

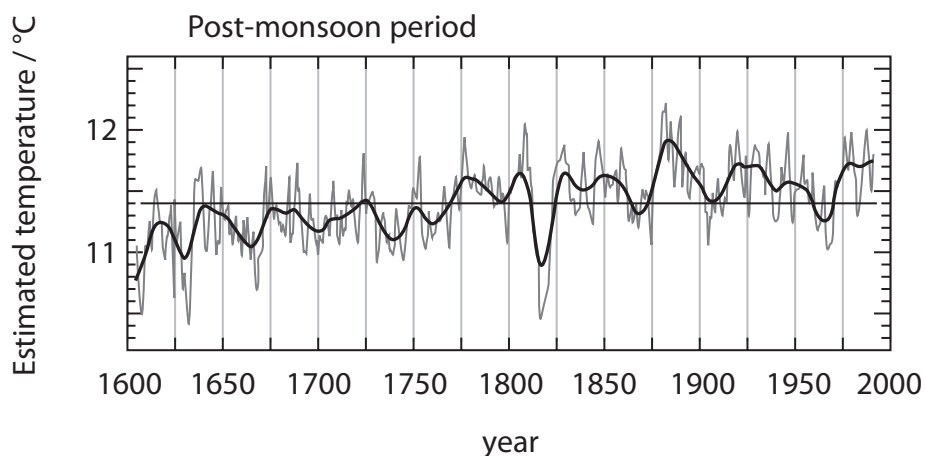
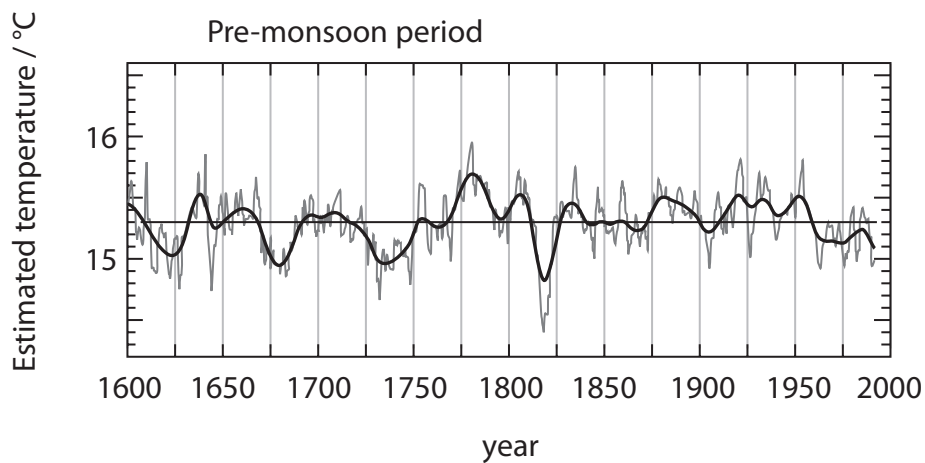
- 1 If a tree trunk is cut across horizontally, growth rings can be seen in the cut surface. The most significant factor that affects the formation of growth rings is environmental temperature. In regions where there is an annual cycle of seasonal temperature changes, it is possible to estimate the year in which a particular ring was formed.

In Nepal, there is an annual seasonal cycle of three distinct periods that is shown in the table below.

Period	Months	Description
Pre-monsoon	February to June	Relatively warm temperature, greater than 15 °C
Monsoon	July to September	Heavy rainfall
Post-monsoon	October to January	Relatively cool, usually less than 12 °C

Data from growth ring studies and other sources have been used to estimate the changes in environmental temperature in Nepal during the past 400 years.

The estimated temperatures for the pre-monsoon and post-monsoon periods are shown in the graphs below.



Key	
—	Mean temperature
—	Raw data

(a) Place a cross ☒ in the box next to the term used to describe the scientific study of tree growth rings.

(1)

- A** climatology
- B** dendrochronology
- C** ecology
- D** ethnobiology

(b) Compare the changes in mean environmental temperature between the pre-monsoon and the post-monsoon periods from 1600 to 2000.

(3)

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(c) (i) Suggest how scientists could use these data to predict future climate change.

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(ii) Suggest why some scientists may not be convinced that these data can be used to predict future climate change.

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(d) Suggest **one** source of evidence, apart from growth ring studies, that could be used to estimate changes in mean environmental temperature in Nepal during the past 400 years.

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(Total for Question 1 = 11 marks)

2 Many scientists think there is a link between global warming and increased levels of carbon dioxide and methane in the upper atmosphere. Most organisms are found in regions where the temperature range is between 0 °C and 40 °C at the Earth's surface.

(a) (i) Suggest why temperatures below 0 °C or above 40 °C would be unsuitable for most organisms.

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(ii) Explain how this range of temperatures has been maintained by the presence of carbon dioxide and methane in the upper atmosphere.

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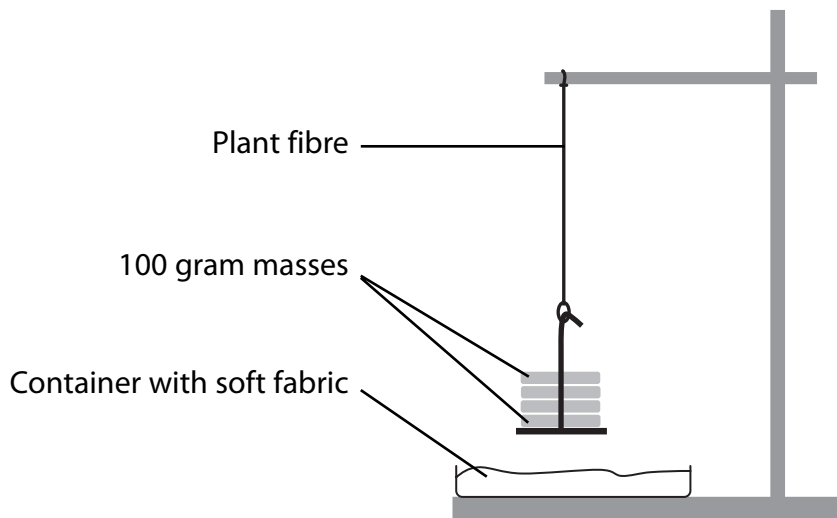
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(iii) Place a tick (✓) in the box in each row to indicate whether each technique could provide evidence of climate change having occurred in the past.

(2)

Technique	Could provide evidence	Would not provide evidence
Amniocentesis		
Dendrochronology		
Peat-bog pollen analysis		
Potassium-argon dating		

3 The diagram below shows a technique used by a student to investigate the mass needed to break dry plant fibres. In this investigation, 100 gram masses were added until the fibre broke.



(a) The student carried out the investigation four times to achieve reliable results.

(i) Suggest **three** factors that would need to be kept constant in this investigation.

(3)

- 1.....
- 2.....
- 3.....

(ii) Describe how the results obtained would be processed to produce a mean.

(2)

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(b) Suggest **two** ways of increasing the mass by 50 grams each time, rather than 100 grams, could increase the accuracy of the student's results.

(1)

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(c) The diagram shows a container with soft fabric in it. Suggest the safety role of this container.

(1)

(d) This student also investigated the mass required to break four samples of an oil-based plastic fibre.

The table below shows the data the student collected for the plastic fibre.

Sample	Mass required to break the plastic fibre / g
1	13 300
2	2 300
3	13 600
4	13 600
Mean	13 500

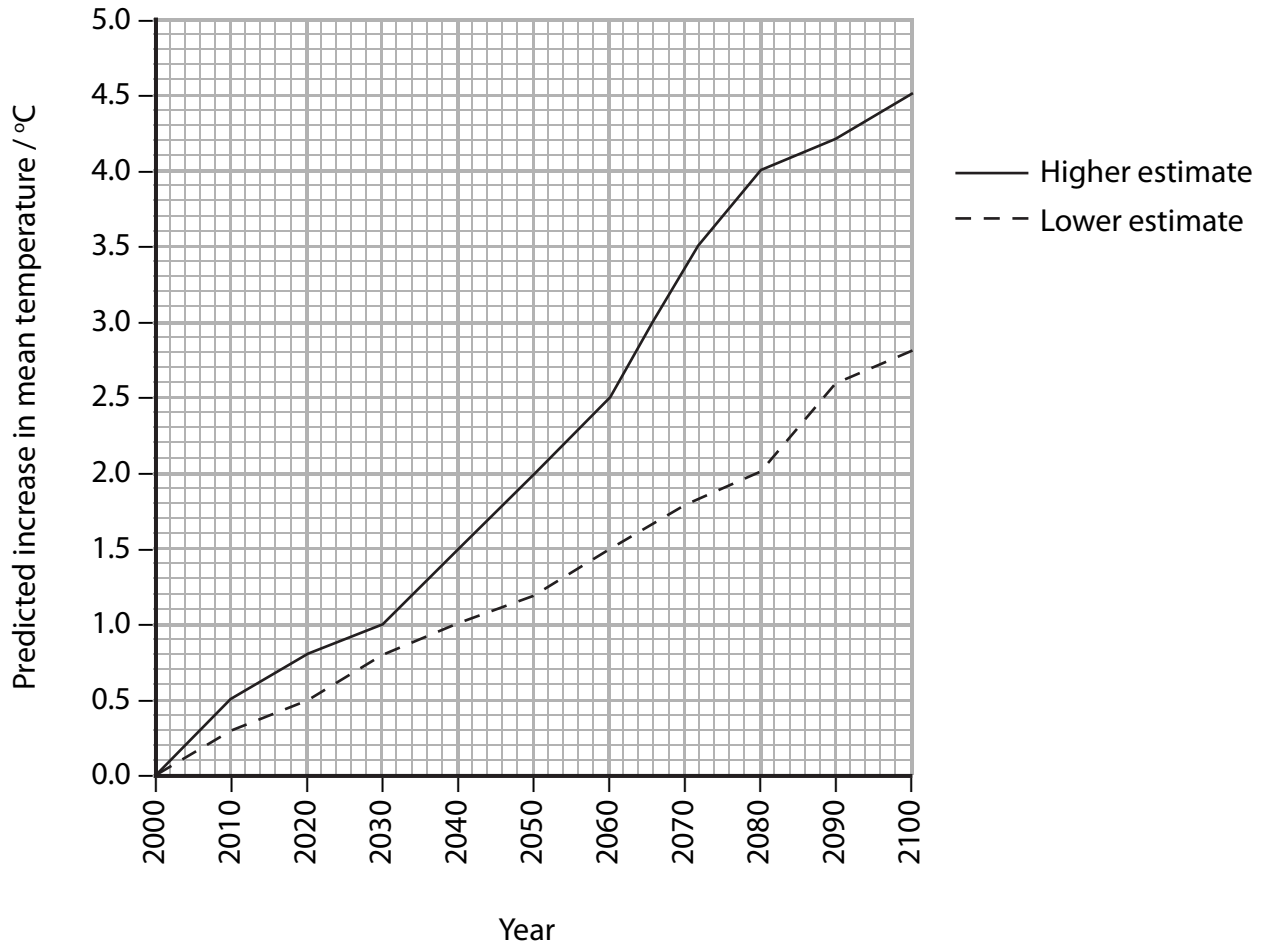
(i) The student calculated the mean using only three of the results from the table.
Explain why the mean for the plastic fibre was calculated using only these three results.

(1)

(ii) Suggest why the use of oil-based plastic fibres such as nylon, rather than plant fibres, does not contribute to sustainability.

(2)

- 4 The mean global temperature is expected to increase as a result of climate change. The graph below shows the predicted changes in mean temperature in New Zealand, during the 21st century. A higher and lower estimate of these changes have been made.



- (a) (i) Explain how increases in carbon dioxide and methane, released into the atmosphere, may be contributing towards the estimated changes in mean temperature shown in the graph.

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(ii) Suggest why a higher estimate and a lower estimate were made.

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(b) Tuataras are reptiles found only on a group of small islands off the coast of mainland New Zealand. Adult tuataras grow to approximately 65 cm in length. They feed on small mammals, bird chicks and invertebrates such as insects and worms.



Tuataras build nests in which their eggs are laid. The gender (sex) of the tuatara, that hatches from an egg, is determined by the incubation temperature in the nest. A temperature of 22 °C or above will mean that a male tuatara will hatch. Female tuataras only hatch from eggs incubated below 22 °C.

During the breeding season in 2000, the temperature of the nests ranged between 18 °C and 24 °C.

- (i) Suggest how the changes in the mean temperature, shown in the graph on page 6, might affect the tuataras on the islands off the coast of New Zealand.

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- (ii) Suggest how other animal populations on these islands might be affected by changes in the tuatara population.

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(Total for Question 4 = 10 marks)