

Reproduction revision notes

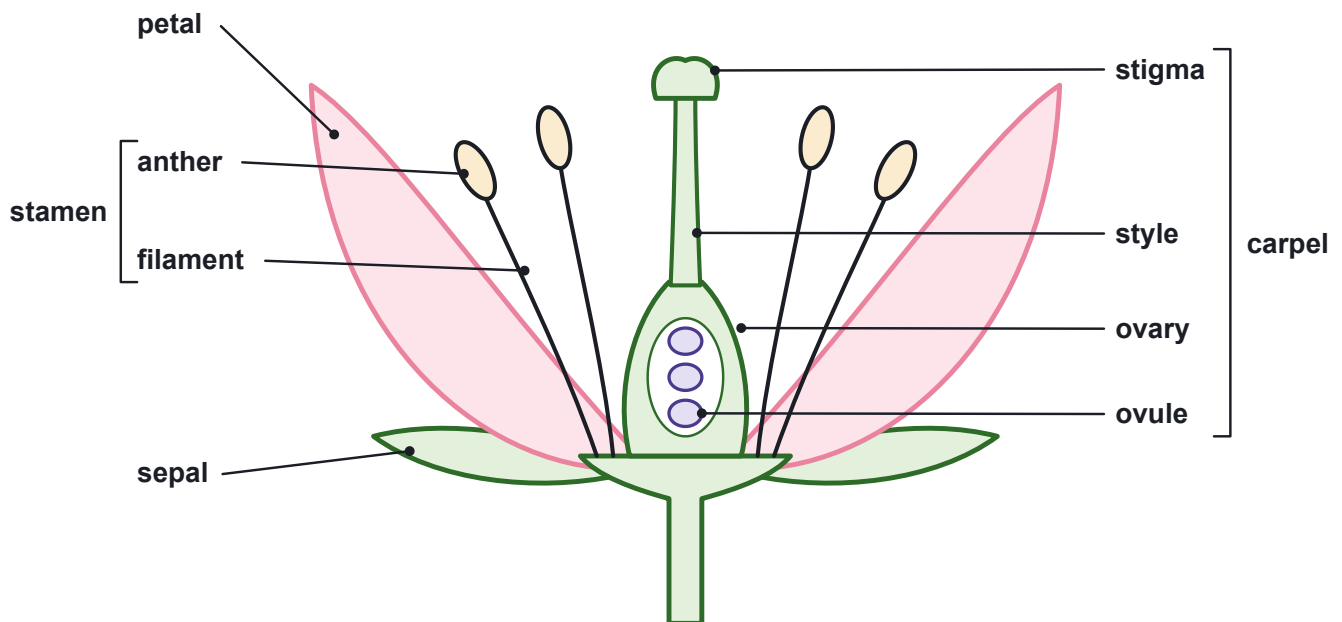
Reproduction is how living organisms produce new individuals of their own kind. This topic covers sexual reproduction in flowering plants and in humans: flower structure, pollination, fertilisation and germination, the reproductive systems and the menstrual cycle.

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

1 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).

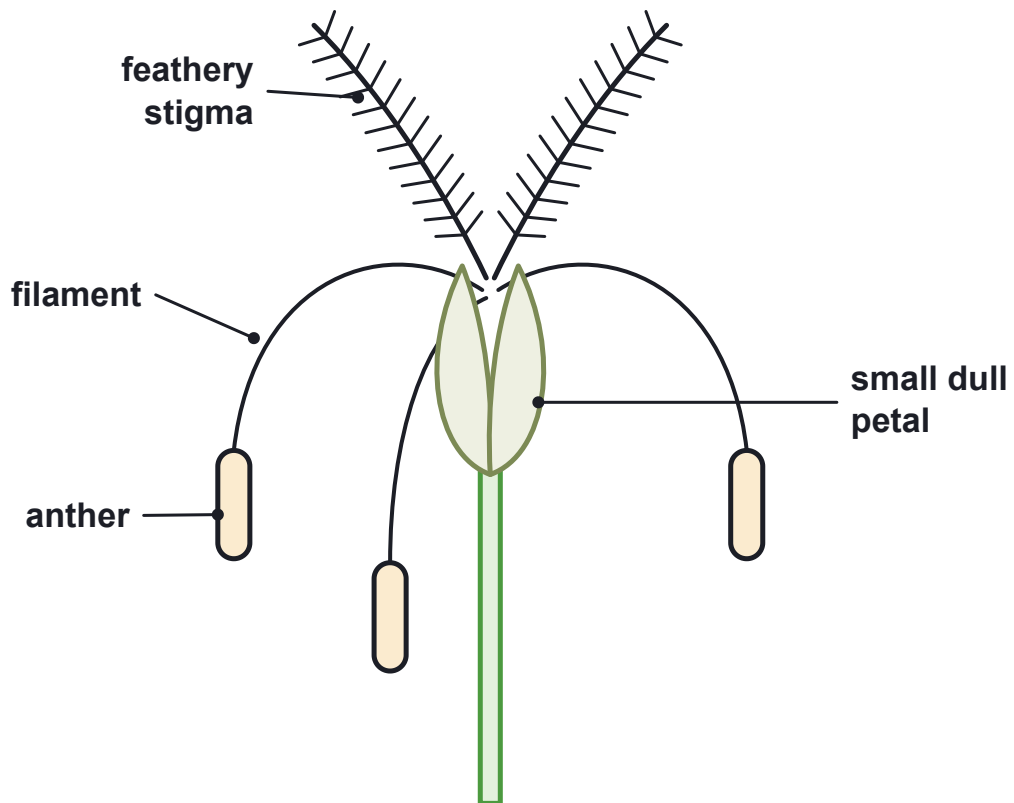
Practical skill: When you draw a flower, use a sharp pencil and a single clear line. Draw it large, do not shade, and label with straight lines that do not cross. Label every part in the list above.

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.

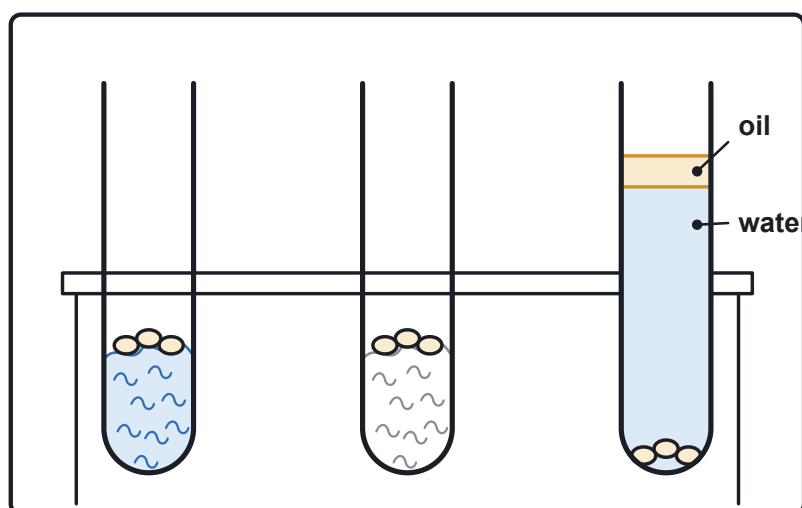
Investigating the conditions needed for germination

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

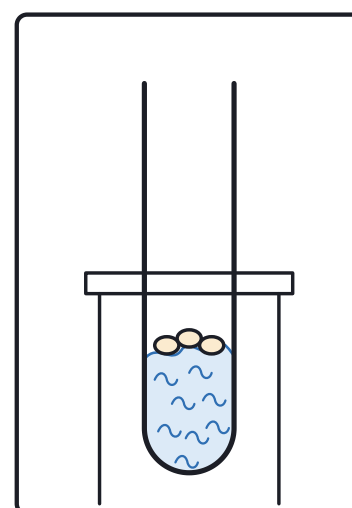


A (control)
damp cotton wool
seeds germinate

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?

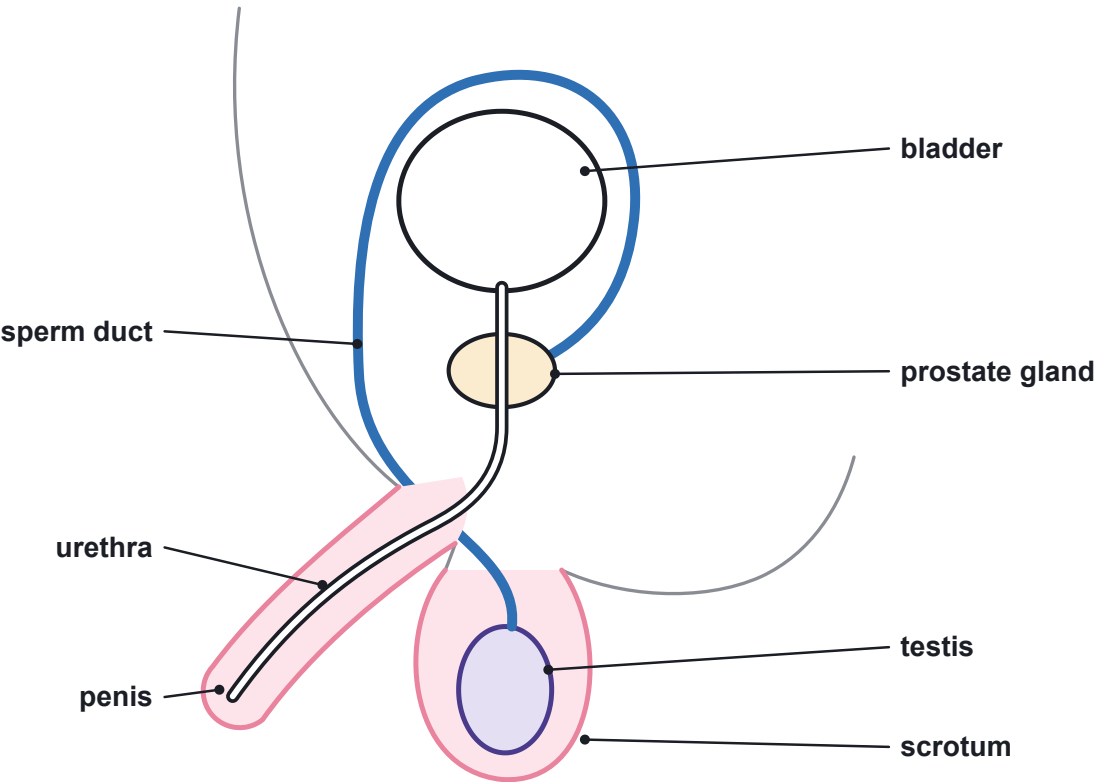
2 Sexual reproduction in humans Spec B14.2

The male and female reproductive systems Spec B14.2.1, B14.2.2

Humans reproduce sexually. The male system makes and delivers **sperm**. The female system makes **egg cells**, receives the sperm and carries the developing baby.

The male reproductive system

Parts of the male reproductive system	
Part	Function
Testes	Make sperm (and the hormone testosterone)
Scrotum	Bag of skin that holds the testes outside the body, where it is cooler than body temperature
Sperm ducts	Tubes that carry sperm from the testes to the urethra
Prostate gland	Adds fluid to the sperm to make semen, which helps the sperm to swim and gives them nutrients
Urethra	Tube inside the penis that carries semen (and urine) out of the body
Penis	Places sperm inside the vagina during sexual intercourse

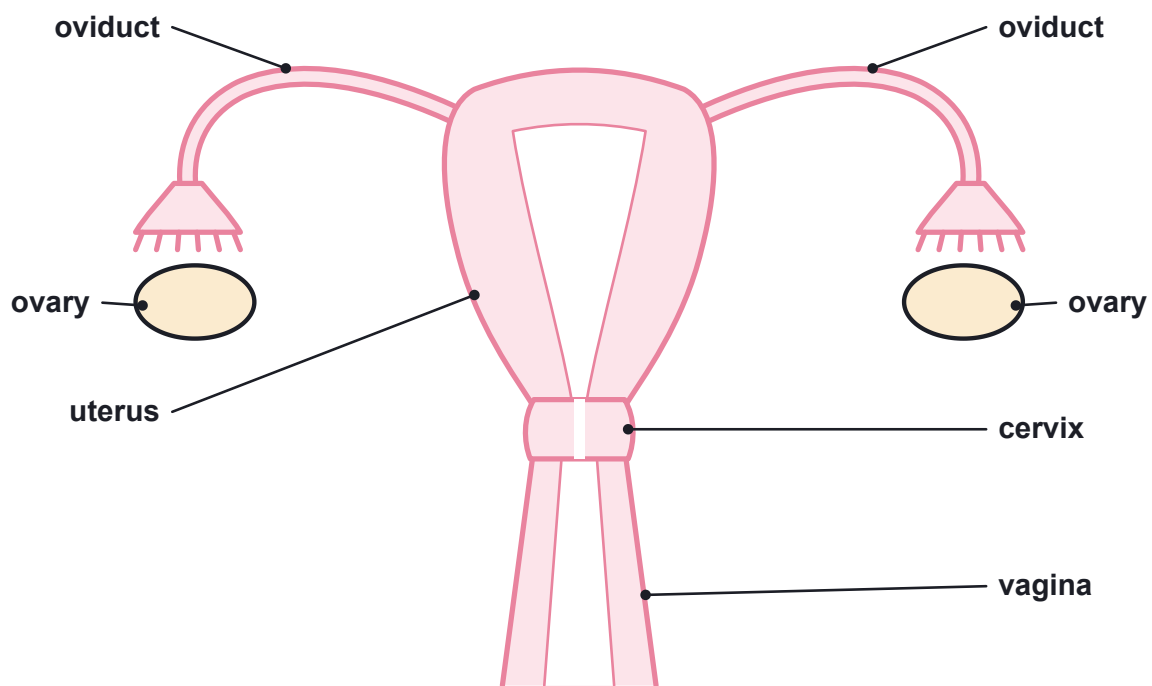


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The male reproductive system. Sperm travel from the **testis** along the **sperm duct** (blue) to the urethra.

The female reproductive system

Parts of the female reproductive system	
Part	Function
Ovaries	Make and release egg cells (and the hormones oestrogen and progesterone)
Oviducts	Tubes that carry the egg cell to the uterus. Fertilisation usually happens here
Uterus	Muscular organ with a soft lining, where the embryo implants and the fetus develops
Cervix	Ring of muscle at the opening of the uterus that keeps the fetus in during pregnancy
Vagina	Receives the penis and the sperm during sexual intercourse. The baby passes through it at birth



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The female reproductive system. The funnel-shaped end of each **oviduct** lies close to an ovary.

Exam tip: Do not mix up the oviduct (carries the egg) and the sperm duct (carries sperm). Do not mix up the urethra and the ureter either. The ureter is part of the urinary system.

Gametes and fertilisation Spec B14.2.3

In humans, **fertilisation** is the fusion of the nuclei from a male gamete (sperm) and a female gamete (egg cell). The fertilised egg is called a **zygote**.

Quick check

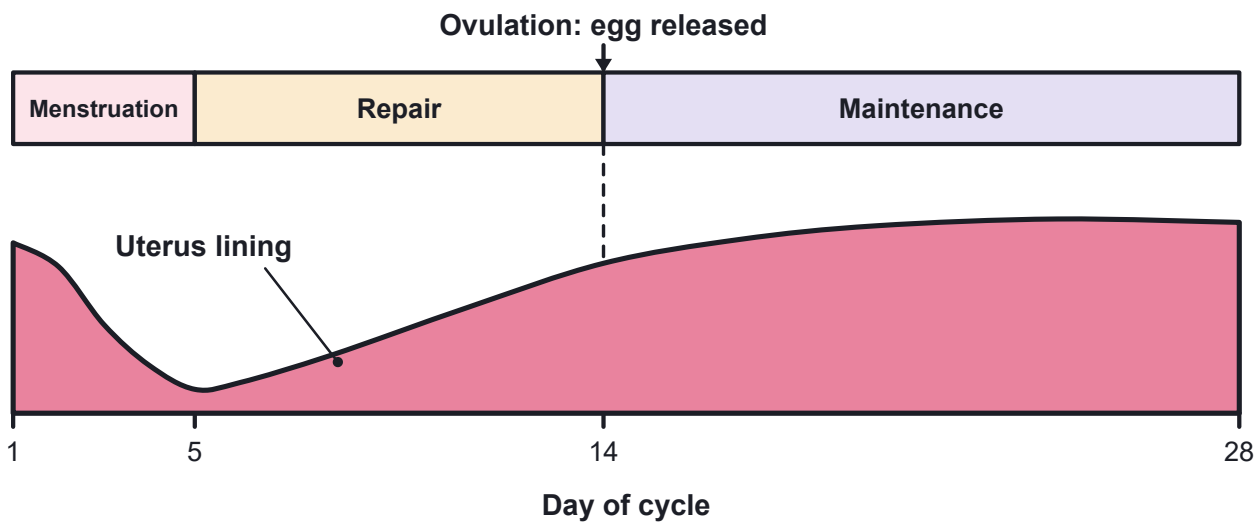
1. Which part of the male reproductive system carries sperm from the testes to the urethra?
2. Name the part of the female system where the fetus develops.
3. What happens at fertilisation?

3 Sex hormones in humans Spec B14.2

The menstrual cycle and pregnancy hormones Spec B14.2.4

The **menstrual cycle** is a series of changes in the ovaries and in the lining of the uterus. It repeats about every 28 days.

Stages of the menstrual cycle (days are approximate)		
Stage	Days	Change in the ovary and the uterus lining
Menstruation	1 to 5	The lining of the uterus breaks down and is lost through the vagina with blood
Repair	5 to 14	An egg cell matures in an ovary. The uterus lining is repaired and thickens
Ovulation	Around 14	An egg cell is released from an ovary into the oviduct
Maintenance	14 to 28	The lining stays thick, ready for an embryo. If there is no pregnancy, the lining breaks down and the cycle starts again



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The stages of the menstrual cycle and how the thickness of the **uterus lining** changes.

Quick check

1. What happens to the uterus lining during menstruation?
2. About how long is one menstrual cycle?
3. What happens to the uterus lining after menstruation?

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.

Sexual reproduction in humans

1. The sperm duct.
2. The uterus.
3. The nucleus of a sperm fuses with the nucleus of an egg cell.

Sex hormones in humans

1. It breaks down and is lost through the vagina with blood.
2. About 28 days.
3. It is repaired and thickens, ready for a fertilised egg.