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Draw a cross through the box (☒) if you have NOT written in this booklet

NZQA

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 2 Biology 2023

91156 Demonstrate understanding of life processes at the cellular level

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of life processes at the cellular level.	Demonstrate in-depth understanding of life processes at the cellular level.	Demonstrate comprehensive understanding of life processes at the cellular level.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–16 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (DO NOT WRITE IN THIS AREA). This area will be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

QUESTION ONE: PHOTOSYNTHESIS AND ENZYMES

Photosynthesis is an enzyme-controlled reaction where the reactants of the process are the substrates for the photosynthesis enzymes. Therefore, photosynthesis can be affected by environmental factors such as temperature and substrate concentration.

(a) Write the **complete** word equation for photosynthesis.

(b) Discuss how both temperature and substrate concentration can affect the process of photosynthesis.

In your answer, refer to the **light-dependent** and **light-independent phases** of photosynthesis, and include a discussion of:

- an enzyme, including a description
- the starting reactants of the photosynthesis reactions, naming them, and how they affect photosynthesis
- how and why both very high and very low temperatures affect enzyme function and photosynthesis.

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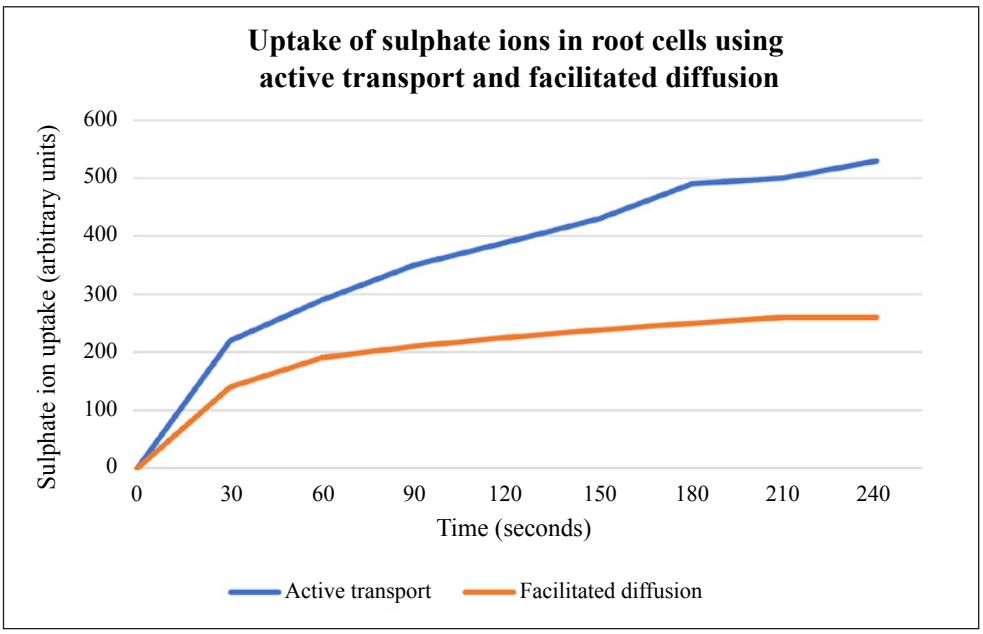
QUESTION TWO: TRANSPORT OF MATERIALS

Plants absorb materials from the soil through the cells in their roots. Some ions, such as the sulphate ion, can enter the root cells by both facilitated diffusion and active transport.

Structure of cell membrane

In an investigation of the uptake of sulphate ions by root cells, the following results were obtained:



Discuss how specific structures in the cell membrane allow it to carry out the transport of the sulphate ion into the plant root.

In your answer, refer to the graph above and include a discussion of:

- active transport, including a description, and why it would be used
- facilitated diffusion, including a description, and why it would be used
- the similarities and differences between active transport and facilitated diffusion
- the reasons for the differences in sulphate ion absorption, as shown in the graph.

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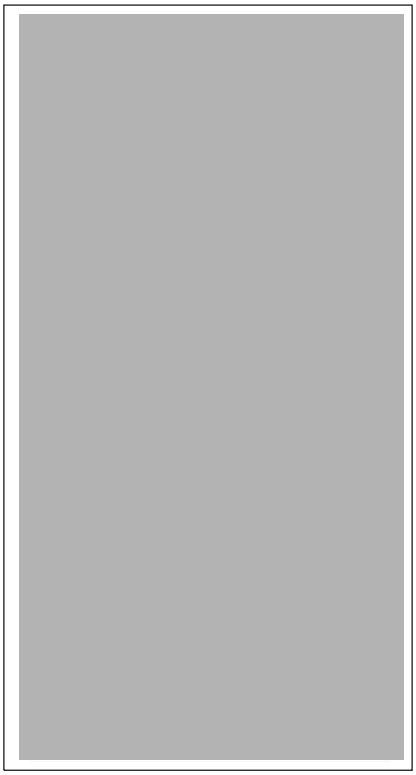
QUESTION THREE: MITOSIS AND DNA REPLICATION

DNA replication and mitosis are important processes for animals.

Life cycle of a butterfly



Replication of a DNA strand

Discuss the relationship between DNA replication and mitosis, and why both are needed for the survival of both a cell and the entire organism.

In your answer, include a discussion of:

- when DNA replication occurs, including a description, and how the process is carried out
- mitosis, including a description, and its purpose
- why mitosis is needed, by referring to stages of a butterfly's life cycle, as shown above.

There is more space for your answer to this question on the following pages.

Extra space if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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QUESTION NUMBER

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QUESTION NUMBER

Acknowledgements
Material from the following sources has been adapted for use in this assessment:

Page 6
Image: https://www.pathwayz.org/Tree/Plain/ORGANELLES
Data: https://practicalbiology.org/exchange-of-materials/active-uptake/tracking-active-uptake-of-minerals-by-plant-roots

Page 10
Images: https://www.floridamuseum.ufl.edu/educators/resource/butterfly-life-cycle/
https://www.zarkanderson.com/2010/10/self-dna-repair.html