OCR
RECOGNISING ACHIEVEMENT

Wednesday 30 January 2013 – Afternoon

A2 GCE GEOLOGY

F795/01 Evolution of Life, Earth and Climate

F712980113

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 45 minutes

F7950 1

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. 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.
- Do **not** write in the bar codes.

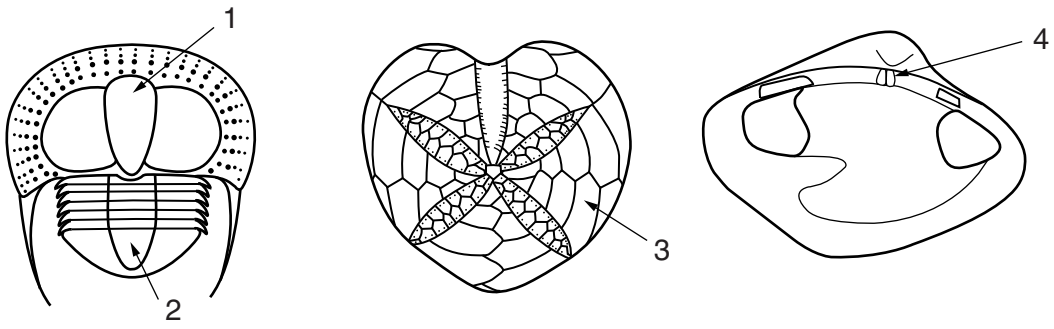
INFORMATION FOR CANDIDATES

- 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.
- This document consists of **20** pages. Any blank pages are indicated.

Answer **all** the questions.

1 **A**, **B** and **C** are different types of fossils.

fossil A **fossil B** **fossil C**



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(a) **(i)** Identify the phylum and group for each of the fossils above.

Fossil	Phylum	Group
A		
B		
C		

[3]

(ii) Label the morphological features **1** to **4**.

1 ..... 2 .....

3 ..... 4 .....

[3]

(iii) The mode of life of fossils **A** and **B** has been interpreted as infaunal. For each fossil describe **two** features shown on the diagrams that support this interpretation. Give reasons for your answers.

fossil A .....

.....

.....

.....

fossil B .....

.....

.....

.....

[4]

(iv) State the original chemical compositions of the hard parts of organisms **A** and **B**.

A ..... **B** .....

[2]

(v) Give **one** morphological difference between fossil **B** and a member of the same group that lives **on** the substrate (epifaunal).

.....

..... **[1]**

(b) Fossil **C** is described as a shallow burrower.

(i) Describe how fossil **C** would have altered its position in a burrow using its foot.

.....

..... **[1]**

(ii) Describe how fossil **C** would have respired in the burrow.

.....

..... **[1]**

(c) (i) Draw labelled diagrams in the space below to show the external morphology of a long hinged and a short hinged brachiopod. Ensure that you add at least four labels to each of your diagrams.

long hinged	short hinged

[4]

(ii) Describe how brachiopods open **and** close their valves.

.....

..... **[1]**

[Total: 20]

2 Dinosaurs evolved from the Archosaurs into two main groups: the saurischia and the ornithischia, based on their morphological characteristics.

(a) (i) The table below shows descriptions of either saurischian or ornithischian dinosaurs.

Match each description to the dinosaur type by circling the correct answer in the second column.

Description	Type of Dinosaur	
armoured with bony plates	**saurischian**	**ornithischian**
have long S shaped necks	**saurischian**	**ornithischian**
pubis bone points backwards	**saurischian**	**ornithischian**
described as 'duck billed' dinosaurs	**saurischian**	**ornithischian**
have hands with three digits	**saurischian**	**ornithischian**

[3]

(ii) Give **one** example of a saurischian dinosaur.

..... **[1]**

(iii) When did dinosaurs first appear in the fossil record?

..... **[1]**

(b) (i) Dinosaurs are believed to have laid amniotic eggs. Describe **three** morphological advantages of amniotic eggs and give reasons for your answers.

.....

.....

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..... **[3]**

(ii) Sometimes whole dinosaur eggs are found fossilised in nests. What is the environment of deposition in which they were preserved?

.....

..... **[1]**

(c) Suggest how we can infer the mode of life of a dinosaur using trace fossils.

.....

.....

.....

..... **[2]**

(d) Describe the depositional environment required to exceptionally preserve dinosaur skin in the fossil record. Give reasons for your answer.

.....

.....

.....

..... **[2]**

(e) **(i)** One morphological feature that *Archaeopteryx* and modern birds have in common is wings. State **two** other morphological features present in both *Archaeopteryx* and modern birds.

1 .....

2 .....

[2]

(ii) What does this suggest about the relationship between modern birds and dinosaurs?

.....

..... **[1]**

[Total: 16]

3 **(a)** Radiometric dating is used to calculate the age of the Earth. Define the terms *half-life* and *isotope*.

half-life .....

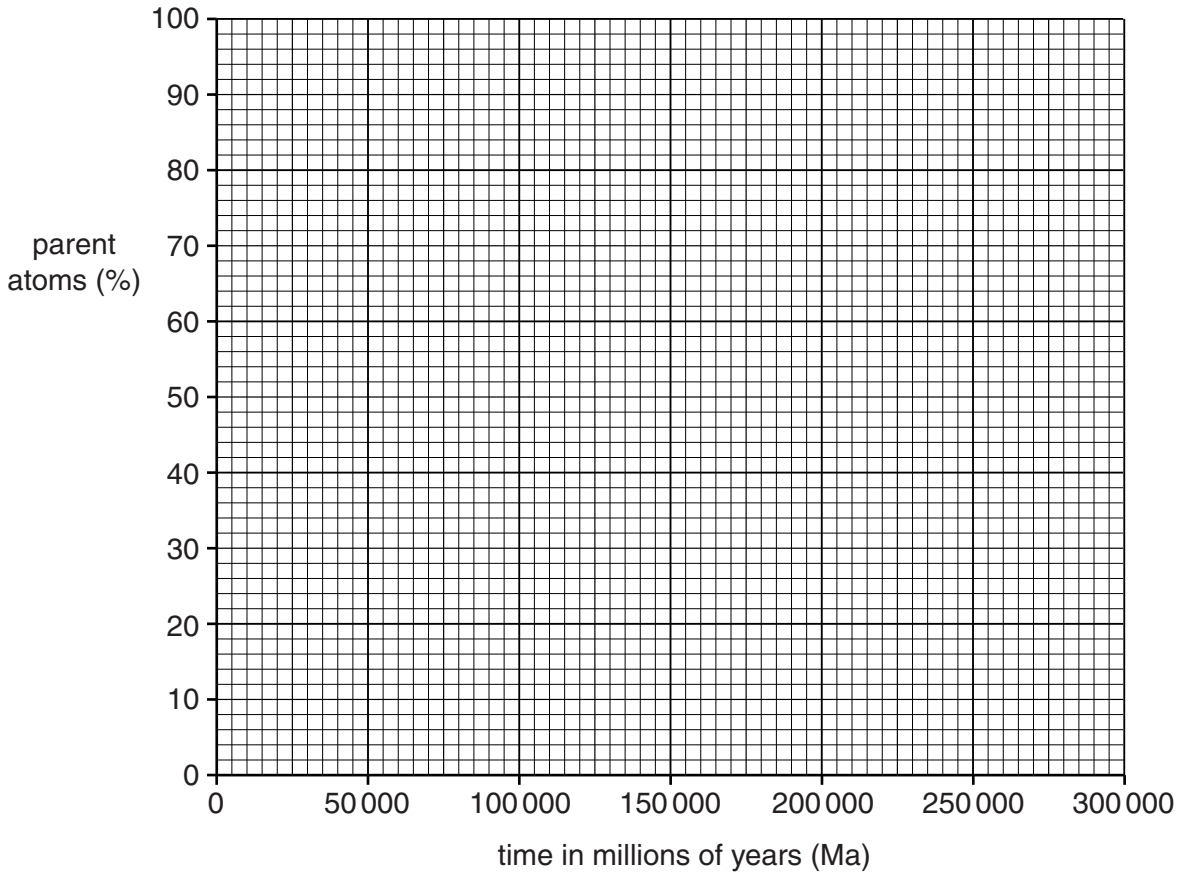
.....

isotope .....

.....

[2]

(b) The radioactive isotope ^{87}Rb decays to ^{87}Sr, and has a half-life of 50 000 million years.



(i) Plot the decay of the parent ^{87}Rb on the graph above for four half-lives. Draw the decay curve. **[2]**

(ii) If a rock contains 70% of the parent ^{87}Rb isotope, what is the age?

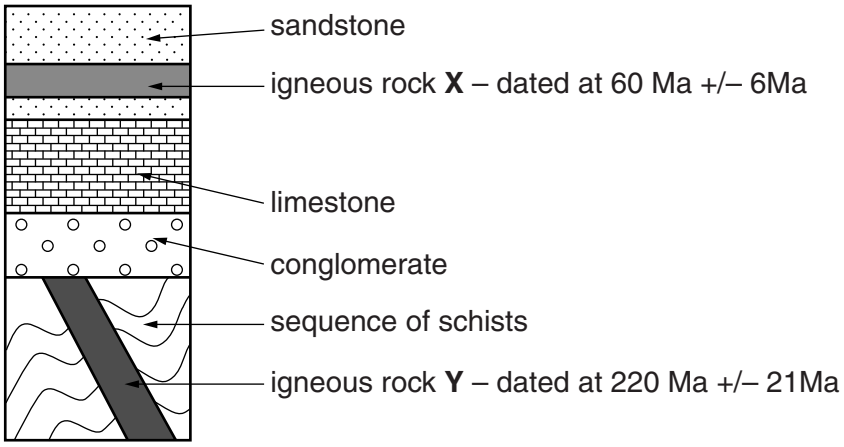
..... **[1]**

(iii) The ^{87}Rb–^{87}Sr method of dating is described as an absolute method of dating. Explain the meaning of the term *absolute dating*.

.....

..... **[1]**

(c) A geologist has been asked to interpret the sequence shown below. The igneous rocks have been dated using the ^{40}K–^{40}Ar method.



(i) What is the half-life of ^{40}K?

..... **[1]**

(ii) Which of the following minerals is most suitable to date these igneous rocks using the ^{40}K–^{40}Ar method? Circle the correct answer.

glauconite **muscovite mica** **quartz** **zircon**

[1]

(iii) What can be deduced about the age of the schist in the diagram?

.....

..... **[1]**

(iv) What evidence would we need to look for in the field to determine whether igneous rock **X** or the sandstone is youngest?

.....

..... **[1]**

(v) Explain why the ^{40}K–^{40}Ar method gives a margin of error on the dates shown in the diagram.

.....

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..... **[2]**

(d) Explain how the law of included fragments can be used to determine relative ages. Use diagram(s) to illustrate your answer.

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..... **[2]**

(e) Geologists have attempted to date the Earth using methods available to them at the time. Describe the method used by Joly in 1899 to estimate the age of the Earth by using the salt content of the oceans.

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..... **[2]**

(f) **(i)** Fossils can be used to correlate and date rocks. State the technical term used to describe this method.

..... **[1]**

(ii) Outline how microfossils can be used to correlate and date rocks.

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.....

..... **[2]**

[Total: 19]

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Question 4 begins on page 10

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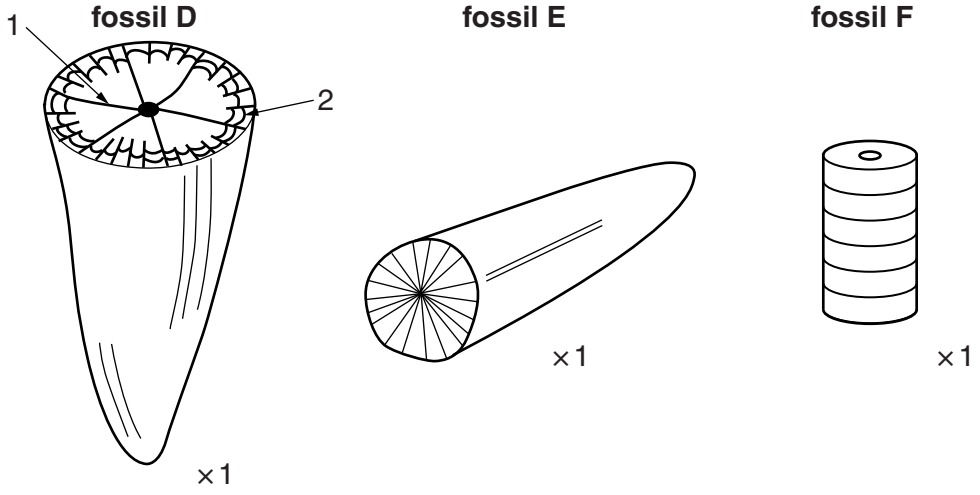
4 Fossils **D**, **E** and **F** are drawings made by a student in a practical lesson.



(a) (i) For each fossil, state the group to which it belongs and **one** distinguishing feature that enables you to place it in that group.

Fossil	Group	Distinguishing Feature
D		
E		
F		

[3]

(ii) Identify the features labelled **1** and **2** on fossil **D**.

1 ..... 2 .....

[1]

(iii) What palaeoenvironment could **all** three fossils have lived in?

..... **[1]**

(iv) Explain why fossil **E** had a wider geographical distribution than **D** or **F**.

.....

..... **[1]**

(v) Describe **one** similarity between the mode of life of fossils **D** and **F**.

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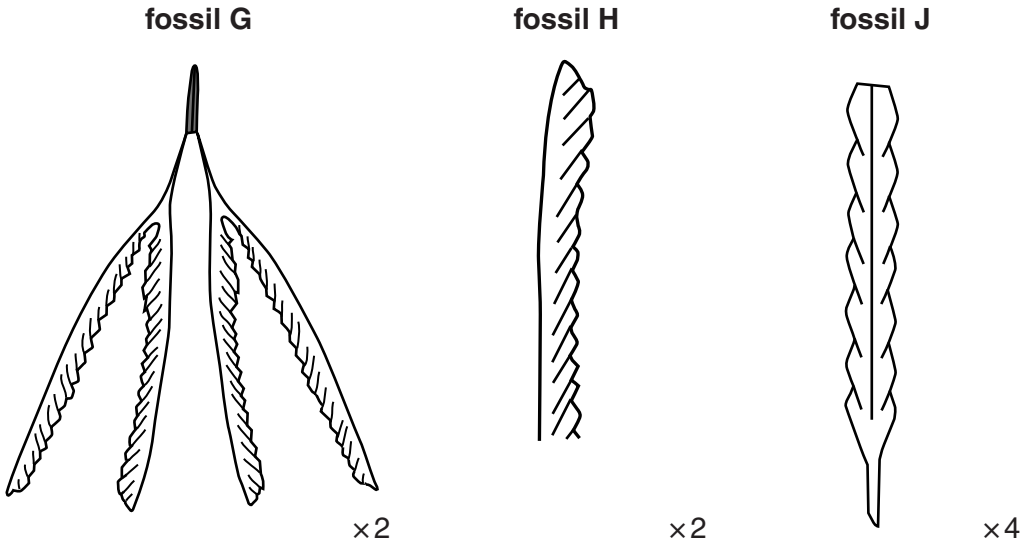
..... **[1]**

(b) Fossils **G**, **H** and **J** are members of the same fossil group, but are found in different horizons in Lower Palaeozoic rocks.



(i) To which fossil group do fossils **G**, **H** and **J** belong?

..... **[1]**

(ii) Label **three** morphological features on fossil **G** above. **[2]**

(iii) What is the form of fossil **J** above? Circle the correct answer.

scandent **pendant** **reclined**

[1]

(iv) Place fossils **G**, **H** and **J** in evolutionary order.

youngest .....

.....

oldest ..... **[1]**

(c) Why are these fossils good zone fossils for the Lower Palaeozoic? Give reasons for your answers.

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..... **[2]**

[Total: 14]

5 Climate change has occurred throughout geological history.

(a) Explain the difference between the terms *climate* and *weather*.

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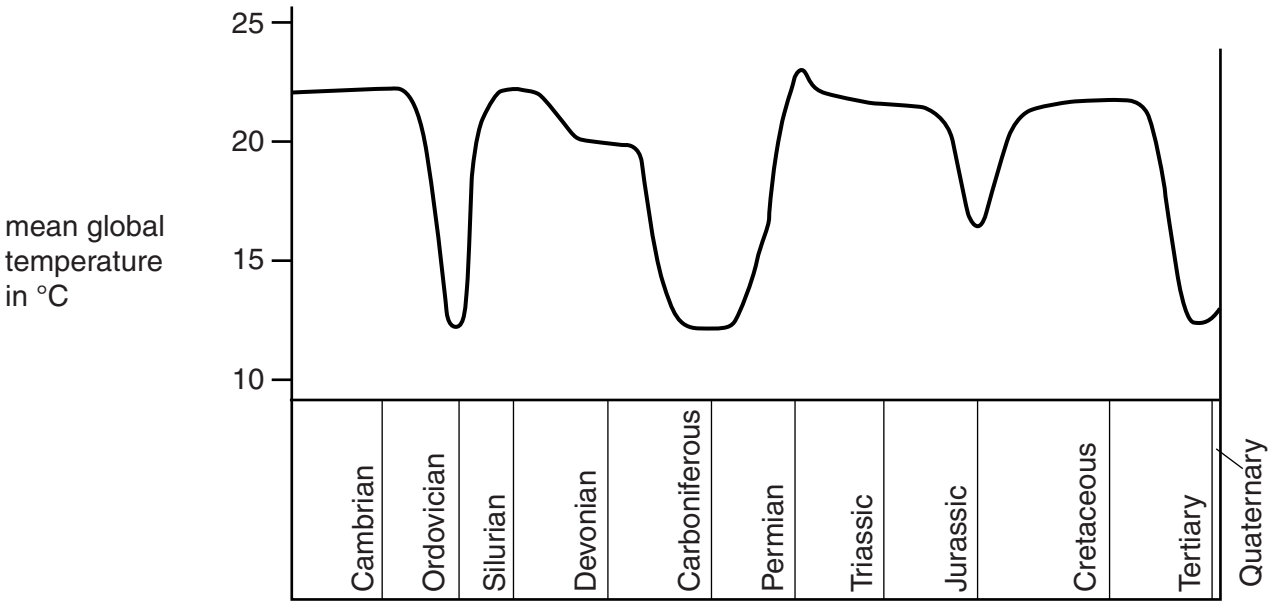
..... **[2]**

(b) The graph shows the calculated average world temperatures throughout geological history.



(i) Describe what is meant by the term *greenhouse* Earth.

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..... **[1]**

(ii) Shade on the graph when icehouse conditions have existed globally in the past. **[1]**

(iii) Describe how the presence of ice sheets can increase global cooling and maintain icehouse conditions.

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..... **[2]**

(c) Milankovitch cycles are thought to have a major effect on the world climate. There are three main cycles in operation; eccentricity, obliquity and precession.

(i) Complete the table below to show the correct descriptions and cycle times for each of the three cycles, using **K**, **L**, **M**, **N**, **P** and **Q**.

	Description
K	the tilt of the Earth's axis varies by up to 3°
L	Earth's orbit changes from a circular to an elliptical path
M	Inclination of the Earth's orbit changes in relation to where it is on the orbit

	Timing of Cycle in Years
N	41 000
P	19 000 or 23 000
Q	100 000

	Letter	
Cycle	**Description**	**Timing of Cycle in Years**
eccentricity		
obliquity		
precession		

[3]

(ii) Evidence for Milankovitch cycles can be seen in the Blue Lias and the Kimmeridge Clay in Dorset. These rocks show alternating beds of limestone and clay.

Explain how these alternating sediments can give evidence for the existence of Milankovitch cycles.

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..... **[2]**

[Total: 11]

6 Describe how the following bivalves are adapted to live in different environments:

- epifaunal cemented
- epifaunal attached
- nektonic bivalves.

Diagrams are essential to illustrate your answer.

Your answer should clearly link the descriptions of the morphological adaptations to the reasons for them.

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[Total: 10]

7 Describe how an asteroid impact and increased volcanic activity could both be the cause of the Cretaceous-Tertiary mass extinction.

Your answer should clearly link the evidence with the reasons for the mass extinction.

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[Total: 10]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.

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