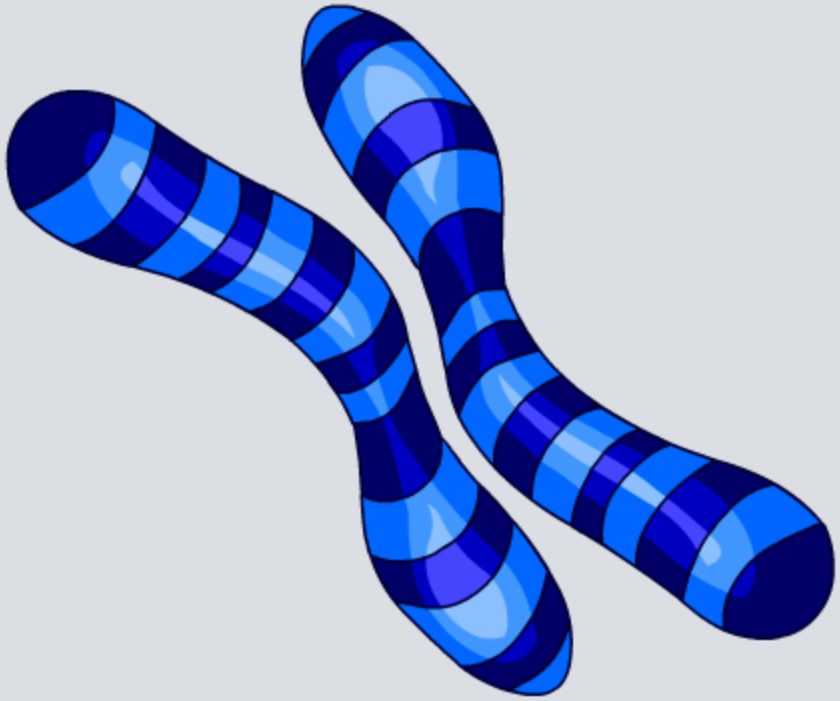
Genes and Alleles



Family resemblance

Members of the same family often look similar.

Which parent do these children look more like?

If the son and daughter have children of their own one day, will they also look like their parents?

Why do members of the same family look similar?

Humans, like all organisms, inherit characteristics from their parents. How do these characteristics affect their appearance?

Phenotype and genotype

The **overall** appearance of an organism depends on two things:

1. its genes (inherited characteristics)

2. the effects of the environment in which it lives.

All the observable characteristics of an organism are called its **phenotype**.

The full set of genes of an organism is called its **genotype**.

An organism's phenotype therefore depends on its genotype **plus** environmental effects.

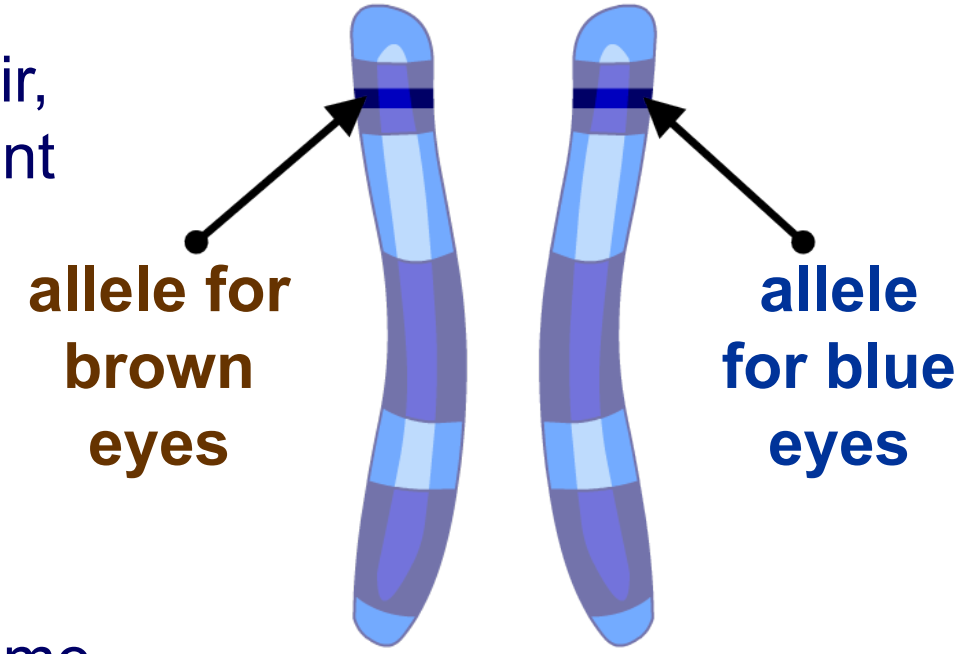
phenotype = genotype + environmental effects

Different versions of genes

Chromosomes in a **homologous pair** contain the same type of genes that code for the same characteristics, such as eye color.

Each chromosome in the pair, however, may have a different **version** of the gene.

For example, the version of a gene on one chromosome may code for **brown** eyes, while the version of the gene on the other chromosome may code for **blue** eyes.

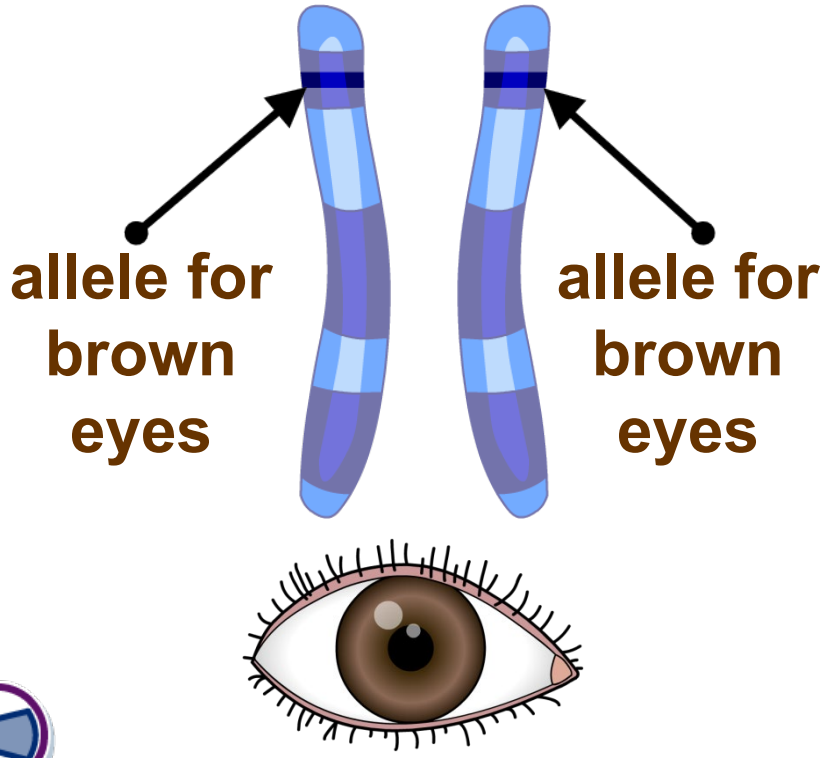


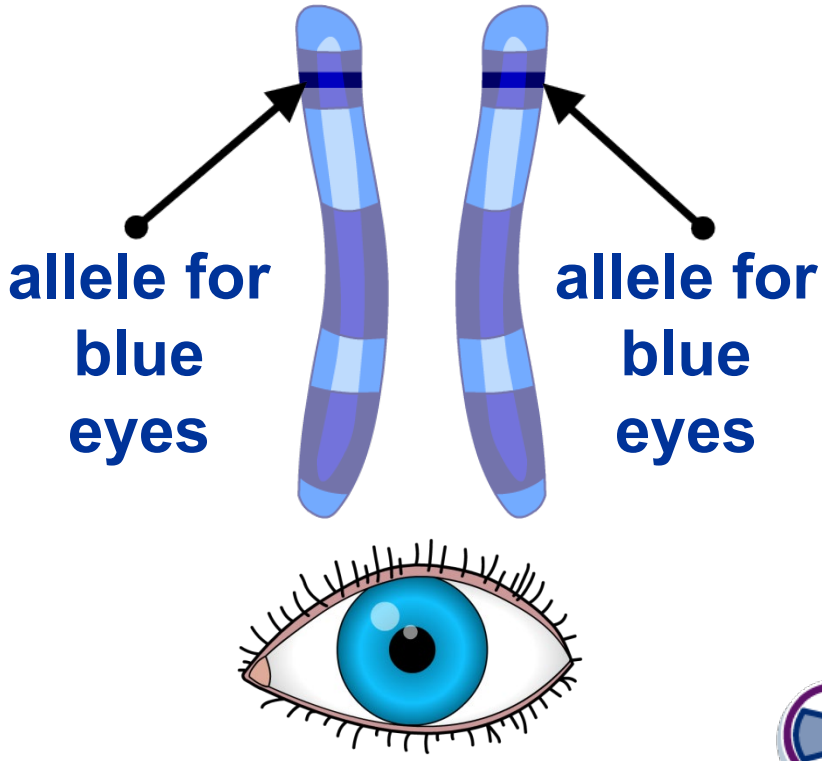
Each different version of a gene is called an **allele**.

Homozygous alleles

If the alleles for a characteristic in a homologous pair are the same, the organism is said to be **homozygous** for that characteristic.

What color eyes will these homozygous pairs of alleles produce?

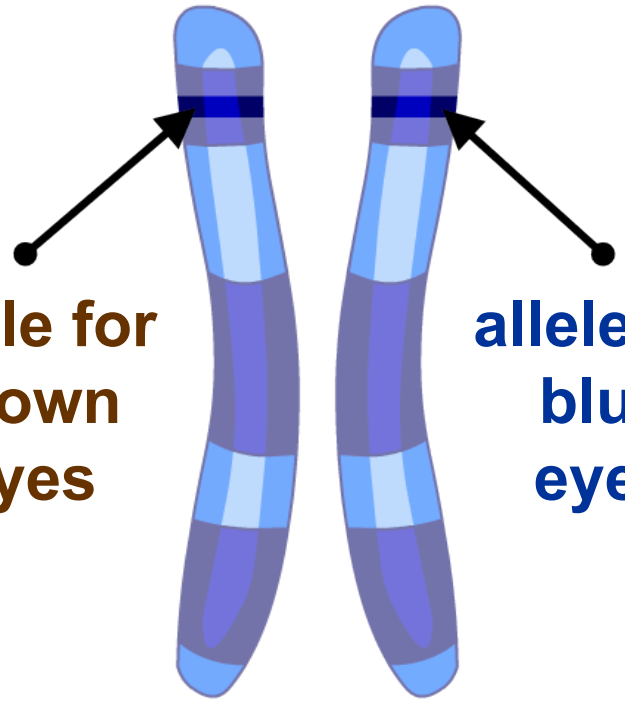




Heterozygous alleles

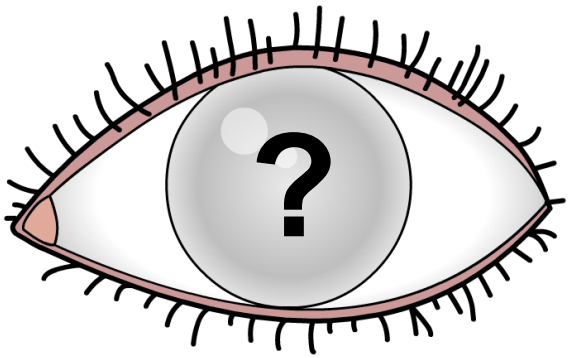
If the alleles for a characteristic in a homologous pair are different, the organism is said to be **heterozygous** for that characteristic.

What color eyes will this heterozygous pair of alleles produce?



allele for brown eyes

allele for blue eyes



The characteristic expressed by heterozygous alleles will depend on which allele is **dominant** and which allele is **recessive**.

Dominant or recessive?

The expression for a particular characteristic depends on which allele is **dominant** and which allele is **recessive**.

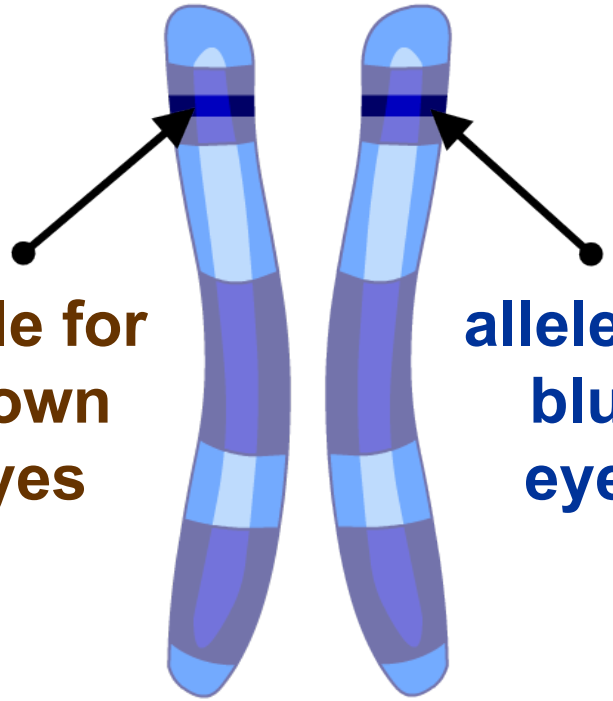
- **Dominant** alleles are always expressed in an organism's phenotype. Only one copy of the dominant allele needs to be inherited in order for it to be expressed. Dominant alleles (e.g. **brown** eyes) are represented by an upper case letter (e.g. '**B**').

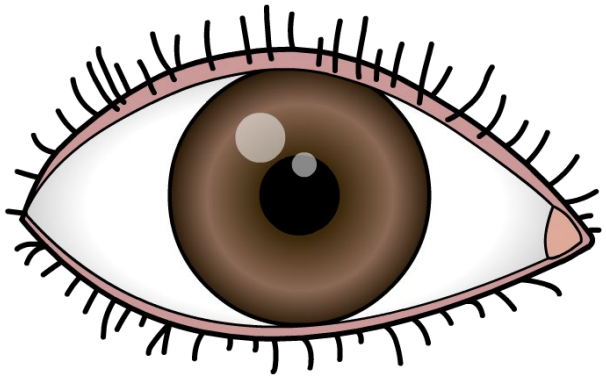
- **Recessive** alleles are only expressed in a organism's phenotype if two copies of it are present. If only one copy is present, its effect is 'masked' by the dominant allele. Recessive alleles (e.g. **blue** eyes) are represented by a lower case letter (e.g. '**b**').

What eye color?

The allele for **brown** eyes is dominant over the allele for **blue** eyes.

So, what color will the eyes be of an individual who is heterozygous for eye color?





The individual will have **brown** eyes, because the allele for brown eyes masks the allele for **blue** eyes.

Inheritance terms

Match the term to its description

allele	An allele that is always expressed, even if the cell only contains one copy.
homozygous	An allele that is only expressed if two versions of it are present in a cell.
heterozygous	Having two identical alleles of a specific gene.
dominant	Having two different alleles of a specific gene.
recessive	One of two or more versions of a gene, found at a specific location on a chromosome.

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solve