Human Chromosome

By
Lectural
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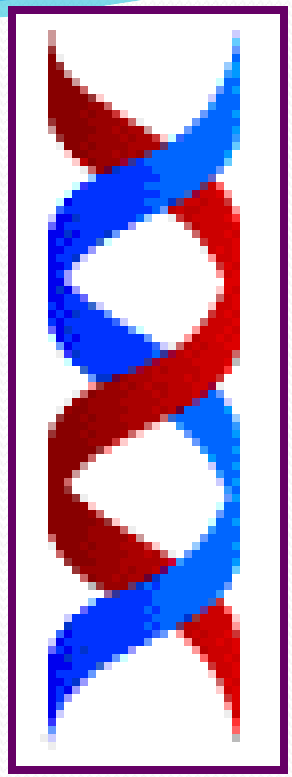
Cytogenetics

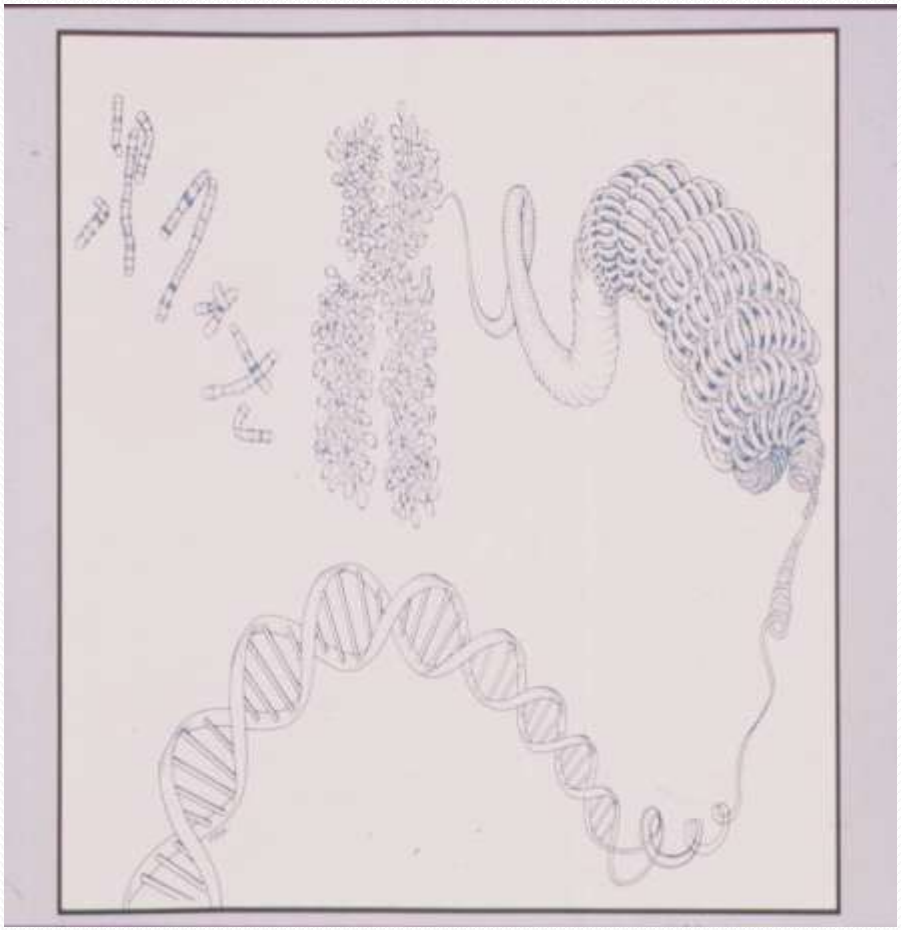
- **Definition**

Cytogenetic is the study of genetic material of cell



Cytogenetics

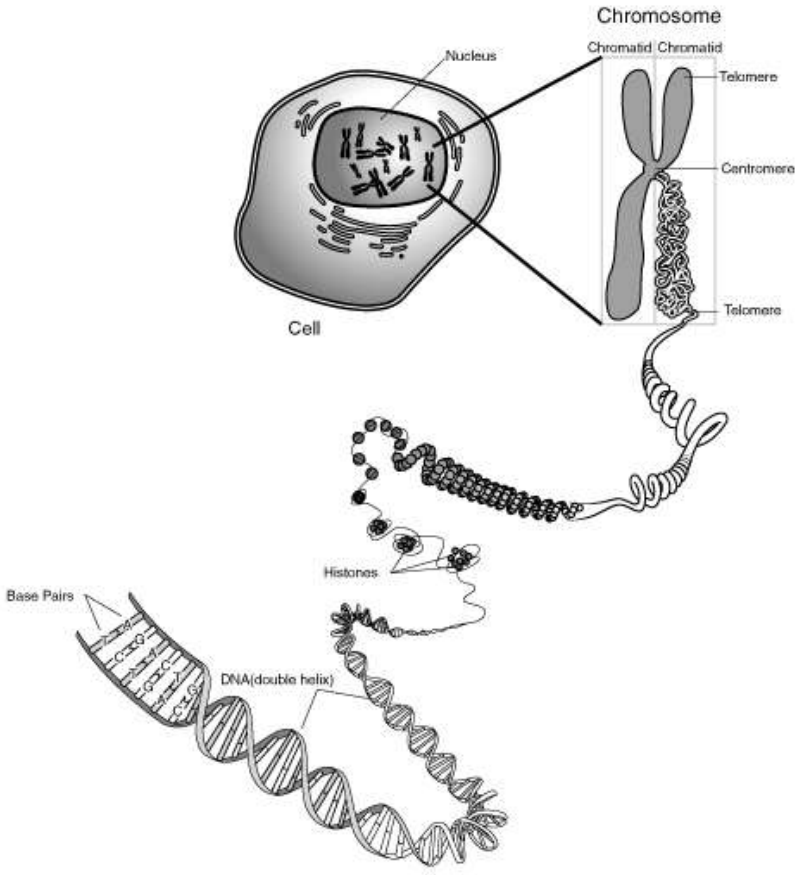
- The study of chromosome and the related disease states caused by abnormal chromosome number and\or structure.



What are chromosome?

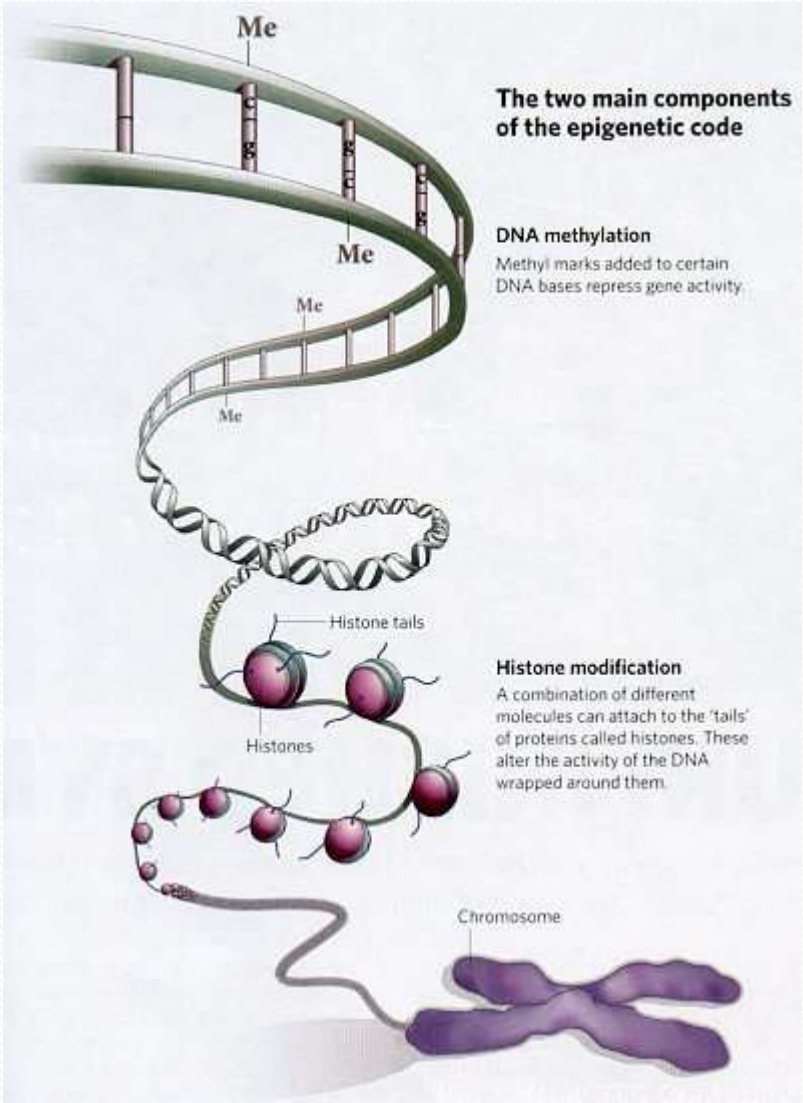
***Chromosomes** are the cellular structures that carry genes*

Chromosomes are distinct dense bodies found in the nucleus of cells , composed of protein and DNA.



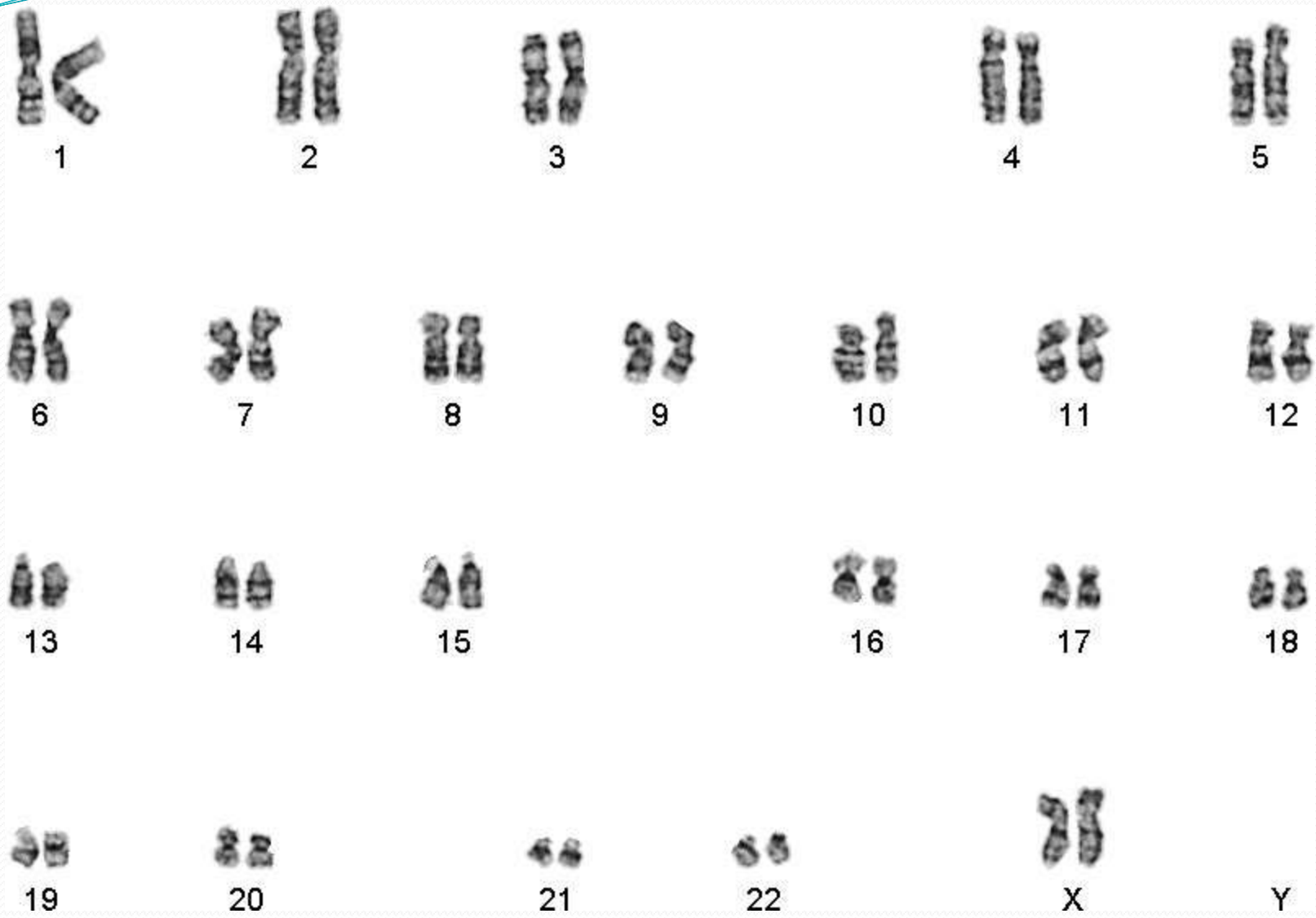
Chromosomes

- Coiled DNA, with some RNA and histone proteins
- DNA strand coils around histones, which look like beads
- genes or Genetic information is contained in the DNA of chromosomes in the form of linear sequences of bases (A,T,C,G).



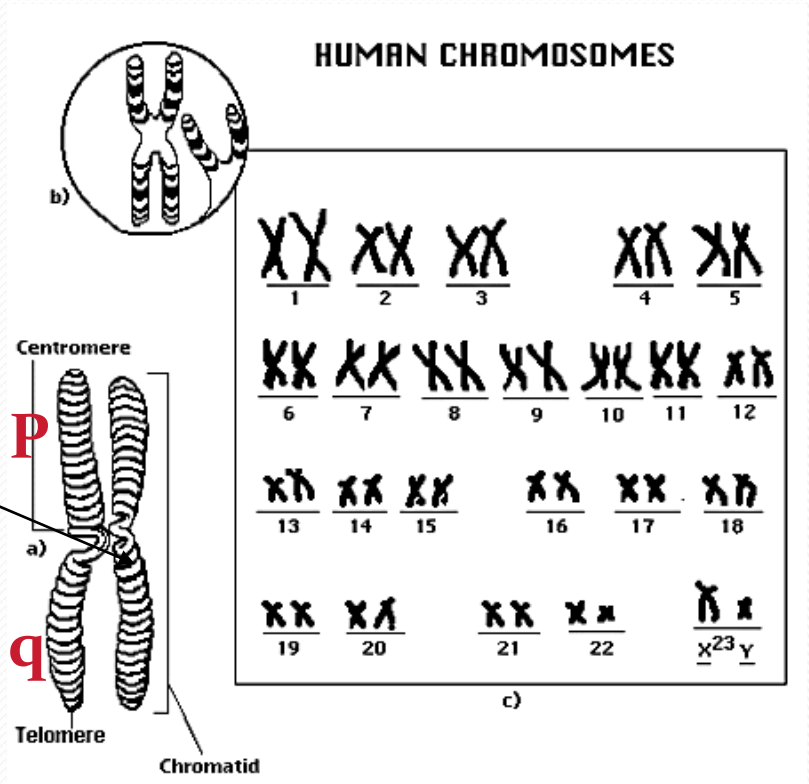
What are chromosomes ?

- **The number of chromosomes in human cells is 46 with 22 autosomal pairs (one of each type contributed by the mother and one of each type from the father) and 2 sex chromosomes - 2 X chromosomes for females (one from father and one from mother) or an X and a Y chromosome for males (the X from the mother and the Y from the father).**


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
X
Y

Chromosome

- Each chromosome is visualized as **two chromatids** that are joined at a central constriction called the **centromere**.
- The centromere divides the chromosomes into two arms: a **short** arm **(P)** and a **long** arm **(q)**



A typical mitotic chromosome at metaphase

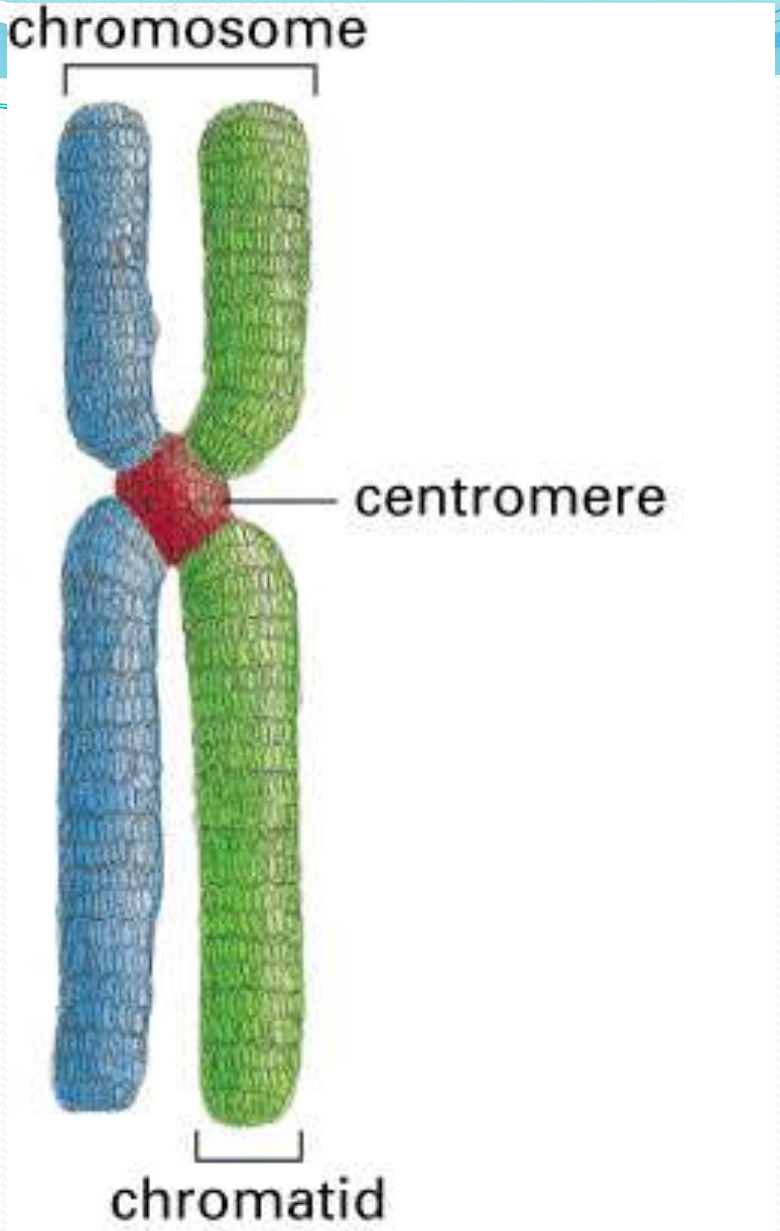
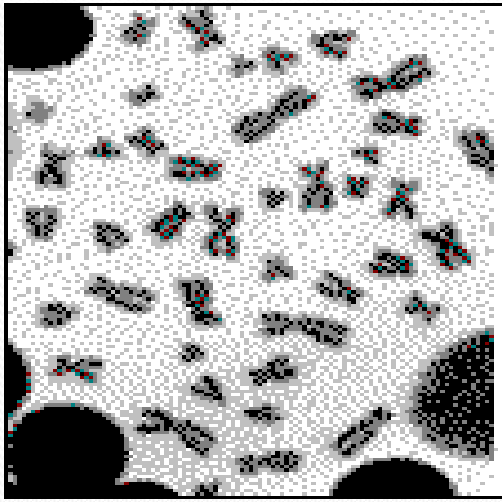
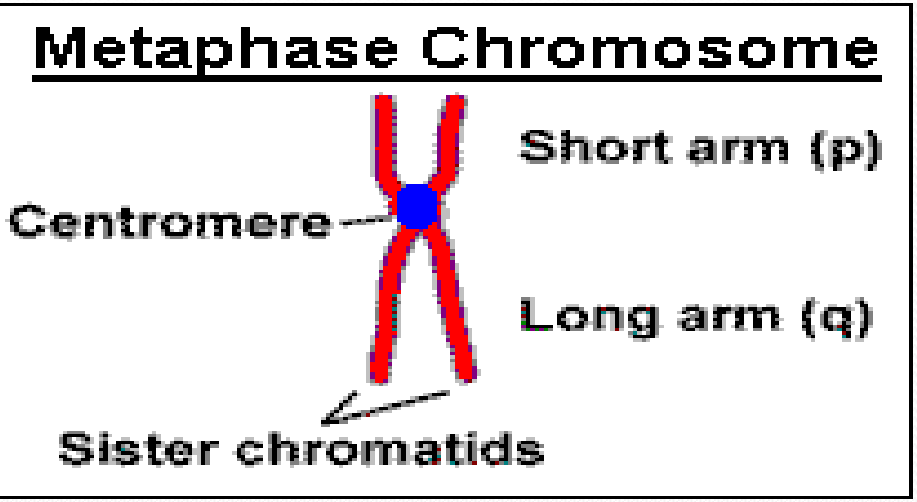
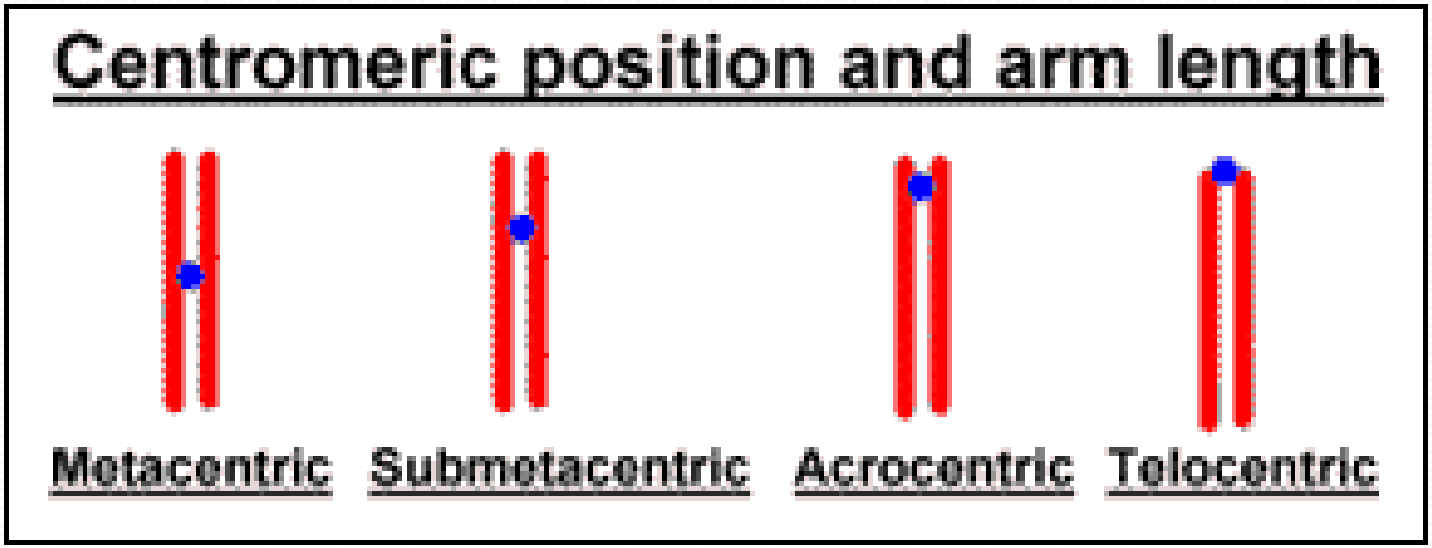


Figure 4–52. Molecular Biology

Nomenclature of chromosomes







Chromosomes are divided into 7 groups, A……G

- **Group A:** 1,2,3
- **Group B:** 4,5
- **Group C:** 6-12, x
- **Group D:** 13,14,15
- **Group E:** 16,17,18
- **Group F:** 19,20
- **Group G:** 21,22,Y

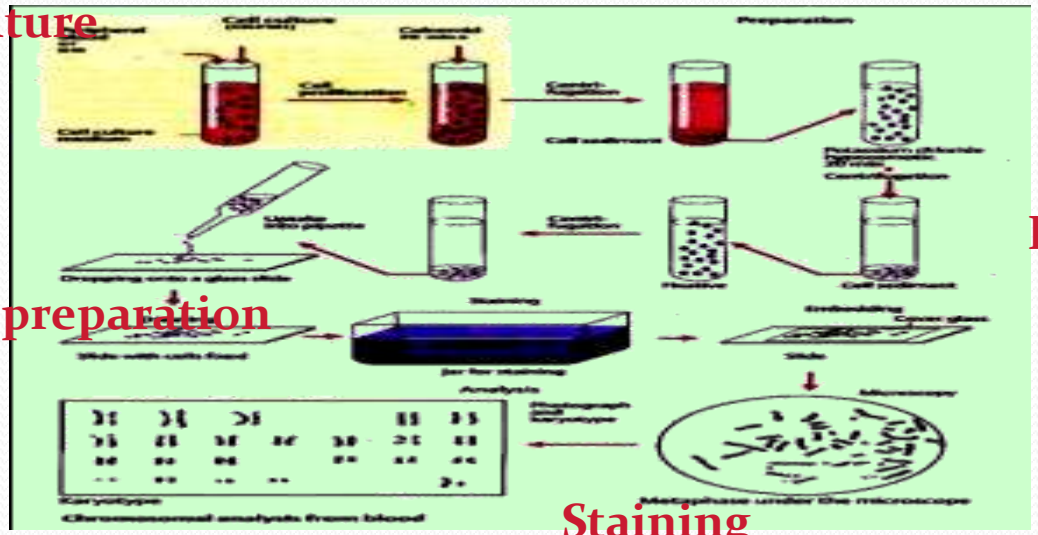
Obtaining Cells

- Obtain cells by 4 methods:
- Amniocentesis
- Chorionic villus sampling
- Fetal Cell sorting
- Maternal blood screening

Conventional Cytogenetic Analysis

Hypotonic

Culture

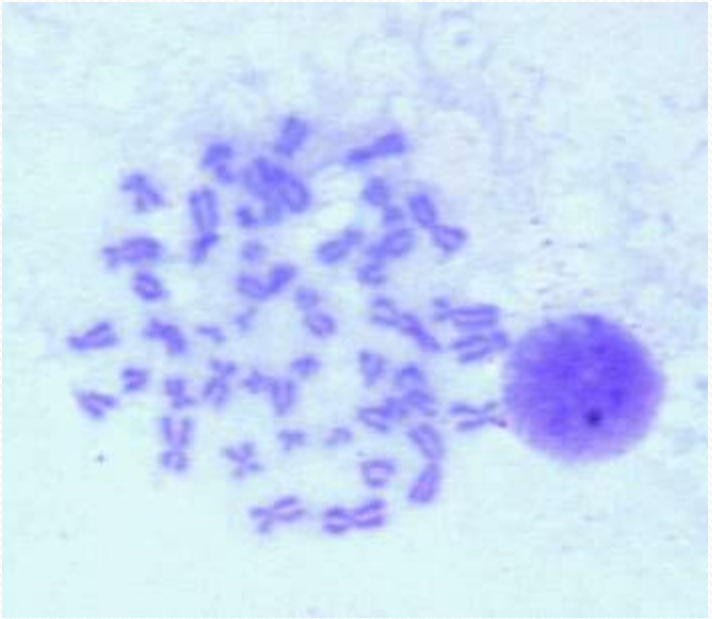


Fixation

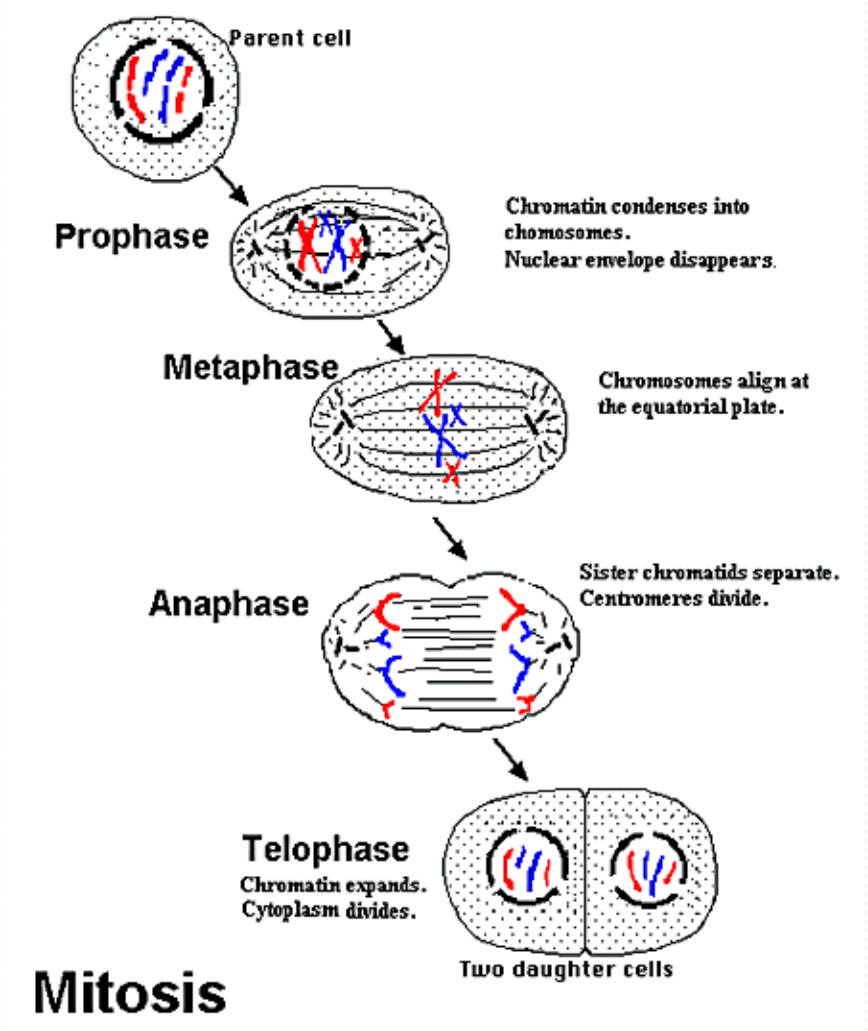
Slide preparation

Staining

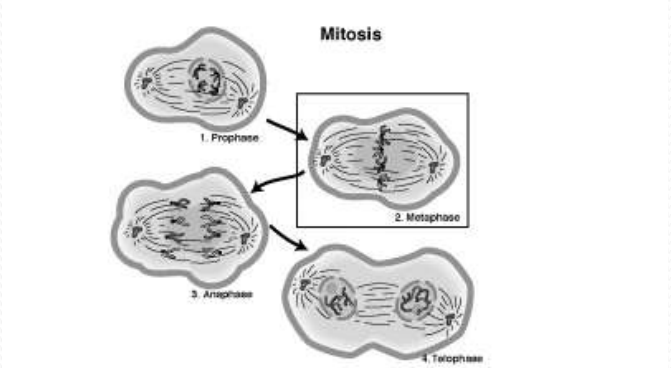
Metaphase spread



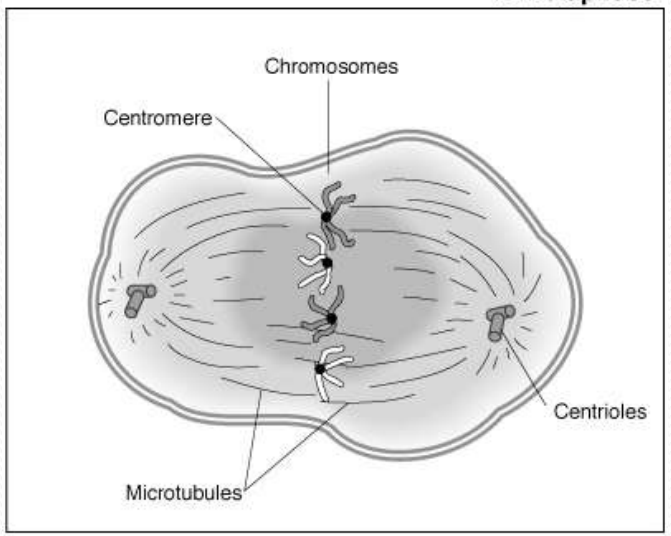
Mitosis


Parent cell
Prophase
Chromatin condenses into chomosomes.
Nuclear envelope disappears.
Metaphase
Chromosomes align at the equatorial plate.
Anaphase
Sister chromatids separate.
Centromeres divide.
Telophase
Chromatin expands.
Cytoplasm divides.
Two daughter cells
Mitosis

- The chromosomes are most easily seen and identified at the **metaphase stage** of cell division.



2. Metaphase




Thank you ...