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Unit B5

Growth and Development

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The topics in this unit are:

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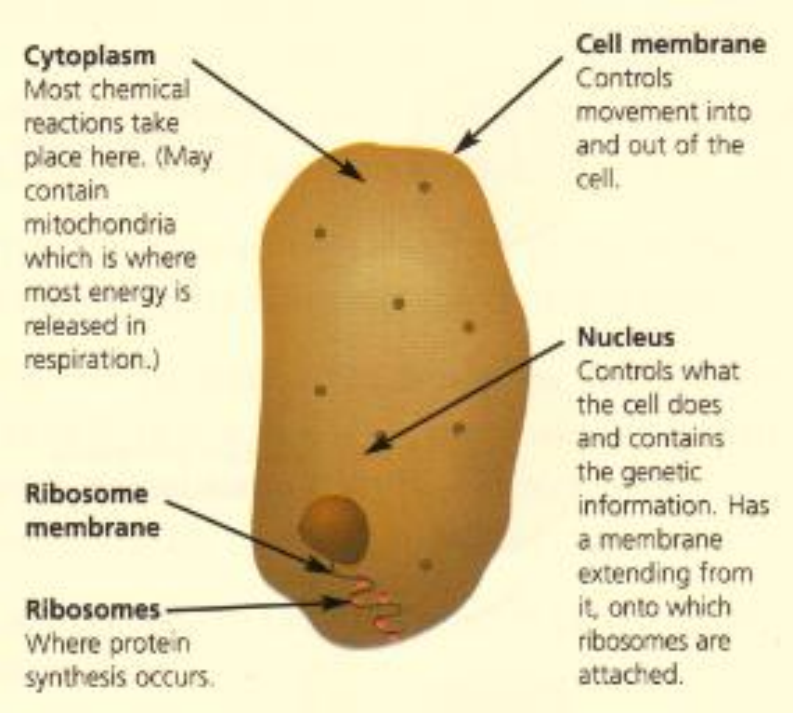
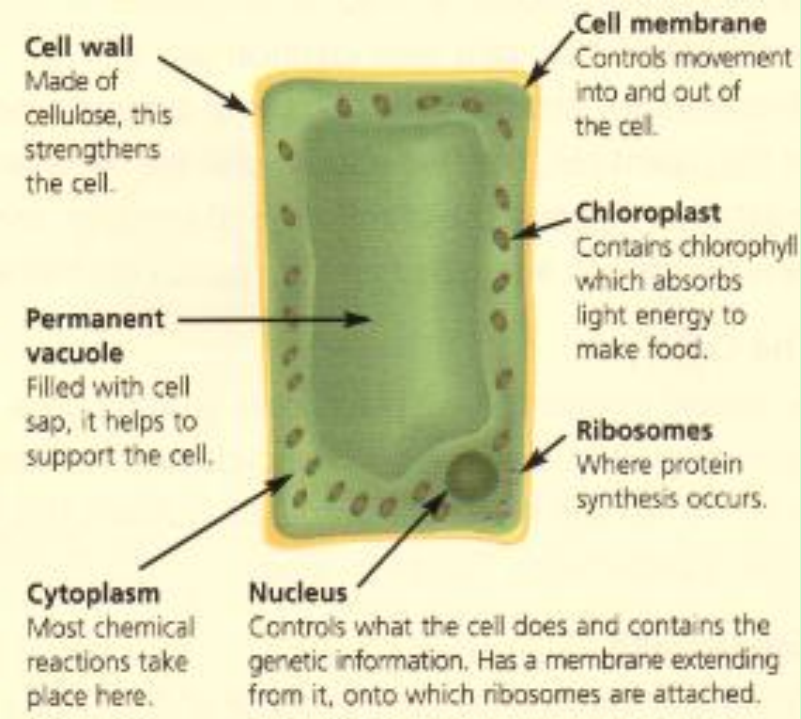
Cells





The **nucleus** contains the **DNA**

The **chloroplasts** in plant cells are where **photosynthesis** takes place

Mitochondria are where **respiration** takes place

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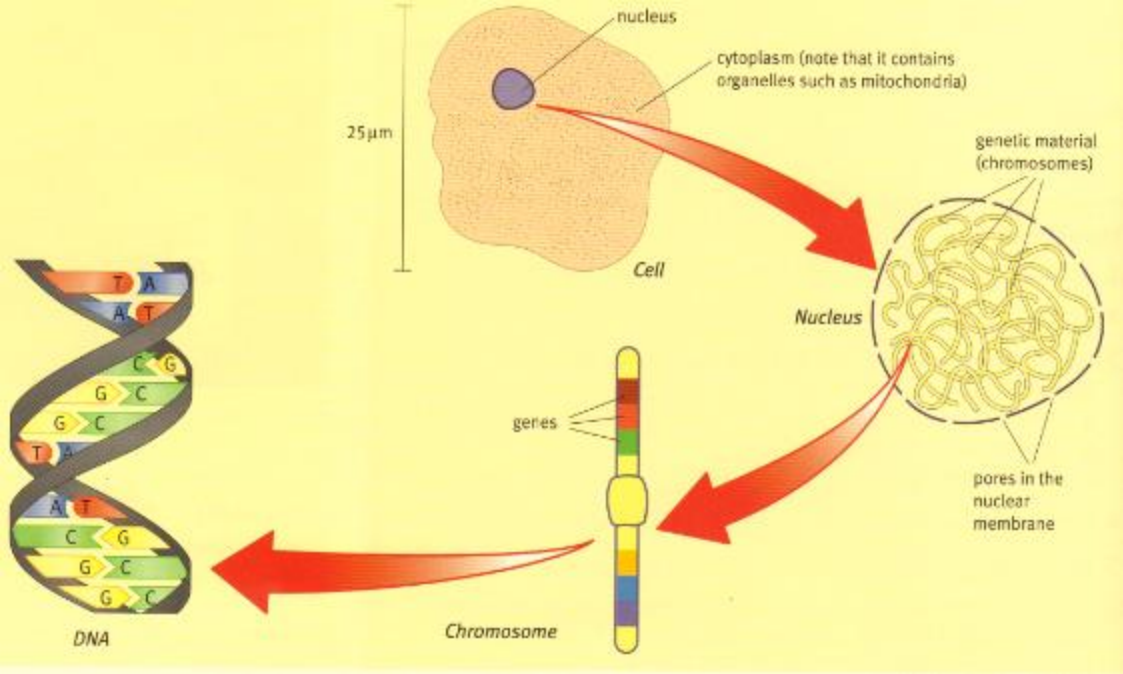
Inside the Cell



Cells are **building blocks** of all living things.

All cells contain **DNA** (deoxyribonucleic acid)

DNA molecules are in the form of a double helix and contain the **genetic code**

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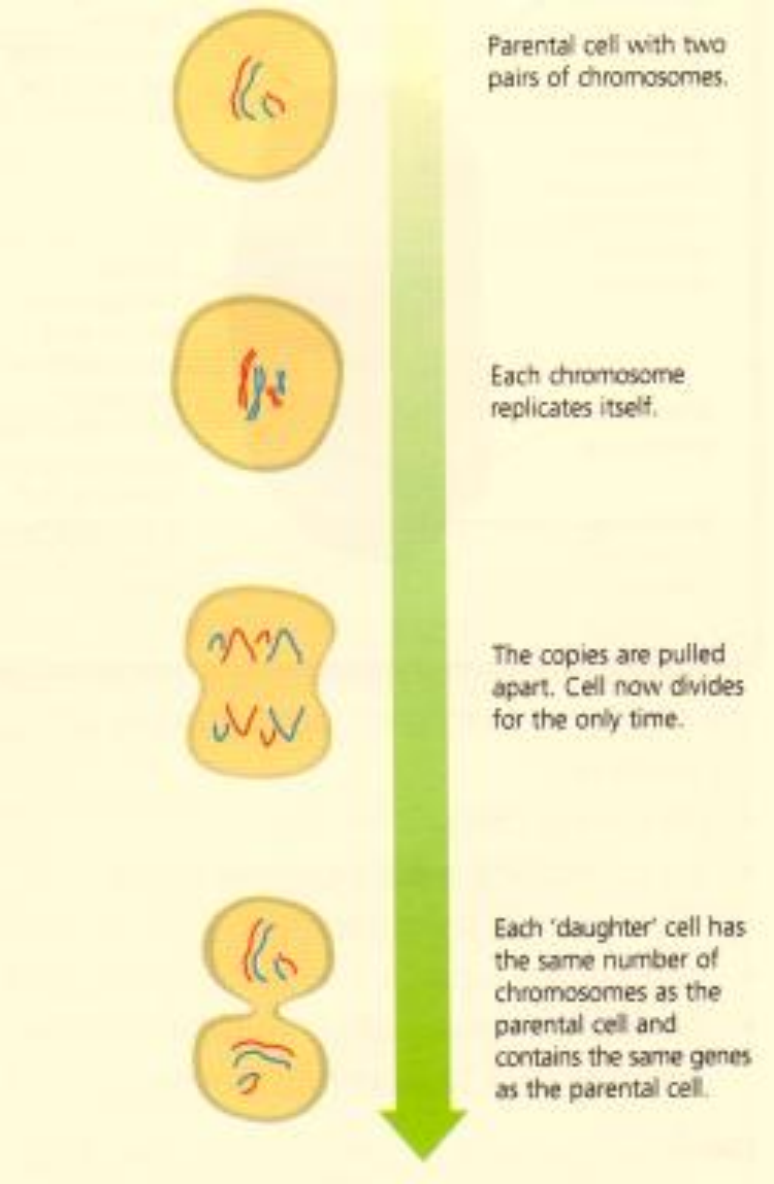
Mitosis



Mitosis is the process in which a cell **divides** to produce two new cells with **identical** sets of chromosomes

The purpose of mitosis is to produce new cells for **growth** and **repair** and to replace old tissues.

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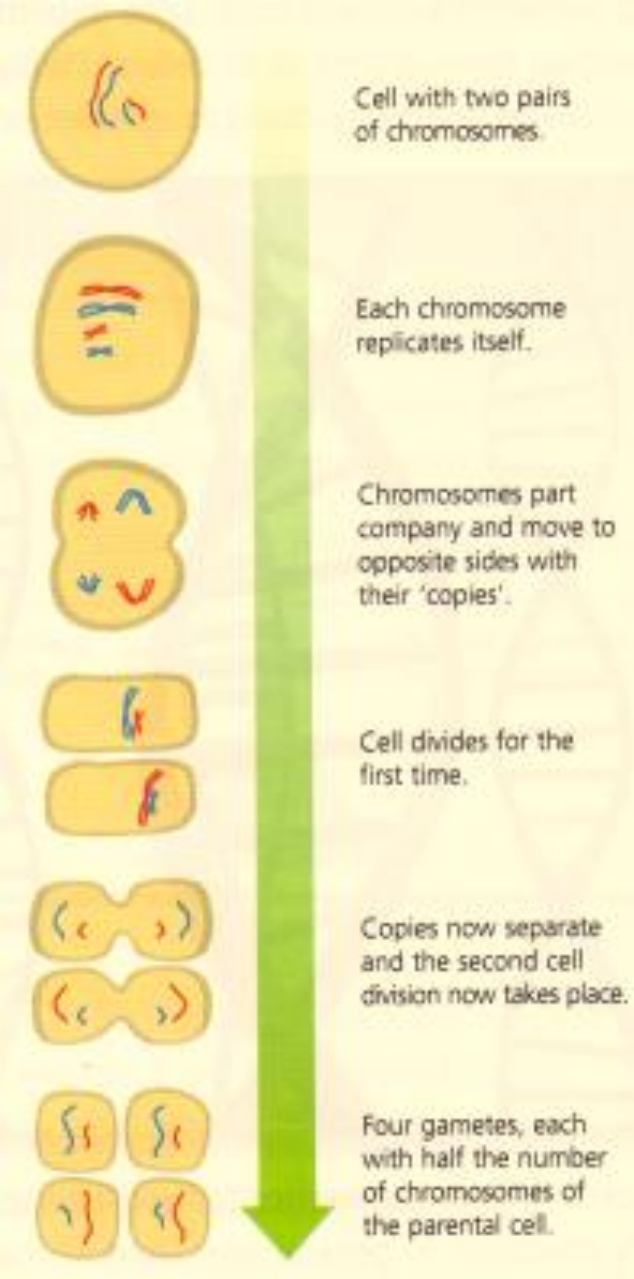
Meiosis



Meiosis only takes place in the **testes** and **ovaries**.

It is a special type of cell division that produces **gametes** for **sexual reproduction**.

Gametes contain **half** the number of **chromosomes** of the parent cell.

Meiosis produces **variation** as when the gametes fuse, **genetic information** from two individuals is combined

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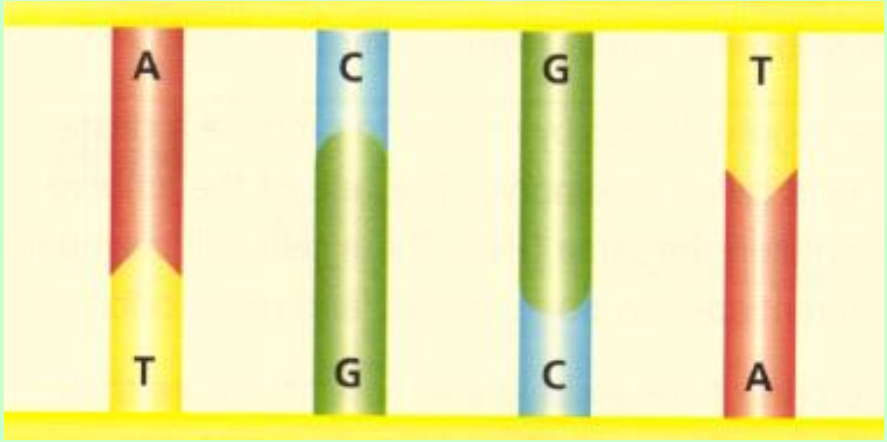
DNA and Growth

Growth and development in organisms is controlled by **genes** present on the **chromosomes**.

Genes provide instructions to produce **proteins**

The **instructions** are in the form of a code, made up of **4 bases** which keep the two strands of DNA together



The bases always pair up in the same way

Adenine and Thymine

Cytosine and Guanine

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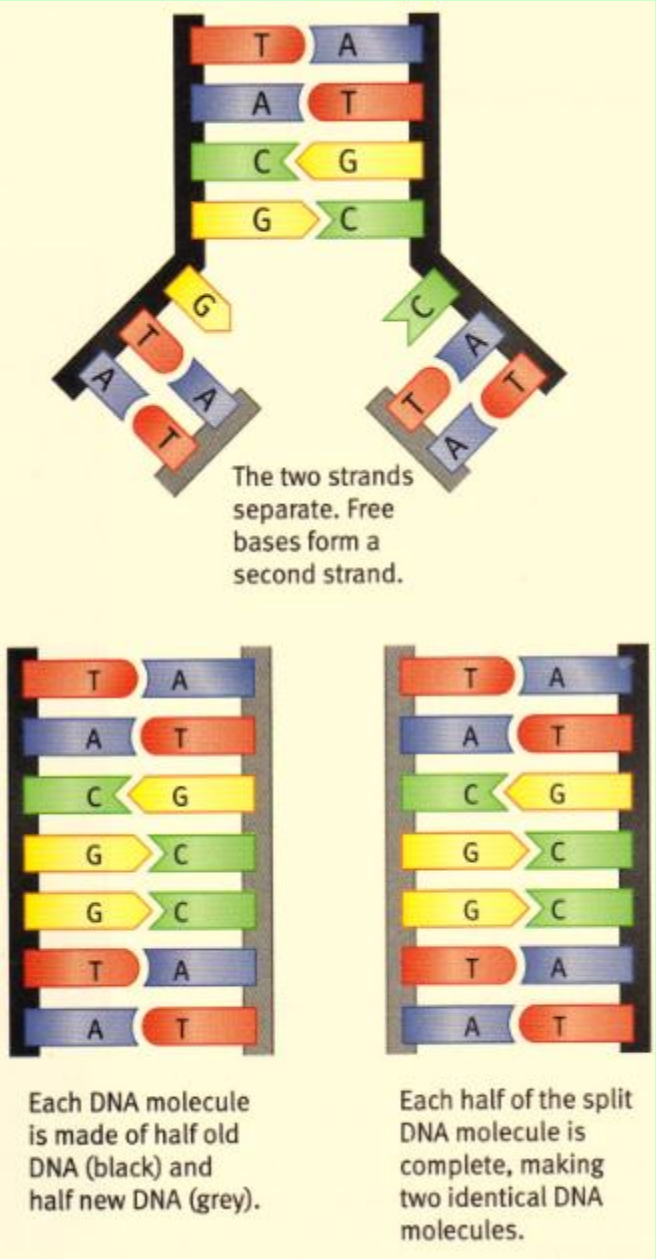
Messenger RNA



The production of **proteins** takes place outside the nucleus in the **cytoplasm**

The DNA cannot **leave** the cell because it is too large

The section of DNA is "unzipped" and instructions are **copied** onto smaller molecules called messenger RNA (mRNA)

These leave the nucleus and take the instructions and the **ribosomes** can make the relevant protein

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Stem Cells

Cells in the adult human body are **SPECIALISED** to carry out specific jobs.

However, up to the **8-cell stage**, all cells in human embryos are **unspecialised** and can turn into any kind of cell.

These cells are called **STEM CELLS**

After the 8-cell stage the cells in an embryo become **specialised** and form different types of **tissues**.

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Uses of Stem Cells

Stem cells could potentially be used to:

- Help treat **diseases** and **disorders**
- **Repair** damage to various tissues

If we could make	They could be used to treat
Nerve cells	Parkinson's disease
Heart muscle cells	Damage from heart attacks
Insulin secreting cells	Diabetes
Skin cells	Burns and ulcers
Retina cells	Some kinds of blindness

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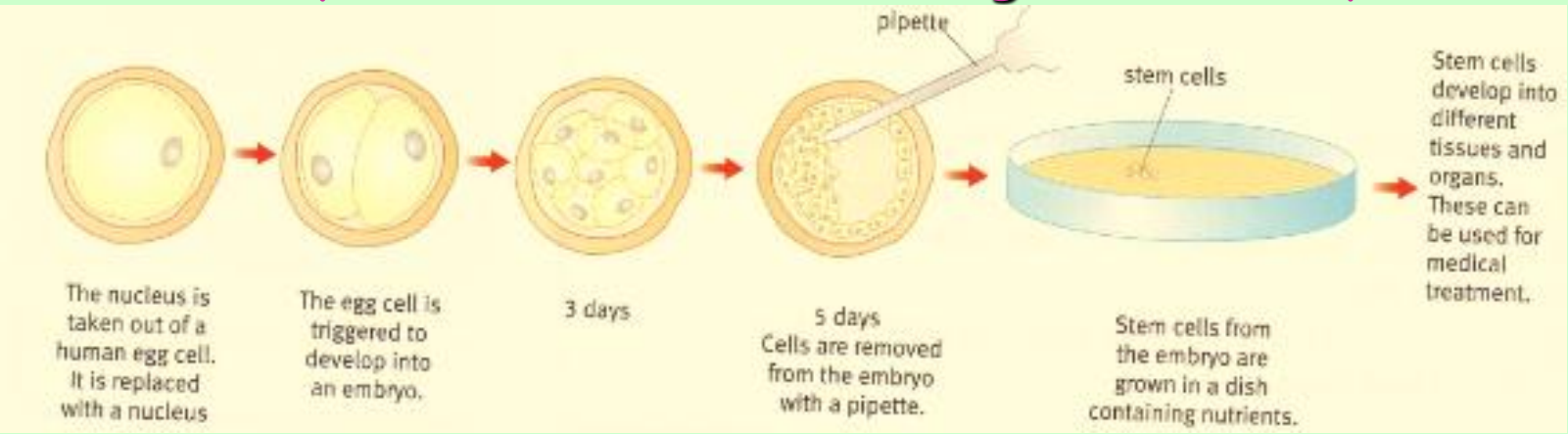
Therapeutic Cloning

Therapeutic cloning involves **removing** the **nucleus** from an egg cell and **replacing** it with the nucleus from one of the **patients cell**

The egg cell is then is stimulated so that it stats to **divide**

The stem cells produced have the **same genes** as the patient



The advantage is that the patient would not **reject** the tissues from a transplant

Scientists have so far been able to grow **ears**, **skin** and recently a **bladder**

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Growth in Plants

Plants are different to humans because most plants **continue** to grow in **height** and **width** throughout their lives.

Plants grow by the **cells dividing**. They divide by the process of **mitosis**.

When a plant grows, the new cells can **specialise** into roots, leaves or flowers.

Plants increase in length by making new cells at the **tips** of both shoots and roots. They also have rings of cells in their **stems** to increase their width.

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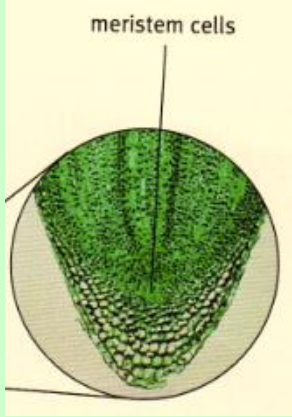
Meristems

Meristems are sites where **unspecialised** cells divide over and over again.

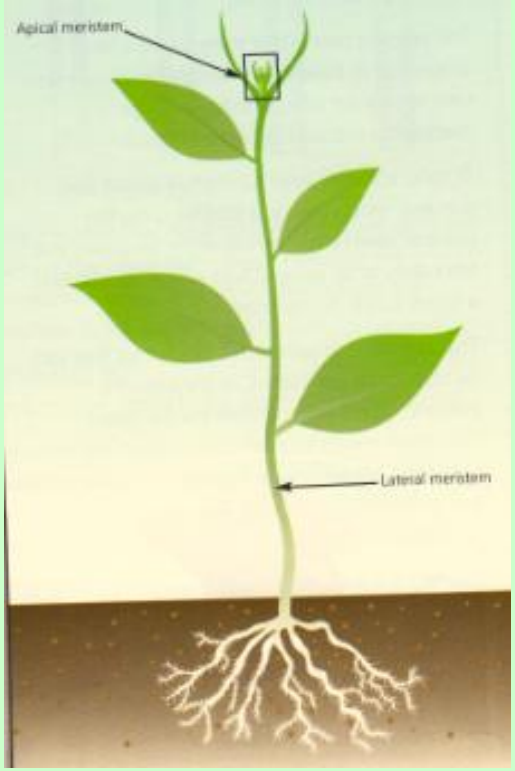
The cells then become **specialised**.

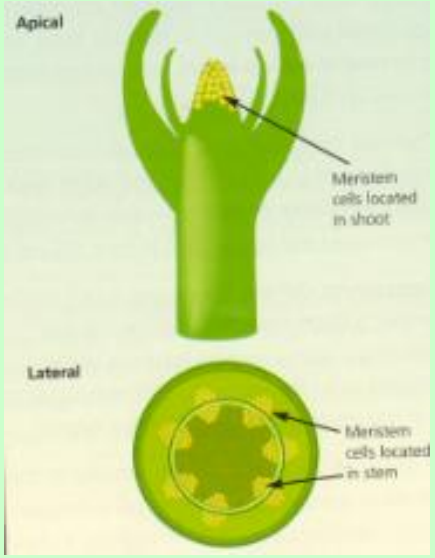


If the conditions in their environment are changed, the unspecialised cells can develop into:

Tissues eg xylem, phloem

Organs – leaves, roots, flowers





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Cuttings

Because of the mortises, plants can be **cloned**.

Plants are cloned by taking **cuttings**. This is just a shoot or leaf from a plant.

The cutting is placed in a **rooting hormone**. This is usually a hormone called **auxin**.

Roots will start to form and the new plant develops.

The plants that form have identical DNA to the plant the cutting was taken from. It is a **clone**.

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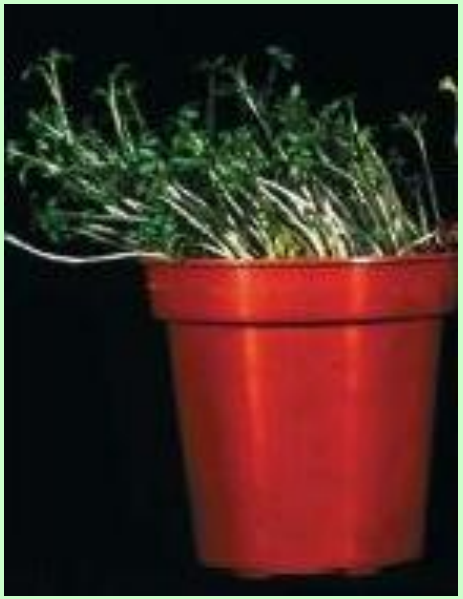
Phototropism

Plants need **light** to survive.

They **respond** to light by changing the direction which they grow. This is called **phototropism**.

Phototropism increases the plants chances of **survival**.



Received light on one side

Received light all around

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