

Biology
Standard level
Paper 2

Specimen paper

Candidate session number

1 hour 30 minutes

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Instructions to candidates

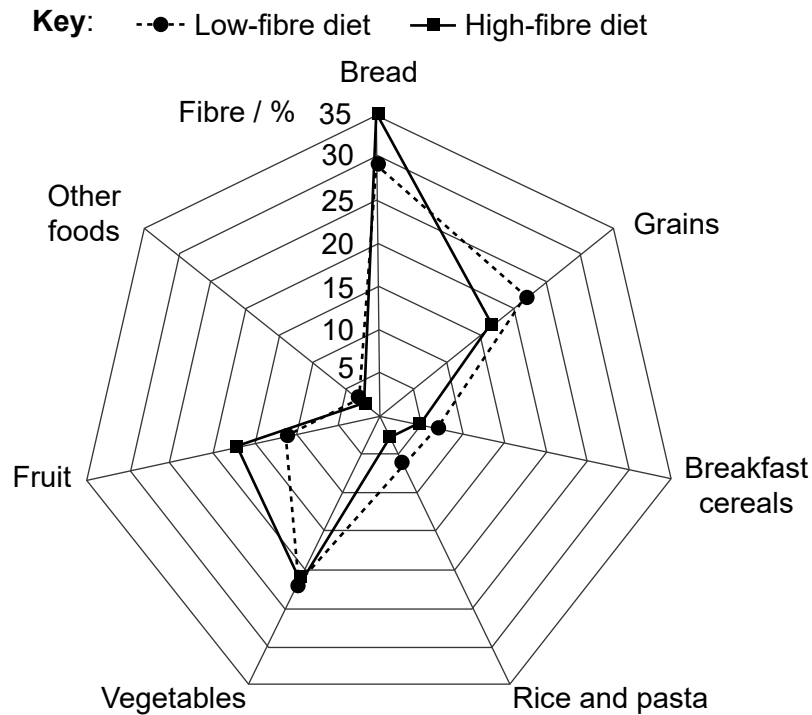
- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer one question.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[50 marks]**.



Section A

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

1. A long-term study looked at the effect of diets with differing fibre content in 543 children between the ages of 8 months and 9 years. The children were divided into groups according to the amount of fibre in their diet. The chart shows the sources of fibre for the 9-year-olds as a percentage of the total fibre intake.



[Source: adapted from Ruottinen, S., Lagström, H.K., Niinikoski, H., Rönnemaa, T., Saarinen, M., Pahkala, K.A., Hakanen, M., Viikari, J.S.A. and Simell, O., 2010. *The American Journal of Clinical Nutrition*, 91(3), pp.651–661. REDACTED.]

- (a) (i) State the source of fibre that provides 5% of the fibre intake for those in the high-fibre group. [1]

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- (ii) State the percentage of the daily fibre intake obtained from fruit by the low-fibre group. [1]

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(Question 1 continued)

- (b) Compare and contrast the fibre intake of the two groups.

[2]

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- (c) Explain whether it is possible to determine from the data which group eats the most grains in a day.

[2]

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- (d) Suggest with a reason, based on the data in the chart, **one** food that should be increased for children on the low-fibre diet.

[2]

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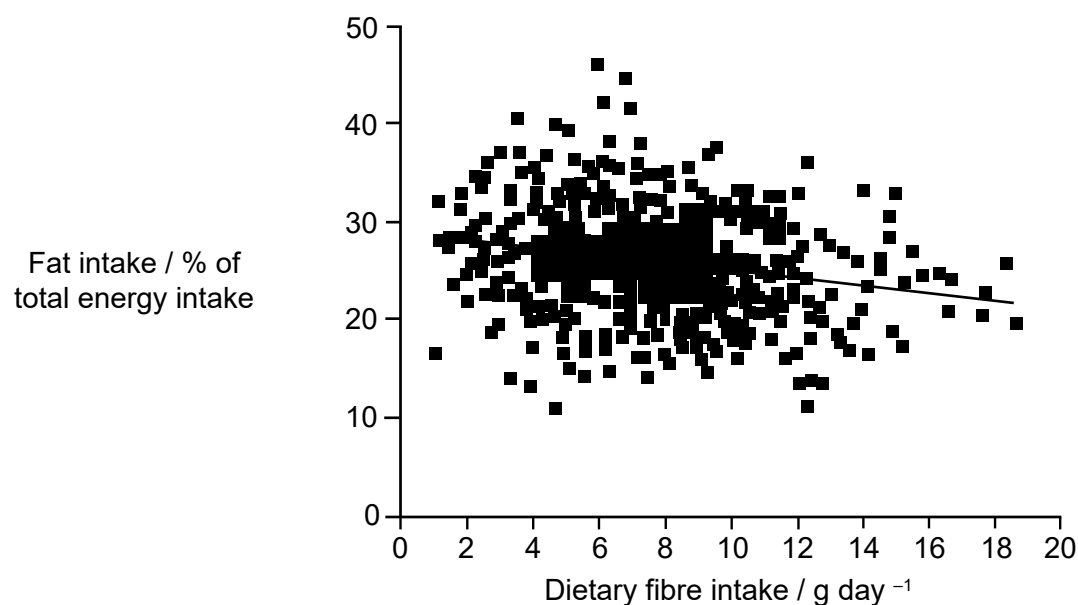
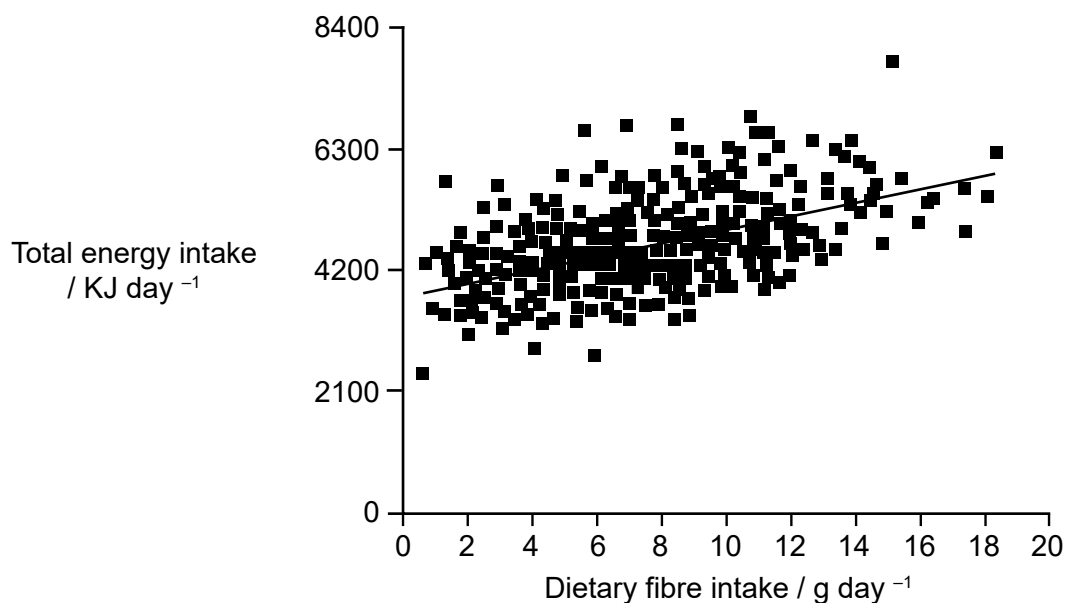
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(Question 1 continued)

The graphs show how the energy intake of the 13-month-old children varied with the daily intake of fibre and the percentage of this energy that came from fat.



[Source: adapted from Ruottinen, S., Lagström, H.K., Niinikoski, H., Rönnemaa, T., Saarinen, M., Pahkala, K.A., Hakanen, M., Viikari, J.S.A. and Simell, O., 2010. *The American Journal of Clinical Nutrition*, 91(3), pp.651–661. REDACTED.]

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(Question 1 continued)

- (e) Compare the effect of increasing daily dietary fibre intake on total energy intake and percentage of total energy from fat.

[1]

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- (f) Fibre is known to have no energy value. Suggest a reason for the relationship between dietary fibre intake and total energy intake.

[1]

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- (g) Discuss whether the study supports the hypothesis that high-fibre diets are healthy for children.

[1]

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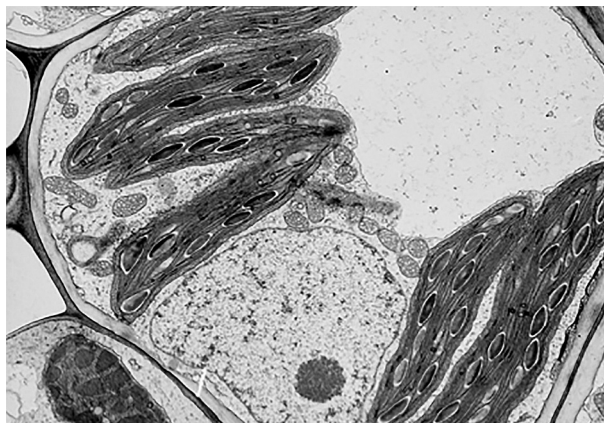


Please **do not** write on this page.

Answers written on this page
will not be marked.



2. The cytoplasm in eukaryotic cells is compartmentalized into membrane-bound organelles, as seen in this electron micrograph of a plant cell.



- (a) State **two** membrane-bound organelles that are common to both plant and animal cells. [2]

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- (b) (i) State **one** organelle that is found in a plant cell but not in an animal cell. [1]

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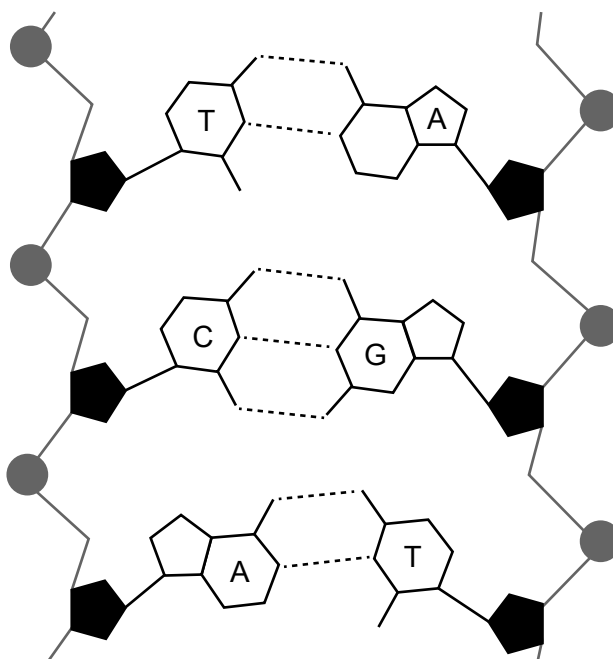
- (ii) State **one** organelle that is common to prokaryotic and eukaryotic cells. [1]

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3. The diagram shows a short stretch of DNA with complementary base pairing.



- (a) Identify **two** features of DNA shown in this diagram that distinguish it from RNA. [2]

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- (b) Explain the significance of complementary base pairing in DNA. [3]

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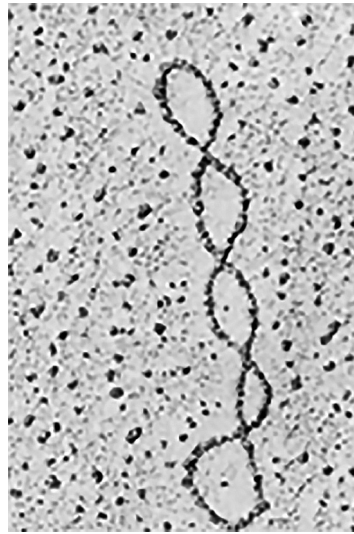
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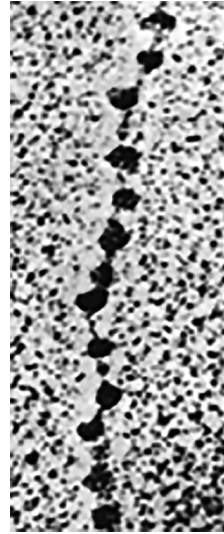


(Question 3 continued)

The images are electron micrographs of DNA from a prokaryote and from a eukaryote.



Prokaryote DNA



Eukaryote DNA

(c) Distinguish between the structure of DNA in prokaryotes and eukaryotes.

[2]

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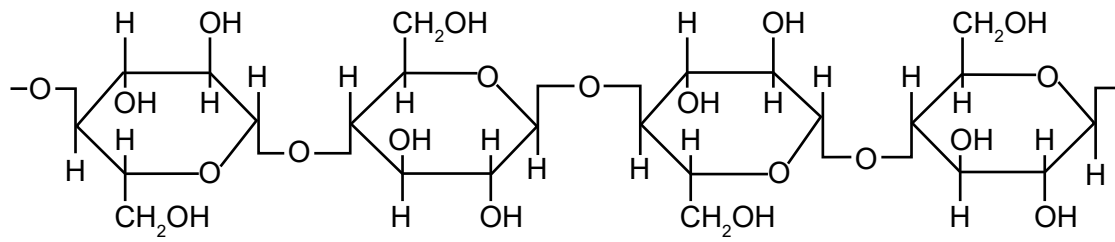
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4. The structure of part of a cellulose molecule is shown.



- (a) Identify the monomer from which cellulose is composed.

[1]

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- (b) Explain how the structure of cellulose is related to its function.

[3]

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5. Many flowering plants require an animal pollinator in order to transfer pollen from one flower to another.



- (a) Explain the type of ecological relationship between the hummingbird and the flower on which it feeds.

[2]

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- (b) State **one** way that plants attract animal pollinators.

[1]

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- (c) Hummingbirds have few natural predators. Suggest **one** type of behaviour that an animal such as a hummingbird can display to reduce the risk of predation while it is feeding.

[1]

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6. In humans, sex is determined genetically and human populations have approximately equal numbers of males and females in each generation.

(a) Outline how sex is determined in humans.

[2]

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(b) Explain how sexual reproduction gives rise to genetic variation.

[2]

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Section B

Answer **one** question. One additional mark is available for the construction of your answer. Answers must be written within the answer boxes provided.

7. Mutations have a range of consequences for organisms.
- (a) Outline how mutation can lead to cancer. [4]
 - (b) Outline **one** example of a human disease caused by an autosomal recessive allele. [4]
 - (c) Explain the role of mutations in evolution. [7]
8. Biological systems are sensitive to temperature changes, so they have mechanisms to resist temperature changes.
- (a) Explain the mechanisms involved in thermoregulation in humans. [7]
 - (b) Explain the relationship between temperature and the activity of enzymes. [4]
 - (c) Distinguish between the thermal properties of air and water as they relate to the habitat of animals. [4]



[illegible]

2. *Electron micrograph of cells from the leaf of a corn plant*, n.d. [image online] Available at: <<http://innolearn.weebly.com/bio-cell.html>> [Accessed 9 December 2020].
- 3c. Left image:
Polder, L., 1992. [*Prokaryote DNA*]. [image online] Available at: <<http://www.siumed.edu/~bbartholomew/images/chapter29/F29-17.jpg>> [Accessed 9 December 2020].

Right image:
[*Eukaryote DNA*], n.d. [image online] Available at: <http://www.mun.ca/biology/desmid/brian/BIOL2060/BIOL2060-18/18_22.jpg> [Accessed 9 December 2020].
5. UC Davis School of Veterinary Medicine, n.d. [*Hummingbird*]. [image online] Available at: <<https://hummingbirds.vetmed.ucdavis.edu/help-us-protect-hummingbirds>> [Accessed 30 July 2020].

