

# OCR (B) Biology GCSE

Topic B3.2: How do producers get the substances they need?

Flashcards



# What is simple diffusion?



# What is simple diffusion?

The net movement of molecules from an area of high concentration to an area of low concentration down a concentration gradient



# Define osmosis



## Define osmosis

The net movement of water molecules from an area of high water concentration to an area of low water concentration across a partially permeable membrane



# What is active transport?



## What is active transport?

The movement of molecules across a cell membrane from an area of low concentration to an area of high concentration, against the concentration gradient, using energy



By what process do substances enter and leave single-celled organisms?





By what process do substances enter and leave single-celled organisms?

Simple diffusion



Why can't multicellular organisms rely on simple diffusion alone?



# Why is simple diffusion less efficient in multicellular organisms?

- Small surface area to volume ratio
- Several layers of tissue too deep to diffuse through



Why must carbon dioxide be transported into plants and oxygen be transported out?



Why must carbon dioxide be transported into plants and oxygen be transported out?

Carbon dioxide is required for photosynthesis.

Oxygen is a by-product of photosynthesis so it is released.



How do gases such as oxygen and carbon dioxide move into and out of plants?



# How do gases such as oxygen and carbon dioxide move into and out of plants?

- Diffuse through stomata on the lower surface of the leaf and through air-filled spaces within the leaf
- Move between cells via simple diffusion across partially permeable cell membranes



# Why do plants require water?





# Why do plants require water?

- Photosynthesis
- Maintenance of structure (turgidity)
- Cooling effect



# Why do plants require mineral ions?



# Why do plants require mineral ions?

For growth e.g. nitrates are required to produce proteins



# How are water and minerals transported into plants?



# How are water and minerals transported into plants?

- Lower concentration of water in root hair cells than in the soil. Water diffuses down its concentration gradient into root hair cells by osmosis.
- Lower concentration of mineral ions in the soil than in the root. Root hair cells take up mineral ions by active transport.



Outline how root hair cells are adapted for the absorption of water and minerals



# Outline how plant roots are adapted for the absorption of water and minerals

Plant roots are composed of millions of root hair cells which have:

- Long hairs that extend from the cell body, increasing the surface area for absorption
- Many mitochondria which produce ATP for active transport of mineral ions



Name the two plant transport tissues





Name the two plant transport tissues

Xylem

Phloem



What is the function of the xylem?



What is the function of the xylem?

Transports water and minerals up the plant, from the roots to the leaves via the transpiration stream



Describe how the xylem is adapted to its function



## Describe how the xylem is adapted to its function

- Composed of dead cells laid end-to-end to form a long, hollow, continuous column
- No end walls which provides little resistance to the passage of water
- Thick cell wall, composed of cellulose, is strengthened with lignin to provide support



# What is the function of the phloem?



# What is the function of the phloem?

Transports sugars up and down the stem from photosynthetic tissues (e.g. mature green leaves) to non-photosynthetic tissues (e.g. developing seeds) via translocation



What are the two cell types that make up the phloem?





What are the two cell types that make up the phloem?

Sieve tube elements

Companion cells



Describe how the phloem is adapted to its function



# Describe how the phloem is adapted to its function

- Sieve tube elements are long, thin cells, laid end-to-end, with perforated end plates to enable the flow of sugars
- Sieve tube elements contain no nucleus and little cytoplasm to allow the unimpeded flow of sugars
- Companion cells contain a dense cytoplasm, nucleus and mitochondria
- They provide energy for metabolic processes in both cell types



# What is transpiration?



# What is transpiration?

The loss of water vapour from the parts of a plant exposed to the air due to evaporation and diffusion



# Describe the process of transpiration



# Describe the process of transpiration

- Water evaporates from the mesophyll cell surfaces and diffuses out of the stomata
- Water molecules (which have cohesive properties) are drawn up the xylem vessels to replace the water that has been lost
- This causes more water molecules to be absorbed from the soil into root hair cells



# What are stomata?





# What are stomata?

Pores found in the lower epidermis of a leaf that allow gas exchange



# What are guard cells?



# What are guard cells?

Specialised cells surrounding the stoma that change shape to control the size of the pore



In response to stimuli such as light, the stomata open. Explain how this happens.



In response to stimuli such as light, the stomata open. Explain how this happens.

- Stimuli e.g. light
- Potassium ions are actively pumped into guard cells
- Reduces the water concentration in the guard cells
- Water diffuses into the guard cells by osmosis
- Guard cells swell and become turgid
- Bend and draw away from each other, opening the stomata



Describe what happens to the stomata when potassium ions leave the guard cells.



Describe what happens to the stomata when potassium ions leave the guard cells.

- Potassium ions leave the guard cells
- Increases the water concentration in the guard cells
- Water diffuses out of the guard cells by osmosis
- Guard cells become flaccid, closing the stomata



What factors affect the rate of transpiration? (3)





## What factors affect the rate of transpiration? (3)

- Light intensity
- Temperature
- Air movement



Describe how high light intensity affects the rate of transpiration



## Describe how high light intensity affects the rate of transpiration

- High light intensity, greater number of stomata are open to allow gas exchange for photosynthesis
- As photosynthesis increases, more water is taken up from the soil, pushing water up the xylem
- More water vapour diffuses out of the stomata
- Rate of transpiration increases



Describe how low light intensity affects the rate of transpiration



Describe how low light intensity affects the rate of transpiration

At a low light intensity, fewer stomata are open so the rate of transpiration decreases.



Describe how temperature affects the rate of transpiration



# Describe how temperature affects the rate of transpiration

- Temperature increases
- Water molecules have more KE so diffuse out of the stomata more rapidly
- Photosynthesis also increases so more water is taken up from the soil, pushing water up the xylem
- More water vapour diffuses out of the stomata
- Rate of transpiration increases



Describe how air movement affects the rate of transpiration





## Describe how air movement affects the rate of transpiration

- Air movement increases
- High water concentration gradient maintained between the air spaces in the leaf and atmosphere
- Increased rate of diffusion of water molecules out of the stomata
- Rate of transpiration increases



# What is translocation?



# What is translocation?

The movement of sugars (sucrose, amino acids etc.) up and down a plant, from the source to the sink, via the phloem



Briefly describe the process of  
translocation



## Briefly describe the process of translocation

- Sucrose actively transported into the phloem using ATP
- Water enters the phloem by osmosis
- Sucrose diffuses into surrounding cells followed by water down its concentration gradient

