

Transcription

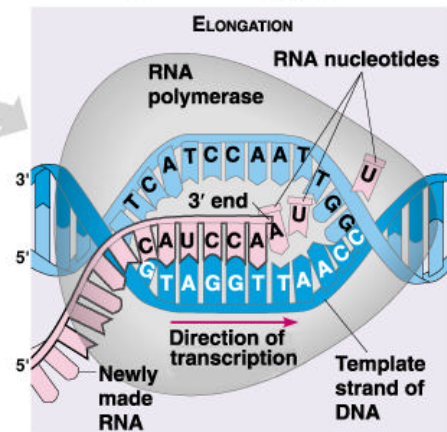
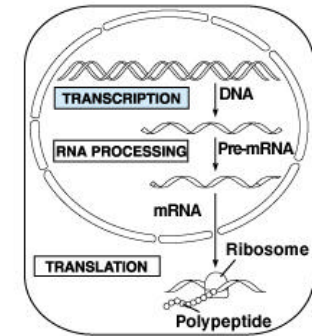
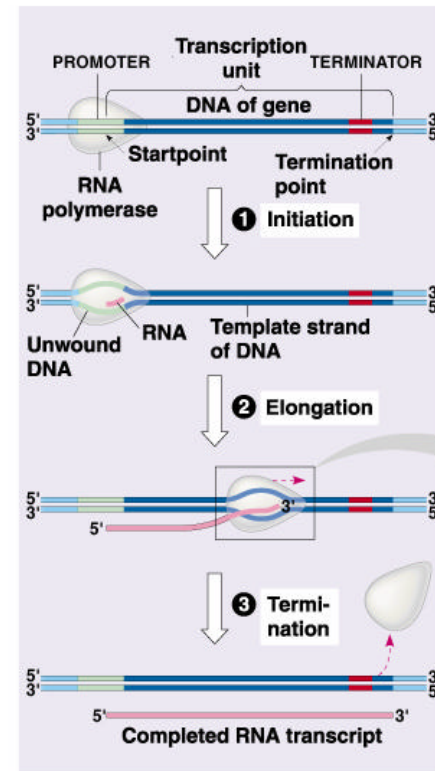
Chapter 17

Objectives

- Understand the process of transcription
- Recognize the role of RNA Polymerase
- Recognize the significance of promoter and terminator regions of DNA
- Explain how transcribed RNA is modified prior to exiting the nucleus. Understand the significance of this process

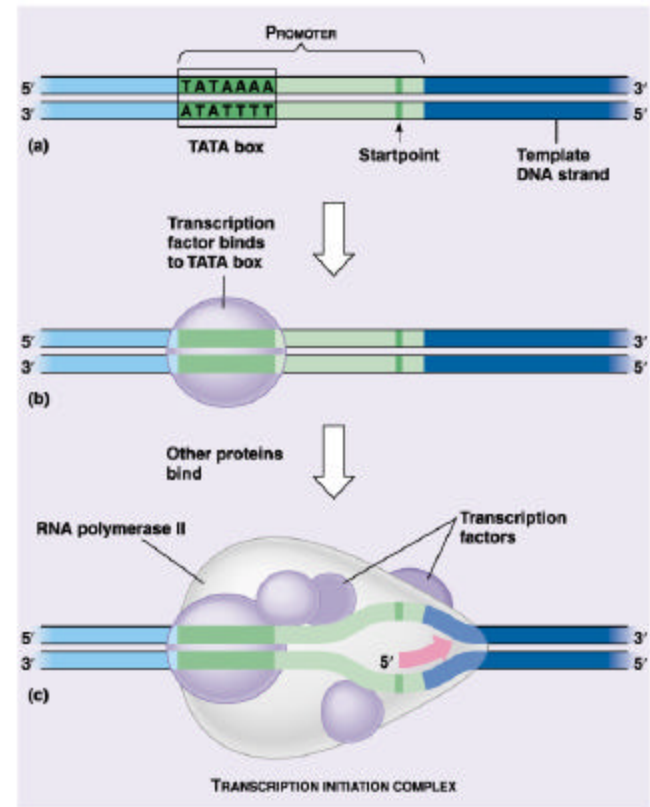
Transcription

- Consists of three stages
 - **Initiation:** attachment of RNA Polymerase to the promoter region on DNA
 - **Elongation:** building of the mRNA from the 3' end of the nucleotide polymer
 - **Termination:** release of RNA polymerase and mRNA following transcription of the terminator region of the DNA



Initiation

- Genes on the DNA begin with a promoter region consisting of a sequence of A & T (**TATA box**) and the first nucleotide involved in the peptide sequence
- **Transcription factors** (proteins that assist the binding of RNA polymerase to the promoter) are found in association with the promoter region
- **Transcription initiation complex:** transcription factors & RNA polymerase bound to the promoter region of the DNA

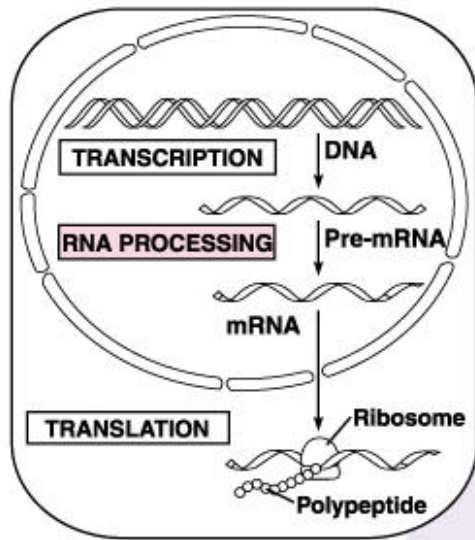


Elongation

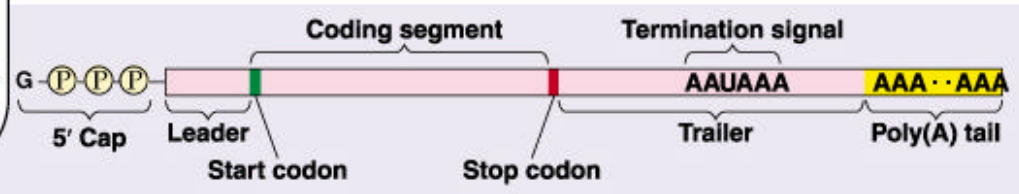
- Once initiation is complete the 2 strands of the DNA unwind
- RNA polymerase builds a mRNA strand complimentary to the DNA **transcription unit** (60 bases/sec)
- Once the RNA Polymerase passes the DNA strands reform their double helix

Termination

- When the RNA Polymerase transcribes the terminator region of the DNA, the Polymerase releases the mRNA
- The transcribed termination sequence on the mRNA is AAUAAA

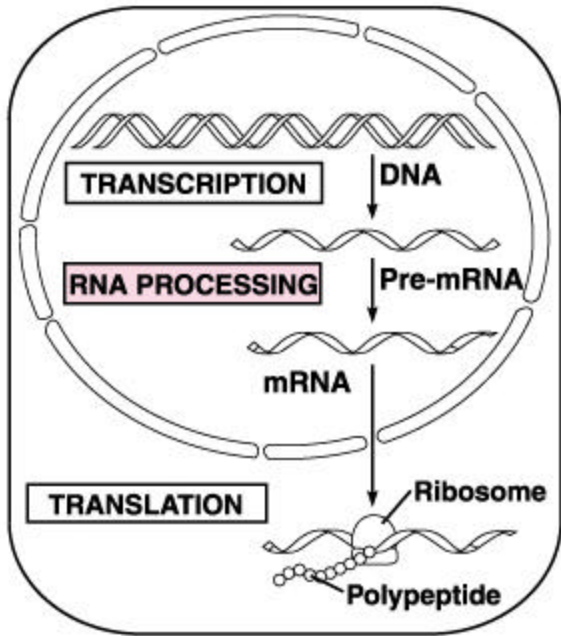


Modification of mRNA



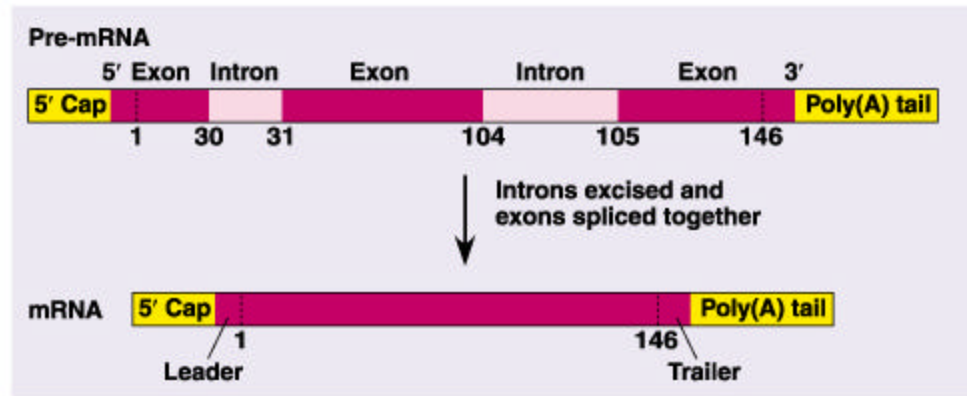
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- Transcribed mRNA (pre-mRNA) must be modified before leaving the nucleus
- modifications include:
 - addition of **5' cap**
 - Prevents “unraveling”
 - addition of **poly A tail**
 - Prevents “unraveling”
 - Helps ribosome attach
 - Assists in the export of mRNA from nucleus



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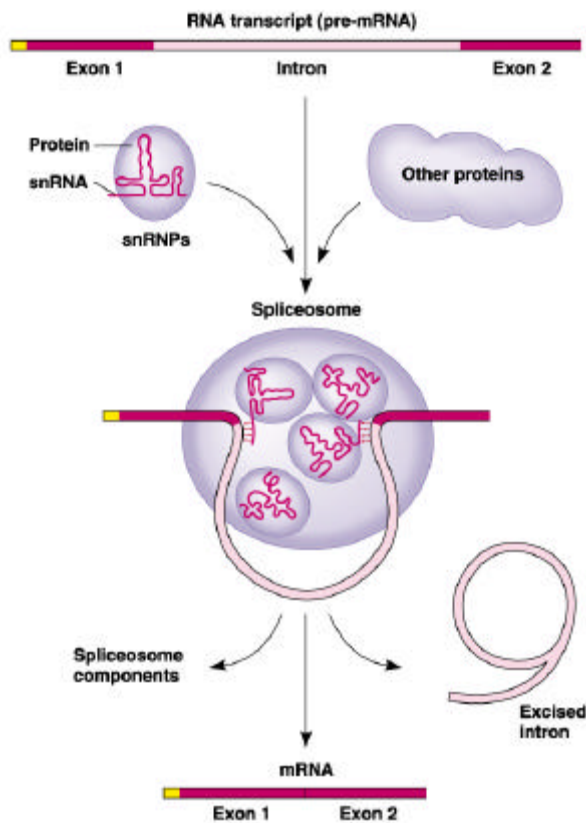
Further Modifications



- Transcribed RNA is too long and is shortened in the nucleus
- Exons are segments of the pre-mRNA that contain information that will be reflected in the polypeptide
- Introns are segments of the pre-mRNA that separate (intervene) exons

How is this done?

- Small nuclear ribonucleoproteins (snRNP) recognize intron ends and together with proteins form a structure called a **spliceosome**
- Spliceosomes remove introns while connecting exons together
- Ribozymes may also catalyze this process in some organisms (introns may act as ribozymes)



Why bother with introns?

- Introns may **regulate** gene activity and the passage of mRNA into the cytoplasm
- Genes may play roles in multiple proteins, introns may enable a gene to be **diverse** in function
- May increase recombination of genetic material (easier to cut and paste)