Diploma Programme
Programme du diplôme
Programa del Diploma

Biology
Standard level
Paper 1B

28 October 2025

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

Candidate session number

1 hour 30 minutes [Paper 1A and Paper 1B]

Instructions to candidates

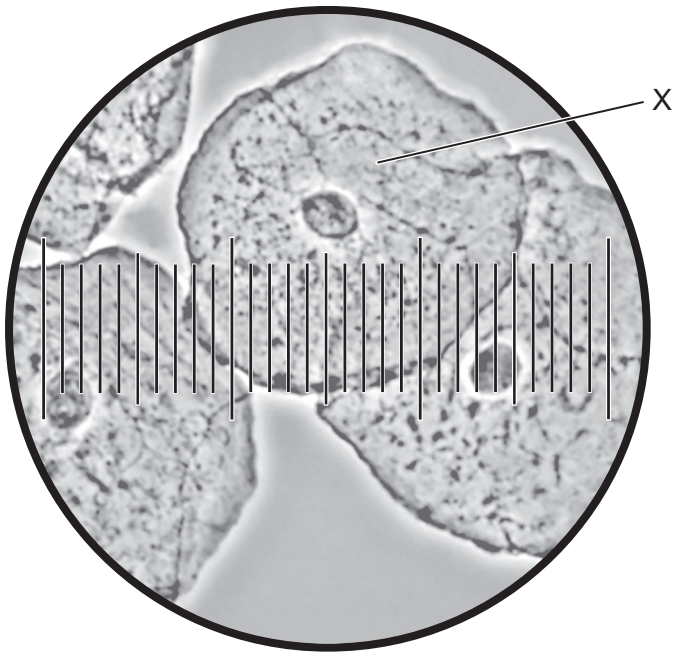
- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for paper 1B is **[25 marks]**.
- The maximum mark for paper 1A and paper 1B is **[55 marks]**.

8825 – 6023

11 pages

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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(Question 1 continued)

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

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(c) Compare and contrast the cell components of eukaryotic and prokaryotic cells. [2]

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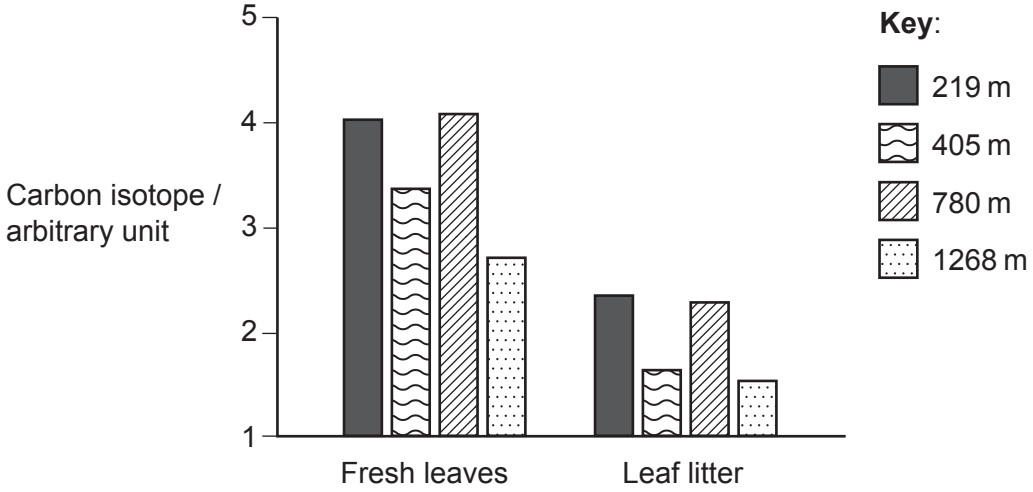
2. A study was conducted on the presence of a form (isotope) of carbon, carbon-13 (^{13}C), in trees at four different altitudes of Lushan, a mountain in central subtropical China.

Samples of fresh leaves and leaf litter (dead leaves on the ground) were taken from altitudes between 219 m and 1268 m. The carbon isotope in the leaves was measured in each sample. Presence of the carbon isotope was measured to indicate the relative uptake of carbon dioxide in photosynthesis.



(a) State the method that is used to measure changes in the distribution of organisms and abiotic factors across a specific distance. [1]

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(b) Compare and contrast the data for fresh leaves with the data for leaf litter. [2]

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(Question 2 continued)

(c) Suggest **one** abiotic variable that would affect the carbon isotope content of the fresh leaves at high altitudes. [1]

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(d) Carbon enters a plant as carbon dioxide from the air. Outline the route that the gas takes to reach chloroplasts in a dicotyledonous plant. [2]

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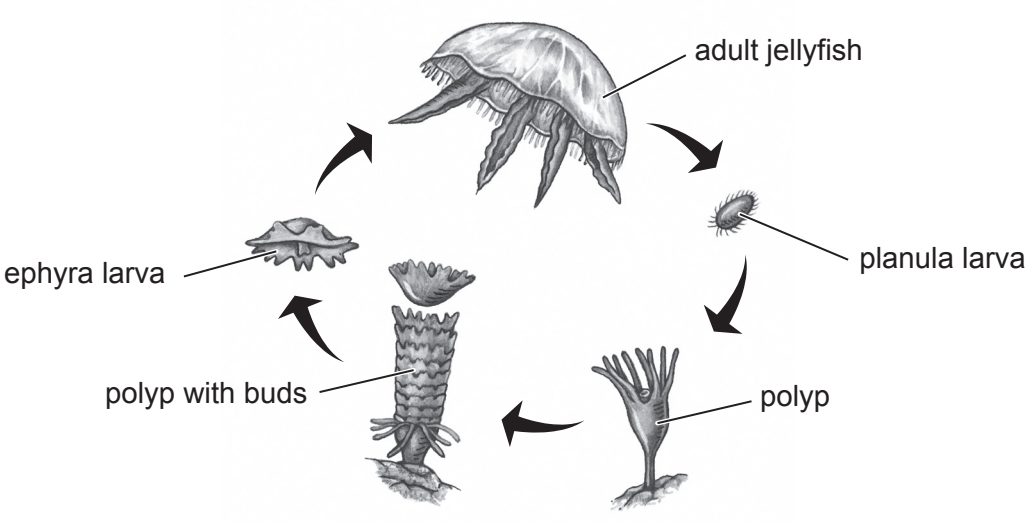
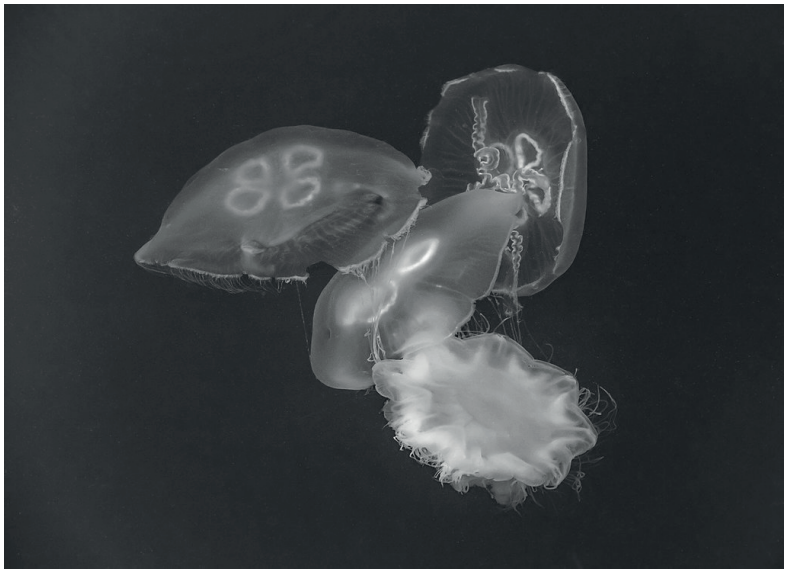
Please **do not** write on this page.

Answers written on this page
will not be marked.

3. The diagram shows the life cycle of a jellyfish. At one stage in the cycle, polyps attach to rocks. The photograph shows adult free-swimming *Aurelia* jellyfish.





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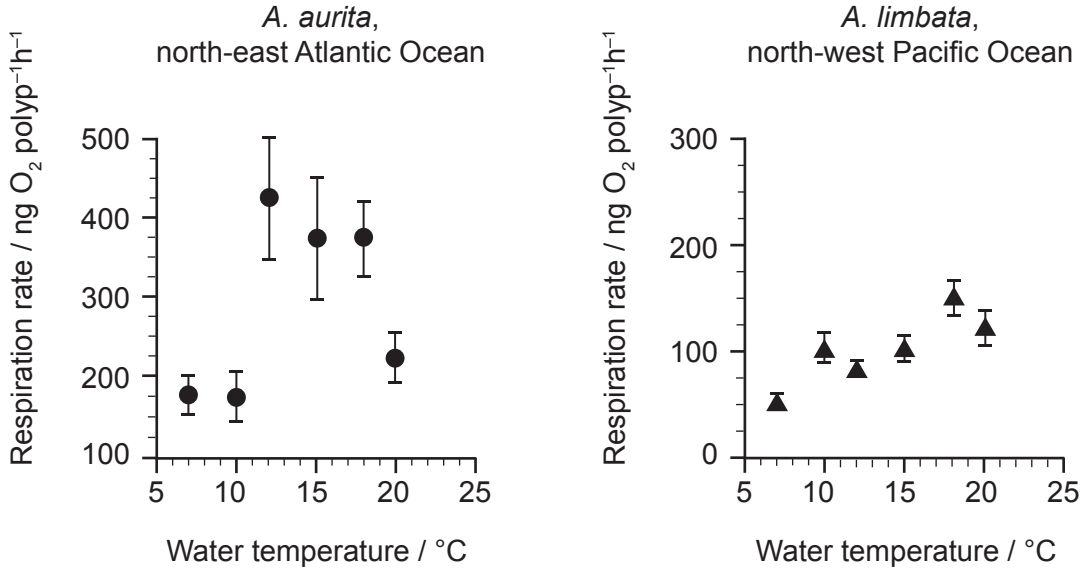
(Question 3 continued)

Waters in the north-east Atlantic Ocean and north-west Pacific Ocean have a similar annual temperature range of 9–13 °C. The mean respiration rate of polyps from two jellyfish species (*Aurelia aurita* and *Aurelia limbata*), collected from the two regions, were measured at different temperatures in the laboratory.



(a) State the instrument that was used to enable calculation of respiration rate. [1]

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(b) Suggest an alternative measurement that could be taken to calculate the respiration rate. [1]

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(c) Calculate the difference between the temperature at which the maximum respiration rate occurs in the two species. [1]

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(Question 3 continued)

(d) A jellyfish bloom is a rapid increase in jellyfish population size. Discuss, using only the data, which species is more likely to form a bloom if the ocean temperature rises 5 °C above its usual range due to global warming. [2]

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(e) Jellyfish have a network of neurons that can transmit impulses in the form of action potentials. Outline how adenosine triphosphate (ATP) from respiration is used to generate the resting potential in neurons. [2]

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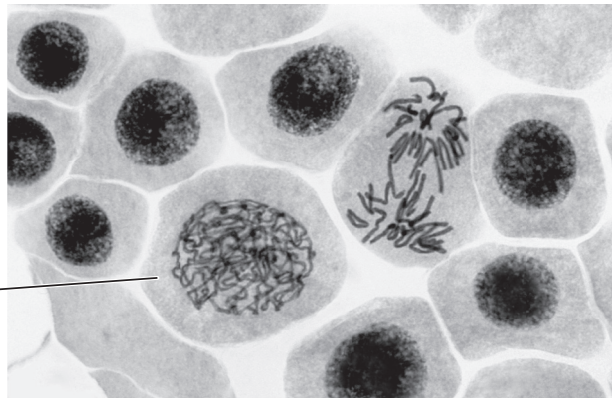
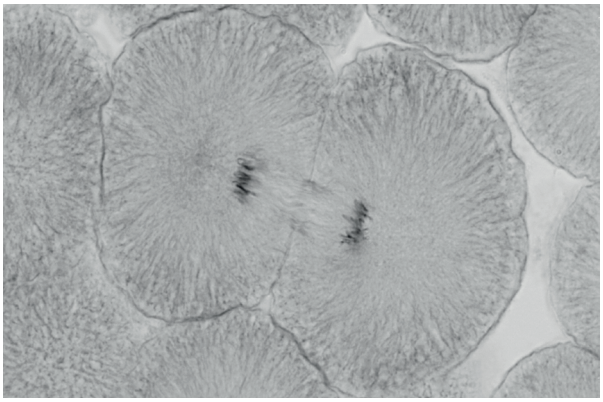
4. Both the genome and the environment of an organism affect its growth and development. Variation between individuals of a species can be continuous or discrete (discontinuous). Mitosis produces identical cells for growth and meiosis allows for variation.

The micrographs show onion and whitefish cells in mitosis.

Onion (*Allium cepa*)



Whitefish (*Coregonus lavaretus*)



(a) Identify the phase of mitosis labelled X. [1]

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(b) The process of cytokinesis is occurring in the whitefish embryo cells. Explain how cytokinesis occurs in this animal cell. [2]

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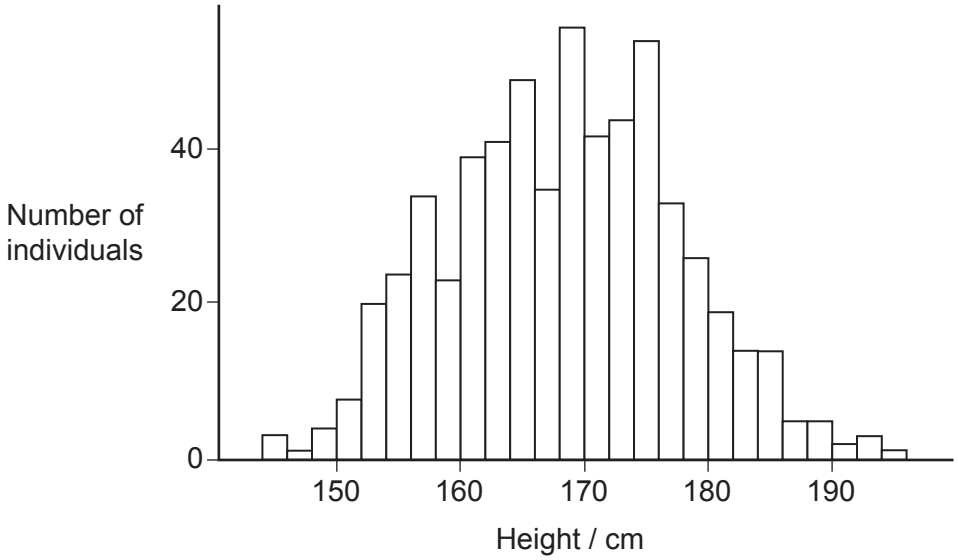
(Question 4 continued)

The National Health and Nutrition Examination Survey in the USA measured heights of individuals aged 21–79. Height is an example of continuous variation.



(c) State the range of heights that is the mode. [1]

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(d) Blood group in humans is an example of discrete (discontinuous) variation. Explain the inheritance of ABO blood groups in humans. [3]

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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.

2.a Du, B., Liu, C., Kang, H., Zhu, P., Yin, S., Shen, G., Hou, J. and Ilvesniemi, H., 2014. *Figure 2.* [image online] Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0086440 [Accessed 23 October 2024]. Reference redacted. Source adapted.

3. Antoniou, E., 2010. *Illustration of life cycle of jellyfish*. [image online] Available at: https://www.gettyimages.co.uk/detail/illustration/illustration-of-life-cycle-of-jellyfish-royalty-free-illustration/95644630?searchscope=image%2Cfilm&adppopup=true [Accessed 23 October 2024]. Source adapted.

W.carter, 2020. *Three moon jellyfishes captured by a lion's mane jellyfish 1*. [image online] Available at: https://en.wikipedia.org/wiki/File:Three_moon_jellyfishes_captured_by_a_lion%27s_mane_jellyfish_1.jpg Licensed under the Creative Commons CC BY-SA 4.0 license: https://creativecommons.org/licenses/by-sa/4.0/. [Accessed 6 November 2025]. Source adapted.

Reprinted from *Journal of Experimental Marine Biology and Ecology*, Volume 459, 2014, by Gambill, M. and Peck, M.A., Respiration rates of the polyps of four jellyfish species: Potential thermal triggers and limits, pages 17–22. Available at: https://www.sciencedirect.com/science/article/pii/S0022098114001245?ref=pdf_download&fr=RR-2&rr=8c9306260f77cdaf [Accessed 23 October 2024]. Source adapted.

4.a Reischig, J., 2014. *Mitosis (261 14)*. [image online] Available at: https://commons.wikimedia.org/wiki/File:Mitosis_(261_14)_Pressed;_root_meristem_of_onion_(cells_in_prophase,_anaphase).jpg. Licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license: https://creativecommons.org/licenses/by-sa/3.0/deed.en. [Accessed 23 October 2024]. Source adapted.

Reschke, E., 2012. *Whitefish mitosis*. [image online] Available at: https://www.gettyimages.co.uk/detail/photo/whitefish-mitosis-whitefish-embryo-royalty-free-image/139814315?adppopup=true [Accessed 23 October 2024]. Reference redacted. Source adapted.

4.c National Health and Nutrition Examination Survey, 2017. *Height of NHANES subjects ages 2179*. [image online] Available at: https://thomaselove.github.io/431notes-2017/dataviz.html [Accessed 23 October 2024]. Source adapted.