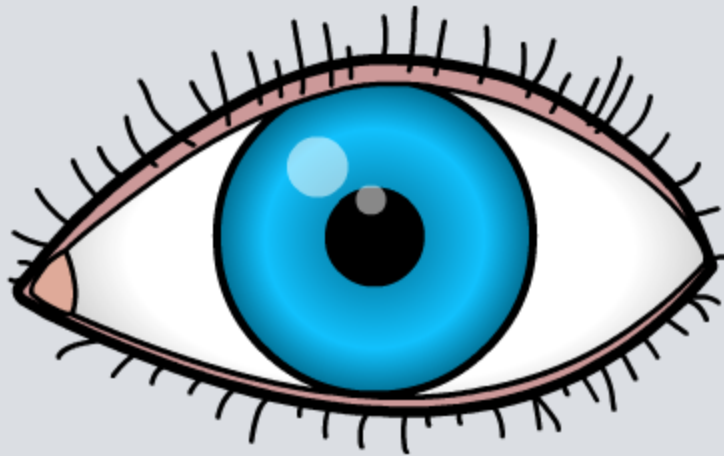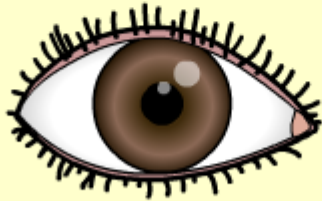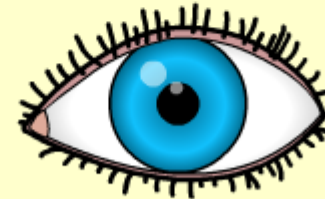# Inheritance

Eye color in the offspring of homozygous parents

The allele for **brown** eyes (**B**) is dominant over the allele for **blue** eyes (**b**).

If a **homozygous brown-eyed** person and a **homozygous blue-eyed** person reproduce, what are the possible eye colors of their offspring?

Click "**start**" to find out.
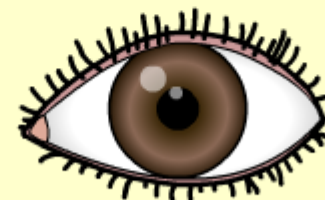
start

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Eye color in the offspring of heterozygous parents

The allele for **brown** eyes (**B**) is dominant over the allele for **blue** eyes (**b**).

If two F1 **heterozygous brown-eyed** parents reproduce, what are the possible eye colors of their offspring?

Click "**start**" to find out.

start

For some characteristics, the genotype of a homozygous recessive individual can be determined from their phenotype.

For example, the allele for **brown** fur (**B**) in mice is dominant over the allele for **white** fur (**w**). This means that all **white** mice must therefore have the genotype **ww**.

But what about individuals that have **brown** fur? Is their genotype **BB** or **Bw**?

A **test cross** can be used to determine whether an individual is homozygous or heterozygous for a dominant trait.

What is a test cross?

During a test cross, an individual with an unknown genotype is crossed with a homozygous recessive individual. The phenotype of the offspring will reveal the unknown genotype.

- If **all** the offspring display the dominant phenotype, then the parent of unknown genotype must be **homozygous** for the characteristic.

- If **half** the offspring show the dominant phenotype, and **half** show the recessive phenotype, then the parent must be **heterozygous** for the characteristic.

Using test crosses to find out genotype

The allele for **brown** fur (**B**) in mice is dominant over the allele for white fur (w).

The genotype of a white mouse is always ww, but the genotype of a **brown** mouse can be unknown.

Click "**start**" to find out how a test cross can determine the genotype of the brown mouse.

start

Sometimes two different alleles are neither fully dominant or recessive to each other.

In heterozygous individuals, this creates a phenotype that is an intermediate mix of the other two. This is called **incomplete dominance**.

For example, when a **red** *Mirabilis jalapa* plant (also called the snapdragon or 'four o'clock flower') is crossed with a **white** *Mirabilis jalapa* plant, all the offspring flowers are **pink** because both the red and white alleles are expressed.
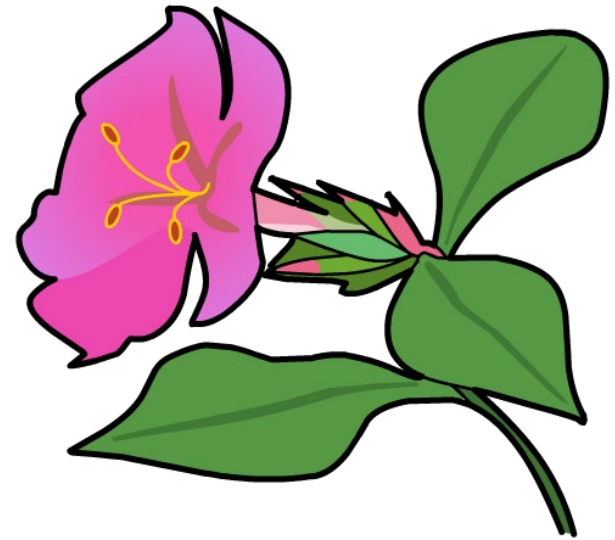
What is codominance?

The human ABO blood group system is controlled by three alleles: **A**, **B** and **o**. **A** and **B** are dominant while **o** is recessive.

In heterozygous individuals who have both **A** and **B** alleles, both are fully expressed, creating an extra phenotype.

Jupiterimages Corporation

This is called **codominance**.

What is the pattern of inheritance of the ABO blood system?

Codominance in humans

Blood groups in the offspring of heterozygous parents

Humans have four different types of blood group, which are controlled by just three alleles (**A**, **B** and **o**).

If a person who is heterozygous for blood group **A** reproduces with someone who is heterozygous for blood group **B**, what are the possible blood groups of their offspring?

Click "**start**" to find out.

start

What are sex chromosomes?

Humans cells contain one pair of **sex chromosomes**, which control gender.

Y chromosome

- Males have one **X** and one **Y** chromosome (**XY**).

- Females have two **X** chromosomes (**XX**).

Y chromosomes are very small and contain 78 genes, whereas **X** chromosomes are larger and contain 900–1,200 genes.

Andrew Syred / SPL

X chromosome

Because females can only produce **X** gametes, it is the sperm that determine the sex of the offspring at fertilization.
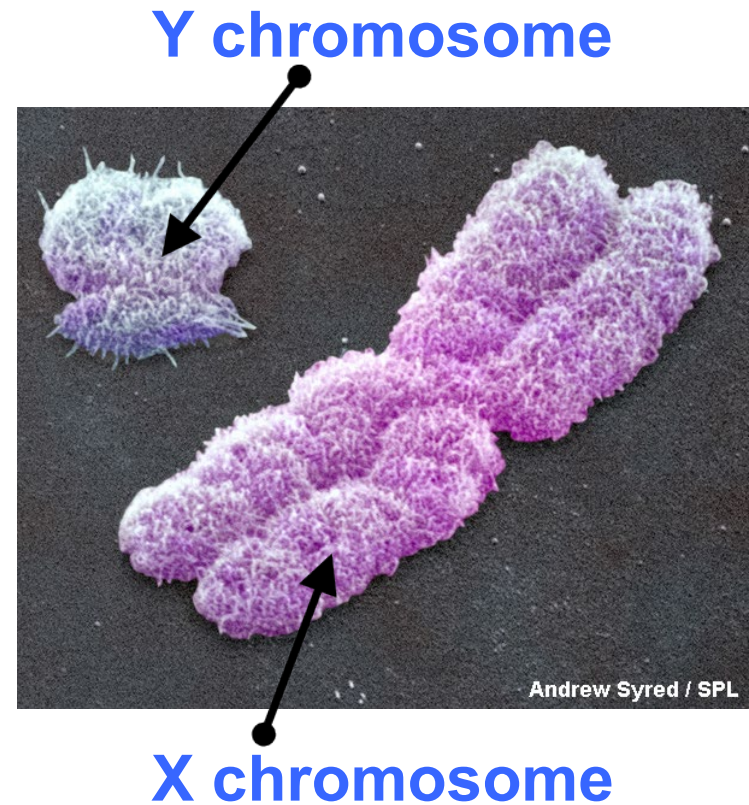
How is sex inherited?

The combination of sex chromosomes that a baby inherits will determine whether it will develop into a boy or a girl.

Click **"play"** to find out more.