DNA structure and chromosome.

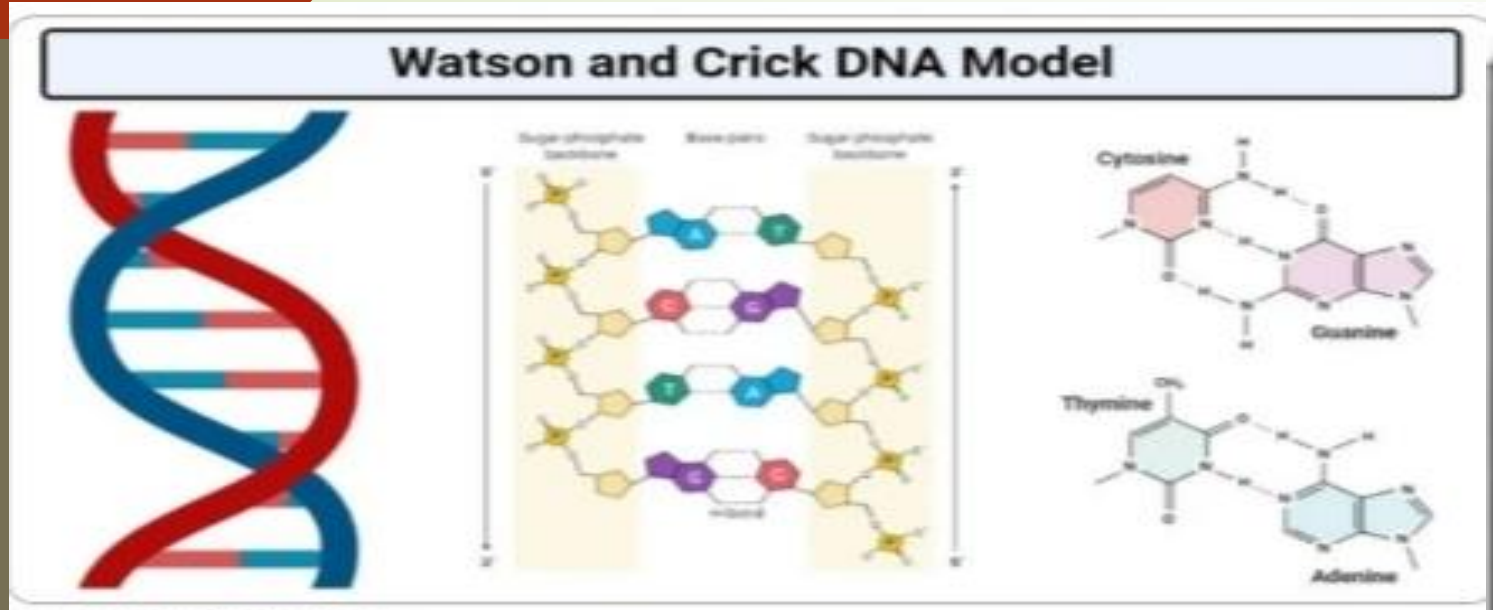
Structure of nucleotides and the DNA double helix.

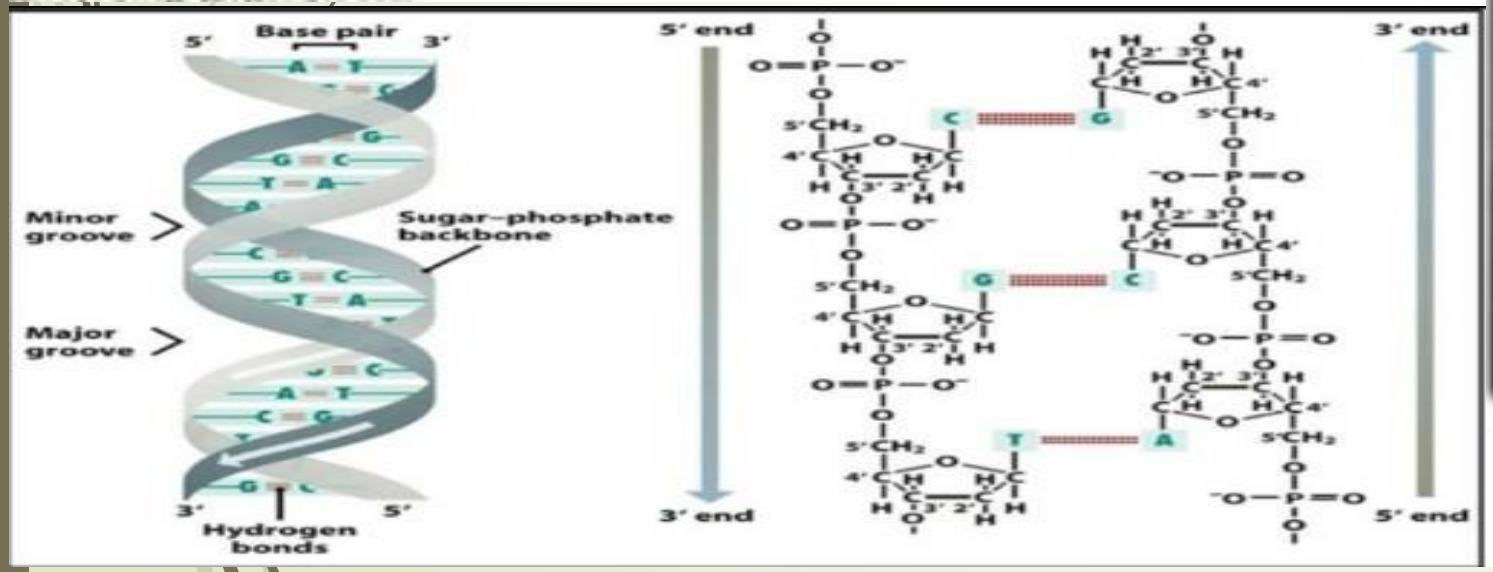
Replication of DNA.

What is DNA needed for?

- **DNA**, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms.
- Genetic information is used for gene expression.
- Information of a gene is transferred from DNA and converted to protein.
- RNA molecules work as messangers.
- Proteins are the biological workers.

- 1953 :- Using Franklin's photo and Chargaff's rules, Watson and crick develop a model of DNA.
  - Model consist of two strand of nucleotides bounded together in shape of twisted ladder.
    - The shape is known as double helix model.





James Watson

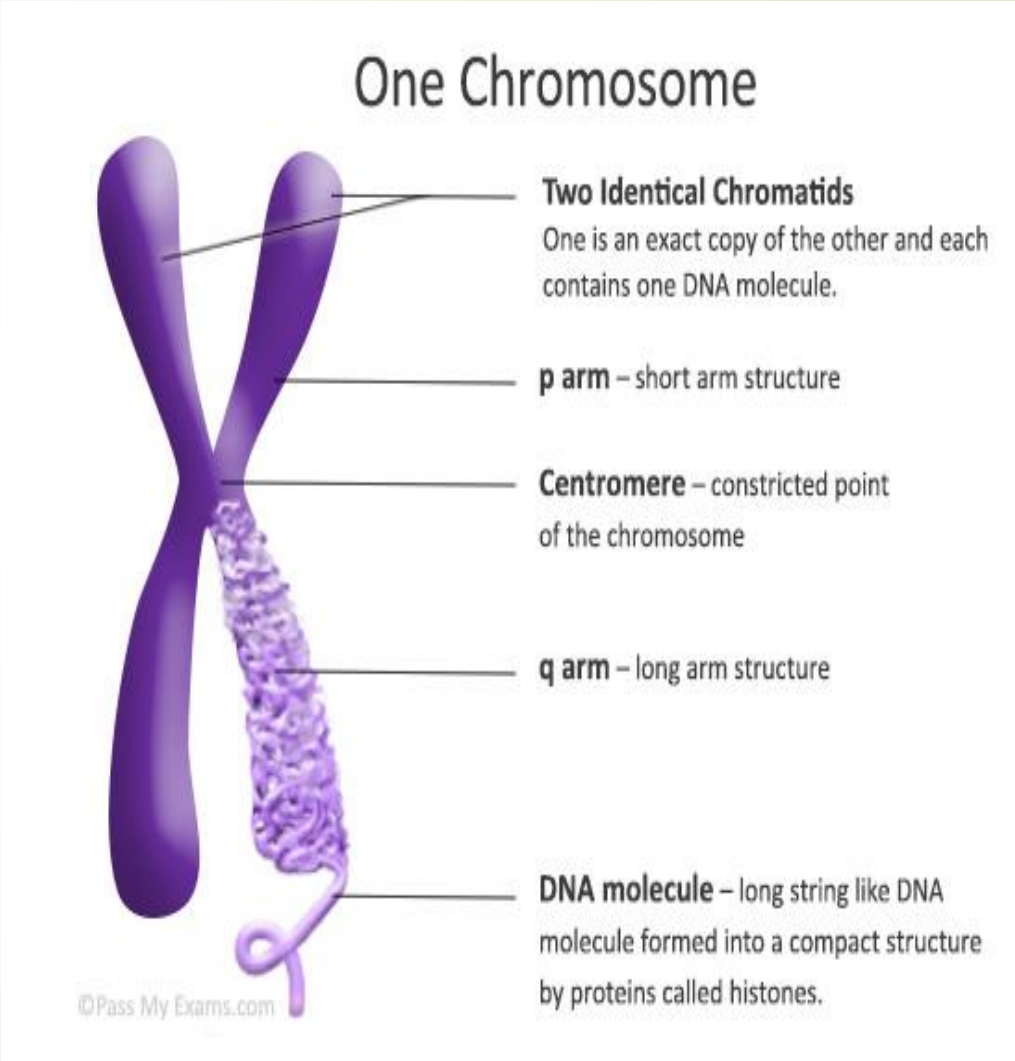
Francis Crick

Chromosomes

- Chromosomes are structures found in centre(nucleus) of the cells that carry long pieces of DNA. DNA is the material that hold genes. Chromosomes also contain proteins that help DNA exist in proper form. Chromosomes are seen during metaphase stage of mitosis when stained and observed under light microscope. Chromosomes are the thread like structures located inside the nucleus of an animal or plant cell.
- Each chromosome is made up of protein, and a single molecule of DNA
- Each cell has usually 23 pairs of chromosomes.
- It is generally recognized that chromosomes was first discovered by Walther Flamming in 1882.

Structure of Chromosomes:

- Chromosome has a unique structure.
- Each of them has 2 short arms called p arms
- It also has 2 long arms known as q arms.
- These arms held together at the center by centromere.
- The tips of chromosomes are capped by the sections of DNA called telomeres.



Function of Chromosomes:

- The main function is that it contains genetic information to be passed from 1 generation to another.
- It is also responsible for gene regulation.
- Important for protein synthesis and cellular replication
- Plays important role in cell division.
- They protect DNA from getting tangled and damaged.
- Plays crucial role in growth, reproduction, repair and regeneration processes.

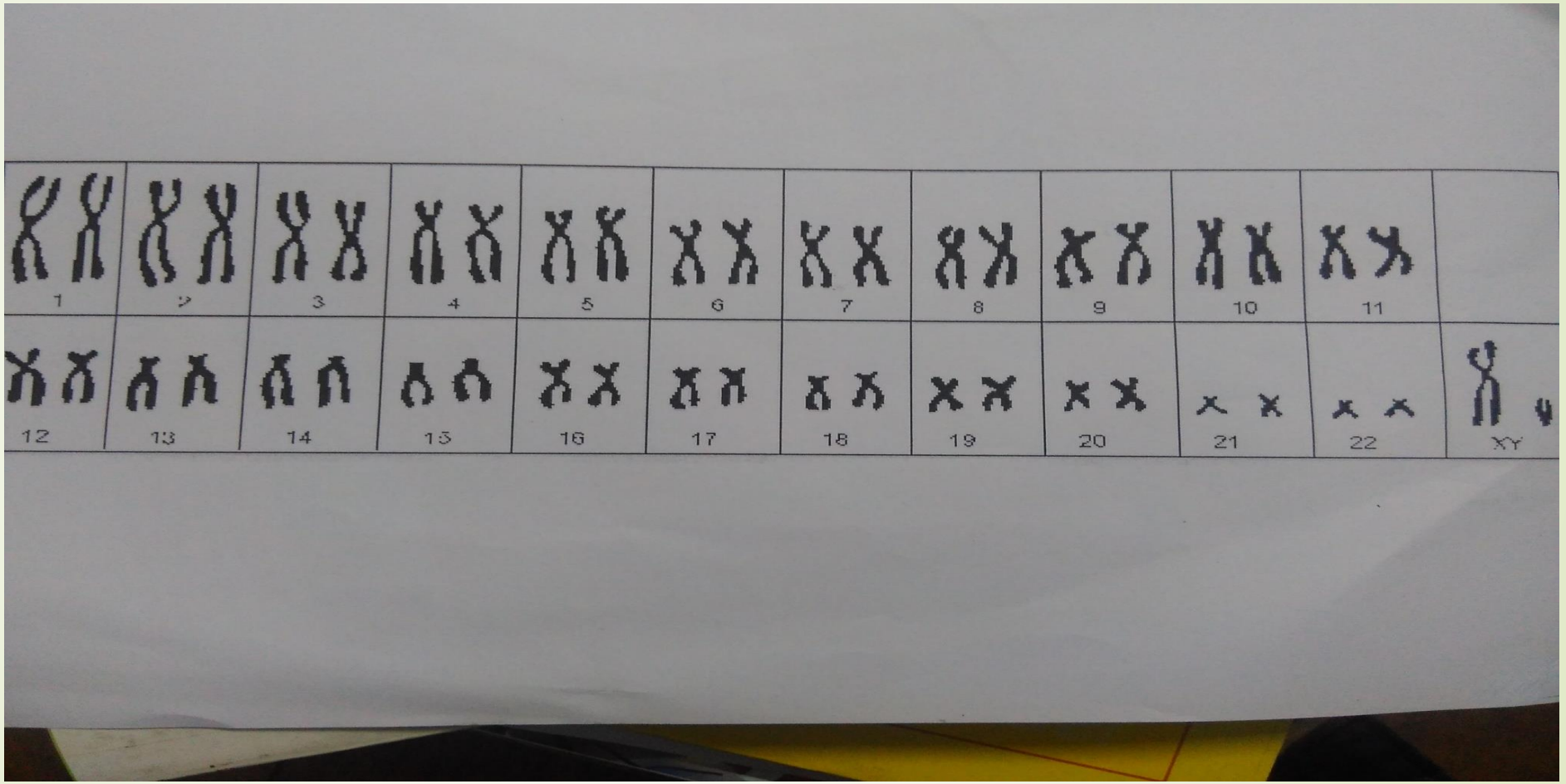
X-linkage.

- In humans and other mammals, biological sex is determined by a pair of sex chromosomes: XY in males and XX in females.
- Genes on the X chromosome are said to be X-linked. X-linked genes have distinctive inheritance patterns because they are present in different numbers in females (XX) and males (XY).
- X-linked human genetic disorders are much more common in males than in females due to the X-linked inheritance pattern.

Karyotype :

- A **karyotype** is the number and appearance of chromosomes in the nucleus of a eukaryotic cell. The term is also used for the complete set of chromosomes in a species or in an individual organism and for a test that detects this complement or measures the number.
- Karyotypes describe the chromosome count of an organism and what these chromosomes look like under a light microscope. Attention is paid to their length, the position of the centromeres, banding pattern, any differences between the sex chromosomes, and any other physical characteristics. The preparation and study of karyotypes is part of cytogenetics.

Karyogram of human male using Giemsa (Geman chemist) staining



Ideogram

- **An ideogram is a diagrammatic representation** of the karyotype that shows all of the pairs of homologous chromosomes in the nucleus. The pairs of chromosomes are lined up in order of size, so that the centromeres are aligned and the short arm is uppermost. An ideogram is a useful point of reference for analyzing mutations.

DNA replication

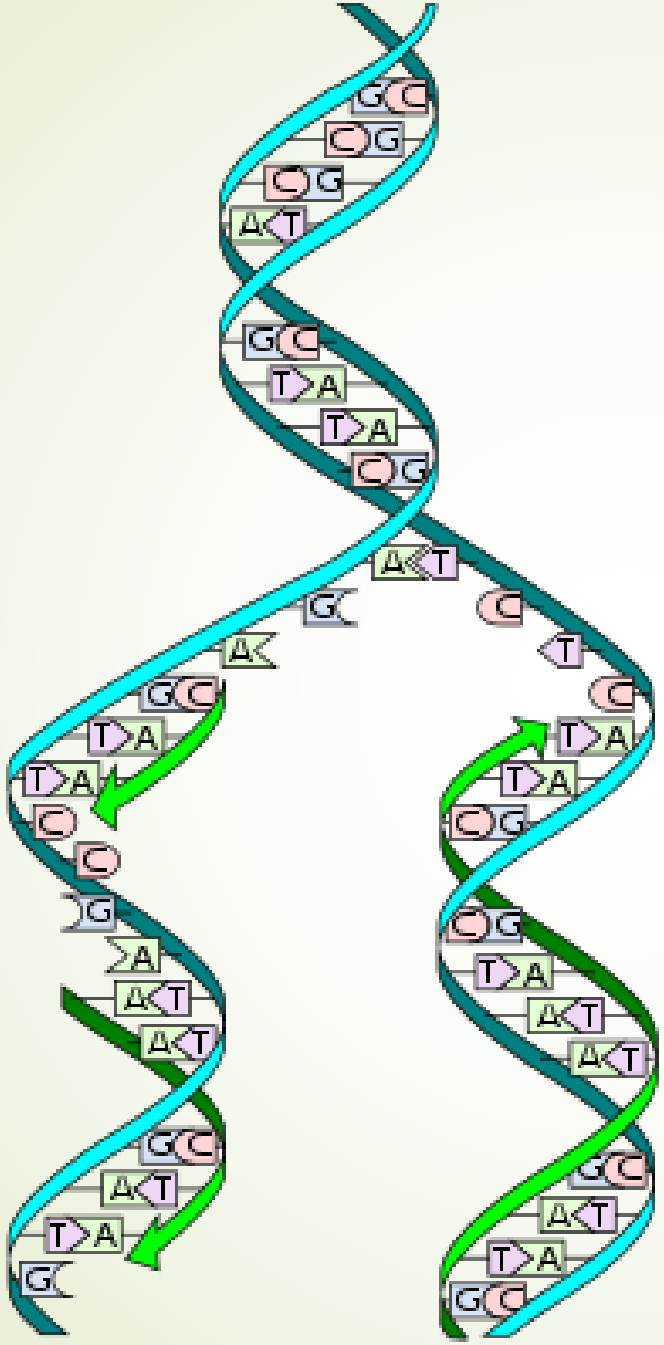
- **DNA replication** is the biological process of producing two identical replicas of DNA from one original DNA molecule. DNA replication occurs in all living organisms acting as the most essential part for biological inhertance. This is essential for cell division during growth and repair of damaged tissues, while it also ensures that each of the new cells receives its own copy of the DNA**.**

DNA replication

- The cell possesses the distinctive property of division, which makes replication of DNA essential.
- DNA is made up of a double helix of two complementary strands. The double helix describes the appearance of a double-stranded DNA which is thus composed of two linear strands that run opposite to each other and twist together to form. During replication, these strands are separated.

DNA replication

- In a cell, DNA replication begins at specific locations, or origins of replication, in the genome which contains the genetic material of an organism. Unwinding of DNA at the origin and synthesis of new strands, accommodated by an enzyme known as helicase, results in replication forks growing bi-directionally from the origin.



DNA replication

- DNA replication, like all biological polymerization processes, proceeds in three enzymatically catalyzed and coordinated steps: initiation, elongation and termination.
- Therefore, it is not surprising that the **initiation** of DNA replication is a highly regulated process. It begins when initiator proteins bind in multiple copies to specific sites in the replication origin, wrapping the DNA around the proteins to form a large protein–DNA complex.
- Basically, **elongation** is the stage when the RNA strand gets longer, thanks to the addition of new nucleotides. During elongation, RNA polymerase "walks" along one strand of DNA, known as the template strand, in the 3' to 5' direction.
- DNA replication ends when converging replication forks meet. During this process, which is known as replication **termination**, DNA synthesis is completed, the replication machinery is disassembled and daughter molecules are resolved.

Thank you for your attention!