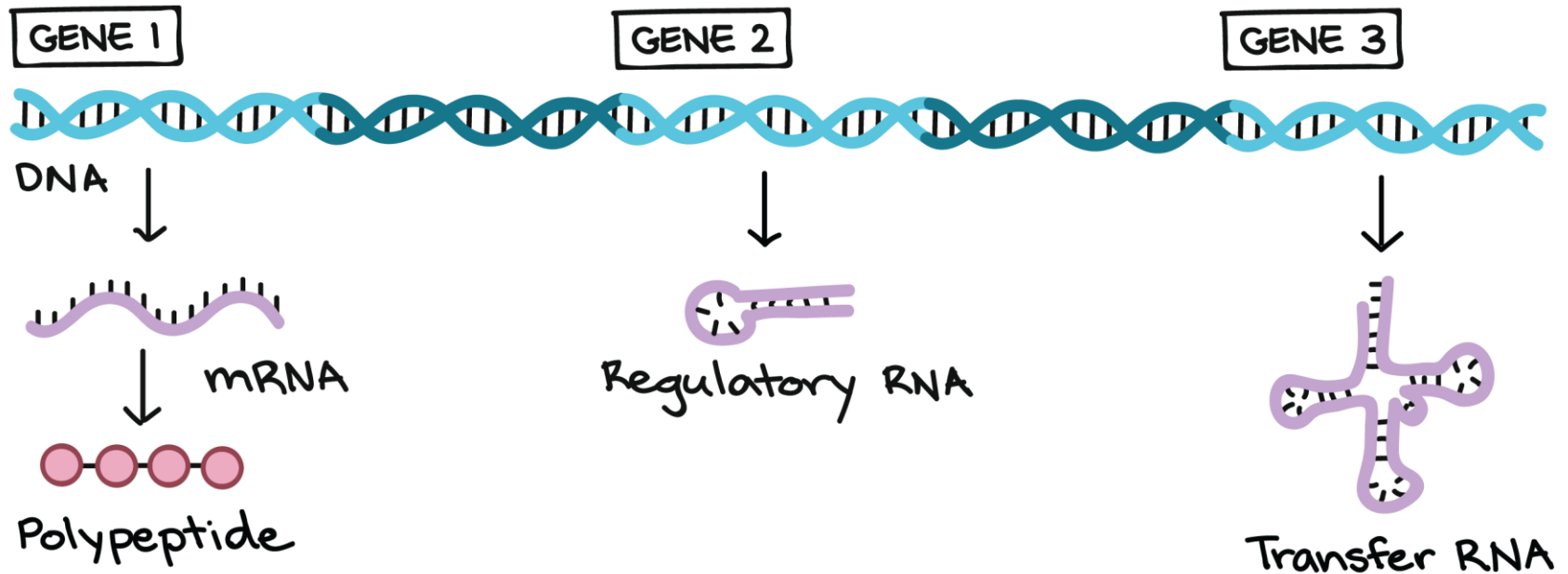


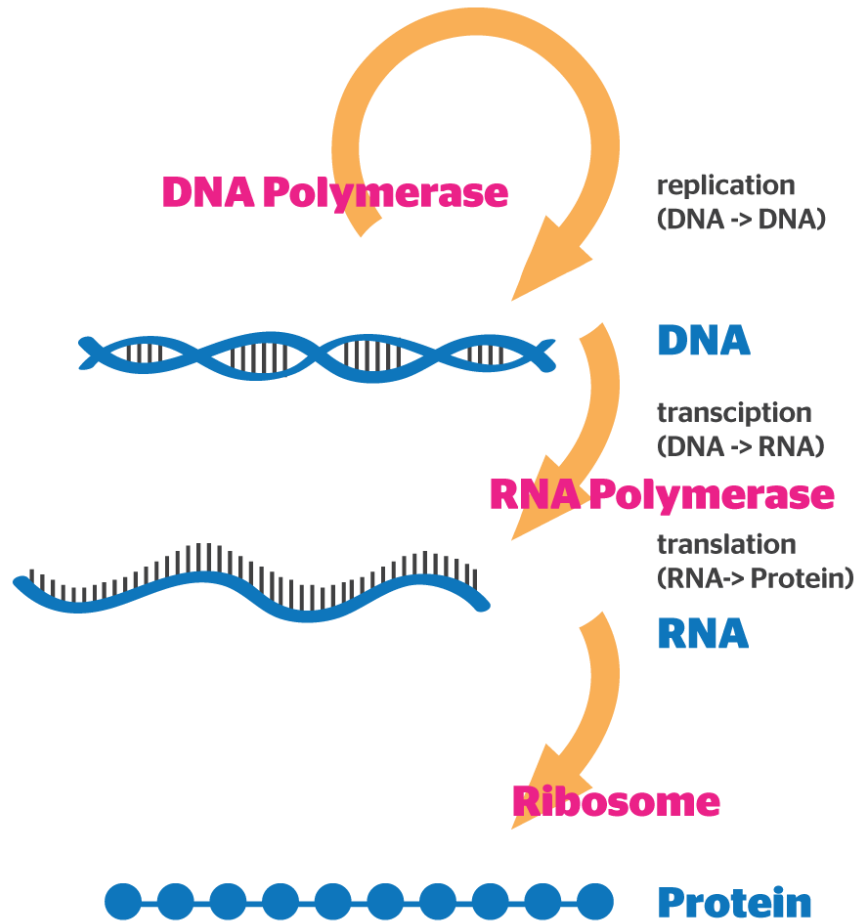
Gene Expression

Gene expression is the process by which information from a gene is used in the synthesis of a functional gene product.

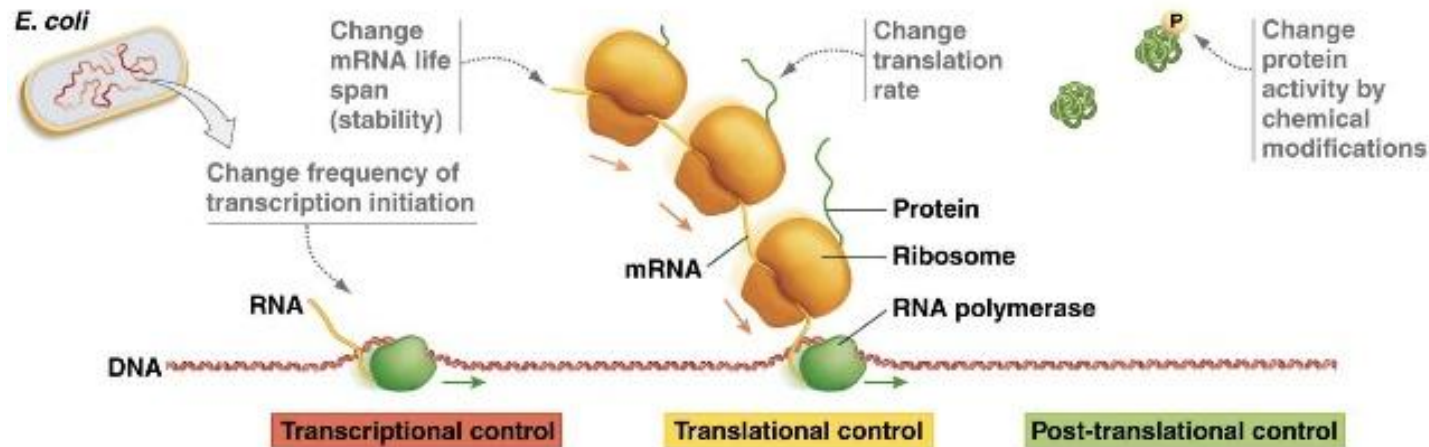
Functional gene products



Central dogma of molecular biology



Regulation of Gene Expression



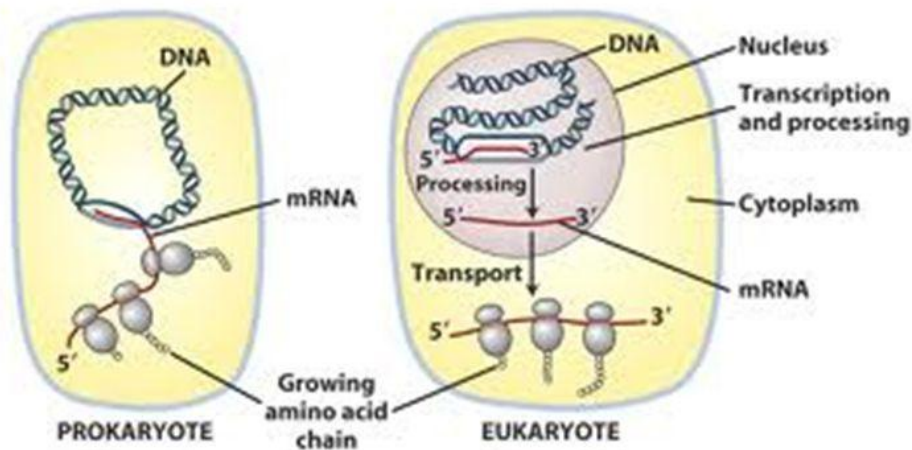
- Gene expression can be regulated:
 - During transcription (transcriptional control).
 - During translation (translational control).
 - After translation (post-translational control).

Differences in gene expression between prokaryotes and eukaryotes -1

- In prokaryotes transcription and translation often occurs simultaneously and co-localized
- In eukaryotes transcription occurs in nucleus. Messenger RNA is transported outside nucleus where it is translated

Bacteria vs. Eukaryotes

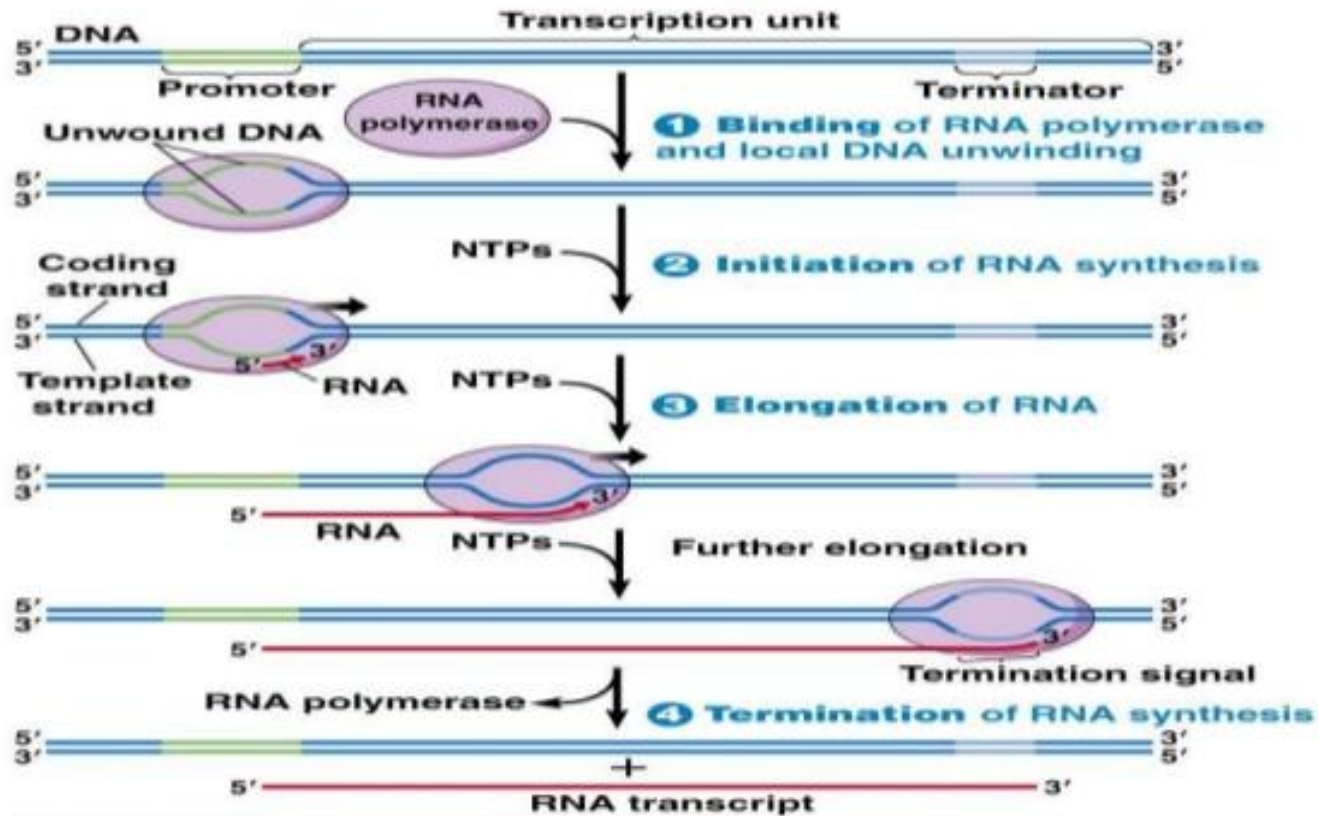
- Both alter their patterns of gene expression in response to changes in environmental conditions
 - This regulation often happens during transcription



DNA Transcription in prokaryotes

- There are 3 stages in the transcription process – initiation, elongation and termination.
- In bacteria transcriptional control is facilitated mostly through changes in frequency of initiation of transcription

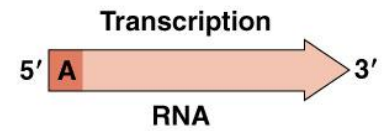
Overview of Prokaryotic DNA Transcription

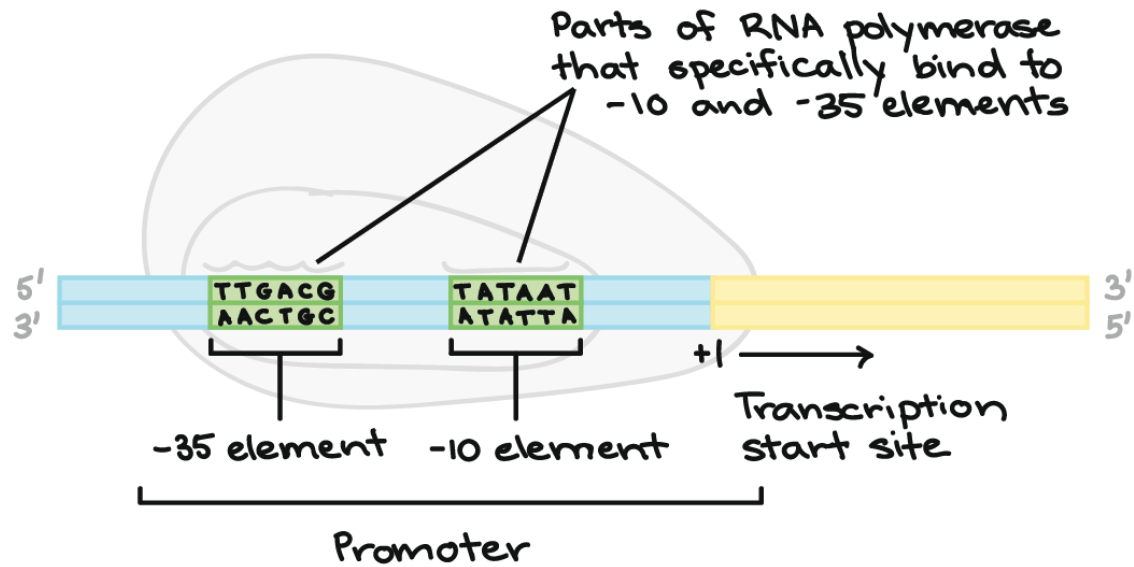


Bacterial promoter

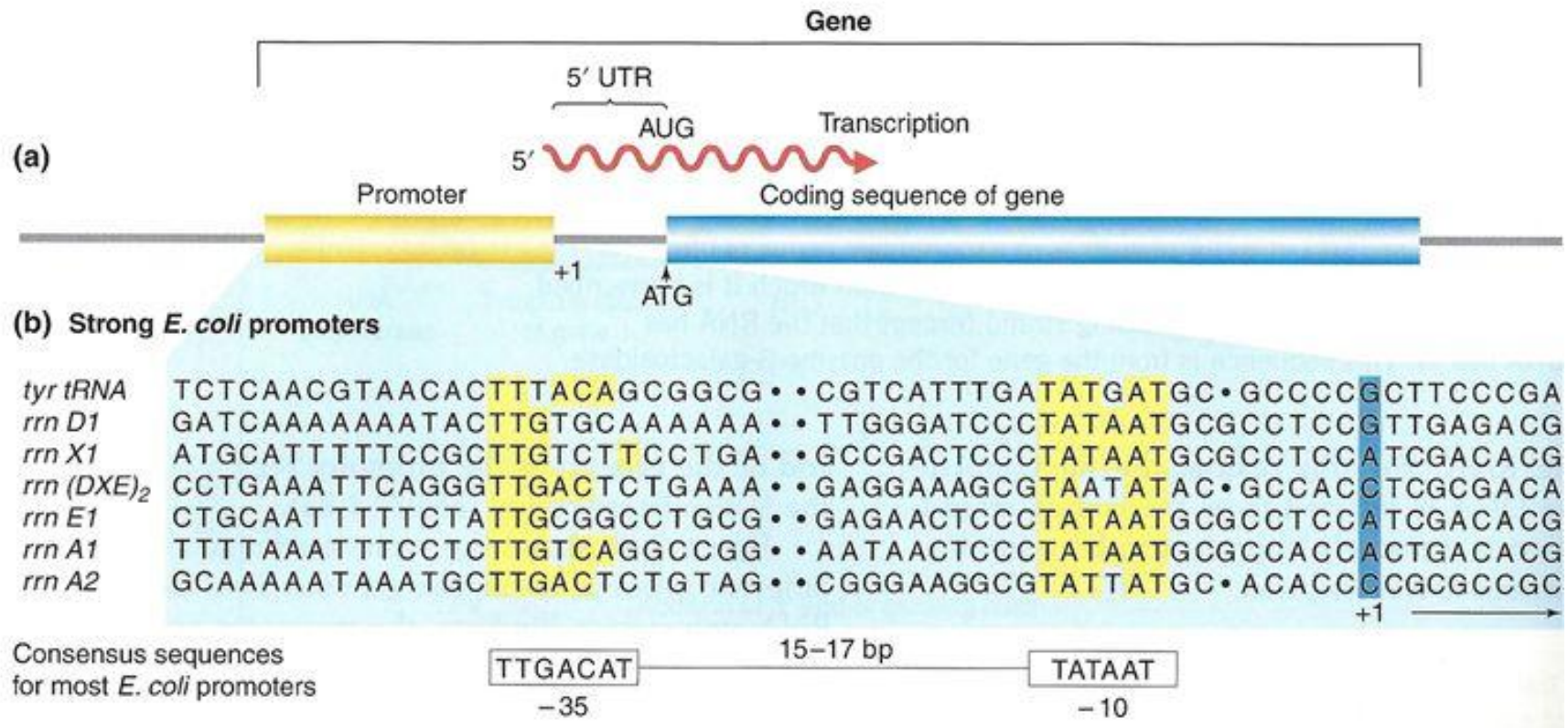
- In genetics, a promoter is a region of DNA that initiates transcription of a particular gene.
- In bacteria, the promoter contains two short sequence elements approximately 10 (Pribnow Box) and 35 nucleotides upstream from the transcription start site.

Promoter DNA





Promoters may differ from the consensus sequence



Typical Bacterial Promoter

82 84 78 65 54 48

TTGACA

-35

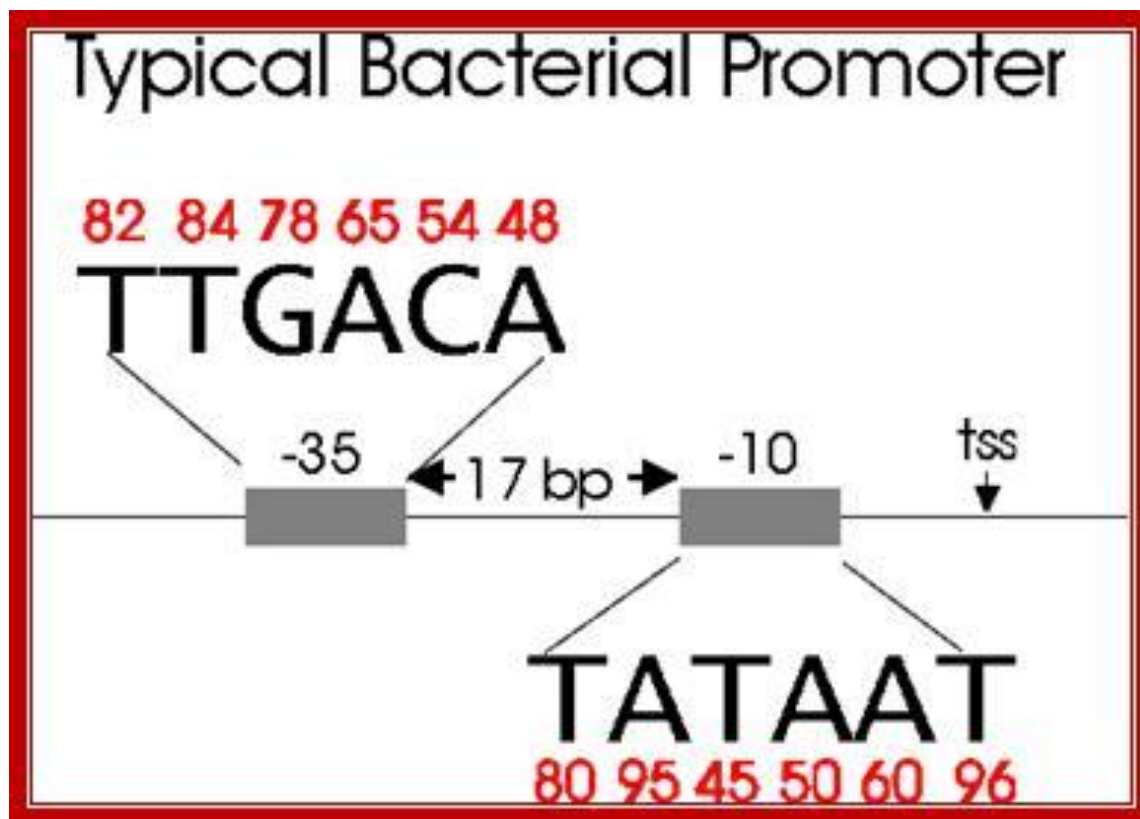
← 17 bp →

-10

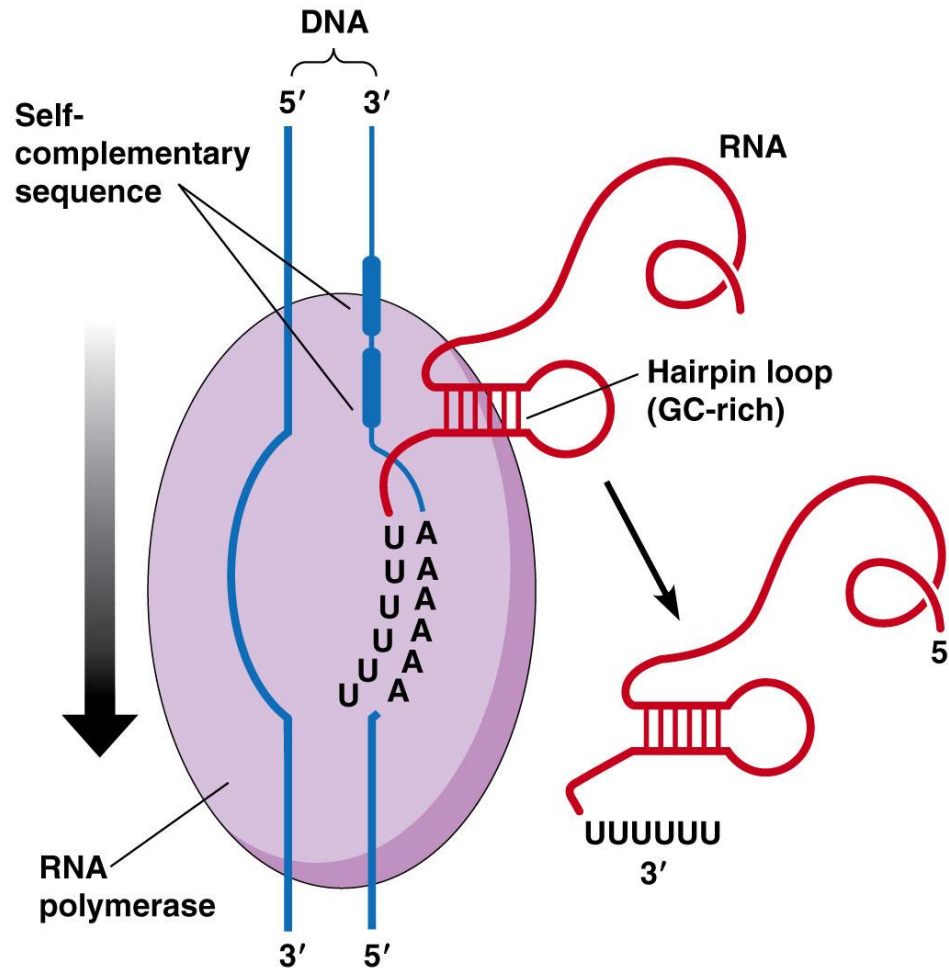
tss
↓

TATAAT

80 95 45 50 60 96



Termination of transcription in prokaryotes



- -35 and -10 sequences determine the rate of a bacterial gene transcription – “*strength of the promoter*”
- Cell might need some proteins all the time. These proteins are synthesized continuously at the same rate. This is called *constitutive* gene expression.
- Other proteins could be synthesized in response to an external stimulus, e.g. certain nutrient present in the growth medium.