

1.1.3 Cell specialisation

AQA GCSE Biology (Higher) Question and answer notes

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How to use these notes

These notes cover everything you need to know for this part of the specification. They have been written in question-answer format to make them easier for you to study from.

In order to study successfully, I recommend you do the following for each question and answer:

- Read it carefully and make sure you **understand** it.
- **Memorise** the answer.
- **Practice** applying your understanding to past exam questions.

A good way to memorise information is to use **retrieval practice**. This is when you practise retrieving information from your memory. You could do this by making a flashcard for each question with the question on one side and the answer on the other. Or you could use a flashcard app. Alternatively, use a sheet of paper to cover up the answer so you can only see the question. Try to answer the question and then check how you did.

You should practise retrieving each answer from your memory until you can do it perfectly. Even once you can retrieve the answer perfectly, your ability to retrieve it will probably fade as time passes without practising. Therefore you will need to keep going back to the questions that you have previously mastered and practising them again. However, each time you re-learn the answer, the memory will be stronger and will last longer than the time before.

What is a specialised cell?

A specialised cell is a cell which carries out a particular function. It has structural features which enable it to carry out that function.

What are examples of specialised cells in animals?

Examples of specialised cells in animals include sperm cells, nerve cells and muscle cells.

What are examples of specialised cells in plants?

Examples of specialised cells in plants include root hair cells, xylem cells and phloem cells.

What is the function of a sperm cell?

The function of a sperm cell is to fuse with an egg cell during sexual reproduction to create a new individual.

What adaptations does a sperm cell have that enable it to carry out its function?

A sperm cell has the following adaptations: a tail, many mitochondria, an acrosome, a haploid nucleus.

How does a sperm cell's tail enable it to carry out its function?

A sperm cell's tail enables it to swim to the egg cell.

How do a sperm cell's many mitochondria enable it to carry out its function?

A sperm cell's many mitochondria release energy - through aerobic respiration - for swimming to the egg cell.

What is an acrosome and how does it enable a sperm cell to carry out its function?

An acrosome is a special structure found in the head of a sperm cell. It contains enzymes that break down the outer layer of the egg cell, allowing the sperm cell to fuse with it.

What is a haploid nucleus?

A haploid nucleus is a nucleus which only contains half the usual number of chromosomes.

How does having a haploid nucleus enable a sperm cell to carry out its function?

Having a haploid nucleus means that when a sperm cell fuses with an egg cell (which also has a haploid nucleus), the zygote formed has the full usual number of chromosomes.

What is the function of a nerve cell?

The function of a nerve cell is to transmit electrical impulses in order to carry information around the body.

What is the structure of a nerve cell?

The nucleus of a nerve cell is in the cell body. Coming off from the cell body are many branches called dendrites and a long, thin structure called the axon, which is wrapped in a fatty structure called the myelin sheath. At the end of the axon there are axon terminals.

How do the dendrites enable a nerve cell to carry out its function?

The dendrites receive electrical impulses from other nerve cells. Because there are many dendrites, the nerve cell can receive information from many other nerve cells.

How does the axon enable a nerve cell to carry out its function?

The axon carries electrical impulses away from the cell body. Because it is very long, it allows the nerve cell to transmit information over long distances within the body.

How does the myelin sheath enable a nerve cell to carry out its function?

The myelin sheath insulates the axon, speeding up the transmission of electrical impulses.

How do the axon terminals enable a nerve cell to carry out its function?

The axon terminals allow the nerve cell to transmit electrical impulses to other nerve cells or to muscles.

What is the function of a muscle cell?

The function of a muscle cell is to contract in order to generate movement.

What adaptations does a muscle cell have that enable it to carry out its function?

A muscle cell has the following adaptations: protein filaments made of actin and myosin, a large number of mitochondria, and a store of glycogen.

How do a muscle cell's protein filaments enable it to carry out its function?

A muscle cell's protein filaments are able to slide over each other in order to bring about contraction of the cell.

How does having a large number of mitochondria enable a muscle cell to carry out its function?

The many mitochondria in a muscle cell provide energy - through aerobic respiration. This energy is used in contraction.

How does a muscle cell's glycogen store enable it to carry out its function?

The glycogen in a muscle cell can be broken down into glucose, which can then be broken down through respiration to release energy for contraction.

What is the function of a root hair cell?

The function of a root hair cell is to absorb water and mineral ions from the soil.

What adaptations does a root hair cell have that enable it to carry out its function?

A root hair cell has the following adaptations: a root hair (a long, hair-like structure) sticking out into the soil, a thin cell wall, a large vacuole, and a large number of mitochondria.

How does the root hair enable the root hair cell to carry out its function?

The root hair greatly increases the surface area for the absorption of water and mineral ions.

How does having a thin cell wall enable a root hair cell to carry out its function?

Having a thin cell wall reduces the distance that water and mineral ions have to travel to enter the cell, which enables them to be absorbed more quickly.

How does having a large vacuole enable a root hair cell to carry out its function?

The large vacuole in a root hair cell enables it to store the water that it absorbs.

How does having many mitochondria enable a root hair cell to carry out its function?

A root hair cell's many mitochondria carry out aerobic respiration to release energy from food molecules. This energy is used to actively transport mineral ions into the cell.

What is the function of a xylem cell?

The function of a xylem cell is to transport water and mineral ions.

What adaptations does a xylem cell have that enable it to carry out its function?

A xylem cell has the following adaptations: it is a hollow, dead cell, it has no end walls, and it has lignin in its cell wall.

How does being a dead, hollow cell enable a xylem cell to carry out its function?

Because a xylem cell is dead and has no contents, water and mineral ions are able to flow through it easily.

How does having no end walls enable a xylem cell to carry out its function?

Because a xylem cell has no end walls, it is able to join together with other xylem cells to form a continuous tube for water and mineral ions to flow through.

How does having lignin in its cell wall enable a xylem cell to carry out its function?

The lignin in the cell wall of a xylem cell strengthens the cell to prevent it from collapsing. It also helps to waterproof the cell to prevent water from leaking out.

What is the function of a phloem cell?

The function of a phloem cell is to transport sugar from the leaves to the rest of the plant.

What are the two types of phloem cells and what are their roles?

The two types of phloem cells are sieve tube elements, which transport sugar, and companion cells, which support sieve tube elements.

How are sieve tube elements adapted for their function?

Sieve tube elements have the following adaptations: they have holes in their end walls, and they do not have a nucleus.

How does having holes in their end walls enable sieve tube elements to carry out their function?

The holes in the end walls of sieve tube elements allow sugar to travel from cell to cell through the phloem.

How does not having a nucleus enable sieve tube elements to carry out their function?

The lack of nucleus in a sieve tube element creates more space for sugar to move through the phloem.

How are companion cells adapted for their function?

Companion cells are adapted for their function by having many mitochondria.

How does having many mitochondria enable companion cells to carry out their function?

Having many mitochondria enables companion cells to supply the sieve tube elements with energy for the transport of sugar.