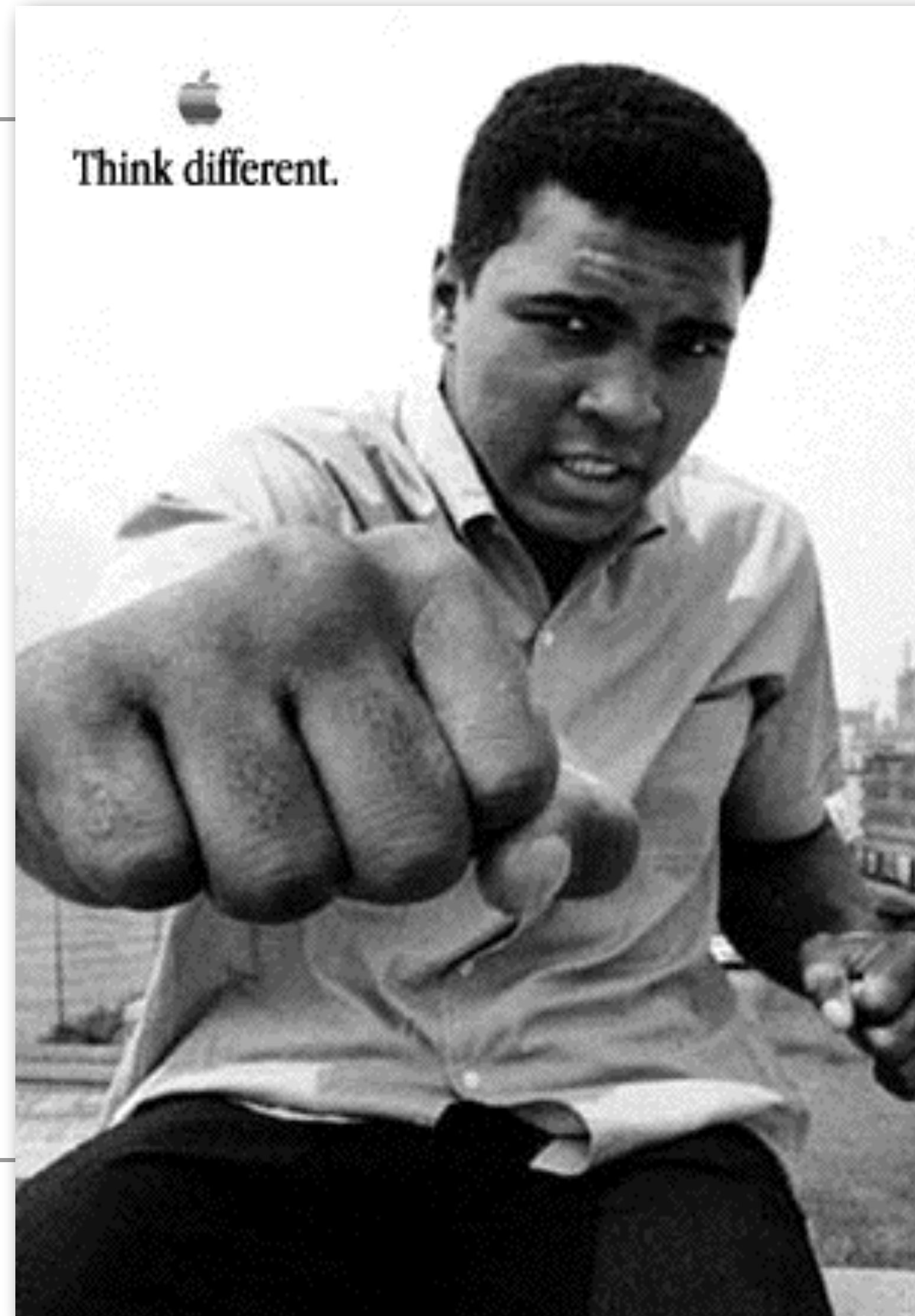


LB145 Spring 2023



1. **Pick up** Name Folder

- Pick up name folder and set it up at seat.

2. **Sit** with your group.

- laptops on outer perimeter (avoid distracting)

3. **Clicker** Attendance

- Launch your Top Hat, and get ready to click.



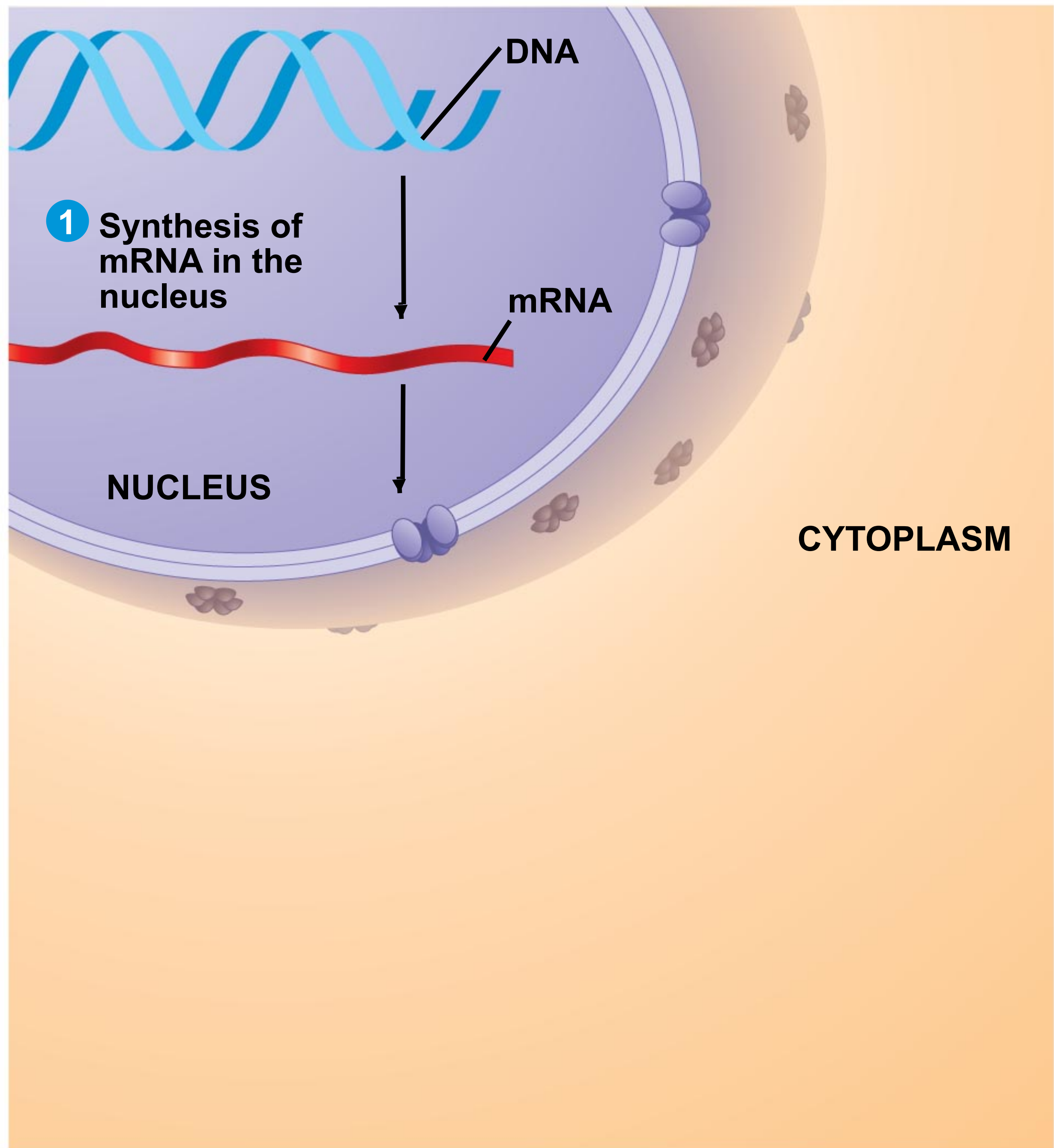
The sense strand of a given gene includes the sequence 5'-G C A T G T A T C A G G C A-3'.

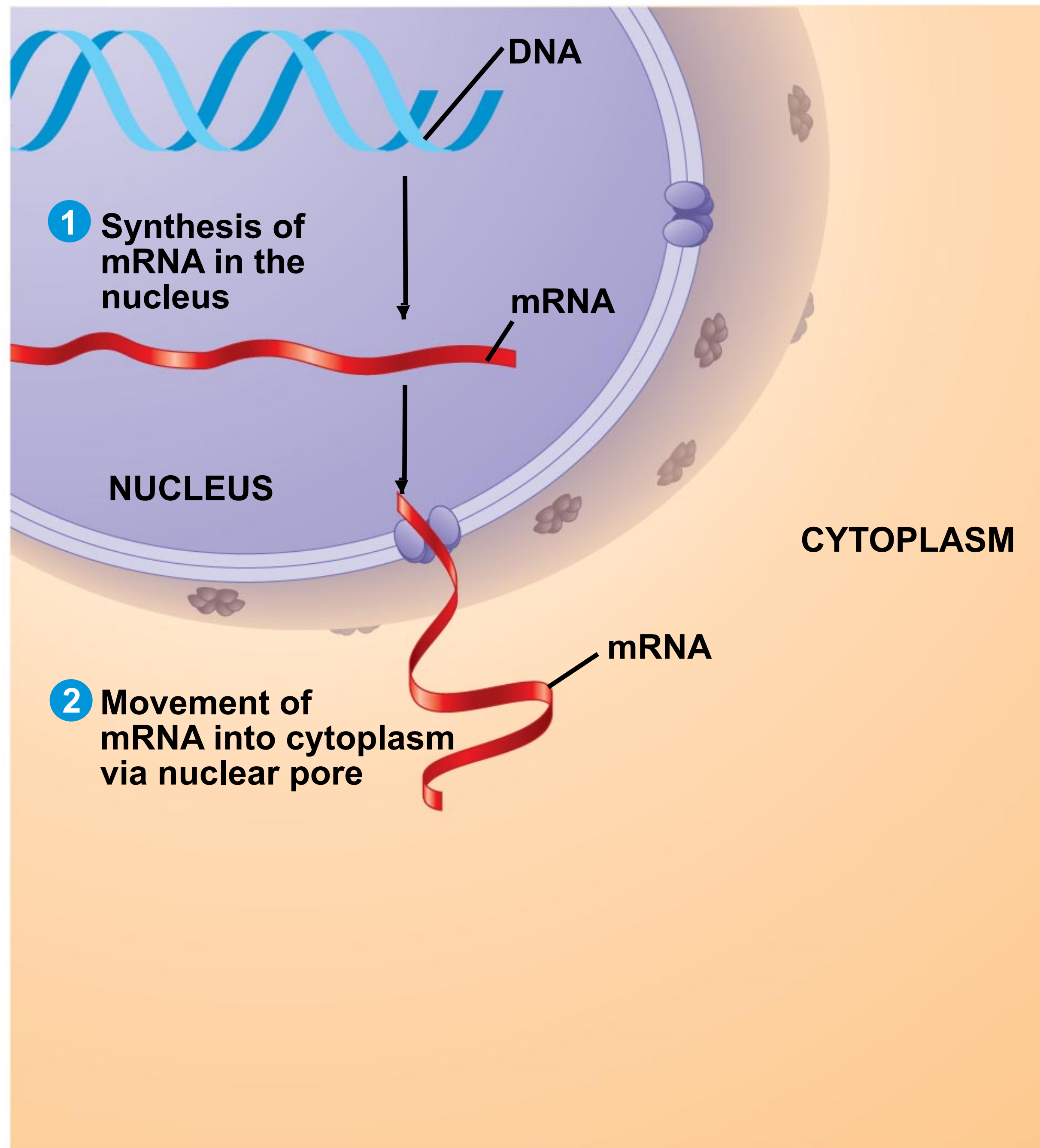
- a) What is the sequence of the mRNA strand?

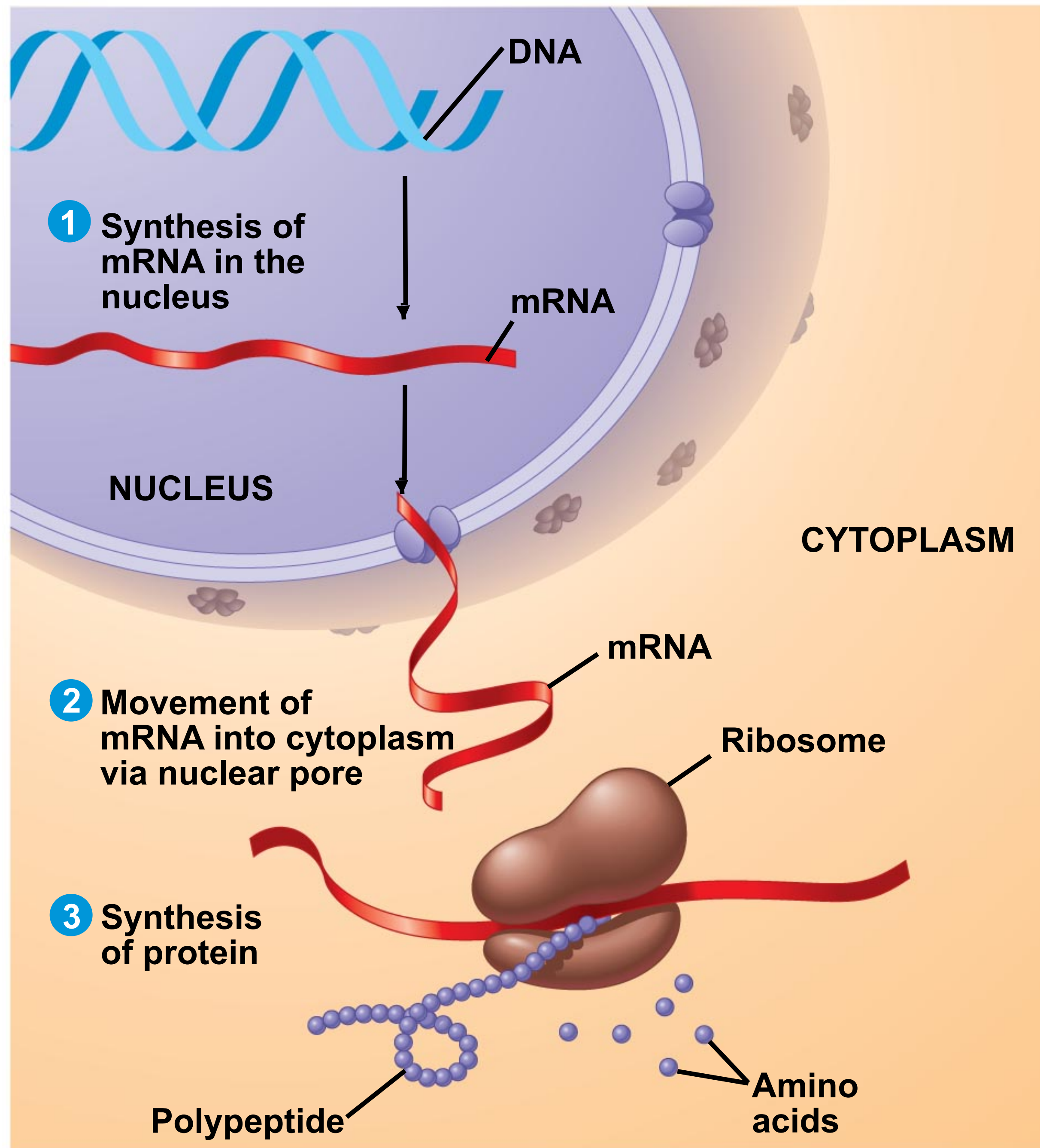
- b) What predicted protein sequence is made?

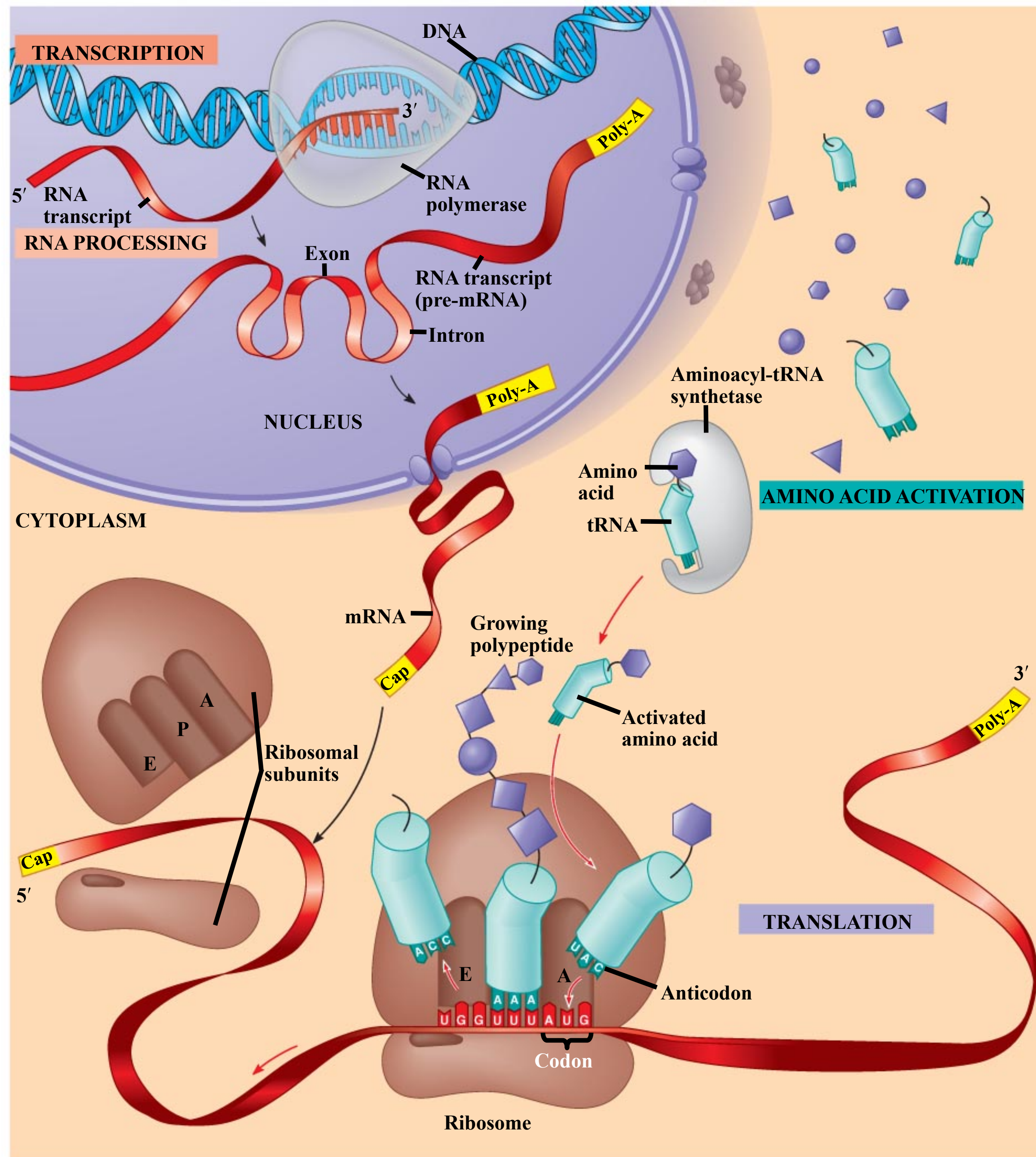
Be sure to indicate 5' and 3' ends.

		Second base					
		U	C	A	G		
First base	U	UUU } Phenylalanine F UUC } UUA } Leucine L UUG }	UCU } Serine S UCC } UCA } UCG }	UAU } Tyrosine Y UAG } UAA } Stop codon UAG } Stop codon	UGU } Cysteine C UGC } UGA } Stop codon UGG } Tryptophan W	Third base	U
	C	CUU } Leucine L CUC } CUA } CUG }	CCU } Proline P CCC } CCA } CCG }	CAU } Histidine H CAC } CAA } Glutamine Q CAG }	CGU } Arginine R CGC } CGA } CGG }		C
	A	AUU } Isoleucine I AUC } AUA } AUG } Methionine start codon M	ACU } Threonine T ACC } ACA } ACG }	AAU } Asparagine N AAC } AAA } Lysine K AAG }	AGU } Serine S AGC } AGA } Arginine R AGG }		A
	G	GUU } Valine V GUC } GUA } GUG }	GCU } Alanine A GCC } GCA } GCG }	GAU } Aspartic acid D GAC } GAA } Glutamic acid E GAG }	GGU } Glycine G GGC } GGA } GGG }		G

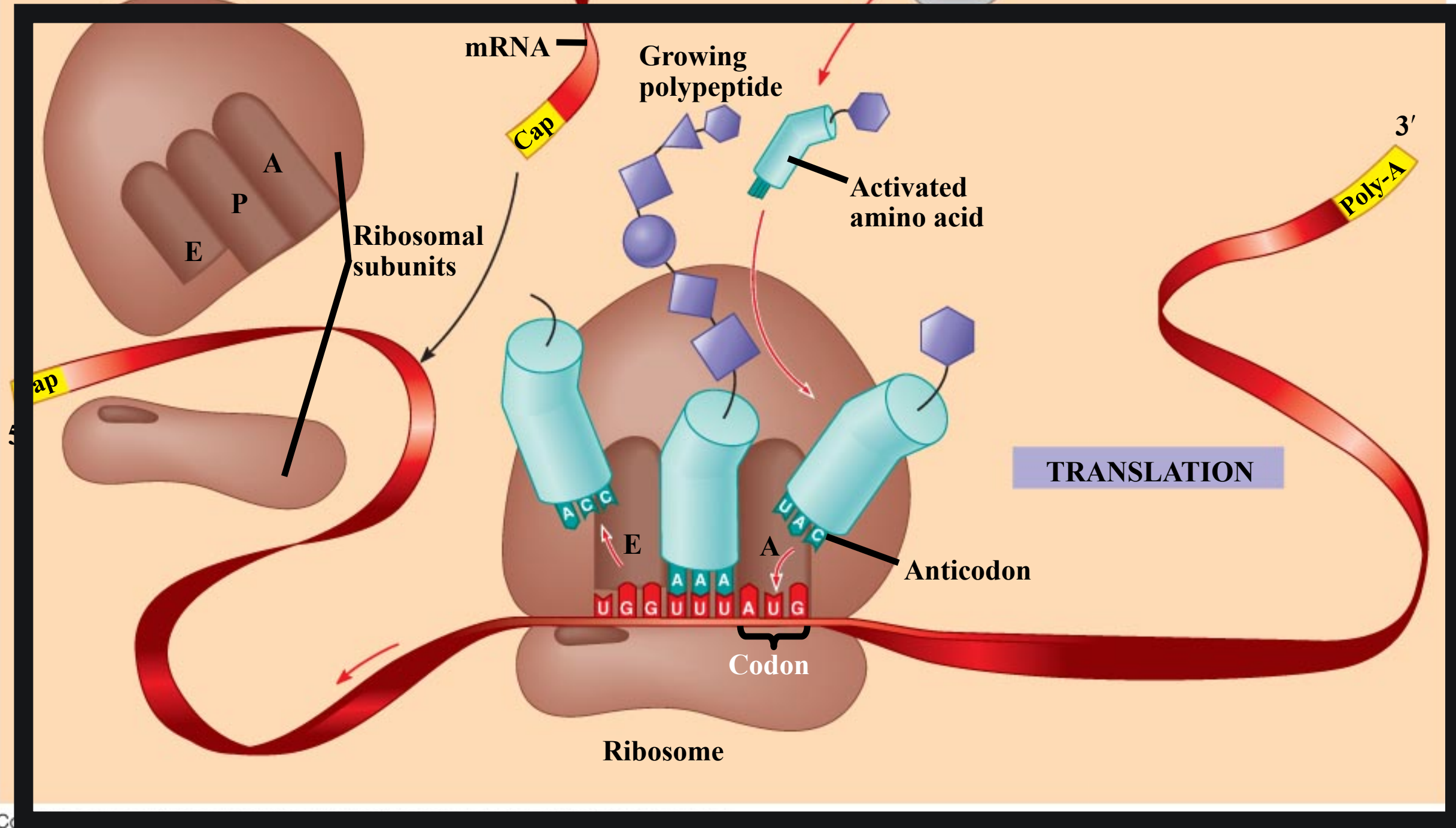
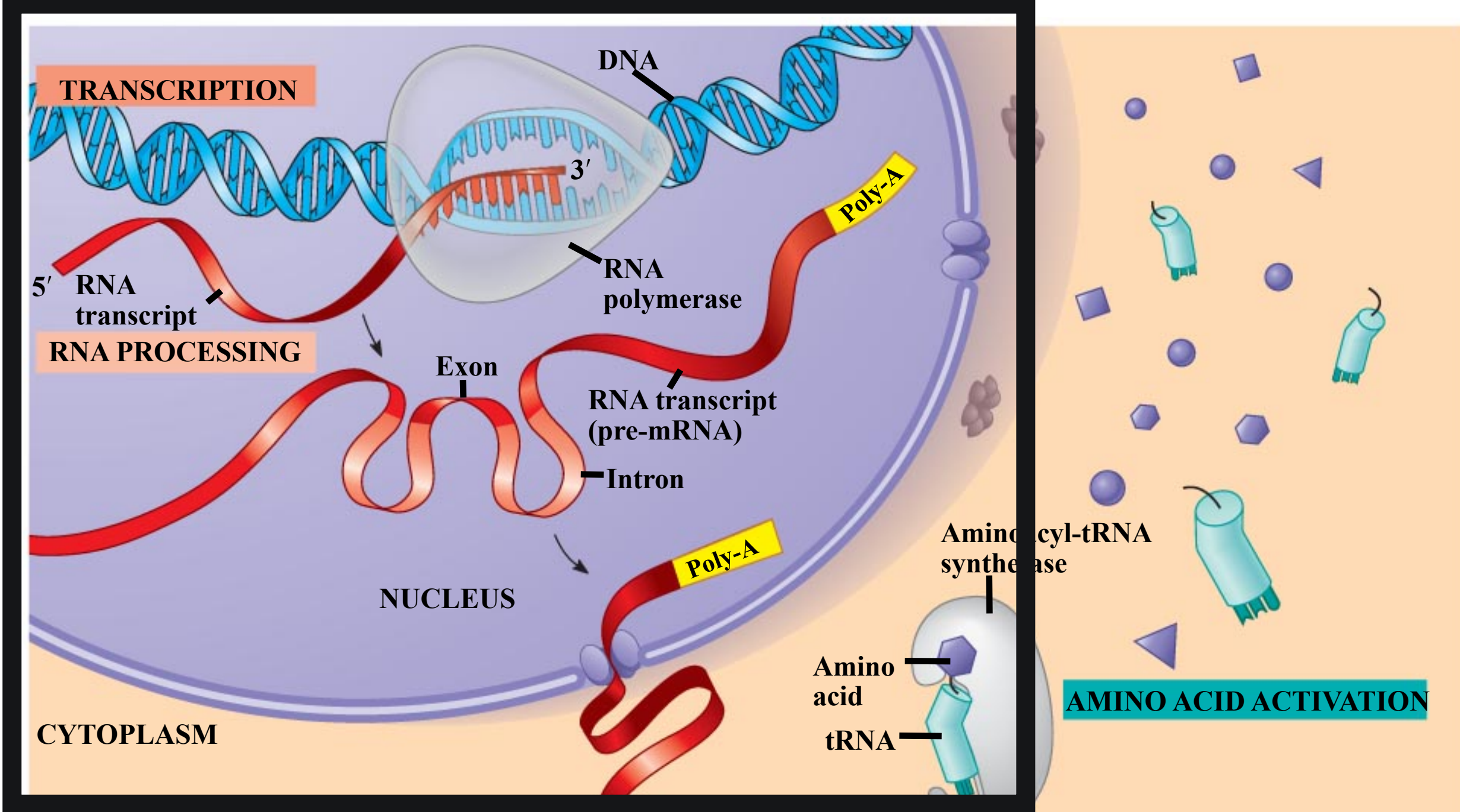








Transcription

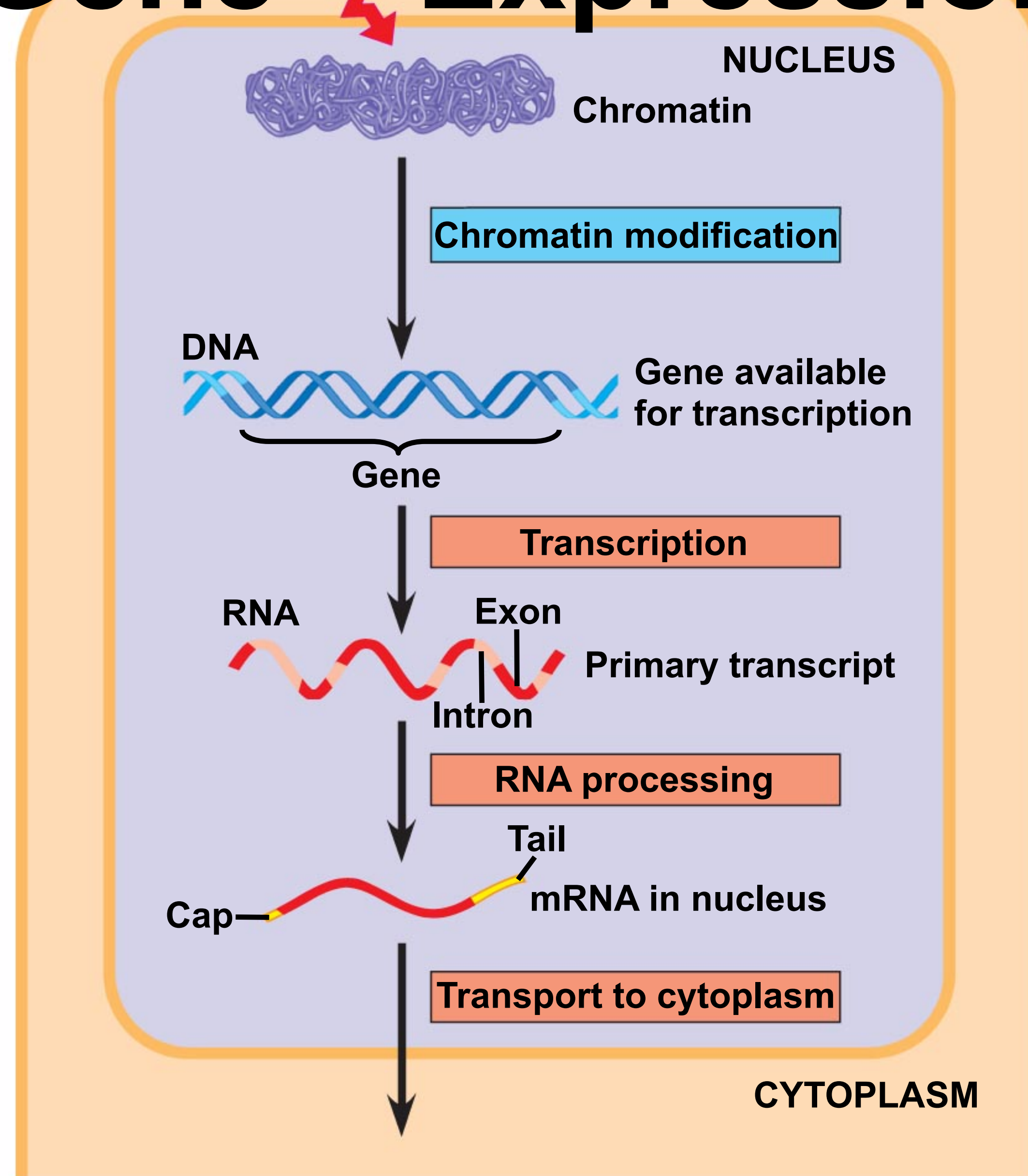


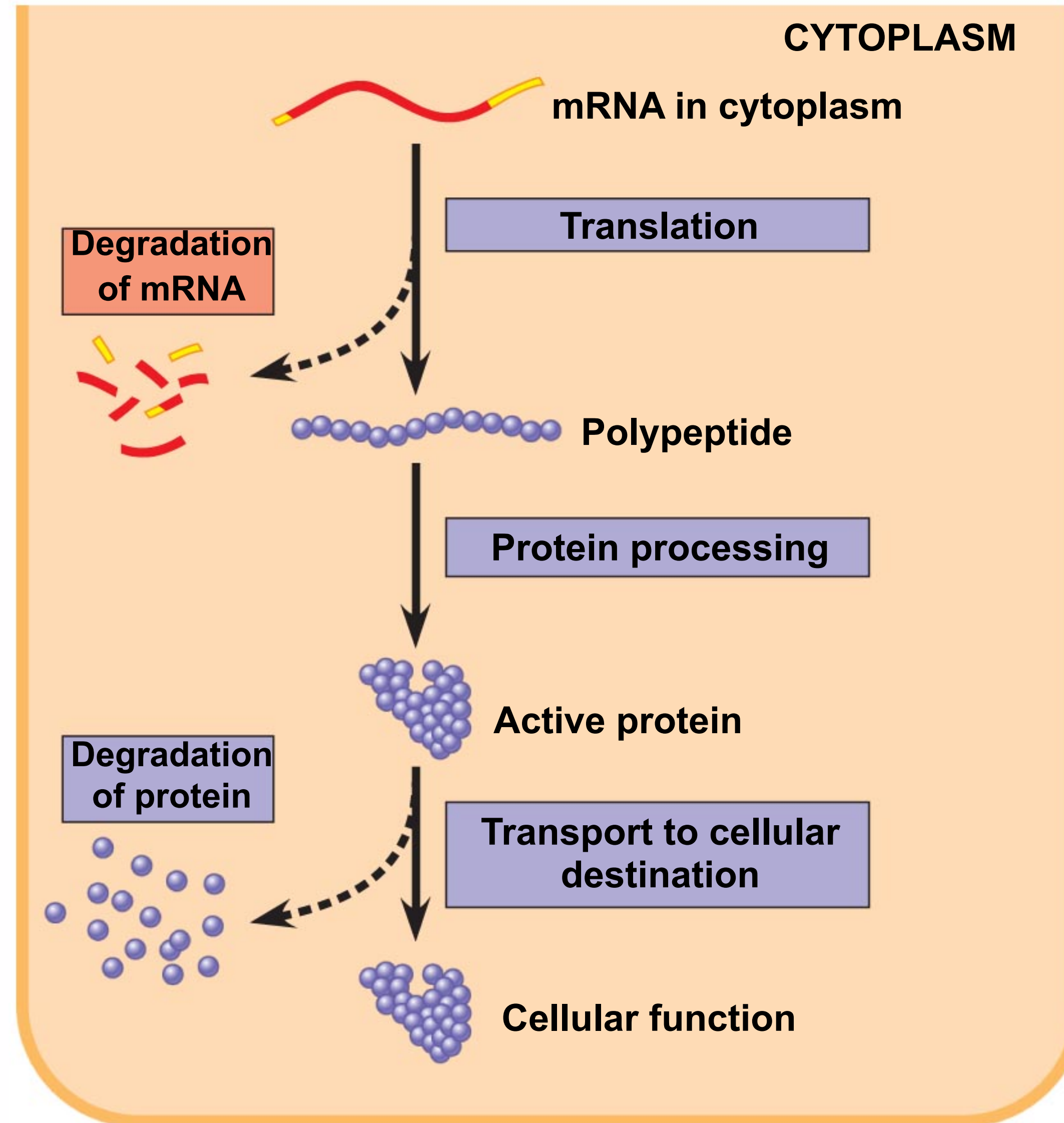
Translation

Questions

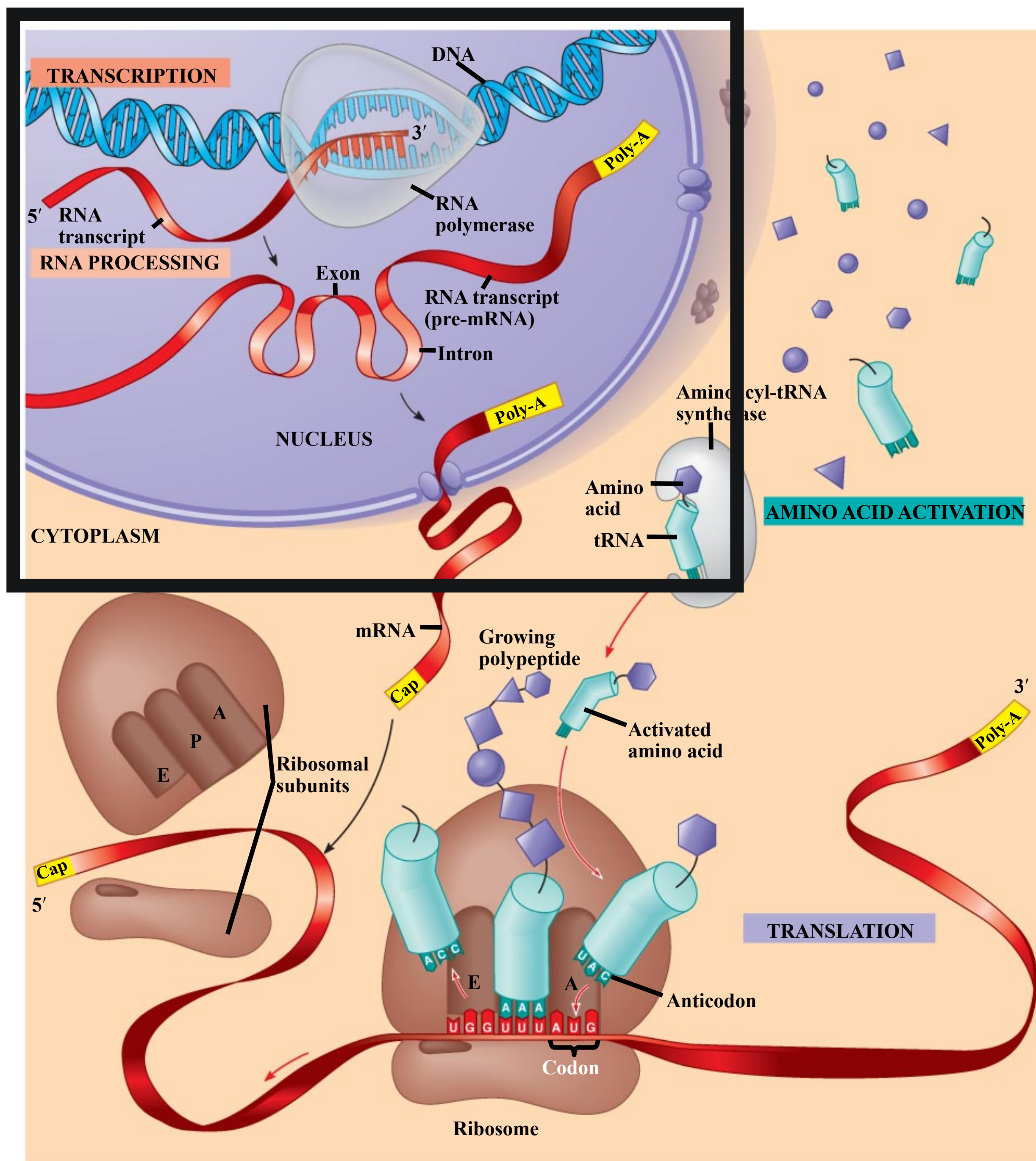
- What happens when a gene is expressed?

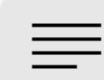
Gene Expression





Transcription





Create



Douglas



Aa

[Genes and Proteins \(OSB\)](#)

Edit Tools

15.3 Eukaryotic Transcription

Summary: By the end of this section, you will be able to:

- List the steps in eukaryotic transcription
- Discuss the role of RNA polymerases in transcription
- Compare and contrast the three RNA polymerases
- Explain the significance of transcription factors

Prokaryotes and eukaryotes perform fundamentally the same process of transcription, with a few key differences. The most important difference between prokaryotes and eukaryotes is the latter's membrane-bound nucleus and organelles. With the genes bound in a nucleus, the eukaryotic cell must be able to transport its mRNA to the cytoplasm and must protect its mRNA from degrading before it is translated. Eukaryotes also employ three different polymerases that each transcribe a different subset of genes. Eukaryotic mRNAs are usually monogenic, meaning that they specify a single protein.

Initiation of Transcription in Eukaryotes

Unlike the prokaryotic polymerase that can bind to a DNA template on its own, eukaryotes require several other proteins, called transcription factors, to first bind to the promoter region and then help recruit the appropriate polymerase.

The Three Eukaryotic RNA Polymerases

The features of eukaryotic mRNA synthesis are markedly more complex those of prokaryotes. Instead of a single polymerase comprising five subunits, the eukaryotes have three polymerases that are each made up of 10 subunits or more. Each eukaryotic polymerase also requires a distinct set of

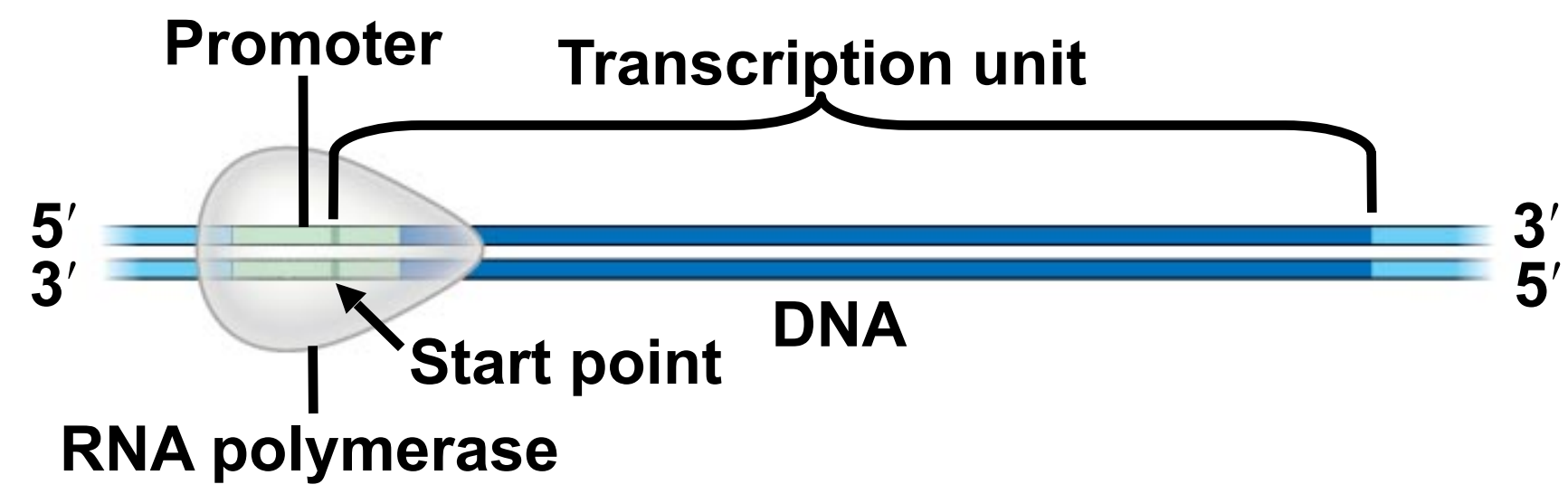
transcription factors to bring it to the DNA template.

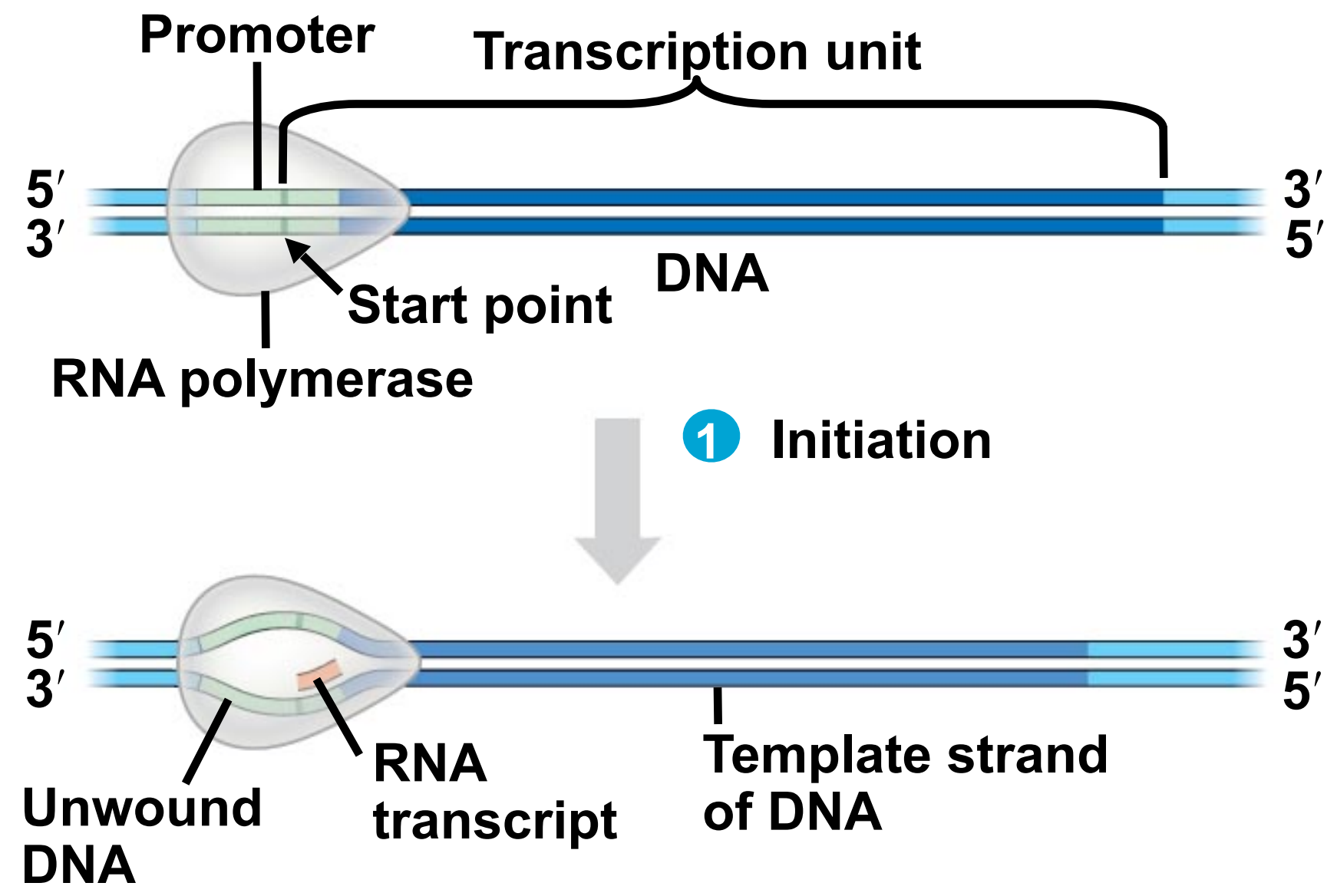
[Genes and Proteins \(OSB\) 15.3 Eukaryotic Transcription](#)

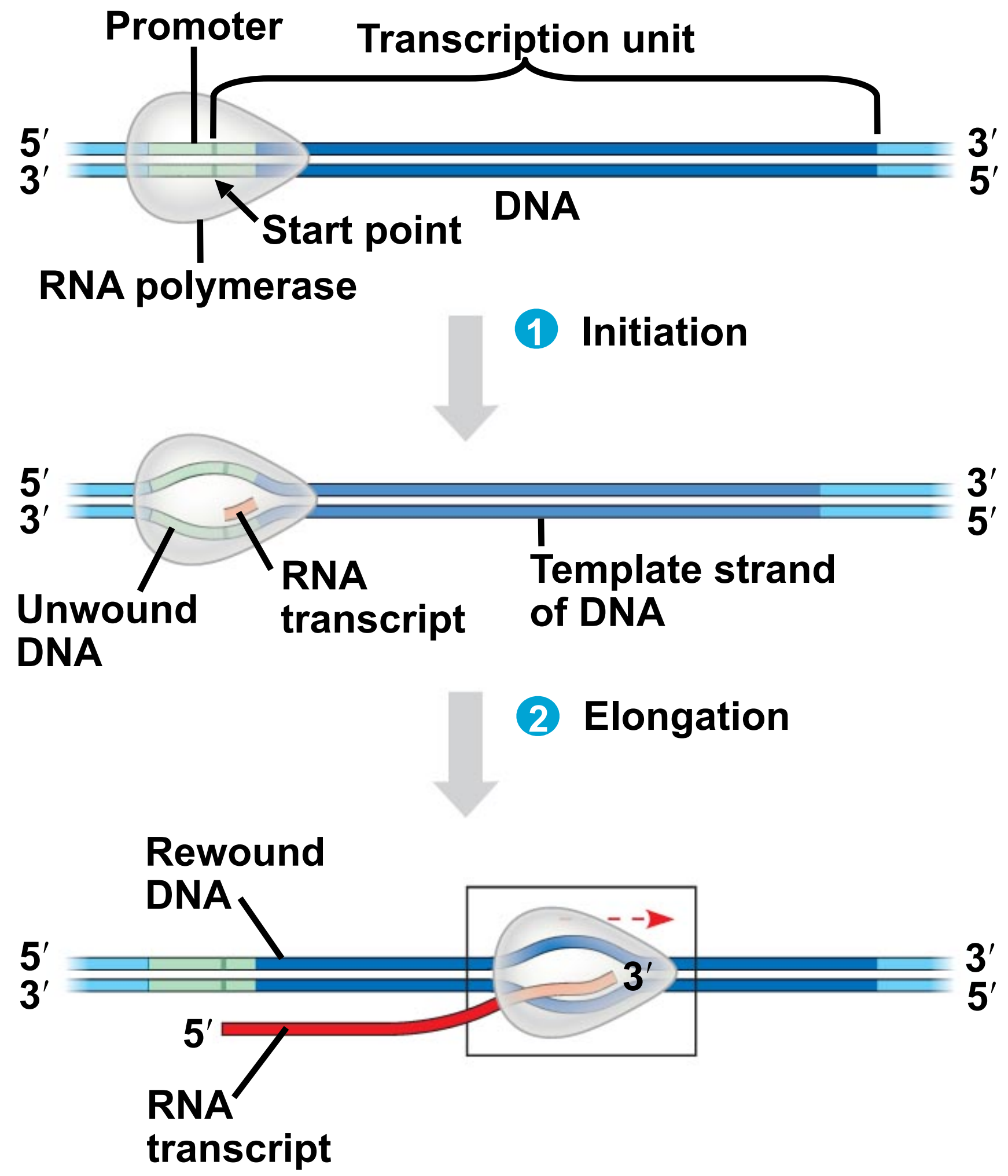


Questions

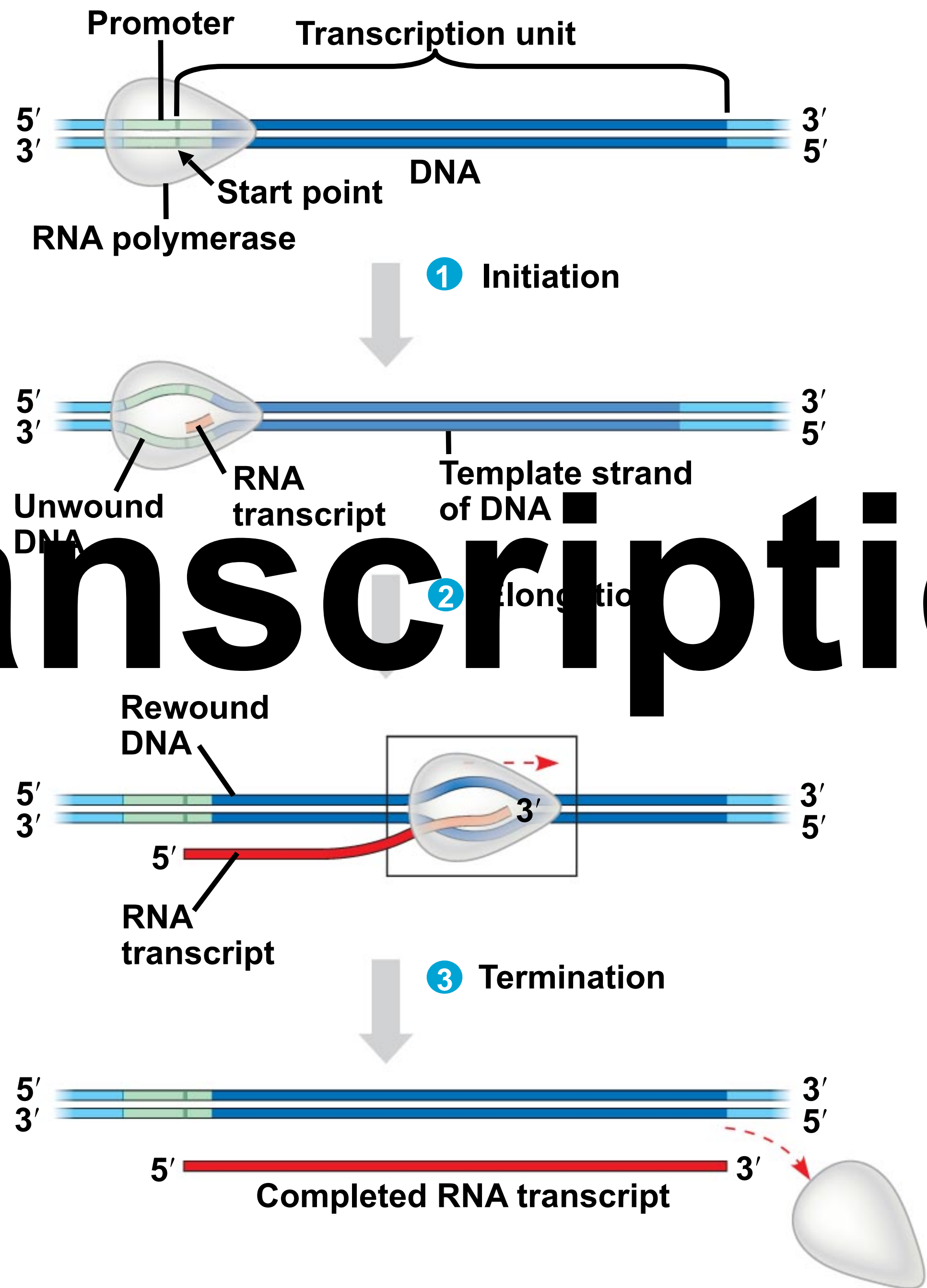
- What happens when a gene is transcribed?





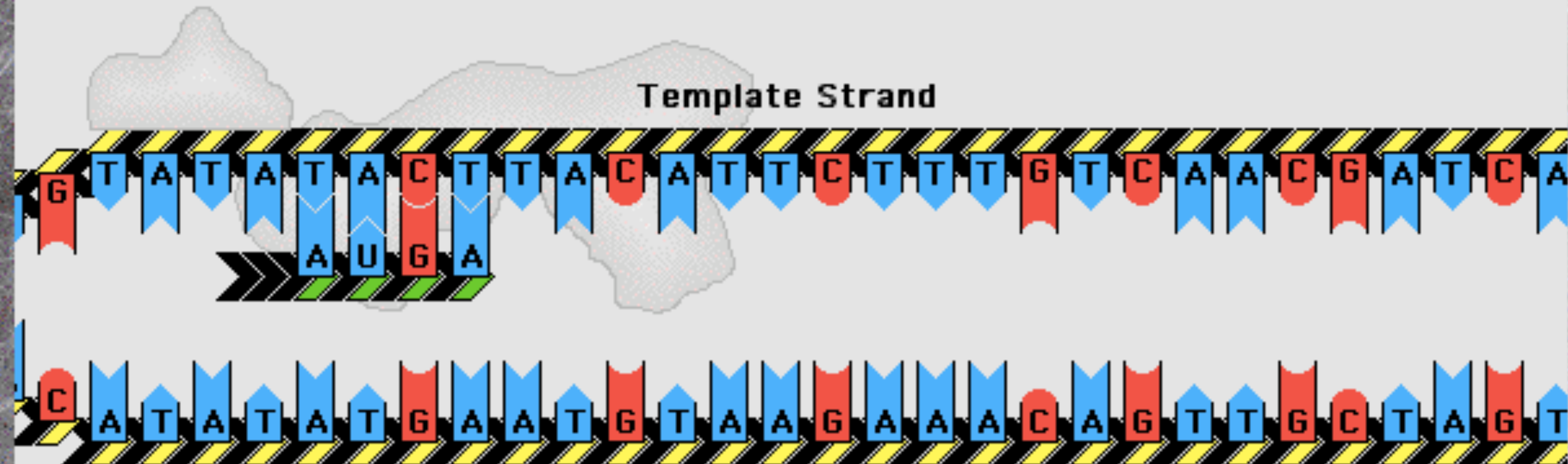


Transcription



Transcription animation course website

The RNA-polymerase binds nucleoside triphosphates (NTP's) and uses complementary base-pairing and the energy of phosphate group release to assemble an RNA polynucleotide strand complementary to the template strand of DNA.



Exit

Previous

Slower

Section 5

Faster

Next

Play

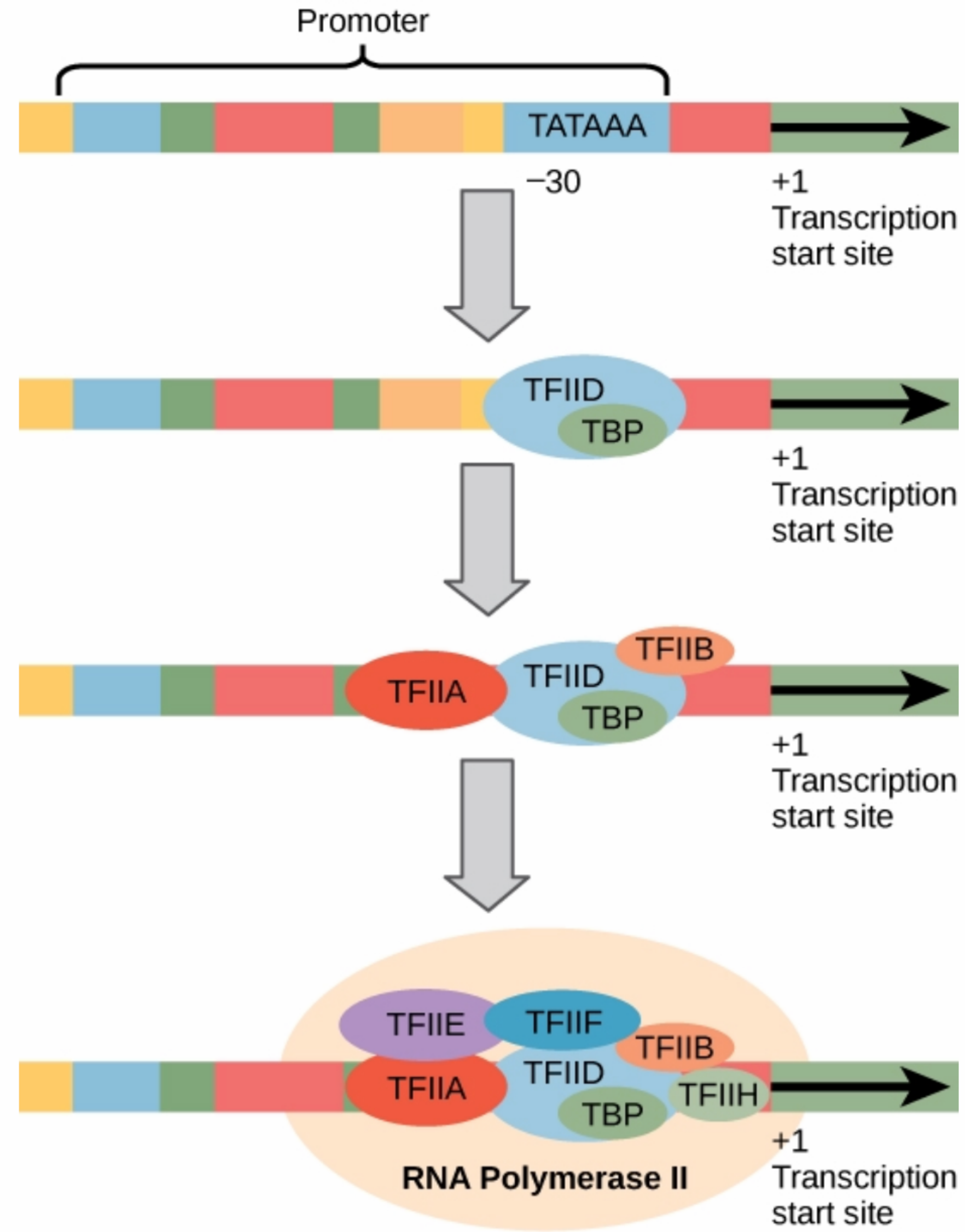
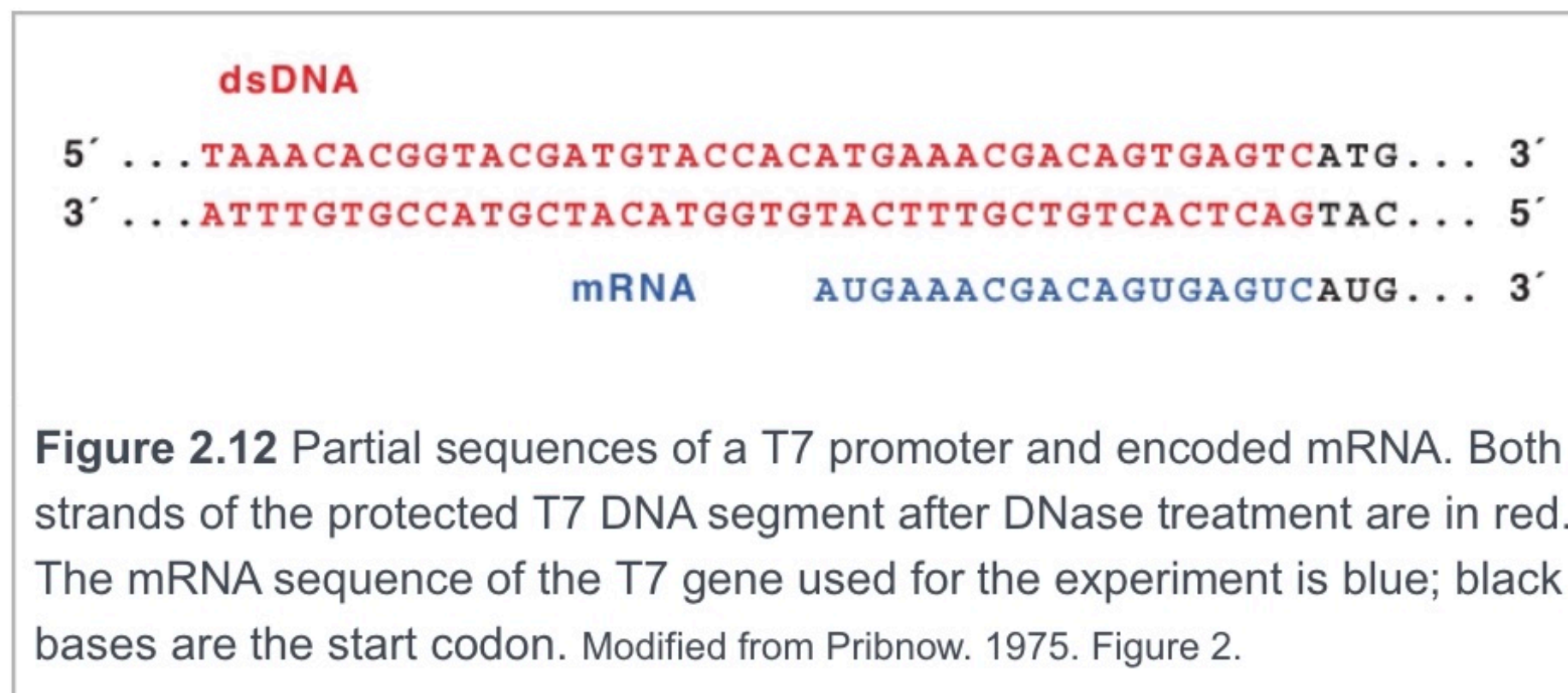


Figure 1: A generalized promoter of a gene transcribed by RNA polymerase II is shown. Transcription factors recognize the promoter. RNA polymerase II then binds and forms the transcription initiation complex.

3pt *Trifecta* exercises

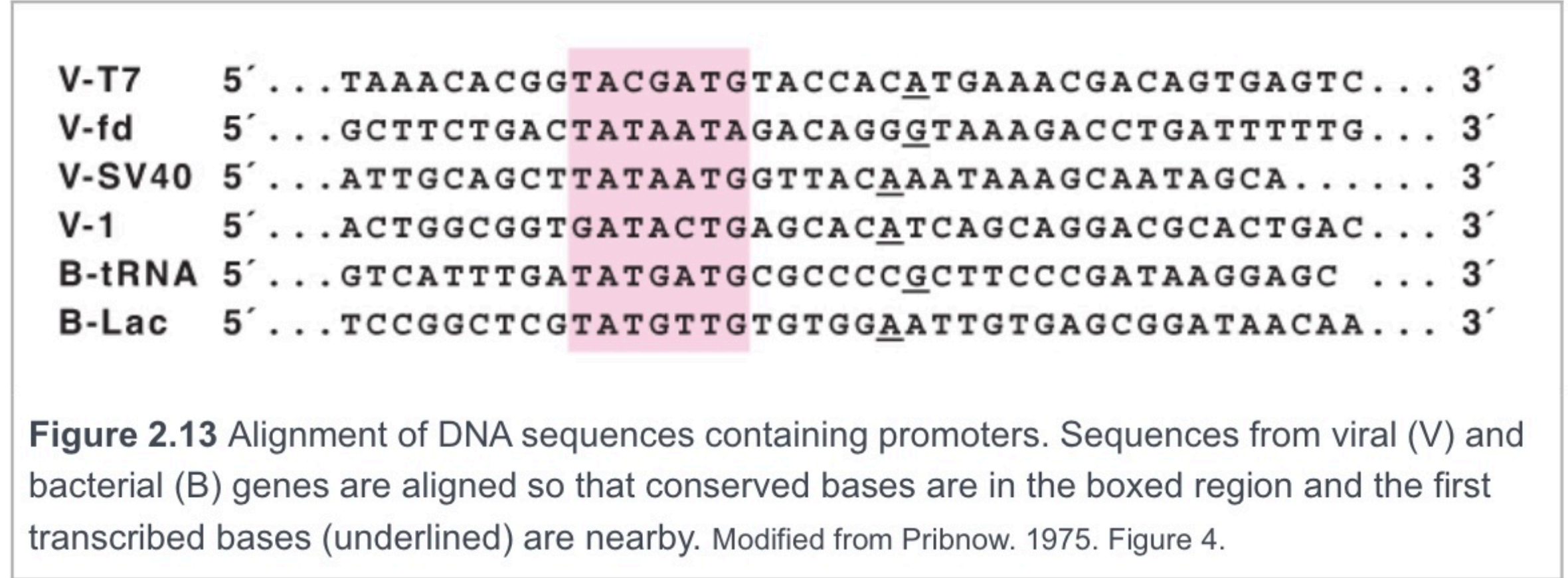


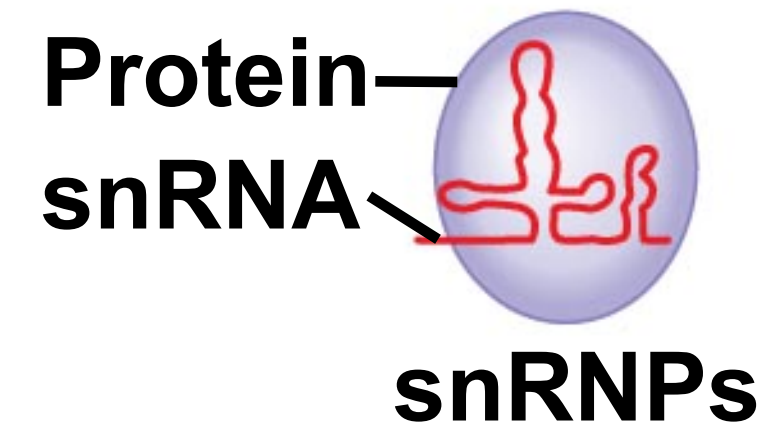
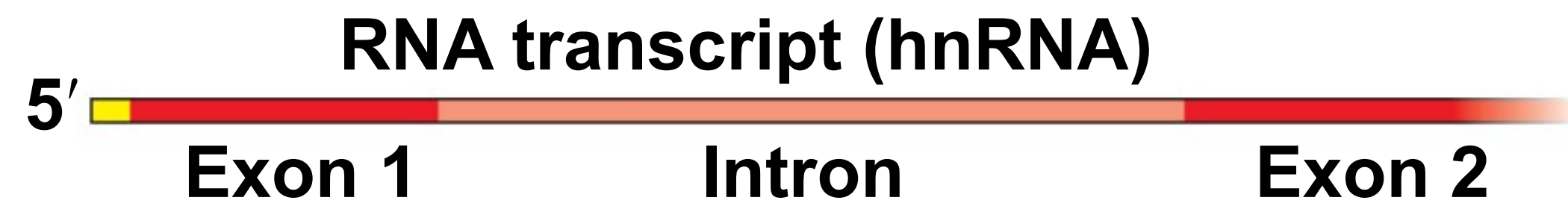
Pribnow was building on the work of many others when he started his project to define a consensus promoter sequence. He mixed *E. coli* RNA polymerase with DNA containing the promoter for a virus called T7. Like all viruses, T7 is especially adept at stealing the host's central dogma machinery to make more viruses. For this reason, choosing a viral promoter was clever because T7 DNA has an exceptionally high

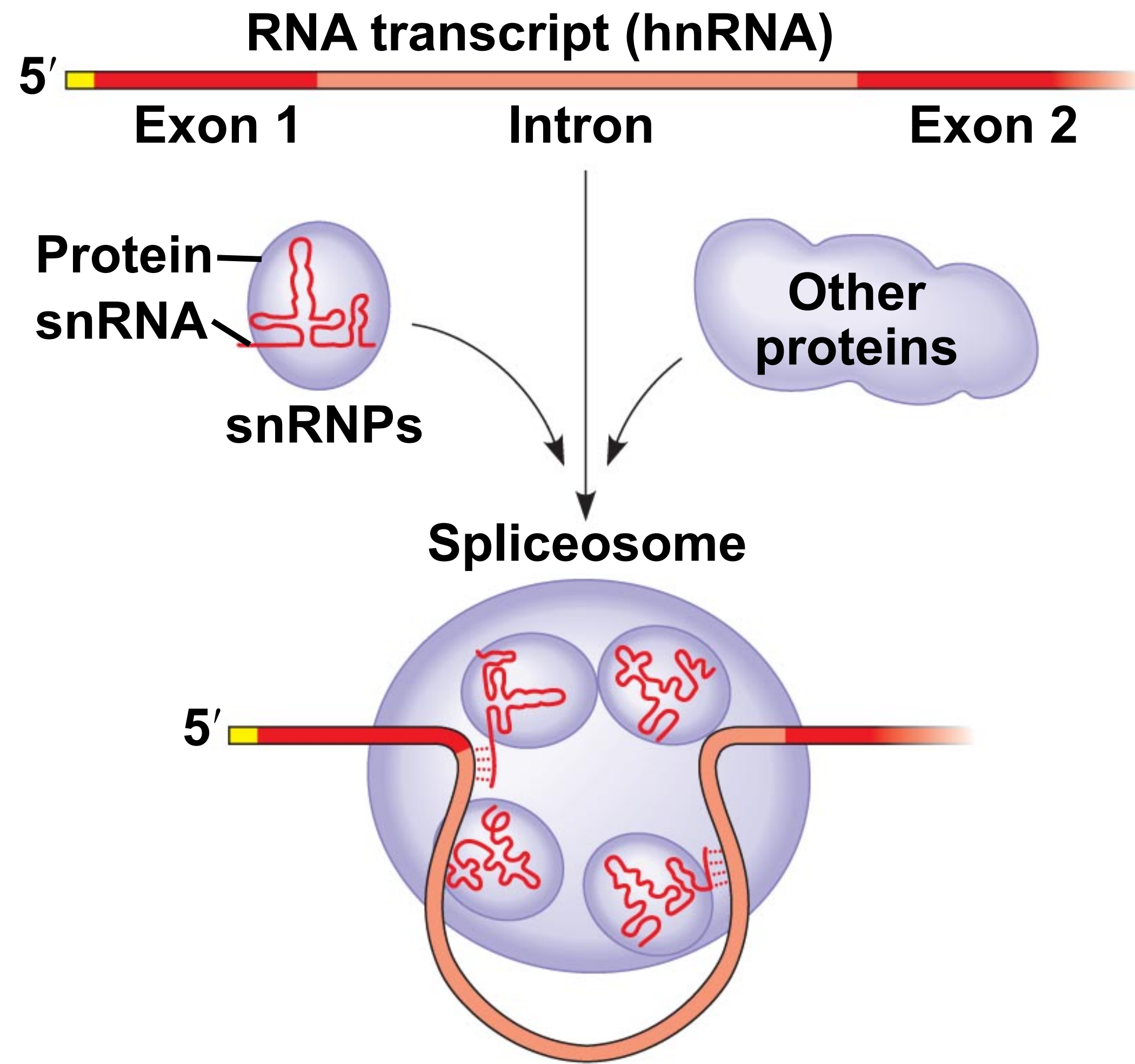
affinity for *E. coli* RNA polymerase. Pribnow mixed T7 DNA with *E. coli* RNA polymerase and then added DNase, which digests any DNA not covered by the RNA polymerase protein. RNA polymerase shielded the T7 promoter from DNase. This discovery led to the development of the T7 promoter system.

Trifecta: purpose, methods, findings

Pribnow knew that other investigators had isolated segments of DNA containing several different promoters, but no one was sure exactly where the RNA polymerase paused before beginning transcription. He aligned the DNA sequences from other promoters with the T7 promoter that he had carefully mapped with DNase. He wanted to know whether any sequences were conserved across the mixture of bacterial and viral promoters (Figure 2.13). Back in the 1970s, this sort of alignment was performed manually and required a lot of patience. Now, we have **bioinformatics** tools to automate sequence alignment. Bio-

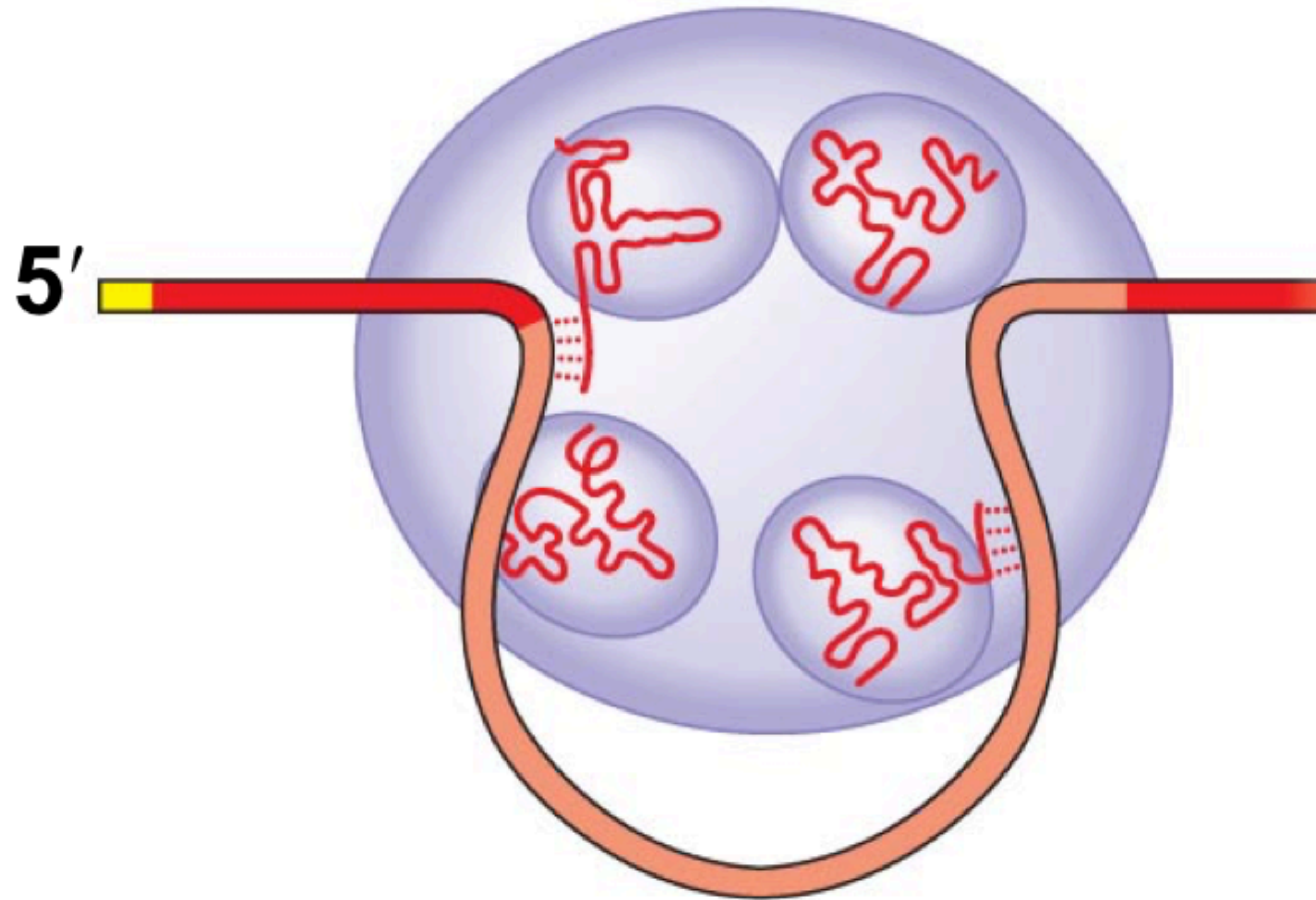






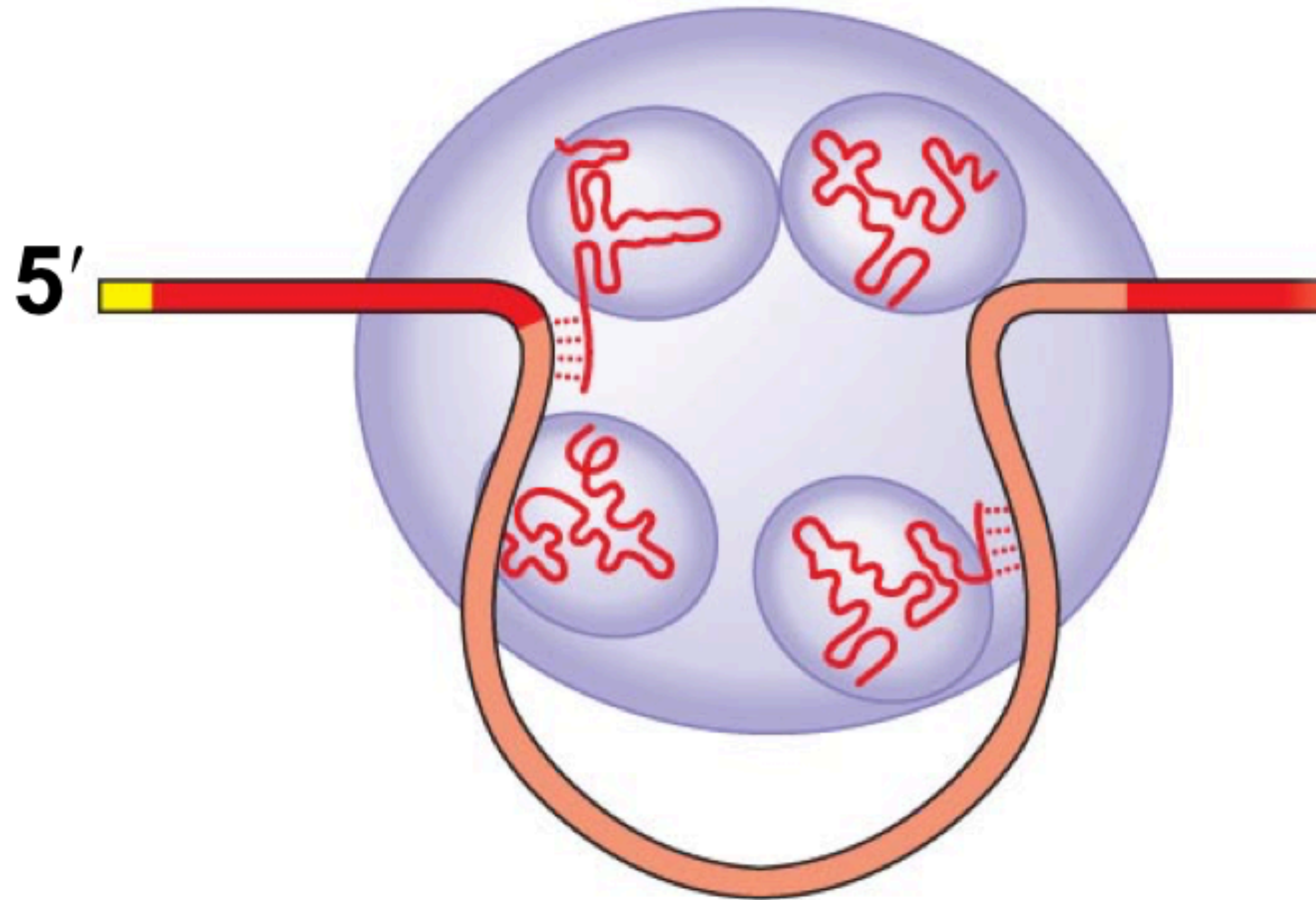
Predict: What role does snRNA (red) serve?

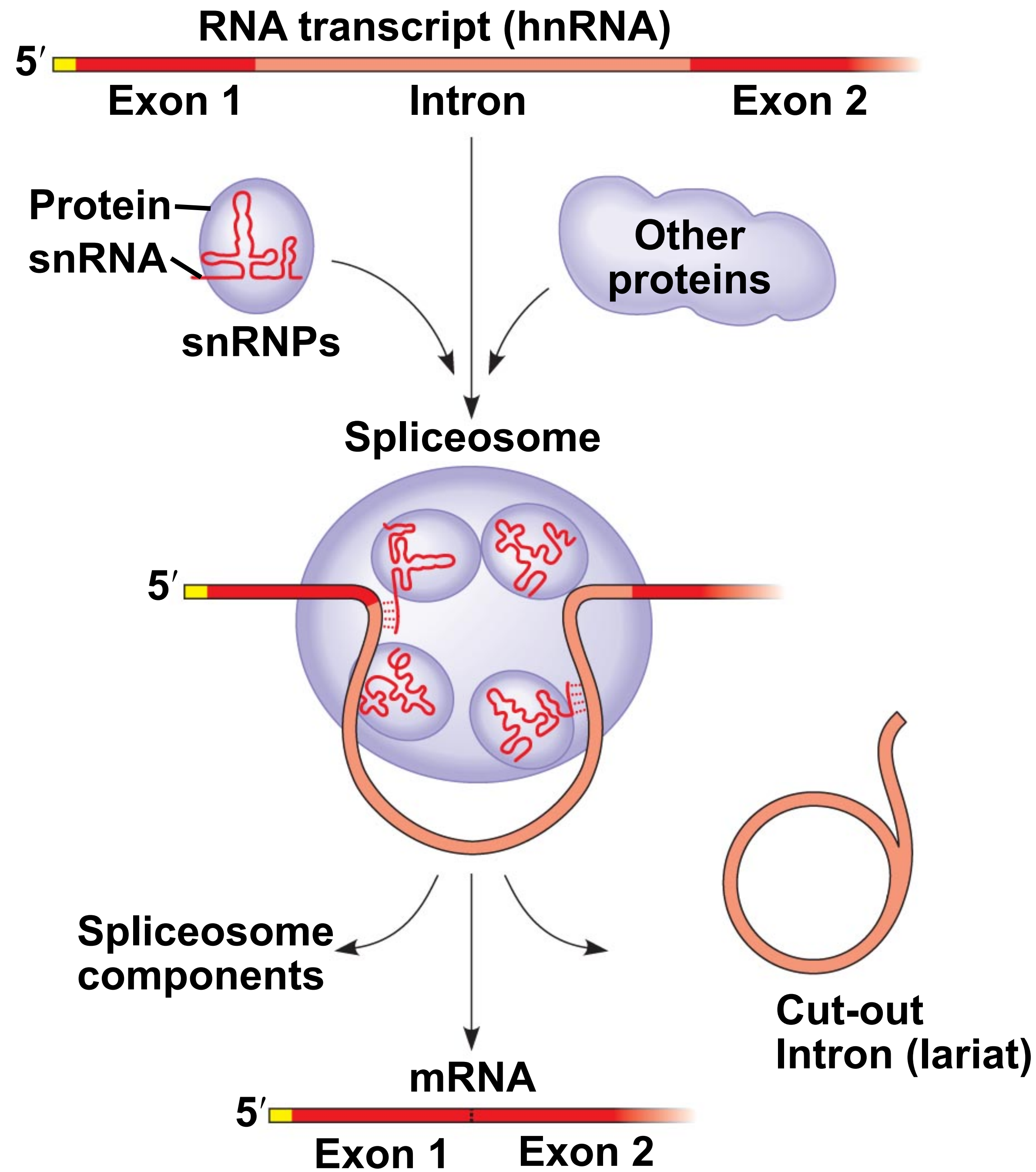
Spliceosome

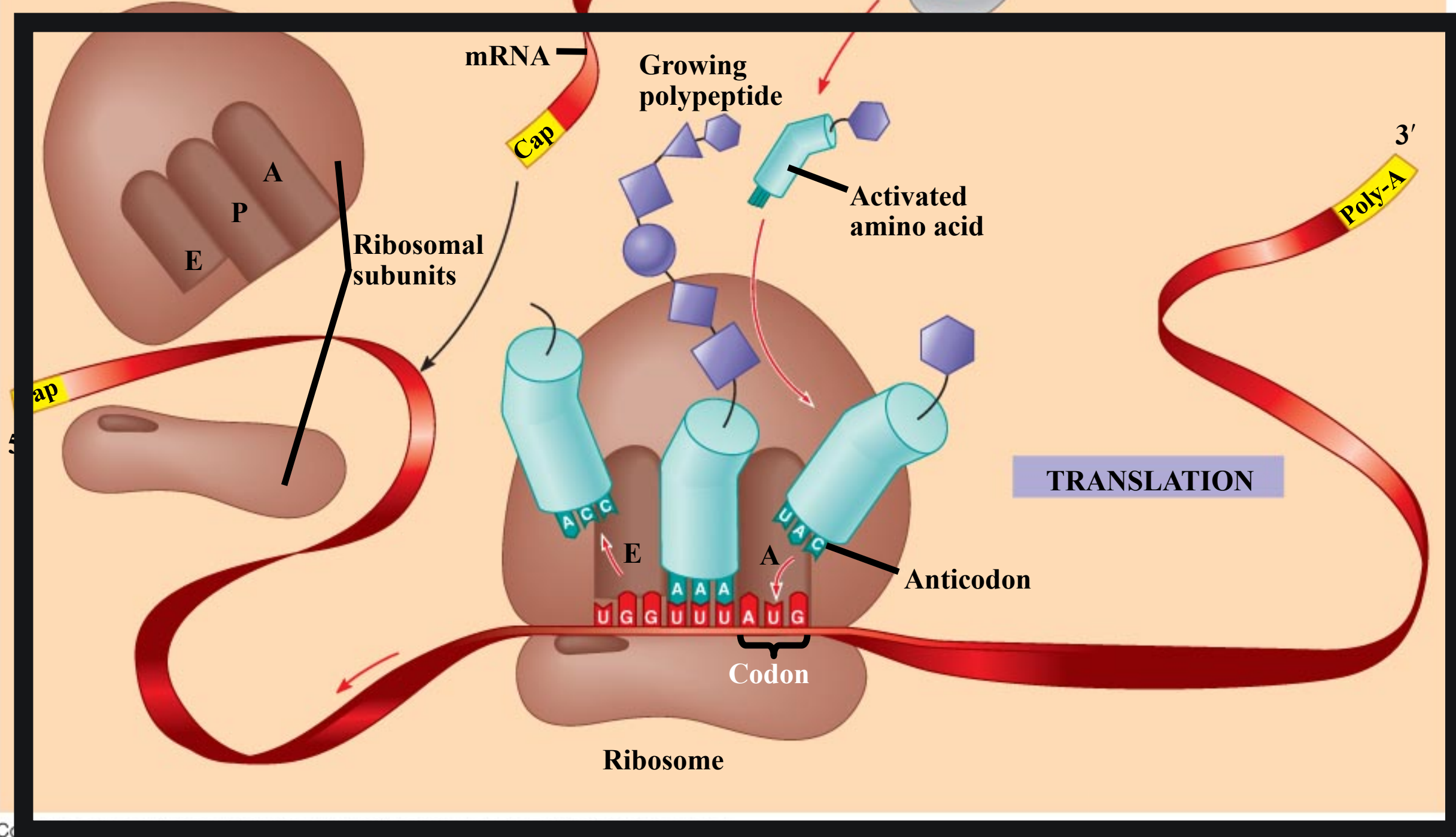
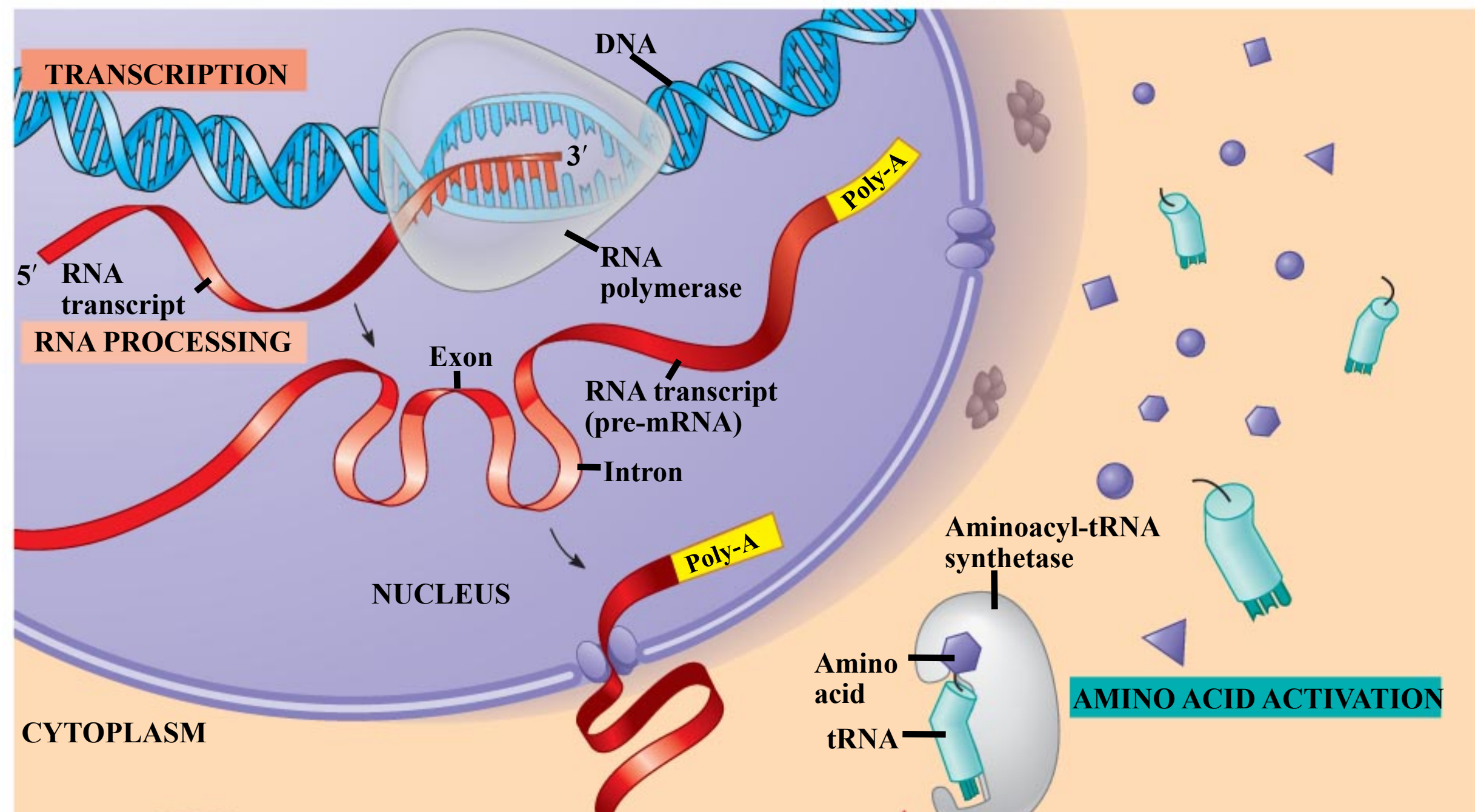


snRNAs work with a complex of proteins to form snRNPs
(pronounced “snurps”)

Spliceosome







Translation

Questions

Take a second...

- **Be ready to explain Figure 2 aloud to class.**

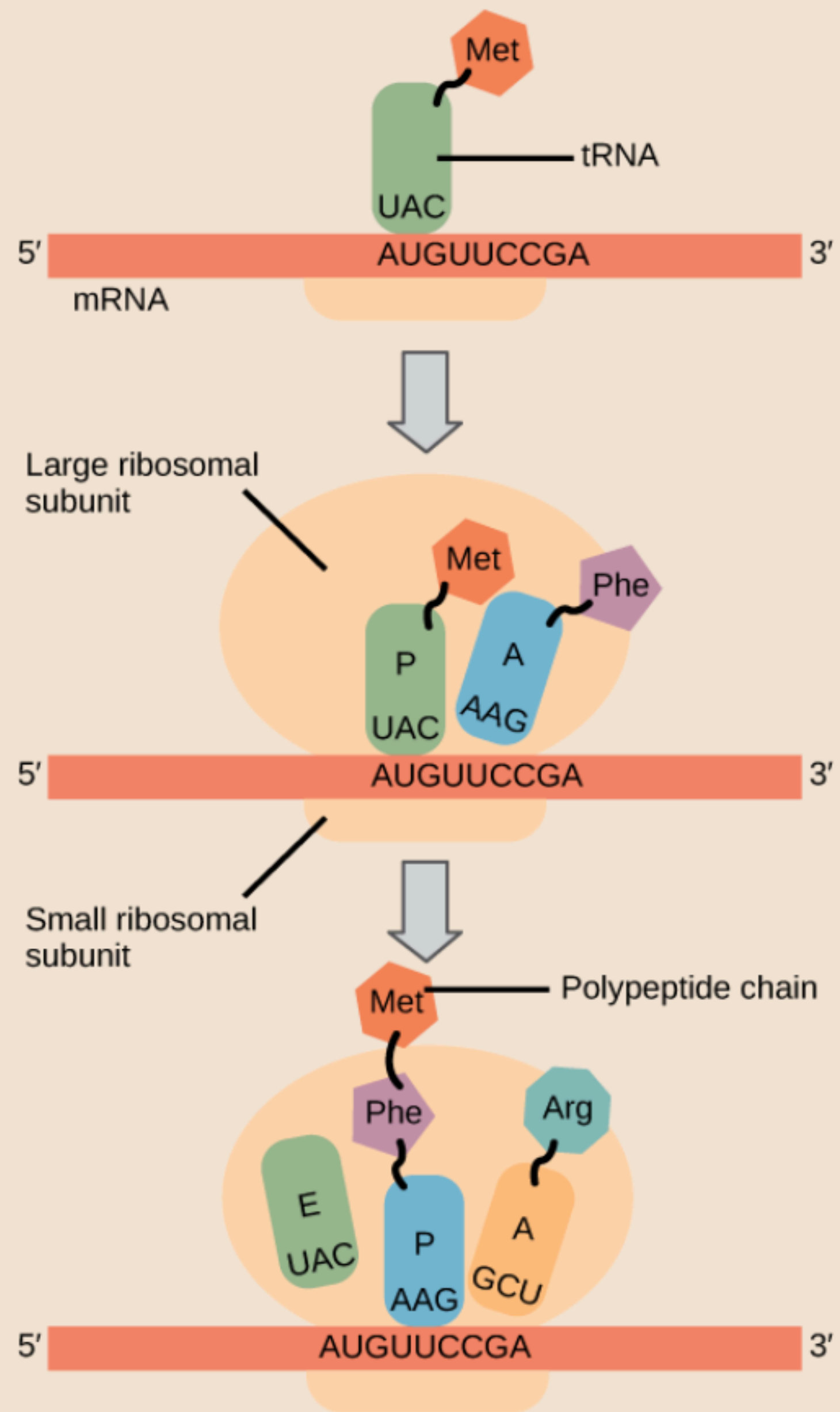
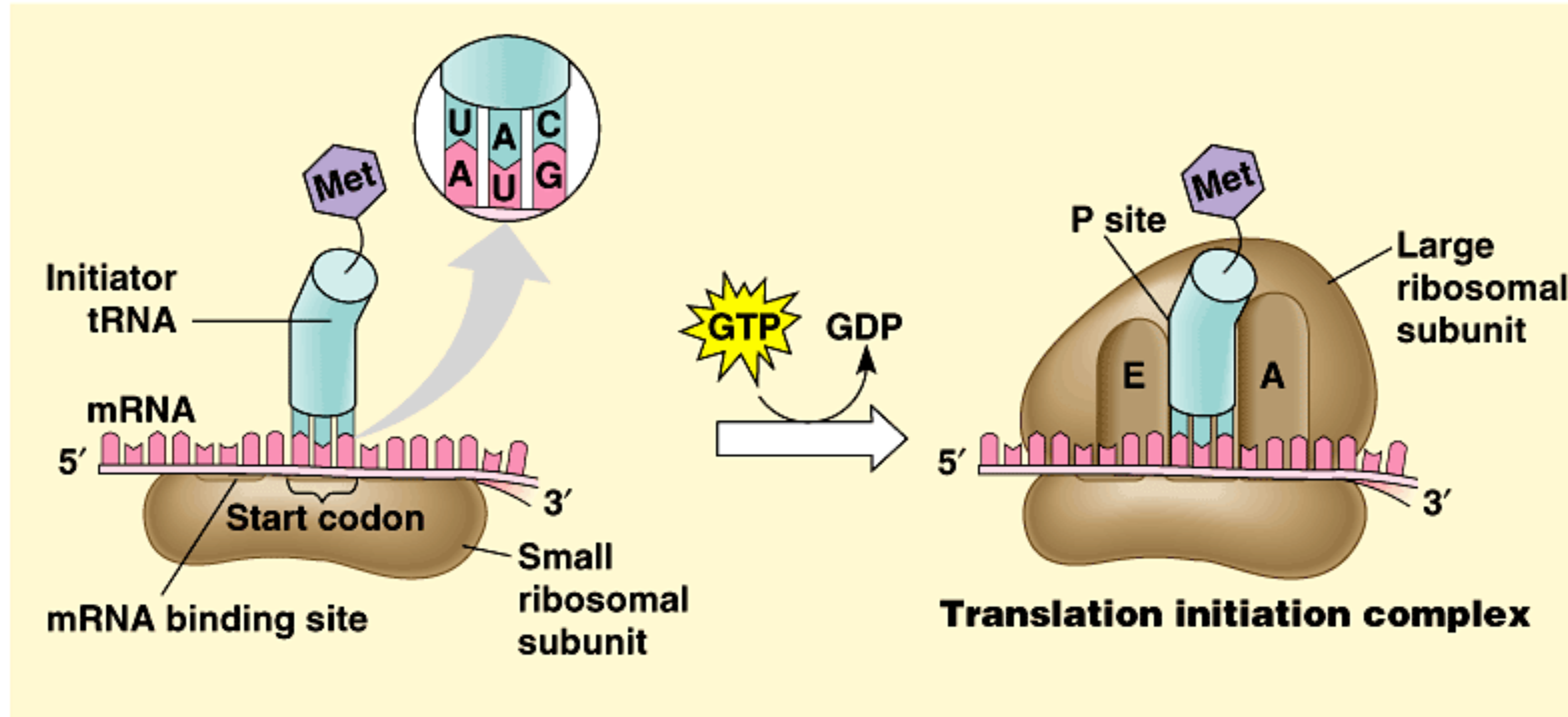
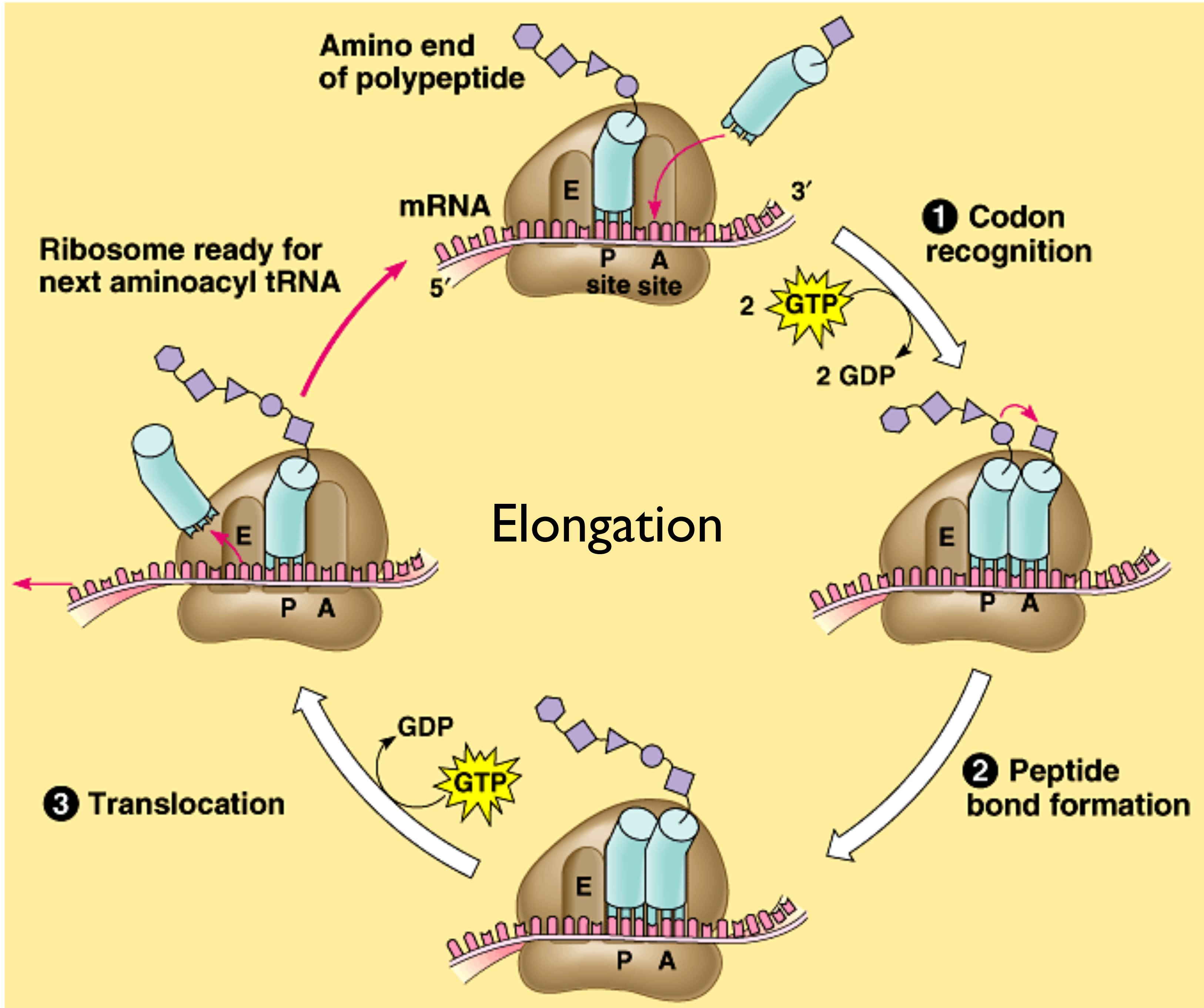


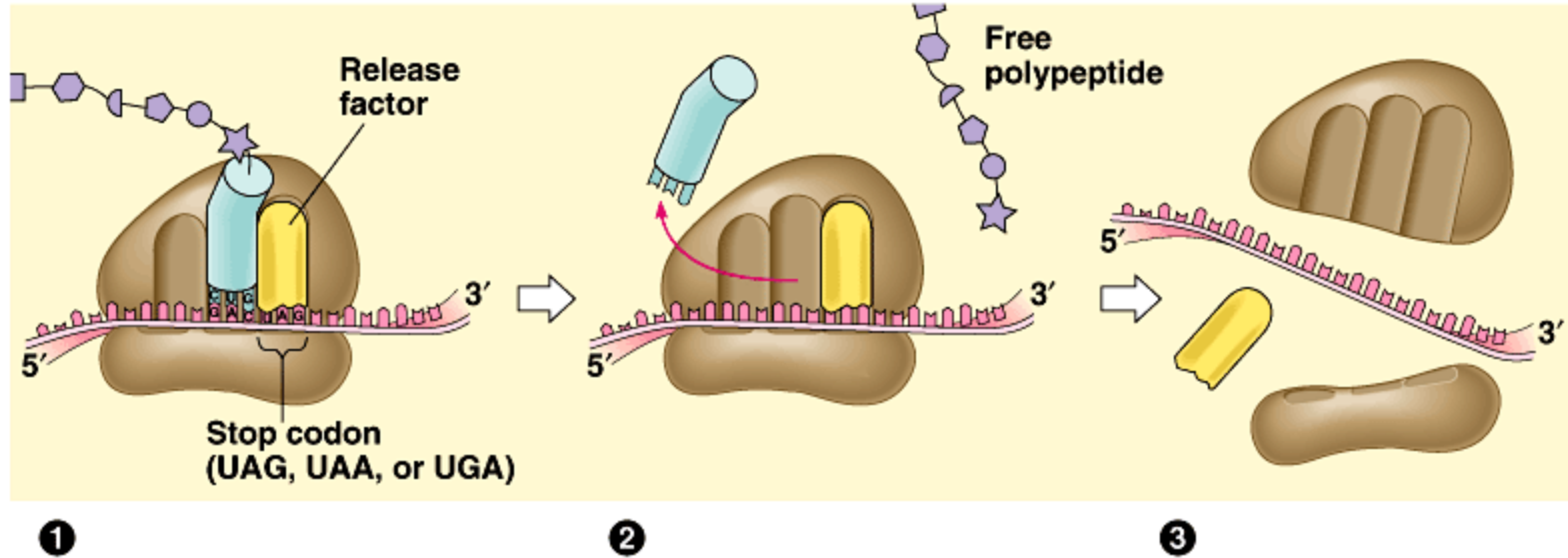
Figure 2: Translation begins when an initiator tRNA anticodon recognizes a codon on mRNA. The large ribosomal subunit joins the small subunit, and a second tRNA is recruited. As the mRNA moves relative to the ribosome, the polypeptide chain is formed. Entry of a release factor into the A site terminates translation and the components dissociate.

Initiation



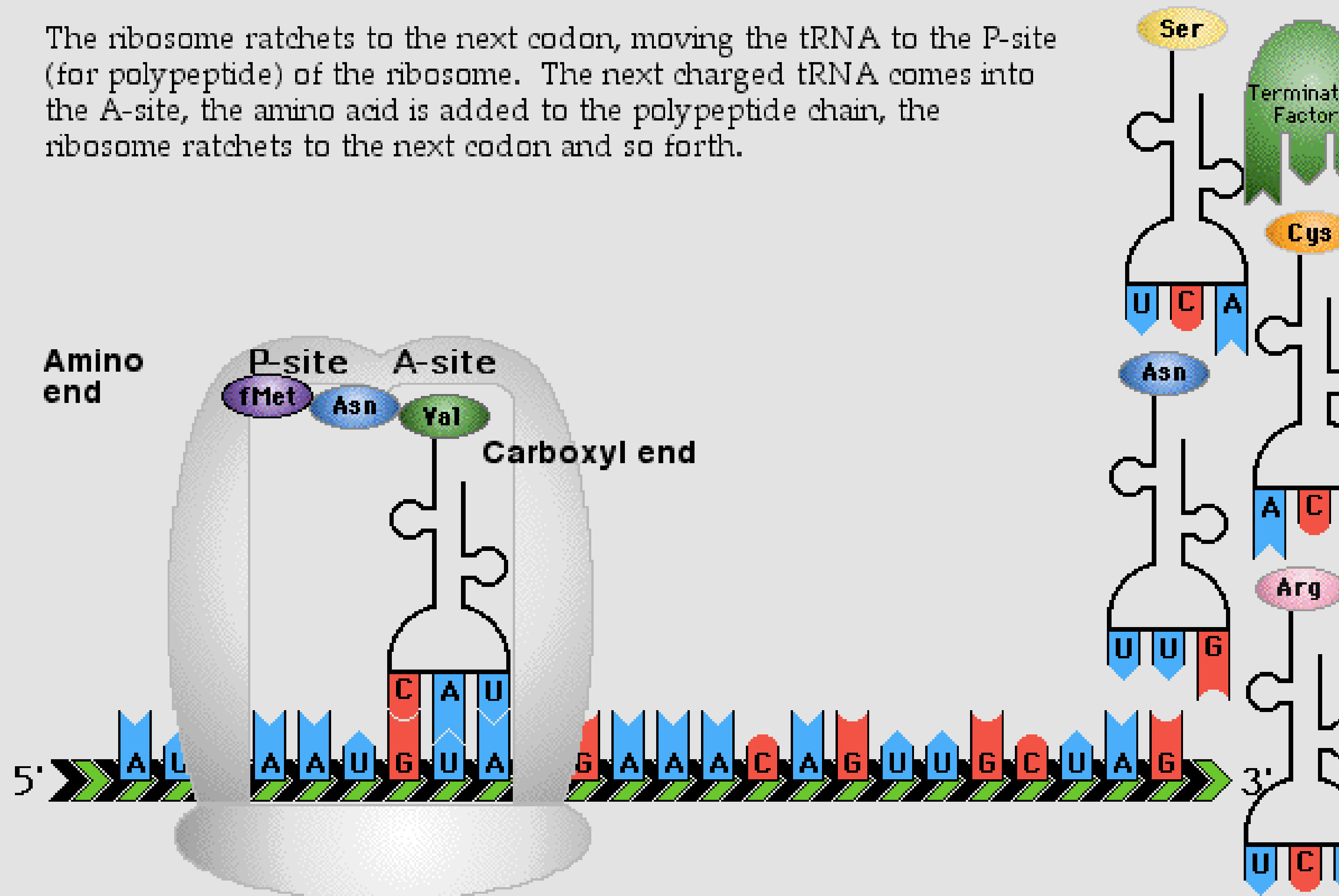


Termination



Translation steps

The ribosome ratchets to the next codon, moving the tRNA to the P-site (for polypeptide) of the ribosome. The next charged tRNA comes into the A-site, the amino acid is added to the polypeptide chain, the ribosome ratchets to the next codon and so forth.



Exit

Previous

Slower

Section 10

Faster

Next

Play

Questions

- **Where does folding occur? (& if goes wrong?)**

