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]

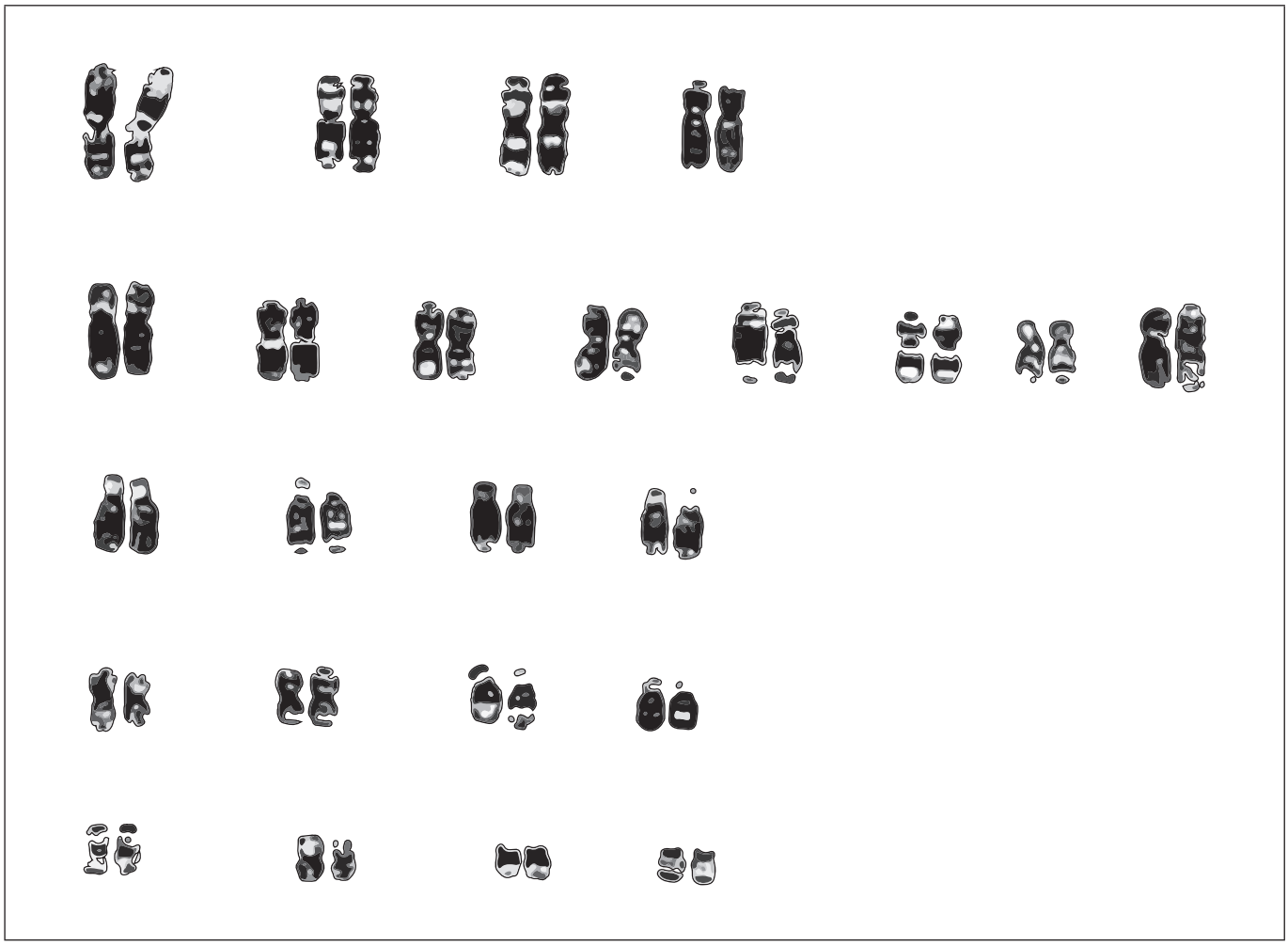
Instructions to candidates

- 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]**.

8825–6011

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

1. The western gorilla (*Gorilla gorilla*) is the largest primate. Sex determination in gorillas is the same as in humans. The image shows a karyogram of a gorilla.



(a) (i) Acrocentric chromosomes have a centromere near one end of the chromosome. Draw a circle around the row on the karyogram that contains all acrocentric chromosomes. [1]

(ii) State the chromosome number in this gorilla. [1]

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(b) Deduce with a reason the sex of this gorilla. [1]

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(This question continues on the following page)

(Question 1 continued)

(c) Describe how a karyogram is constructed. [2]

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2. The distribution of native grasses in a temperate arid region of Mendoza, Argentina, was studied in six habitats (I to VI) at different altitudes. The table shows the presence (+) or absence (–) of the species in each habitat.

Species / Habitats	I	II	III	IV	V	VI
Bromus araucanus	–	–	–	–	–	+
Bromus brevis	–	–	–	+	+	+
Bromus sp.	–	–	–	–	+	+
Cortaderia rudiuscula	–	–	+	–	–	–
Elymus erianthus	–	–	+	+	+	–
Elytrigia attenuata	–	–	–	–	–	+
Elytrigia mendocina	–	–	–	–	–	+
Festuca rubra	–	–	–	–	–	+
Koeleria mendocinensis	–	–	–	–	–	+
Melica andina	–	–	–	–	+	+
Piptochaetium napostaense	–	–	+	+	+	+
Poa lanuginosa	–	–	–	–	+	+
Poa resinulosa	–	–	–	–	+	+
Poa ligularis	–	–	+	–	+	+
Polypogon monspeliensis	–	–	+	–	+	+
Schismus barbatus	–	–	–	–	+	–
Stipa debilis	–	–	+	–	+	–
Stipa ichu	+	–	+	+	+	+
Stipa paramilloensis	–	–	–	–	+	+
Stipa plumosa	–	+	+	+	+	–
Stipa psittacorum	–	–	+	–	+	–
Stipa sanluisensis	–	–	+	+	+	–
Stipa scirpea	–	–	+	–	+	+
Stipa tenuis	–	–	+	+	+	–
Stipa tenuissima	–	–	+	–	+	+
Stipa vaginata	–	–	+	+	+	+
Total species present	1	1	14	8	20	18

(This question continues on the following page)

(Question 2 continued)

(a) Suggest **one** abiotic factor, other than altitude, that could be affecting the distribution of species in the different habitats. [1]

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(b) Define habitat. [1]

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(c) Explain how the number of organisms of each species could be determined experimentally. [3]

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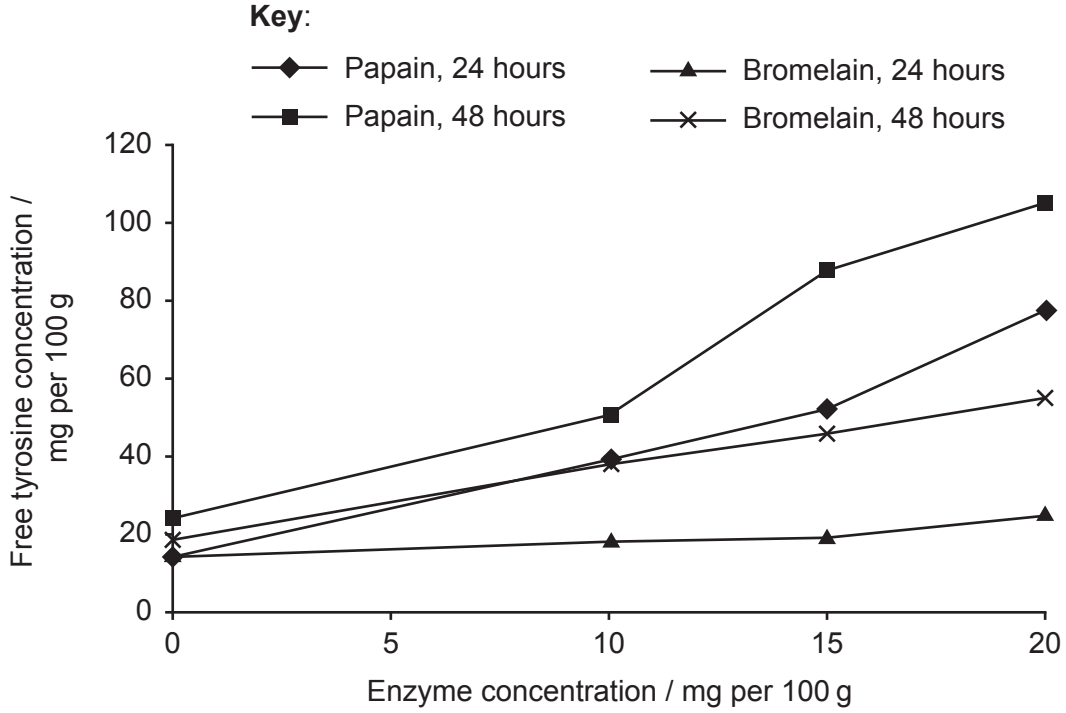
3. Protease enzymes break down (degrade) protein. The catalytic activity of the protease enzymes papain and bromelain on meat tenderization was evaluated by injecting the enzymes at different concentrations into beef. Meat tenderization was assessed by measuring the concentration of the amino acid tyrosine, which is released from proteins as they become degraded. The graph shows the effect of enzyme concentration after 24 and 48 hours.



(a) State an independent variable in this experiment. [1]

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(b) Outline the effect of increasing the papain concentration on the free tyrosine concentration. [1]

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(Question 3 continued)

(c) Distinguish between the results for bromelain activity at 24 hours and at 48 hours. [2]

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(d) Justify the use of the concentration of amino acids, such as tyrosine, to assess protease enzyme activity. [3]

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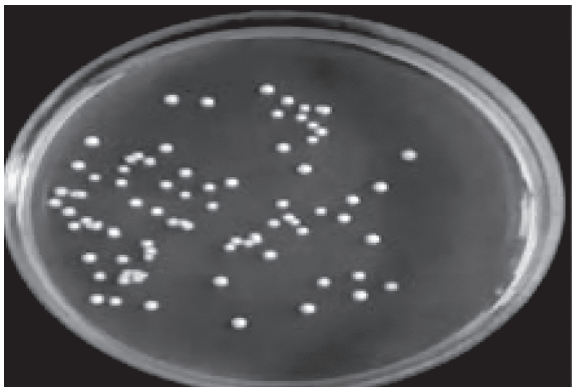
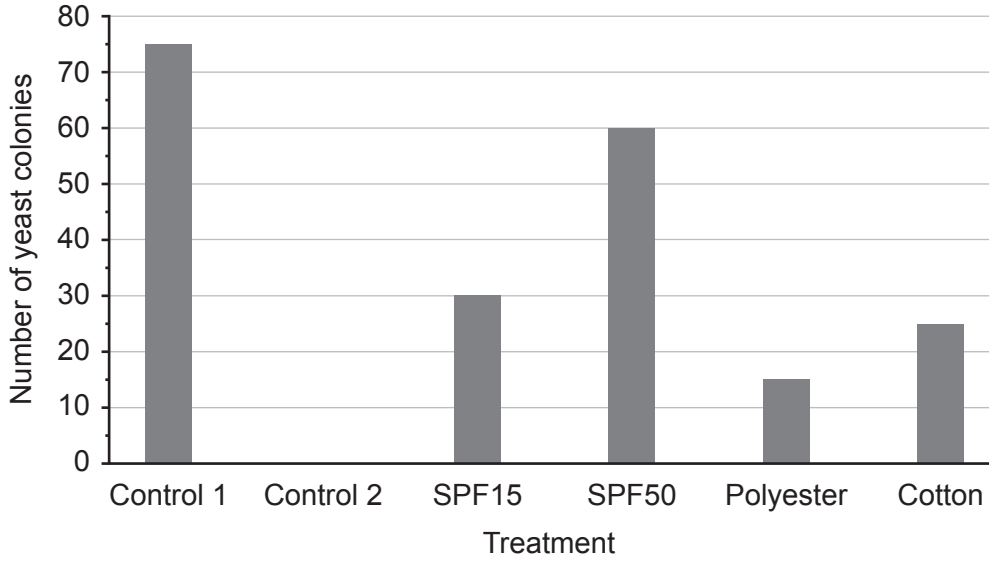
4. Ultraviolet (UV) light can penetrate cells, causing DNA damage. This effect can be reduced by using sunscreens or covering skin with clothing.

In an experiment to look at the effect of different treatments to reduce UV damage to DNA, yeast fungus (*Saccharomyces cerevisiae*) was used as the test organism. Six Petri dishes with agar were inoculated with yeast in sucrose solution. The Petri dishes were labelled according to the treatment applied to the lid, with sunscreen (Sun Protection Factors SPF15 or SPF50), cloth (polyester or cotton) or control (no treatment). Control 1 was placed in the dark and all the other Petri dishes were placed in direct sunlight for 6 hours. The dishes were then incubated for three days. The image shows yeast colonies that grew on the agar in one of the Petri dishes. The bar graph shows the number of yeast colonies present per Petri dish.





(a) Describe how yeast cells reproduce. [2]

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(Question 4 continued)

(b) Identify **one** type of mutation that can be induced by UV light. [1]

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(c) State **one** role of sucrose in this experiment. [1]

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(d) Suggest a possible reason for the difference in number of yeast colonies

(i) between Control 1 and Control 2. [1]

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(ii) between SPF15 and SPF50. [1]

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(e) Using the experimental results, evaluate the use of cotton clothing instead of polyester in humans. [2]

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References:

1. Lucas, M. and Wallace, I., 1973. Chromosomes of *Gorilla gorilla gorilla J. Zool.* 169, pp. 403–407. Available at: https://zslpublications.onlinelibrary.wiley.com/doi/abs/10.1111/j.1469-7998.1973.tb04565.x. Source adapted.

2. Cavagnaro, J.B., 1988. Distribution of C_3 and C_4 grasses at different altitudes in a temperate arid region of Argentina. *Oecologia* 76(2), pp. 273–277. https://doi.org/10.1007/bf00379962. Source adapted.

3. Ionescu, A., Aprodu, I. and Pascaru, G., 2008. Effect of papain and bromelain on muscle and collagen proteins in beef meat. *The annals of the University Dunarea de Jos of Galati. Fascicle VI- Food Technology*, Year II (XXXI), pp. 9–16. Source adapted.

4. Alhamdy, T. and Al-Sowayan, N.S., 2020. The Effect of Sunscreens on Yeast to Prevent Ultraviolet Damage. *Advances in Bioscience and Biotechnology* 11, pp. 111–122. https://doi.org/10.4236/abb.2020.114009. Licensed under the Creative Commons Attribution 4.0 International Deed license: https://creativecommons.org/licenses/by/4.0/deed.en.

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