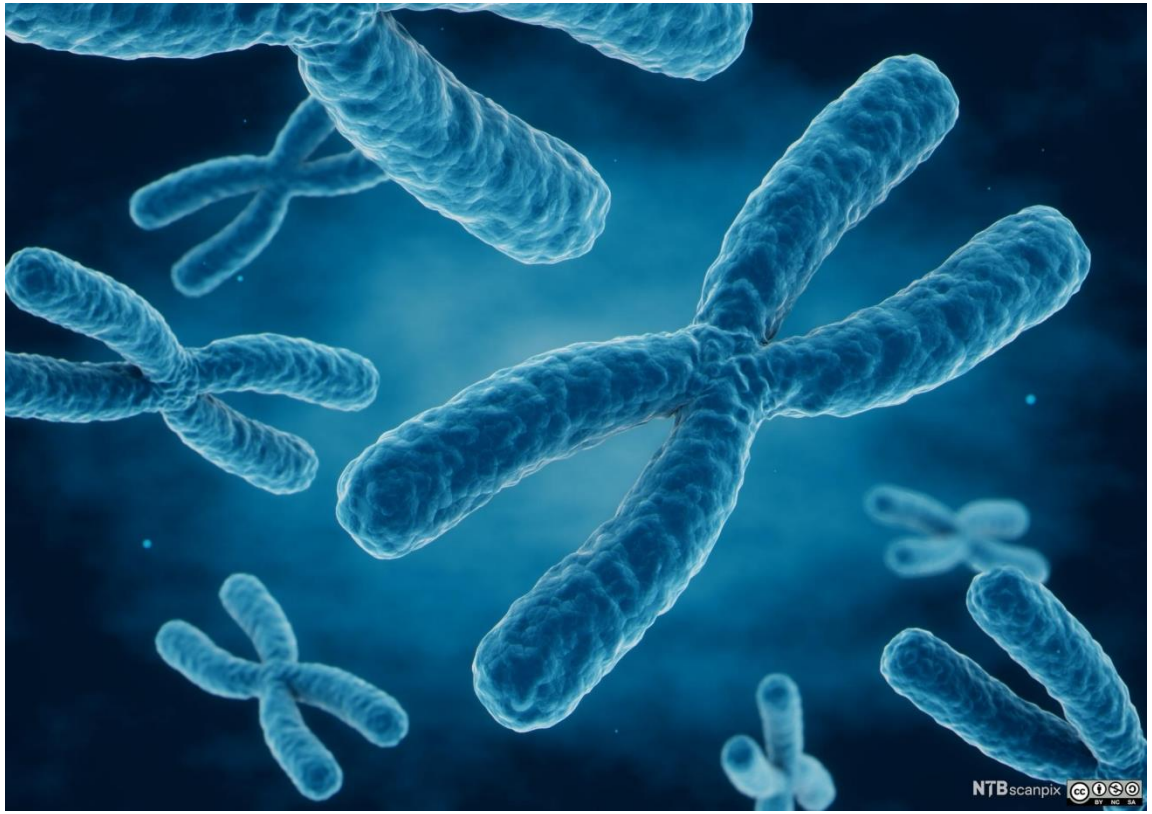


Chromosoms and Genes

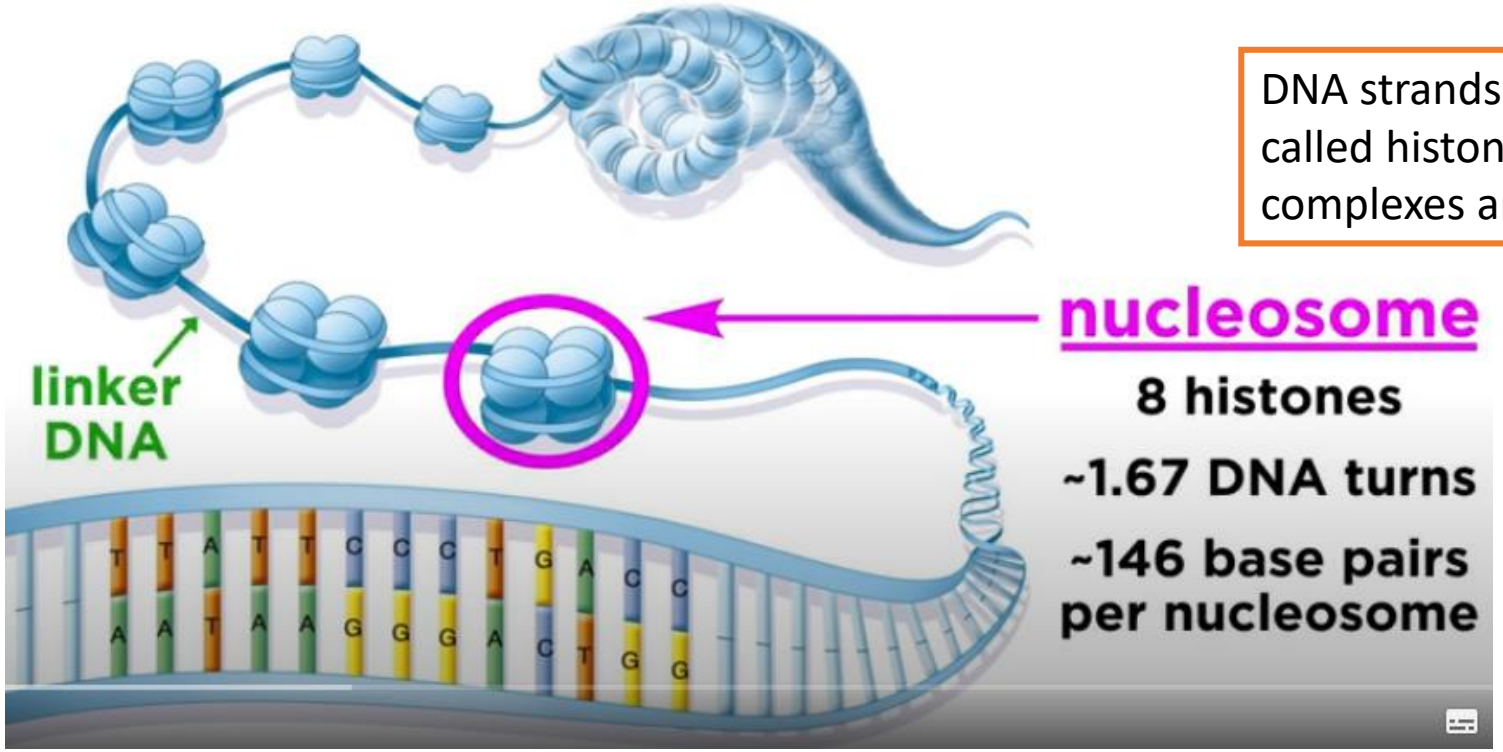
Doç.Dr. Zühal KILIÇ-KURT

Chromosome

- A chromosome is an organized package of DNA found in the nucleus of the cell.
- Different organisms have different numbers of chromosomes.
- Humans have 23 pairs of chromosomes--22 pairs of numbered chromosomes, called autosomes, and one pair of sex chromosomes, X and Y.
- Each parent contributes one chromosome to each pair so that offspring get half of their chromosomes from their mother and half from their father.

https://www.genome.gov/genetics-glossary/Chromosome

- The word chromosome comes from chroma, "colour" and soma, "body", describing their strong staining by particular dyes.

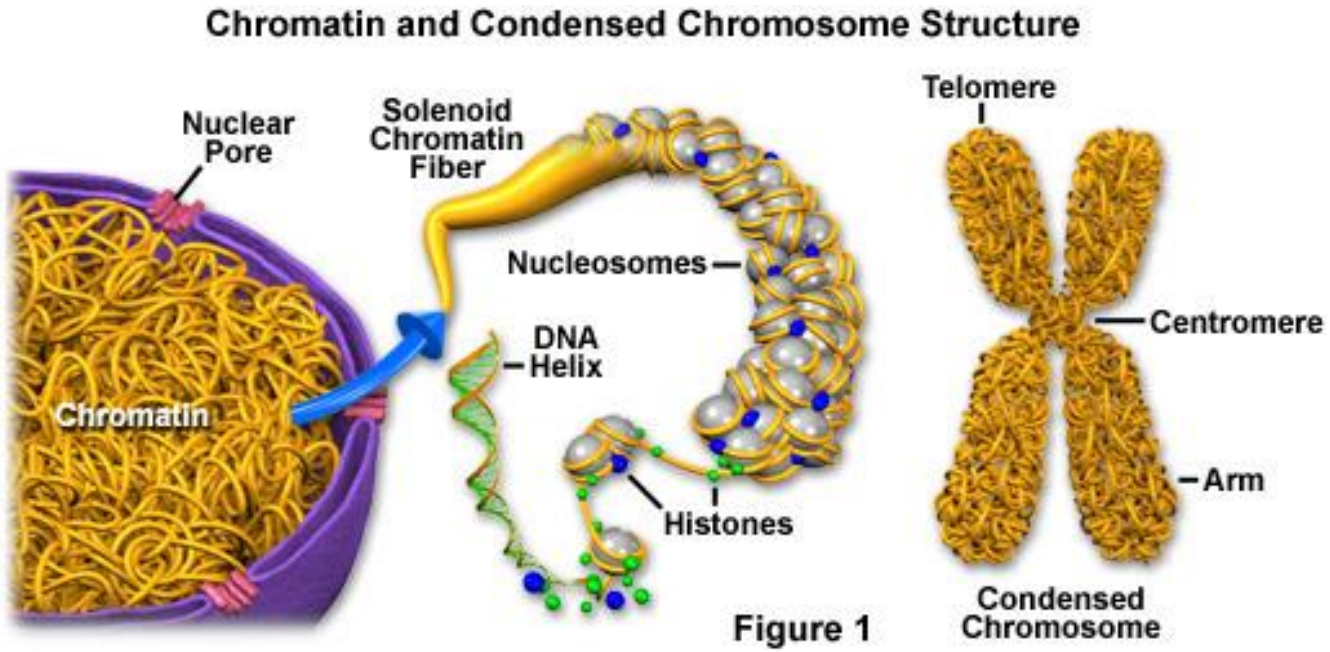


DNA strands are wrapped around proteins called histones. These DNA-histone complexes are called nucleosome.

- A chromosome is a long DNA molecule with part or all of the genetic material of an organism.
- Each chromosome is made up of DNA tightly coiled many times around proteins called histones that support its structure.

https://www.youtube.com/watch?v=BbA-pHyirzohttps://en.wikipedia.org/wiki/Chromosome
https://medlineplus.gov/genetics/understanding/basics/chromosome/

- Chromosomes are not visible in the cell's nucleus—not even under a microscope—when the cell is not dividing.
- However, the DNA that makes up chromosomes becomes more tightly packed during cell division and is then visible under a microscope.
- Chromosomes are normally visible under a light microscope only during the metaphase of cell division.

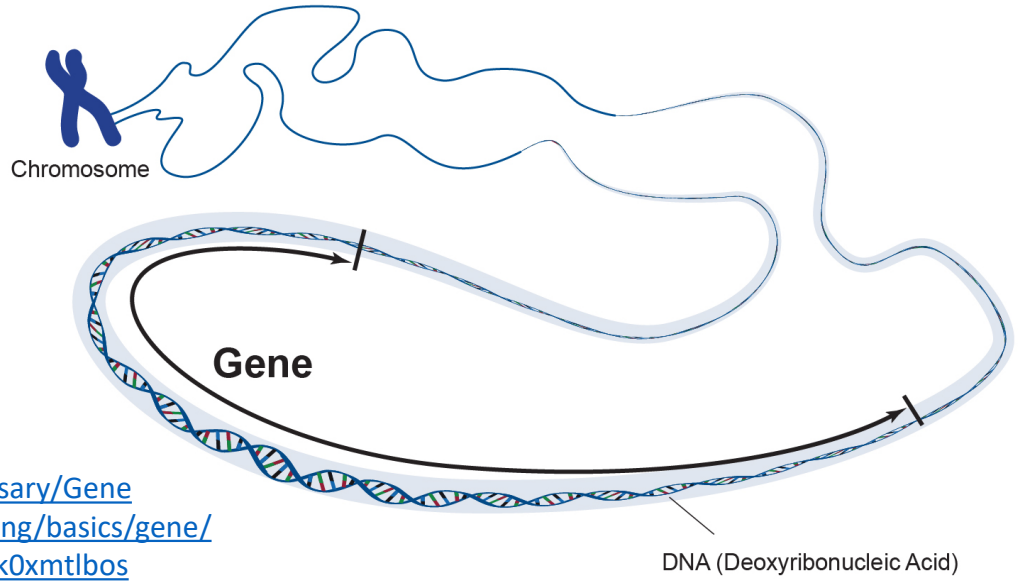


http://aboutmolecularbiology.blogspot.com/2019/01/dnann-nukleus-icerisindeki.html
https://en.wikipedia.org/wiki/Chromosome
https://medlineplus.gov/genetics/understanding/basics/chromosome/

Gene

- A gene is the basic physical and functional unit of heredity. Genes are passed from parents to offspring and contain the information needed to specify traits.
- Genes are made up of DNA.
- Every person has two copies of each gene, one inherited from each parent.
- Most genes are the same in all people, but a small number of genes (less than 1 percent of the total) are slightly different between people.

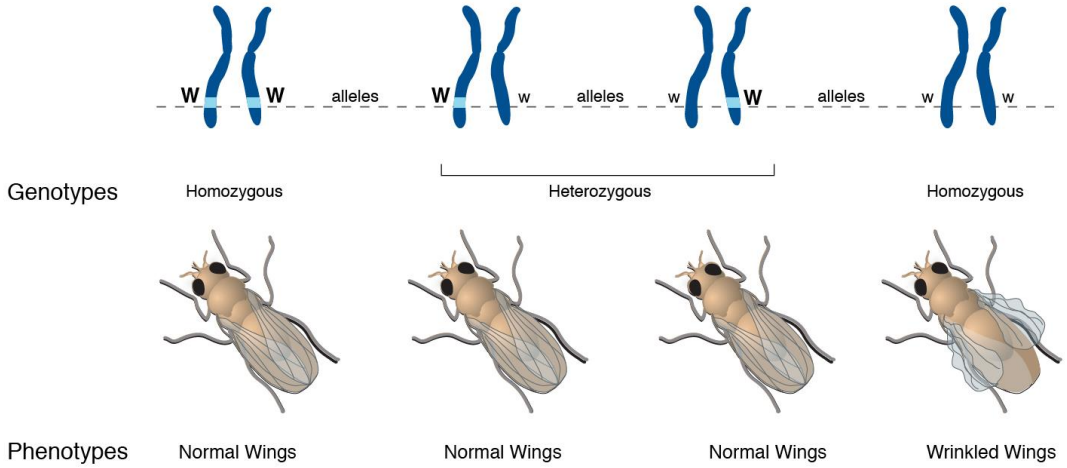
- Genes are arranged, one after another, on structures called chromosomes.
- A chromosome contains a single, long DNA molecule, only a portion of which corresponds to a single gene.
- Humans have approximately 20,000 genes arranged on their chromosomes.



https://www.genome.gov/genetics-glossary/Gene
https://medlineplus.gov/genetics/understanding/basics/gene/
https://www.youtube.com/watch?v=LVk0xmtlbos
https://www.youtube.com/watch?v=gG7uCskUOrA

Genotype

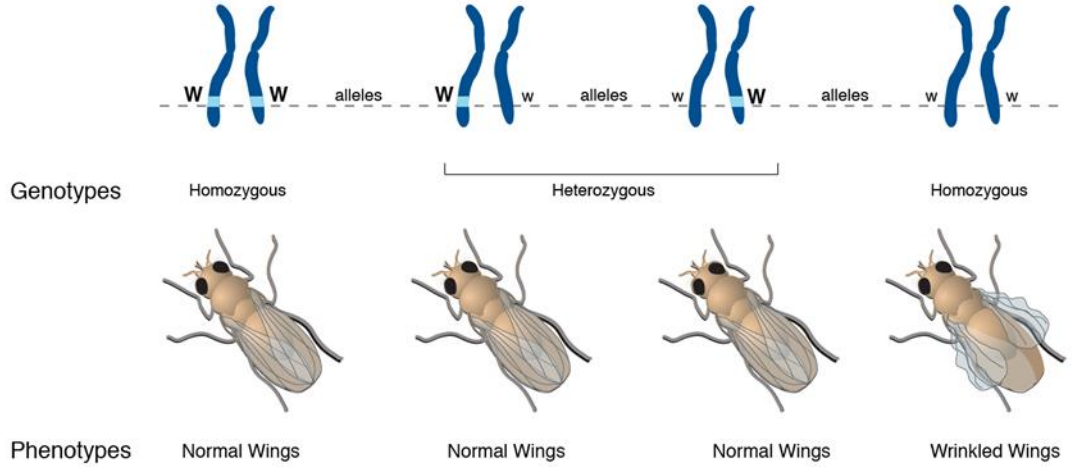
- A genotype is an individual's collection of genes.
- The term also can refer to the two alleles inherited for a particular gene.
- The genotype is expressed when the information encoded in the genes' DNA is used to make protein and RNA molecules.
- The expression of the genotype contributes to the individual's observable traits, called the phenotype.



https://www.genome.gov/genetics-glossary/genotype

Phenotype

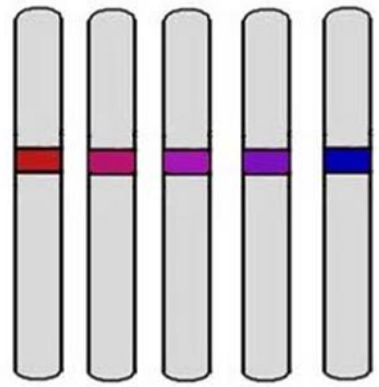
- A phenotype is an individual's observable traits, such as height, eye color, and blood type.
- The genetic contribution to the phenotype is called the genotype.
- Some traits are largely determined by the genotype, while other traits are largely determined by environmental factors.

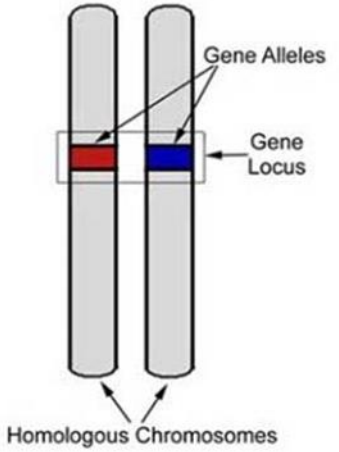


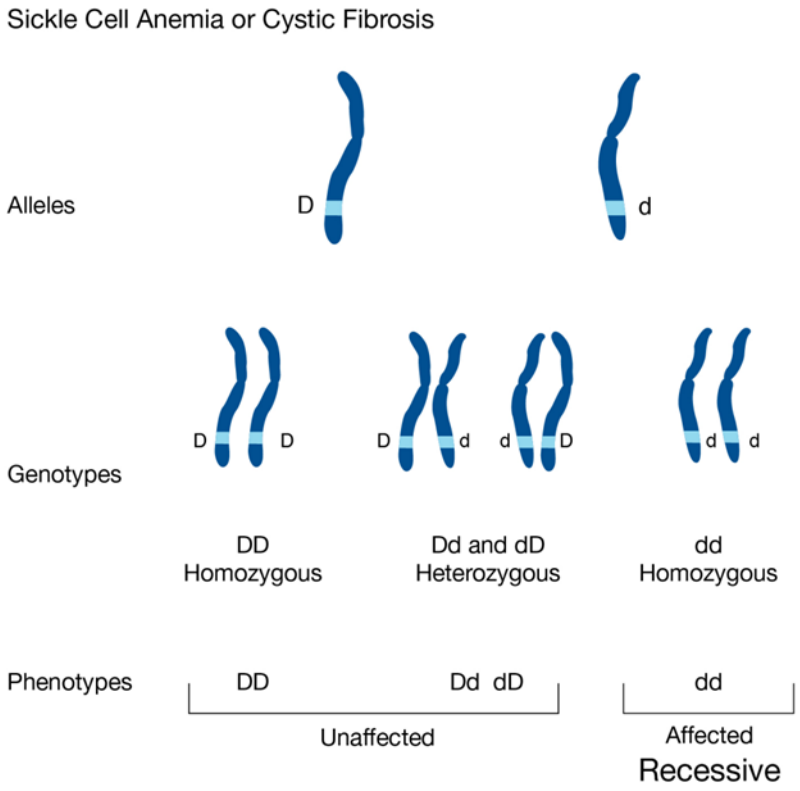
https://www.genome.gov/genetics-glossary/Phenotype

Allele

- An allele is one of two or more versions of a gene.
- An individual inherits two alleles for each gene, one from each parent.
- If the two alleles are the same, the individual is homozygous for that gene.
- If the alleles are different, the individual is heterozygous.



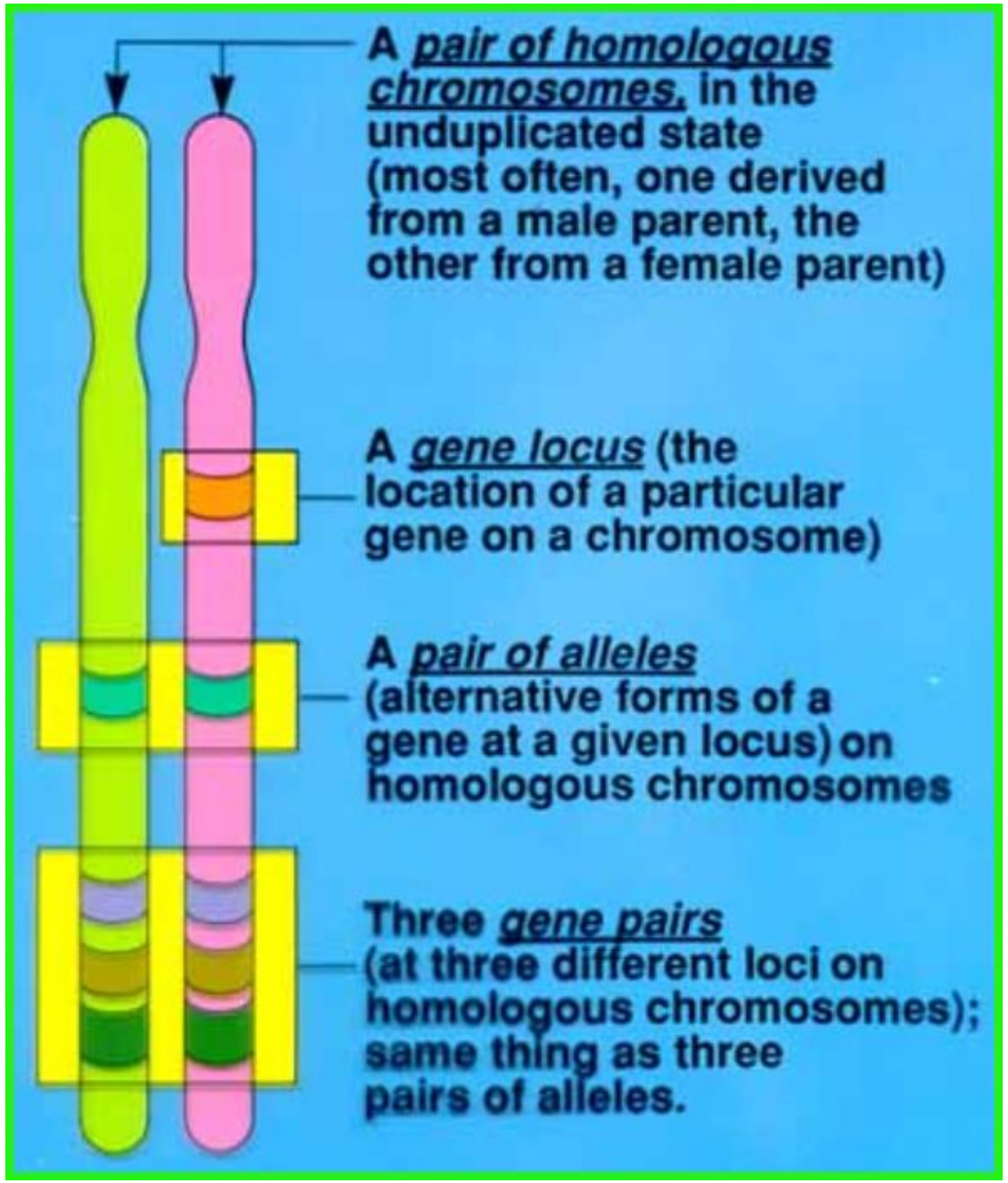




https://www.genome.gov/genetics-glossary/Allele

Locus

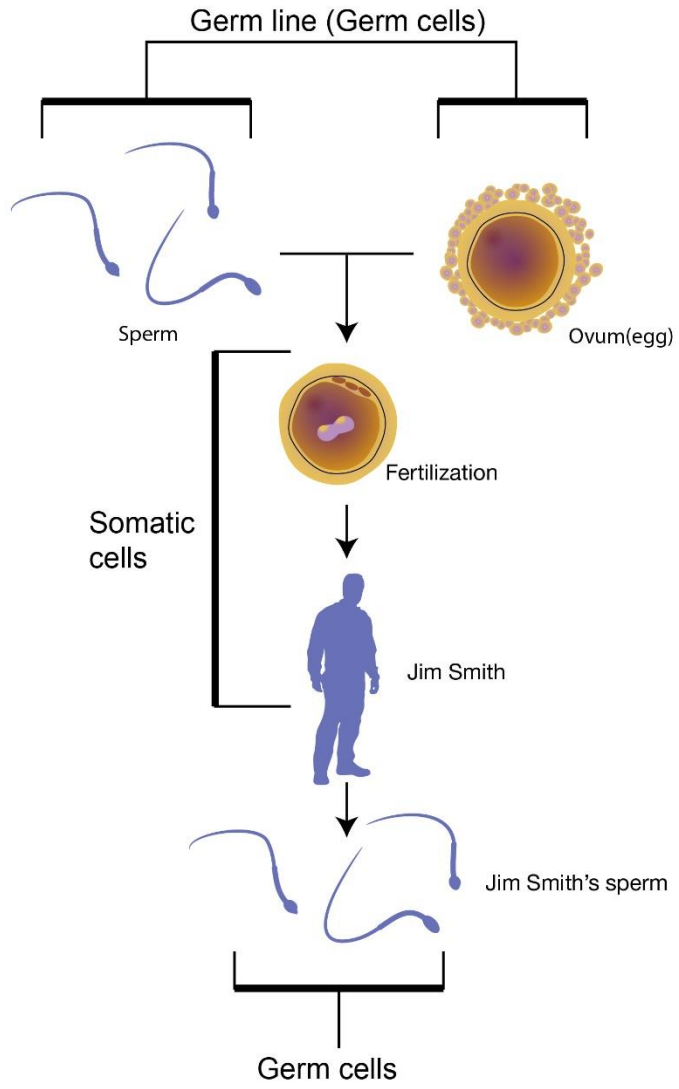
- A locus is the specific physical location of a gene or other DNA sequence on a chromosome, like a genetic street address. The plural of locus is loci.



https://www.genome.gov/genetics-glossary/Locus

Human Chromosoms

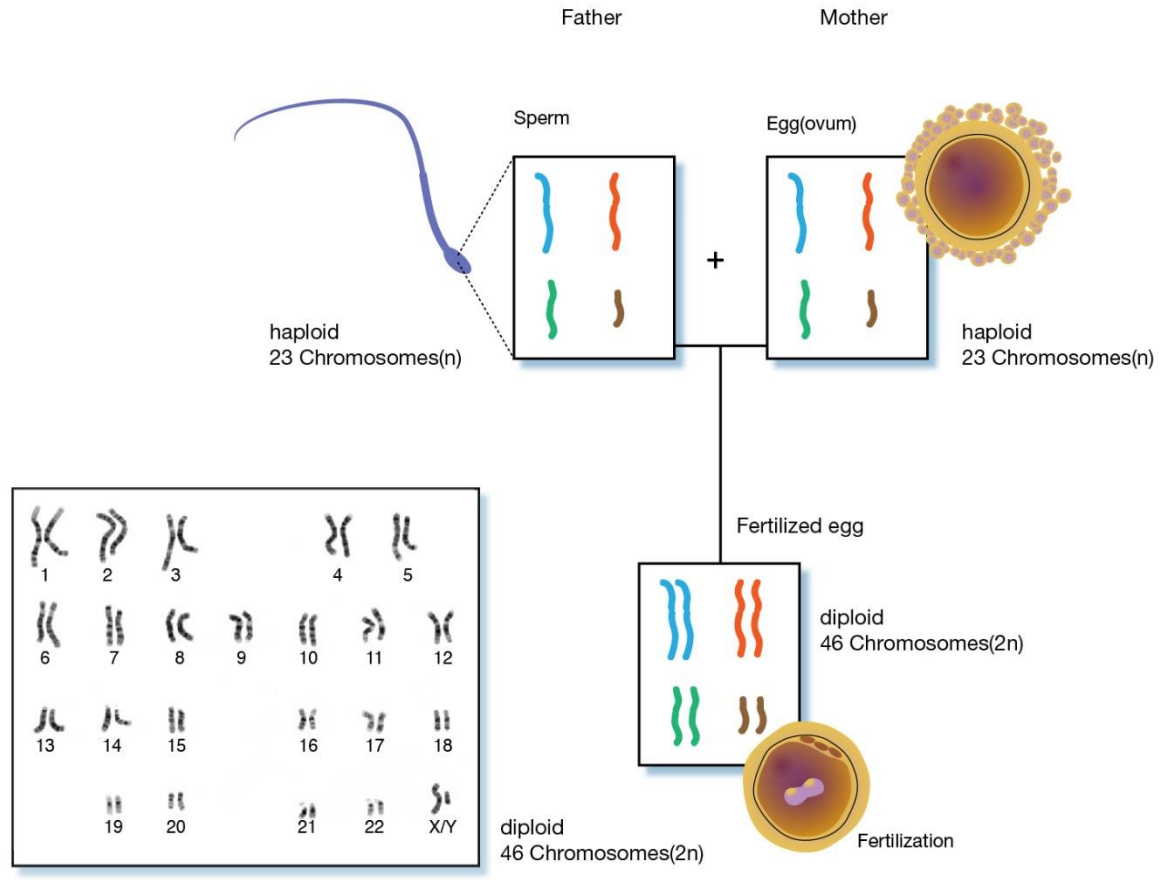
- In humans, each cell normally contains 23 pairs of chromosomes, for a total of 46.
- Twenty-two of these pairs, called autosomes, look the same in both males and females.
- The 23rd pair, the sex chromosomes, differ between males and females. Females have two copies of the X chromosome, while males have one X and one Y chromosome.
- A somatic cell is any cell of the body except sperm and egg cells.



https://www.genome.gov/genetics-glossary/Somatic-Cells
https://medlineplus.gov/genetics/understanding/basics/howmanychromosomes/

Human Chromosoms

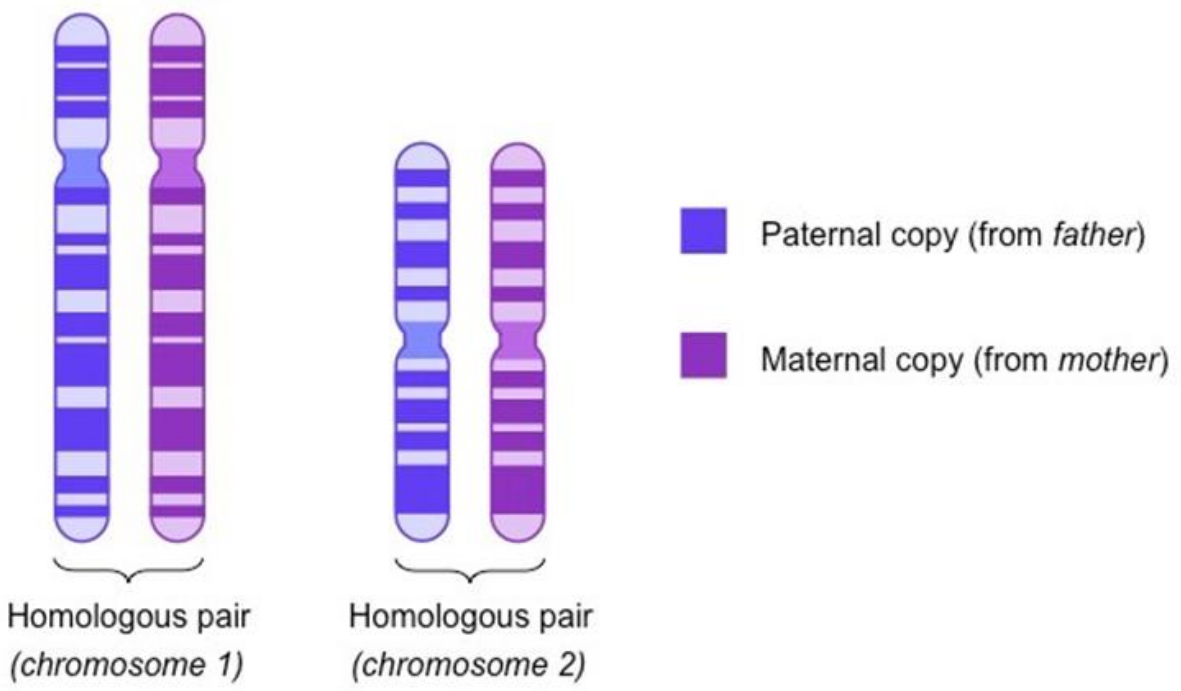
- Somatic cells are diploid (2n), meaning that they contain two sets of chromosomes, one inherited from each parent.
- In humans, cells other than human sex cells, are diploid and have 23 pairs of chromosomes.
- Human sex cells (egg and sperm cells) contain a single set of chromosomes and are known as haploid (n).
- Maternal chromosomes originate from the mother while the paternal chromosomes originate from the father.



https://www.genome.gov/genetics-glossary/Diploid

Homologous chromosomes

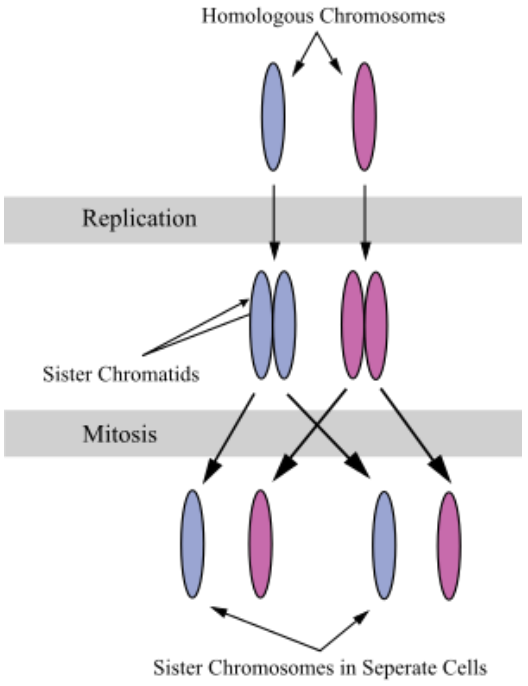
- A couple of **homologous chromosomes**, or **homologs**, are a set of one maternal and one paternal chromosome that pair up with each other inside a cell during fertilization.

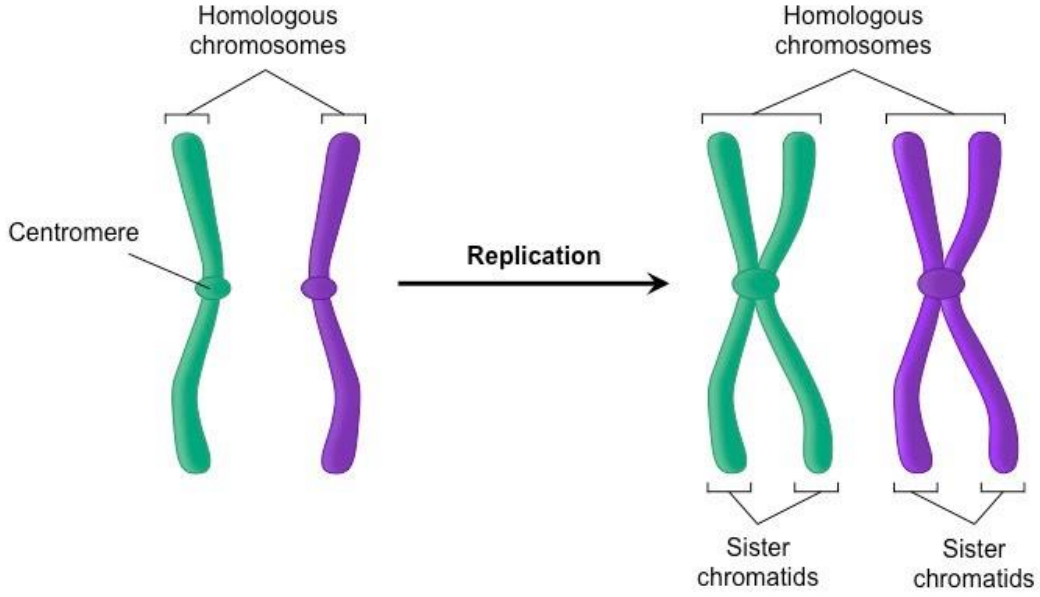


https://ib.bioninja.com.au/standard-level/topic-3-genetics/32-chromosomes/homologous-pairs.html

Chromatid

- A chromatid is one of two identical halves of a replicated chromosome.
- During cell division, the chromosomes first replicate so that each daughter cell receives a complete set of chromosomes.
- Following DNA replication, the chromosome consists of two identical structures called **sister chromatids**, which are joined at the centromere.

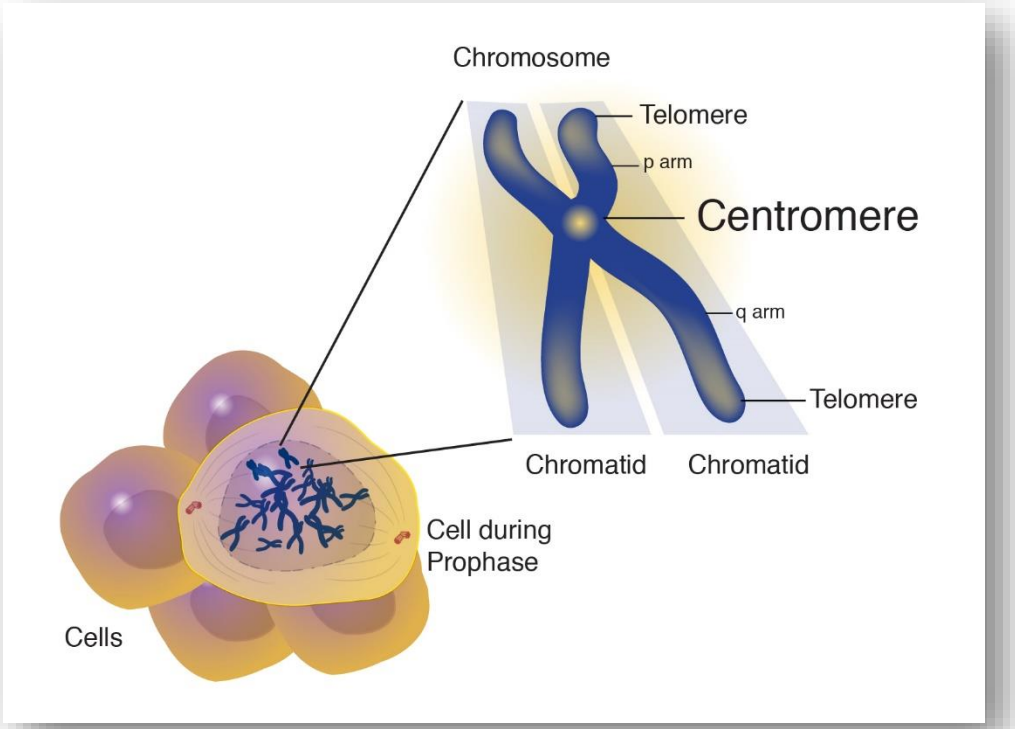




https://www.genome.gov/genetics-glossary/Chromatid
https://en.wikipedia.org/wiki/Sister_chromatids
https://ib.bioninja.com.au/standard-level/topic-3-genetics/33-meiosis/sister-chromatids.html

Centromere

- A centromere is a constricted region of a chromosome that separates it into a short arm (p) and a long arm (q).
- During cell division, the chromosomes first replicate so that each daughter cell receives a complete set of chromosomes.
- Following DNA replication, the chromosome consists of two identical structures called sister chromatids, which are joined at the centromere.

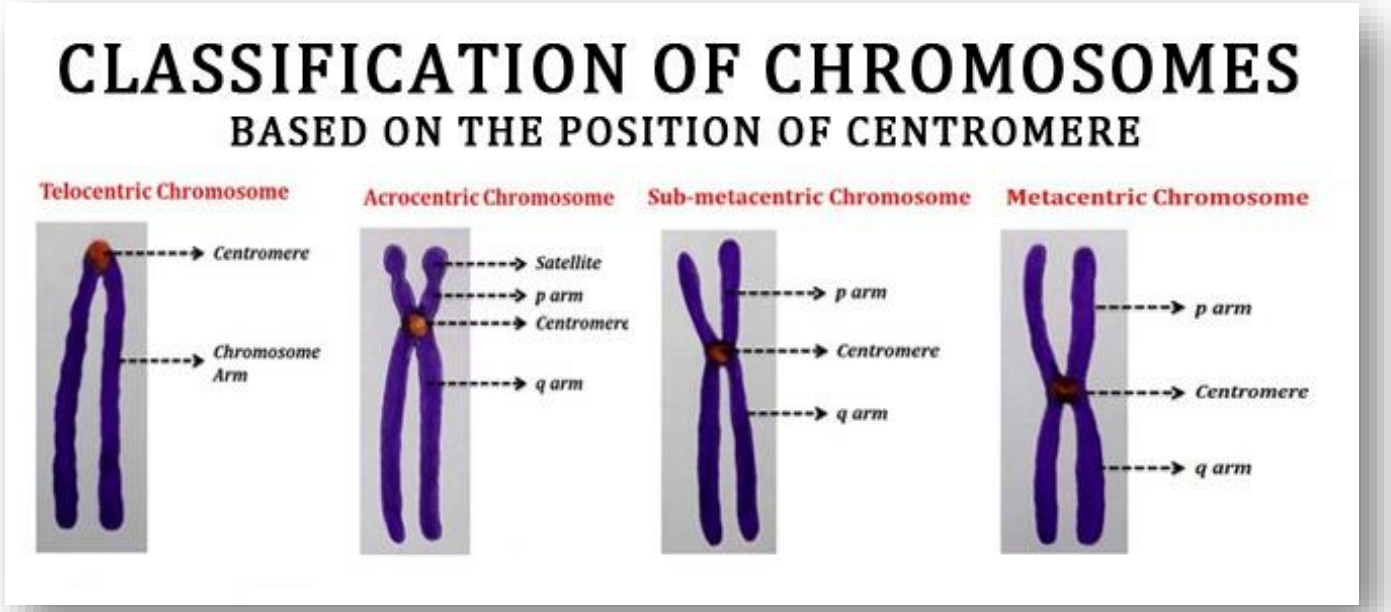


https://www.genome.gov/sites/default/files/tg/en/illustration/centromere.jpg

Classification of Chromosoms

- The centromere can be located in different positions and this forms the basis for the four different classes of chromosome:
- **Metacentric** – centromere is in middle, meaning p and q arms are of comparable length
- **Submetacentric** – centromere off-centre, leading to shorter p arm relative to q arm
- **Acrocentric** – centromere severely off-set from centre, leading to much shorter p arm
- **Telocentric** – centromere found at end of chromosome, meaning no p arm exists

(chromosome not found in humans)

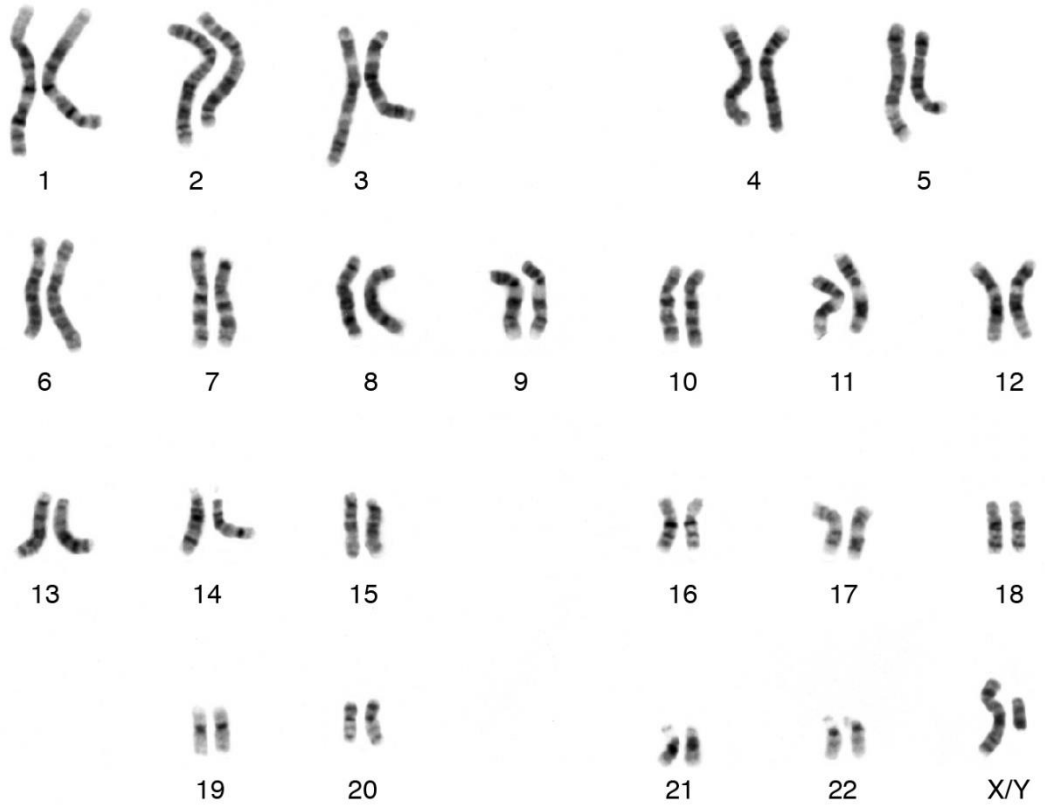


https://ib.bioninja.com.au/standard-level/topic-3-genetics/32-chromosomes/chromosome-types.html

https://www.easybiologyclass.com/classification-of-chromosome-based-on-position-of-centromere-and-length-of-chromosomal-arms/

Karyotype

- A karyotype is an individual's collection of chromosomes.
- The term also refers to a laboratory technique that produces an image of an individual's chromosomes.
- The karyotype is used to look for abnormal numbers or structures of chromosomes.



https://www.genome.gov/genetics-glossary/Karyotype