for each rock group. The first feature has been completed for you.**

FEATURE	IGNEOUS	METAMORPHIC	SEDIMENTARY
has beds			✓
is crystalline			
may contain the mineral olivine			
may contain fossils			
may contain the mineral sillimanite			
may have an amygdaloidal texture			
may contain phenocrysts			

[5]

(b) The thin section diagrams opposite are both foliated metamorphic rocks.

(i) Define the term foliation.

_____ [1]

(ii) Identify the rocks A and B. State the type and grade of metamorphism for each rock.

ROCK	NAME	TYPE OF METAMORPHISM	METAMORPHIC GRADE
A			
B			

[4]

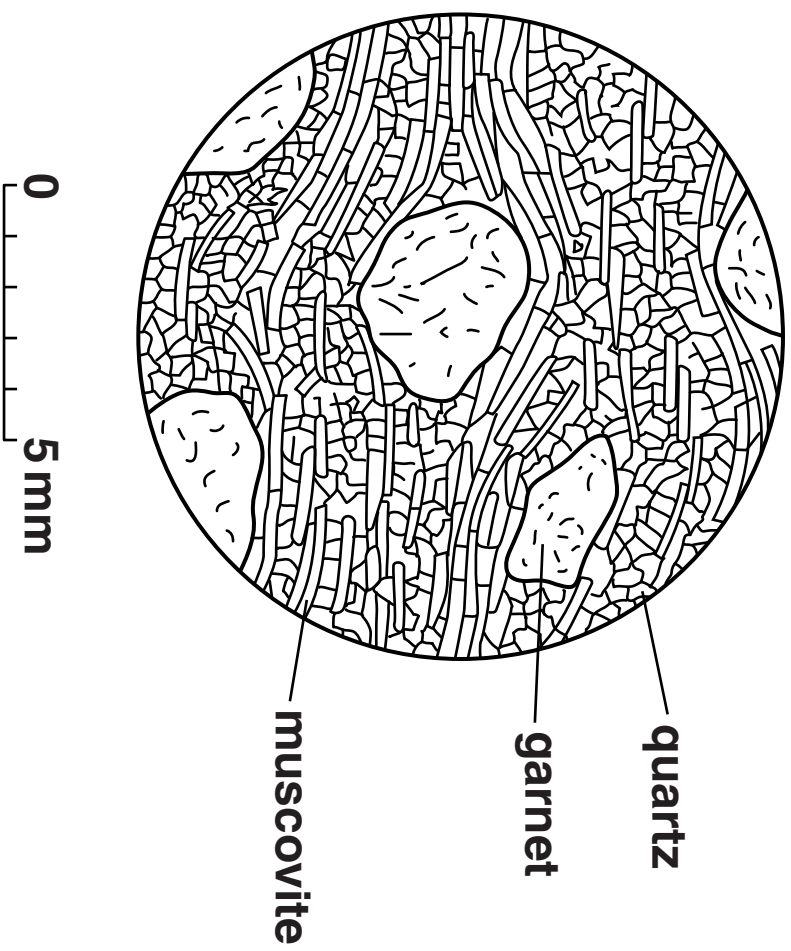
(c) Some metamorphic rocks have no foliation. Name one unfoliated metamorphic rock and describe the texture.

name _____

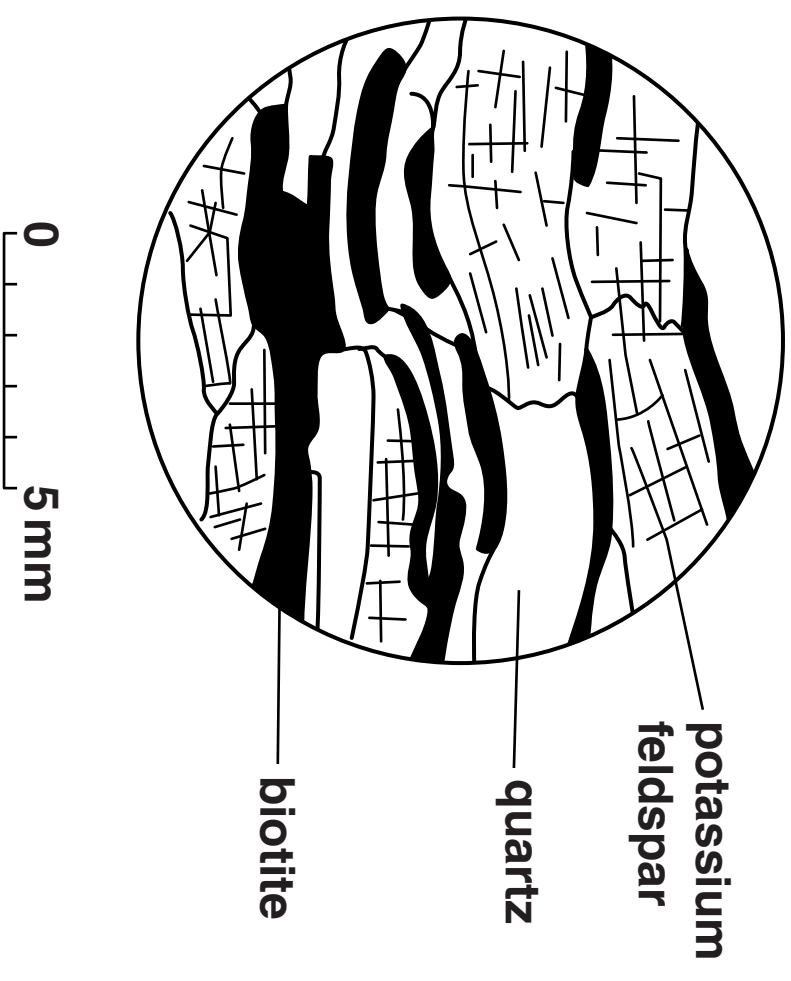
texture _____

_____ [2]

A



B



(d) Study the simplified map of Japan opposite which shows metamorphic belts of the same age.

(i) Name the type of plate margin where the metamorphic belts formed.

_____ **[1]**

(ii) Draw arrows on the map to show the directions of plate movement. **[1]**

(iii) Name the type of metamorphism that formed the metamorphic rocks.

_____ **[1]**

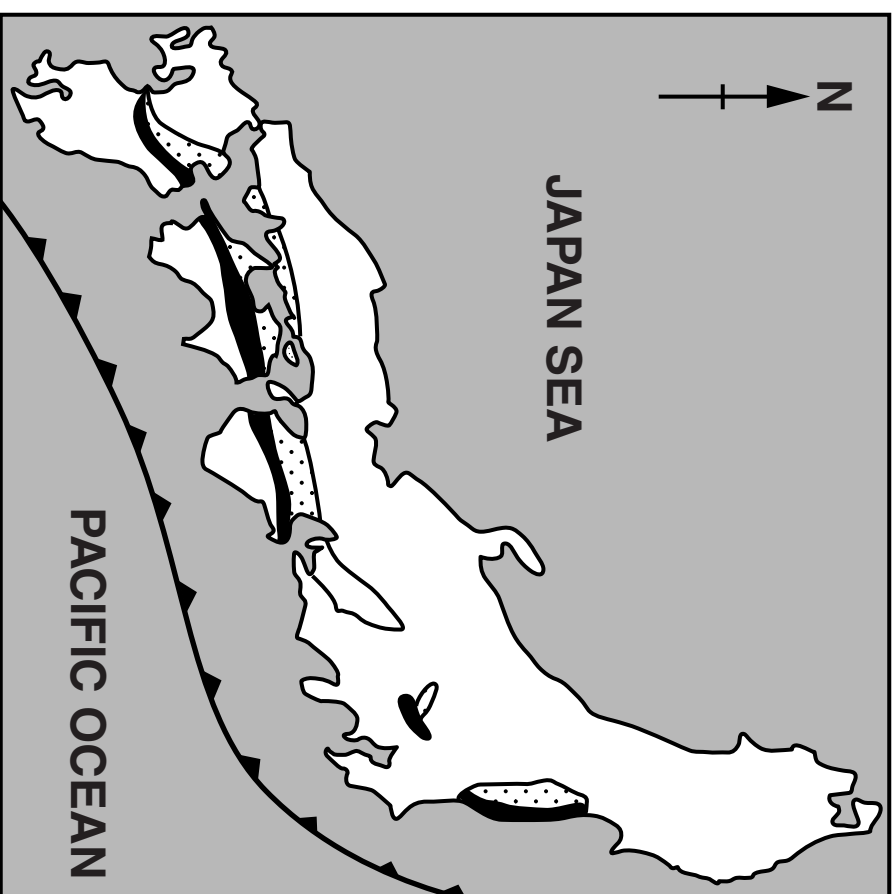
(iv) Name metamorphic belt C shown in the key.

_____ **[1]**

(v) Explain how the metamorphic belts formed.

_____ **[2]**

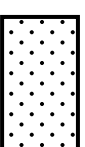
[Total: 18]



KEY:



trench



low pressure

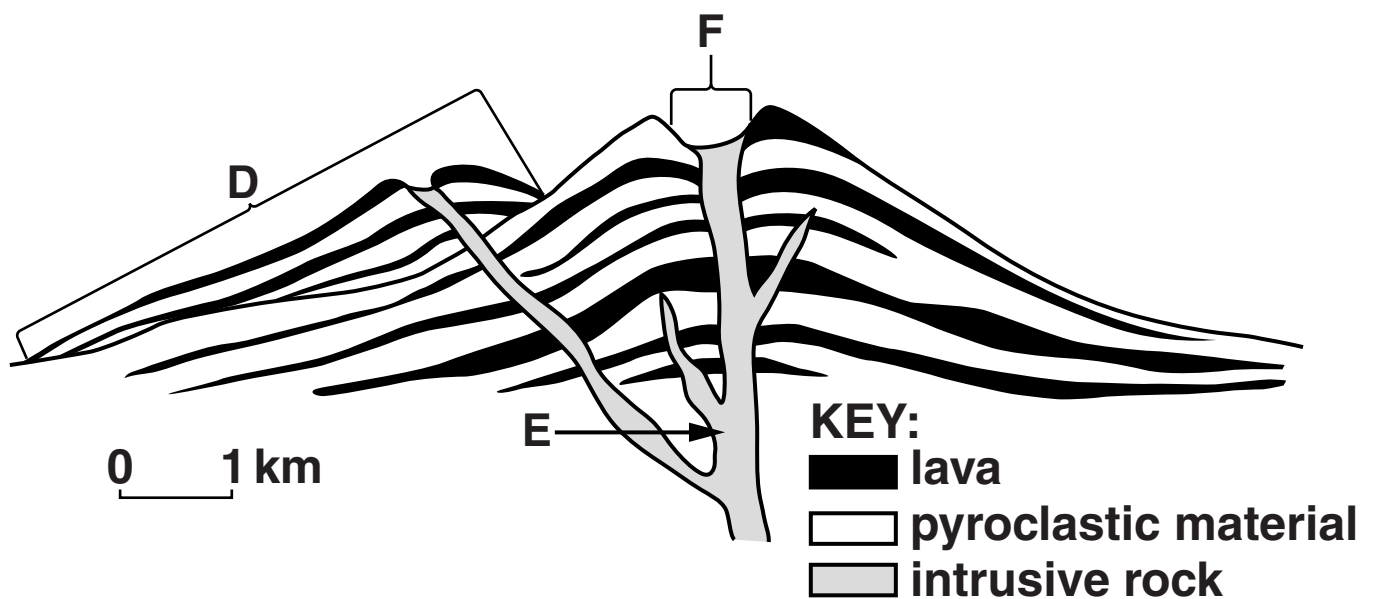
high temperature belt



belt C

0 200 km

2 The diagram shows a volcano.



(a) (i) Identify the features D, E and F.

D _____

E _____

F _____ [3]

(ii) Describe the shape of this volcano.

_____ [1]

(iii) Identify the type of volcano shown.

_____ [1]

(iv) State the type of activity of this volcano under the following headings:

gas content _____

viscosity of lava _____

frequency of eruption _____ **[3]**

(v) Explain the pattern of lava and pyroclastic material.

_____ **[2]**

(b) (i) Define the term pyroclast.

_____ [1]

(ii) Name one pyroclastic rock that is likely to be found in this volcano.

_____ [1]

(iii) Define the term lava.

_____ [1]

(iv) Name one igneous rock that is likely to be found as a lava flow from this volcano.

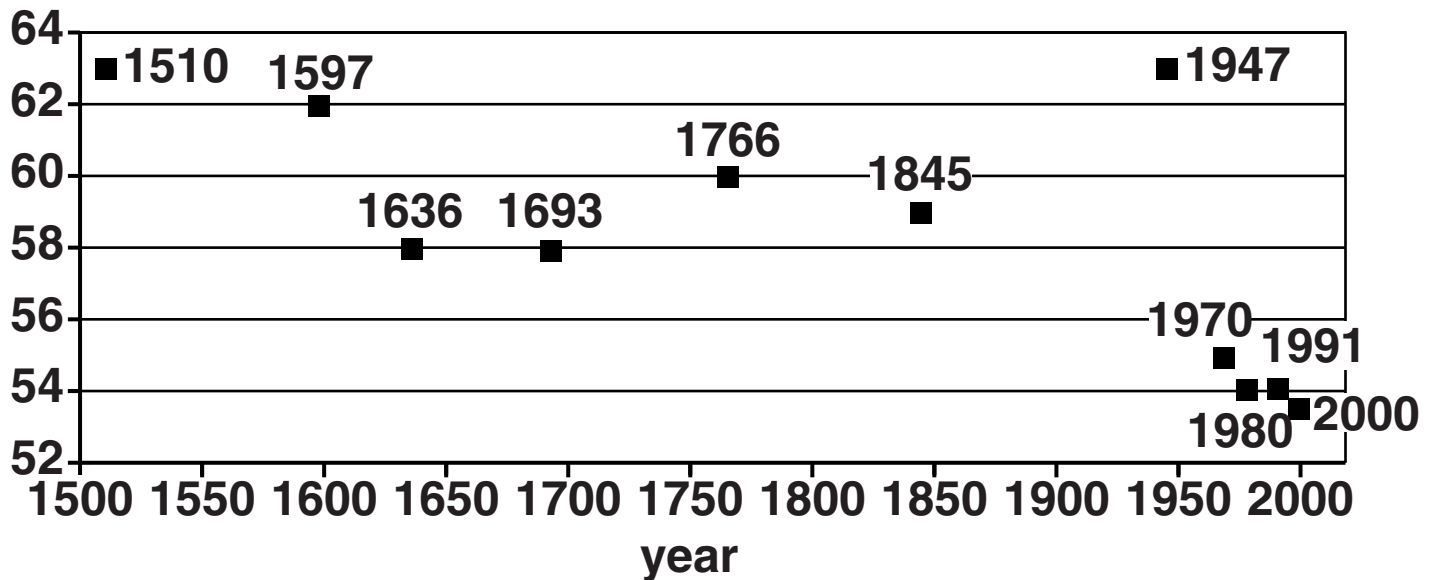
_____ [1]

(v) What is the likely plate tectonic setting of this volcano?

_____ [1]

(c) Hekla is a volcano in Iceland that has erupted a number of times in recorded history. The silica percentage of the material erupted has varied between 53 and 63%.

% silica

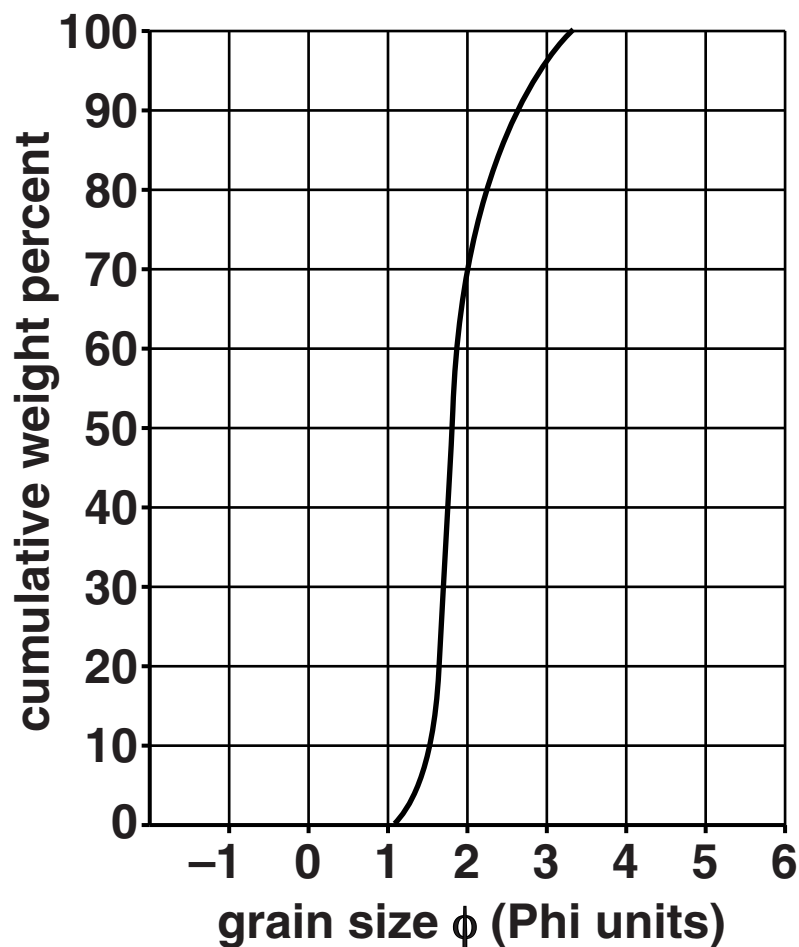


Describe and explain the relationship of the time interval between eruptions and the silica percentage of erupted materials.

[3]

[Total: 18]

- 3 The graph below shows a cumulative frequency curve for an unknown sediment.



- (a) (i) Define the term sorting and give two examples to illustrate your answer. You may use a diagram to help you make your description.



[2]

- (ii) Use the cumulative frequency graph and the information below to calculate the coefficient of sorting.

$$\text{coefficient of sorting} = \frac{\phi 84 - \phi 16}{2}$$

(Where $\phi 84$ is the grain size of the cumulative weight of 84% of the sample and $\phi 16$ is the grain size of the cumulative weight of 16% of the sample.)

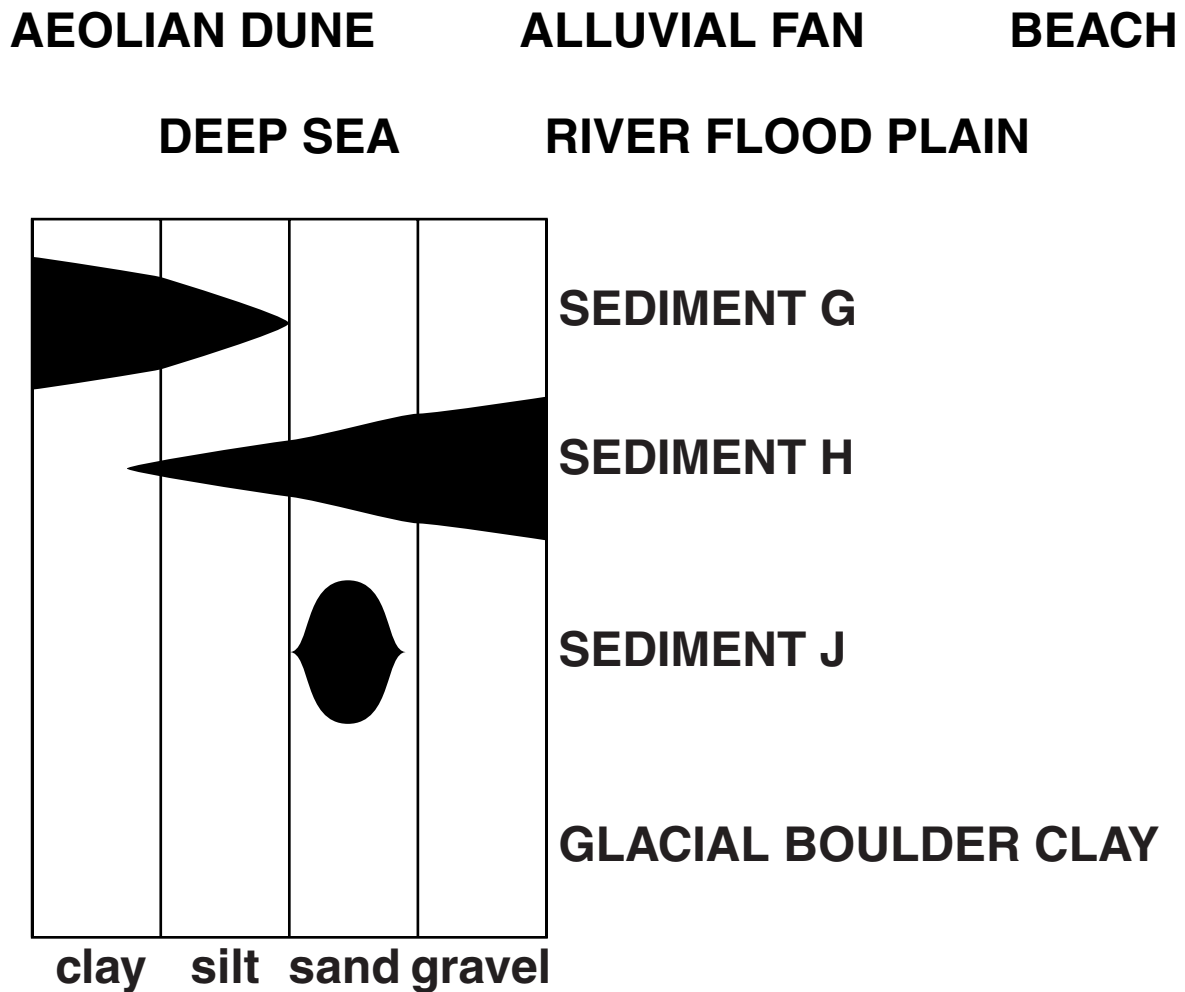
COEFFICIENT OF SORTING	DESCRIPTION
<0.50	well sorted
0.50 – 1.00	moderately sorted
>1.00	poorly sorted

coefficient of sorting _____

description _____

[2]

(b) The diagram below shows the grain size variation of three sediments G, H and J from three of the following environments:



(i) State the environment from the list above which best fits each sediment.

G _____

H _____

J _____

[3]

- (ii) Complete the diagram opposite to show the grain sizes for a glacial boulder clay. Explain your answer.

_____ [2]

- (c) Identify the sedimentary rocks described in the table below.

ROCK	DESCRIPTION	ROCK NAME
K	<ul style="list-style-type: none">• composed of rounded quartz grains• grey colour• well cemented by quartz	
L	<ul style="list-style-type: none">• composed of rock fragments, sub angular quartz grains• dark grey colour• in a clay matrix	
M	<ul style="list-style-type: none">• composed of clay minerals• black colour• in laminated beds with fossils on bedding planes	

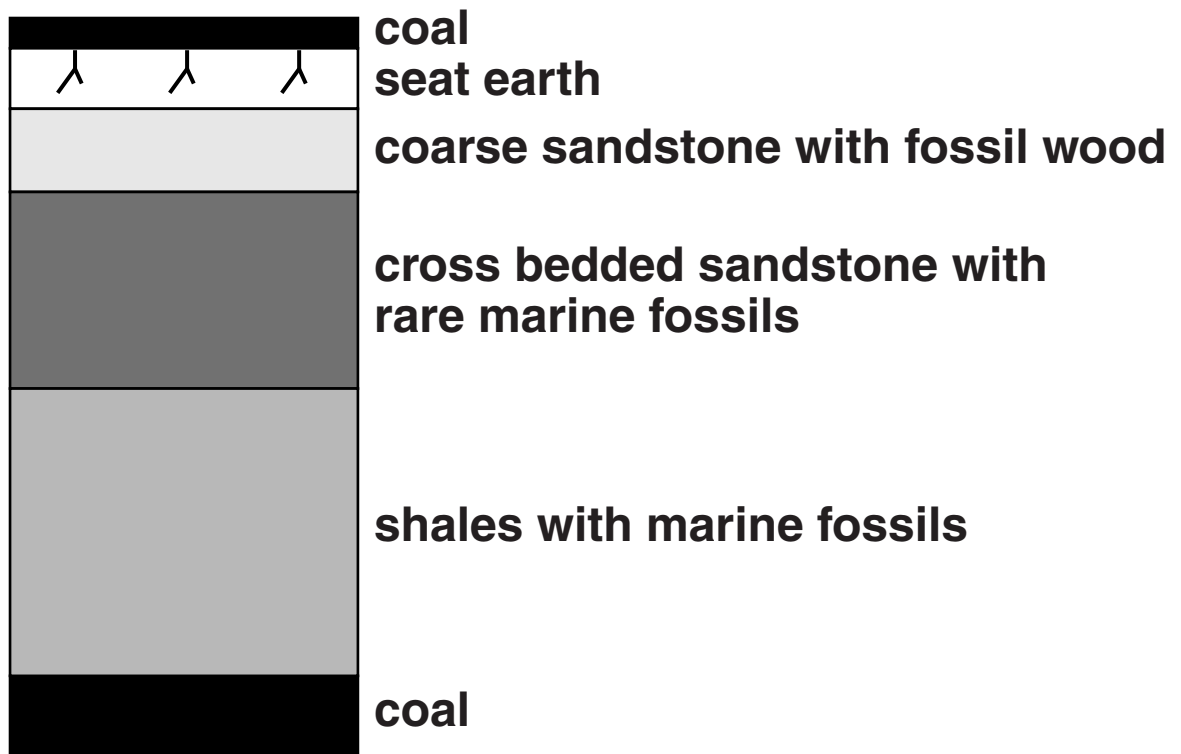
[3]

[Total: 12]

- 4 (a) Describe where and why deposition occurs to form a delta.

[2]

- (b) The diagram below shows a vertical sequence of rocks deposited in a delta.

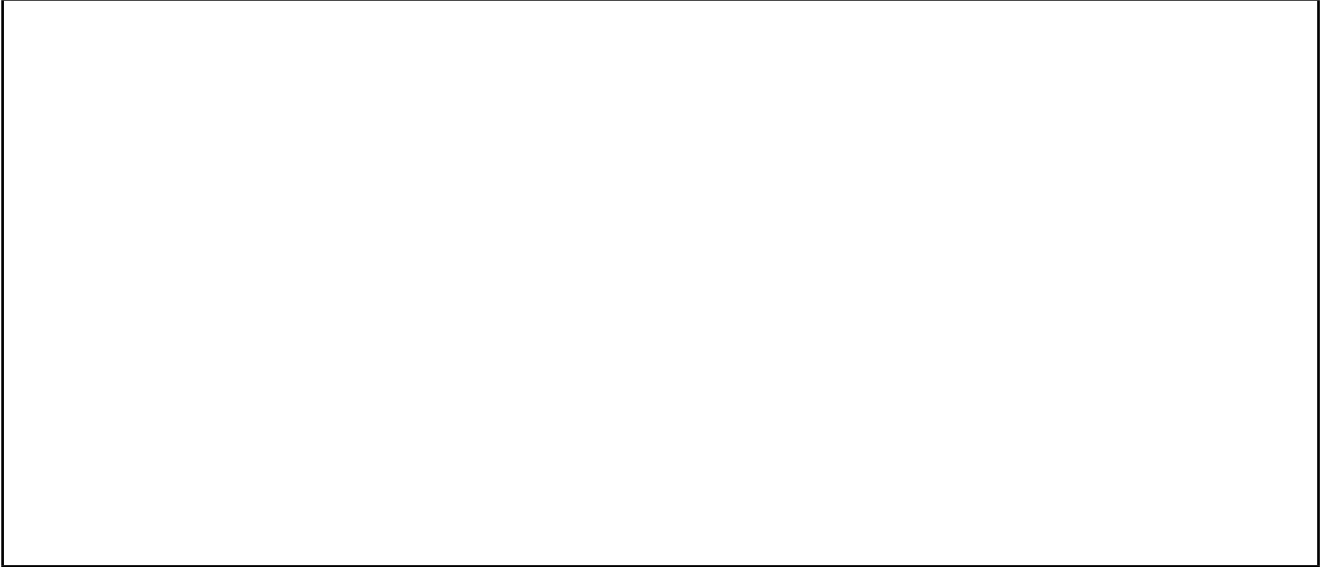


- (i) Clearly label on the diagram above where the following beds were deposited:

- bottomsets
- foresets
- topsets.

[2]

- (ii) Describe clearly the cross sectional structure of a delta to describe where the bottomset, foreset and topset beds are deposited. You may make a drawing to help you answer this question.**



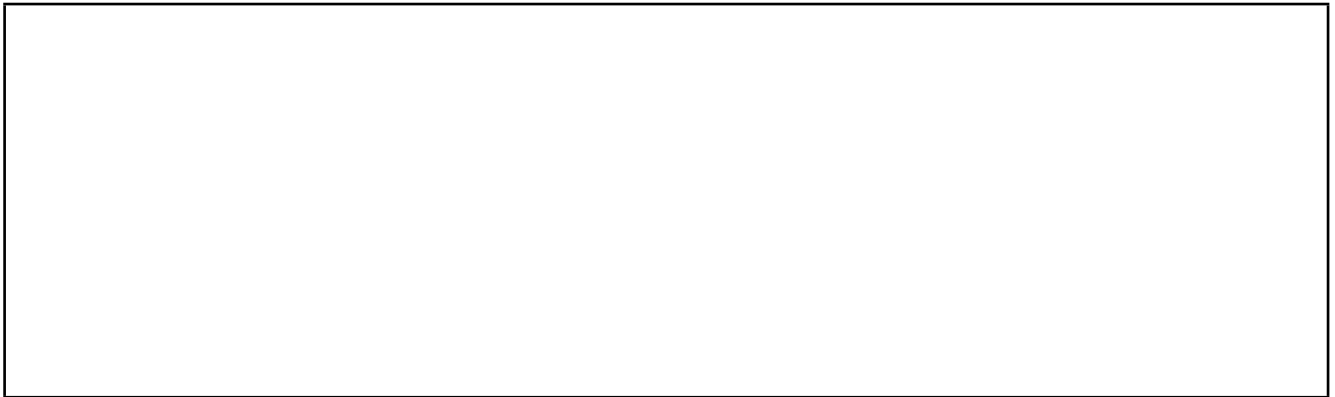
[3]

- (c) What name is given to a repeated sequence of deltaic deposits?**

_____ **[1]**

(d) Sedimentary structures such as ripple marks and cross bedding are common in deltaic sequences.

(i) Describe how asymmetrical ripples formed in the coarse sandstone. You may use a diagram to help you make your description.



[2]

(ii) Describe clearly the cross bedding found in the sandstone. You should include reference to dip angles in your answer. You may use a diagram to help you make your answer. The diagram should have a scale and appropriate dip angles.



[2]

- (e) Complete the following passage by using the most appropriate terms to fill the gaps.**

The geological timescale is usually arranged in a table called the _____ .

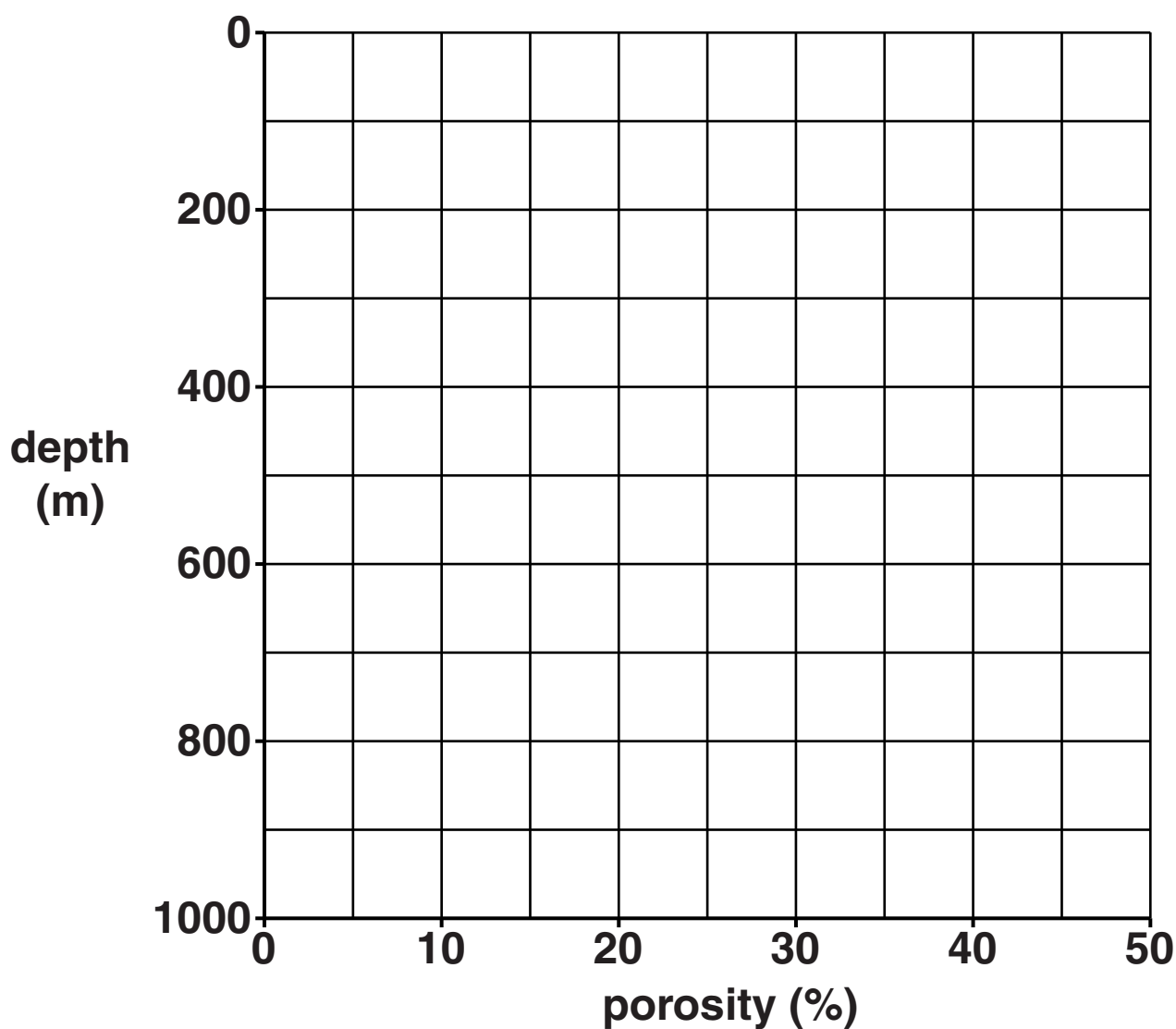
The last 542 Ma is divided into major time units called _____. Each major time unit is subdivided into _____ which are

shorter time units. [3]

[Total: 15]

- 5 (a) A layer of unconsolidated sediment is progressively buried. The table below shows how porosity of the sediment changes with depth.

DEPTH (m)	POROSITY (% PORE SPACE)
0	46
200	21
400	10
600	4
800	2
1000	1



(i) Plot a line graph to show how porosity changes with depth. [2]

(ii) State the relationship between porosity and depth of the sediment.

_____ [1]

(iii) Explain this relationship.

_____ [1]

(iv) If the geothermal gradient is 30°C per km calculate the temperature at 1200 m. The surface temperature is 10°C .

temperature _____ $^{\circ}\text{C}$ [1]

(b) The bar chart opposite shows the relative thickness of different coals that all started with the same amount of organic material.

(i) Estimate the relative thickness of peat needed to produce one unit of anthracite.

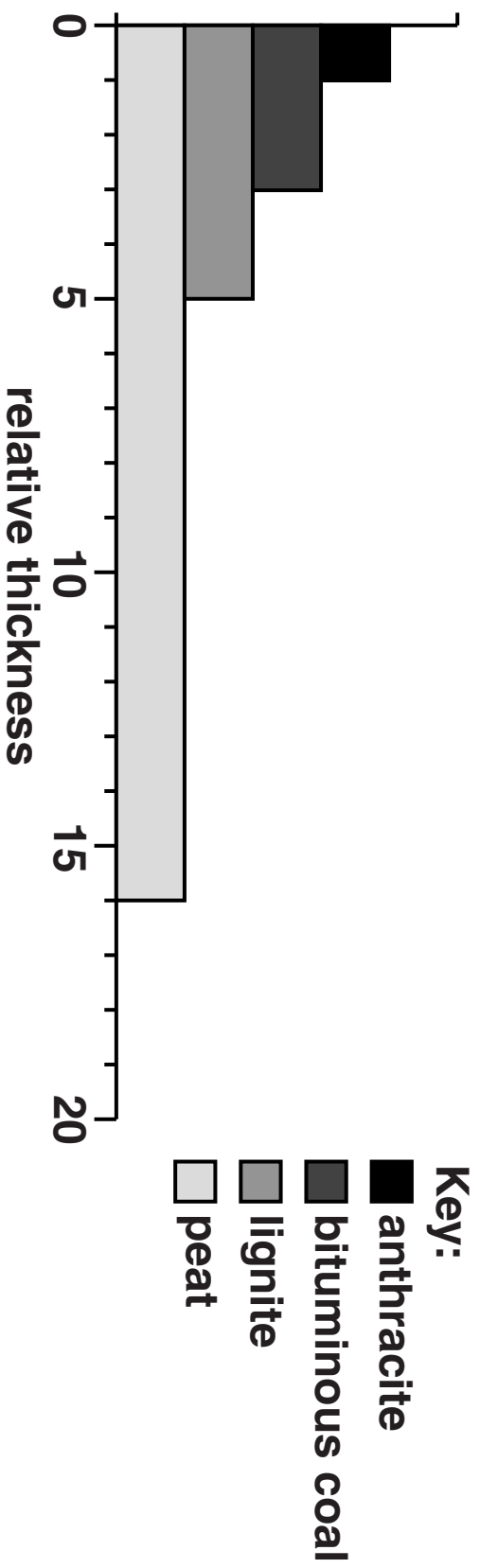
_____ [1]

(ii) Calculate the thickness of peat required to produce a layer of lignite 0.5 m thick. Show your working.

thickness _____ m. [1]

(iii) Use the bar chart to help describe the diagenetic changes that occur when peat plant material is changed to form bituminous coal.

_____ [2]



(c) Explain the relationship between diagenesis and burial metamorphism.

[2]

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Question 5 continues on page 28

(d) The map opposite shows a granite batholith outcrop of 2 km diameter intruded into a series of gently dipping sedimentary rocks.

(i) Name the type of metamorphism that is found within the metamorphic aureole.

_____ **[1]**

(ii) Name the rocks found at

P _____

Q _____

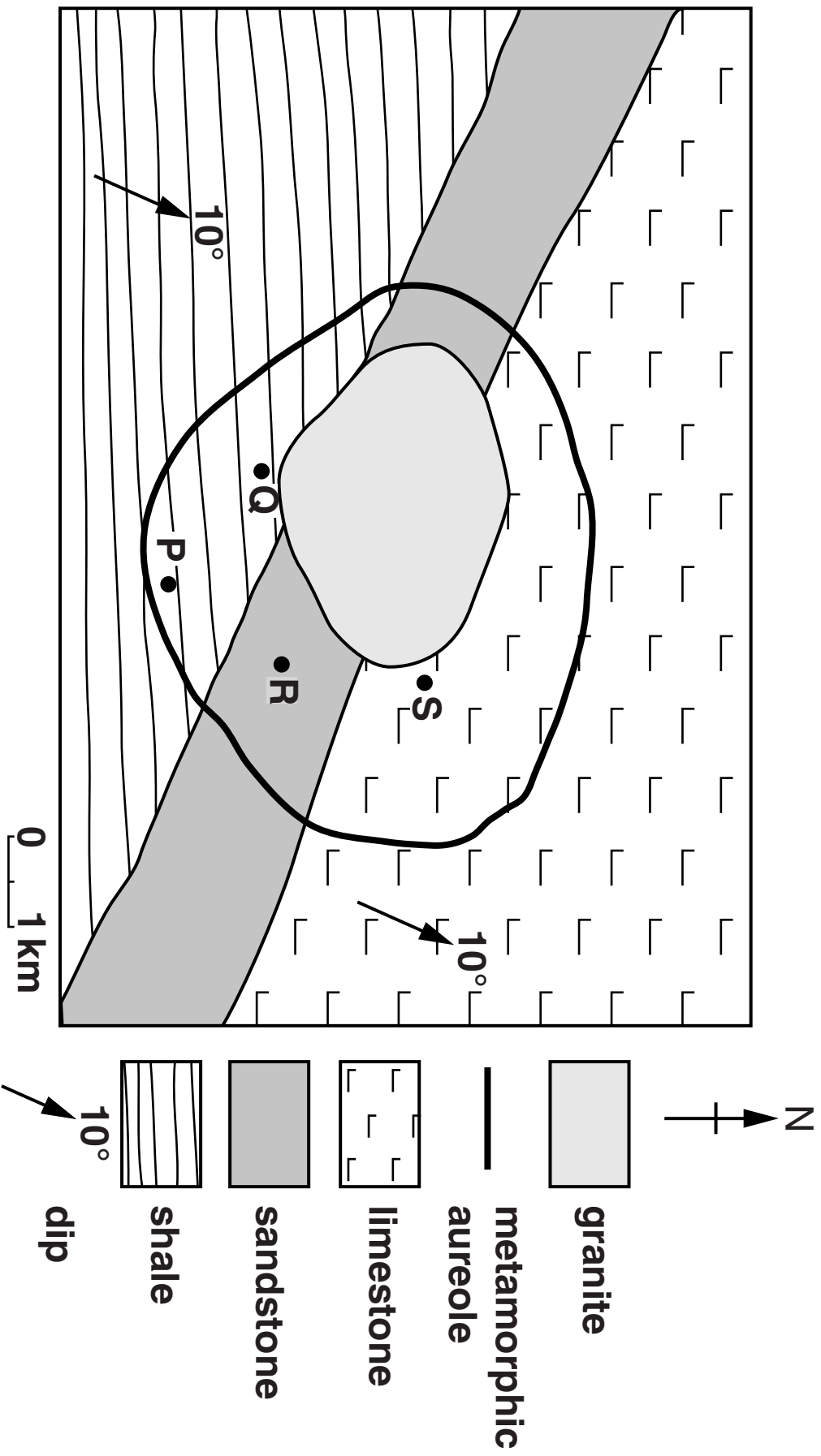
R _____

S _____ **[4]**

(iii) Suggest a reason why the width of the metamorphic aureole is greater in the east than in the west.

_____ **[1]**

[Total: 17]



- 6 Describe the deposition in hot desert environments of wadi conglomerates, dune sandstones and evaporites in playa lakes. You may use diagram(s) to illustrate your answer.**



In your answer you should make clear the links between the environments and the rocks deposited.

wadi conglomerates _____

dune sandstones _____

evaporites in playa lakes _____

[10]

[Total: 10]

7

[illegible]

[illegible]

[Total: 10]

END OF QUESTION PAPER

ADDITIONAL PAGE

IF ADDITIONAL SPACE IS REQUIRED, YOU SHOULD USE THE LINED PAGES BELOW. THE QUESTION NUMBER(S) MUST BE CLEARLY SHOWN.

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ADDITIONAL PAGE

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