

Biology

Higher level

Paper 1B

12 May 2025

Zone A afternoon | Zone B afternoon | Zone C afternoon

Candidate session number

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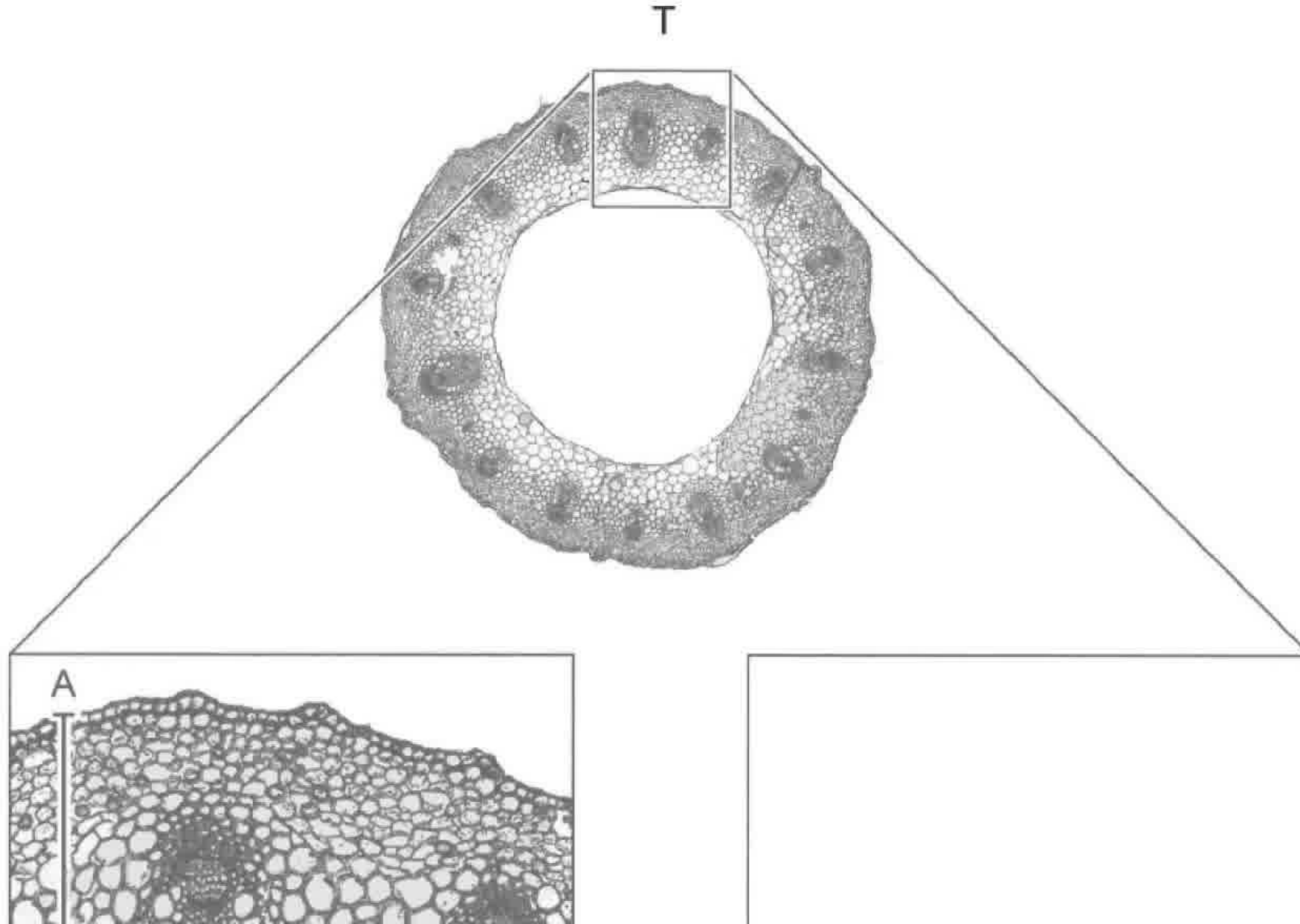
2 hours [Paper 1A and Paper 1B]

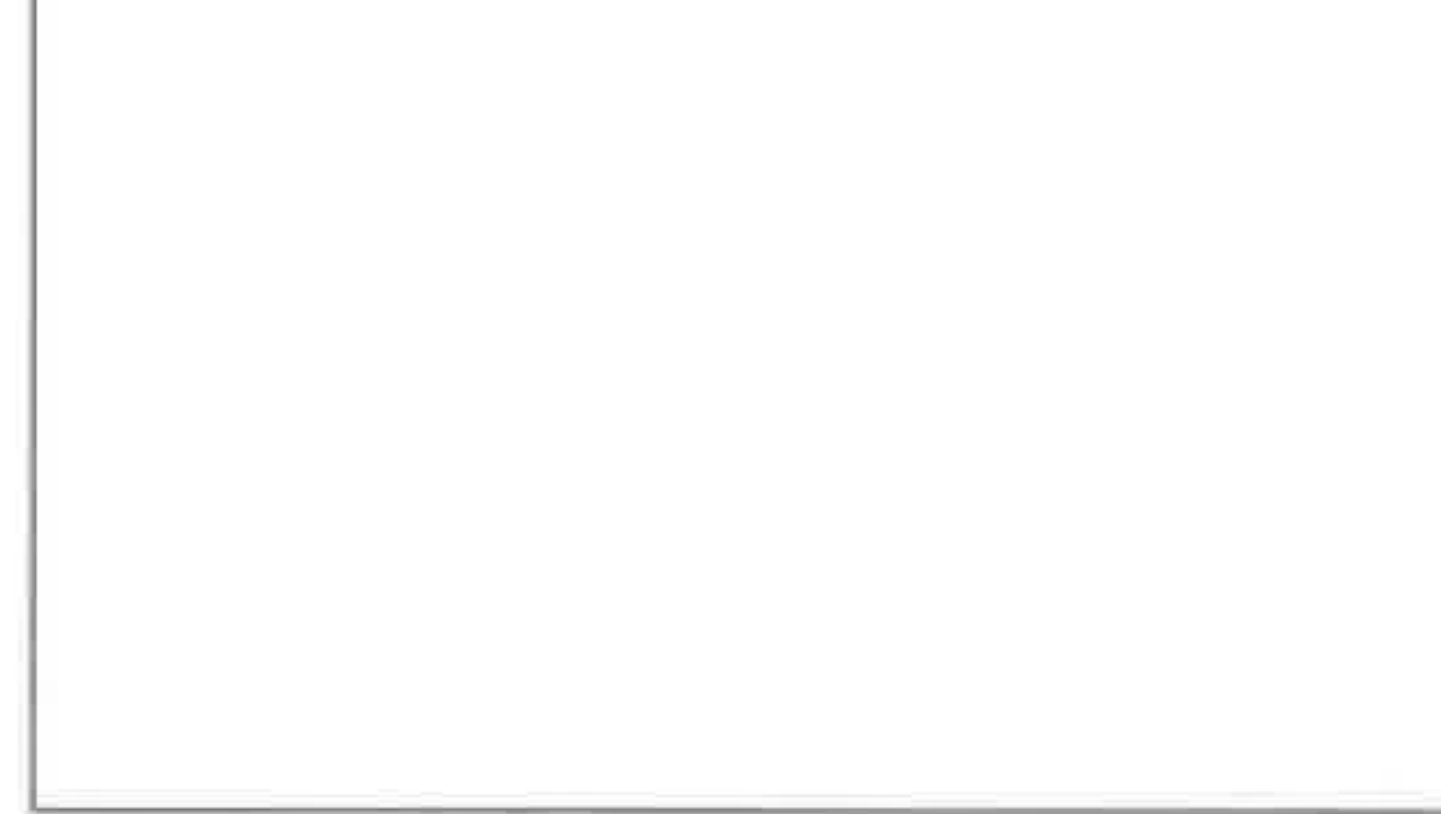
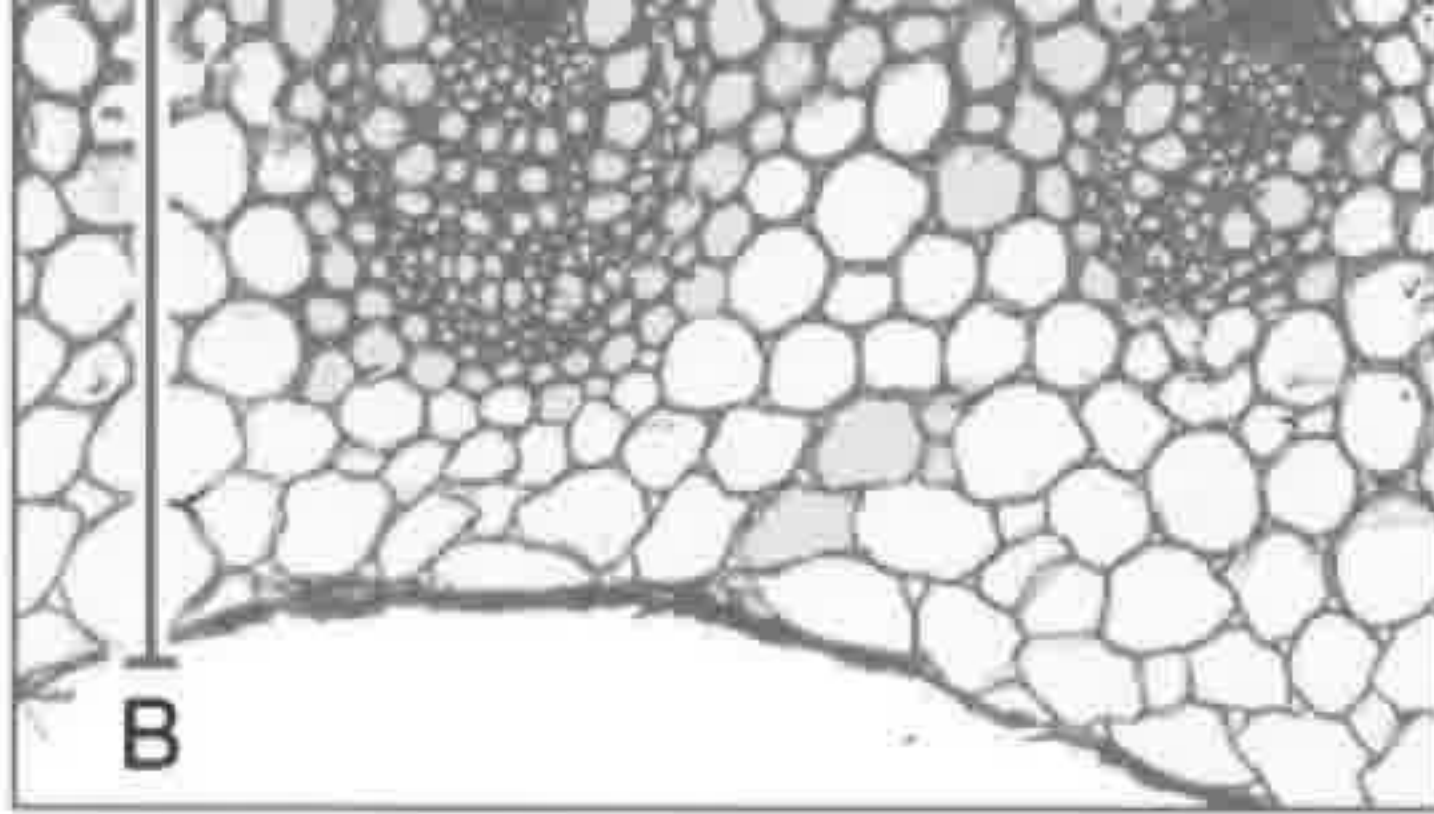
Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for paper 1B is **[35 marks]**.
- The maximum mark for paper 1A and paper 1B is **[75 marks]**.



1. The micrograph shows a buttercup (*Ranunculus bulbosus*) stem in transverse section. Region T has been highlighted to show more detail.





- (a) In the right-hand box, draw a **labelled** plan diagram of region T to show the distribution of tissues. [3]

- (b) (i) Calculate the actual thickness of the stem, measured by the line AB that has been magnified $100\times$. [1]

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(Question 1 continued)

- (ii) Outline how the actual thickness of the stem could be calculated using a microscope with an eyepiece graticule.

[1]

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- (c) State **one** way in which plants can protect themselves from herbivores.

[1]

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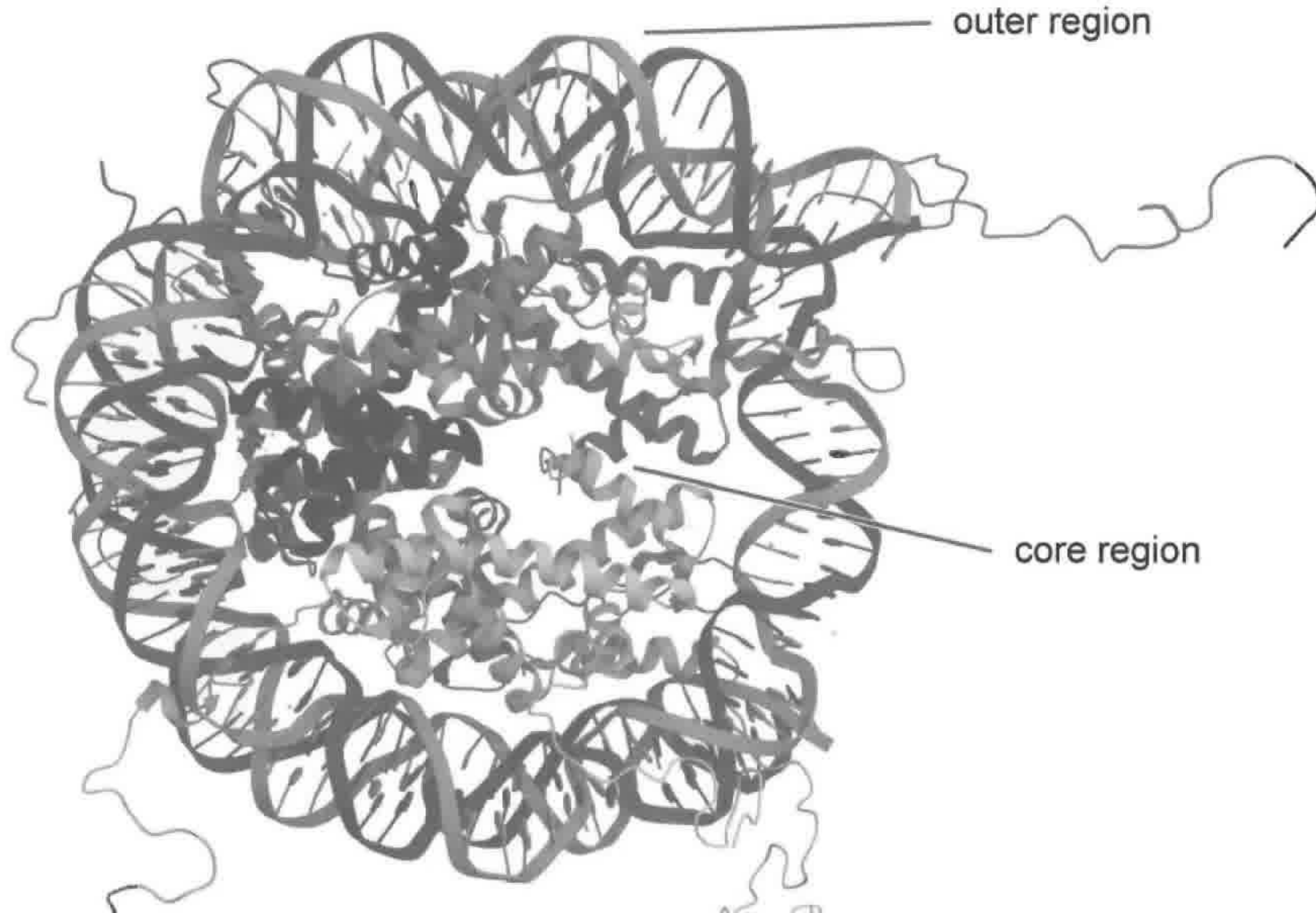
- (d) Explain **two** adaptations of leaves that allow plants to live in hot deserts.

[2]

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2. Molecular visualization software was used to produce the representation of a human nucleosome.



(a) Using the image,

(i) identify, giving a reason, the molecule found in the outer region. [1]

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.....

(ii) describe the structure of the core region. [2]

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(Question 2 continued)

(b) Suggest a reason that nucleosomes are absent in bacterial DNA. [1]

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(c) Explain how DNA can be used in cladistics. [4]

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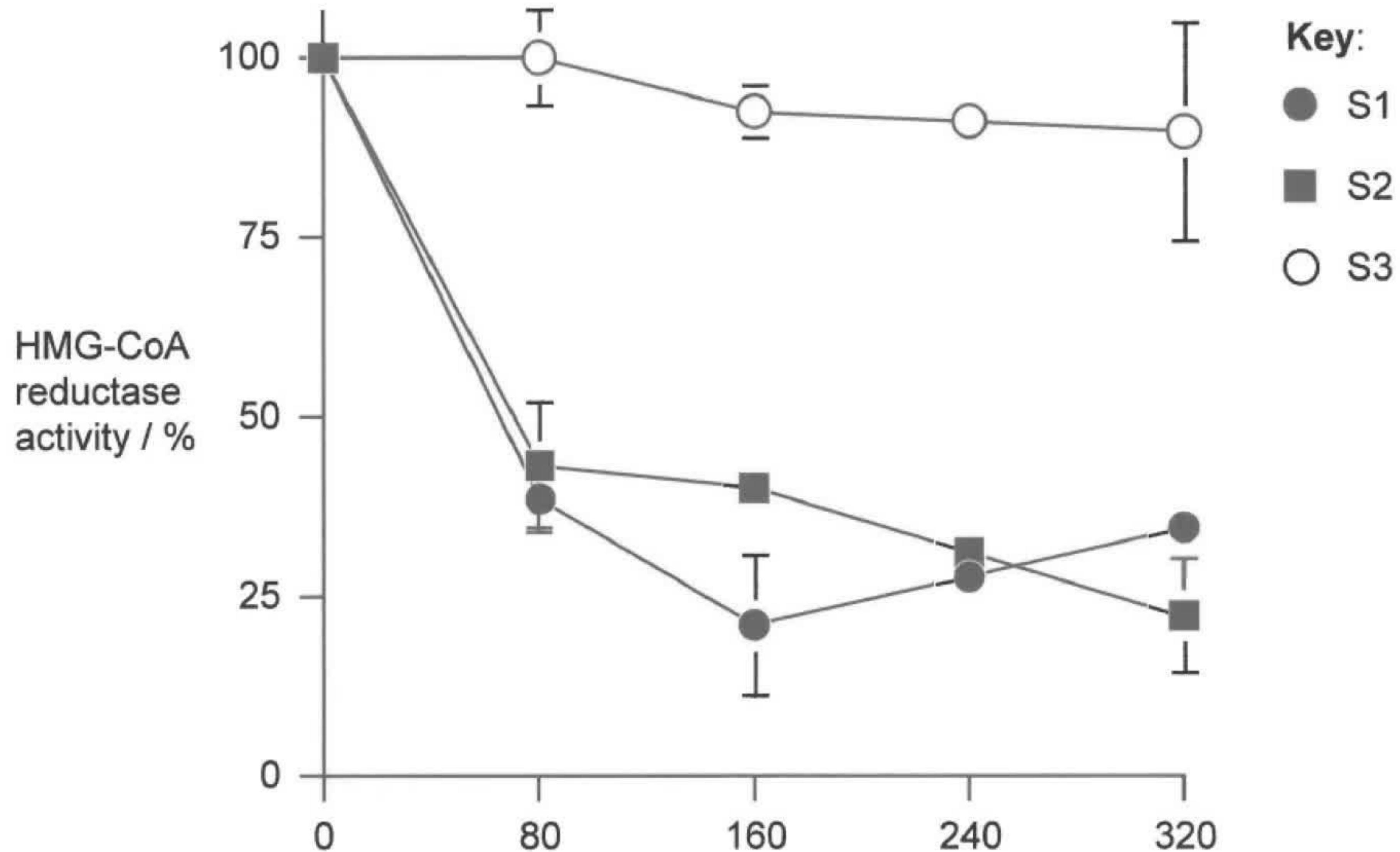
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3. The inhibitory effect of three different statins (S1, S2 and S3) on the activity of HMG-CoA reductase, an enzyme involved in cholesterol metabolism in the liver, was investigated.



0 80 160 240 320

Concentration of inhibitor / μM

- (a) (i) Identify an independent variable in this investigation. [1]

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- (ii) State **one** variable that needs to be controlled. [1]

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(Question 3 continued)

(b) Compare and contrast the effect of increasing concentrations of S1 and S2 on the mean activity of HMG-CoA reductase.

[3]

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(c) Outline how the rate of reaction of HMG-CoA reductase can be calculated.

[1]

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- (d) Statins limit the synthesis of cholesterol by acting as competitive inhibitors.
Distinguish between competitive and non-competitive inhibition.

[1]

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- (e) Describe the role of enzymes in **one named** process that prevents infections in the human body.

[2]

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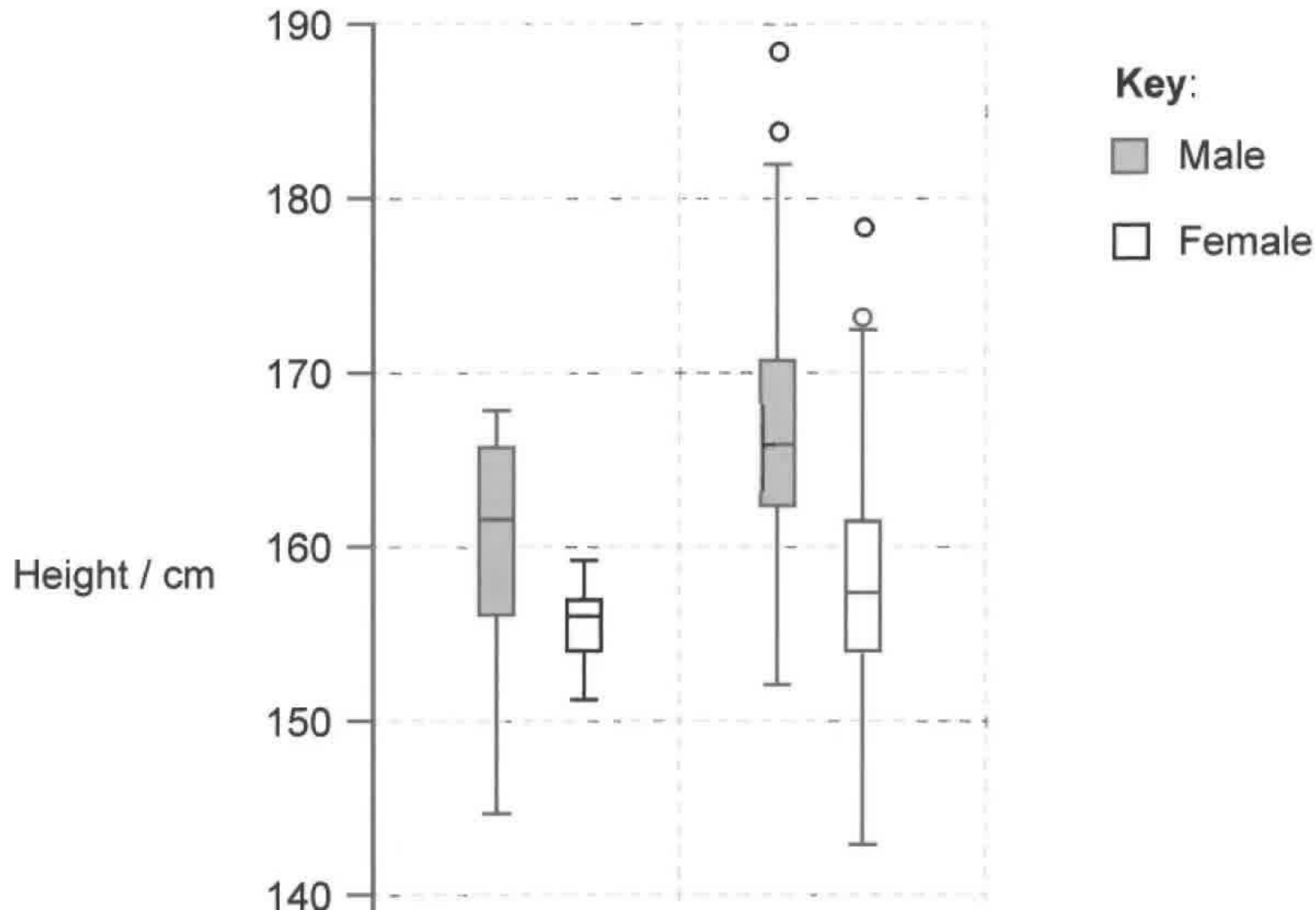
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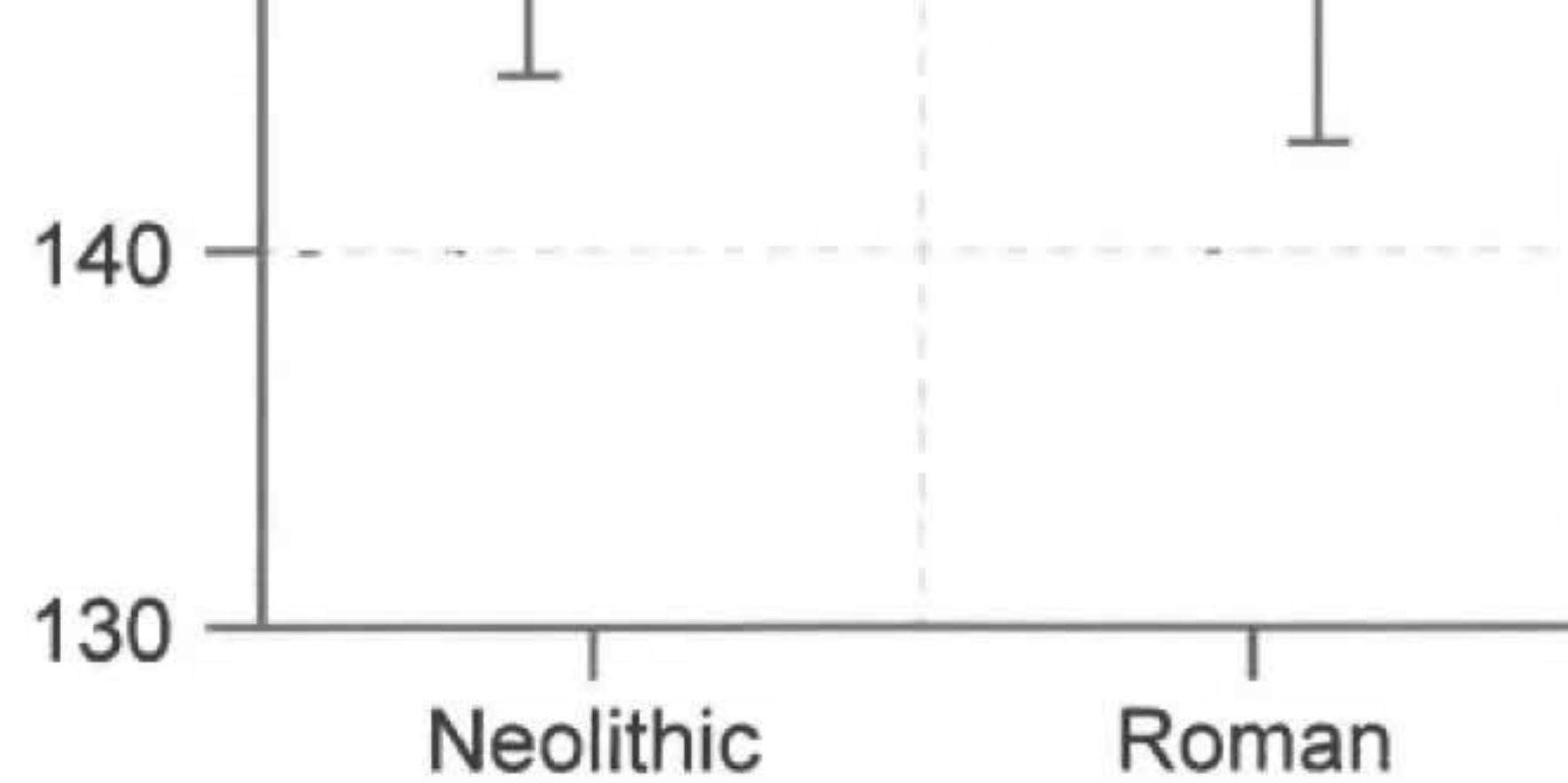
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4. Male and female human skeletons obtained from different archaeological sites in Greece were studied in order to find trends in human height evolution in Europe. The box-and-whisker plots show heights of skeletons dating from two historical periods: Neolithic (6500–3000 BC) and Roman (146–324 AD).





(a) Using the graph,

(i) estimate the median height of females in the Roman period.

[1]

..... cm

(ii) estimate the maximum height of males in the Neolithic period.

[1]

..... cm

(iii) State the reason that some of the data points were plotted outside the whiskers. [1]

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(b) Using the data, discuss the hypothesis that variation in human height is due to polygenic inheritance. [2]

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(c) Phenotypic variation allows natural selection within populations. Compare and contrast directional and disruptive selection. [2]

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(d) Discuss the use of the Hardy–Weinberg equation in population genetics studies.

[3]

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