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Biology
Standard level
Paper 1B

12 May 2025

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

Candidate session number

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

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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]**.



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

1. The image shows a cast of the lower surface of a leaf from a busy Lizzie (*Impatiens walleriana*) plant as seen under a light microscope with a magnification of 600 \times .



- (a) On the image, label a guard cell. [1]
- (b) State how the magnification of the microscope was calculated. [1]

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(This question continues on the following page)



(Question 1 continued)

- (c) (i) Outline how stomatal density in busy Lizzie leaves can be estimated within a known field of view.

[1]

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- (ii) Suggest how this estimate can be made more reliable.

[1]

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- (d) Explain **one** feature of tree roots that help trees to survive in mangrove swamps.

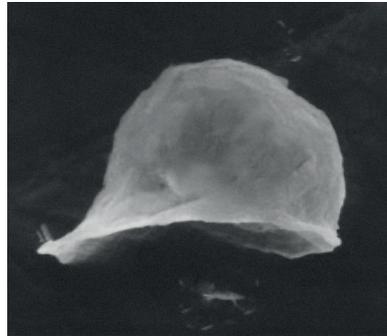
[2]

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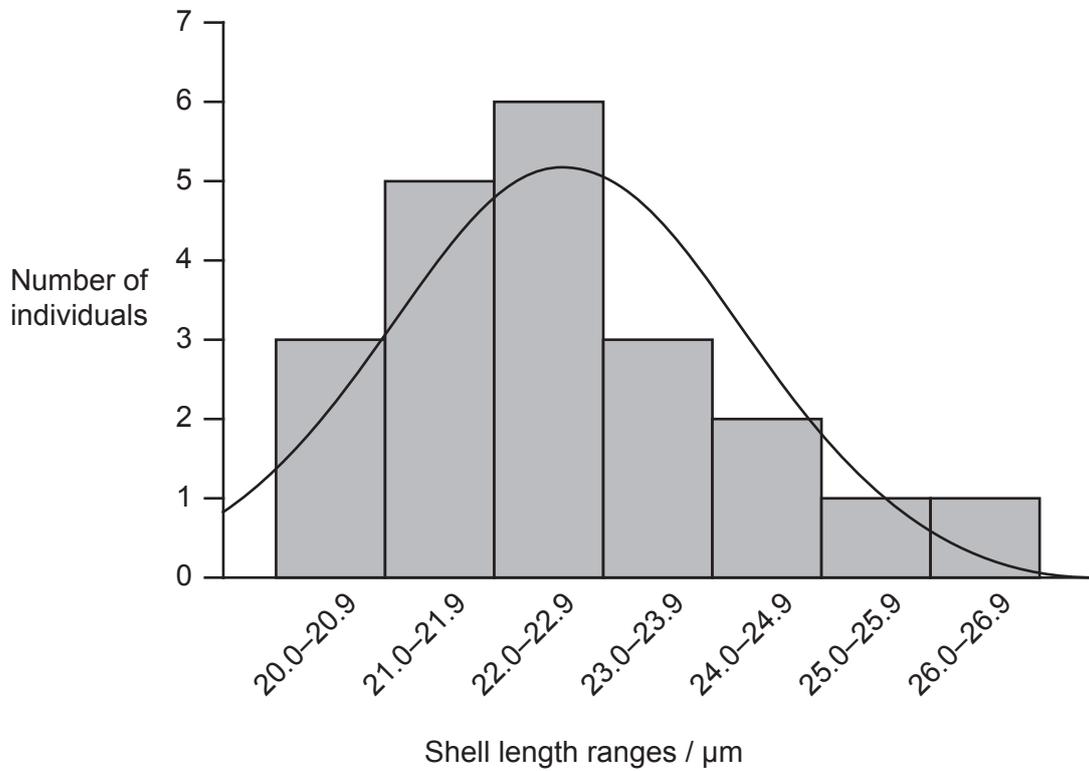


2. *Psammonobiotus balticus* belongs to a group of protists (unicellular eukaryotic organisms) that have a shell surrounding most of the cell, which provides shelter from predators. The graph shows the frequency of varying shell lengths in a population of *P. balticus*.

P. balticus



10 μm



(This question continues on the following page)



(Question 2 continued)

(a) From the diagram,

(i) identify the range of shell length that is the mode. [1]

..... μm

(ii) identify the range that includes the individual with the median shell length. [1]

..... μm

(b) State, giving a reason, the type of variation shown by shell length. [2]

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(c) Mutations may increase variation within a species. Compare and contrast substitution and insertion mutations. [2]

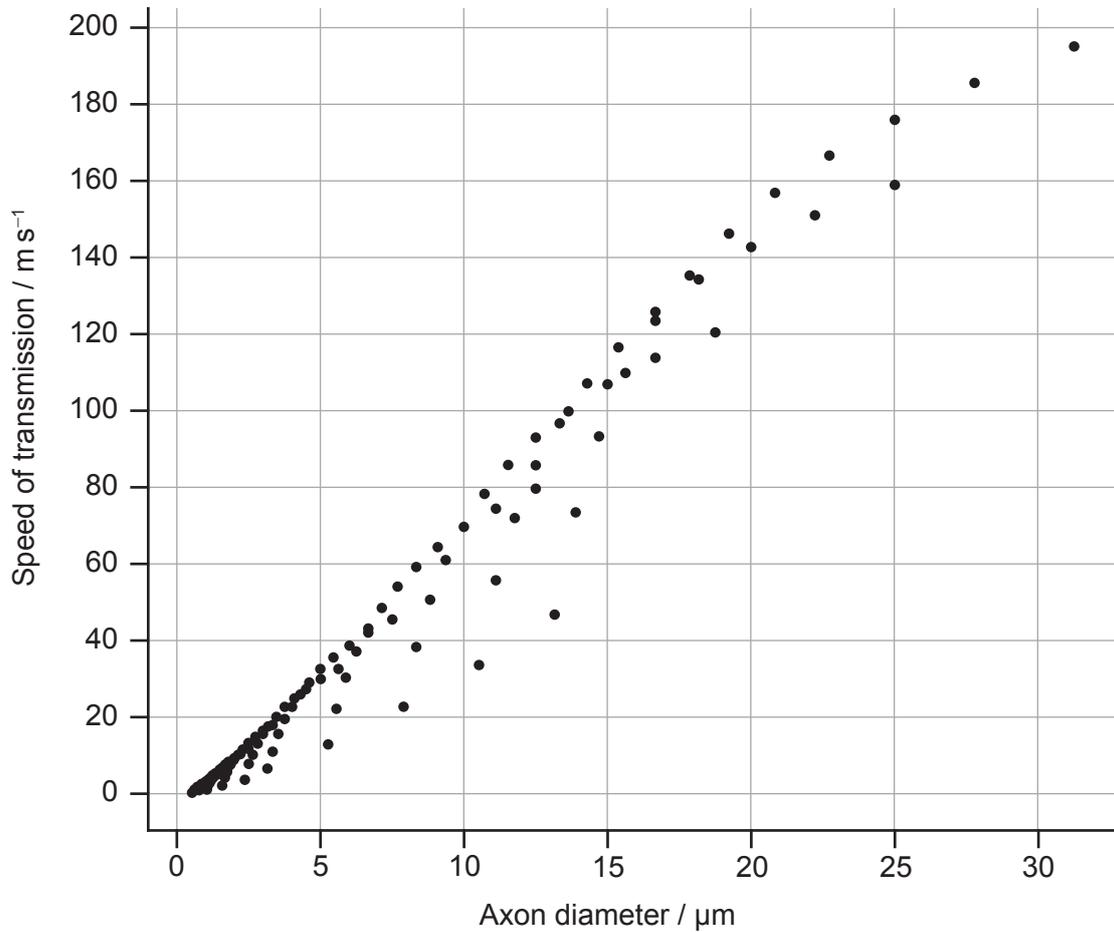
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(d) Outline the reason that some species of protists are classified as mixotrophs. [1]

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3. Scientists used MRI to calculate the speed of transmission of nerve impulses along axons of brain neurons.



- (a) (i) Describe the relationship between speed of transmission and axon diameter. [1]

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- (ii) In a similar experiment, scientists determined an R^2 value of 0.92. Comment on this result. [2]

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(Question 3 continued)

(b) Distinguish between the functions of sensory and motor neurons. [1]

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(c) The transmission of nerve impulses along axons relies on a supply of energy. Explain how ATP is adapted to perform this function. [3]

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4. The table shows the nuclear DNA content of some plant and animal species.

Species scientific name	Common name	Chromosome number	Genome size / DNA million base pairs
<i>Apis mellifera</i>	honey bee	16	215
<i>Homo sapiens</i>	human	46	3080
<i>Ailurus fulgens</i>	red panda	36	2340
<i>Pinus sylvestris</i>	Scots pine	22	20 000
<i>Paris japonica</i>	canopy plant	40	150 000

(a) Suggest, giving a reason, whether gametes or somatic cells have been used to provide the information in the table. [1]

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(b) State **one** way in which chromosomes are classified to construct the karyotype of an individual. [1]

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(c) Outline the role of histones in plant and animal chromosomes. [1]

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(Question 4 continued)

- (d) Using the data provided in the table, discuss whether genome size positively correlates to organism complexity. [2]

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References:

1. tonaquatic, 2021. [*Leaf epidermis under light microscope view*]. [image online] Available at: <https://www.gettyimages.co.uk/detail/photo/the-leaf-epidermis-under-light-microscope-view-has-royalty-free-image/1323853398> [Accessed 14 June 2024]. Reference redacted. Source adapted.
2. Golemansky, V. and Todorov, M., 2006. New Data to the Shell Ultrastructure and the Biometry of the Marine Interstitial Testate Amoebae (Rhizopoda: Testaceafilosia). *Acta Protozoologica* 45(3), pp. 301–312. Source adapted.
3. Drakesmith, M., Harms, R., Rudrapatna, U., Parker, G. D., Evans, J. and Jones, D. K., 2019. Estimating axon conduction velocity in vivo from microstructural MRI. *NeuroImage* 203, 116186. <https://doi.org/10.1016/j.neuroimage.2019.116186>. Source adapted. Licensed under CC BY 4.0: <https://creativecommons.org/licenses/by/4.0/>.



12EP10

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12EP11

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12EP12