

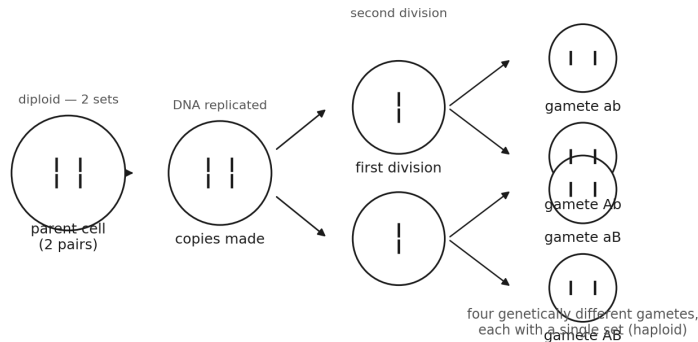
Exercise walk-through

6.1

Reproduction, DNA and genomes (4.6.1.1–4.6.1.5)

AQA · GCSE · Biology

Meiosis in two divisions



- Copies of the genetic information are made first.
- Two divisions give four genetically different gametes.
- Fertilisation restores the number; mitosis builds the embryo.

Punnett squares and family trees

Mother's gametes			
Father's mates	X	X	
X	XX	XX	
Y	XY	XY	

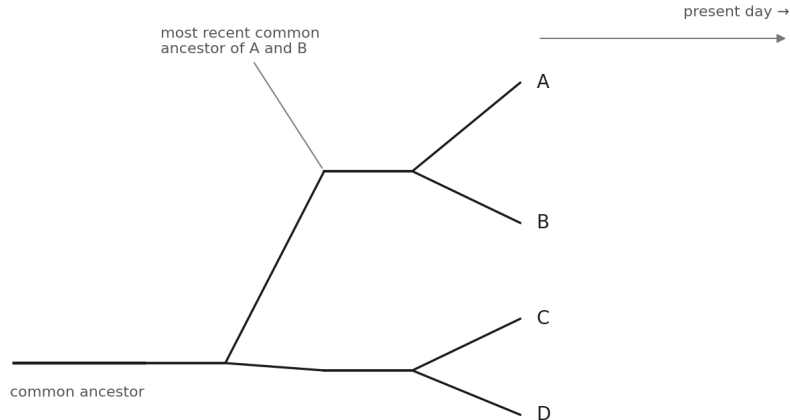
XX female : XY male = 1 : 1 (50 % each)

Carrier mother ($X^N X^n$)			
Father ($X^N Y$)	X^N	X^n	
X^N	$X^N X^N$	$X^N X^n$	
Y	$X^N Y$	$X^n Y$	

e.g. red-green colour blindness cross — ratios read straight off

- Write the parents' gametes on the edges first.
- Read ratios straight off — 3 to 1, 1 to 1, probabilities as fractions.
- Family trees — track carriers through the generations.

Fossils and extinction



- Fossils — no decay, mineral replacement, preserved traces.
- Soft-bodied early life — a record we cannot trust fully.
- Extinction — disease, predators, competition, catastrophe.

Exercises 2.1·2.3

2.1 Give two differences between sexual and asexual reproduction. [2]

2.2 How many gametes does one meiosis produce, and how do they compare genetically?[2]

2.3 Give three reasons why studying the human genome matters for medicine. [3]

Exercises 2.1·2.3

2.1 Give two differences between sexual and asexual reproduction. [2]

2.1 Any two: sexual needs two parents/gametes, asexual one; sexual gives genetically different offspring, asexual gives identical clones; sexual involves meiosis and fertilisation, asexual only mitosis.

2.2 How many gametes does one meiosis produce, and how do they compare genetically?[2]

2.2 Four gametes; each is genetically different from the others.

2.3 Give three reasons why studying the human genome matters for medicine. [3]

2.3 Search for genes linked to different diseases; understanding and treatment of inherited disorders; tracing human migration patterns from the past.

Exercises 3.1·3.2

3.1 A strawberry plant reproduces sexually through seeds and asexually through runners. Compare the offspring of the two methods and suggest when each is an advantage. [5]

3.2 (*Bio*) Describe the structure of DNA, including nucleotides and how the base sequence relates to protein structure. [5]

Exercises 3.1·3.2

3.1 A strawberry plant reproduces sexually through seeds and asexually through runners. Compare the offspring of the two methods and suggest when each is an advantage. [5]

3.1 Seeds are produced by sexual reproduction – gametes from two parents fuse, so offspring show genetic variation; variation gives a survival advantage if the environment changes, e.g. new disease or drought. Runners are asexual – mitosis only, so the new plants are genetically identical clones of the parent; this is an advantage when conditions are favourable, because many identical, well-adapted offspring grow quickly, without needing a mate.

3.2 (*Bio*) Describe the structure of DNA, including nucleotides and how the base sequence relates to protein structure. [5]

3.2 DNA is a polymer made of two strands coiled into a double helix; each nucleotide has a common sugar and phosphate group with one of four bases – A, C, G or T – attached to the sugar; the backbone alternates sugar and phosphate; a sequence of three bases codes for one amino acid; the order of the bases controls the order of amino acids assembled into the protein.

Exercise 3.3

3.3 (*HT*) Explain how a mutation in a gene can change the protein made and the organism's phenotype.

[4]

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3.3 A mutation changes the base sequence of the gene; a different amino-acid sequence is assembled, so the protein's shape changes when it folds; an altered enzyme may no longer fit the substrate binding site, so its reaction stops; the phenotype changes because the protein no longer works – or only slightly, since most mutations have no effect. Non-coding DNA variants may instead switch the gene on or off, changing expression.