Biology
Higher level
Paper 1B

12 May 2025

Zone A afternoon | **Zone B** afternoon | **Zone C** afternoon

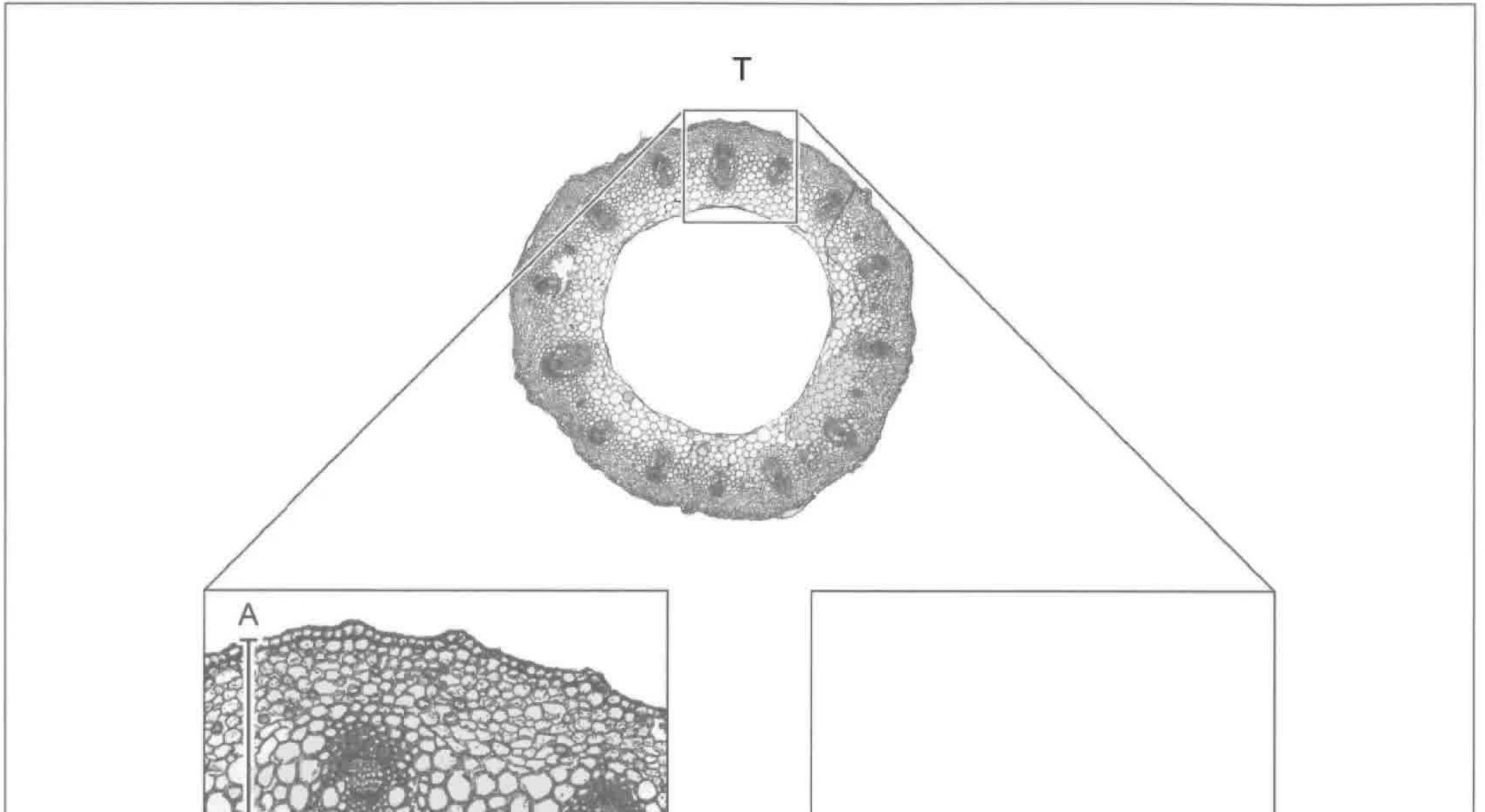
Candidate session number

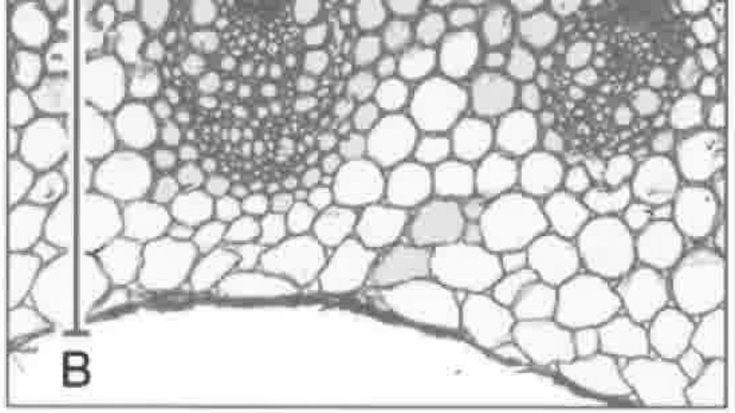
2 hours [Paper 1A and Paper 1B]

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×. [1]

. . . . . .

(ii) Outline how the actual thickness of the stem could be calculated using a microscope with an eyepiece graticule. [1]

. . . . . .

. . . . . .

(c) State **one** way in which plants can protect themselves from herbivores. [1]

. . . . . .

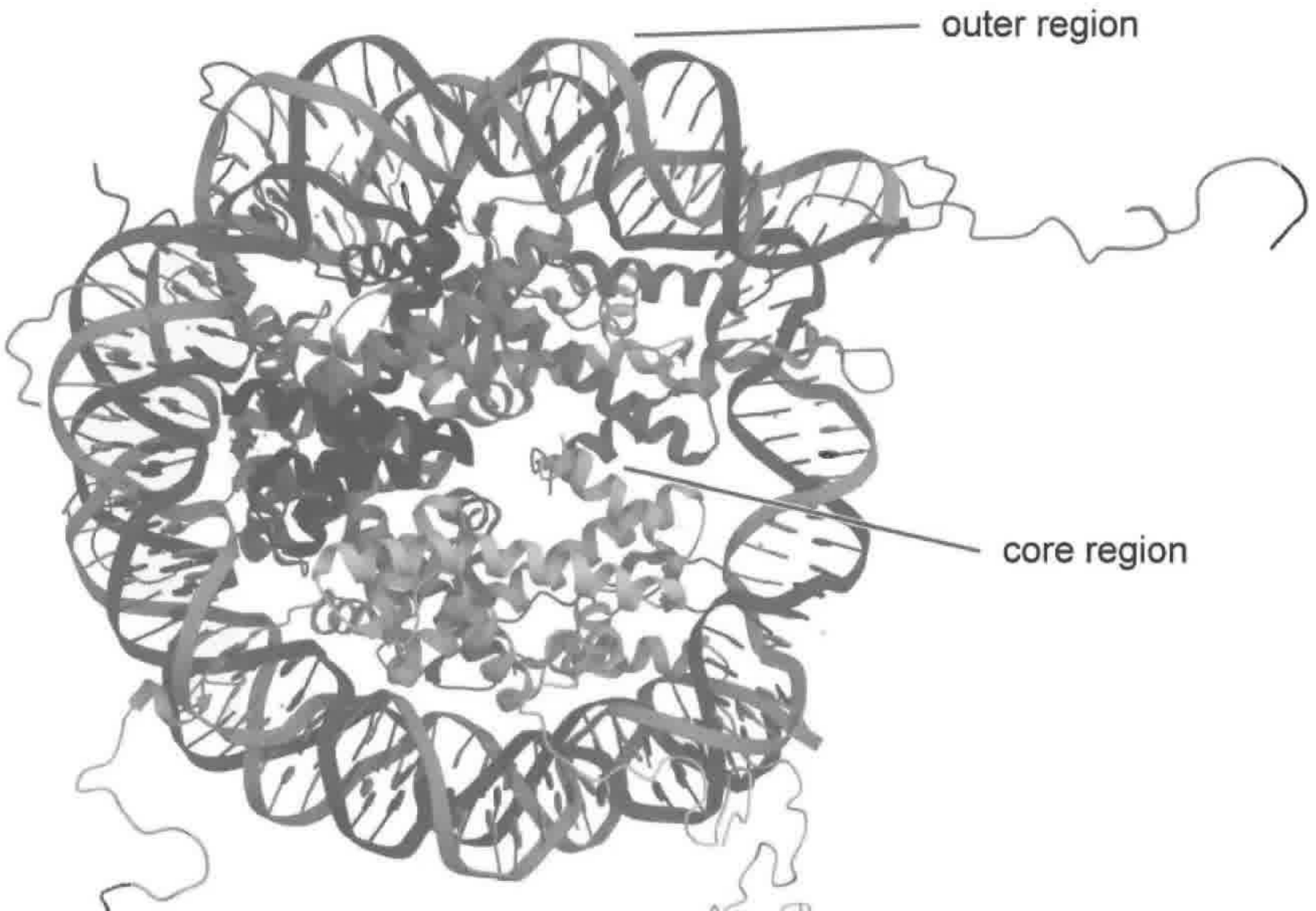
. . . . . .

(d) Explain **two** adaptations of leaves that allow plants to live in hot deserts. [2]

. . . . . .

. . . . . .

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]

. . . . . .

. . . . . .

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

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(Question 2 continued)

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

. . . . . .

. . . . . .

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

. . . . . .

. . . . . .

. . . . . .

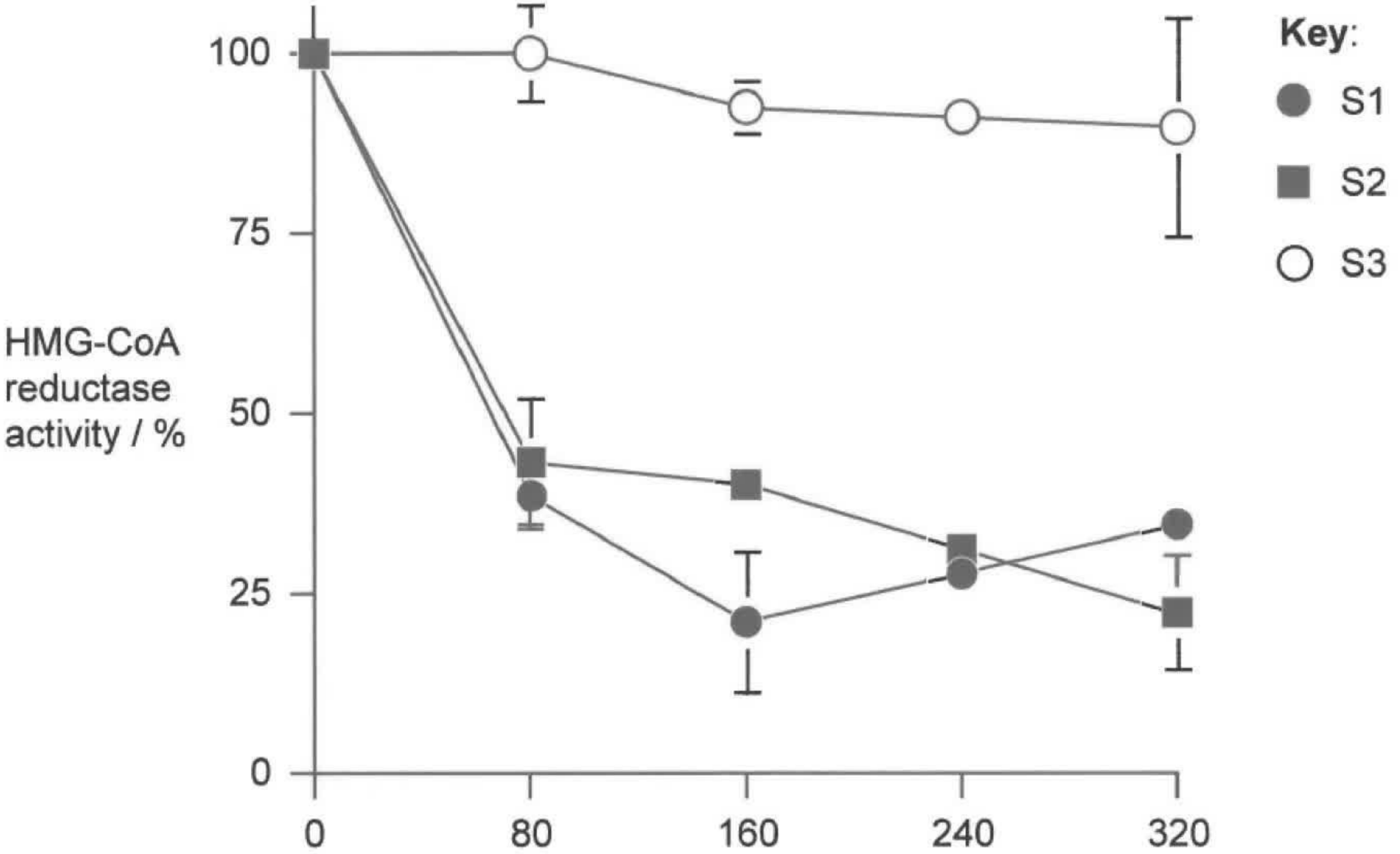
. . . . . .

. . . . . .

. . . . . .

. . . . . .

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]

. . . . . .

. . . . . .

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

. . . . . .

. . . . . .

(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]

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(c) Outline how the rate of reaction of HMG-CoA reductase can be calculated. [1]

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(d) Statins limit the synthesis of cholesterol by acting as competitive inhibitors. Distinguish between competitive and non-competitive inhibition. [1]

. . . . . .

. . . . . .

(e) Describe the role of enzymes in **one named** process that prevents infections in the human body. [2]

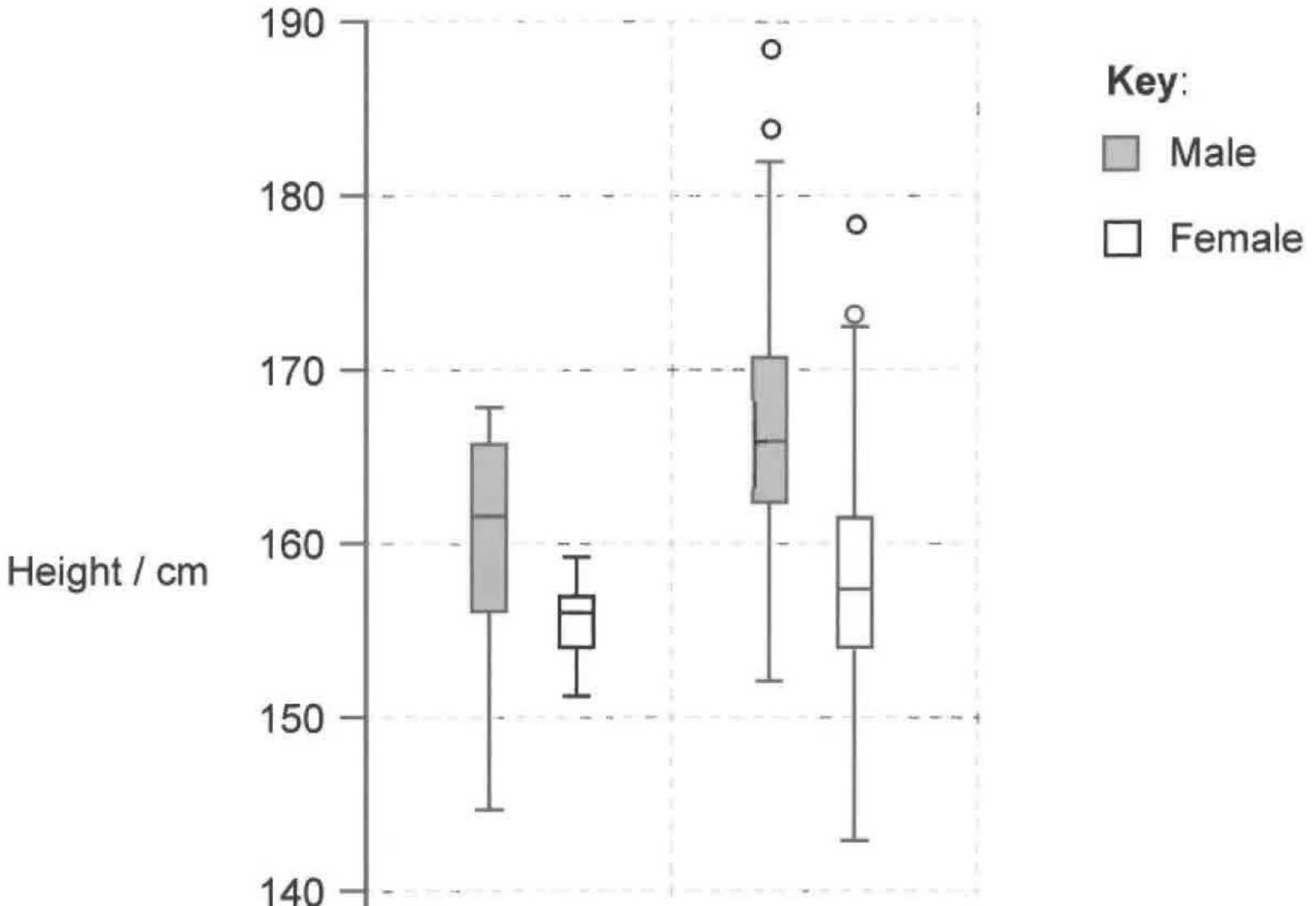
. . . . . .

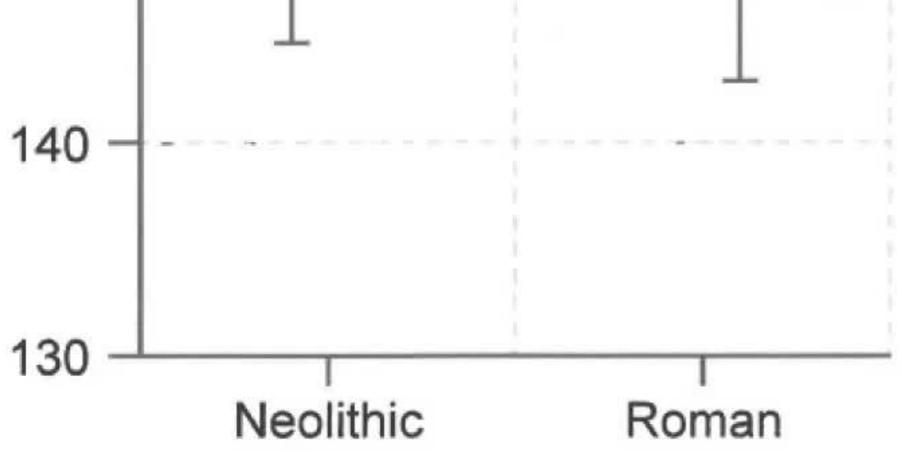
. . . . . .

. . . . . .

. . . . . .

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]

. . . . . .

. . . . . .

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

. . . . . .

. . . . . .

. . . . . .

. . . . . .

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

. . . . . .

(d) Discuss the use of the Hardy–Weinberg equation in population genetics studies. [3]