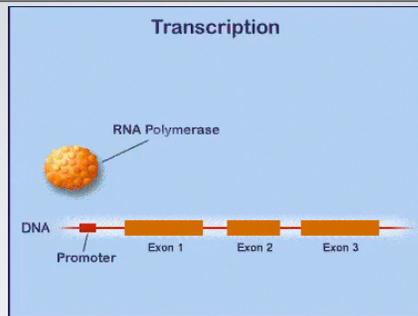




Umm AL Qura University

# TRANSCRIPTION

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TRANSCRIPTION

## COMPARISON OF DNA & RNA

	RNA	DNA
Sugar	Ribose	Deoxyribose
Bases	AUCG	ATCG
Strand length	Short	Long
No. strands	One	Two
Helix	Single	Double

# TRANSCRIPTION

- **Transcription is the 1<sup>st</sup> stage of gene expression** or by which genetic information is transmitted from DNA to RNA.
- The information stored in the **genetic code** is transmitted from the DNA of a gene to **messenger RNA** or **mRNA**.
- Every base in the mRNA molecule is complementary to a corresponding base in the DNA of the gene but with **uracil** replacing **thymine** in mRNA.

## BASE PAIRING

DNA Base Pairs

A	T
C	G
C	G
G	C
T	A
A	T
A	T

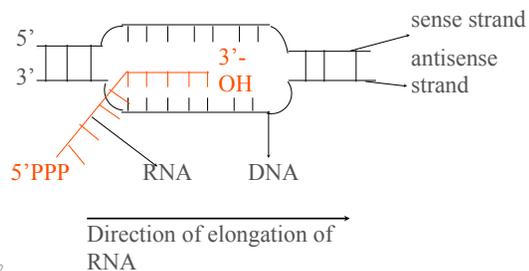
DNA-RNA base pairs

A	U
C	G
C	G
G	C
T	A
A	U
A	U

One strand of DNA

RNA

## I. DNA TEMPLATE

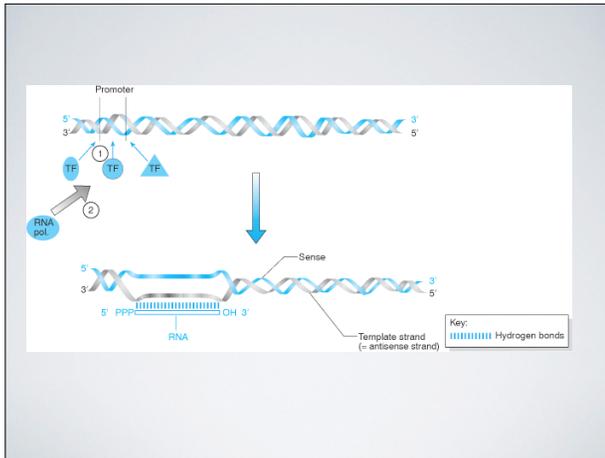


2

RNA copied only from ONE strand - complementary bases  
Same base sequence (T/U) of other strand  
Only part of DNA transcribed  
RNA is antiparallel to DNA strand being copied  
Direction 5 - 3

Other sections of DNA may be copied - other strand transcribed

Summary:  
Small area of DNA opens up  
1 strand = template  
complementary base pairing of incoming ribose nucleotides  
linkage by phospho-diester bonds 5-3  
DNA reforms and displaces RNA - Release from DNA



## MAJOR STEPS

- Pre-initiation
- Initiation
- Promoter clearance
- Elongation
- Termination

[http://en.wikipedia.org/wiki/Transcription\\_\(genetics\)](http://en.wikipedia.org/wiki/Transcription_(genetics))

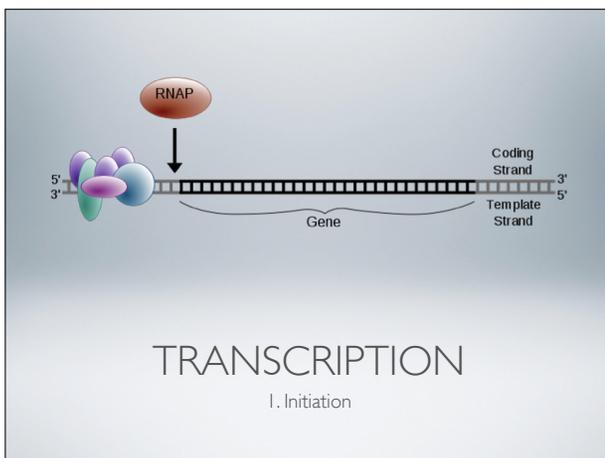
## Major steps

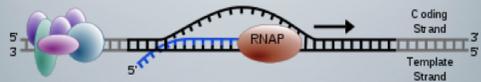
[\[edit\]](#)

### Pre-initiation

In eukaryotes, RNA polymerase, and therefore the initiation of transcription, requires the presence of a core [promoter](#) sequence in the DNA. Promoters are regions of DNA which promote transcription and in eukaryotes, are found at -30, -75 and -90 base pairs upstream from the start site of transcription. Core promoters are sequences within the promoter which are essential for transcription initiation. RNA polymerase is able to bind to core promoters in the presence of various specific [transcription factors](#).

The most common type of core promoter in eukaryotes is a short DNA sequence known as a [TATA box](#), found -30 base pairs from the start site of transcription. The TATA box, as a core promoter, is the binding site for a transcription factor known as [TATA binding protein](#) (TBP), which is itself a subunit of another transcription factor, called [Transcription Factor II D](#) (TFIID). After TFIID binds to the TATA box via the TBP, five more transcription factors and RNA polymerase combine around the TATA box in a series of stages to form a [preinitiation complex](#). One transcription factor, DNA helicase, has [helicase](#) activity and so is involved in the separating of opposing strands of double-stranded DNA to provide access to a single-stranded DNA template. However, only a low, or basal, rate





## TRANSCRIPTION

2. Elongation



## TRANSCRIPTION

3. Termination

- **mRNA** is **single stranded** being synthesized by the enzyme **RNA polymerase**.
- In any particular gene only **one DNA** strand of the double helix acts as *template strand*.

## GENERAL SYNTHESIS OF RNA (TRANSCRIPTION)

- DNA template (1 strand)
- RNA polymerase
- RNA and DNA template antiparallel
- Chain grows 5'  3'

5

## m RNA

- **long helix**, high MW
- Base arrangement **complementary to DNA** from which formed
- COLINEAR: direct copy of opposite DNA strand
- Nucleus  Cytoplasm
- Function: transcription

pores in nuclear membrane

lifetime in cytoplasm short

bacteria: degrades after a few mins (fluctuating environment)

euks: hours/ few days  
therefore continuous synthesis

transcription - mRNA carries a coded sequence of instructions about protein synthesis from DNA in nucleus to ribosomes attached to ER

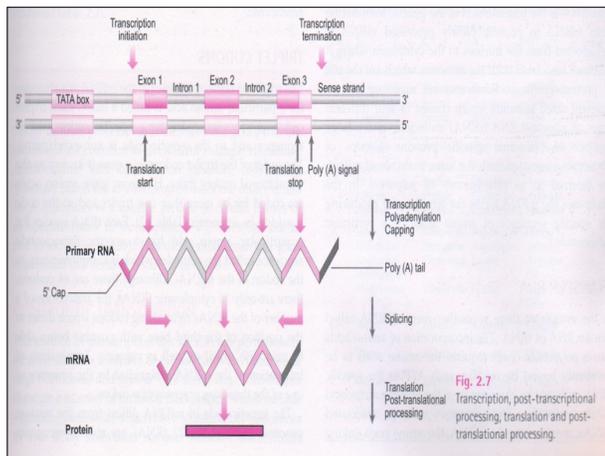
## POST-TRANSCRIPTIONAL PROCESSING

Before the primary mRNA molecule leaves the nucleus, it undergoes a number of **modifications** or what is known as **post-transcriptional processing**.

## I. mRNA Splicing

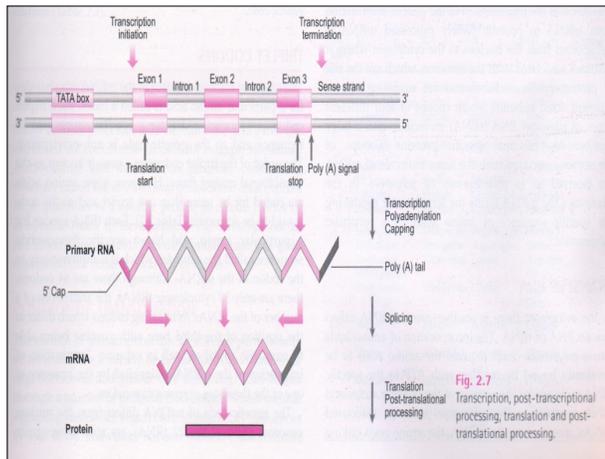
After transcription, the **non-coding introns** in the primary mRNA are **removed**, and the non-adjacent **coding exons** are **spliced together** to form a **shorter mature mRNA**.

## THE GENE



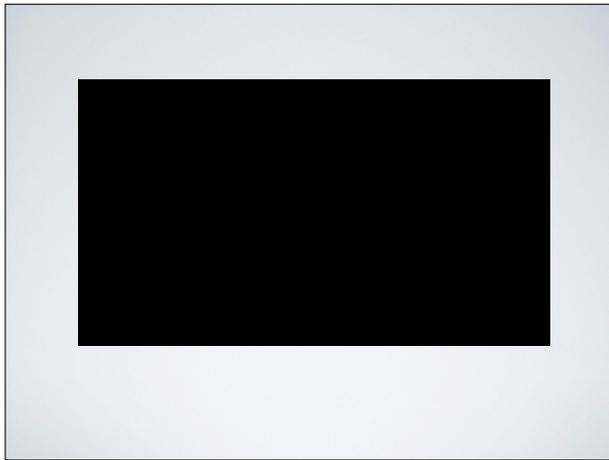
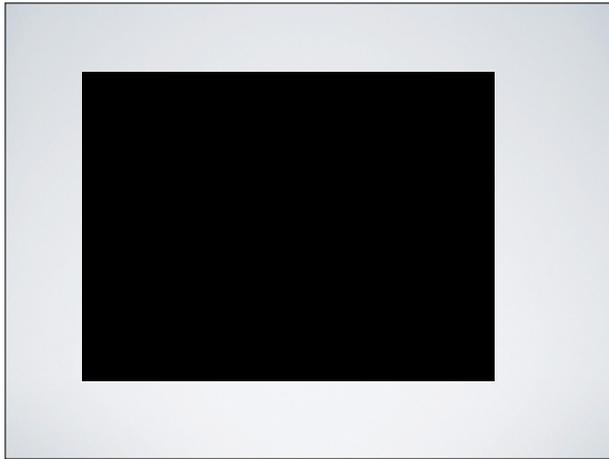
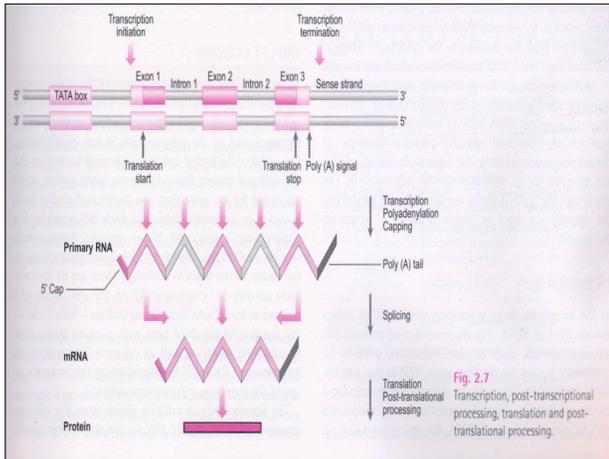
## 2- 5' CAPPING:

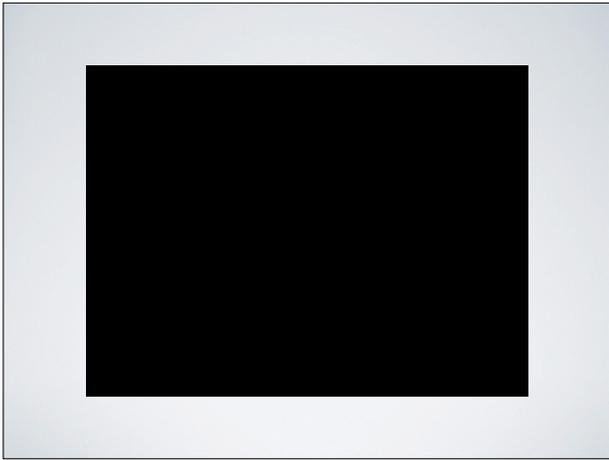
- **After transcription** the mRNA is modified by the **addition of a methylated guanine nucleotide to the 5' end** of the molecule.
- **The 5' cap** is thought to facilitate transport of the mRNA to the **cytoplasm** and **attachment to the ribosomes** as well as **protect the RNA** transcript from **degradation** by endogenous cellular exonucleases.



## 3- POLYADENYLATION:

- The **cleavage of the 3' end** of the mRNA molecule from the DNA involves the **addition of approximately 200 adenylate** residues, the **so-called poly(A) tail**.
- The addition of the poly(A) tail is thought to facilitate **transport** of the mRNA to the **cytoplasm** and translation.





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**Thanks**

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