

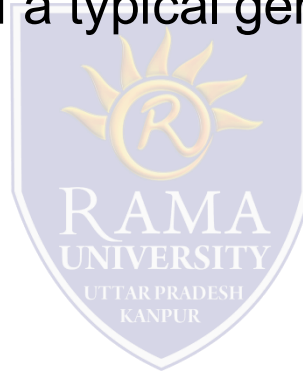


FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY

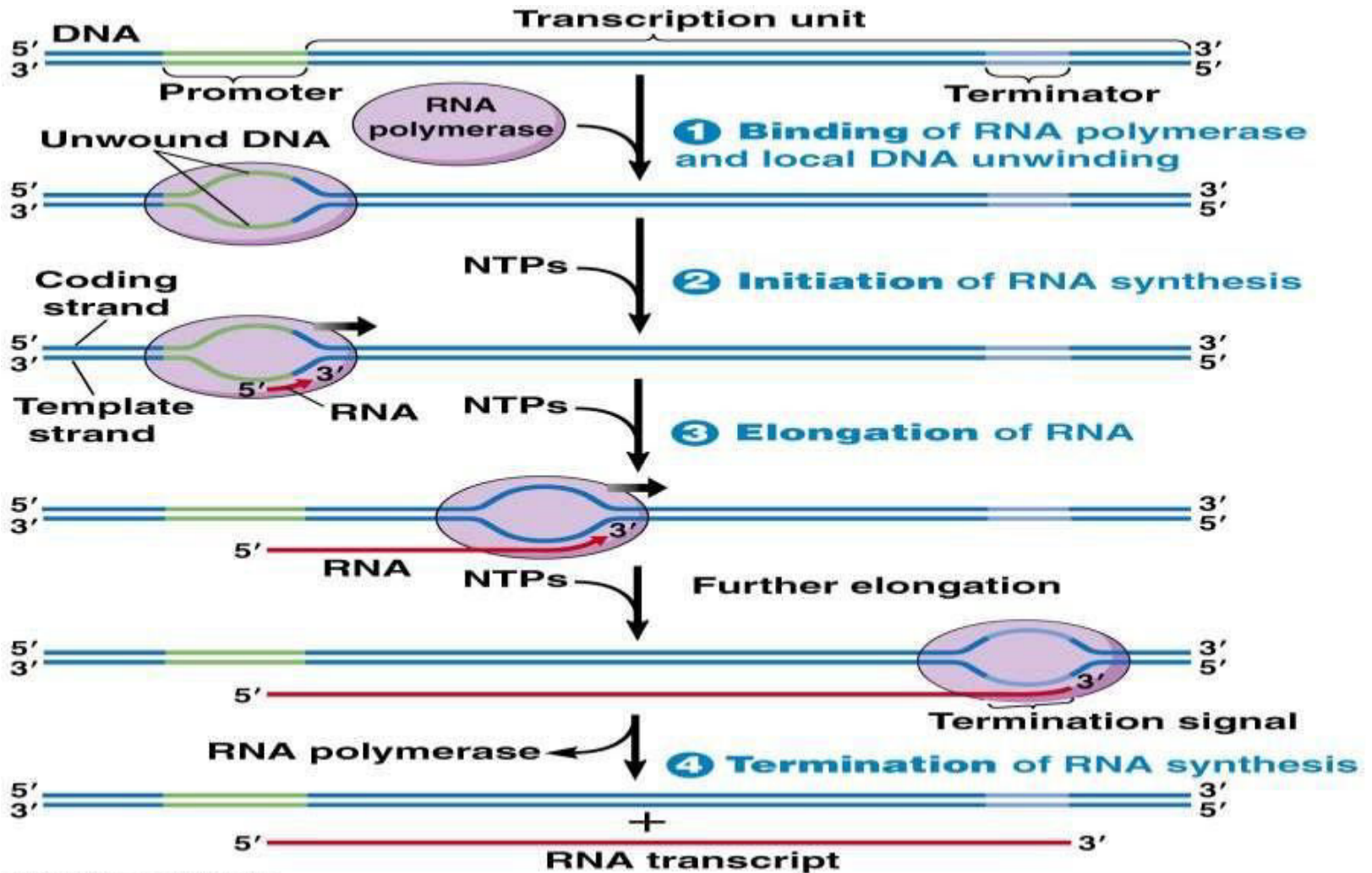
Steps of RNA Synthesis-

The process of transcription of a typical gene of *E. Coli* can be divided in to three phases-

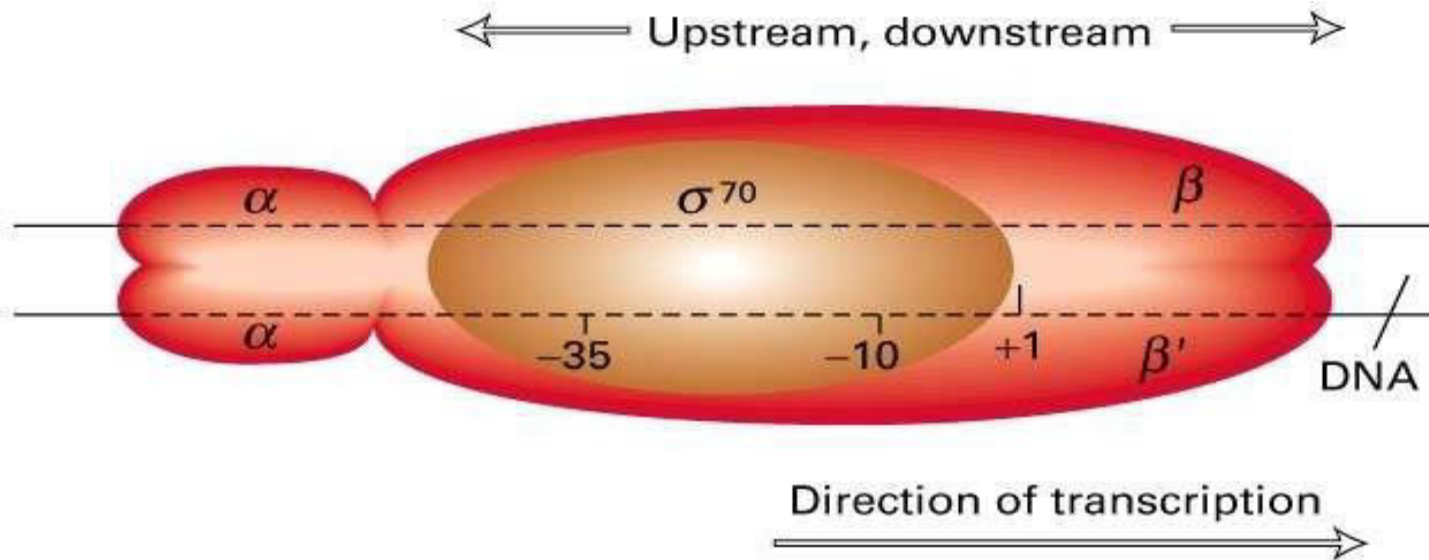
- i) Initiation
- ii) Elongation
- iii) Termination



Overview of Prokaryotic DNA Transcription



Initiation of Transcription



- Initiation of transcription involves the binding of the RNA polymerase holoenzyme to the promoter region on the DNA to form a **preinitiation complex, or PIC**
- Characteristic "Consensus" nucleotide sequence of the prokaryotic promoter region are highly conserved.

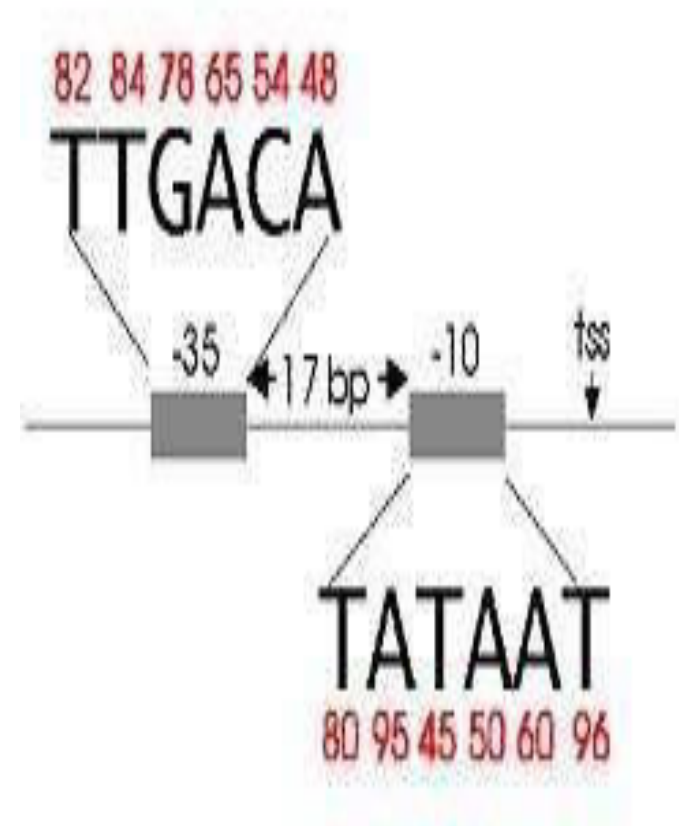
Structure of bacterial prokaryotic promoter region

Pribnow box

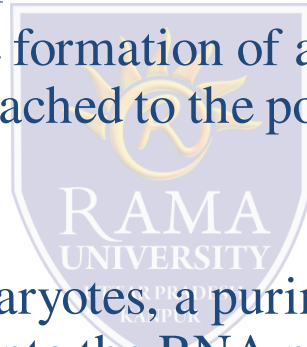
- This is a stretch of 6 nucleotides (5'-TATAAT-3') centered about 8- 10 nucleotides to the left of the transcription start site.

-35 Sequence

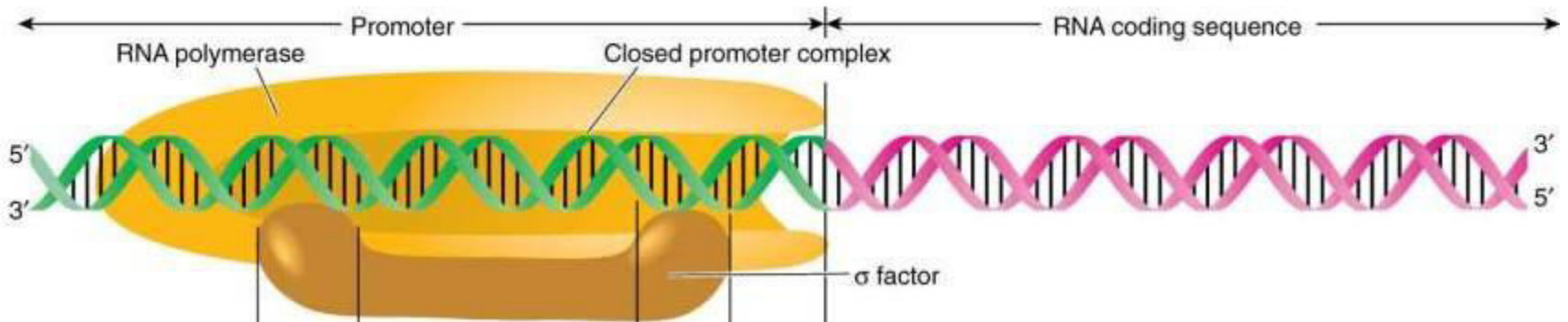
- A second consensus nucleotide sequence (5'-TTGACA-3'), is centered about 35 bases to the left of the transcription start site.



- Binding of RNA-polymerase (RNAP) to the promoter region is followed by a conformational change of the RNAP, and the first nucleotide (almost always a purine) then associates with the initiation site on the subunit of the enzyme.
- In the presence of the appropriate nucleotide, RNAP catalyzes the formation of a phosphodiester bond, and the nascent chain is now attached to the polymerization site on the subunit of RNAP.
- In both prokaryotes and eukaryotes, a purine ribonucleotide is usually the first to be polymerized into the RNA molecule.
- After 10–20 nucleotides have been polymerized, RNAP undergoes a second conformational change leading to **promoter clearance**.
- Once this transition occurs, RNAP physically moves away from the promoter, transcribing down the transcription unit, leading to the next phase of the process, elongation.



a) In initiation, the RNA polymerase holoenzyme first recognizes the promoter at the -35 region and binds to the full promoter.



b) As initiation continues, RNA polymerase binds more tightly to the promoter at the -10 region, accompanied by a local untwisting of the DNA in that region. At this point, the RNA polymerase is correctly oriented to begin transcription at +1.

