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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]

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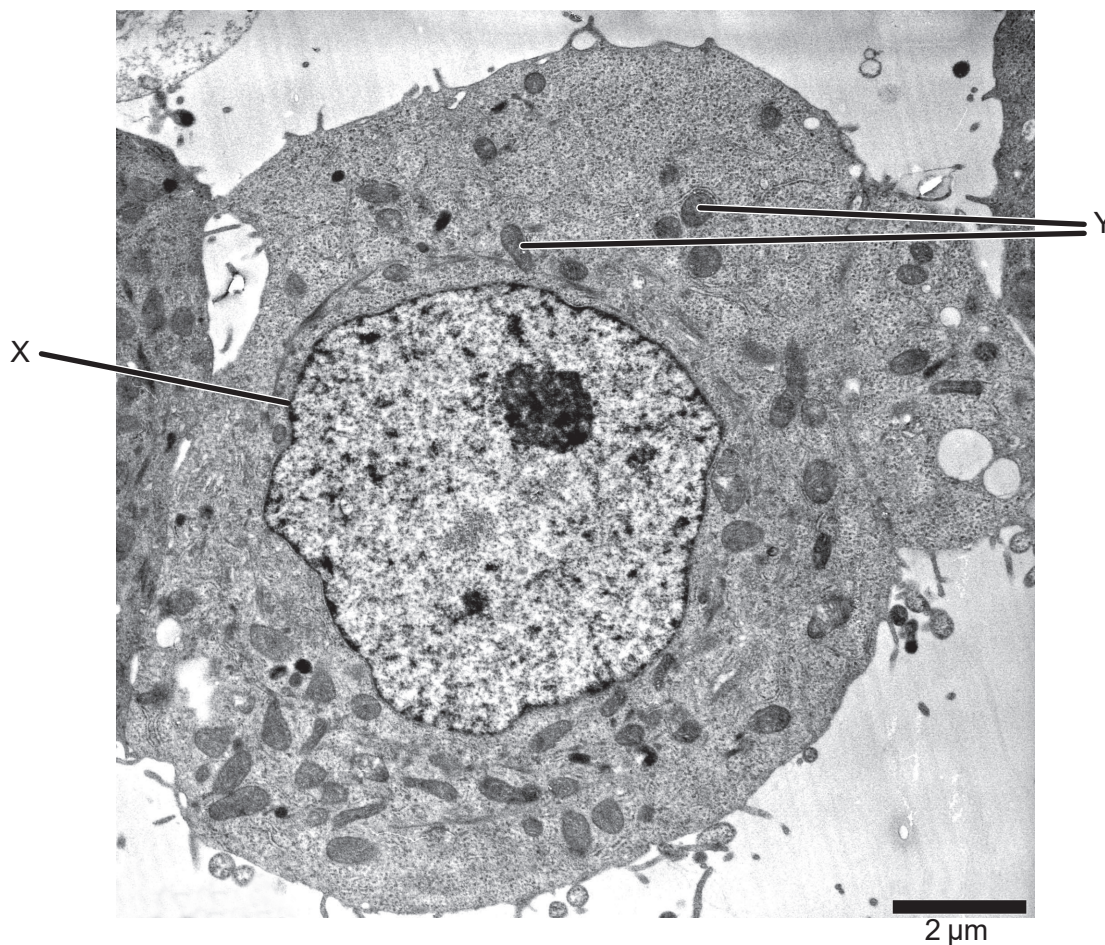
Instructions to students

- 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]**.



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

1. The electron micrograph shows a eukaryotic cell.



- (a) Calculate the magnification of this electron micrograph.

[1]

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- (b) State the name of the organelle labelled X.

[1]

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(This question continues on the following page)



(Question 1 continued)

- (c) Identify, with a reason, whether the cell is from a plant or an animal. [1]

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- (d) Explain how the organelles labelled Y provide evidence for the theory of endosymbiosis. [2]

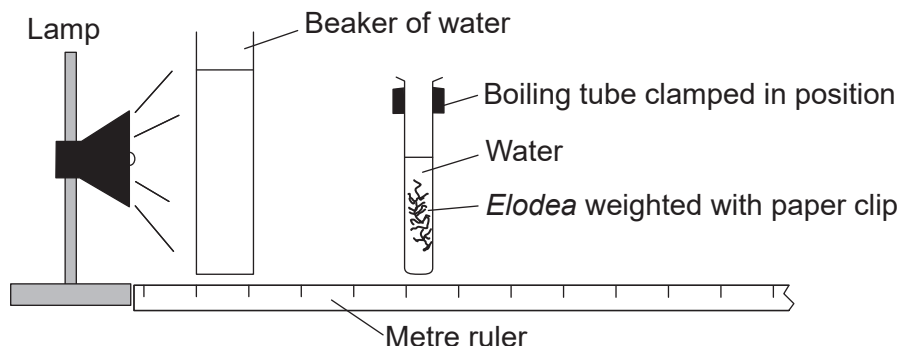
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- (e) Describe the advantages of compartmentalization in cells. [3]

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2. An experiment was carried out to test the effect of light intensity on the rate of photosynthesis in *Elodea*, an aquatic plant. The boiling tube with *Elodea* was moved to different distances from the light source (lamp). Rate was measured by counting the number of bubbles released by *Elodea* over a two-minute period. Three trials were run for each distance. The diagram shows the experimental set-up. Data collected from the experiment is shown in the table.



Distance from the lamp to <i>Elodea</i> / cm	Number of bubbles of oxygen produced in 2 minutes		
	Trial 1	Trial 2	Trial 3
10	75	80	79
20	31	33	45
30	13	13	16
40	5	5	5
50	4	5	5

- (a) Calculate the mean rate of oxygen production in *Elodea* at 10 cm from the lamp.

[1]

(This question continues on the following page)



(Question 2 continued)

- (b) State the relationship between the light intensity and rate of photosynthesis. [1]

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- (c) (i) Suggest the purpose of the beaker of water between the lamp and the boiling tube containing *Elodea*. [1]

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- (ii) Identify **two** variables that should be constant in this experiment. [2]

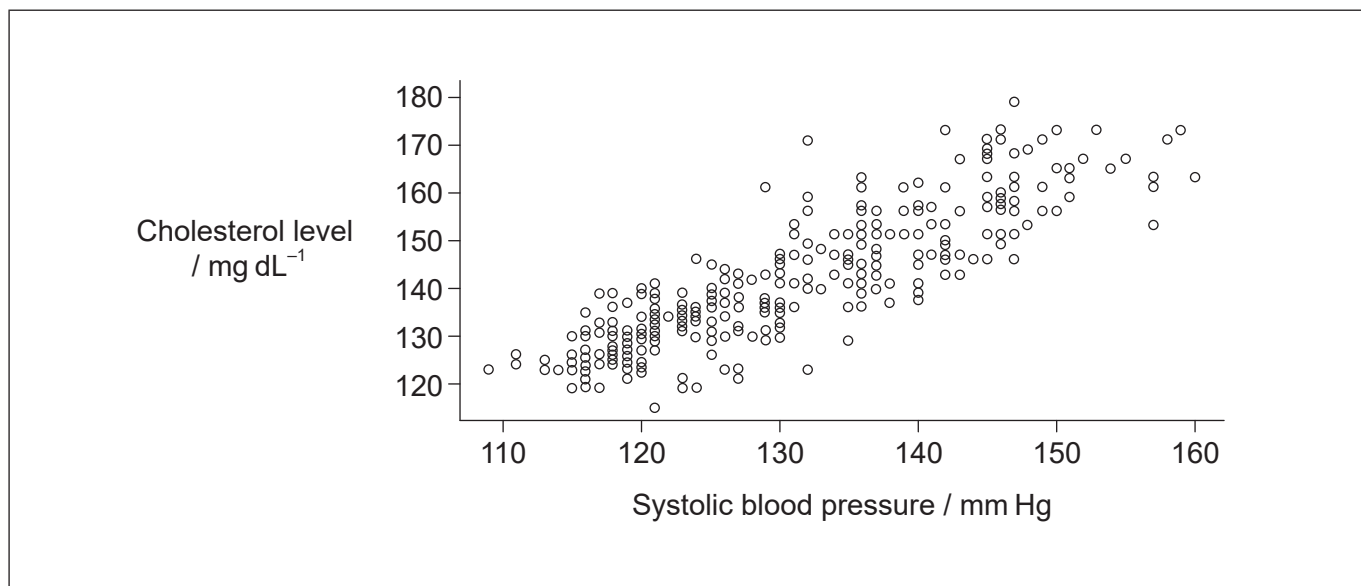
1.
2.

- (d) Outline how oxygen is produced in the leaves of *Elodea*. [4]

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3. The graph shows data correlating cholesterol levels with systolic blood pressure in human patients with coronary heart disease.



- (a) Draw a line of best fit on the graph. [1]
- (b) The correlation coefficient (r) between systolic blood pressure and cholesterol level is 0.863. Comment on the significance of this value. [2]

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- (c) Describe how a student could measure heart rate in human patients. [2]

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(Question 3 continued)

(d) Compare and contrast the circulation of blood in bony fish and in mammals.

[3]

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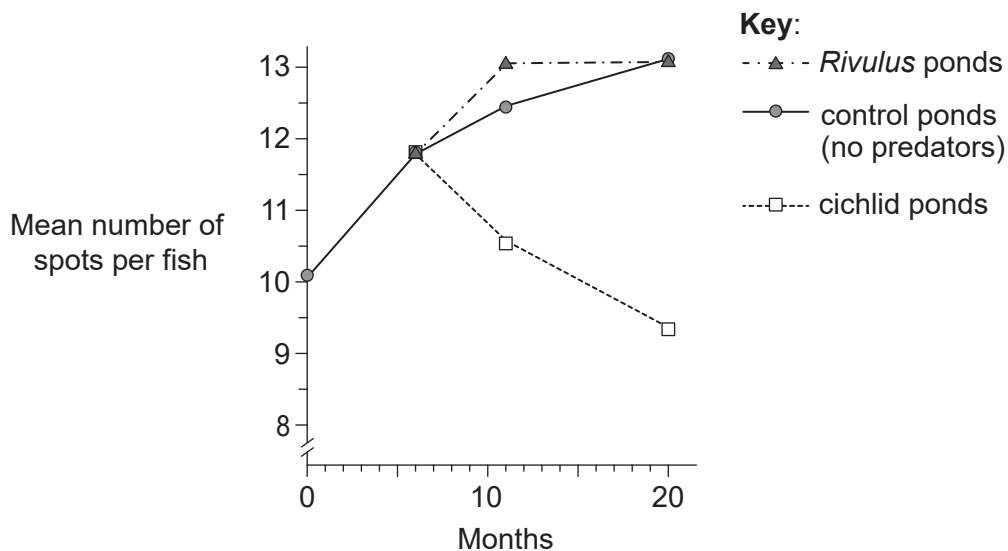
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4. John Endler observed variation in the number of spots on guppies (*Poecilia reticulata*) in different natural streams. He noticed that guppies sharing a stream with predatory cichlids had fewer spots than guppies living with *Rivulus* (killifish), which are weaker predators.

Endler moved guppies into artificial ponds with no predators and left them for six months, allowing several generations of fish to grow up, reproduce and die. He then divided his guppy population among 10 artificial ponds, some with cichlids, some with *Rivulus* and some without predators. After 11 months and again at 20 months, he counted the spots on male guppies from his artificial ponds.



[Source: John A. Endler. 'Natural Selection on Color Patterns in *Poecilia reticulata*.' *Nature* (34) 1 (1980): 76–91. <https://doi.org/10.2307/2408316>. Reproduced by permission of Oxford University Press on behalf of the Society for the Study of Evolution. Source adapted.]

- (a) Identify the mean number of spots per fish found in cichlid ponds at 20 months. [1]

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- (b) State the dependent variable in Endler's experiment. [1]

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(This question continues on the following page)



(Question 4 continued)

- (c) Explain what caused the number of spots to change in the control population. [2]

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- (d) Justify Endler's conclusion that predators affected the variation among the population of guppies. [3]

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- (e) Outline the Hardy–Weinberg conditions that must be maintained for the guppy populations in natural streams to be in genetic equilibrium. [3]

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References:

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2. Nuffield Foundation and Royal Society of Biology, 2019. Investigating factors affecting the rate of photosynthesis. [online] Available at: <https://practicalbiology.org/energy/photosynthesis/investigating-factors-affecting-the-rate-of-photosynthesis.html> [Accessed 27 January 2025]. Source adapted.
3. Used with permission of Springer Nature BV, from A nonparametric copula-based decision tree for two random variables using MIC as a classification index, Khan, Y. A.; Shan, Q. S.; Liu, Q.; Abbas, S. Z., Vol 25, Issue 15, 2021; permission conveyed through Copyright Clearance Center, Inc.
4. John A. Endler. 'Natural Selection on Color Patterns in *Poecilia reticulata*.' *Nature* (34) 1 (1980): 76–91. <https://doi.org/10.2307/2408316>. Reproduced by permission of Oxford University Press on behalf of the Society for the Study of Evolution. Source adapted.

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12EP10

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12EP11

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12EP12