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NZQA

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QUALIFY FOR THE FUTURE WORLD
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Level 2 Biology, 2016

91156 Demonstrate understanding of life processes at the cellular level

9.30 a.m. Friday 18 November 2016
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 space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–11 in the correct order and that none of these pages is blank.

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

Achievement

TOTAL 11

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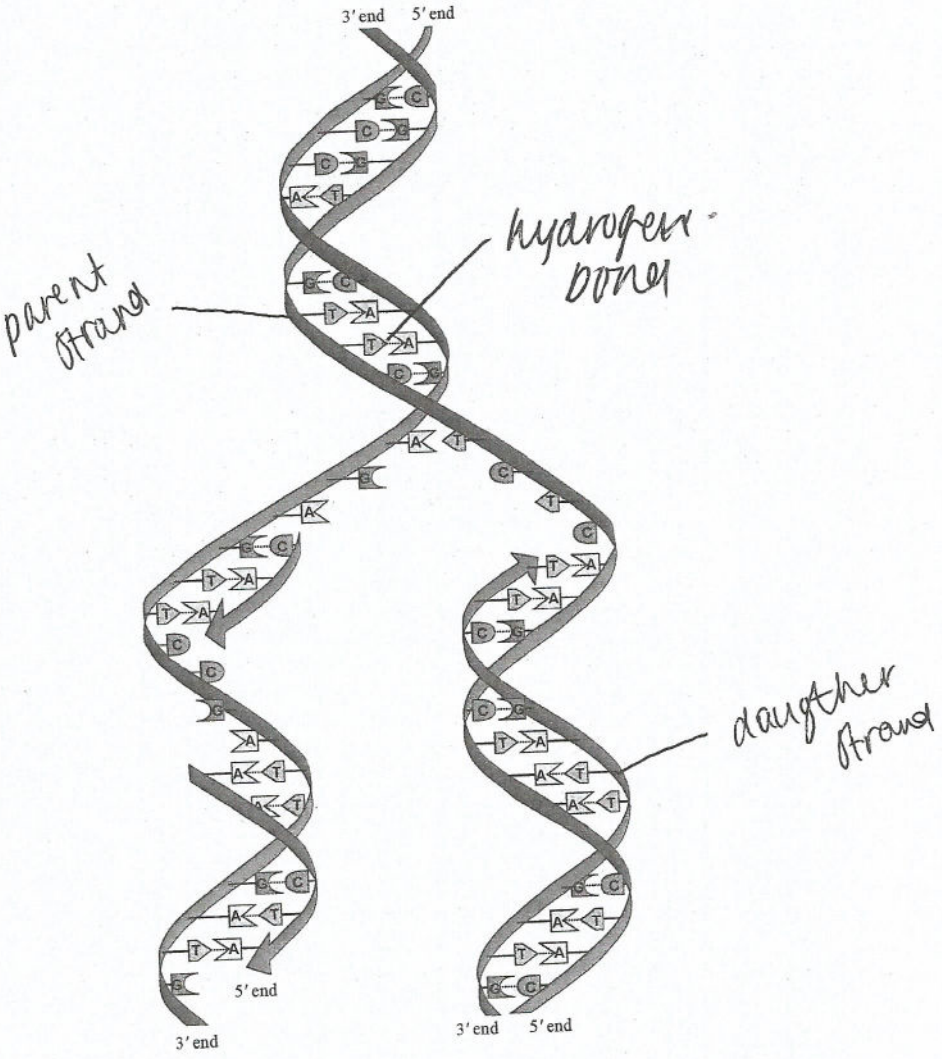
QUESTION ONE: DNA REPLICATION

(a) The model below shows DNA replication.

Label the following on the diagram:

- nucleotide
- nitrogen base
- ~~hydrogen bond~~
- ~~parent strand~~
- ~~daughter strand~~
- sugar-phosphate backbone.



(b) Explain the purpose of DNA replication.

The purpose of DNA replication is to create two identical strands of DNA, from one strand.

(c) Enzymes are needed for DNA replication.

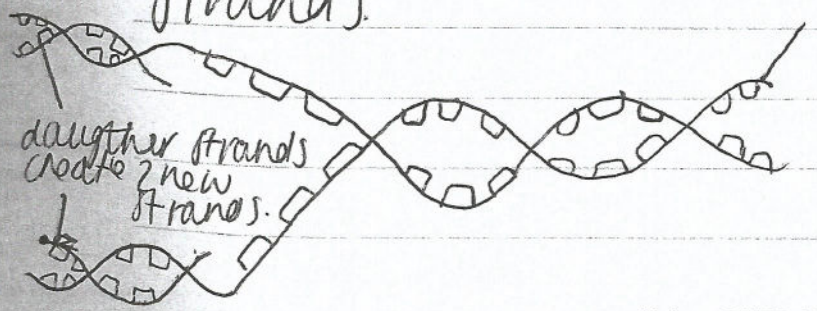
Discuss the function of enzymes in DNA replication and the factors that affect them.

In your answer include:

- a description of the structure of an enzyme
- an explanation of how enzymes function in DNA replication
- a discussion of at least three factors that affect enzymes during DNA replication.

You may use diagrams in your answer.

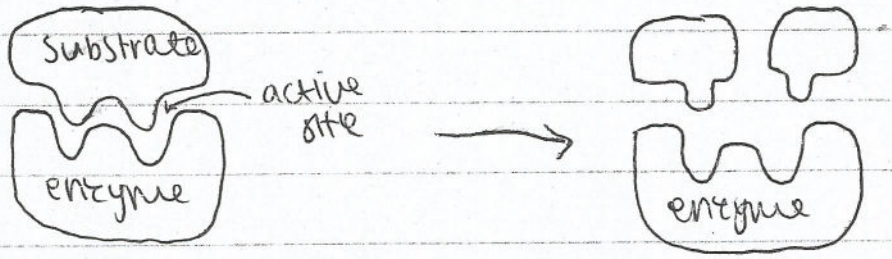
An enzyme is a globular protein that helps catalase chemical reactions at faster speeds without using as much energy. An enzyme has a region called the active site, this is where the chemical reaction between the enzyme and substrate take place.
For DNA replication, we start off with one strand that is 'unzipped' by the enzyme DNA helicase. This enzyme breaks the hydrogen bonds which hold the strand together.
The DNA strand is now two strands which are then paired with two different strands. We call the original DNA strand the parent strand and the two strands that pair up with the split parent strand., daughter strands.



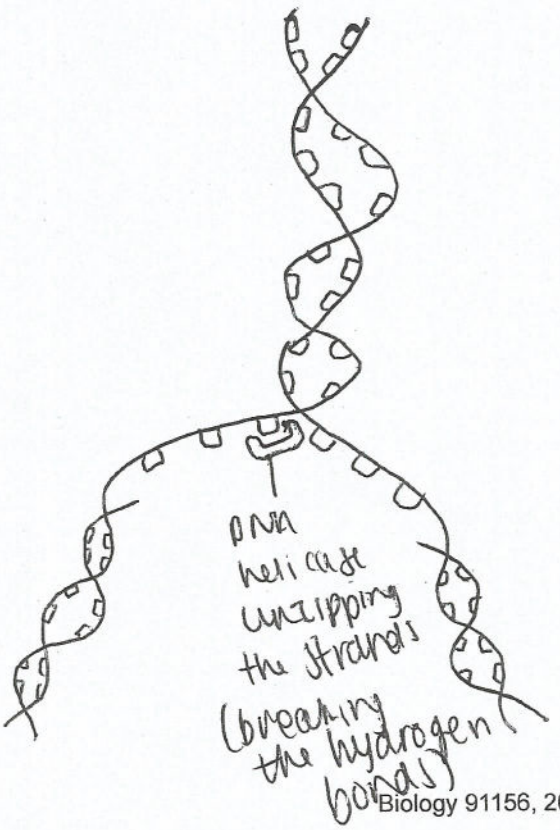
There is more space for your answer to this question on the following page.

Three factors that affect enzymes during DNA replication could be;

1. enzyme concentration. Not enough could affect or slow down the process, and too much a higher amount will speed up the process.
2.



how enzymes work.



A4

QUESTION TWO: MITOSIS AND MOVEMENT OF MATERIALS

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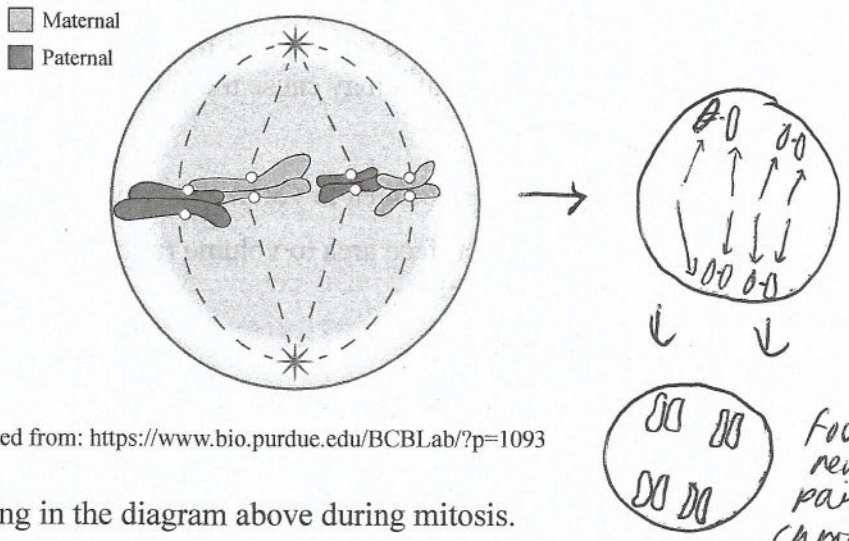


four newly paired chromosomes.

adapted from: https://www.bio.purdue.edu/BCBLab/?p=1093

(a) Describe what is happening in the diagram above during mitosis.

about to be
The chromosomes are split apart in the daughter cell and made into ~~for~~ four newly paired chromosomes. The chromosomes are lined up and then pulled apart and made into four newly paired chromosomes.

(b) Explain the purpose of mitosis, and how this type of cell division occurs.

The purpose of mitosis is to create → half. from chromosomes with one ~~each from~~ each parents* The chromosomes are split and → half paired with a new chromosome* from a different pair. There are four chromosomes per daughter cell, that are made up of one half of a chromosome from each parent. The chromosomes are pulled apart by

* chromosome

(c) Most cells in the human body grow to a limited size then divide. The new cells grow, but also divide when they have reached a certain size.

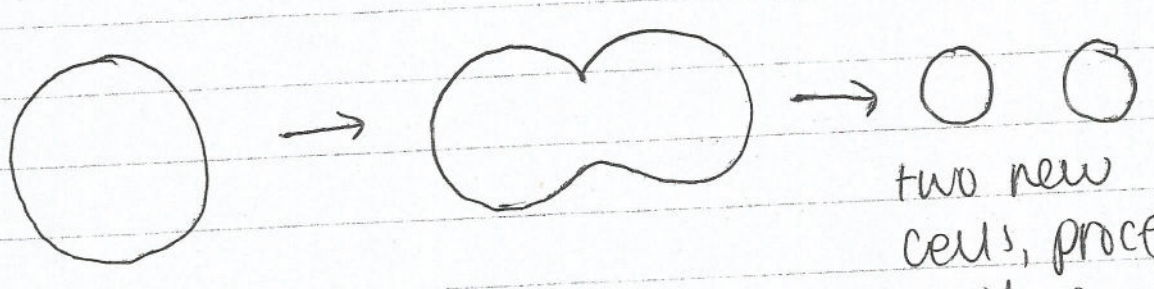
Discuss how the surface area to volume ratio affects the process of diffusion, and why the changes in surface area to volume ratio may cause the cell to divide.

In your answer include:

- a description of how the surface area to volume ratio changes as the cell grows
- an explanation of how the surface area to volume ratio affects the movement of materials into and out of a cell
- an explanation of diffusion
- a discussion of how the surface area to volume ratio can affect diffusion and cell division.

Diffusion is the ~~random~~ movement of molecules from high concentration to low concentration. An example of diffusion in the human body is the diffusion of oxygen into our blood. An example of diffusion in plants is diffusion of CO_2 (carbon dioxide) from the atmosphere into plant cells.

cell division:



cell grows to ~~a~~ certain size

then splits apart

two new cells, process then repeated

Cell division would occur in skin cells because skin needs to stretch and repair.

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A3

QUESTION THREE: CELL PROCESSES

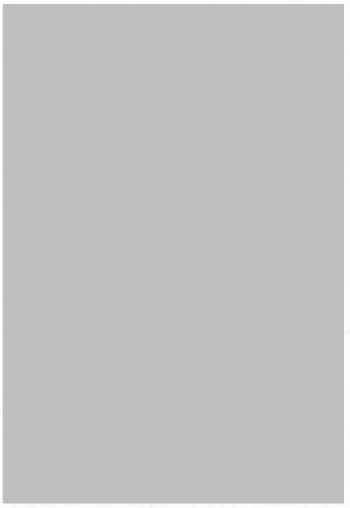
Photosynthesis and cell respiration are cell processes carried out within a plant.

Discuss the similarities and differences between photosynthesis and aerobic cell respiration in a plant.

In your answer include:

- a word equation of photosynthesis and aerobic cell respiration
- an explanation of how both aerobic cell respiration and photosynthesis are required to support the overall survival of the plant
- a discussion of the similarities and differences of the two processes.

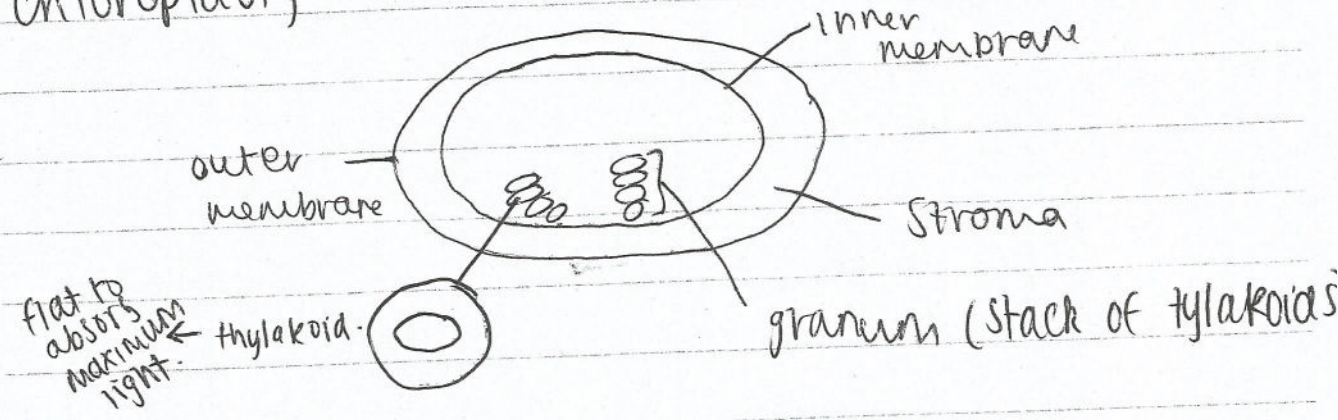
Specific details of stages for each process are NOT required.



http://www.ecoagra.com/eA_BPP-HowItWorks.html

The purpose of photosynthesis is for the plant to feed itself using sunlight. The word equation for this is; carbon dioxide + water → oxygen + glucose. Photosynthesis takes place in the chloroplast

Chloroplast;



Photosynthesis is essential for the plant to survive because it is how it feeds itself and stays alive. The plant produces glucose because it doesn't consume it the way we do.

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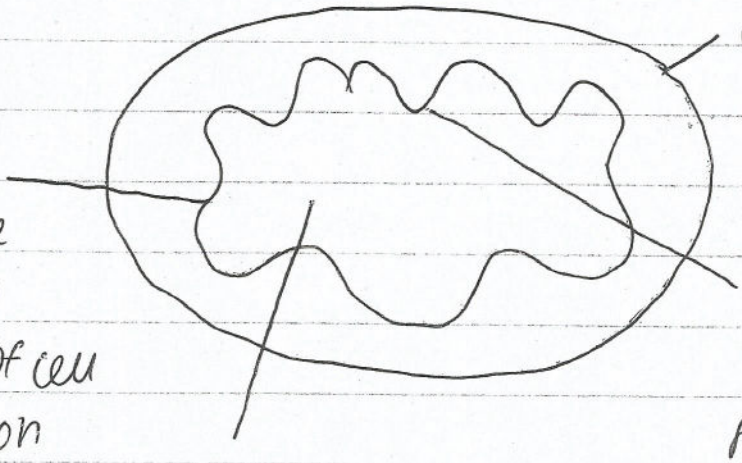
The purpose of cell respiration is to release energy from food. The word equation for this is; oxygen + glucose → carbon dioxide + water + ATP molecules. Usually 28-38 ATP molecules are produced. Cell respiration takes place in the mitochondria;

mitochondria;



Respiration produces ATP which is the energy currency for cells. It is essential for some cells that require energy/movement such as when the plant is growing the cells need energy to keep that process.

There are more chloroplasts than mitochondria in plant cells due to plants not needing as much movement energy

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

QUESTION NUMBER

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Question three cont. = ~~from~~ for example animals, who are basically constantly moving.
The differences between photosynthesis and respiration are that they take in and put out the opposite things. Photosynthesis takes in carbon dioxide and water, and puts out oxygen and glucose. Whereas respiration takes in oxygen and glucose, and puts out carbon dioxide and water (and ATP).
The similarity is that both of these processes are essential for the plant to thrive and function.

A4

Annotated Exemplar Template

Achieve exemplar 2016

Subject:	Biology	Standard:	AS91156	Total score:	11

Q	Grade score	Annotation
1	A4	a) Only three labels are attempted rather than the five required. b) Correctly states the Identical DNA is produced. c) Correctly states that an enzyme catalyses a chemical reaction and that it is responsible for the “unzipping” of the molecule. Enzyme concentrations is stated as a factor affecting enzyme activity.
2	A3	a) And b) both incorrectly relate to Meiosis rather than Mitosis. Part c) – Diffusion is defined and the statement that cell division occurs in skin cells can be treated holistically as a reference to the purpose of Mitosis required in part b)
3	A4	The word equation for aerobic respiration is correct and that for photosynthesis omits the need for sunlight so is partially correct. The sites of both processes are stated and the Merit statement that the reactants of one process are the products of the other is correct. As 3 X M are needed for M5 this cannot increase the grade awarded.