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91156



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SUPERVISOR'S USE ONLY

Level 2 Biology, 2015

91156 Demonstrate understanding of life processes at the cellular level

9.30 a.m. Monday 16 November 2015

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 2–12 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.

High Not Achieved

TOTAL

06

ASSESSOR'S USE ONLY

QUESTION ONE: RESPIRATION AND ENZYMES

- (a) Describe the purpose of cellular respiration, AND where it occurs in the cell.

Respiration occurs in the mitochondria of a cell. The purpose of cellular respiration is to produce oxygen for the living cell.

- (b) The eastern oyster's (*Crassostrea virginica*) habitat is the rocky shore, which experiences large changes in environmental temperature and oxygen concentration. This habitat can also contain heavy metals, such as cadmium.



Eastern oyster (*Crassostrea virginica*)

<http://www.bily.com/pnwsc/web-content/Family%20Pages/Bivalves%20-%20Ostreidae,%20Anomiidae.html>

The eastern oyster's cellular respiration and enzyme activity are affected by environmental temperature, oxygen concentration, and cadmium.

Discuss how temperature, oxygen concentration, and cadmium can affect cellular respiration AND enzyme activity in the eastern oyster.

In your answer:

- describe the purpose of an enzyme
- explain how temperature and cadmium affect enzyme activity
- discuss how environmental temperature, oxygen concentration, and cadmium can affect the rate of cellular respiration in the eastern oyster.

You may use diagrams in your answer.

The eastern oyster's cellular respiration and enzyme activity are affected by environmental temperature, oxygen concentration and cadmium. Temperature and cadmium can ~~change~~ increase or decrease enzyme activity depending on what the cell required to function. If a cell's enzyme activity requires a high temperature ~~and~~ a decrease in temperature may affect the cell's enzyme activity resulting in a decrease of enzyme activity. Levels of cadmium in the environment may also affect the eastern oyster's enzyme activity. If the cell is exposed to a heavy metal such as cadmium this could have negative affects on the cell's enzyme activity and cause it to decrease because for this oyster, cadmium is an unwanted substance. Enzymes are responsible for the functions of the cell. Environmental temperature, oxygen concentration and cadmium can affect the rate of cellular respiration in the eastern oyster because it requires a certain level of these substances to function at its best meaning an increase or decrease of these would result in a change of cellular respiration. For example if the oyster required a high oxygen level to maintain its normal rate of cellular respiration and the oxygen only contained a low concentration the

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Cell would have to work harder, using more energy to maintain its rate of cellular respiration. Changes in temperature and cadmium may also have these affects on the cell meaning it would have to adapt to this environment to maintain its rate of cellular respiration and to stay alive.

ND

QUESTION TWO: MOVEMENT OF MATERIALS

The lugworm (*Arenicola marine*) lives on sandy shores where the salt water concentration can fluctuate slightly. To survive in this habitat, the lugworm **passively** adjusts the salt water concentration of its body to match the surrounding seawater. Oxygen consumption remains constant during this process.



<http://marinebio.org/species.asp?id=57>

The hogchoker (*Trinectes maculates*) lives in estuaries, where salt water concentration changes regularly. However, the hogchoker **actively** adjusts the salt water concentration of its body when in high salt concentration water. As salt concentration increases, oxygen consumption also increases.



http://www.okeefes.org/Photo_Journal/Summer_2013/Summer_2013.htm

Discuss the movement of materials in the lugworm and hogchoker cells, and how oxygen consumption affects these processes.

In your answer:

- describe diffusion, osmosis, and active transport
- explain how salt water moves across the cell membrane in a lugworm via osmosis and facilitated diffusion
- explain how salt water moves across the cell membrane in a hogchoker via osmosis and active transport
- discuss why oxygen consumption remains constant in the lugworm, whereas oxygen consumption increases in the hogchoker as salt water concentration increases, and link this to the life process of cellular respiration.

You may use diagrams in your answer.

Diffusion is the movement of materials into and out of a cell via the cell membrane. The lugworm lives on sandy shores where the salt water concentration can fluctuate slightly. To survive in this habitat the lugworm passively adjusts the salt water concentration of its body to match the surrounding sea water. Oxygen consumption remains constant through this process. In a lugworm, salt water moves across the cell membrane via osmosis and facilitated diffusion. Osmosis is the diffusion of water. The salt water moves across the cell membrane, as this occurs the lugworm uses its cell membrane to diffuse only what it needs. Because it has passively adjusted the salt water concentration of its body to match the surrounding seawater it will have an equal concentration level in its body as the sea water meaning it has adapted to its way of life. The lugworm's oxygen consumption remains constant during this process. The hogchoker lives in an environment where the salt water concentration changes regularly. The hogchoker actively adjusts the salt water concentration of its body when in high salt concentration water. As salt concentration increases, oxygen consumption also increases. In the hogchoker salt water moves across the cell membrane via osmosis.

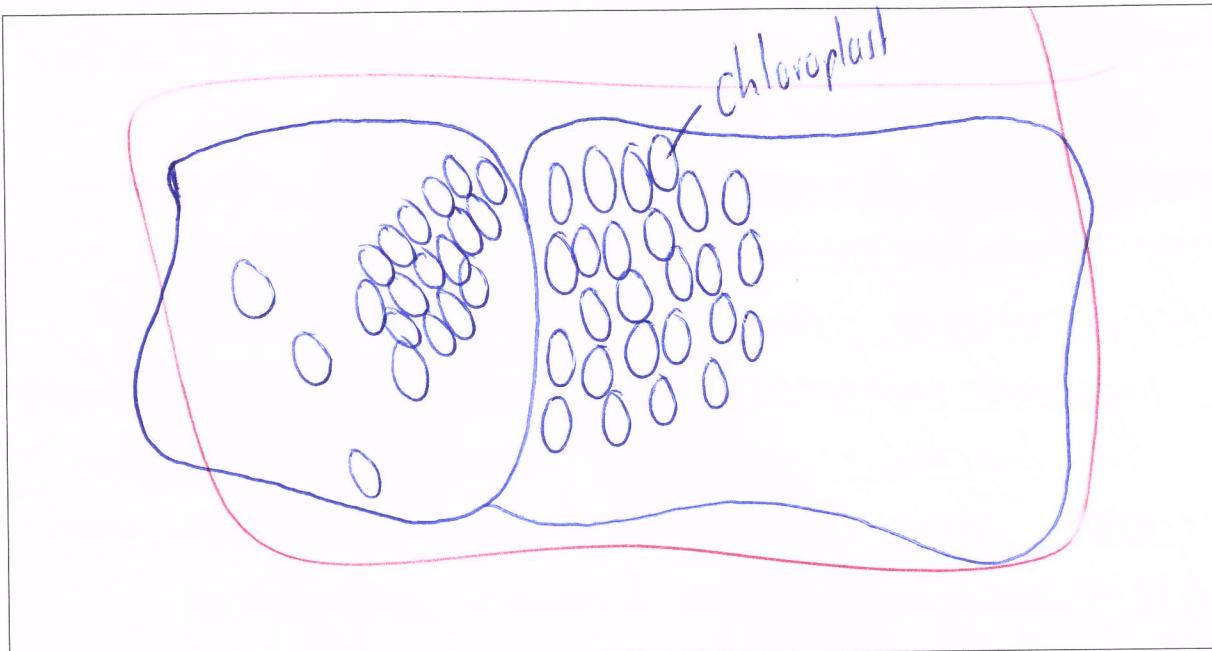
and active transport. This means that the hogchoker diffuses an increased concentration of salt water when in high salt concentration water to increase the salt water concentration of its body. This allows the hogchoker to adapt to environments with a high salt water concentration to carry out its way of life. During these processes of the lugworm and the hogchoker oxygen consumption remains constant in the lugworm whereas oxygen consumption increases in the hogchoker as salt water concentration increases. This is the difference between passive and active transport. The lugworm adapts its salt water concentration to any salt water concentration in the surrounding seawater. Its oxygen consumption remains constant because it is always changing (by adapting) whereas the hogchoker only increases its salt water concentration when it is in an environment of high concentration salt concentration water, this is why the hogchokers oxygen consumption increases during this process. During these processes the lugworm is able to maintain its cellular respiration whereas the hogchoker is not hence the increase of oxygen consumption //

N1

QUESTION THREE: PHOTOSYNTHESIS

Photosynthesis occurs in the chloroplasts, and requires light energy.

- (a) Draw a diagram of a chloroplast, labelling the outer membrane, inner membrane, stroma, and thylakoid.



- (b) Biologists have found that chloroplasts can move within the cell in response to light availability, and that shade plant chloroplasts are bigger than non-shade plant chloroplasts.



<http://www.shutterstock.com/video/clip-3943691-stock-footage-chloroplasts-in-the-living-plant-cells-under-microscope-magnification-x-phase-contrast.html>

Discuss why plants found in shady areas have bigger chloroplasts, and explain how chloroplast distribution within the cell can be influenced by light availability.

In your answer:

- explain the process of photosynthesis
- explain why chloroplasts move within a cell due to light availability
- discuss why plants found in shady areas have bigger chloroplasts than plants found in non-shady areas, and how this relates to photosynthesis.

Photosynthesis is a chemical reaction in plants that requires light, carbon dioxide and water. Photosynthesis produces a substance called glucose which is food for the plants that produces energy. Photosynthesis occurs in the chloroplasts of a cell. The chloroplasts within that cell may move due to light availability. Because chloroplasts absorb the light to undergo photosynthesis they may require movement when less light is available to them. Plants found in shady areas have bigger chloroplasts than plants found in non-shady areas. This is because plants found in shady areas find it more difficult to absorb light to undergo their life process, photosynthesis. The chloroplasts in plants found in shady areas adapt to the environment by increasing the size of their chloroplasts making it more likely to absorb light due to an increase of surface area. Without light plant cells would not be able to undergo photosynthesis therefore they would not

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be able to produce glucose and without food and energy the plants will die. The plants in the non-shady areas find it easier to absorb light, because of this they do not require bigger chloroplasts because light is available to them and they can undergo photosynthesis. The size of plants' chloroplasts depends on light availability.

A3

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

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Write the question number(s) if applicable.**

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High N - Score of 06

Question	Commentary
1	The candidate correctly identifies the location but not the purpose of respiration in part a. There is no additional evidence towards this in part b. Statements made in part b are too vague and generally do not link the change in the factor to the change in rate of either enzyme action or respiration. The candidate provides evidence for the effect of temperature at the achieved level only. Therefore an N2 is awarded.
2	This response provides evidence towards N1 rather than a higher grade because the candidate has not provided basic definitions for any of the cellular processes related to the question. Much of their effort has been put into rephrasing the content of the question with no new evidence being supplied. Had they made links between the types of transport and the direction of movement a higher grade may have been awarded.
3	The candidate has been awarded A3 as they have shown sufficient understanding of the process involved at achieved level. They have also identified the importance of light and the advantage of larger chloroplasts. In this case they also explained this advantage. A higher grade may have been awarded if this candidate had related the need for larger chloroplasts more comprehensively to the process of photosynthesis.