Chromosomes

Etymology
☐ *Originated from the **Greek** word **(chroma, colour)** and **(soma, body)**.*

DEFINITION
"A **chromosome** is an organized structure of DNA and protein found in cells. It is a single piece of coiled DNA containing many genes, regulatory and other nucleotide sequences. Chromosomes also contain DNA-bound proteins, which serve to package the DNA and control its functions".

Prokaryotic Chromosomes

☐ Genomes are simple and the organization of DNA is also different.
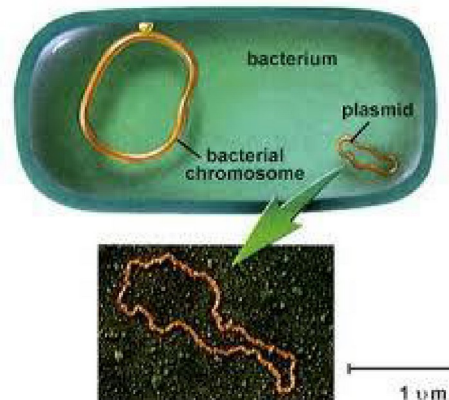
   Genomes are contained in single chromosomes, which are usually circular DNA molecules.

   DNA is associated with proteins but no histones present.

   DNA packaging is different from and is not well understood.

   Variation in genome length bearing genes.
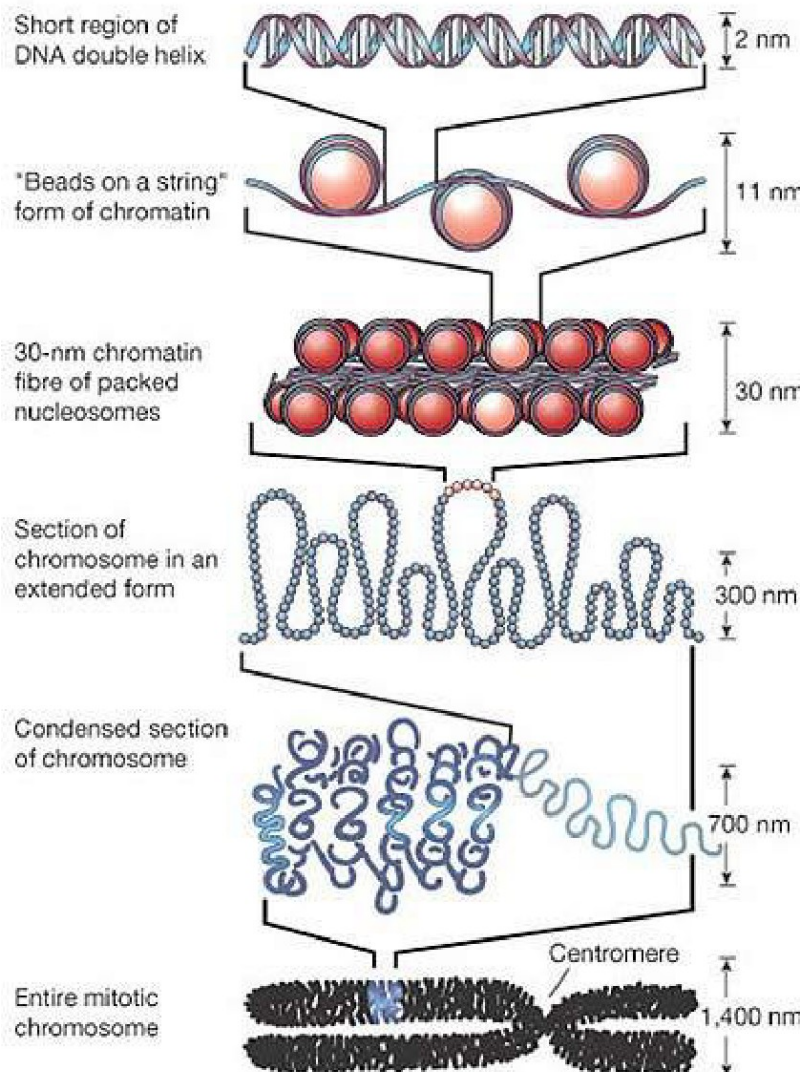
   RNA viruses having smallest genome.

Eukaryotic Chromosomes

☐ Genomes are composed of multiple chromosomes, each containing a linear molecule of DNA.

Histones are unique feature of eukaryotic cells.

The packaging of DNA is due to histones.

Structure of Chromosome

☐ Typically a chromosome is made of two chromatids, a centromere and a secondary constriction.

Sister chromatids are two identical copies of the chromosome connected by a centromere.

☐ The two chromatids of one homologous chromosome with respect to those of the other homologue are called **Nonsister chromatids**
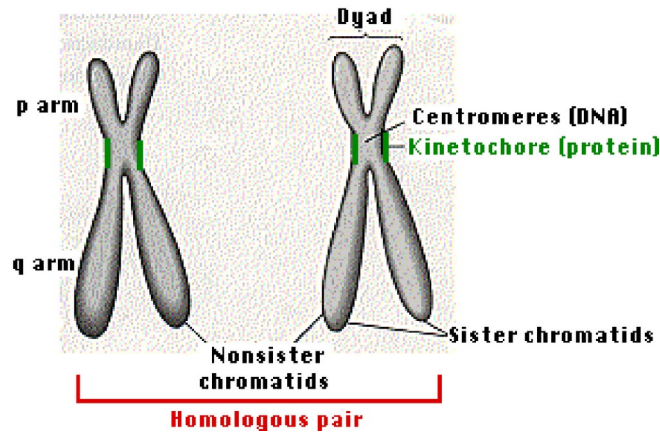
Centromere

☐ The region where two sister chromatids of a chromosome appear to be joined during cell division is called **Centromere**.

Also termed as **Primary constriction**.

Darkly-stained region.

In humans, the centromere contains 1–10 million base pairs of DNA.

• First part of chromosomes to be seen moving towards the opposite poles during anaphase.

Kinetochore

is the protein structure on chromosomes where the spindle fibers attach during cell division to pull the chromosomes apart.

Telomere

☐ Derived from the Greek nouns **telos** "end" and **meros** "part"

A **telomere** is a region of repetitive DNA sequence at the end of a chromosome, which protects the end of the chromosome from deterioration or from fusion with neighboring chromosomes.

Required for the replication and stability of the chromosome.

McClintock noticed that if two chromosomes were broken in a cell, the end of one could attach to the other and vice versa.
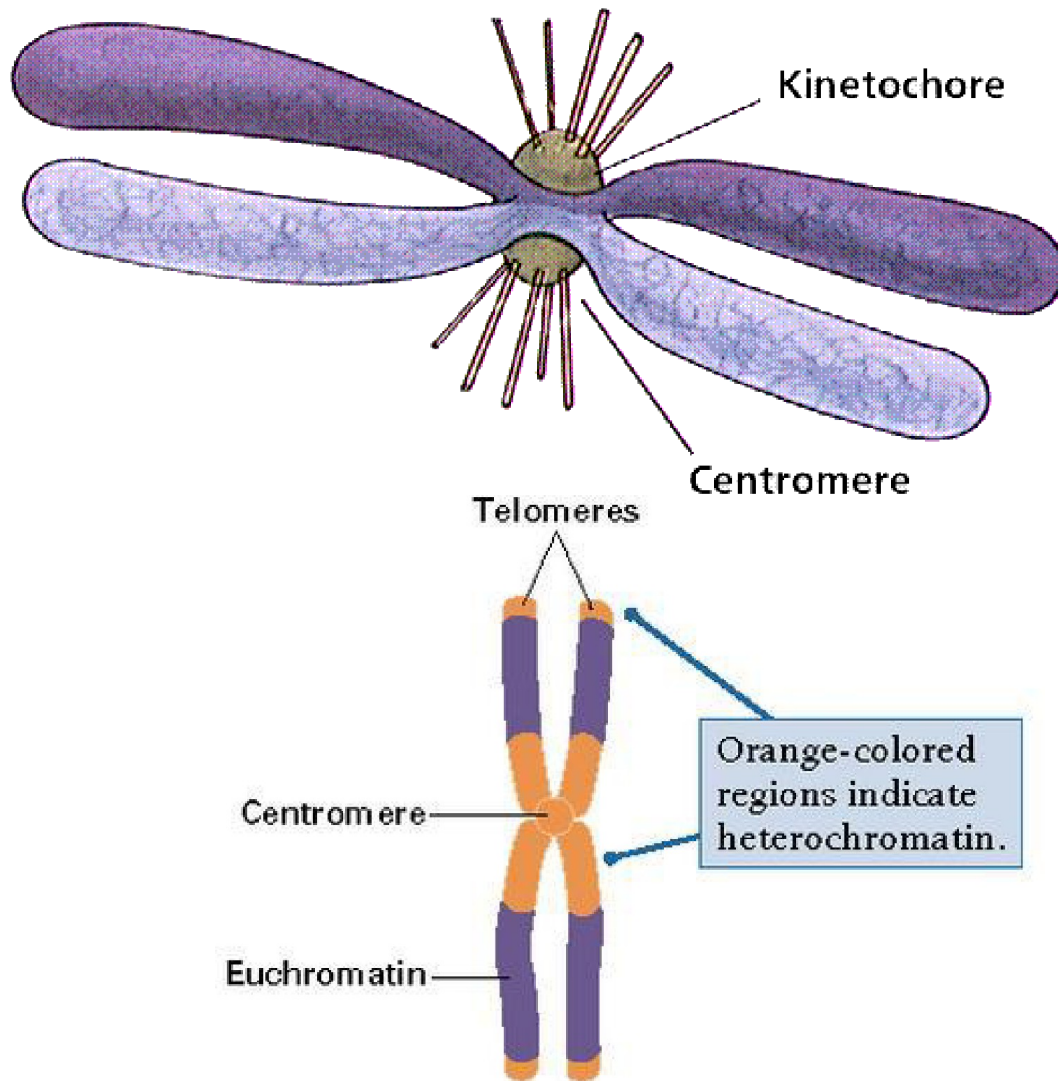
Regions of Chromosomes:

Several different chemical techniques are used to identify certain chromosomal regions by staining them so that they form **chromosomal bands**.

There are 2 types of regions in chromosomes.

● *Euchromatin* :Light staining regions.

● **Heterochromatin :** Darkly staining and tightly coiled throughout the cell cycle .

Types of chromosomes:

● *Autosomes*

Chromosomes that are not directly concerned with reproduction and sex determination are called autosomes.

 These are identical in both sexes in human.

● *Allosomes/Heterosome*

These chromosomes are directly associated with reproduction and differ from autosomes in size, form and behavior.

Usually there is a single pair of allosomes in mammals termed as 'X" and "Y" chromosomes.

Number of Chromosomes :

 Normally all the individuals of a species have the same number of chromosomes.

   Closely related species usually have similar chromosome number.

   Presence of a whole set of chromosomes is called **Euploidy**.

   It includes haploids, diploids, triploids, tetraploids etc.

   The condition in which the chromosomes sets are present in multiples of **"n"** is **Polyploidy.**

Chromosome Size :
 The size of chromosomes shows a remarkable variation depending upon the stages of the cell division.

   Longest and thinnest in Interphase.

   Most easily observed during **metaphase** when they are very thick, quite short and well spread in the cell.

Karyotype:

 A **karyotype** is the number and appearance of chromosomes in the nucleus of a eukaryotic cell , It describes the number of chromosomes, and what they look like under a light microscope.