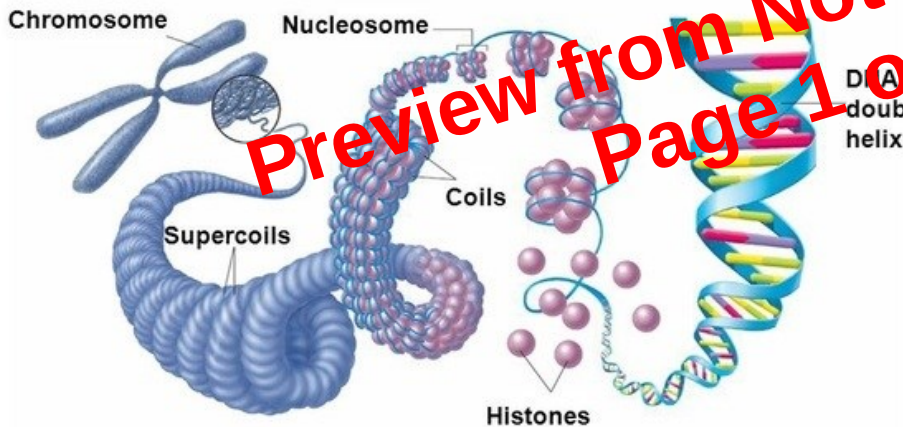


Chromosome Structure:

Chromosomes are only visible as distinct structures when a cell is dividing. For the rest of the time they are widely dispersed throughout the nucleus.

When they first become visible the chromosomes appear as two threads, joined at a single point. Each thread is called a **chromatid** because **DNA has already replicated to give two identical DNA molecules**. The DNA in chromosomes is held by **histones**. The considerable length of **DNA found in each cell is highly coiled and folded**.



The double helix is wound around histones to fix it in position. This DNA-Histone complex is then coiled which is then looped and further coiled before being packed into the chromosome. A lot of DNA is condensed into a single chromosome (around 2m of DNA in every human cell).

Humans have 46 chromosomes (23 pairs). This varies between species.



DNA and chromosomes

Homologous Chromosomes:

Humans are the result of the fusion of a sperm and egg, each of which contributes one complete set of chromosomes to offspring. **One of each pair is derived from the chromosomes provided by the mother (maternal chromosomes) and father (paternal chromosomes).**

These are known as **homologous pairs** and the total number is referred to as the **diploid number** (in humans its 46). **A homologous pair is always two chromosomes that carry the same genes but not necessarily the same alleles of the genes.**

For instance, a homologous pair of chromosomes may each possess genes for tongue rolling and blood group, but one chromosome may carry the allele for non-roller and blood group A whereas the other carries the allele for roller and blood group B. **During meiosis the halving of the number of chromosomes is done to ensure that each daughter cell receives one chromosome from each homologous pair.**

In this way, **each cell receives one gene for each characteristic of the organism. When these haploid cells combine, the diploid state, with paired homologous chromosomes is restored.**

What is an Allele:

An allele is one of a number of alternative forms of a gene.

Genes are sections of DNA that contain coded information in the form of specific sequences of bases. Each gene exists in two (sometimes more) different forms. Each of these forms is an allele.

Each individual inherits one allele from each of its parents. These two alleles may be the same or they may be different. **When they are different, each allele has a different base sequence, therefore a different amino acid sequence, so produces a different polypeptide.**

Any changes in the base sequence of a gene produces a new allele of that gene (a mutation) and results in a different sequence of amino acids being coded for. This different sequence will lead to the production of a different polypeptide, hence a different protein. **Sometimes this different protein may not function properly or at all, causing consequences for the organism.**