

Sexual reproduction in plants

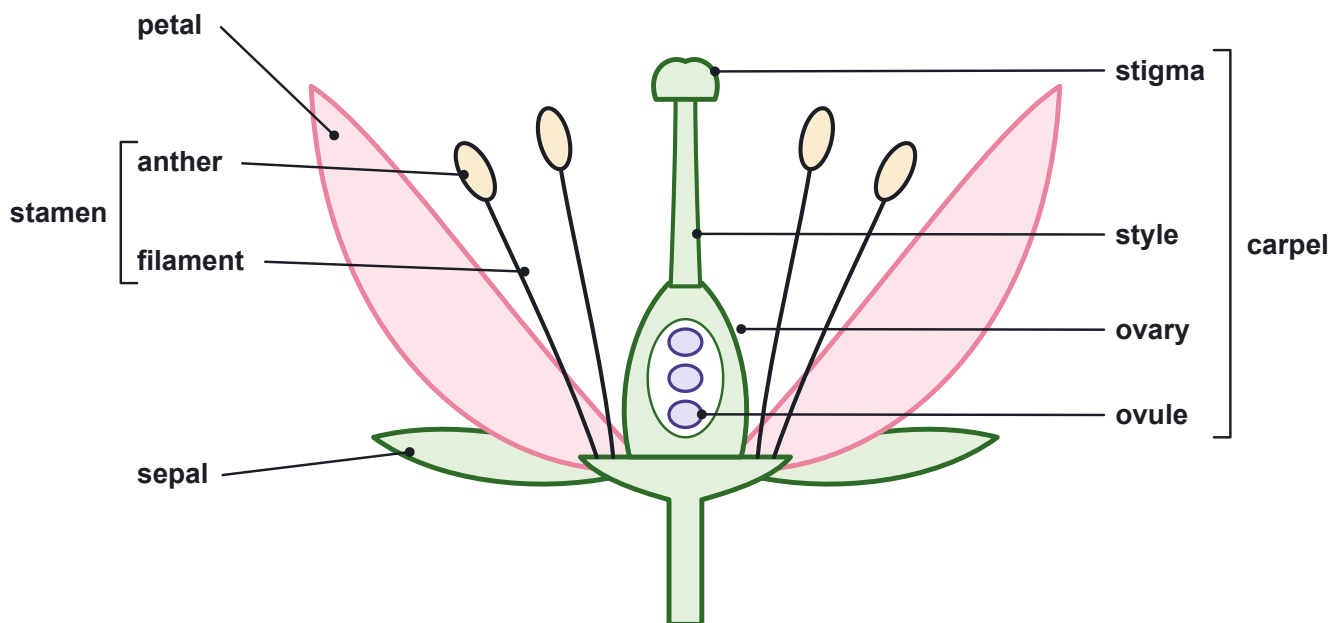
Revision notes • The parts of an insect-pollinated flower, wind-pollinated flowers, pollination and fertilisation, and the conditions seeds need to germinate.

For Cambridge IGCSE Combined Science 0653. **Supplement** is Extended content, only examined on Papers 2 and 4.

Sexual reproduction in plants Spec B14.1

Structure of an insect-pollinated flower Spec B14.1.1, B14.1.2

You must be able to identify, and draw, the parts of an insect-pollinated flower, and state what each part does. The **stamen** is the male part and the **carpel** is the female part.



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Half-flower of an insect-pollinated flower. The **stamen** (anther and filament) is the male part; the **carpel** (stigma, style, ovary and ovules) is the female part.

Parts of an insect-pollinated flower and their functions

Part	Function
Sepal	Protects the flower in the bud
Petal	Brightly coloured, to attract insects
Stamen	Male part of the flower; made of an anther and a filament
Anther	Produces pollen grains, which contain the male gametes
Filament	Holds the anther up
Carpel	Female part of the flower; made of the stigma, style, ovary and ovules
Stigma	Receives pollen grains; often sticky so that pollen grains stay on it
Style	Holds up the stigma
Ovary	Contains the ovules
Ovule	Contains the female gamete (egg cell); after fertilisation it develops into a seed

Common mistake: The anther makes the pollen. The stigma only receives it. Do not mix up the stamen (male) and the carpel (female).

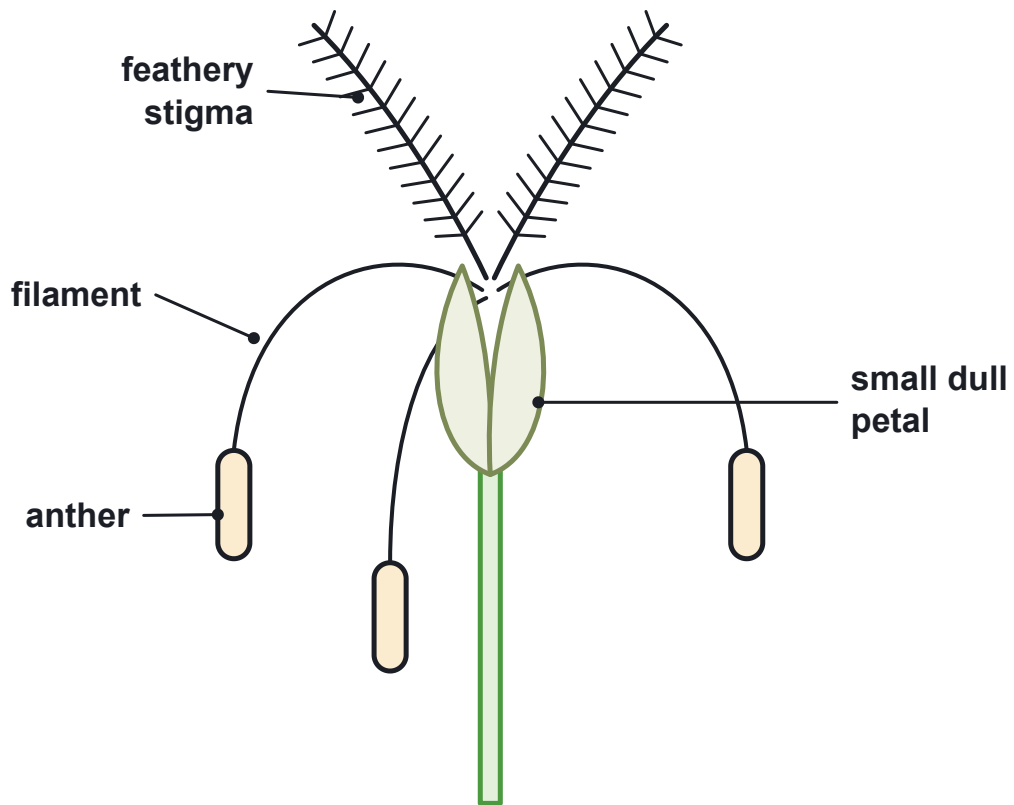
Practical skill: When you draw a flower, use a sharp pencil and a single clear line. Draw it large, do not shade, and label with straight lines that do not cross. Label every part in the list above.

Insect- and wind-pollinated flowers Spec B14.1.6 Supplement

Flowers are adapted to be pollinated either by insects or by wind. Their structures differ in ways you can see and describe.

Wind-pollinated flowers

In a wind-pollinated flower, such as a grass, the **anthers** hang outside the flower on long filaments, where the wind can blow the pollen away. The **stigmas** are large and feathery and also hang outside the flower, to catch pollen grains carried in the air.



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A wind-pollinated grass flower: **anthers hang outside** on long filaments and the **feathery stigmas** catch pollen from the air.

Exam tip: Always link a feature to its job. 'Feathery stigma' scores less than 'feathery stigma gives a large surface area to catch pollen from the wind'.

Pollination and fertilisation Spec B14.1.3, B14.1.4

Pollination is the transfer of pollen grains from an anther to a stigma. Pollination is not the same as fertilisation. Pollen has to reach the stigma first, then fertilisation can happen.

Fertilisation occurs when a pollen nucleus fuses with a nucleus in an ovule.

Pollination	The transfer of pollen grains from an anther to a stigma.
Fertilisation (in plants)	The fusion of a pollen nucleus with a nucleus in an ovule.

Common mistake: Pollination and fertilisation are different. Pollination is the transfer of pollen to the stigma. Fertilisation is the fusion of nuclei.

Germination Spec B14.1.5

Germination is when a seed begins to grow into a new plant. A seed needs three conditions to germinate: **water**, **oxygen** and a **suitable temperature**. Light is not needed for most seeds to germinate.

Why seeds need these conditions

Condition	Why it is needed
Water	The seed absorbs water and swells, and its enzymes become active. The enzymes break down the stored food so it can be used for growth.
Oxygen	Needed for aerobic respiration, which releases energy for growth
Suitable temperature	Enzymes work best at a suitable temperature. Too cold and reactions are too slow; too hot and enzymes are denatured.

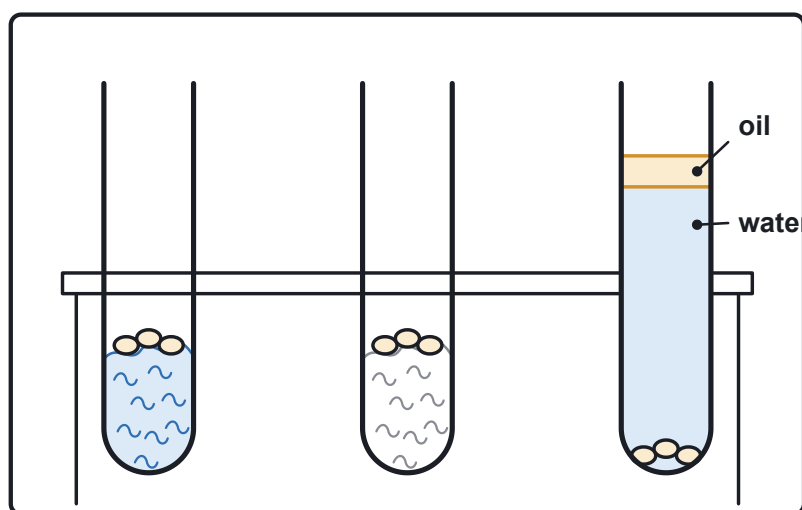
Investigating the conditions needed for germination

Set up several tubes with the same number of seeds and change one condition at a time. Tube A has all three conditions and is the **control**. Keep all the tubes in the dark (a fridge is dark inside), so that light is the same for every tube and is not a confounding variable.

Germination investigation

Tube	Water	Oxygen	Temperature and light	Expected result
A (control)	Damp cotton wool	Air present	20 °C, dark cupboard	Seeds germinate
B	Dry cotton wool	Air present	20 °C, dark cupboard	No germination: no water
C	Seeds covered with boiled, cooled water and a layer of oil	Little or none: boiling removes dissolved oxygen, and the oil stops air entering	20 °C, dark cupboard	No germination: no oxygen
D	Damp cotton wool	Air present	Fridge, about 4 °C (dark)	No germination: too cold

dark cupboard at 20 °C

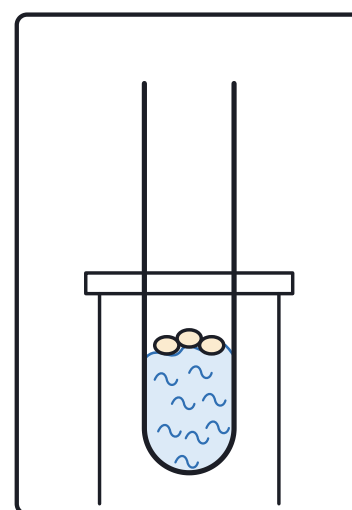


A (control)
damp cotton wool
seeds germinate

B
dry cotton wool
no water

C
boiled, cooled water
with oil on top
no oxygen

fridge at about 4 °C (dark)



D
damp cotton wool
too cold

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Each tube differs from the **control** (A) in one condition only. Only tube A has water, oxygen and a suitable temperature.

Practical skill: Keep every other variable the same: same type and number of seeds, same volume of water, same light (all in the dark) and same time. Leave the tubes for several days and count the seeds that have germinated in each. Using more seeds per tube makes the result more reliable.

Exam tip: Say what each tube shows by comparing it with the control. Only one condition should differ between the control and each other tube.

Quick check

1. Which part of a flower makes pollen?
2. Define pollination.
3. What three conditions does a seed need to germinate?

Quick check answers

Sexual reproduction in plants

1. The anther.
2. The transfer of pollen grains from an anther to a stigma.
3. Water, oxygen and a suitable temperature.