Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

ADVANCED GCE

F795

GEOLOGY

Evolution of Life, Earth and Climate

WEDNESDAY 8 JUNE 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:

Electronic calculator
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (LEO/SW) 11MEP06330 48376/1

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 marks for the quality of written communication in your answer.**
- **You may use an electronic calculator.**

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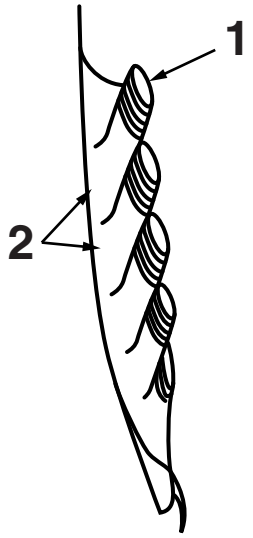
Answer ALL the questions.

1 Fossils A, B and C are members of different groups of fossils.

FOSSIL A



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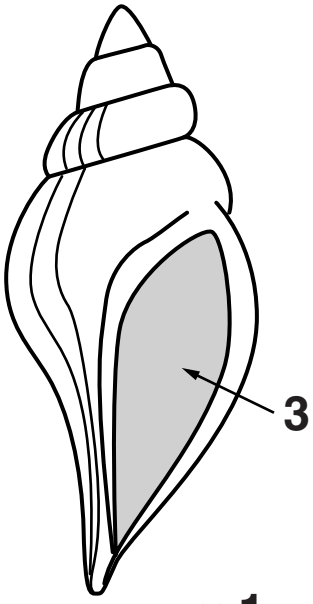
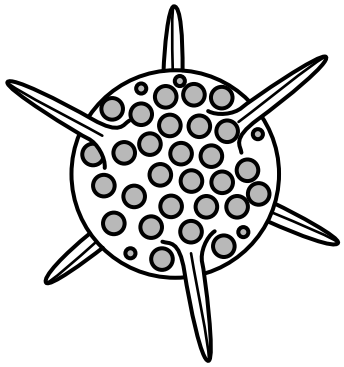
FOSSIL B



× 1

FOSSIL C



× 100

(a) (i) For each of the fossils above, state the group to which it belongs.

FOSSIL	GROUP
A	
B	
C	

[3]

(ii) Identify the morphological features 1 to 3.

1 _____

2 _____

3 _____ **[3]**

(iii) Describe and explain the mode of life of fossil A when it was alive.

_____

_____

_____

_____ **[2]**

(iv) Describe the type of coiling shown by fossil B using technical terms.

_____ **[1]**

(v) Describe the mode of life of fossil B.

_____

_____

_____

_____ **[2]**

(b) State the most likely methods of preservation of organisms A and B.

A _____

B _____ **[2]**

(c) (i) Describe clearly the morphology of a crinoid. You may draw a diagram to help your description.

_____

_____

_____

_____ **[3]**

(ii) Describe ONE morphological similarity present in both crinoids and regular echinoids, as seen in the fossil record.

_____

_____ **[1]**

(iii) Describe ONE difference between the modes of life of crinoids and regular echinoids.

_____

_____ **[1]**

[Total: 18]

2 (a) The table below shows descriptions of different modes of life.

Complete the table by filling in the correct term chosen from the list provided. Terms may be used once, more than once or not at all.

ARTICULATED

BENTHONIC

INFAUNAL

NEKTONIC

PLANKTONIC

SESSILE

VAGRANT

MODE OF LIFE	TERM
lives in sediment, usually in a burrow	
bottom dweller that lives on or in the sediment substrate	
actively swims in the water column	
moves around the sea bed	
floats in the water column, carried by currents	

[4]

(b) (i) Explain how a derived fossil is formed.

_____

_____

_____

_____ **[2]**

(ii) Describe why derived fossils cause problems when dating rocks.

_____

_____ **[1]**

(c) (i) Describe and explain THREE features of a good zone fossil.

_____

_____

_____

_____

_____

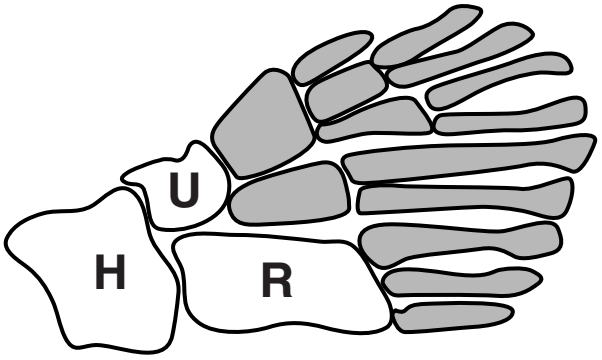
_____ **[3]**

(ii) Name ONE macrofossil used to zone the Lower Palaeozoic.

_____ **[1]**

(d) The limbs of an early fish and an early amphibian are shown below.

FISH



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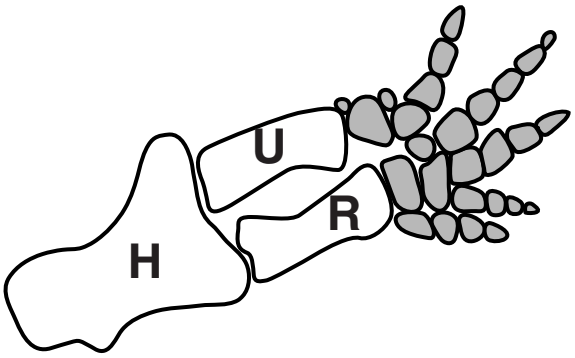
AMPHIBIAN



× 1

KEY: U = ulna, R = radius and H = humerus

(i) Analyse the diagrams above and use them to describe the similarities and differences between early fish and early amphibians.

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

(ii) Describe ONE other morphological change that occurred as fish evolved into early amphibians.

_____

_____ **[1]**

[Total: 16]

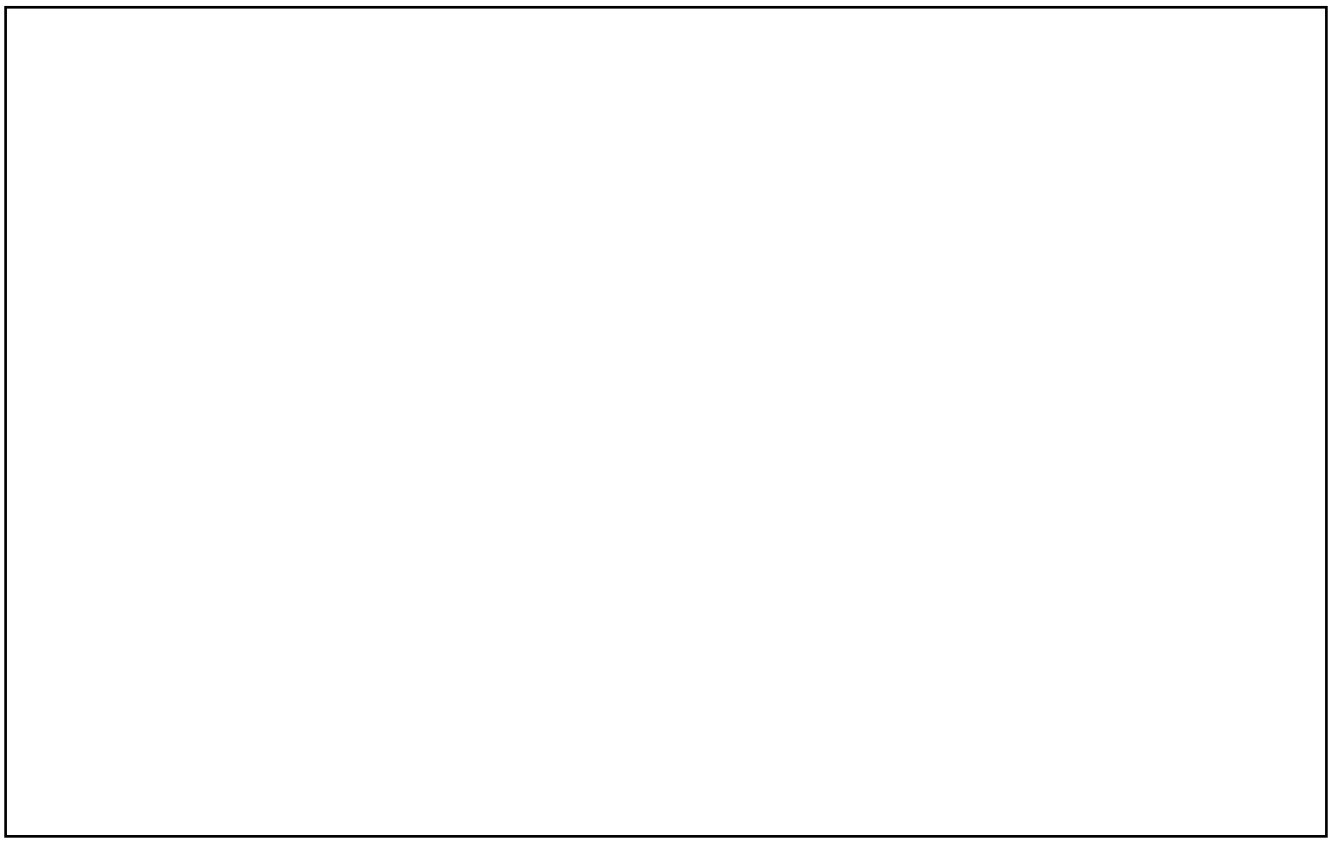
3 (a) Several definitions are given below for common geological terms. Match each term to its definition using the letters given.

DEFINITION	
D	largest time units dividing geological history into four, e.g. Mesozoic
E	the rate of increased temperature with depth, on average is 25 °C per km
F	thin layers of sediment laid down seasonally in lakes
G	dating of rocks using fossil remains
J	all the rocks from a particular period

TERM	DEFINITION D, E, F, G or J
biostratigraphy	
era	
system	
varve	

[4]

(b) Describe how rocks can be dated using ideas of cross cutting relationships. You may use a diagram to illustrate your answer.



_____

_____

_____

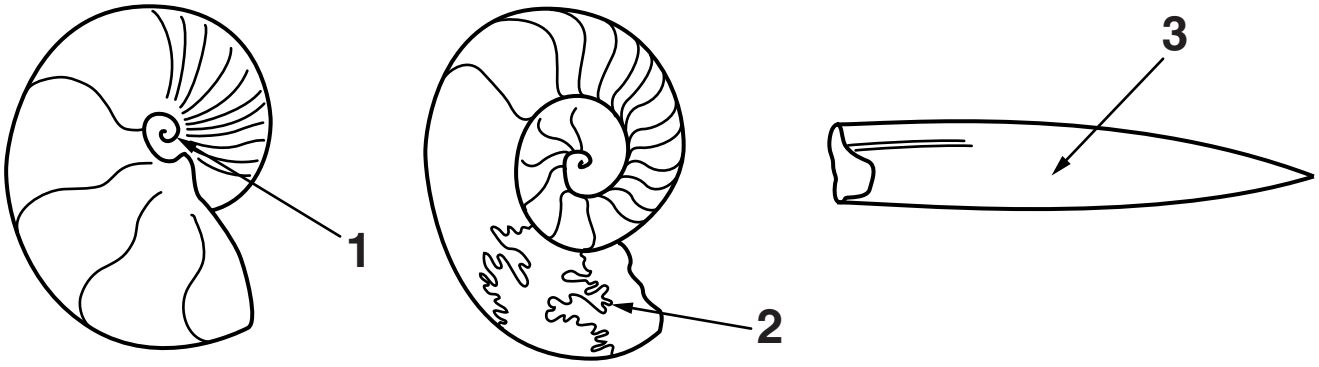
_____

_____

_____ **[3]**

(c) Fossils K, L and M show members of the phylum Mollusca.

FOSSIL K **FOSSIL L** **FOSSIL M**



× 0.5 **× 0.5** **× 0.5**

(i) Identify the morphological features 1 to 3.

1 _____

2 _____

3 _____ **[3]**

(ii) Describe the probable function of morphological feature 2.

_____

_____ **[1]**

(iii) Describe how fossils K, L and M were able to alter their vertical and horizontal position in the sea.

_____

_____

_____

_____

_____

_____ **[3]**

(iv) Describe the changes in the position of the siphuncle and the septal necks between nautiloids and ammonoids. You may use diagrams to illustrate your answer.

NAUTILOID	AMMONOID

_____

_____

_____

_____

_____

_____ **[4]**

[Total: 18]

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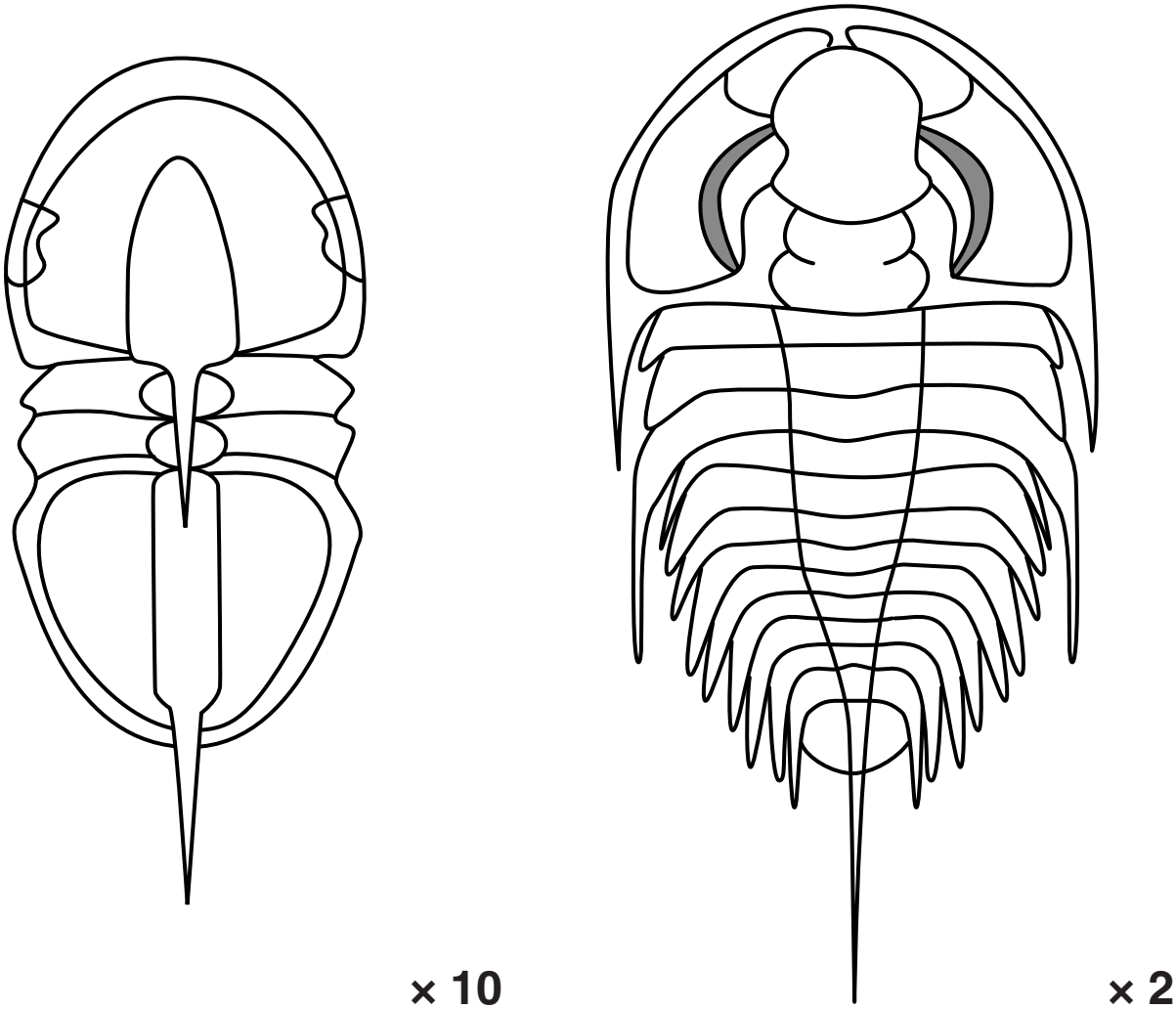
TURN OVER FOR QUESTION 4

4 (a) Fossils N and Q are trilobites.

fossil N **fossil Q**



× 10 **× 2**

(i) Label the following morphological features on the diagram of fossil Q above.

FACIAL SUTURE

GENAL SPINE

GLABELLA **[3]**

(ii) Indicate, by using a bracket and the letter P, the position and extent of the pygidium on fossil N. **[1]**

(iii) **Describe and explain the likely mode of life of each trilobite. Give morphological evidence to support your answer.**

fossil N_____

_____

_____

_____

fossil Q_____

_____

_____

_____ **[4]**

(b) Describe the nature of the compound eye, found in some trilobites.

_____

_____ **[1]**

(c) Discuss the difficulties in inferring the mode of life of trilobites.

_____

_____

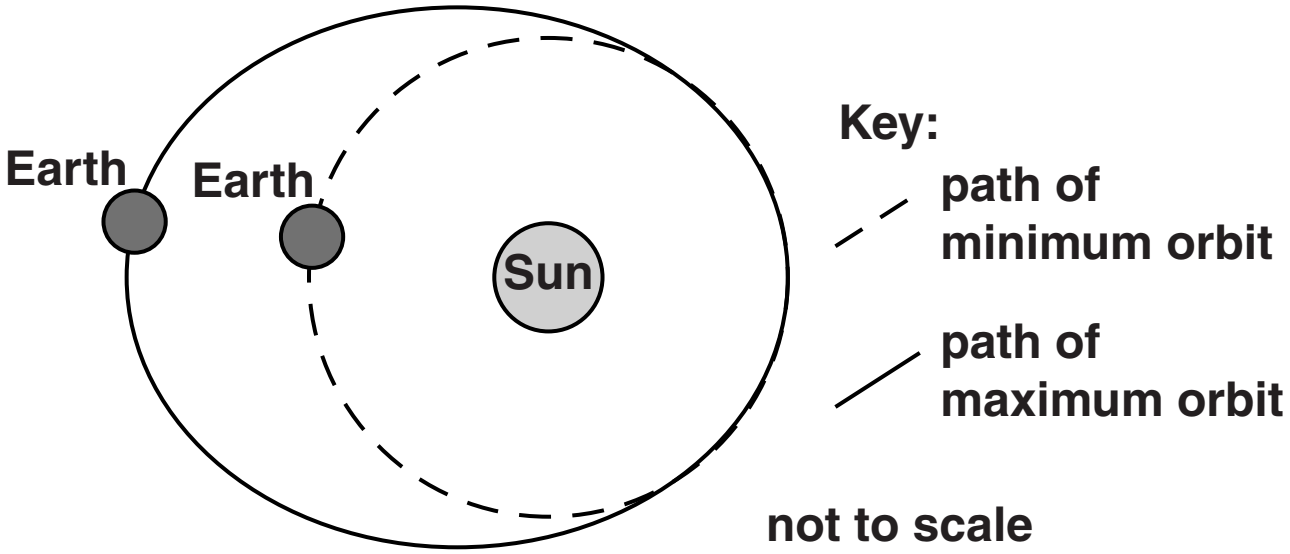
_____

_____ **[2]**

[Total: 11]

5 (a) **Milankovitch cycles are caused by changes in the amount of solar radiation reaching the Earth from the Sun over time. There are three main types of cycle that operate together described as eccentricity, obliquity and precession.**

The diagram below shows how the Earth's orbit changes over time.



(i) **Indicate the name of the cycle shown in the diagram above. Circle the correct answer below.**

ECCENTRICITY

OBLIQUITY

PRECESSION **[1]**

(ii) Describe how the changes in the Earth's orbit will affect the amount of solar radiation reaching the surface of the Earth.

_____

_____

_____

_____

_____

_____ **[3]**

(iii) Describe how Milankovitch cycles can be identified in rocks.

_____

_____

_____

_____ **[2]**

(b) The ratio of the isotopes ^{16}O and ^{18}O in bivalve shells can be used to determine sea temperatures.

The table below shows the concentration of ^{18}O isotope data for six bivalve shells from a sequence of six beds.

BIVALVE IDENTIFICATION NUMBER	^{18}O (PARTS PER MILLION)
6 (youngest)	0.25
5	3.20
4	2.85
3	0.10
2	3.00
1 (oldest)	2.50

(i) How is oxygen incorporated into the shells of bivalves?

_____

_____ **[1]**

(ii) Describe the conditions that result in increased amounts of ^{18}O in rocks.

_____

_____ **[1]**

(iii) Describe and account for the variation in the isotope data given in the table above.

_____

_____

_____

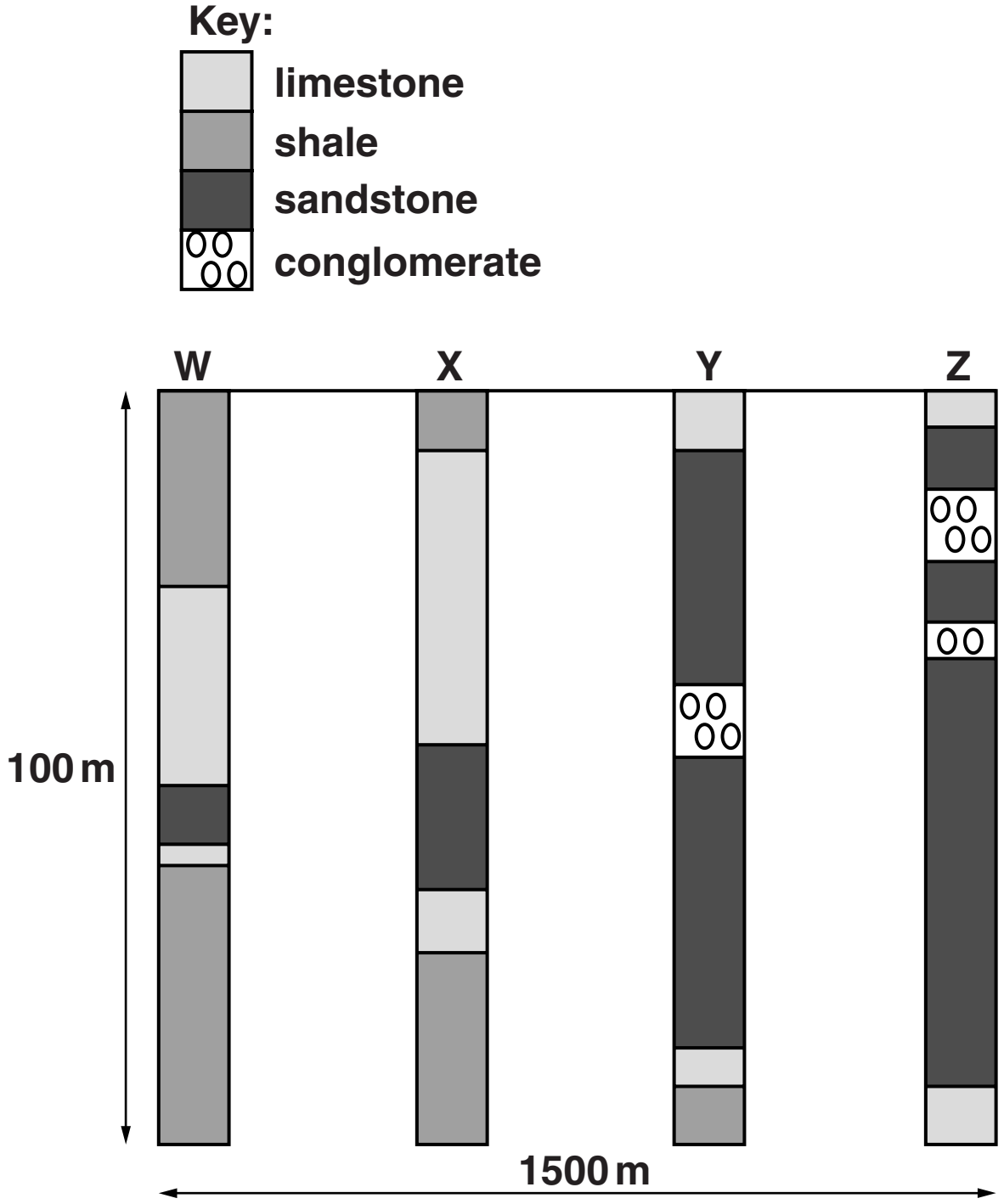
_____

_____

_____ **[3]**

[Total: 11]

6 (a) Four boreholes (W, X, Y and Z) were logged and are shown in the diagram below.



(i) Correlate the beds by drawing lines between the four boreholes. [3]

(ii) By which method did you correlate the four sequences?

_____ **[1]**

(b) Explain the problems of using this method of correlation.

_____

_____

_____

_____ **[2]**

[Total: 6]

7 Explain how radiometric dating is used to establish an absolute time scale. Describe and explain the problems of obtaining accurate radiometric dates.

You should structure your answer to include:

- **the theory behind the method**
- **the problems dating sedimentary, igneous and metamorphic rocks.**

_____

_____

_____

_____

_____

_____

_____

_____ **[10]**

[Total: 10]

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TURN OVER FOR QUESTION 8

8 Describe how fossils are exceptionally preserved in tar pits, amber and the Solenhofen Limestone.

You should structure your answer to include the conditions essential for exceptional preservation.

TAR PITS _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

AMBER _____

_____

_____

_____

_____

_____

SOLENHOFEN LIMESTONE

[10]

[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 SHOWN CLEARLY.

ADDITIONAL PAGE

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