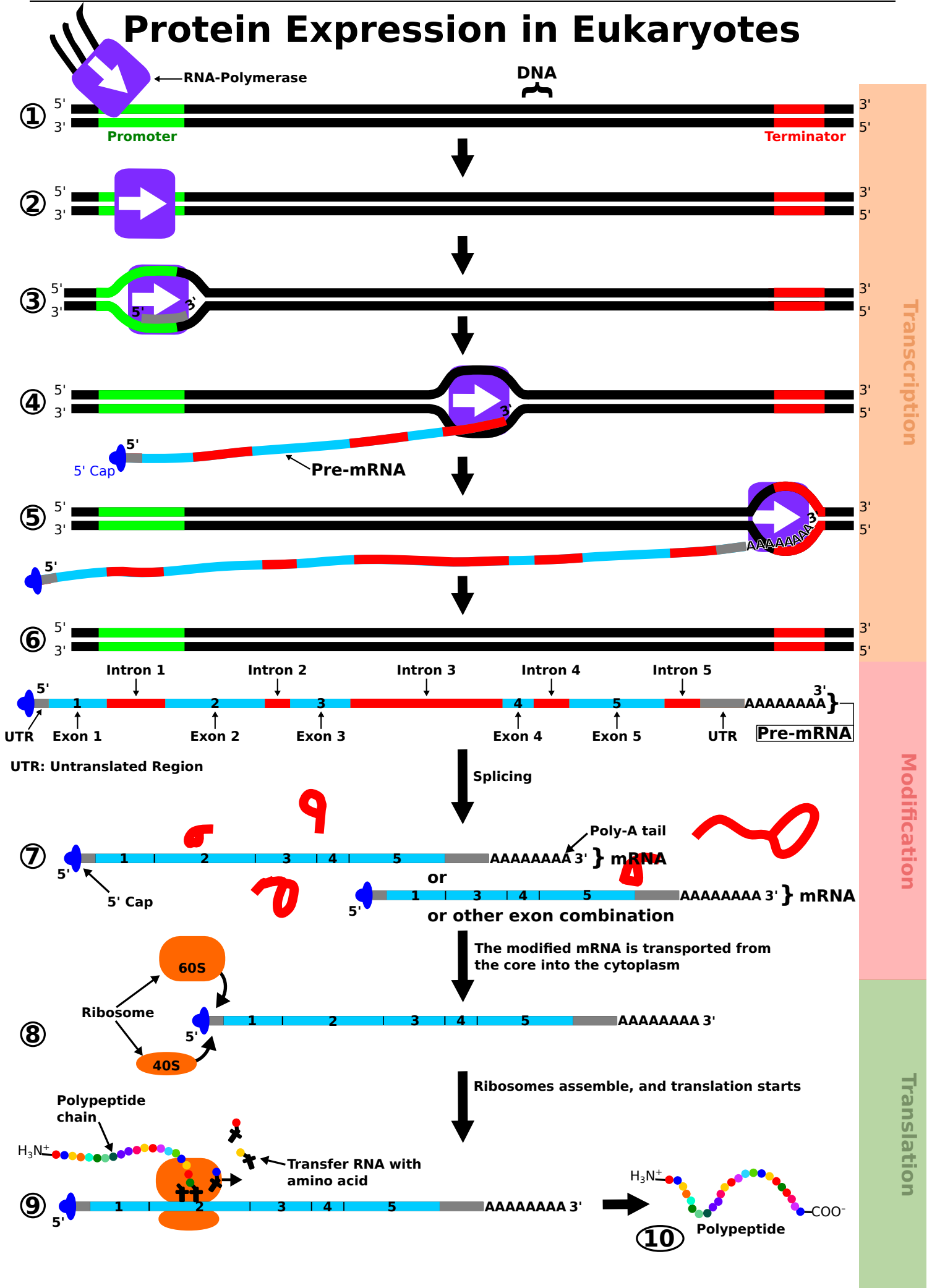


Protein Expression in Eukaryotes



Transcription

- 1.) RNA – Polymerase attaches to the promoter. The promoter is a region on the DNA, which is located upstream, near the transcription start side.
- 2.) Transcription is initiated.
- 3.) The RNA-Polymerase is starting to synthesize the Pre-mRNA from the 5' to the 3' direction.
- 4.) The RNA-Polymerase continues to synthesize the pre-mRNA. The 5' end of the pre-mRNA receives a 5' Cap. The 5' Cap is usually a modified guanine molecule. The 5' Cap increases the stability of the pre-mRNA and the mRNA.
- 5.) The terminator region of the DNA codes a poly(A) sequence, thus the pre-mRNA receives at its 3' end a poly(A)-tail. The poly(A) tail stabilizes the mRNA from degradation in the cytoplasm. The poly(A) tail also helps to transport the mRNA from the nucleus to the cytoplasm.

Modification

- 6.) The transcription is finished, and the pre-mRNA is ready to be spliced. Note: All pre-mRNA modifications happen inside the nucleus.
- 7.) The pre-mRNA gets spliced, where introns get removed. Note: As described in the scheme, the exons are combined together. They can be combined in a different order, such as 1-2-3-4-5 or 1-3-5 or 2-4, but not 1-5-3-4 (A higher integer number cannot lay in between two smaller numbers).

Translation

- 8.) The 40S and 60S ribosomal subunits are mediated to the mRNA by its 5' Cap. The 40S ribosomal subunit attaches first to the mRNA. Subsequently the 60S ribosomal subunit binds to the 40S ribosomal subunit on the mRNA to form the functional ribosome.
- 9.) Once the ribosome is assembled, the translation of the mRNA is initiated from a start codon on the mRNA. tRNA's charged with amino acids enter the ribosomes, where their amino acid is transferred on to the growing polypeptide chain. Once the tRNA donated its amino acid, it exits the ribosome. Note: The polypeptide chain is being built from N-terminus ($-NH_3^+$) to C-terminus ($-COO^-$).
- 10.) The built polypeptide chain is now ready to be folded into the destined protein.