

# Molecular Biology

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# Molecular Biology

- Molecular biology is a branch of science concerning biological activity at the **molecular level**.
- The field of molecular biology overlaps with **biology and chemistry** and in particular, genetics and biochemistry.
- A key area of molecular biology concerns understanding how **various cellular systems** interact in terms of the way DNA, RNA and protein synthesis function.
- **Molecular** biology is the study of **molecular** underpinnings of the **process** of replication, transcription and translation of the genetic material.

- The specific techniques used in molecular biology are native to the field but may also be combined with methods and concepts concerning genetics and biochemistry, so there is no big distinction made between these disciplines.

- However, when the fields are considered independently of each other, biochemistry concerns chemical materials and essential processes that take place in living organisms.
- The role, function and structure of biomolecules are key areas of focus among biochemists, as is the chemistry behind biological functions and the production of biomolecules.

- Molecular biology looks at the molecular mechanisms behind processes such as replication, transcription, translation and cell function.
- One way to describe the basis of molecular biology is to say it concerns understanding how genes are transcribed into RNA and how RNA is then translated into protein.
- However, this simplified picture is currently being reconsidered and revised due to new discoveries concerning the roles of RNA.

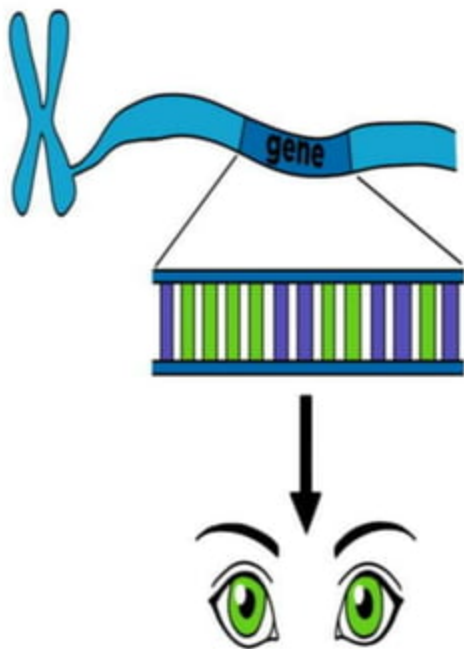
# Genes

- A **gene** is the basic physical and functional unit of heredity.
- **Genes** are made up of DNA.
- Segment / Sequence of DNA.
- Some **genes** act as instructions to make molecules called proteins.
- However, many **genes** do not code for proteins.
- In humans, **genes** vary in size from a few hundred DNA bases to more than 2 million bases.

- Each gene contains information about a certain trait..
- Genes are transcribed and translated by the cell to make proteins.

**Example:**

- One gene might code for eye color.
- This gene is used by the cell to make proteins which create green **pigment** in our eyes.



# Function of Genes

- Genes control the functions of DNA and RNA.
- Proteins are the most important materials in the human body which not only help by being the building blocks for muscles, connecting tissue and skin but also takes care of the production of the enzyme.
- These enzymes play an important role in conducting various chemical processes and reactions within the body. Therefore, protein synthesis is responsible for all activities carried on by the body and are mainly controlled by the genes.
- Genes consist of a particular set of instructions or specific functions. For example, the globin gene was instructed to produce haemoglobin.

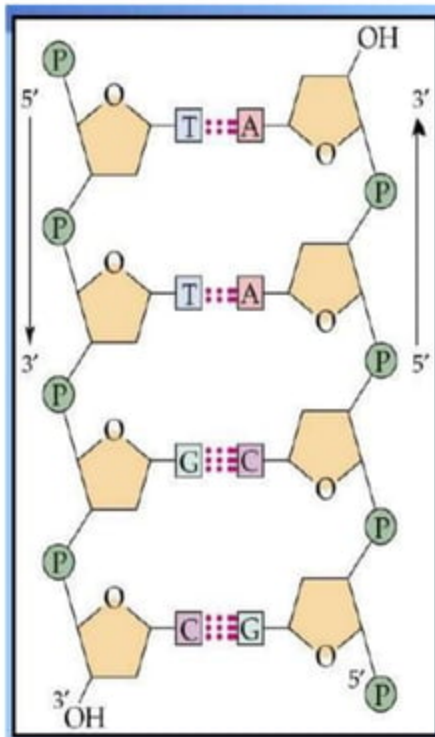


# DNA

- In short, DNA is a long molecule that contains each person's unique genetic code.
- It holds the instructions for building the proteins that are essential for our bodies to function.
- DNA instructions are passed from parent to child, with roughly half of a child's DNA originating from the father and half from the mother.

# DNA

- DNA is a **two-stranded molecule** that appears twisted, giving it a unique shape referred to as the **double helix**.
- Each of the two strands is a long sequence of **nucleotides** or individual units made of:
  - a phosphate molecule
  - a sugar molecule called deoxyribose, containing five carbons
  - a nitrogen-containing region



There are four types of nitrogen-containing regions called **bases**:

- ❖ Adenine (A)
- ❖ Cytosine (C)
- ❖ Guanine (G)
- ❖ Thymine (T)

- The order of these four bases forms the **genetic code**, which is our instructions for life.
- The bases of the two strands of DNA are stuck together to create a ladder-like shape.
- Within the ladder, **A** always sticks to **T**, and **G** always sticks to **C** to create the “rungs.”
- The length of the ladder is formed by the sugar and phosphate groups.

Chromosome

Nucleosome

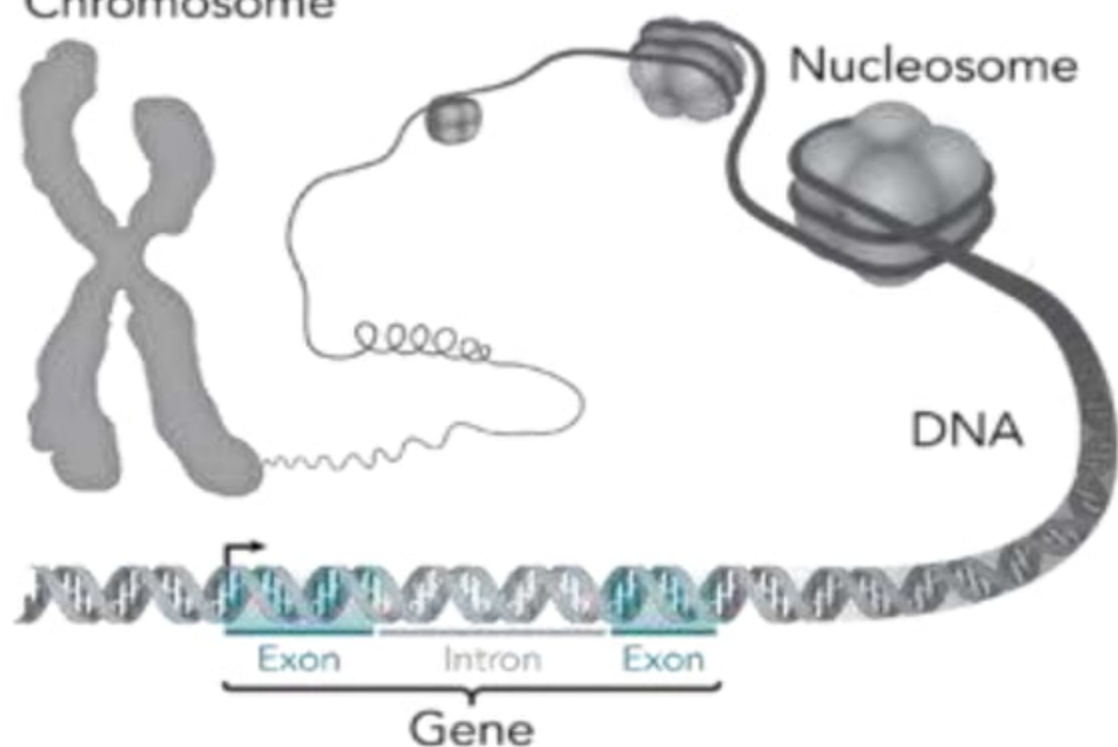
DNA

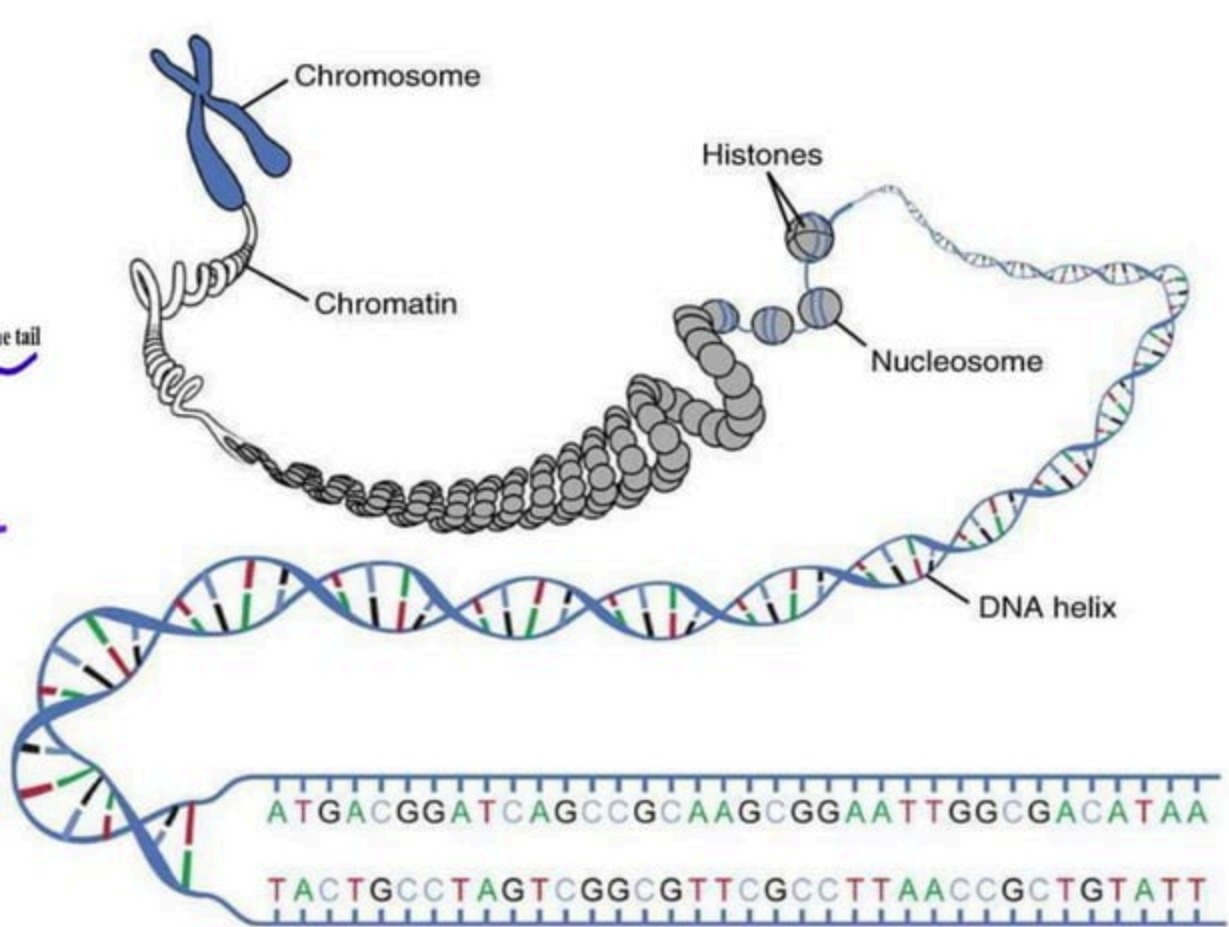
Exon

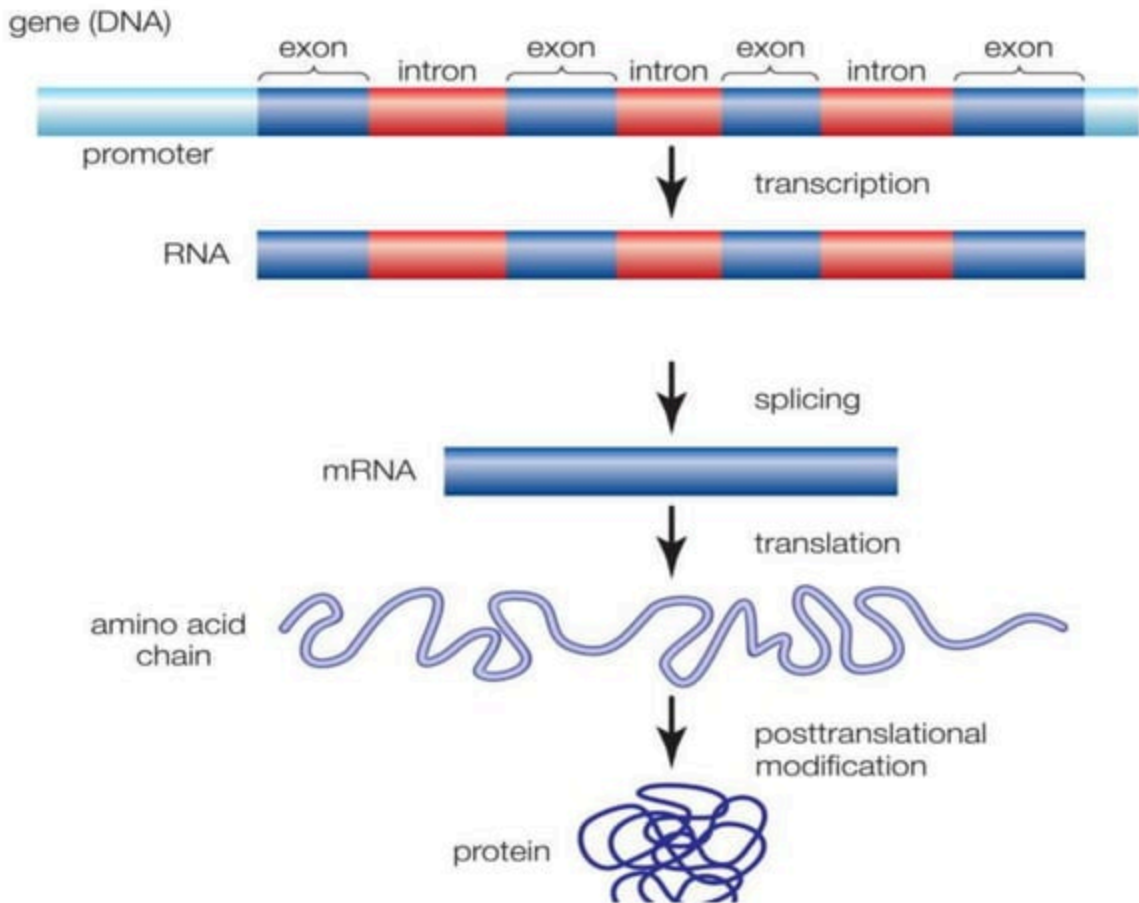
Intron

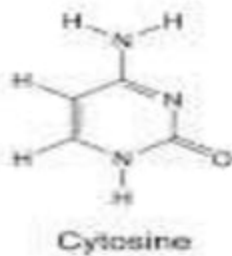
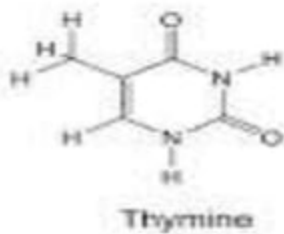
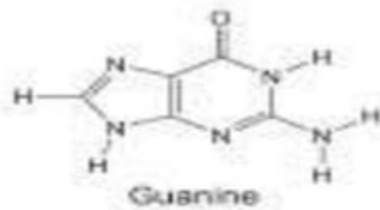
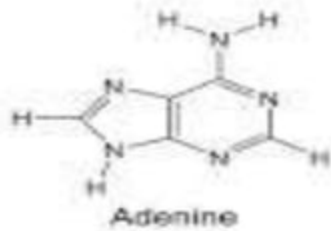
Exon

Gene

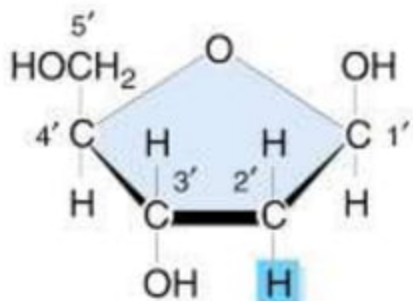






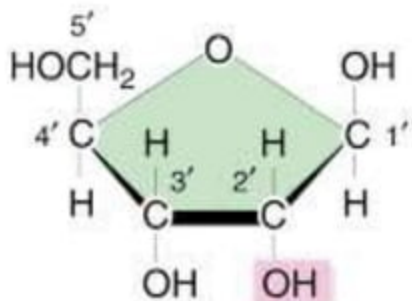




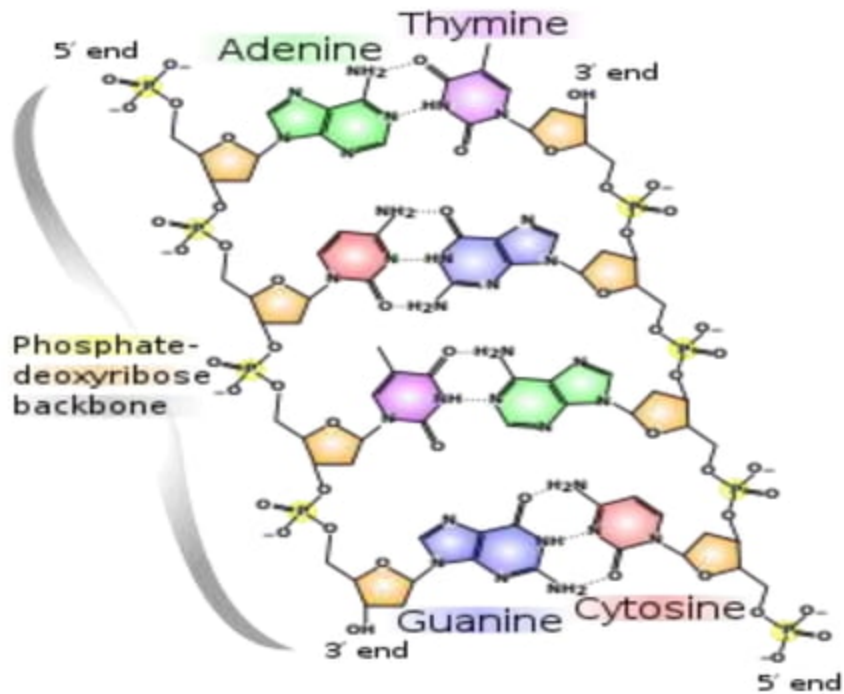


**Deoxyribose**

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**Ribose**



**Group A****Group B****Group C**

1. What do you know about molecular biology & also write its applications.

1. What is gene & Functions of gene with example. Also write how many genes are present on DNA?

1. What are proteins? Write down different forms of five proteins and their functions.

What are exon and intron?

2. Write a note on DNA, its function and also label diagram of DNA?

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3. What do you know about Storage proteins, Hormonal proteins, Contractile and motor proteins.

3. What do you know about Defensive proteins, Transport proteins, Receptor proteins, Structural proteins.

3. What do you know about Contractile and motor proteins, Defensive proteins, Transport proteins, Structural proteins.