

Source: [KBhBIO101ProteinSynthesis](#)

1 | DNA Transcription

The process of DNA transcription is done by the RNA Polymerase Enzyme. DNA transcription begins by ripping apart hydrogen bonds using DNase enzyme, then the RNA polymerase reads one side (the “template strand”, a.k.a. noncoding “antisense” strand that runs from 3’ to 5’) of the double helix, recognizing each nucleotide.

The point of transcription is to recognize the series of promoters that code for a gene and copying them into the appropriately matching mRNA.

Definition 1 · **Gene** information that successfully encodes a functional protein or a functional catalytic RNA

1.1 | Starting Transcription

1. Series of utility “factors” proteins begin to assemble at the promoter which signals transcription to call the attention of RNA polymerase.
2. RNA polymerase binds to the Sigma Subunit => form a holoenzyme to unwind DNA — creates a **transcription bubble**
3. Sigma subunit informs the enzyme where to find a promoter (beginning of binding)
4. “Enhancer” gene sequences help bind with activator proteins to help attract RNA polymerase II

Promoters Promoters are the signaling devices that mark the beginning of a nucleotide in a gene. The strength of promoters could be modulated to create different rates of transcription. Stronger promoters/enhancers => “enhance” “more.” i.e. tumor viruses strengthen promoters for cell growth

1.2 | Actually transcribing

The RNA Polymerase Enzyme starts at a promoter (typically found upstream of the 5’ start site) and ends at a terminator.

- A Box of TATTAA highlights transcription rate and the start site
- TFIIA cofactor in RNA (polymerase?) recognizes TATTAA box, TFIIB recognizes C/CG/CG/CGCCC upstream

The RNA polymerase will pluck the correct corresponding nucleotide out of the nucleus to form the antiparallel mRNA sequence.

- G->C
- C->G
- A->U
- T->A

1.3 | Finishing Transcription

RNAs could also be catalysts!

Terminators

- Found in the end of the template sequence

- Two types in prokaryotes
 - Rho-independent terminators — roll back onto itself, causing the RNA to terminate and mRNA to be released
 - Rho-dependent terminators — activate cofactor named rho + unwind the transcribed RNA-DNA hybrid
- In Eukaryotes
 - Pol I genes — transcription stopped through termination factor by unwinding the transcribed RNA-DNA hybrid
 - Pol II genes — don't stop until the end, but a polymerase has a "cleavage" mechanism that clips the end out using a poly(A) tail consensus sequence

1.3.1 | **Before we continue, two words**

- *Non-coding sequence*: metadata for DNA for the processors
- *Coding sequence*: DNA content for amino-acid production