Topic 3: Reproduction and inheritance

Edexcel International GCSE Biology 4BI1 · Section 3 · statements 3.1–3.39 · sheets 3.1–3.2

Sexual and asexual reproduction

Sexual

Two parents; gametes fuse at **fertilisation**.

Offspring genetically different, so a population varies.

Asexual

One parent; no gametes.

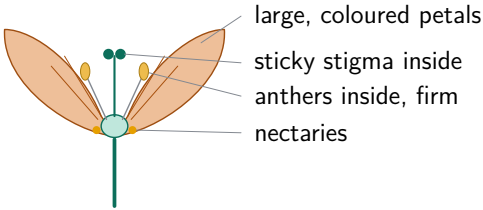
Offspring genetically identical clones, e.g. runners, cuttings.

Insect- and wind-pollinated flowers

Feature	Insect-pollinated	Wind-pollinated
petals	large, colourful, scented, nectar	small, green or dull, no nectar
anthers and stigma	inside the flower	hang outside; feathery stigma
pollen	sticky, larger, less of it	light, smooth, huge quantities

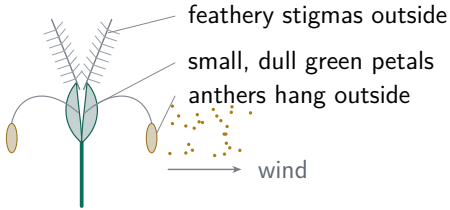
Two flowers, two pollen carriers

insect-pollinated



petals large, colourful, scented
nectar present; guide marks lead to it
pollen sticky or spiky, small quantity
anthers, stigma inside the flower, firm

wind-pollinated



petals small, dull, often green
nectar absent
pollen light and smooth, huge quantity
anthers, stigma hang outside; stigma feathery

Anthers and stigma inside the flower mean insects; hanging outside means wind.

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From pollen to seed and fruit

Pollination: pollen lands on the stigma.

A **pollen tube** grows down the style to the ovule.

Fertilisation: the male nucleus fuses with the egg nucleus.

The ovule becomes the seed; the ovary becomes the fruit.

> A germinating seed lives on its food store until the seedling can photosynthesise.

Four hormones in one menstrual cycle

FSH matures an egg in a follicle in the ovary.

↓

The follicle releases **oestrogen**,
which thickens the uterus lining.

↓

Oestrogen triggers the LH surge; ovulation at about day 14.

↓

Progesterone keeps the lining thick;
when it falls, menstruation begins.

(B) FSH and LH come from the pituitary gland.

Placenta and sex hormones

Placenta and amniotic fluid

The placenta supplies oxygen and nutrients and removes waste.

Amniotic fluid cushions and protects the embryo.

Puberty

Oestrogen: secondary sexual characteristics in girls.

Testosterone: secondary sexual characteristics in boys.

Genes, alleles and (B) DNA

Term	Meaning
genome	all of an organism's DNA
gene	a section of DNA coding for one protein
allele	an alternative form of a gene
dominant, recessive	shows with one copy; needs two copies
homozygous, heterozygous	two identical alleles; two different alleles
(B) DNA, RNA	double helix, A–T and C–G; RNA single-stranded, U replaces T

(B) Protein synthesis

Transcription: the gene is copied to mRNA in the nucleus.

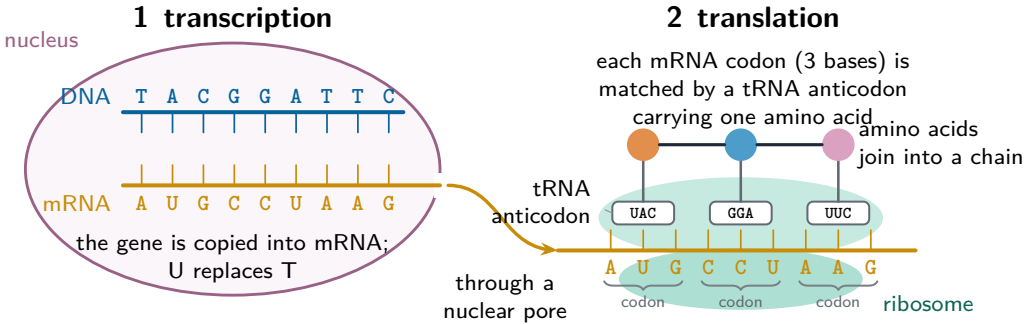
The mRNA moves out to a ribosome.

Translation: each **codon** is matched by a tRNA anticodon carrying an amino acid.

The amino acids join into a chain that folds into the protein.

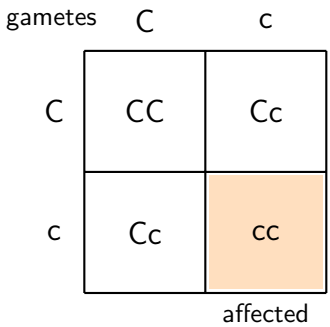
(B) A mutation that changes one base can change one amino acid, and the protein's shape.

(B) Codons and anticodons



TAC on the DNA becomes AUG on the mRNA, matched by the anticodon UAC.

Worked example: a monohybrid cross



Cc × Cc: 3 unaffected : 1 affected, a 1 in 4 chance for every child.

- Cystic fibrosis **allele** c is **recessive**.
- Parents Cc × Cc; each gamete carries C or c.

Your turn: sex and a test cross

Your turn

Draw the genetic diagram for each.

A. XX $\times$ XY. What is the chance of a girl, and whose gamete decides?

B. Cc $\times$ cc. Give the phenotype ratio.

C. Name one cause of increased mutation rate.

Mitosis and meiosis

	Mitosis	**Meiosis**
cells made	two	four
chromosomes	same as parent (diploid, 46)	half (**haploid**, 23)
genetically	identical	all different
used for	growth, repair, cloning, asexual reproduction	gametes

Use the evidence

Random **fertilisation** of any sperm with any egg adds further variation.

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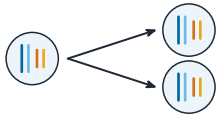
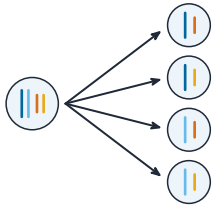
Two cells or four gametes

mitosis
(growth, repair)



2 **identical** cells
(diploid: full set)

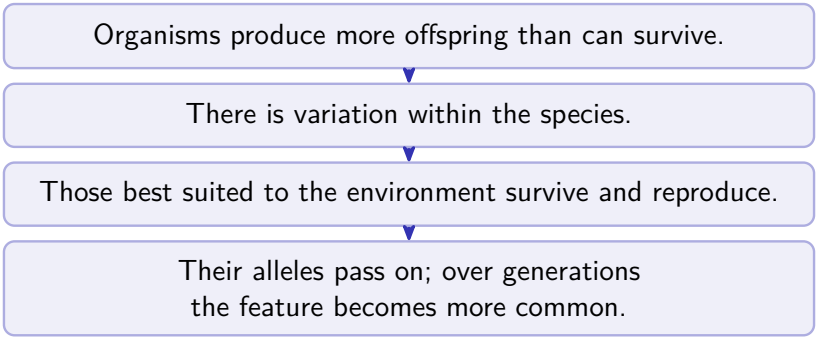
meiosis
(makes gametes)



4 **different** gametes
(haploid: half the set)

Mitosis: two identical diploid cells. **Meiosis**: four different **haploid** gametes.

Natural selection



Antibiotic resistance is selection in action

1. **Mutation** A random **mutation** makes one bacterium resistant.
2. **Selection** The antibiotic kills the non-resistant majority.
3. **Spread** The resistant bacterium survives and reproduces; resistance spreads.
4. **Slow it** Complete courses of antibiotics and avoid overuse.

Decision

Bacteria do not get used to the antibiotic; resistant ones are selected.

Check yourself

Your turn

Answer without notes, then check.

A. State two adaptations of a wind-pollinated flower.

B. Which hormone surges at day 14, and what does it cause?

C. Define gene, allele and genome.

D. Give two differences between mitosis and meiosis.

E. Explain antibiotic resistance in three steps.