Diploma Programme
Programme du diplôme
Programa del Diploma

Biology
Higher level
Paper 1B

28 October 2025

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

Candidate session number

2 hours [Paper 1A and Paper 1B]

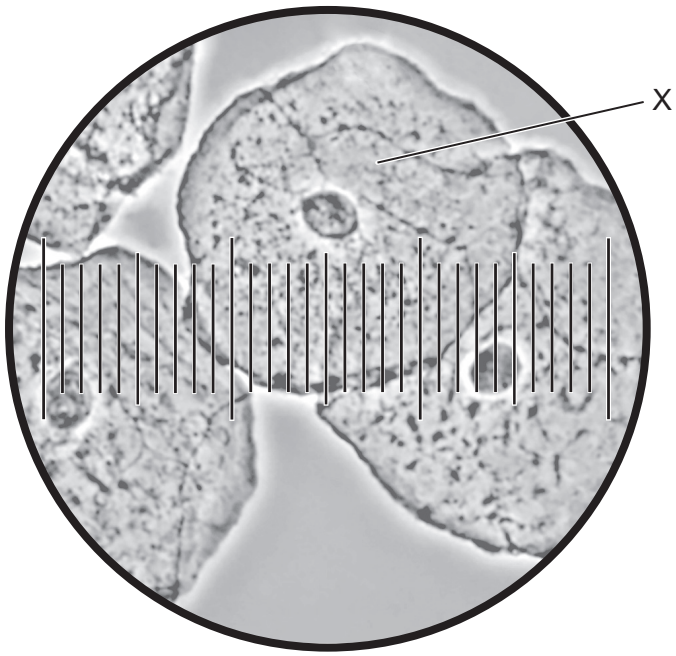
Instructions to candidates

- 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]**.

8825–6020

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

1. The micrograph is an image of human cheek cells viewed with a light microscope.



(a) Identify the piece of equipment that is used together with the microscope to measure the size of the cells. [1]

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(b) Each small division of the scale in the micrograph is equivalent to 2.5μm.

(i) Calculate the diameter of the cell labelled X. [1]

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(This question continues on the following page)

(Question 1 continued)

(ii) Calculate the magnification of the image. [1]

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(c) The electron micrograph shows part of an animal cell.

Outline the functions of Y and Z in the cell. [2]

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Please **do not** write on this page.

Answers written on this page
will not be marked.

(Question 1 continued)

(d) Viruses depend on living cells to reproduce. Compare and contrast the lysogenic and lytic cycles of the bacteriophage lambda. [3]

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2. Ehlers–Danlos syndrome (EDS) causes joint hypermobility, where joint movement extends well beyond the normal range. Researchers used two different methods to measure angles of movement at a joint of the smallest (fifth) finger.

(a) Suggest in which direction the finger was moved to assess hypermobility. [1]

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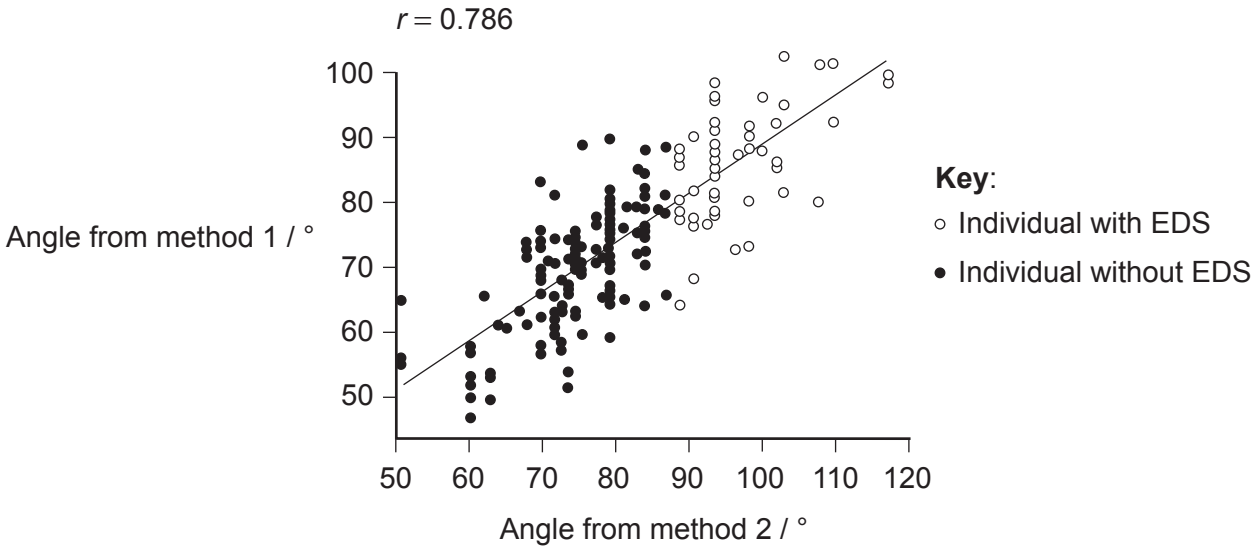
The graph shows all angles of movement of the finger, measured in degrees (°) using both methods.



(b) Suggest a method which could have been used to measure the angle of movement of the finger. [1]

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(c) Estimate the threshold (minimum) angle for a diagnosis of EDS. [1]

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(Question 2 continued)

(d) Suggest which structure at the finger joint is affected by EDS. [1]

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(e) Describe the level of correlation between the data from the two measurement methods. [1]

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(f) Joints are part of the musculoskeletal system of animals, which provides support and movement to the body. Xylem provides support in plants and also transports water and minerals. Explain the adaptations of xylem for its functions. [3]

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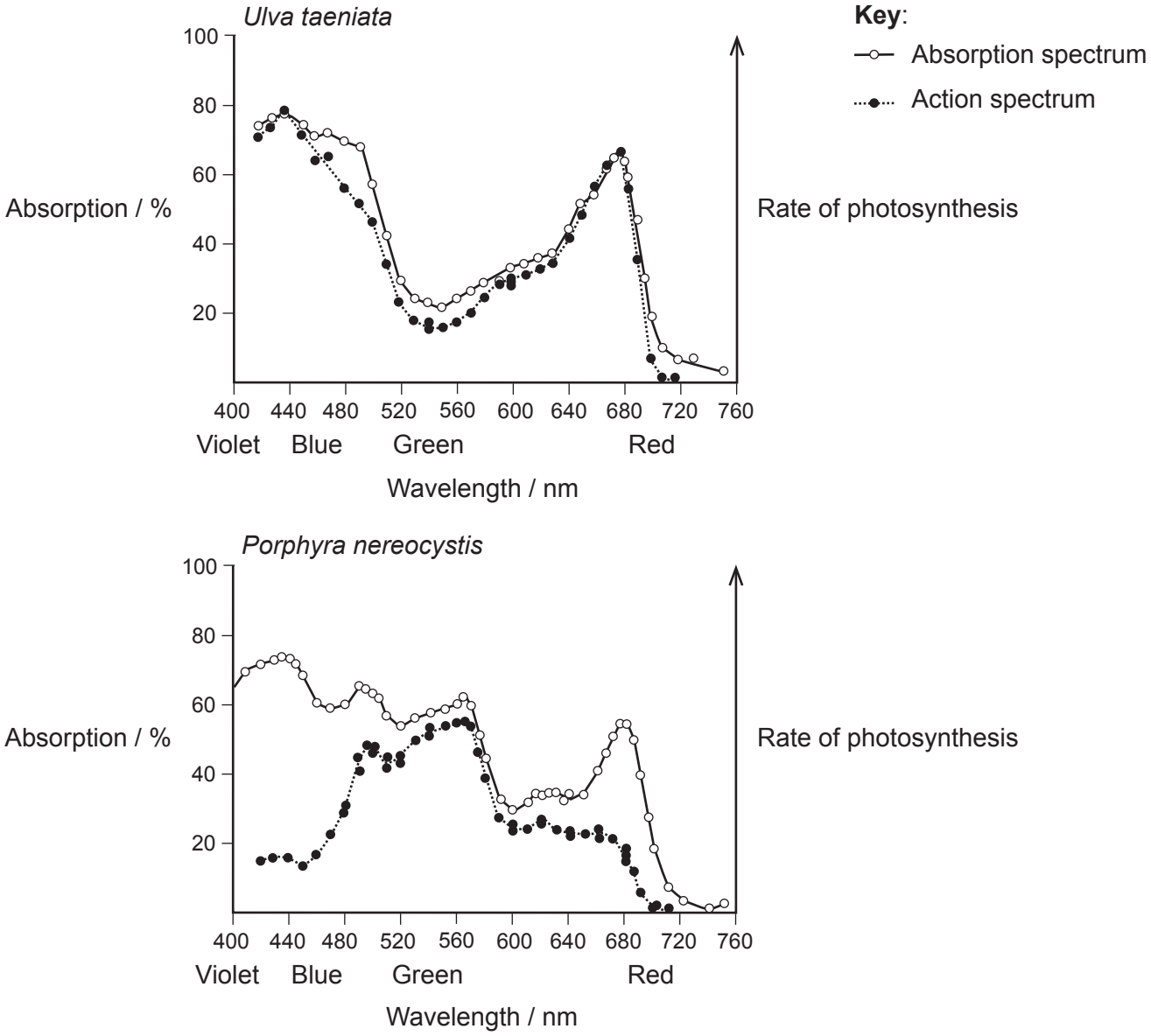
3. In water, shorter wavelengths of light such as blue and green penetrate deepest, and longer wavelengths of light penetrate less far. Red light does not reach depths of more than 50 m. Marine algae live at various water depths. Certain species of algae contain the pigments that enable them to adapt to life at different depths.

The graphs show the absorption and action spectra for two species of algae: *Ulva taeniata*, which is green, and *Porphyra nereocystis*, which is red.



(a) In each species, identify the colour of light that is used mainly for photosynthesis. [2]

Ulva taeniata: . . . . . .

Porphyra nereocystis: . . . . . .

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(Question 3 continued)

(b) Deduce, with a reason, which algae lives at a greater depth. [1]

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(c) Describe how the rate of photosynthesis could be measured in a marine alga, to produce an action spectrum. [3]

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(d) Outline the structure and location of photosystems. [2]

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(e) State the method used to separate photosynthetic pigments in a leaf extract. [1]

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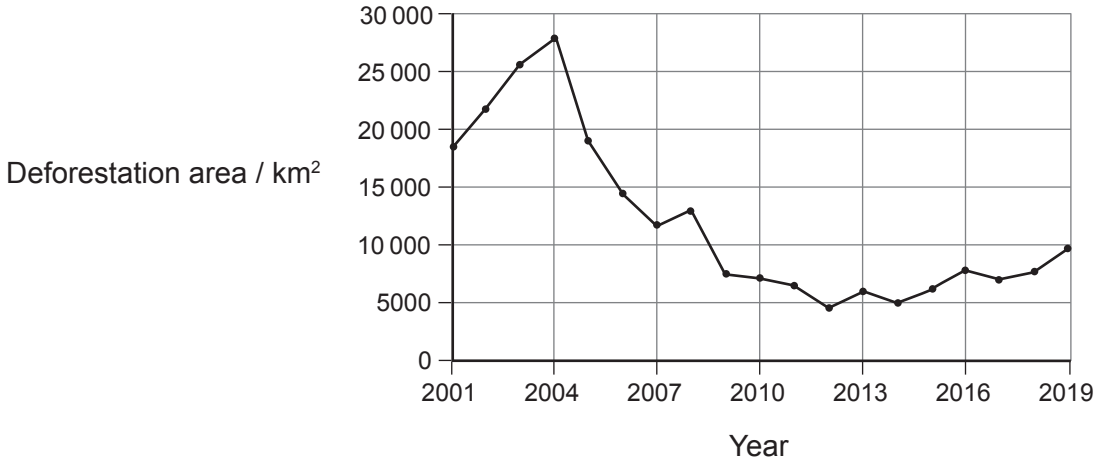
4. Satellite imagery has been used for many years in the Amazon rainforest to monitor deforestation. Annual deforestation can be calculated using data from several satellites that have varying levels of accuracy. The graph shows the area of the Amazon rainforest that was deforested each year from 2001 to 2019, calculated using satellite images.



(a) Calculate the percentage decrease from the maximum deforestation area on the graph to the area in 2019. [1]

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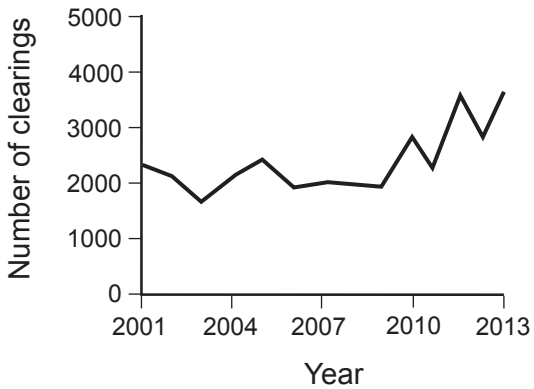
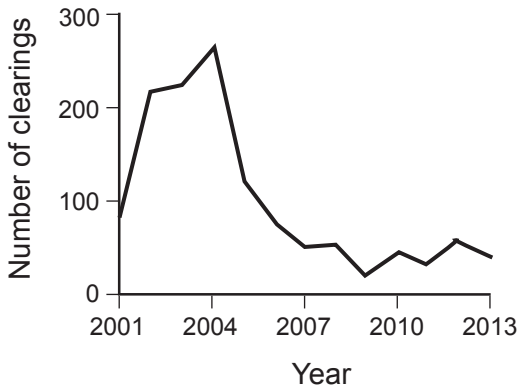
Other researchers have studied deforestation in relation to the size of new clearings (deforested areas) within forests. The graphs show the numbers of new clearings smaller than 1 hectare and larger than 1000 hectares, between 2001 and 2013. 1 hectare is 0.01 km².

Forest clearings smaller than 1 hectare



Forest clearings larger than 1000 hectares



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(Question 4 continued)

(b) Suggest a reason that the number of small clearings increased while the number of large clearings decreased greatly since 2004. [1]

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(c) The Amazon rainforest currently releases very large amounts of water vapour into the atmosphere through transpiration. Suggest **one** consequence of this. [1]

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(d) Discuss how the isolation of populations due to the fragmentation of forests could lead to changes in gene pools. [3]

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(e) Explain how positive feedback cycles could increase the rate of warming of the Earth. [4]

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References:

1.a Nikon's MicroscopyU, n.d. *Buccal epithelial cells*. [image online] Available at: https://www.microscopyu.com/gallery-images/buccal-epithelial-cells [Accessed 23 October 2024]. Source adapted.

1.c Medcell/Yale University, n.d. [*Micrograph*]. [online] Available at: https://medcell.org/histology/cell_lab/golgi_em.php. [Accessed 23 October 2024]. Source adapted.

2. Sabo, A., Mittal, N., Deshpande, A., Clarke, H. and Taati, B., 2023. *Figure 2*. [image online] Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC10712662/figure/fig2/ [Accessed 23 October 2024]. Source adapted.

3. Used with permission of Rockefeller University Press from Haxo, F.T. and Blinks, L.R., 1949, *Figure 8: Absorption spectrum of the green alga* Ulva taeniata. [image online] Available at: https://rupress.org/jgp/article-abstract/33/4/389/12271/PHOTOSYNTHETIC-ACTION-SPECTRA-OF-MARINE-ALGAE?redirectedFrom=fulltext. Permission conveyed through Copyright Clearance Center, Inc. [Accessed 10 November 2025]. Source adapted.

Used with permission of Rockefeller University Press from Haxo, F.T. and Blinks, L.R., 1949, *Figure 13: Absorption and action spectra of the red alga* Porphyra nereocystis. [image online] Available at: https://rupress.org/jgp/article-abstract/33/4/389/12271/PHOTOSYNTHETIC-ACTION-SPECTRA-OF-MARINE-ALGAE?redirectedFrom=fulltext. Permission conveyed through Copyright Clearance Center, Inc. [Accessed 10 November 2025]. Source adapted.

4.a NASA, 2019. *PRODES Amazon deforestation rate*. [image online] Available at: https://earthobservatory.nasa.gov/images/145988/tracking-amazon-deforestation-from-above [Accessed 23 October 2024]. Source adapted.

4.b Kalamandeen, M., Gloor, E., Mitchard, E., Quincey, D., Ziv, G., Spracklen, D., Spracklen, B., Adami, M., Aragão, L.E.O.C. and Galbraith, D., 2018. *Figure 5: Forest loss across Brazilian and Non-Brazilian Amazon based on GFC Hansen et al. product according to patch sizes*. [image online] Available at: https://www.nature.com/articles/s41598-018-19358-2/figures/5 [Accessed 23 October 2024]. Source adapted.