AS 91156 Demonstrate understanding of life processes at the cellular level.

ENZYMES

(2016:1)

(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.

(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.

(2015:1)

(a) Describe the purpose of cellular respiration, AND where it occurs in the 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*)

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.

(2013: 2)

The rate of photosynthesis is directly related to the availability of light. Normally, an increase in light intensity also leads to an increase in temperature. However, if the temperature gets too high, the rate of photosynthesis may decrease or even stop completely. Experiments have shown that if light is kept constant but temperature is varied independently, then the rate of photosynthesis can still be seen to change.

(a) With reference to the structure and function of enzymes, and the conditions that they are best suited to, explain why the rate of photosynthesis varies with changes in temperature.

(2012:3)

DNA replication is the starting point for cell division. In common with other cellular processes, the replication of DNA is reliant on the presence of a number of enzymes and the rate at which they can carry out their function.

The rate of enzyme activity can be affected by factors such as temperature, pH, substrate, concentration, co-enzymes and enzyme poisons.
Discuss how any THREE of these factors can change the rate of enzyme activity, and why this would be important in the case of DNA replication.

(2011: 2)

(a) Enzymes play an important role in most of the cellular functions that are carried out by organelles. Molecules can be broken down into smaller parts as well as the opposite process where molecules are joined together. These processes take place in organelles such as lysosomes and the Golgi body.
Describe the function of these two organelles:

(b) The term 'specific' can be used to describe the physical / chemical conditions in which an enzyme works, and the type of substrate on which it works.
Explain this statement, with reference to one or more named examples.

(c) Enzyme activity is rarely at a constant rate. The amount of enzyme available, the amount of substrate on which the enzymes can act, as well as the presence or absence of enzyme poisons or co-enzymes, are all factors that can change the rate of activity within a cell.
Discuss the effect of any THREE of these factors on the rate of activity within animal or plant cells.

(2010: 2)

Discuss the structure and function of enzymes.
In your answer you should include:

- the reason(s) why the enzymes are important
- an explanation of TWO models of enzyme activity
- TWO factors that affect enzyme activity and how each factor is linked to the functioning of enzymes.

You may include diagrams to help you answer the question.

(2009: 2)

Changes in temperature can alter the rate of activity of enzymes, which in turn affects the metabolic rate of an organism.
Discuss the reasons why enzyme activity is affected by temperature.
In your answer you should include:

- the structure of enzymes (you may use a labelled diagram to support your answer)
- the purpose of enzymes
- how enzymes work
- reasons for the different effects of temperature on enzymes.

(2008: 2)

Enzymes are found in both animals and plants, and have important roles in their metabolism.

(a) Describe the general purpose of enzymes.

(b) Explain the difference between the 'lock and key' and 'induced fit' models of enzyme activity. You may use diagrams in your answer if you wish.

(c) Some of the factors that affect the rate of enzyme activity within cells include the amount of substrate, the enzyme concentration, coenzymes, and enzyme poisons (inhibitors).

Discuss how any THREE of these factors can change the rate of activity within cells.

(2007: 2)

Chemical reactions in living organisms are made possible by the action of enzymes. Enzymes are usually specific in terms of the conditions they operate in, and the substrates they act upon.

(a) Use the structure of enzymes to explain why they are usually specific to the substrates they act upon.

(b) Discuss the effect of temperature on the activity of an enzyme. (You may include a diagram in your answer if you wish.)

(2006: 2)

Bread can be made by mixing flour, water, salt, sugar and a small amount of yeast. Carbon dioxide is produced from the fermentation of simple sugars. Fermentation is controlled by enzymes from the yeast.

(a) Explain why the shape of an enzyme is important for the way it functions. (You may use a diagram to help with your explanation.)

(b) In relation to enzyme structure, describe why the enzyme will not function at 45ºC.

Researchers have investigated the effect of temperature on yeast activity. The following table is a summary of their results.

Temperature	Fermentation
–20ºC	No fermentation
27ºC–38ºC	Optimum Fermentation range
35ºC	Optimum fermentation temperature

Temperature	Cell division
Less than 20ºC Greater than 40ºC	Cell division significantly reduced
20ºC–27ºC	Most favourable range for yeast to multiply
26ºC	Optimum temperature for multiplication of yeast
Greater than 60ºC	Nil

Between two and three hours are needed for the yeast to ferment the dough before it is baked in an oven.

(c) Discuss, with respect to the number of yeast cells and the fermentation rate, why it is important to have the temperature at:

- 26^{o}C for the first hour and
- 35^{o}C for the next two hours, before the dough is baked.

If the concentration of simple sugars is greater than 6% of the flour, the rate of fermentation is slowed because there is less water inside the yeast cell.

(d) Explain how the increase in concentration of sugar will slow the rate of fermentation in the yeast cell. (You may use a diagram to help with your explanation.)

Heavy metals, such as mercury and lead, are enzyme inhibitors.

(e) Explain how an enzyme inhibitor affects enzyme activity. (You may use a diagram to help with your explanation.)