Diploma Programme
Programme du diplôme
Programa del Diploma

Biology
Higher level
Paper 1B

11 May 2026

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

Session number

2 hours [Paper 1A and Paper 1B]

Instructions to students

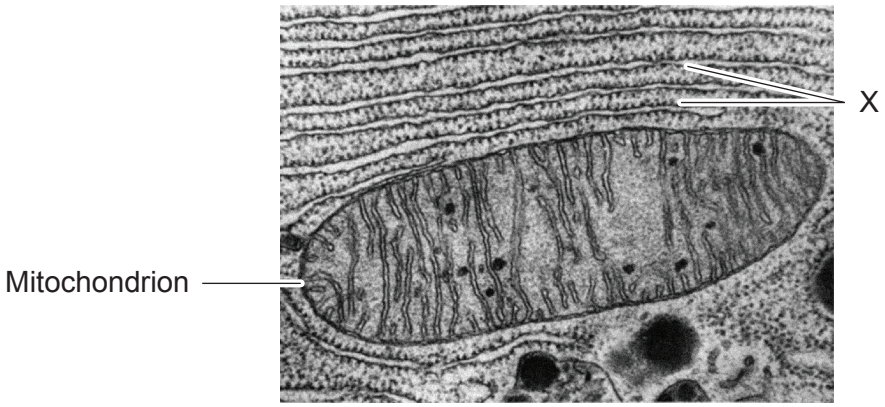
- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for paper 1B is **[35 marks]**.
- The maximum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

2226–4017

9 pages

Answer **all** questions. Answers must be written within the answer boxes provided.

1. The electron micrograph shows part of a cell.



(a) (i) Draw a labelled diagram of the structures of the mitochondrion that are visible in the micrograph. [3]

(ii) The organelles labelled X are also contained inside the mitochondria. Distinguish between X and these organelles inside the mitochondria. [1]

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(iii) Structure X synthesizes proteins for secretion out of the cell. State another organelle required for this process. [1]

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(This question continues on the following page)

(Question 1 continued)

(b) Explain how to prepare and view a temporary mount of a tissue such as onion (*Allium cepa*) epidermis. [3]

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2. A student monitored their heart rate and blood pressure (BP) before, during and after (recovery period) exercise. The graph shows the data they collected.

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(a) (i) Calculate the maximum increase in systolic blood pressure from the beginning of the investigation. [1]

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(ii) Compare and contrast the change in heart rate and systolic blood pressure during the investigation. [2]

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(Question 2 continued)

(iii) Suggest a reason for the changes seen in diastolic blood pressure over the course of the investigation. [1]

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(b) (i) State the adaptation in the capillaries of some tissues for extremely rapid exchange. [1]

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(ii) Distinguish between the structure of arteries and veins. [3]

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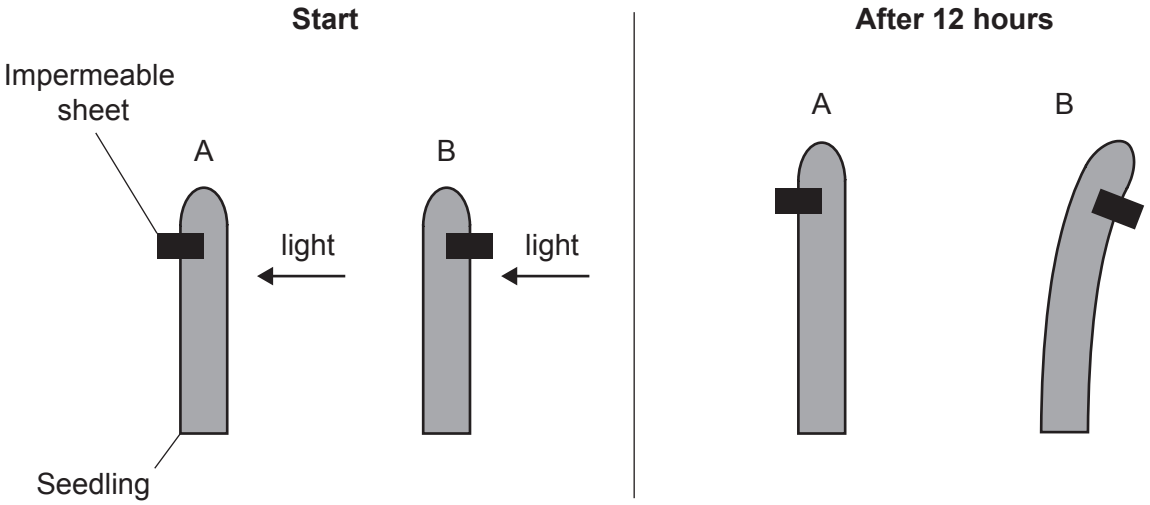
3. Researchers inserted small pieces of impermeable plastic sheet into opposite sides of two seedlings, A and B, that were growing vertically. They exposed the seedlings to unilateral light (light from one direction) for 12 hours. The diagram shows the results.



(a) (i) Identify the response shown by seedling B. [1]

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(ii) Suggest a control for this investigation. [1]

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(iii) Explain the difference in the appearance of seedlings A and B after 12 hours. [3]

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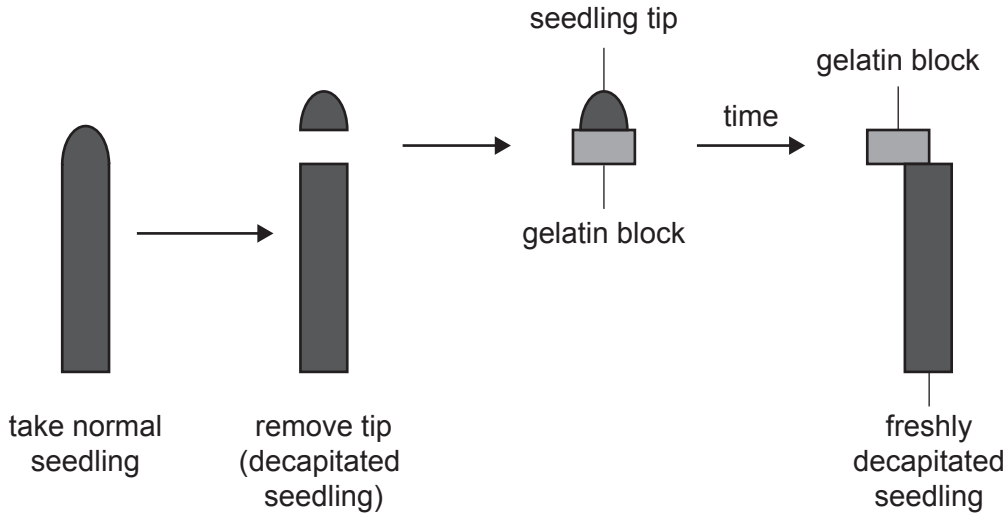
(Question 3 continued)

(b) In another experiment carried out in the dark, 10 tips of seedlings were removed. Each tip was placed on a separate block of gelatin, which can absorb chemicals. Every hour, a tip was removed from one gelatin block, and the block was placed on a freshly decapitated seedling, as shown in the diagram.



(i) Once the blocks were added to the freshly decapitated seedlings, the seedlings were left for 48 hours before the results were recorded. Predict the results of the experiment. [2]

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(ii) Suggest a quantitative measurement for this experiment. [1]

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(c) Outline how the phytohormone ethylene (ethene) promotes fruit ripening. [1]

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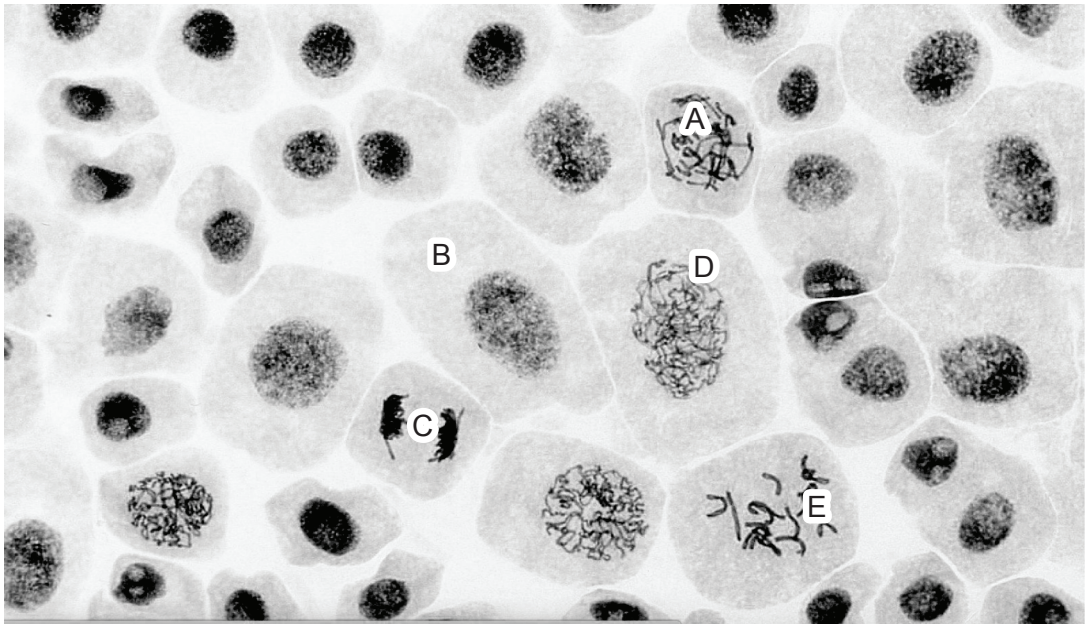
4. Students examined cells from an onion (*Allium cepa*) root tip under the microscope. The micrograph shows a section through the tissue.



(a) (i) List the letters of the cells in order of the phases of mitosis. [1]

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(ii) Identify the phase shown in cell C. [1]

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(iii) State **one** phase that is **not** shown in the micrograph. [1]

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(Question 4 continued)

(b) The mitotic index of 160 cells in meristem tissue was 0.25. Calculate the number of cells in cell division. [1]

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(c) Distinguish between the cells produced at the end of mitosis and meiosis. [2]

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(d) Onion plants are hermaphroditic. Discuss how hermaphroditic plants increase genetic variation in offspring. [4]

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References:

1. Used with permission of Elsevier Science & Technology Journals, from *The cell*, Don W. Fawcett, 1981; permission conveyed through Copyright Clearance Center, Inc.

4. Doc. RNDr. Josef Reischig, CSc. https://commons.wikimedia.org/wiki/File:Mitosis_%28261_15%29_Pressed;_root_meristem_of_onion.jpg. Licensed under CC BY-SA 3.0 https://creativecommons.org/licenses/by-sa/3.0.

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