

Thursday 8 June 2017 – Afternoon

A2 GCE GEOLOGY

F795/01 Evolution of Life, Earth and Climate

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 45 minutes




Candidate forename		Candidate surname	
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Centre number						Candidate number				
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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 page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES

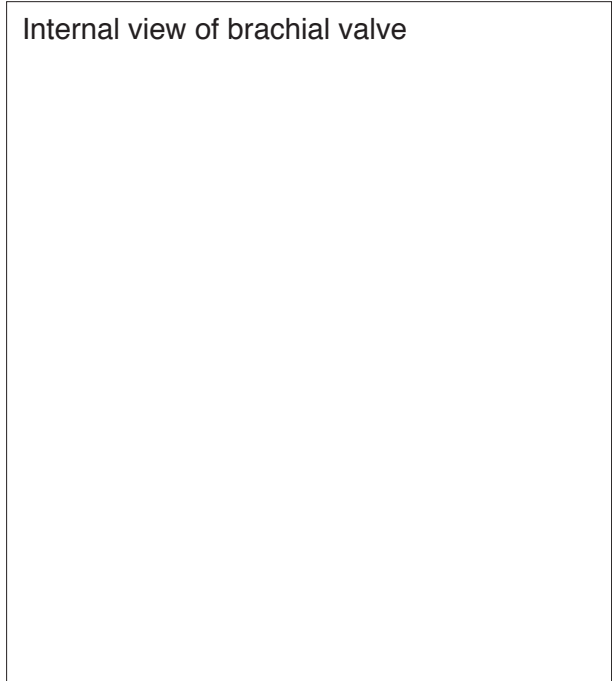
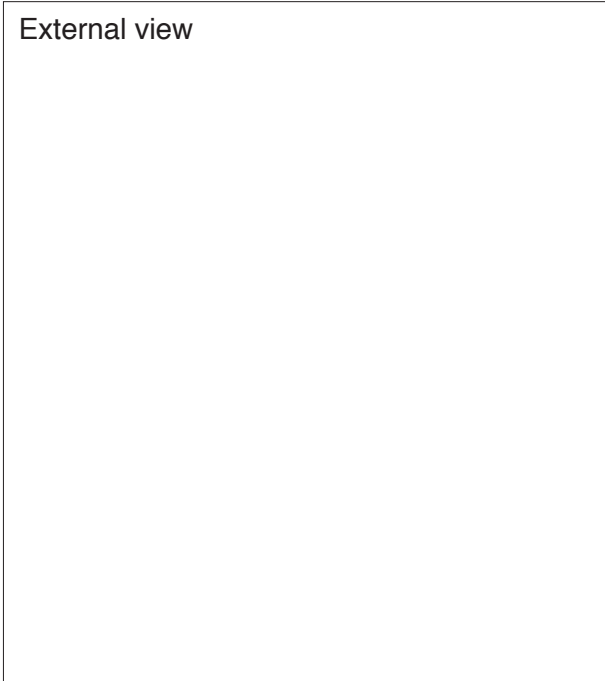
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **100**.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- This document consists of **20** pages. Any blank pages are indicated.

Answer **all** the questions.

1 (a) (i) Draw external and internal views of a fossil brachiopod in the boxes below.

Add labels to the appropriate diagram to show the following morphological features:

commissure growth lines lophophore support muscle scars pedicle foramen umbo



[6]

(ii) State the type of symmetry exhibited by most brachiopods.

..... [1]

(iii) Draw and label the line of symmetry on one of the diagrams you have drawn. [1]

(iv) In some brachiopods the commissure has a pronounced fold and sulcus. Give **one** possible explanation for this morphological feature.

.....

..... [1]

[Total: 9]

- 2 (a) (i) State the conditions necessary for the preservation of organisms by pyritisation.
..... [1]
- (ii) In which environment are such conditions commonly found?
..... [1]
- (iii) Petrified wood or bone is initially preserved when voids are filled by precipitated minerals – a process known as impregnation. State which compound is most effective in preserving organic material in this way.
..... [1]
- (iv) Body fossils are often preserved by the process of replacement. State the name of an original mineral and the mineral it is most commonly replaced by.
original mineral..... replacement mineral..... [1]
- (v) Describe and explain the process of carbonisation.
.....
.....
.....
..... [2]
- (vi) State **two** factors that improve the chances of an organism being fossilised (preservation potential). For each factor, explain how it improves the preservation potential of the organism.
factor 1
.....
factor 2
..... [2]

Question 2(b) begins on page 4

- (b) Trace fossils can be classified according to the type of activity that created them. Assemblages of trace fossils are also used to give an indication of the water depth and energy of the environment in which they formed.

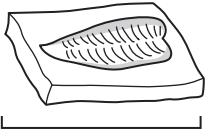
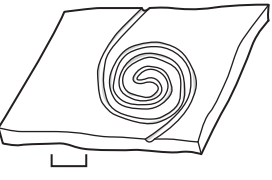
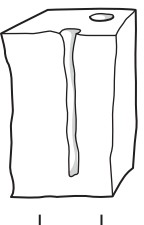

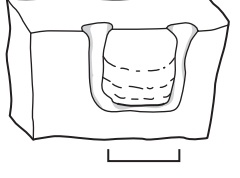
A number of trace fossils are illustrated in the table below.

- (i) Identify the types of trace fossils and fill in the column in the table. Use the following terms:

dwelling trace feeding trace grazing trace locomotion trace resting trace

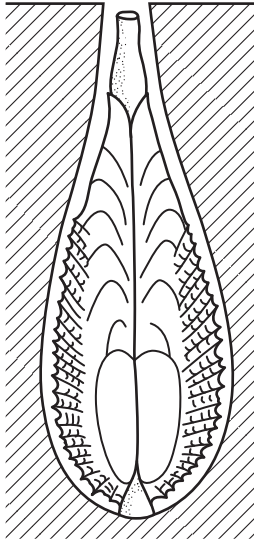
Each term may be used once, more than once or not at all.

[3]

genera	illustration scale bar = 5 cm	type of trace fossil	water depth	energy level
<i>Rusophycus</i>				low
<i>Nereites</i>			deep water	
<i>Skolithos</i>			shallow, nearshore	
<i>Cruziana</i>			shallow, offshore	
<i>Diplocraterion</i>				high

- (ii) Complete the water depth and energy level columns. Some have been done for you. You should include whether shallow water is nearshore or offshore. [2]

(c) *Pholas* is a boring bivalve adapted to live in a hard substrate. Using evidence from the diagram below, label and describe **one** morphological feature which shows adaptation to this mode of life.



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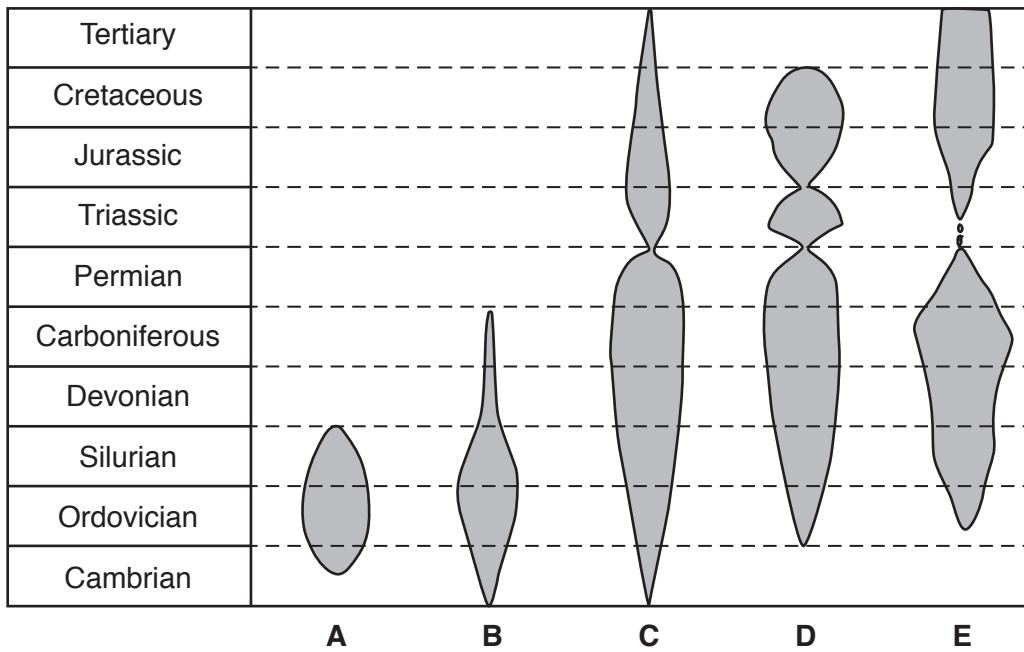
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..... [2]

[Total: 15]

3 The diagram below shows the relative diversity of five invertebrate fossil groups and their stratigraphic ranges.



(a) Complete the table below to identify the most likely invertebrate fossil groups for **A**, **B**, **D** and **E**. State the phylum for each group.

	invertebrate fossil group	phylum
A		
B		
D		
E		

[4]

(b) **C** shows the stratigraphic range and diversity of brachiopods. There is an obvious morphological difference between brachiopods older than the Permo-Triassic mass extinction and those found in younger rocks. Describe this morphological difference.

.....

.....

.....

..... [2]

(c) Use information from the diagram to state which of these fossil groups (**A**, **B**, **C**, **D** or **E**) is the most useful for establishing the age of the rocks they are found in. Explain your answer.

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

(d) A rock was found to contain fossils from groups **B**, **C**, **D** and **E only**. Use information from the diagram to state the possible range of ages for the rock.

..... [1]

(e) Group **D** has three obvious subdivisions. State the name of the subgroup dominant in the Triassic period.

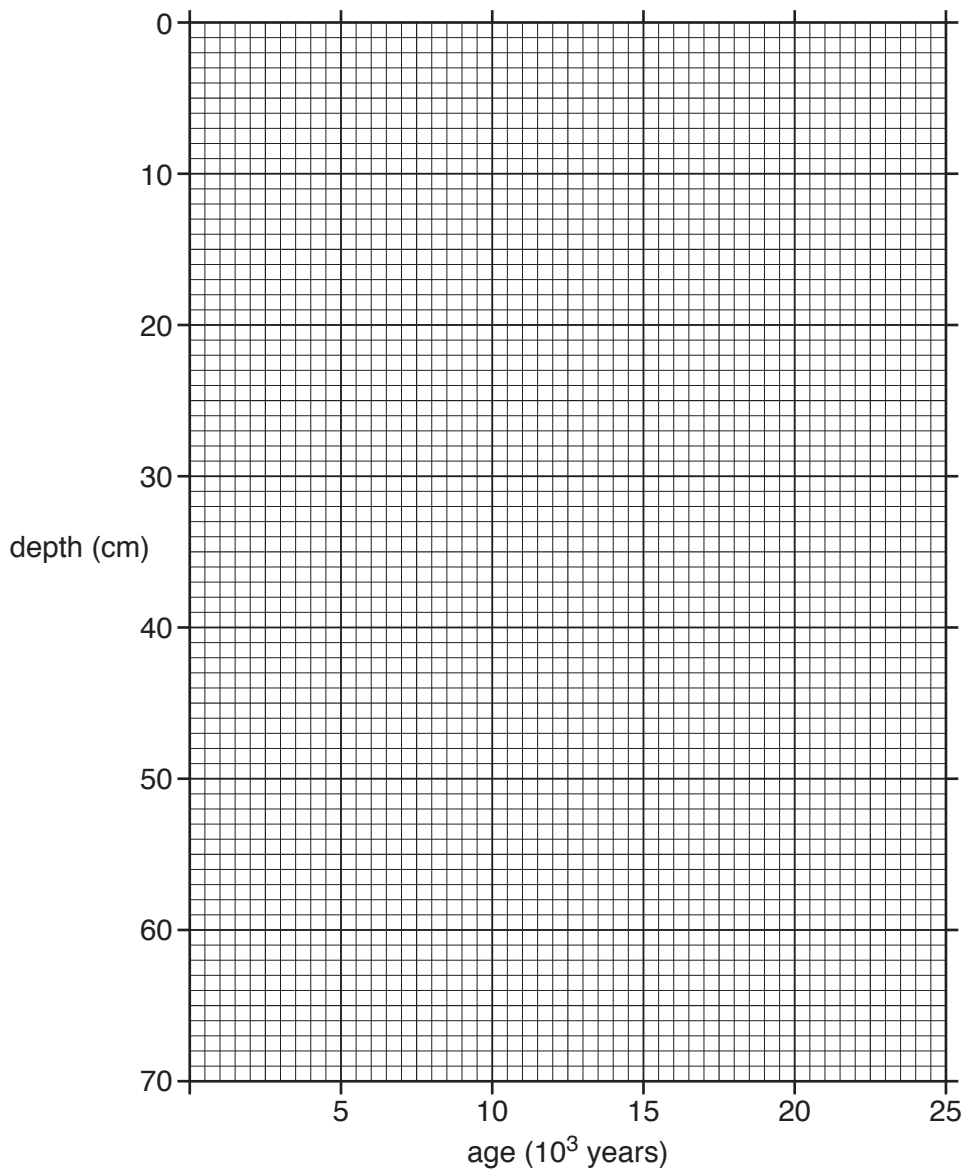
..... [1]

[Total: 10]

- 4 (a) The table shows data from an Indian Ocean core sample. The ages of sediments at different depths have been determined by radiometric dating using carbon isotope analysis.

N Anderson, A Malahoff, 'The Fate of Fossil Fuel CO₂ in the Oceans (Marine Science)', pp355-373, Springer, 1977. Item removed due to third party copyright restrictions.

- (i) Plot the data from the table on the grid below. Add a straight line of best fit between 10000 and 20000 years.



(ii) Use your line of best fit to calculate the average rate of sedimentation between 10 000 and 20 000 years ago. Show your working and give your answer in cm / 10³ years.

..... cm / 10³ years [2]

(iii) This part of the Indian Ocean has been spreading from the ocean ridge for 11 Ma. Use the sedimentation rate from part (ii) to calculate the possible thickness of sediments deposited during this time period. Give your answer in metres.

..... m [1]

(iv) The uppermost 8cm of the core sediments have been bioturbated. Explain what bioturbation is and why this results in an almost vertical section of the graph.

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..... [2]

(b) Give **two** reasons why sedimentation rates cannot be used to calculate a realistic age of the Earth.

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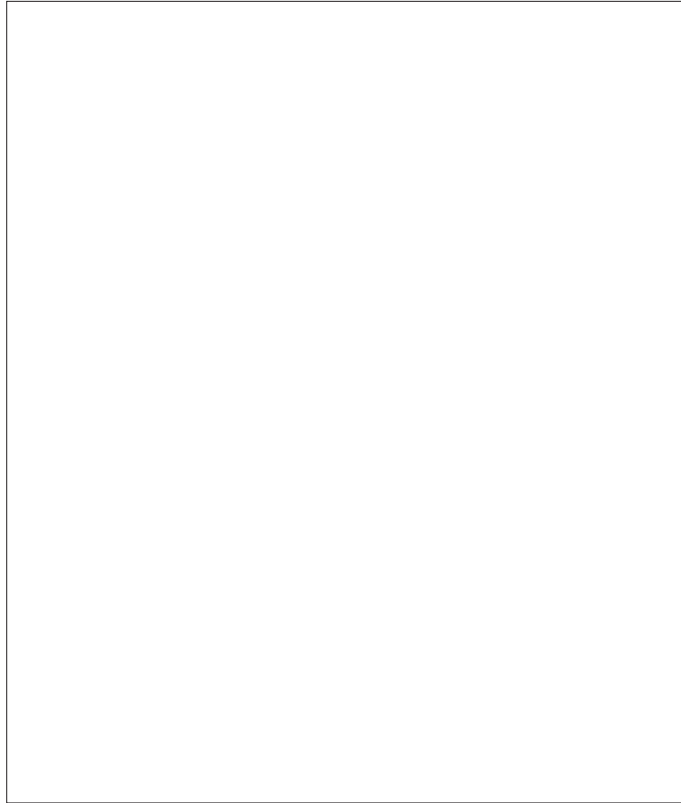
[Total: 10]

5 Macrofossils and microfossils can be used in stratigraphy and palaeo-environmental analysis.

(a) Explain the difference between a macrofossil and a microfossil.

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

(b) (i) In the box below, draw a fully labelled diagram of a crinoid in life position.



[3]

(ii) Choose **three** of the morphological features you have labelled on your diagram. Briefly describe the feature and explain how each allowed the crinoid to live successfully in shallow carbonate seas.

1
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2
.....
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3
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[3]

(iii) Explain why the crinoid skeleton may become disarticulated after the death of the organism.

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

(iv) Describe and explain **two** pieces of evidence from the deposition of crinoid skeletal components that indicate a palaeo-environment with a current.

1
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2
..... [2]

(c) (i) State the names of **two** groups of microfossils that derive from vascular plants.

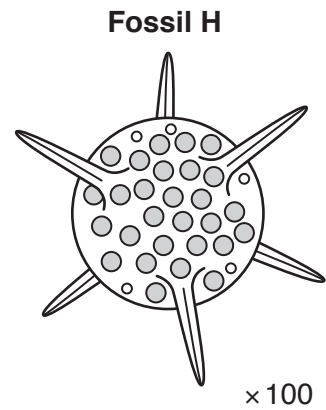
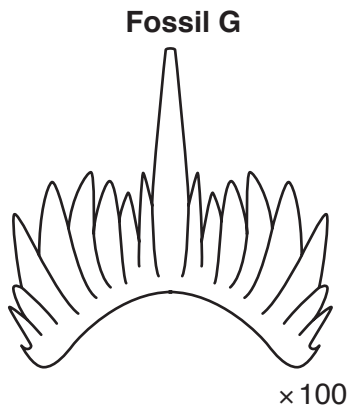
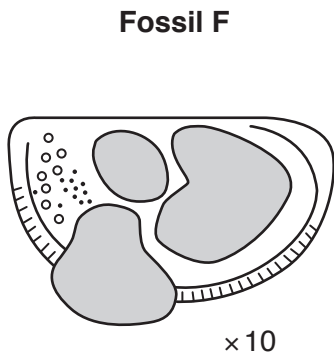
1 2 [1]

(ii) Explain **two** reasons why plant microfossils are important in establishing the stratigraphic record.

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

Question 5(d) begins on page 12

(d) Fossils **F**, **G** and **H** are microfossils.



(i) Complete the table below to identify and give the composition of each of the microfossil groups shown above.

	microfossil group	composition
F		
G		
H		

[3]

(ii) Explain how fossil **F** can be used in palaeo-environmental analysis.

.....
 [1]

(iii) Fossil **G** was part of a larger organism. What function did fossil **G** have in life?

.....
 [1]

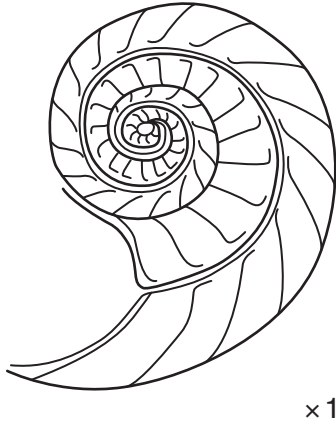
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13
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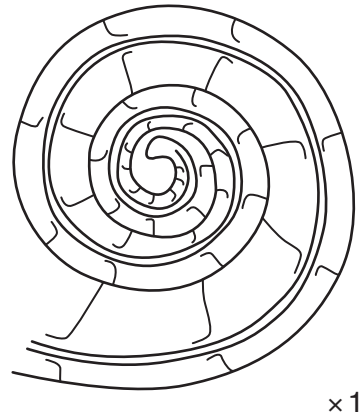
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6 Cross-section views of two different cephalopods are shown below.

Fossil cephalopod J



Fossil cephalopod K



(a) (i) Identify cephalopods **J** and **K**.

J **K** [1]

(ii) Fully label morphological features of cephalopod **J** on the diagram above. [2]

(iii) Describe the differences in internal morphology that can be seen on the diagrams of cephalopods **J** and **K**.

.....

 [2]

(iv) Describe **two external** differences that would distinguish between the two groups of cephalopods shown above.

1

 2
 [2]

(b) (i) It is assumed that the cephalopods had a pelagic mode of life. Name and explain the function of **two** features seen in the **fossil** evidence that support this assumption.

1

 2
 [2]

- (ii) Complete the table below to indicate whether the listed morphological adaptations would advantage, disadvantage or have no effect on horizontal movement through the water. Place a tick in the correct box for each feature.

adaptation	advantage for horizontal movement	disadvantage for horizontal movement	no effect on horizontal movement
ribbing			
evolute shell			
keel			
complex suture			

[2]

- (iii) Early cephalopods often had straight conical shells (orthocones). Explain the problem this may have caused for a nektonic mode of life.

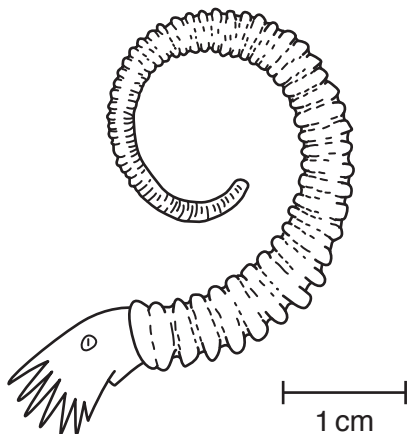
.....
 [1]

- (iv) Describe and explain **two** different evolutionary changes that provided a solution to the problem caused by a straight shell.

.....

 [3]

- (c) (i) To which group of ammonites does the specimen illustrated below belong?



..... [1]

- (ii) Based on the morphology of this late ammonite form, describe the likely mode of life. Justify your answer.

.....

 [2]

[Total: 18]
 Turn over

- 7 Describe and explain the fossil and lithological evidence for the northward movement of the British Isles since the late Precambrian. **[10]**



You should structure your answer to show the northward progression over time and link the fossil and lithological evidence to specific time periods and approximate palaeolatitudes. Diagrams are not required in your answer.

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[Total: 10]

- 8 Describe the characteristics of **Saurischian** dinosaurs. Explain how the morphological adaptations of the Saurischian dinosaur *Diplodocus* were suited to its mode of life. [10]



*You should clearly link the adaptations you describe to the explanations you give.
You may use diagrams to illustrate your answers.*

A series of horizontal dotted lines providing space for the student to write their answer.

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[Total: 10]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

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

A large rectangular area with a solid vertical line on the left side and horizontal dotted lines across the rest of the page, providing space for writing answers.



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