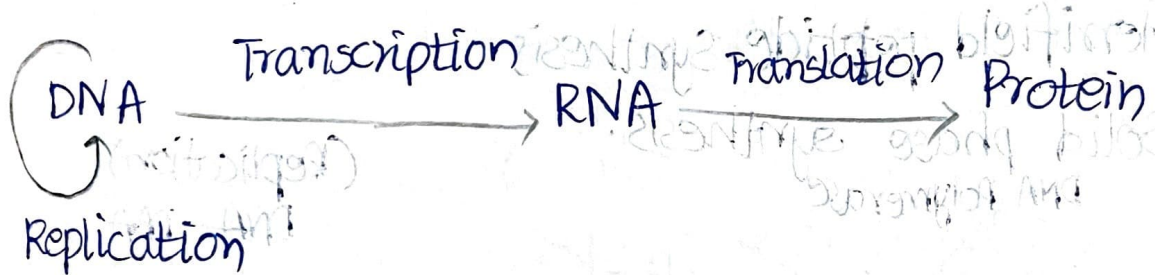


Protein Synthesis :

Central Dogma of Cell:

In molecular biology, central dogma illustrates the flow of genetic information from DNA to RNA to protein. It is defined as a process in which the information in DNA is converted into a functional product. "Francis Crick" proposed central dogma.

The info. present in DNA is essential to make up all proteins and RNA acts as a messenger that carries info. through ribosomes.



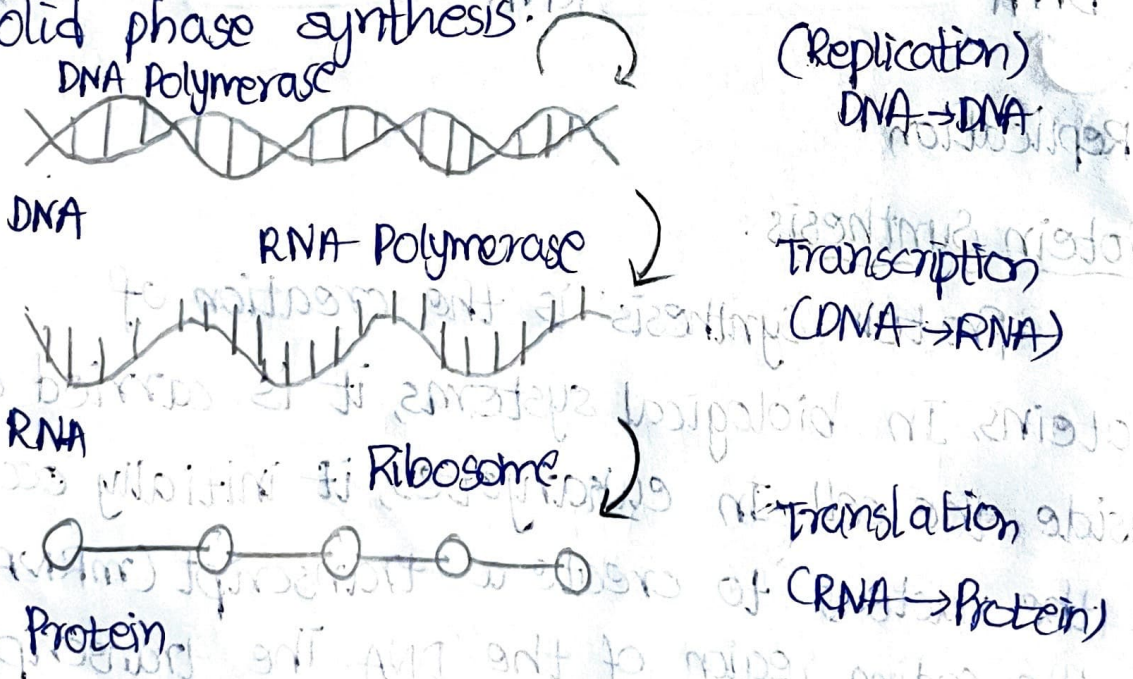
Protein Synthesis :

Protein synthesis is the creation of proteins. In biological systems, it is carried out inside the cell. In eukaryotes, it initially occurs in the nucleus to create a transcript (mRNA) of the coding region of the DNA. The transcript leaves the nucleus and reaches the ribosomes for translation into a protein molecule with a specific sequence of amino acids. In prokaryotes, it occurs in the cytoplasm.

Protein Synthesis is the creation of proteins by cells that uses DNA, RNA and various enzymes. It generally includes transcription, translation, and post-translational events, such as protein folding, modifications & proteolysis.

- mRNA, tRNA and rRNA are 3 major types of RNA involved in protein synthesis.
 - Prokaryotes have 70S ribosomes whereas Eukaryotes have 80S ribosomes. Both types, though, are each made up of 2 subunits of differing sizes.
- laboratory:

1. Merrifield peptide synthesis
2. Solid phase synthesis



Major steps of protein biosynthesis:

1. Transcription
2. Translation
3. Post-translation

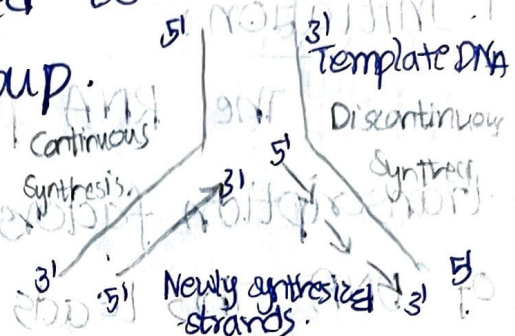
Initiating factors: eIF1-6, eIF4B, eIF4C, eIF4D, eIF4F.

Replication:

DNA replication is semi-conservative. Each strand in the double helix acts as a template for synthesis of a new, complementary strand.

The 5' and 3' indicate the carbon No.s in the DNA's sugar backbone. The 5' carbon has a phosphate group attached to it & the 3' carbon a hydroxyl ($-OH$) group.

- A/T base pairs
- G/C base pairs.

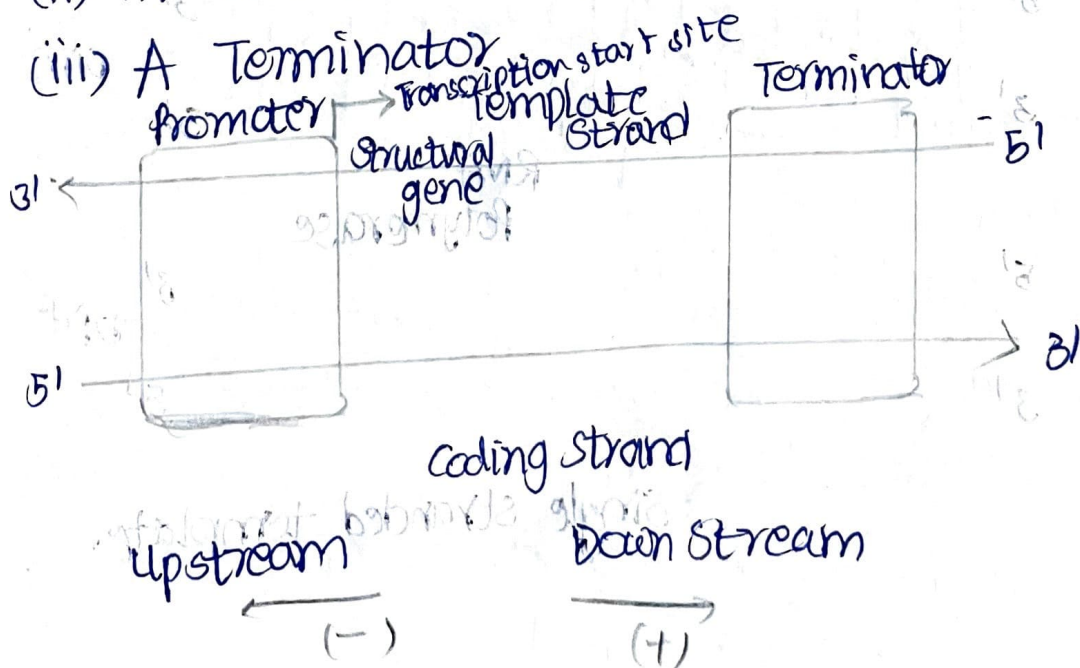


Transcription:

(replicating fork)
The process of transfer of genetic instruction from DNA to mRNA in the nucleus.

A transcription unit in DNA is defined primarily by the 3 regions in the DNA:

- (i) A Promoter
- (ii) The structural Gene
- (iii) A Terminator

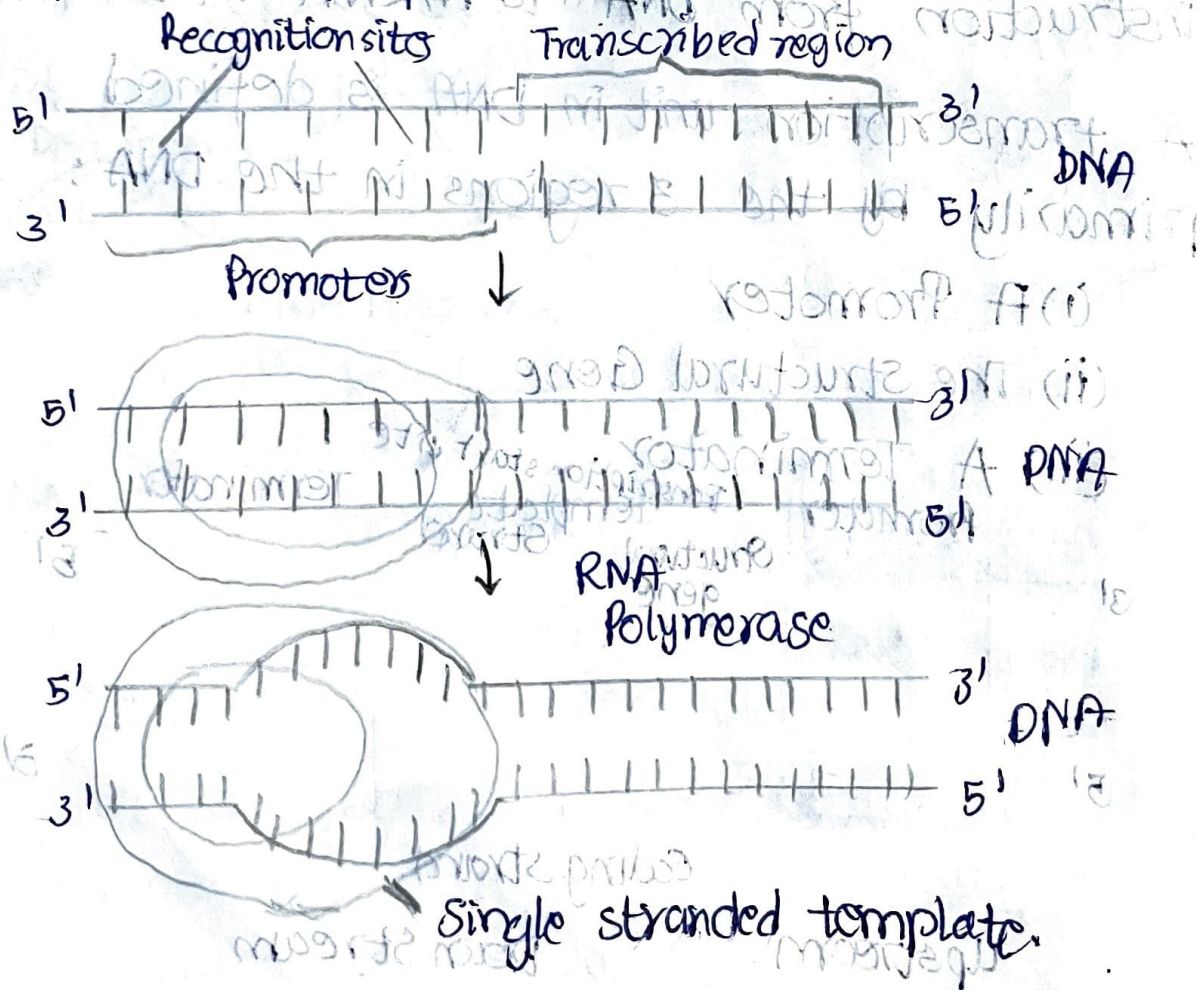


The steps of transcription:

1. Initiation
2. Promoter escape
3. Elongation
4. Termination

1. Initiation:

The RNA polymerase with assistance of transcription factors ^(50 will bind) Helicase, binds to the promoter of DNA. This leads to unwinding of DNA at the promoter region, forming a transcription bubble. It exposes the template strand.

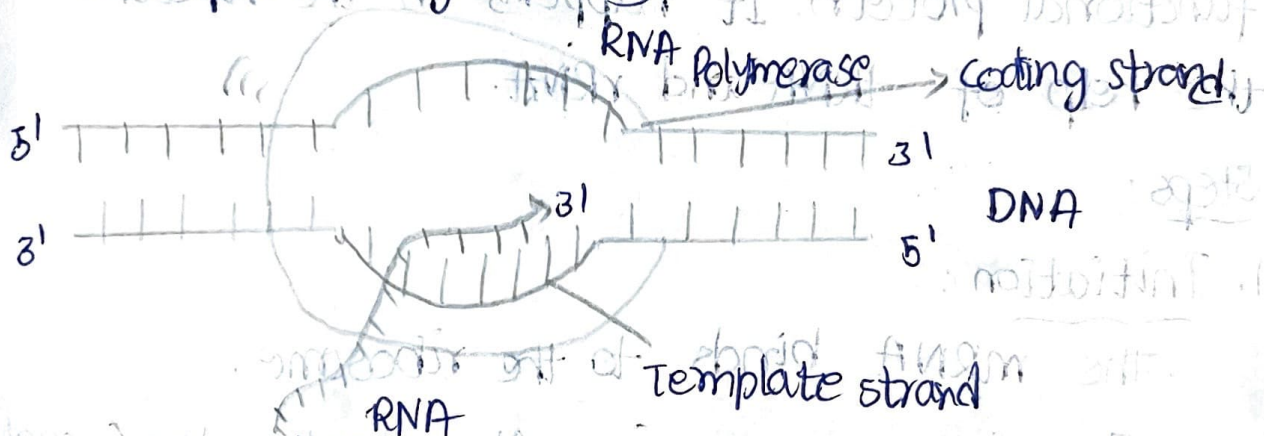


2. Promoter Escape:

The next step is for the RNA to escape the promoter so that it can enter into the elongation step.

3. Elongation:

During elongation, RNA polymerase traverses the template strand of the DNA and base pairs with the nucleotides on the template strand. This results in an mRNA transcript containing a copy of the coding strand of DNA, except for thymine that are replaced by uracils.



Ex:

Coding strand

5' ATGATCGTA 3'

RNA

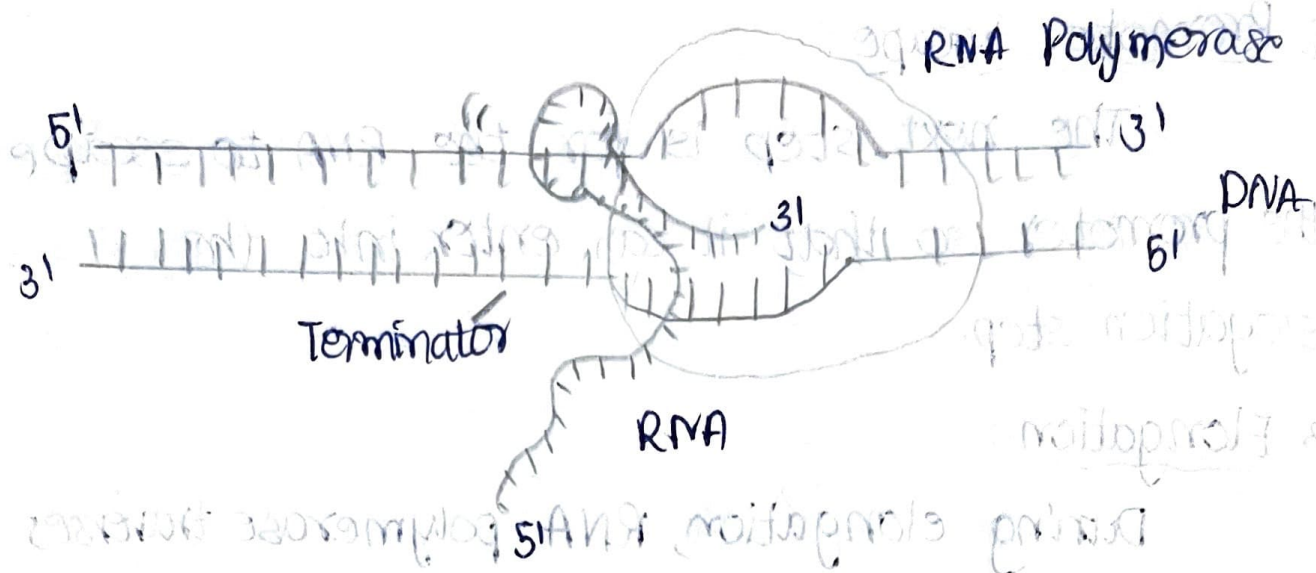
5' A U G A U 3'

Template strand

3' TAC T A G C A T 5'

4. Termination:

During this phase, the hydrogen bonds of the RNA-DNA helix break. Transcript is released from RNA polymerase.



Translation:

The process where the genetic information carried by mRNA is used to build a chain of amino acids (a polypeptide), which folds into a functional protein. It happens in the ribosome with the help of tRNA and rRNA.

Steps:

1. Initiation:

- The mRNA binds to the ribosome.
- The ribosome recognizes the start codon (usually AUG) on mRNA.
- The first tRNA carrying methionine attaches to the start codon.

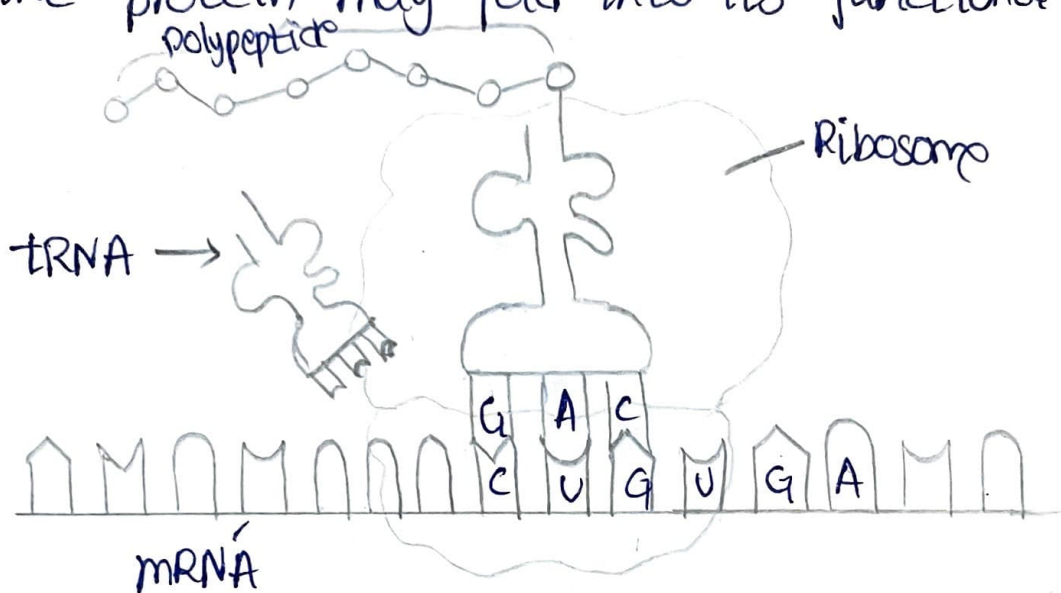
2. Elongation:

- tRNA molecules bring specific amino acids to the ribosome based on codon-anticodon matching.
- Each tRNA has an anticodon that matches with the mRNA codon.

- The ribosome moves along mRNA, joining amino acids together via peptide bonds to form a growing polypeptide chain.

3. Termination:

- When the ribosome reaches a stop codon, no tRNA matches.
- The ribosome releases the completed polypeptide & detaches from the mRNA.
- The protein may fold into its functional shape.



Codon: A sequence of 3 nucleotides which together form a genetic code.

Post Translation:

- It is the stage after a protein is made.
- The polypeptide folds into its functional shape.
- It may be chemically modified / trimmed for activation
- Finally, it is delivered to correct location in the cell.