

# Human Chromosome

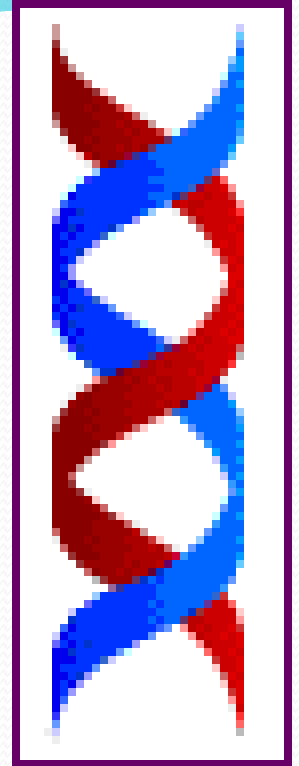
By  
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2016



# Cytogenetics

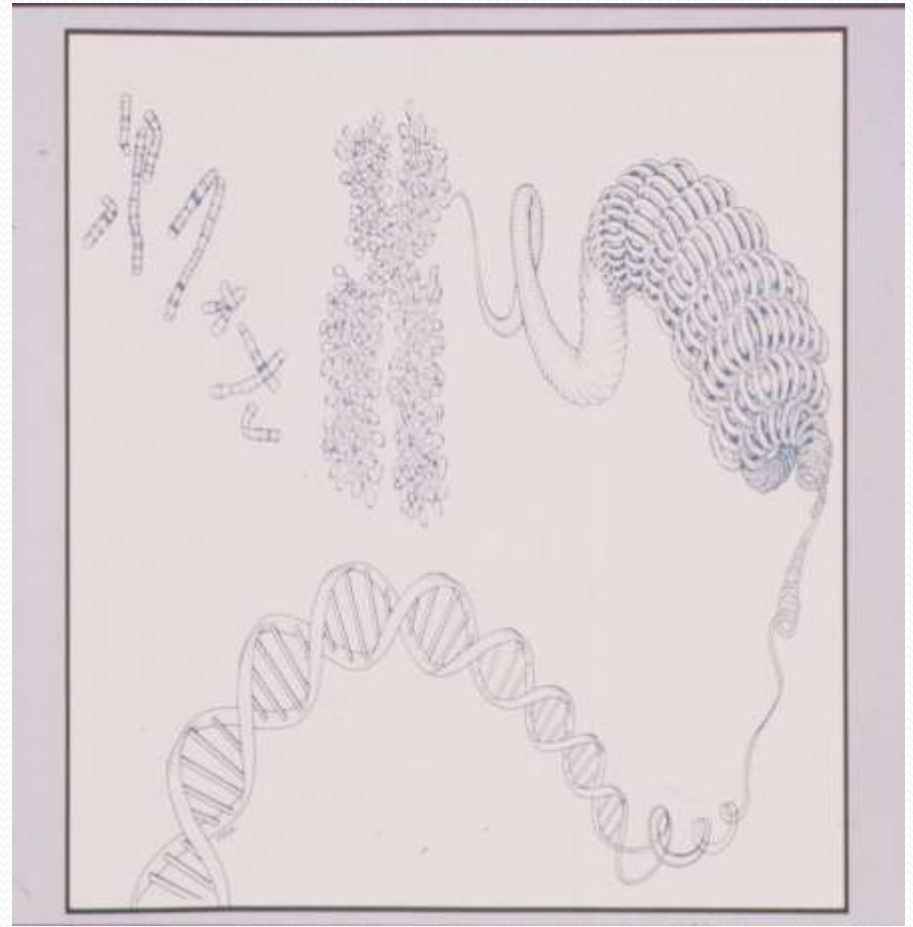
- Definition

**Cytogenetic** is the study of genetic material of cell



# CYTOGENETICS

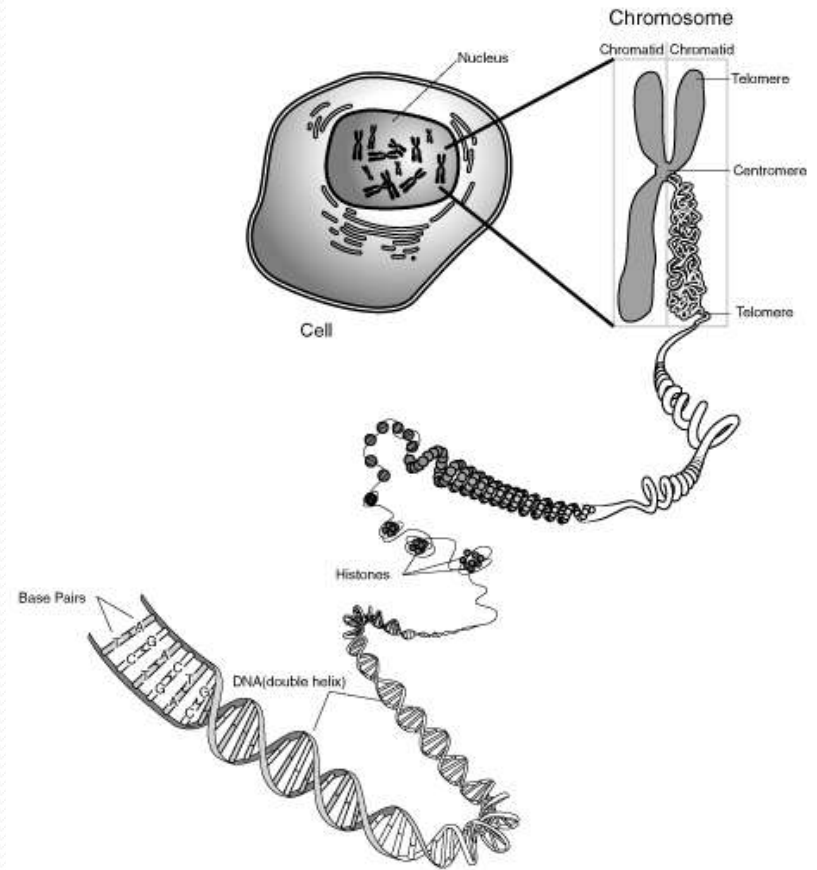
- The study of chromosome and the related disease states caused by abnormal chromosome number and/or structure.



# 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.**

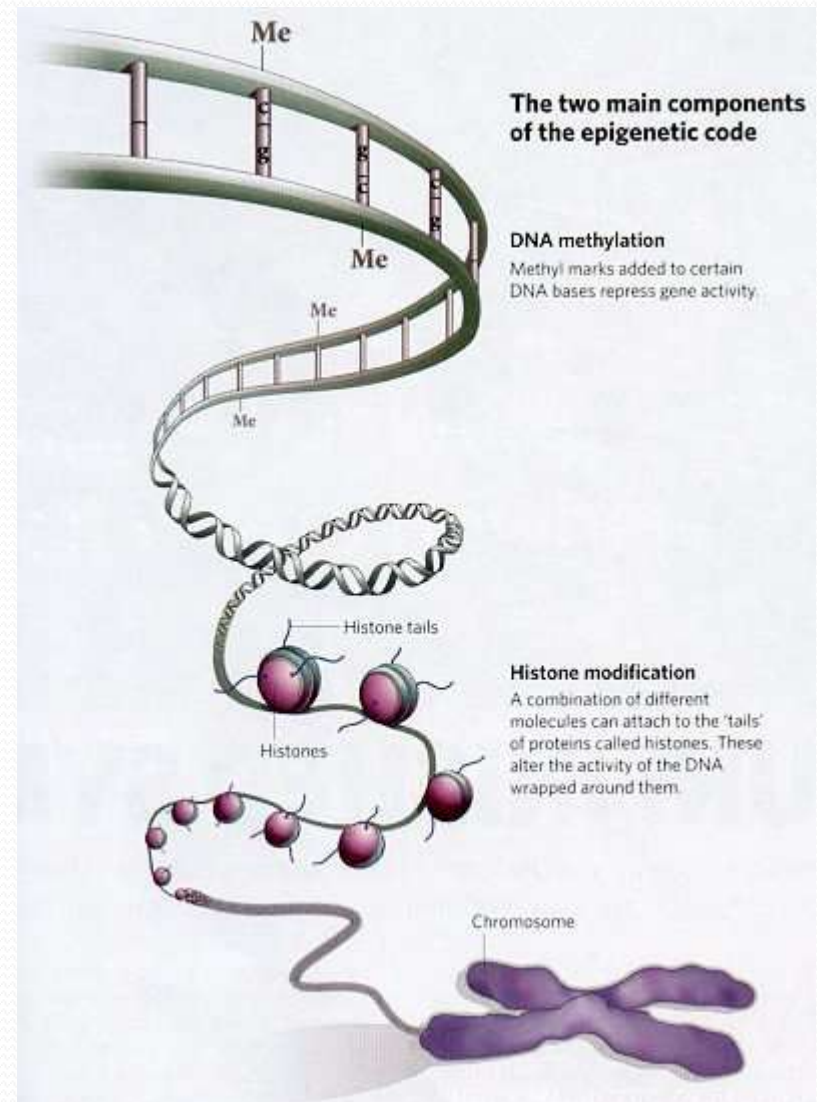


# Chromosomes

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).

Q. No.	Q. Text	Answer	Topic
1	1. What is the function of the cell wall in plant cells?	The cell wall in plant cells provides structural support and protection against mechanical damage and pathogens.	Cell Biology
2	2. How does the cell wall contribute to the rigidity of a plant?	The cell wall is composed of cellulose fibers, which are arranged in a network that provides tensile strength and rigidity to the plant.	Cell Biology
3	3. Why is the cell wall important for water transport in plants?	The cell wall is crucial for the transport of water and nutrients through the xylem and phloem tissues.	Cell Biology
4	4. How does the cell wall protect plant cells from pathogens?	The cell wall acts as a physical barrier that prevents the entry of pathogens and other harmful organisms.	Cell Biology
5	5. What is the primary component of the cell wall?	The primary component of the cell wall is cellulose, a polysaccharide made of glucose units.	Cell Biology
6	6. How does the cell wall affect the growth of a plant?	The cell wall regulates cell expansion and growth by controlling the rate at which water and nutrients enter and exit the cell.	Cell Biology
7	7. How does the cell wall contribute to the overall structure of a plant?	The cell wall provides the structural framework that supports the plant's upright growth and maintains its shape.	Cell Biology
8	8. How does the cell wall contribute to the mechanical strength of a plant?	The cell wall is a key factor in the mechanical strength of a plant, allowing it to withstand external forces and maintain its structure.	Cell Biology
9	9. How does the cell wall contribute to the water potential of a plant?	The cell wall is involved in the regulation of water potential, which is essential for the plant's ability to absorb water from the soil.	Cell Biology
10	10. How does the cell wall contribute to the overall health of a plant?	The cell wall is essential for the overall health of a plant, as it provides structural support, protection, and regulation of growth and development.	Cell Biology



1



2



3



4



5



6



7



8



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11



12



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18



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22



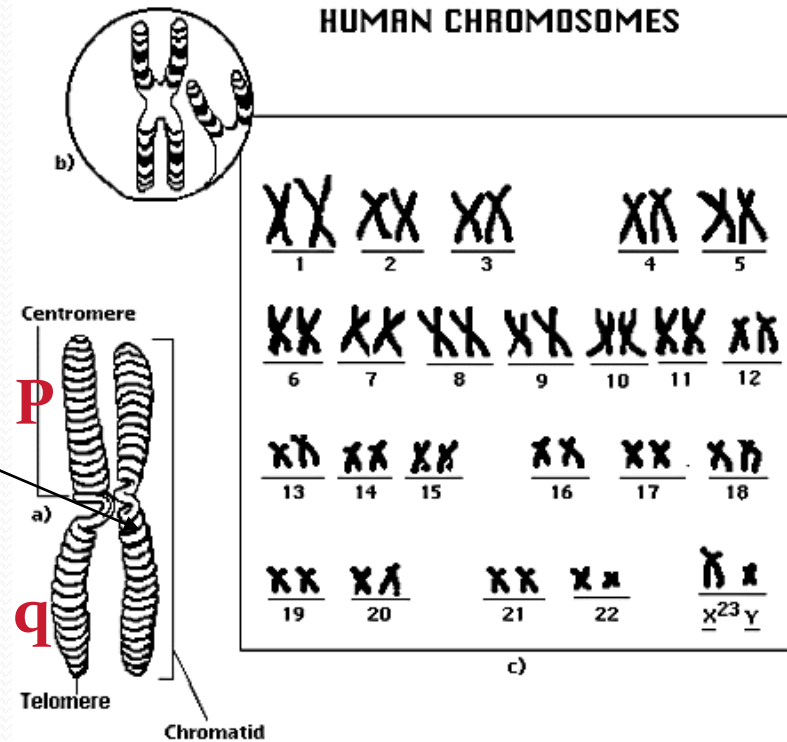
X

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

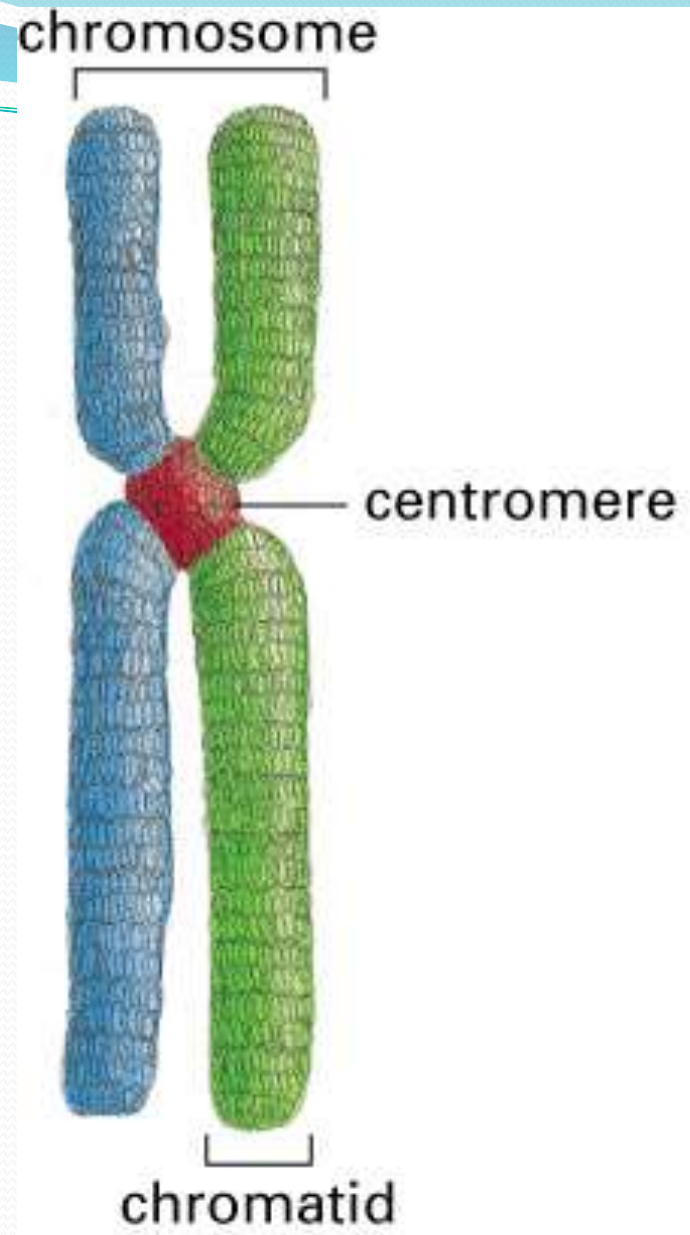
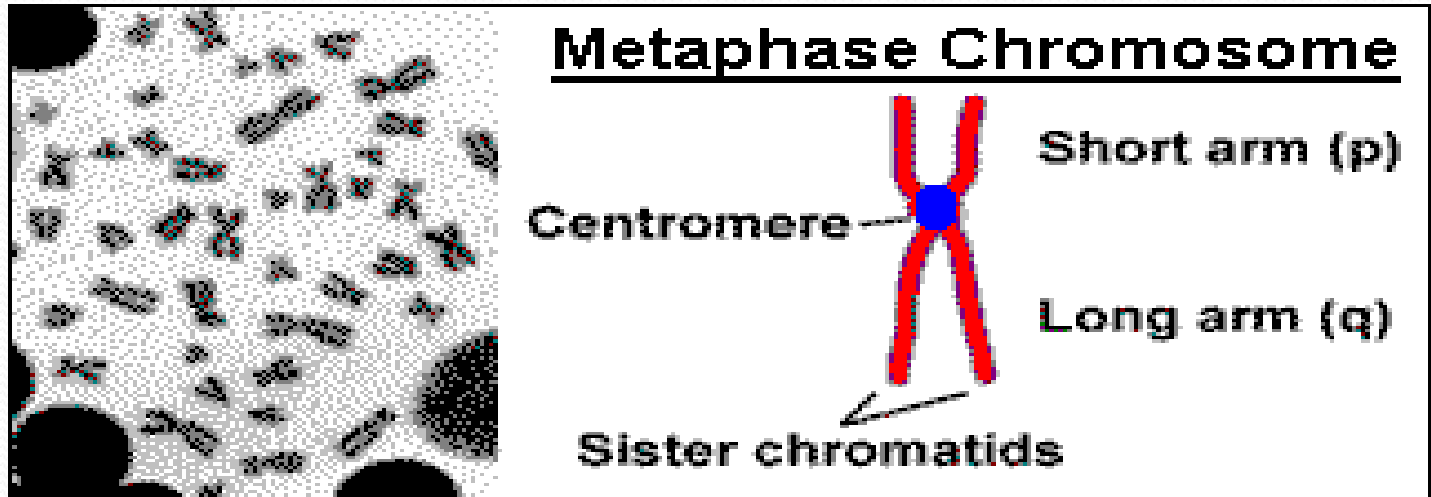


Figure 4-52. Molecular Biology

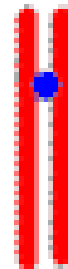
# Nomenclature of chromosomes



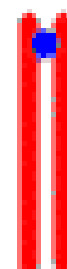
## **Centromeric position and arm length**



**Metacentric**



**Submetacentric**



**Acrocentric**



**Telocentric**

# 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

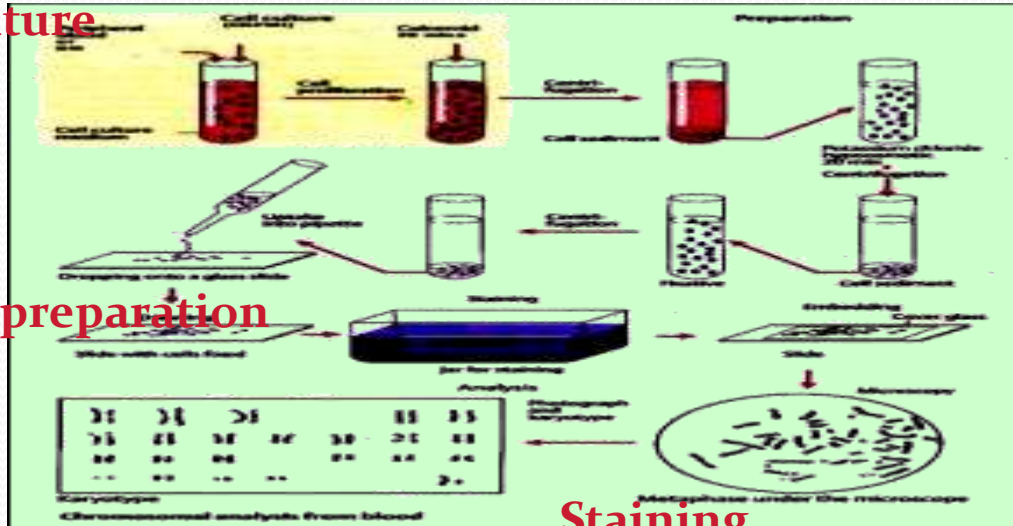
Hypotonic

Culture

Slide preparation

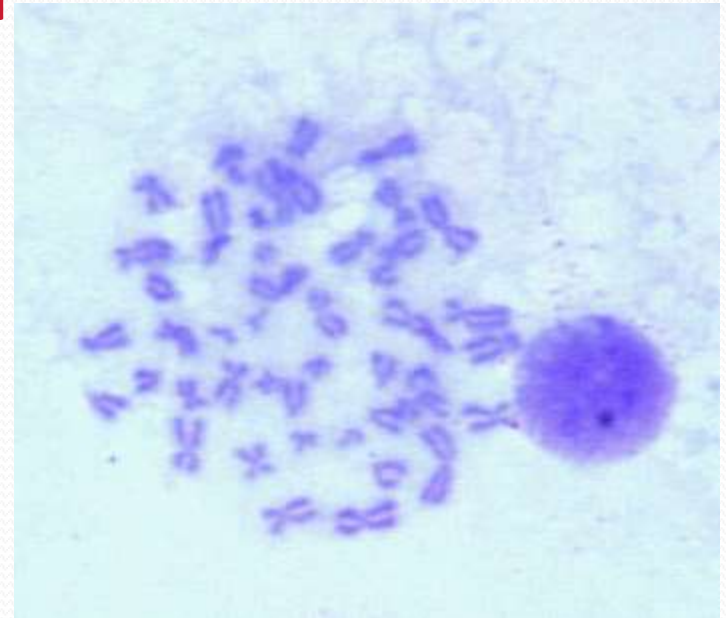
Fixation

Staining

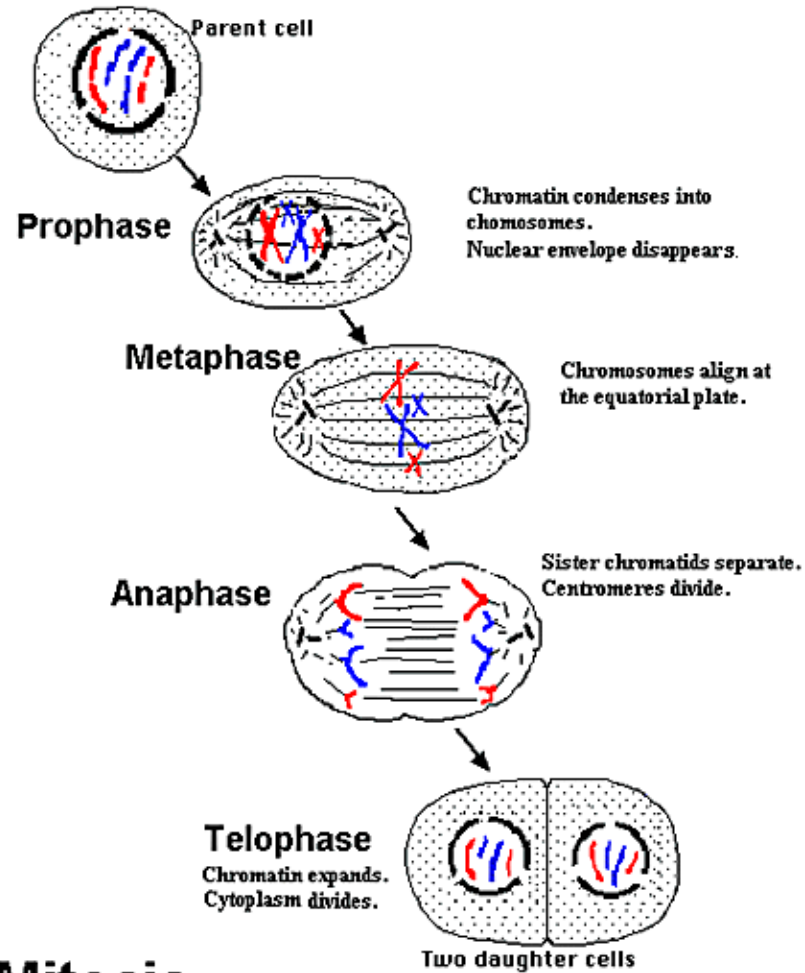


# Metaphase spread

Human male  
G-bands



# Mitosis



**Mitosis**



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

