Plant reproduction 1

Flowers and Pollination

The flower is the organ responsible for sexual reproduction in a plant. The gametes are created, released and combine in the flower. The female gamete is the ovule and the male gamete is the pollen.

Pollination is the transfer of pollen to the stigma.

Self-pollination	Cross-pollination
Pollen from the plant is transferred to the stigma of the same plant.	Pollen from one plant is transferred to the stigma of a different plant of the same species.
The only variation that occurs in the offspring comes from mutation, independent assortment and crossing over in meiosis of gamete creation.	Variation is from meiosis, mutation and having genetic material from 2 different parent plants.
Good for successful plants in a stable environment, but species will be unable to adapt to change.	Species more likely to survive a changing environment due to varied offspring.

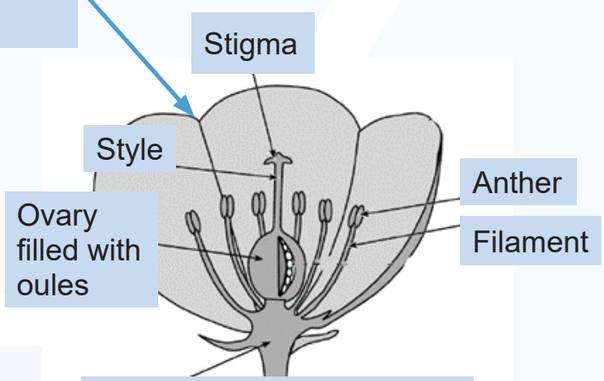
Plants prevent self-pollination by:

- Chemical self- incompatibility-gametes from the same plant cannot combine.
- Irregular flower structure.

Dicotyledonous, insect pollinated Flower structure

A corolla of petals. Colourful and scented to attract insects. In a wind pollinated flower, petals are often lacing or if present small and green.

The carpel (female) made of a sticky stigma to collect pollen from the insects' bodies. In a wind pollinated flower, this is large and feathery and hangs outside the flower to collect pollen blown past.



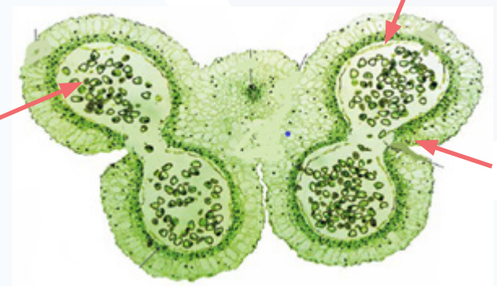
The stamen (male) made of the anther and filament is tucked inside the flower, so the insect rubs past picking up pollen.

In a wind pollinated flower the anther is large and hangs outside the flower, so the small light pollen gets carried away.

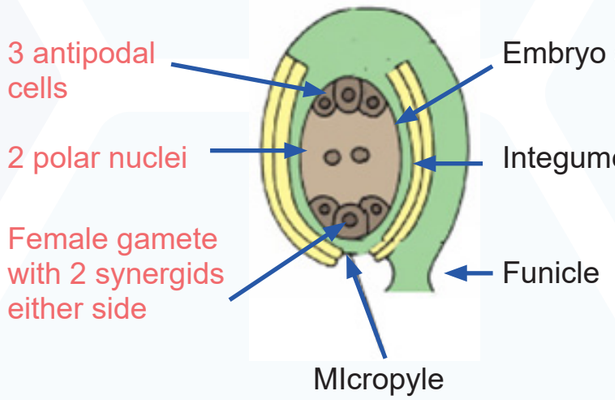
Gametes and fertilisation

The **pollen grains** develop in anthers.

- Pollen mother cells develop by mitosis.
- Meiosis occurs to produce a tetrad of 4 haploid cells.
- In each haploid, pollen grain meiotic division of the nucleus forms a generative nucleus (that mitotically divides to produce 2 male nuclei) and a tube nucleus.



The **ovules** develop in the ovary.



Formation of the ovule:

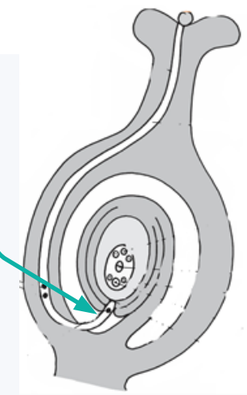
- A megaspore mother cell carries out meiosis and 4 haploid nuclei are formed.
- 3 nuclei degenerate and 1 divides by mitosis three times to produce the cells shown in red above.

Fertilisation

Pollen grain on a compatible stigma produces hydrolase enzymes, forming a pollen tube leading to the micropyle of the embryo sac.

One male gamete enters the embryo sac and fuses with the female gamete to produce a diploid zygote.

The second male gamete fuses with the two polar nuclei to form a triploid primary endosperm nucleus.



Plant reproduction 2

Seeds and Germination

Seeds are an adaptation to terrestrial life. They can survive very dry conditions, have enough of a food store to provide food until the new plant can photosynthesise and plants have developed different mechanisms for dispersal of the seeds to reduce competition with parent plants.

Following fertilisation, the structures develop as shown below:

Structure	Development
Ovule	Develops into a seed
Diploid zygote	Divides by mitosis to form the diploid embryo. This is made of the plumule, radical and 1 or 2 cotyledons.
Triploid endosperm nucleus	Divides by mitosis to form endosperm tissue, an important food storage tissue.
Integuments	Develop into the testa
Micropyle	A pore in the testa
Ovary	Develops into a fruit wall, enclosing seeds.

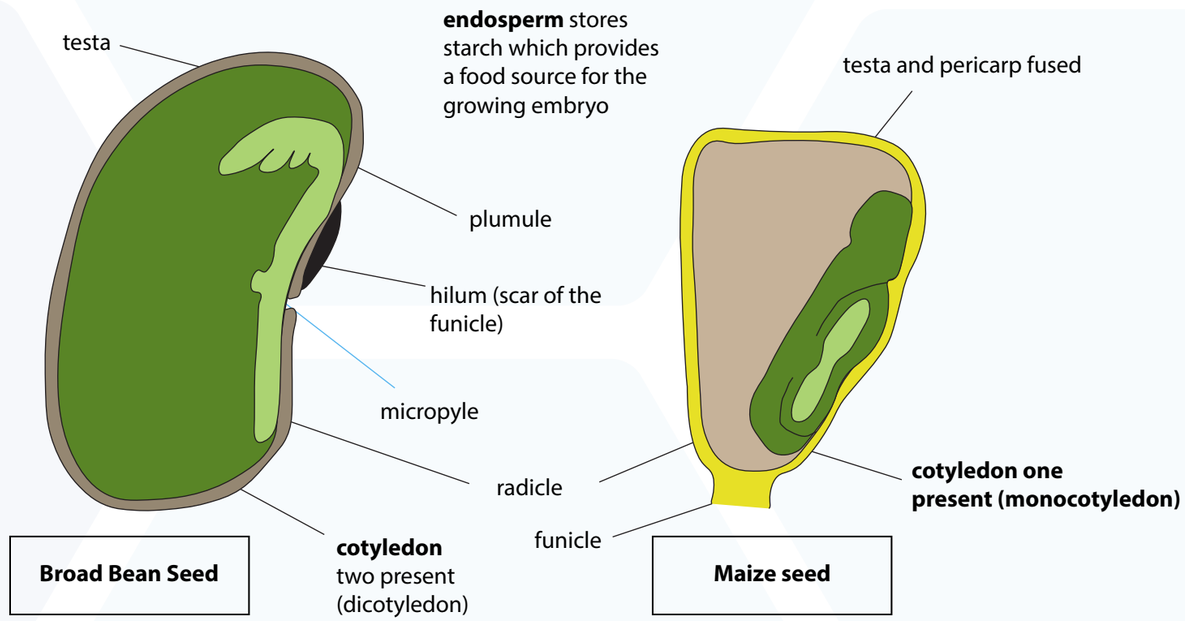
Conditions for germination

Germination is the series of biochemical and physiological processes through which a seed becomes a photosynthesising plant, independent of the food stores in the cotyledons.

Condition	Reason
Temperature	A suitable temperature would be between 5°C and 30°C. This is the optimum temperature for the enzymes needed in germination.
Water	Water is required to make cells turgid, to transport substances and to mobilise enzymes.
Oxygen	Required for aerobic respiration.

The **broad bean** is a non-endospermic seed.

- Germination begins with water entering the micropyle.
- Water enters the seed and swells the cotyledons, splitting the testa.
- The split testa allows more oxygen in for aerobic respiration.
- Starch and proteins stored in the cotyledons are mobilised through hydrolysis.
- The starch and proteins are used as sources of energy for use in respiration and the growth of radicle and plumule.



Maize is an endospermic seed.

- Water enters the seed.
- The embryo releases the plant hormone gibberellin.
- Gibberellin diffuses to the protein rich aleurone layer and amylase enzymes are made to break down stored starch in the endosperm.
- Glucose diffuses to the embryo and used for aerobic respiration and growth.