

91156



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## Level 2 Biology 2022

### 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 2–15 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (///). This area may 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**

All plants require specific reactants to start the process of photosynthesis.



Source: <https://www.doc.govt.nz/nature/native-plants/>

- (a) Describe the reactants required for photosynthesis AND how they enter the plant.

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(b) Photosynthesis takes place inside the chloroplasts. The main structures involved in photosynthesis are: the outer membrane, inner membrane, stroma, thylakoid membrane, and grana.



Adapted from: [www.mcqbiology.com/2013/04/multiple-choice-questions-on-chloroplast.html](http://www.mcqbiology.com/2013/04/multiple-choice-questions-on-chloroplast.html)

Discuss how specific reactants in the light-dependent and light-independent reactions affect the amounts of the products of photosynthesis:

In your answer:

- describe the function of TWO named structures from the chloroplast diagram
- explain how the structures of the chloroplast are built to help them carry out their function
- discuss how the structures of the chloroplast work together to carry out the process of photosynthesis.

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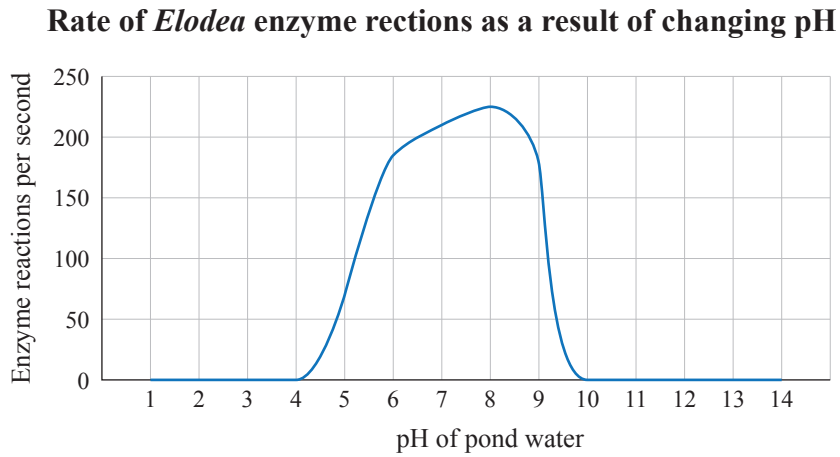




## QUESTION TWO: ENZYMES

Conditions of the water in a small pond can change throughout the day, and over a year. A change in pH can affect the rate of photosynthesis reactions. The presence of pollutants in the water can affect certain nutrients that are needed as co-factors for the enzymes involved in photosynthesis.

In an experiment to test the effect of pH on enzyme activity in *Elodea* cells, the following results were produced.



Adapted from: <https://pubmed.ncbi.nlm.nih.gov/20118304/>

(a) Discuss the effects of pH and co-factors on enzyme activity in *Elodea* plants.

In your answer you should refer to the graph above and:

- describe the function of enzymes and their structure
- explain how co-factors affect enzyme activity
- discuss how and why pH affects enzyme activity in *Elodea*.

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### QUESTION THREE: CELLULAR RESPIRATION

Mosquito larvae come to the surface of the water and absorb oxygen through a breathing tube. When threatened, the larvae retreat to the bottom of the pond where they can absorb dissolved oxygen from the water.

Mosquito larvae are transparent, and it is possible to observe their hearts beating under a microscope. The number of heart beats per minute can be used as a way to measure the cell respiration rate of the heart cells, and to study the factors that affect it.



Source: [https://en.wikipedia.org/wiki/File:Culex\\_sp\\_larvae.png](https://en.wikipedia.org/wiki/File:Culex_sp_larvae.png)

- (a) Describe the purpose of cellular respiration.

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- (b) As oxygen levels in the water decrease, respiration rate, and therefore heart rate decreases. Even when the water has NO oxygen left, the mosquito larvae's hearts could continue to beat.

	<b>Heart beats per minute with changing dissolved oxygen concentrations in pond water</b>				
<b>Dissolved oxygen concentration (% saturation)</b>	0	25	50	75	100
<b>Number of heart beats per minute (bpm)</b>	20	40	50	60	120

Discuss the observations above in relation to aerobic and anaerobic respiration, and their effect on the mosquito larvae's heart rates.

In your answer, refer to the data table and include:

- a description of where aerobic and anaerobic respiration take place in the cell
- an explanation of BOTH respiration processes that includes the materials required for each and their products
- elaborate on the possible effects on larval heart rate and type of respiration when exposed to 0% oxygen for more than a few hours.











