

Genes

4. Inheritance

CONCEPT 2

LESSON GUIDE

MODELLING INHERITANCE

PRECISE LEARNING POINTS

KNOW

I know the role chromosomes play in fertilisation.

APPLY

I can apply my knowledge to explain how dominant and recessive genes are inherited.

EXTEND

I can extend my knowledge to calculate the probability of children having certain inherited characteristics or disorders.

NOTES

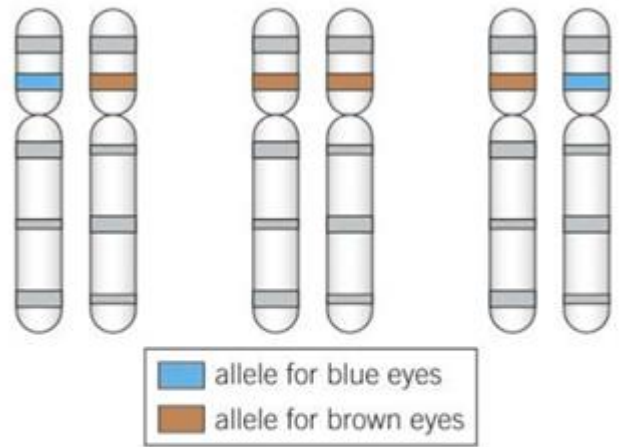
1. How is genetic material inherited?

- Sexual reproduction is the way genetic information from two different individuals can be combined to give a new and unique individual.
- Inside the nucleus of your cells the 46 chromosomes are arranged into 23 pairs
- One copy from each pair comes from your father, and one from your mother.
- Egg and sperm cells (gametes) are the only cells to contain 23 chromosomes. They only have one copy of each chromosome.
- During fertilisation, the egg and sperm cells join together. When their nuclei join, their chromosomes pair, producing an embryo with 46 chromosomes.
- Therefore, every individual has two copies of the same gene.

2. Which characteristics will you inherit?

- A gene is a segment of DNA which provides information that specifies the possible gene products (eg proteins)
- For any gene, a number of different versions (alleles) may exist
- Each version contains slightly different sequence of bases (information) and so results in slightly different products.
- Each individual has two copies of the same gene.
- Some alleles (versions of a gene) will always produce a characteristic in an organism, they are called **dominant** alleles. An individual only needs one copy of a dominant allele for the characteristic to be expressed in the organism eg allele for brown eyes is a dominant allele. If you inherit this allele from your mother, father or both, you will have brown eyes.

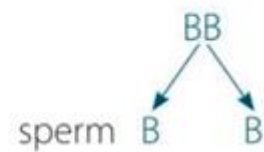
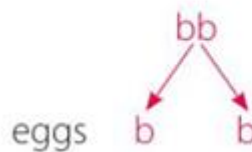
- The allele for blue eye colour is a **recessive** allele. You need two copies of a recessive allele for this characteristic to be expressed and so must inherit this blue eye version of the gene from both your mother and your father.



▲ These pairs of genes show three different ways a person could inherit

Mother: blue eyes

Father: brown eyes



Can characteristics be predicted?

When a sperm fertilises an egg, genes from the mother join with genes from the father. Scientists are able to predict what an organism's offspring will look like by doing a **genetic cross**.

In a genetic cross, alleles are represented by letters. The dominant allele is represented by a capital letter, and the recessive allele by the same, lowercase letter e.g. B for dominant brown eye allele and b for recessive blue eye allele.

Scientists use **Punnett squares** to show what happens in a genetic cross.

Scientists often display the possible outcomes from a genetic cross as the probability of a characteristic being expressed. This could be in the form of a ratio, a percentage or a fraction.

		Father	
		B	B
Mother	b	Bb	Bb
	b	Bb	Bb