

# Edexcel IAL Biology A-level

## 4.1-4.13 - The Structure and Function of Plants

### Flashcards

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Name four structures which are found in plant cells but are not found in animal cells

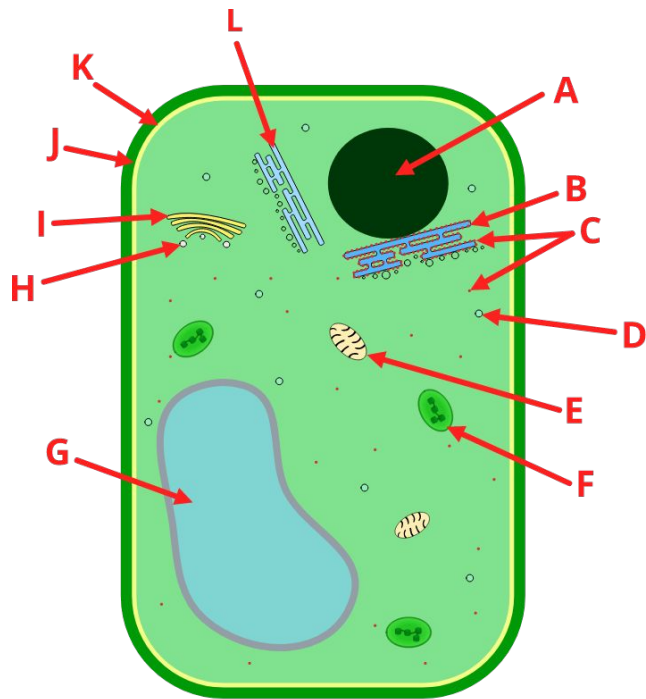


Name four structures which are found in plant cells but are not found in animal cells

- Chloroplasts
- Permanent vacuole
- Cellulose cell wall
- Plastids such as amyloplasts

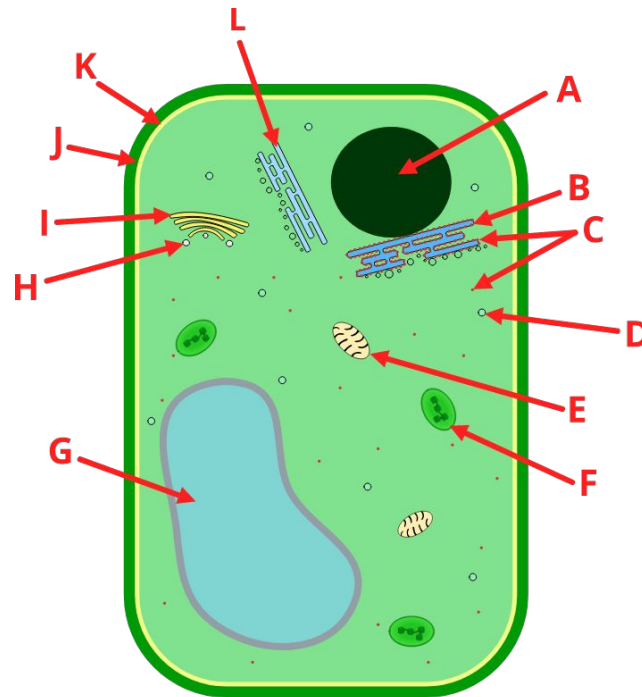


# Label this diagram of a plant cell



# Label this diagram of a plant cell

A	Nucleus	E	Mitochondria
B	Rough endoplasmic reticulum	F	Chloroplast
C	Ribosome	G	Permanent vacuole
D	Amyloplast	H	Vesicle
I	Golgi body	J	Cell wall
K	Plasma membrane	L	Smooth endoplasmic reticulum

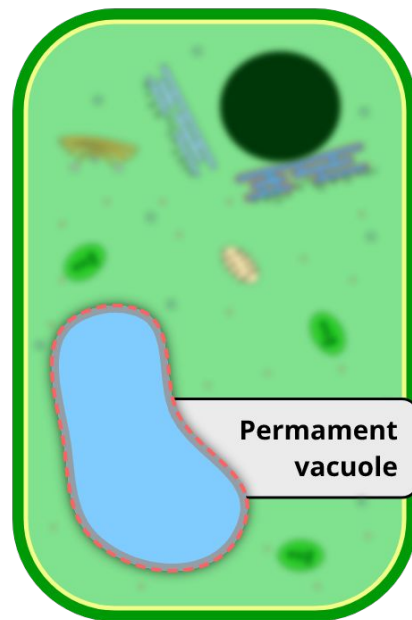


Describe the structure of the permanent vacuole found in plant cells

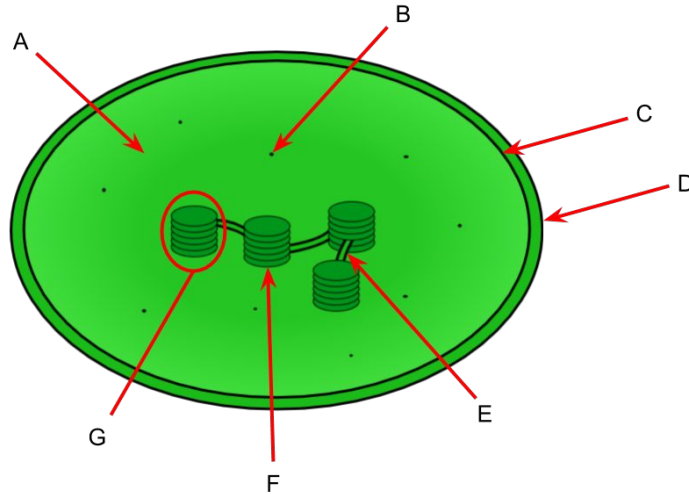


Describe the structure of the permanent vacuole found in plant cells

It contains **cell sap** surrounded by a membrane known as the tonoplast membrane



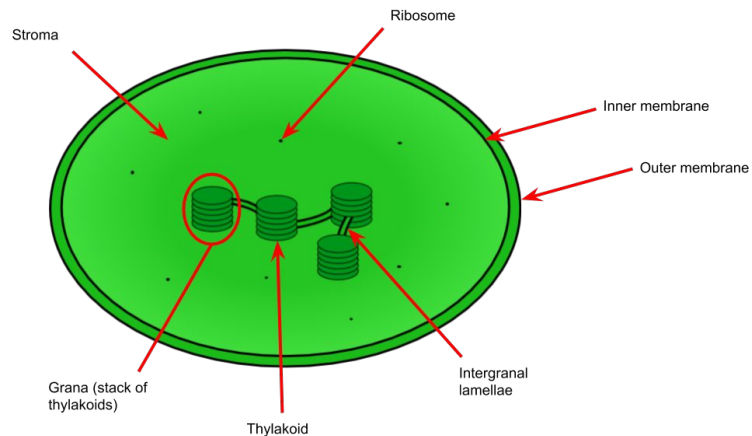
# Label this diagram of a chloroplast





# Label this diagram of a chloroplast

A	Stroma	E	Intergranal lamellae
B	Ribosome	F	Thylakoid
C	Inner membrane	G	Grana
D	Outer membrane		



# What is the function of chloroplasts?



What is the function of chloroplasts?

To carry out photosynthesis

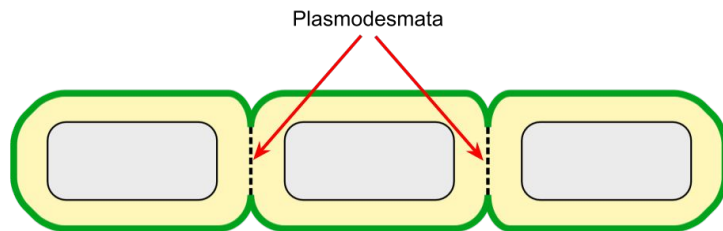


# What are plasmodesmata?



# What are plasmodesmata?

## Cytoplasmic bridges that connect the cytoplasm of neighbouring cells



Give **two** organelles found in animal cells which are not typically found in plant cells



Give **two** organelles found in animal cells which are not typically found in plant cells

Centrioles and lysosomes



# What is the middle lamella?





# What is the middle lamella?

A layer which is made up of calcium pectate and joins the cell walls of adjacent plant cells together



# What are bordered pits?



What are bordered pits?

Unlignified sections of xylem vessels  
which allow water to move laterally  
between cells



# Describe the structure of starch



## Describe the structure of starch

- Made of amylose (joined by alpha 1,4 bonds) and amylopectin (joined by alpha 1,6 bonds)
- Coiled and branched



# What is the function of starch?

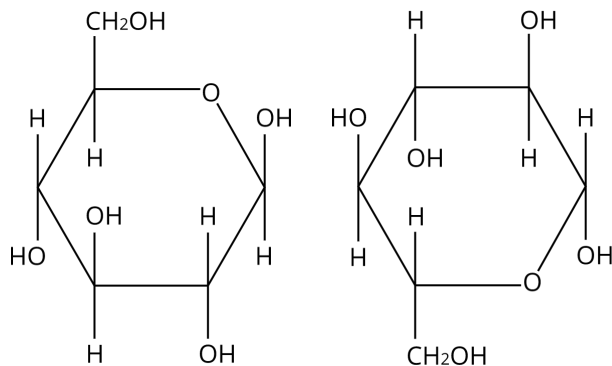


## What is the function of starch?

Starch is an insoluble store of energy in plant cells. The majority of the starch content of plant cells is found inside membrane bound plastids called amyloplasts

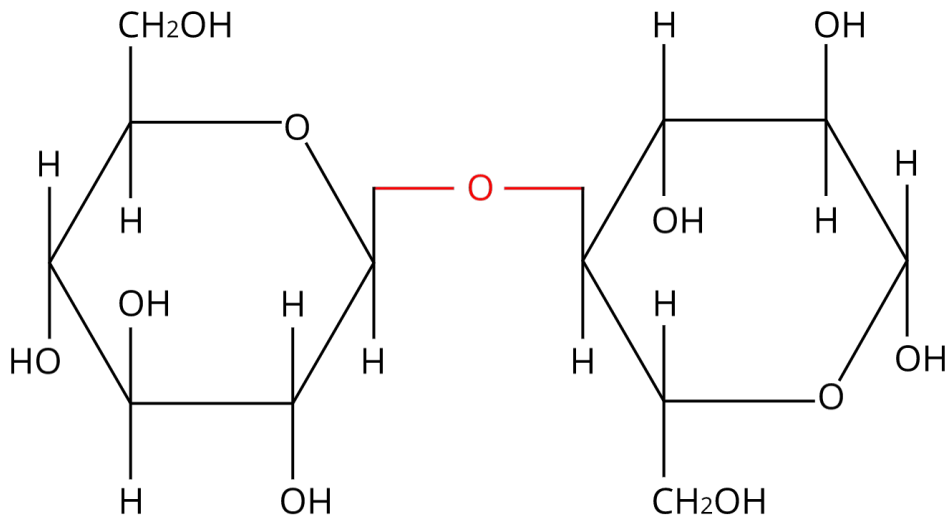


Shown below are two molecules of beta glucose. Draw a beta 1,4 glycosidic bond between them





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 Draw a beta 1,4 glycosidic bond between them

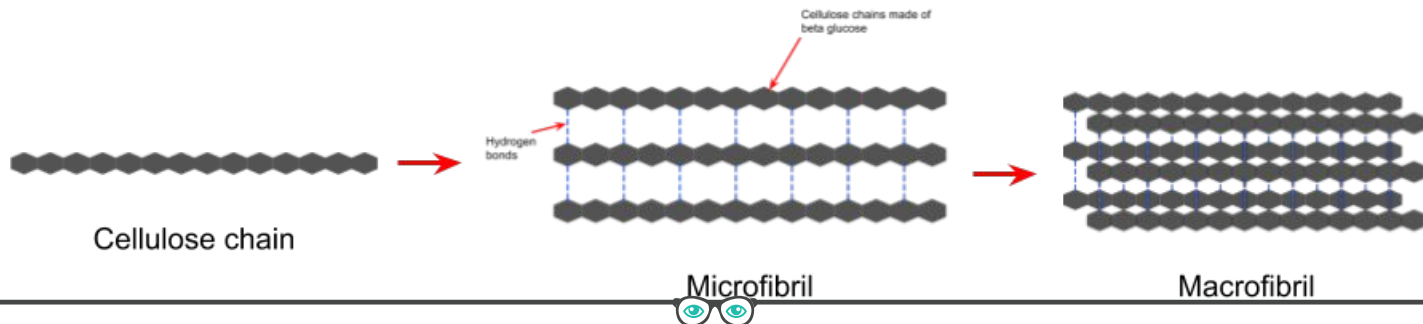


# Describe the structure of cellulose



# Describe the structure of cellulose

- Straight chains of beta glucose joined by  $\beta$  1,4 glycosidic bonds
- Hydrogen bonding between chains strengthens cellulose
- Individual chains pack into microfibrils which themselves pack into macrofibrils which make up cellulose

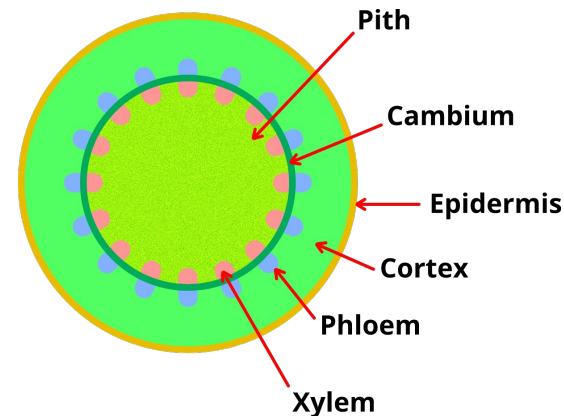


Describe the structure and layout of the stem of vascular plants



# Describe the structure and layout of the stem of vascular plants

- The xylem and phloem are grouped into **vascular bundles** which run down the length of the stem
- The vascular bundles are surrounded by **ground tissue** on either sides. The pith is in the centre of the stem and the cortex is on the outside. They are both mostly composed of parenchyma cells
- The cambium strip runs around the stem between the xylem and phloem. It contains dividing cells which can produce the vascular bundles as the plant grows



What does the xylem transport and in which direction?



What does the xylem transport and in which direction?

The xylem transports water and minerals up the plant from roots to shoots



What does the phloem transport and in which direction?





What does the phloem transport and in which direction?

Cell sap and sugars from source to sink



# What is secondary thickening?



# What is secondary thickening?

The lateral growth of the cambium tissue in plants to increase the thickness of the plant stem and vascular tissue



# What are the sclerenchyma fibres?



# What are the sclerenchyma fibres?

A type of supportive tissue found in plants made up of cells with lignified cell walls



How can humans use the properties of plant fibres to create materials?



# How can humans use the properties of plant fibres to create materials?

- Plant fibres are made of long structural polysaccharide chains.
- These are joined and strengthened by many hydrogen bonds which make the fibres tough.
- One example of a plant-based material is cotton which is made of cellulose fibres and is used to create strong fabrics.



Describe the structure and function of the vascular system in the stem of dicotyledons.





Describe the structure and function of the vascular system in the stem of dicotyledons.

Vascular bundles organised around a central pith. Xylem on the inside of the bundle to provide support and flexibility, phloem on the outside. Cambium is found between the two



Relate the structure of the xylem to its function.



## Relate the structure of the xylem to its function.

- Long, continuous columns made of dead tissue, allowing the transportation of water
- Contain bordered pits, allowing the sideways movement of water between vessels
- Walls impregnated with lignin, providing structural support



# Define translocation



## Define translocation

The movement of organic compounds in the phloem, from sources to sinks



# Summarise the mass-flow hypothesis of translocation



## Summarise the mass-flow hypothesis of translocation

- Sugar loaded into sieve tubes via active transport
- Lowers water potential, causing water to move in from the xylem
- Hydrostatic pressure causes sugars to move towards the sink



# Give evidence for the mass-flow hypothesis





# Give evidence for the mass-flow hypothesis

- Sap is released when the stem is cut  $\therefore$  must be pressure in phloem
- Sap exuding from the stylet (mouthpart) of an **aphid** inserted into sieve tubes provides evidence that sugars are carried in the phloem
- There is a higher sucrose concentration in the leaves than the roots
- **Autoradiographs** produced using carbon dioxide labelled with radioactive carbon provide evidence for translocation in the phloem



What is the role of  $\text{Mg}^{2+}$  in plants?



What is the role of  $\text{Mg}^{2+}$  in plants?

$\text{Mg}^{2+}$  is used to produce chlorophyll



# What is the role of $\text{Ca}^{2+}$ in plants?



What is the role of  $\text{Ca}^{2+}$  in plants?

$\text{Ca}^{2+}$  is used to strengthen cell walls in plants



What is the role of nitrate ions ( $\text{NO}_3^-$ ) in plants?



What is the role of nitrate ions ( $\text{NO}_3^-$ ) in plants?

Nitrate ions are used in the synthesis of amino acids, which are themselves used to produce proteins



# What are the conditions required for bacterial growth?





# What are the conditions required for bacterial growth?

- Sufficient nutrients
- An appropriate temperature
- High moisture levels
- High oxygen levels for aerobic bacteria
- A well regulated pH



Describe the phases of population growth.



## Describe the phases of population growth.

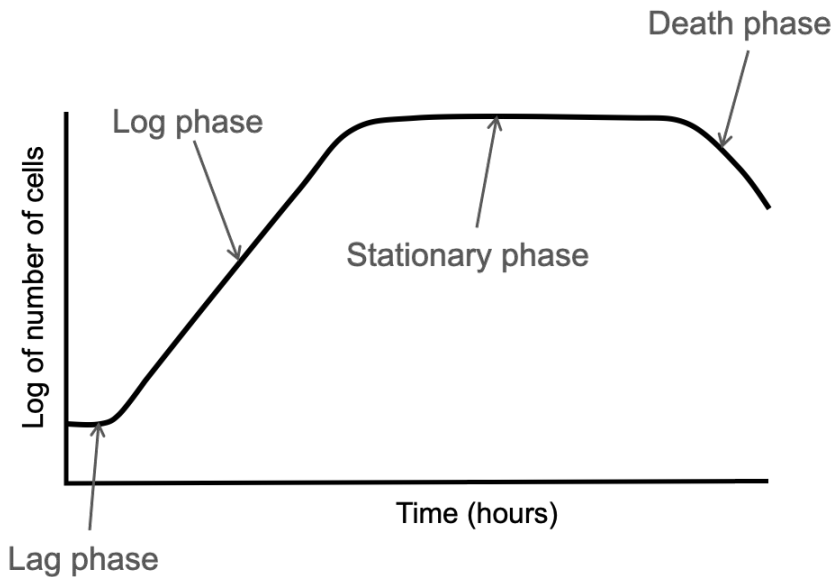
- **Lag phase** - period of slow population growth
- **Log phase** - period of rapid population growth in which birth rate exceeds death rate
- **Stationary phase** - period of stability in which population numbers generally remain constant



Draw a generalised graph of population growth in a bacterial population



# Draw a generalised graph of population growth in a bacterial population



# How can plant-based chemicals be used in healthcare?



# How can plant-based chemicals be used in healthcare?

- Many plants can provide **antimicrobial properties**. For example tea tree oil has certain antifungal and antibacterial properties
- Lots of plants can have other **therapeutic properties**. For example poppy stems can be used to extract **morphine** which is used as an **analgesic** to relieve pain



# What was William Withering's digitalis soup?





# What was William Withering's digitalis soup?

One of the first examples of drug testing where the correct dose of digitalis from the poisonous foxglove plant to treat heart disease was determined by William Withering



# What are double blind trials?



# What are double blind trials?

Trials where neither the researchers or participants in a study know whether a drug is a placebo or the real drug. This eliminates any researcher bias

**Researchers**



**Participants**



# What is a placebo?



## What is a placebo?

A replica of the drug being tested that is indistinguishable from the real drug yet it exerts no effects on the patient whatsoever



Explain how placebos are used in drug testing.



## Explain how placebos are used in drug testing.

- Placebos are identical in every way to the drug being tested, except they do not contain any active ingredient
- Placebos are used to find out whether the drug being tested is actually effective or if any positive effects are actually related to psychological processes



# Summarise the process of three-phased drug testing





Summarise the process of three-phased drug testing.

1. Drug tested on healthy individuals to check for side effects
2. Drug tested on a group of patients
3. Drug tested on large numbers of patients, one group receiving the existing treatment and the other receiving the new treatment

