

What Is The Role Of RNA Polymerase In Transcription?

RNA polymerase is a complex enzyme that plays multiple roles in the process of transcription:

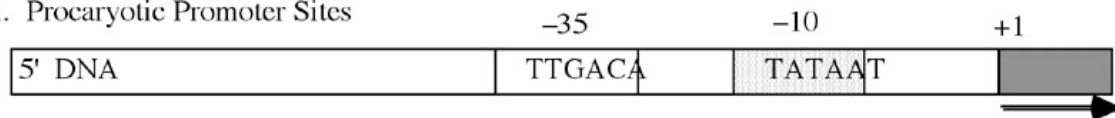
1. It searches DNA for initiation sites, that is, promoter sites. *E. coli* DNA, for instance, has about 2,000 promoter sites in its 4×10^6 base pairs.
2. It unwinds a short stretch of double-helical DNA to produce a single-stranded DNA template from which it takes instructions.
3. It selects the correct ribonucleoside triphosphate and catalyzes the reaction in which the ribonucleotides are added to the 3' -OH end of RNA.

What Are Promoter Sites?

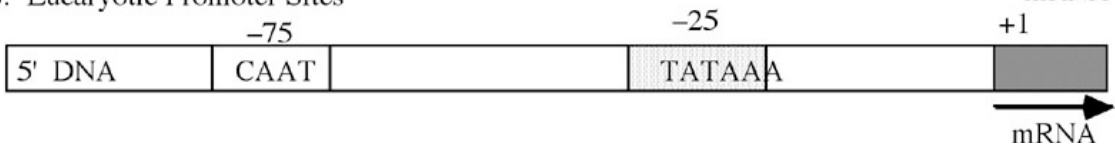
DNA contains initiation sites called **promoters** that specifically bind RNA polymerase and determine where transcription begins. In prokaryotic cells, two sequences on the 5' (upstream) side of the first nucleotide to be transcribed are important (See Fig. A). One has the consensus sequence TATAAT and is centered at -10 (10 nucleotides on the 5' side of the first one transcribed, which is denoted by +1). The other, the -35 region, has the consensus sequence TTGACA.

Eukaryotic genes encoding proteins have promoter sites with a TATAAA consensus sequence centered at about -25 (Fig. B). Many eukaryotic promoters also have a CAAT box centered about -75. Transcription of eukaryotic genes is also facilitated by **enhancer** sequences that can be quite distant from the start site.

A. Prokaryotic Promoter Sites



B. Eucaryotic Promoter Sites



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