

Chromosomes:

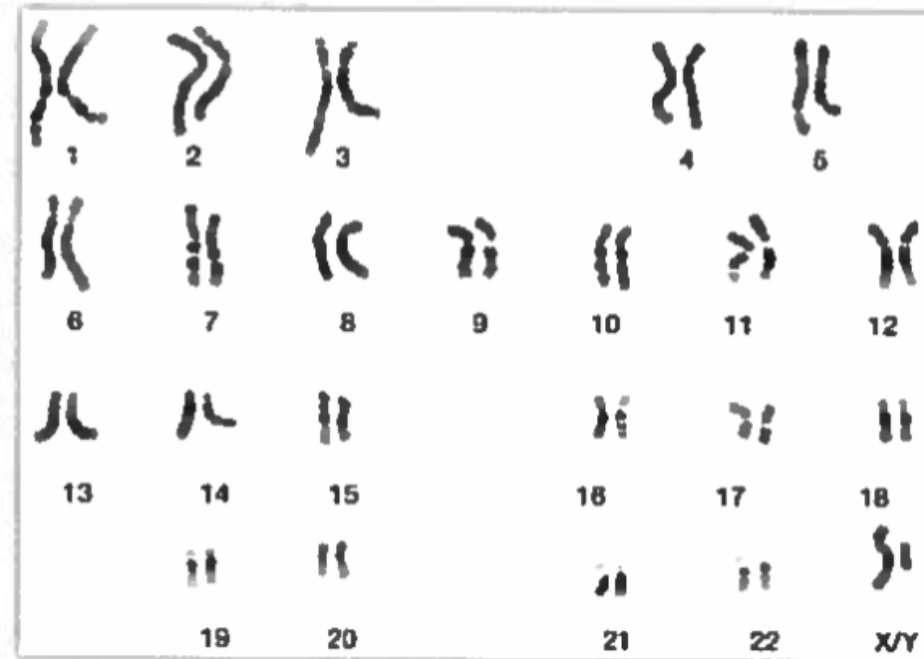
IT TAKES TWO TO MAKE THINGS GO RIGHT!

Chromosomes: It Takes Two to Make a Thing Go Right!

Chromosomes come in matching pairs, with one chromosome in each pair from each parent. Humans have a total of 46 chromosomes, 23 from the biological mother and another 23 from the biological father. With two sets of chromosomes, offspring inherit two copies of each gene, one from each parent.

The image below shows the chromosomes of a human lined up in pairs. Images that show chromosomes lined up with their homologous pair from largest to smallest are called karyotypes. Notice

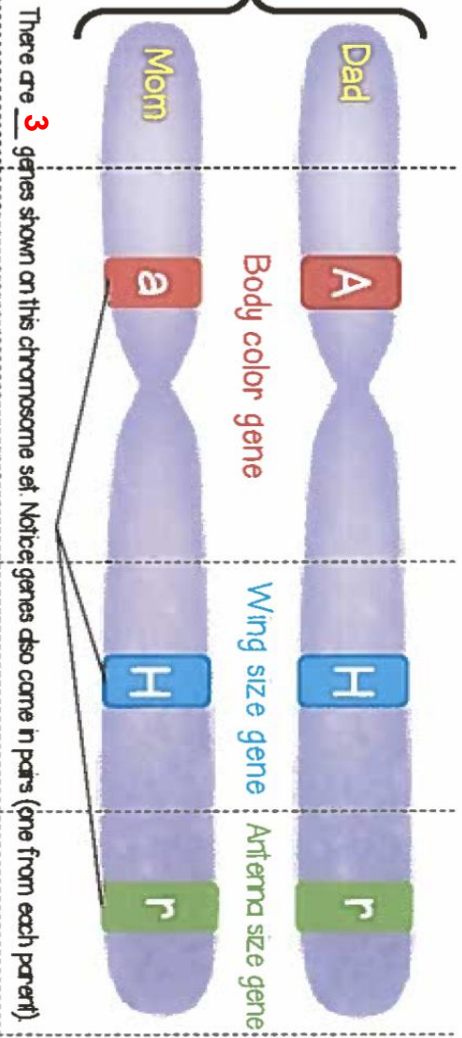
the only two chromosomes that do not always come in matching pairs are the sex chromosomes, X and Y. In humans, females have two matching X chromosomes. Males, however, have a Y chromosome and only one X chromosome. By looking at the sex chromosomes in the image here, we can tell the individual is a male.



Chromosomes come in sets called homologous pairs. One chromosome in the homologues pair is inherited from the mom the other from the dad. These two chromosomes have the same genes located in the same positions along their length. This means that we have two copies of each gene (the sex chromosomes X and Y are exceptions).

Since cells carry two copies of each chromosome they have two versions of each gene. These different versions of a gene are called alleles. We often use capital/lower case letters or superscripts to represent these different versions. The dominant allele always shows its effect over the recessive allele. This means individuals who have only one dominant copy in the gene pair will show the effects of the dominant gene. Individuals with different alleles for a gene (one dominant and one recessive) are said to have a heterozygous genotype.

Homologous Chromosome Pair



<u>Genotype</u>	<u>Phenotype</u>
<u>Aa</u>	= light body color
<u>HH</u>	= large wing size
<u>rr</u>	= small antenna

Individuals that have two dominant alleles in the gene pair are said to have a homozygous dominant genotype. This genotype will always show the dominant phenotype.

Individuals that have two recessive alleles in the gene pair are said to have a homozygous recessive genotype. This genotype will always show the recessive phenotype.

Body Color

Light body

AA or Aa

Dark body

a. a

Wing Size

Large wings

HH or Hh

Small wings

hh

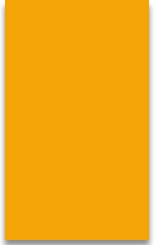
Antenna Size

Long antenna

RR or Rr

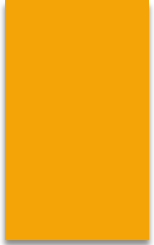
Short antenna

rr



Organisms are made of millions of cells. There are different types of cells that make up an organism, each with its own specific function. However, all cells (no matter the type) have common features such as: all have the same exact set of DNA, all take in nutrients and convert it into energy, all make molecules such as proteins, and all maintain homeostasis.

Almost all cells in an organism have a nucleus containing an organism's genome. A genome is the complete set of DNA that the organism inherited from its biological parents. Half of the genome (DNA) comes from the mother and the other half from the father.



In the nucleus of each cell, DNA is packaged into thread-like structures called chromosomes. Each chromosome is made up of a tightly coiled DNA strand. There are two copies of each chromosome (one from mom, one from dad.) Each chromosome has a constriction somewhere along its length called the 'centromere,' which divides the chromosome into two arms. The short arm ('p' arm) the long arm ('q' arm).

Genes are small sections of DNA within the genome that contain a sequence of genetic instructions for how to build proteins (or in some cases small pieces of functional RNA). Just like chromosomes, every person has two copies of each gene, one gene in the pair is inherited from each parent.

A gene codes for a particular protein that is involved in the expression of a trait. Traits determined by single gene are called Mendelian (single-locus) traits. These traits are often studied because they have predictable inheritance patterns. HOWEVER, most traits have complex, unpredictable inheritance patterns in which many genes along with environmental factors are involved in the expression of the trait.

Genes code for proteins which control an organism's traits. Traits are also known as an organism's phenotype or physical appearance. Phenotype is determined by the organism's gene makeup or genotype.

