

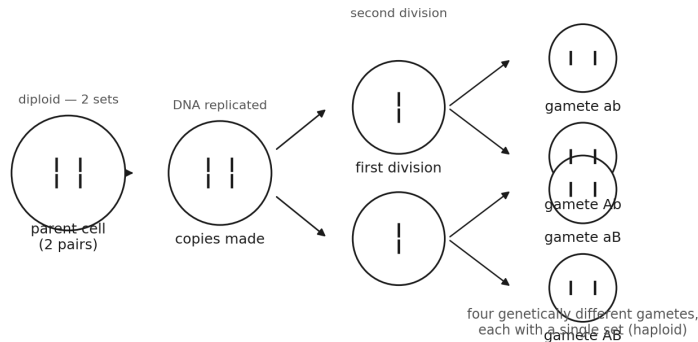
Exercise walk-through

6.3

Variation, selective breeding, genetic engineering and cloning (4.6.2)

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	

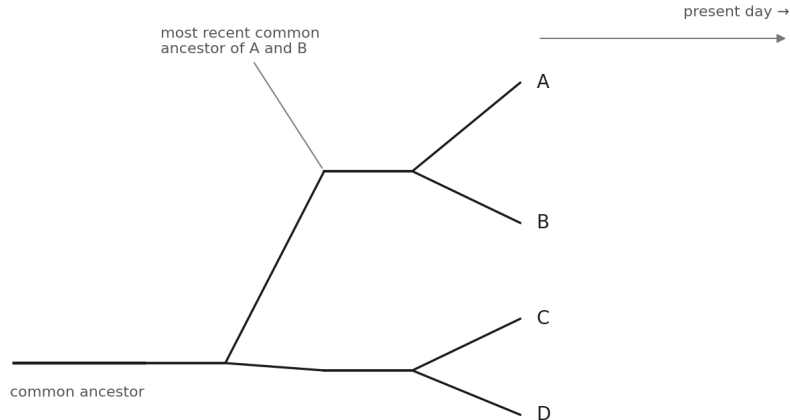
XX female : XY male = 1 : 1 (50 % each)

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 the three causes of variation in a population. [3]

2.2 Order the steps of selective breeding. [1]

2.3 (*HT*) In genetic engineering, what is the vector, and name two kinds used? [3]

Exercises 2.1·2.3

2.1 Give the three causes of variation in a population. [3]

2.1 Genes inherited; conditions in which the individuals developed; a combination of genes and environment.

2.2 Order the steps of selective breeding. [1]

2.2 Choose parents with the desired characteristic, breed them, select the best offspring and breed those – repeated over many generations.

2.3 (*HT*) In genetic engineering, what is the vector, and name two kinds used? [3]

2.3 The carrier that transfers the gene into the cells; a bacterial plasmid; a virus.

Exercises 3.1·3.2

3.1 Explain how evolution occurs by natural selection, using a population of rabbits in a cold winter. [4]

3.2 (*Bio*) Describe how adult cell cloning produces an animal, in order. [5]

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3.1 Explain how evolution occurs by natural selection, using a population of rabbits in a cold winter. [4]

3.1 The rabbit population shows variation in fur thickness – a genetic variant; in the cold winter, rabbits with thicker fur are better suited to the environment and are more likely to survive to breed; they pass on the alleles for thicker fur; over generations the population's inherited characteristics change – evolution by natural selection.

3.2 (*Bio*) Describe how adult cell cloning produces an animal, in order. [5]

3.2 The nucleus is removed from an unfertilised egg cell; the nucleus from an adult body cell (e.g. skin cell) is inserted into the egg cell; an electric shock stimulates the cell to divide and form an embryo; the embryo cells contain the same genetic information as the adult skin cell; once a ball of cells, the embryo is inserted into the womb of an adult female to develop.

Exercise 3.3

3.3 (*HT*) Insulin for diabetes used to come from pigs. Describe how human insulin is now produced by genetic engineering of bacteria, and give one benefit and one concern.[6]

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3.3 The human insulin gene is cut out using enzymes; it is inserted into a vector – a bacterial plasmid or virus; the vector transfers the gene into bacterial cells; the bacteria are grown in large fermenters and produce human insulin, which is harvested and purified. Benefit – an exact match to human insulin, so it works better/no rejection, unlimited supply, no pigs needed. Concern – ethical objections to transferring genes between species; possible effects if engineered genes spread – accept a justified risk or objection.