

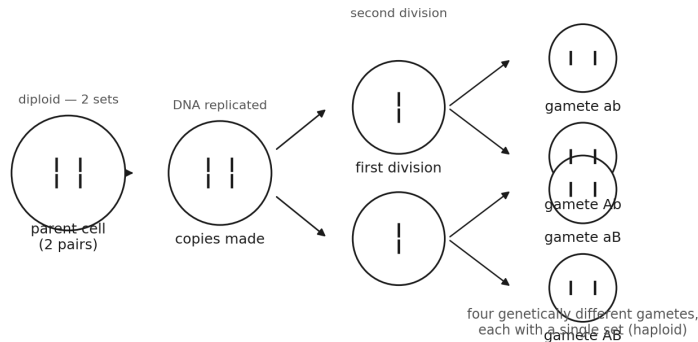
Exercise walk-through

6.4

Evolution, genetics and evidence (4.6.3)

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	

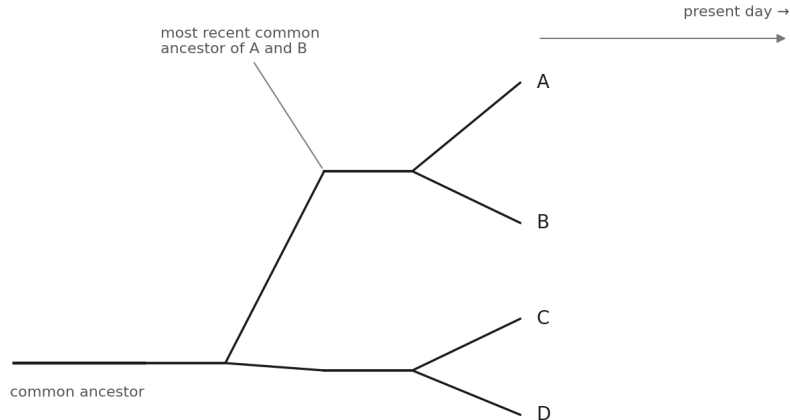
XX female : XY male = 1 : 1 (50 % each)

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 reasons Darwin's theory was accepted only gradually. [2]

2.2 What was Mendel's key observation, and what do we now call his 'units'? [2]

2.3 Give the three ways fossils form. [3]

Exercises 2.1·2.3

2.1 Give two reasons Darwin's theory was accepted only gradually. [2]

2.1 Any two: it challenged the idea that God made all animals and plants; insufficient evidence at the time of publication; the mechanism of inheritance and variation was unknown for 50 years.

2.2 What was Mendel's key observation, and what do we now call his 'units'? [2]

2.2 Each characteristic is determined by 'units' passed on unchanged to descendants; genes.

2.3 Give the three ways fossils form. [3]

2.3 From parts that have not decayed, because a condition for decay is absent; parts replaced by minerals as they decay; preserved traces such as footprints, burrows and rootlet traces.

Exercises 3.1·3.2

3.1 Explain how fossils provide evidence for evolution, and why scientists cannot be certain how life on Earth began. [5]

3.2 Explain how a strain of MRSA becomes resistant and spreads, and give three measures that slow resistance. [6]

Exercises 3.1·3.2

3.1 Explain how fossils provide evidence for evolution, and why scientists cannot be certain how life on Earth began. [5]

3.1 Fossils are the remains of organisms from millions of years ago found in rocks; their sequence shows how organisms have changed/developed over time – evolution; evolutionary trees built from fossils show relatedness. Certainty is impossible because many early life forms were soft-bodied and left few traces; and many of those traces were destroyed by geological activity.

3.2 Explain how a strain of MRSA becomes resistant and spreads, and give three measures that slow resistance. [6]

3.2 Bacteria reproduce rapidly and mutations occur continuously, producing new strains; a mutation may give resistance, so the antibiotic does not kill that bacterium; it survives and reproduces, so the resistant population rises and spreads – people are not immune and no treatment works. Measures: doctors do not prescribe antibiotics for non-serious or viral infections; patients complete the course so all bacteria are killed; agricultural use of antibiotics is restricted.

Exercise 3.3

3.3 Describe how Wallace's work relates to Darwin's, and one reason joint publication mattered. [4]

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3.3 Wallace independently proposed the theory of evolution by natural selection; he published joint writings with Darwin in 1858; this prompted Darwin to publish *On the Origin of Species* in 1859; Wallace's own evidence – gathered worldwide, e.g. warning colouration and speciation – supported the same theory.