

# BIOLOGY ASSIGNMENT

**SB015**

**NAME : JASLENE YU**

**NO MATRIC : MS2123131840**

**CLASS : S1K1T6**

**LECTURER : Madam MUNIRAH BINTI  
AHMAD BM**

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**REFERENCE :**

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2. Clancy, S. (2008) DNA transcription. Nature Education 1(1):41 Retrieved from <https://www.nature.com/scitable/topicpage/dna-transcription-426/>
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4. Lecture Notes Semester 1 session 2011/2022
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# TRANSCRIPTION

## Introduction

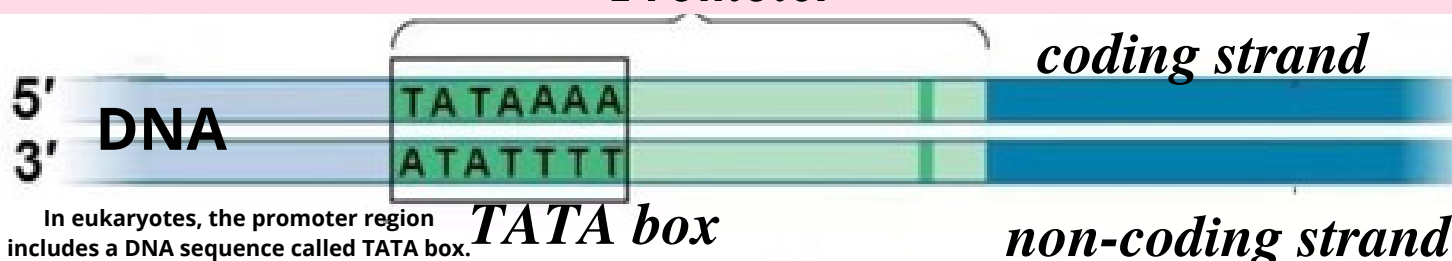
- Process synthesis of RNA using information in the DNA on DNA template.
- Occurs in nucleus in eukaryotic cell, cytoplasm in bacteria.
- Two strands of DNA helix used as template.
- Enzyme RNA polymerase involved.
- Produce mRNA.
- Divided into three stages Initiation , Elongation and Termination.

## Initiation

- Occurs at promoter region on DNA strand.
- In bacteria ,the RNA polymerase itself specifically recognizes and bind to the promoter.

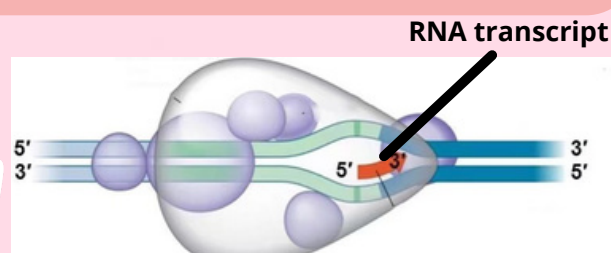
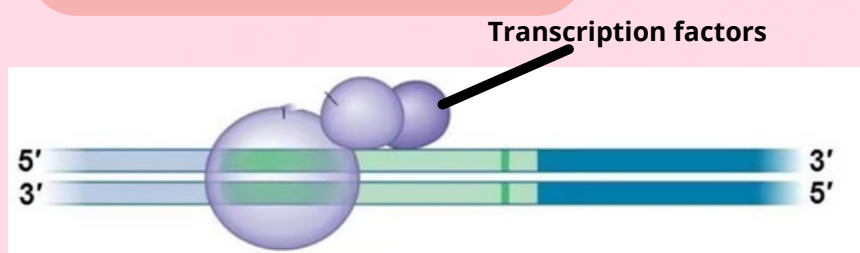
Different gene have different promoter  
Provide binding site of RNA polymerase  
Determine where transcription starts and which two strands of DNA helix used as template.

### Promoter



A collection of protein called transcription factors recognized the TATA box and bind to to the promoter.

Once the transcription factors attached to the promoter, this attracts RNA polymerase II bind in correct position and orientation.



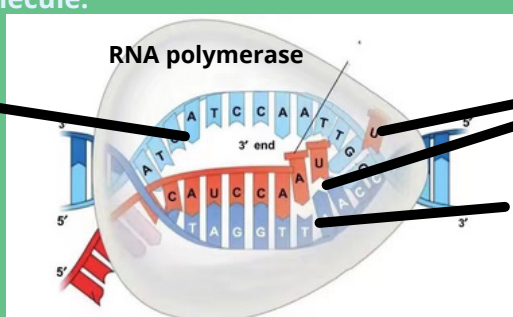
Once binding completed, RNA polymerase starts to unwind the two DNA strands and starts transcribing the template strand.

Transcription initiation complex formed.

## Elongation

- RNA polymerase continue untwist the double helix into coding (sense) strand and non-coding (antisense) strand.
- RNA polymerase elongates DNA non-coding strand from 3' to 5' end .
- 10-20 DNA nucleotides at a time to pair up with RNA nucleotides. The enzyme adds nucleotides to the 3' end of the growing RNA molecule.

coding strand  
Direction of transcription

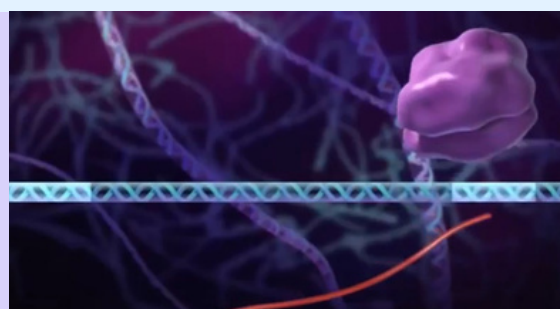


RNA nucleotides  
non-coding strand

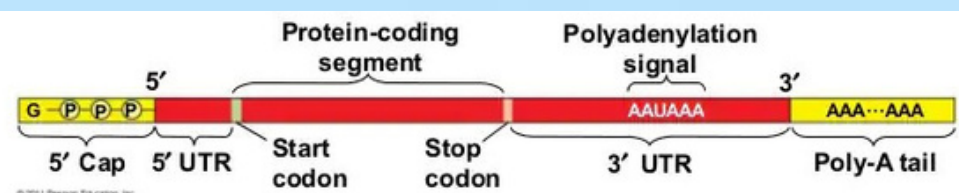
- The new RNA peels away from non-coding strand and double helix reformed with coding strand.
- The product is pre-mRNA made up from Adenine(A), Uracil(U), Guanine(G), Cytosine(C) nucleotides. This nucleotides join together with hydrogen bond.

## Termination

- In bacteria, the transcribed terminator function as the termination signal for polymerase to detach from the DNA. Transcript which needs no further modification before translation produced.
- In eukaryotes ,RNA polymerase transcribed a sequence on the DNA called polyadenylation signal sequence. The proteins associated with the growing RNA transcript cut it free from the polymerase. pre-mRNA released.



## pre-mRNA to mature RNA



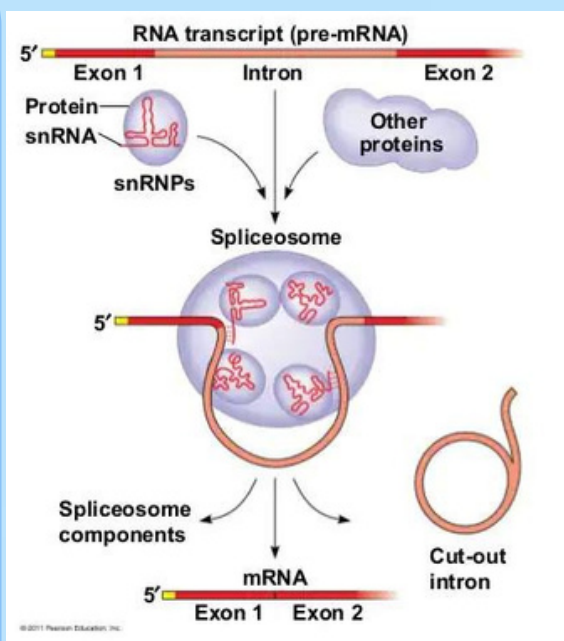
- Introns, the noncoding segments between coding region
- Exon, region eventually expressed ,translated to amino acid sequence.

### Alteration of mRNA ends

**5'cap**  
A modified form of guanine(G) nucleotide added onto the 5'end

**poly-A tail**  
More adenine added on 3' end

- To facilitate the export of the mature mRNA from the nucleus
- Protect the mRNA from degradation of hydrolytic enzyme
- Help ribosomes to attach to the 5' end of the mRNA and once the mRNA reaches the cytoplasm.



### Splicing of mRNA

1. Several snRNPs join together form spliceosome
2. Spliceosome cuts pre-RNA ,releasing the intron for rapid degradation, and the same time splices the exon together.
3. Release mRNA , which now contain only exons