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

Cell Organelles and Transport

(2017: 1) Photosynthesis

(a) Describe osmosis AND explain how it occurs in root cells of a plant.

(b) Write the word equation for photosynthesis AND draw a labelled diagram of a chloroplast showing the inner membrane, outer membrane, stroma, and thylakoid stacks.

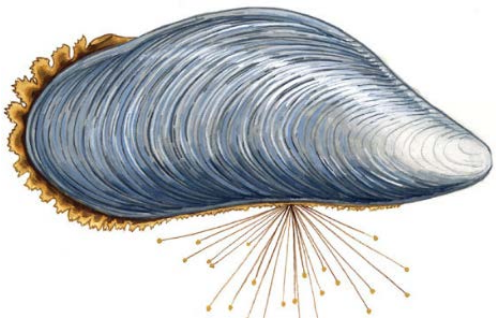
(c) Discuss how photosynthesis occurs, and the factors that affect it.

In your answer:

- explain light-independent AND light-dependent reactions
- indicate on your chloroplast drawing (In part b) where these reactions occur
- discuss how water AND one other factor can affect the rate of photosynthesis.

(2017:2) Cell Respiration

Intertidal animals such as the blue mussel, *Mytilus edulis*, rely on seawater to get dissolved oxygen for aerobic respiration.



At low tide the mussels are exposed to the air and tightly close their shells to prevent desiccation (drying out).

During low tide they rely on anaerobic respiration to maintain essential life processes.

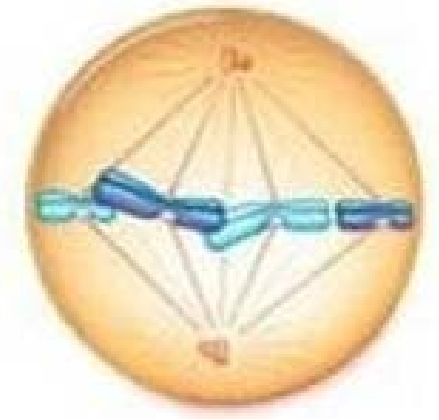
Compare and contrast anaerobic and aerobic respiration in intertidal blue mussels.

In your answer include:

- an explanation of anaerobic respiration that includes where it takes place in the cell, and the products formed
- an explanation of aerobic respiration that includes where it takes place in the cell, and the products formed
- a discussion of one advantage and one disadvantage for BOTH anaerobic AND aerobic respiration in blue mussels.

The earlier questions were collated from the expired Level 2 AS 90464 Describe cell structure and function but are still useful for the new AS 91156 Demonstrate understanding of life processes at the cellular level.

(2016:2) Mitosis and movement of materials



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

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

(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.

(2016:3) 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.

(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.

(2015:2) 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.

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.

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.

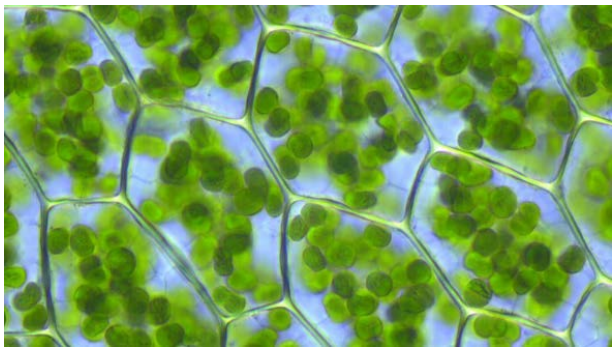
  You may use diagrams in your answer.

(2015:3) 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.



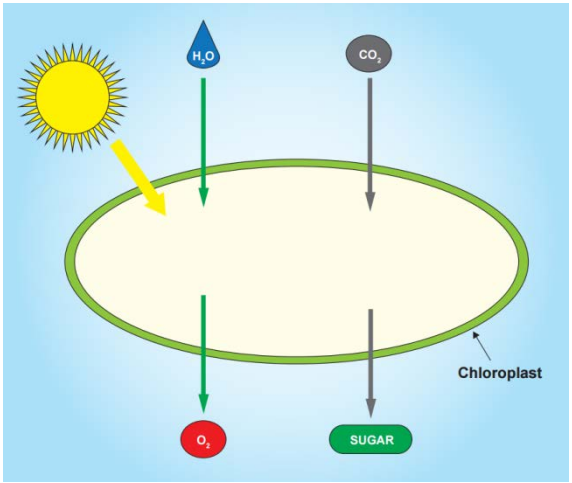
Discuss why plants found in shady areas have bigger chloroplasts and explain how chloroplast distribution within the cell can be influenced by light availability.

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.

(2014:2)

Photosynthesis is an important cell process carried out by green leaf and stem plant cells. The diagram shows this cellular process.



Discuss the factors that affect the rate of photosynthesis.

In your answer:

- describe photosynthesis and give a word equation for this cell process
- explain how water and carbon dioxide can affect the rate of photosynthesis
- discuss in detail how factors other than carbon dioxide and water affect the rate of photosynthesis.

The earlier questions were collated from the expired Level 2 AS 90464 Describe cell structure and function but are still useful for the new AS 91156 Demonstrate understanding of life processes at the cellular level.

(2014:3)

Mitochondria are found in animal and plant cells. The number of mitochondria per cell can vary widely. Red blood cells do not contain any mitochondria, whereas muscle cells may contain hundreds or thousands. The table below shows how the number of mitochondria can vary in different cells.

Human cell type	Number of mitochondria
Red blood cell	0
Skin cell	approx. 200
Liver cell	1000 – 2000
Heart muscle cell	5000+

(a) Draw a diagram of a mitochondrion, labelling the structures: outer membrane, inner membrane, matrix, and cristae.

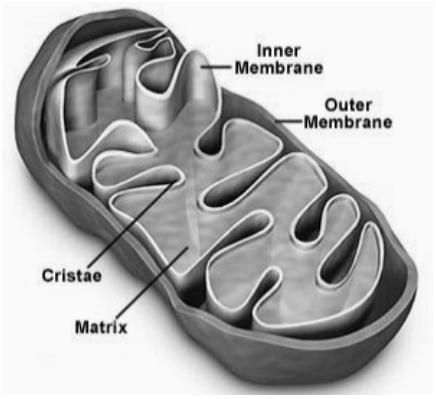
(b) Using the examples in the table above, discuss why there are different numbers of mitochondria in different types of human cells.

In your answer:

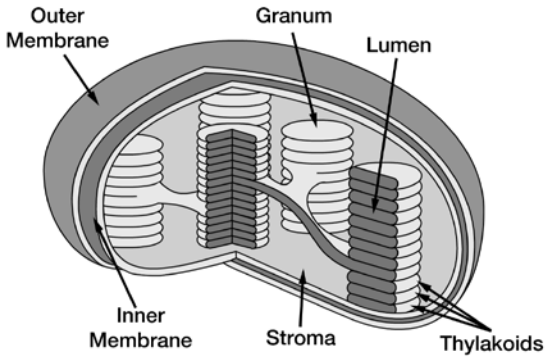
- explain the cell process that mitochondria carry out, and the purpose of this process
- provide reasons why different numbers of mitochondria are found in different types of cells
- make comparisons between the different types of cells in the table, AND link the number of mitochondria in the cell to its function and energy requirements.

(2011: 1)

Compare and contrast the two organelles shown below.



Mitochondria



Chloroplast

In your answer you should:

- describe the processes carried out by the two organelles
- explain how the structures of the organelles allow them to carry out their functions
- discuss reasons for similarities and differences in the structure, location, and number of these organelles.

The earlier questions were collated from the expired Level 2 AS 90464 Describe cell structure and function but are still useful for the new AS 91156 Demonstrate understanding of life processes at the cellular level.

(2013: 1)

Respiration

Although aerobic respiration is an essential cell process in both plants and animals, the location and function of the cell in an organism influences the rate at which respiration takes place. Cells that carry out different levels of respiration are usually found to have different amounts of the organelle in which aerobic respiration occurs.

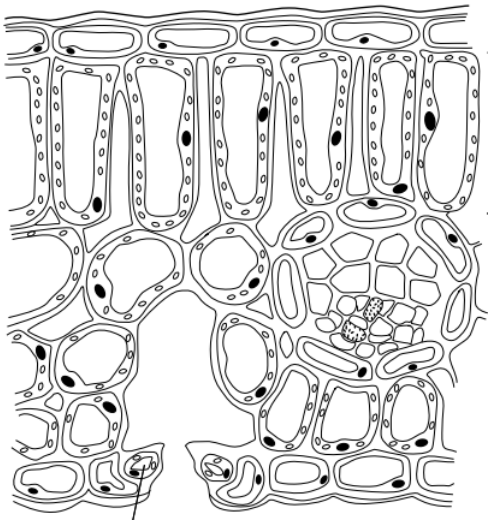
Discuss the process of aerobic respiration.

In your answer:

- describe the purpose of aerobic respiration
- describe what is required for aerobic respiration to occur, and name the products of the process
- name the organelle where aerobic respiration takes place, and relate its structure to its function
- give reasons for the differences in amounts of this organelle, supported by a minimum of TWO justified examples.

(2013:2 (b))

The leaf is made up of several different types of cells. Their shape, size, and chloroplast concentration are related to their function.



With reference to the diagram above, discuss how the location and structure of cells AND organelles in a plant leaf can maximise the rate of photosynthesis.

In your answer:

- describe the different types of cells found in a typical leaf
- describe the structure of the organelle where photosynthesis is carried out
- explain how the structures you have described allow the functions to be carried out
- relate the structure and function of the cells and organelles to the rate of photosynthesis.

You may draw a diagram(s) i to support your answer.

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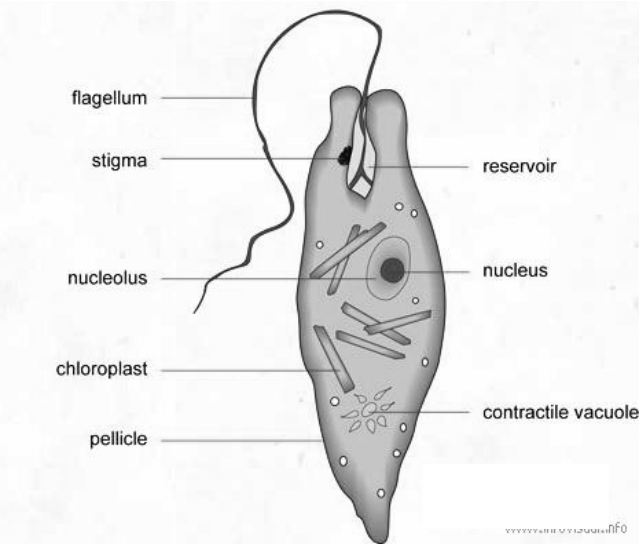
(2010: 1)

Euglena is a single-celled organism that lives in fresh-water lakes and ponds.

With reference to the diagram below, discuss how this organism obtains its energy.

Include in your answer the nature of the cell process involved and how the labelled organelles work together to let the organism get the maximum amount of energy possible.



(2010: 3)

(a) Describe the structure and function of the cell membrane. You may use diagrams to help you answer the question

(b) Cell membranes form the outside of cell organelles. Explain the general role of a membrane on the outside of an organelle.

(c) Active transport and osmosis both occur across the cell membrane. Compare and contrast these two processes. Give examples of active transport and osmosis in living organisms to support your answer.

(2009: 1)

Mitochondria carry out an essential cell process. The number of mitochondria can be different, depending on the location and function of the cell in an organism.

Relate the high number of mitochondria in some cells to their function.

In your answer you should consider:

- the structure of mitochondria (you may use a labelled diagram to support your answer)
- the process carried out by mitochondria
- the types of cells that would have the most mitochondria
- the reasons for higher numbers in some cells.

(2009: 3)

Organisms use a variety of cellular processes for the movement of materials, including osmosis and active transport.

(a) Describe the processes of osmosis and active transport.

(b) Explain why the two different processes are necessary, including an example of where each may occur in an organism.

(c) Compare and contrast the movement of water in and out of the cells of unicellular organisms living in freshwater and those living in saltwater environments, and discuss how unicellular organisms that live in freshwater environments regulate this movement of water.

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(2008: 1)

The endoplasmic reticulum takes up most of the space inside the cytoplasm. Many muscle cells contain both smooth endoplasmic reticulum and rough endoplasmic reticulum.

(a) Describe the main structural difference between these two types of endoplasmic reticulum.

(b) Explain the function of both rough and smooth endoplasmic reticulum, and why they are both needed in muscle cells.

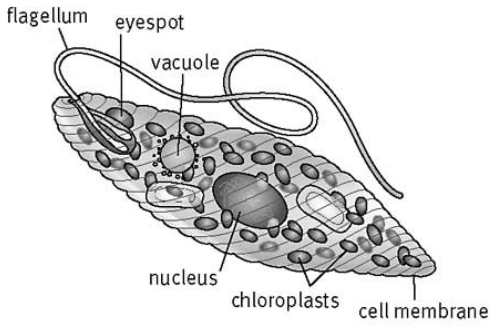
(2008: 4)

(a) Describe the purpose of photosynthesis.

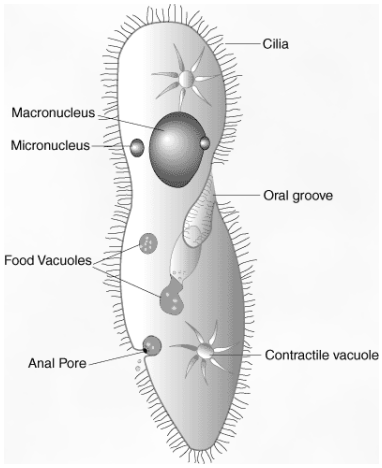
(b) Explain how the structure AND location of chloroplasts affect the process of photosynthesis.

(2008: 3)

Euglena and Paramecium are single-celled organisms that live in areas of fresh water such as lakes and ponds. Both of them have a number of organelles that enable them to function and survive in their environments.



Euglena



Paramecium

(a) The cell membrane that encloses each organism is semi-permeable. Explain the need for a semi-permeable membrane.

(b) Explain why unicellular organisms such as Euglena and Paramecium are restricted to being microscopic in size.

(c) Single-celled organisms such as Euglena and Paramecium live in freshwater environments. Discuss the reasons why contractile vacuoles are necessary in organisms such as these.

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(2007:1)

(a) Describe the process of diffusion.

(b) The surface area of cells is important for the transfer of materials, but the surface area : volume ratio changes as a cell grows. Explain why cells can only grow to a limited size.

(c) Compare the processes of osmosis and active transport, and discuss the reasons for similarities and differences.

(2007: 4)

Two athletes trained for different sports. One athlete trained for sprinting (100 m), and the other for endurance running (marathon). During their training, they had their muscle tissues analysed, and the number of mitochondria was found to be much higher in the endurance athlete.

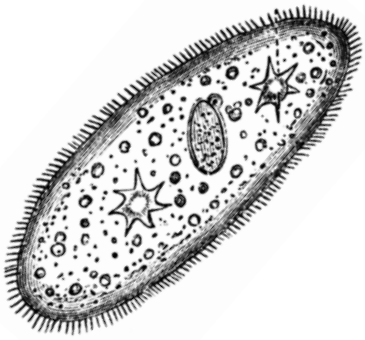
(a) Describe the purpose of cellular respiration.

(b) Explain why there are more mitochondria found in the muscles of the endurance athlete.

(2006: 3)

Paramecium is a common freshwater Protista, found in ponds or slow-moving streams.

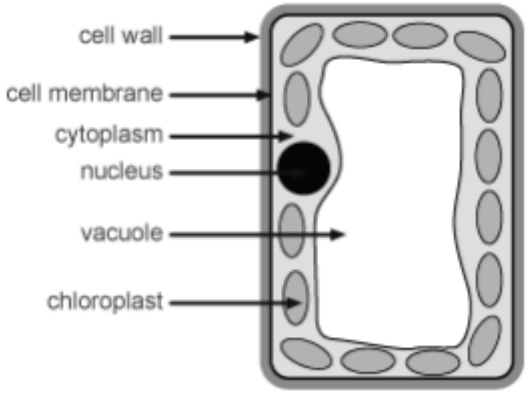
Discuss the relationship between osmosis and contractile vacuole activity in a Paramecium, in its freshwater environment.



(2006: 5)

This diagram shows a cell from the palisade layer of a leaf.

Explain how the role of photosynthesis is affected by the location of the chloroplasts in a palisade layer cell.



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