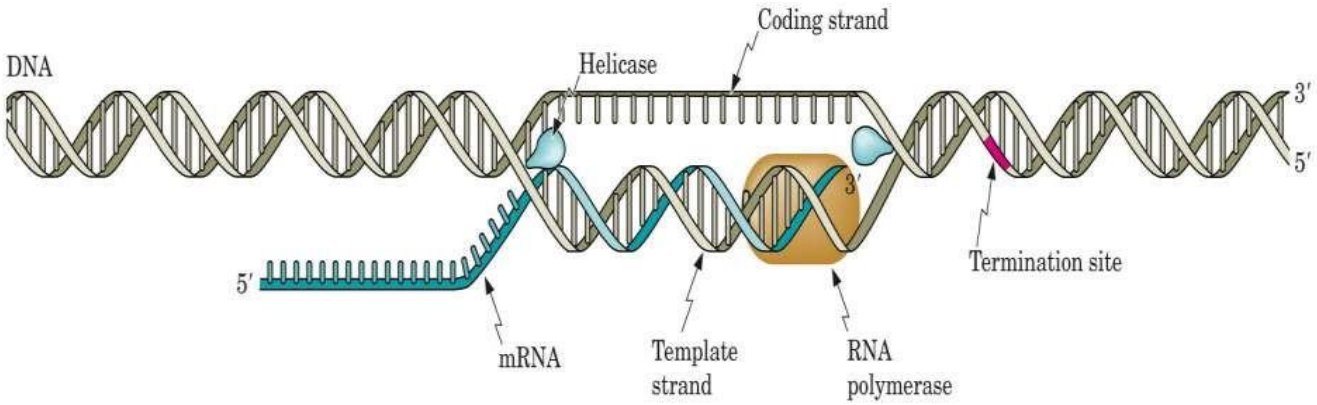
Transcription or RNA synthesis

Transcription is the process by which information encoded in a DNA molecule is copied into an mRNA molecule.

Its takes place in the nucleus. Transcription starts when the DNA double helix begins to unwind near the gene to be transcribed. Only one strand of the DNA is transcribed. Ribonucleotides assemble along the unwind DNA strand in a complementary sequence. Enzymes called polymerases (poly) catalyze transcription.

Transcription:

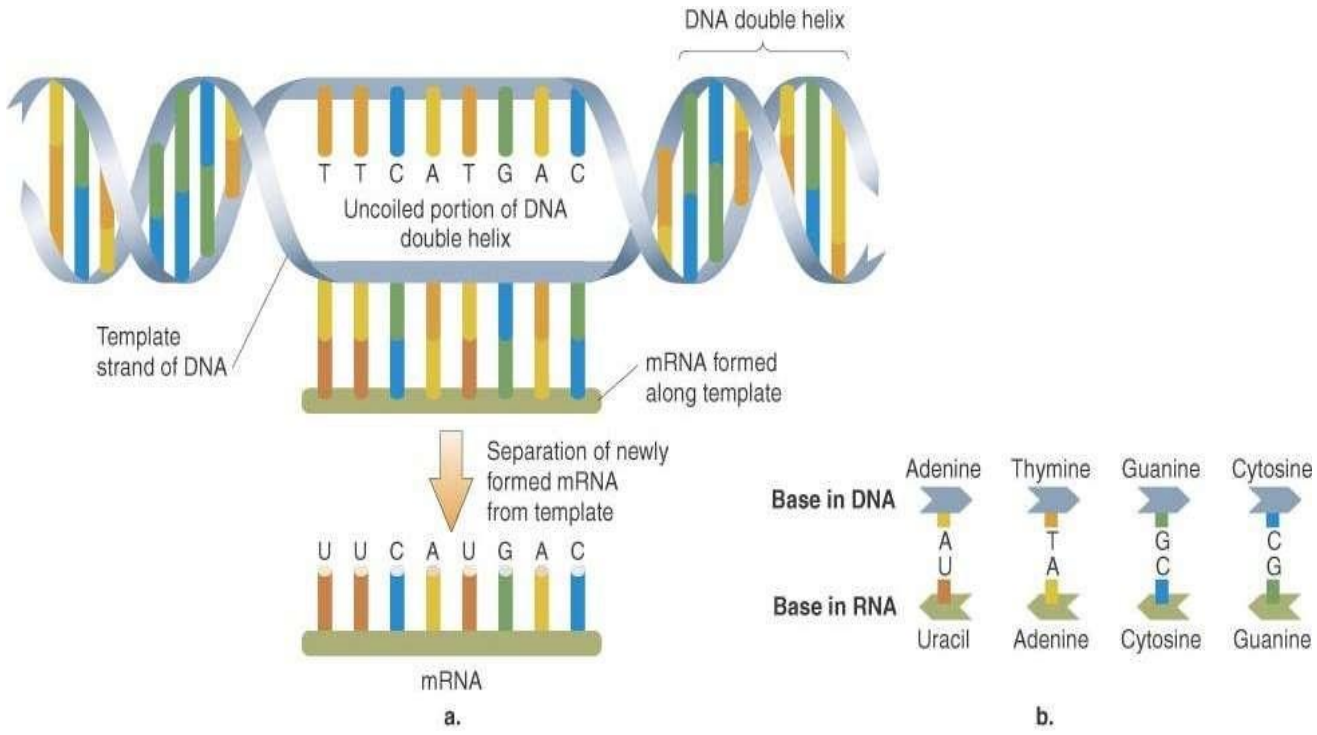
The information in one DNA strand is transcribed to a strand of RNA. The termination site is the locus of termination of transcription.



First step in protein synthesis

The segment of DNA that contains the necessary information, unwinds, to expose the bases

The exposed bases, provide the template for messenger RNA (mRNA) synthesis.



Initiation:

After RNA polymerase binds to the promoter, the DNA strands unwind, and the polymerase initiates RNA synthesis at the start point on the template strand.

Elongation:

The polymerase moves downstream,unwinding the DNA and elongating the RNA transcript 5 -3' . In the wake of transcription, the DNA strands re-form a double helix.

Termination:

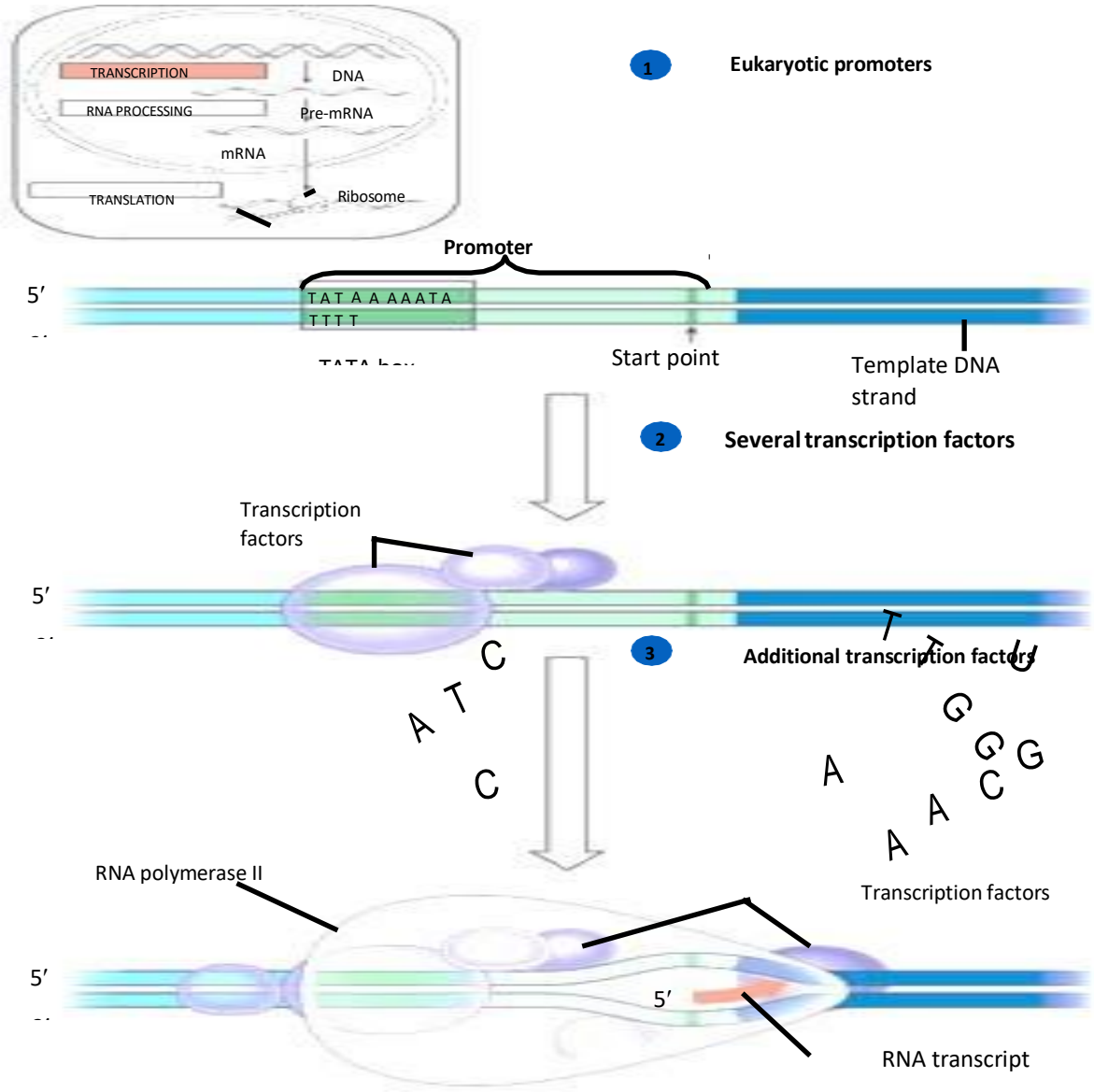
Eventually, the RNA transcript is released, and the polymerase detaches from the DNA.

synthesis of an RNA Transcript - Initiation

Promoters signal the initiation of RNA synthesis

Transcription factors help eukaryotic RNA polymerase recognize promoter sequences

A crucial promoter DNA sequence is called a TATA box.

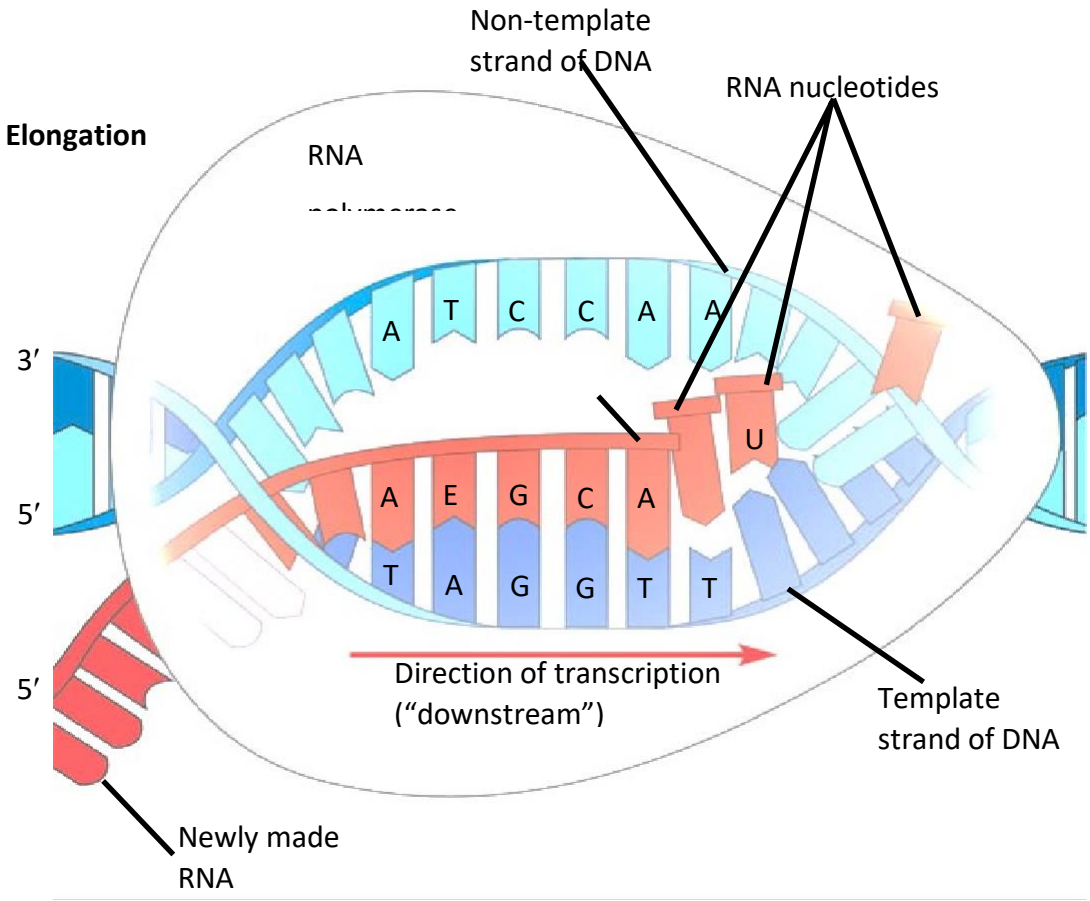


Synthesis of an RNA Transcript

Elongation

RNA polymerase synthesizes a single strand of RNA against the DNA template strand (anti-sense strand), adding nucleotides to the 3’ end of the RNA chain.

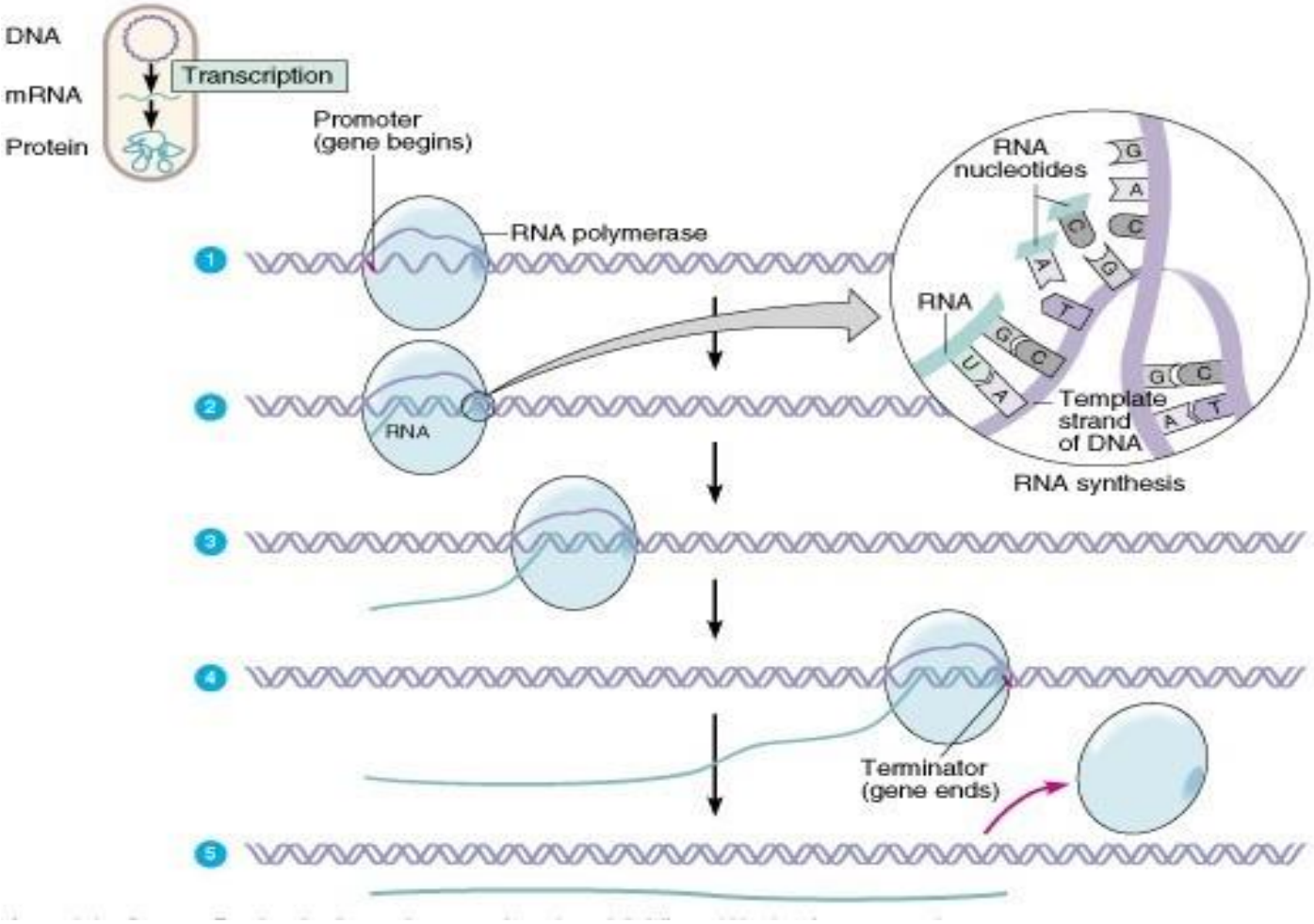
As RNA polymerase moves along the DNA it continues to untwist the double helix, exposing about 10 to 20 DNA bases at a time for pairing with RNA nucleotides.



Synthesis of an RNA Transcript -Termination

Specific sequence in the DNA signal termination of transcription.

When one of these is encountered by the polymerase, the RNA transcript is released from the DNA and the double helix can zip up again.


DNA
mRNA
Protein
Transcription
Promoter
(gene begins)
RNA polymerase
RNA
RNA nucleotides
RNA
Template strand of DNA
RNA synthesis
Terminator
(gene ends)
1
2
3
4
5

Post Termination RNA Processing

Most eukaryotic mRNAs aren't ready to be translated into protein directly after being transcribed from DNA.

mRNA requires processing.

Transcription of RNA processing occur in the nucleus. After this, the messenger RNA moves to the cytoplasm for translation.

The cell adds a protective cap to one end, and a tail of A's to the other end. These both function to protect the RNA from enzymes that would degrade it.

Most of the genome consists of non-coding regions called introns.

Non-coding regions may have specific chromosomal functions or have regulatory purposes.

Introns also allow for alternative RNA splicing.

Thus, an RNA copy of a gene is converted into messenger RNA by doing 2 things:

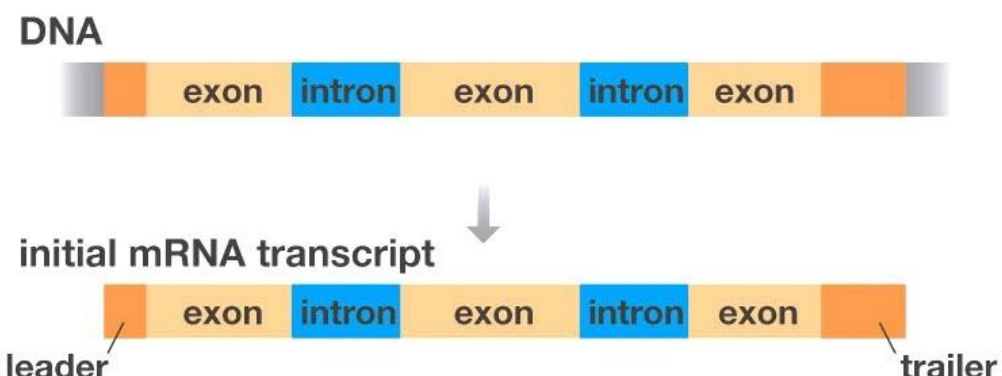
- Add protective bases to the ends.
- Cut out the introns.

RNA Processing - Splicing

The original transcript from the DNA is called pre-mRNA.

It contains transcripts of both introns and exons.

The introns are removed by a process called splicing to produce messenger RNA (mRNA).



Ribozymes are catalytic RNA molecules that function as enzymes and can splice RNA.

RNA splicing removes introns and joins exons.

RNA Splicing can also be carried outby spliceosomes.