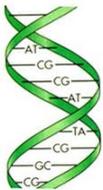


DNA Transcription

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What is Transcription?



Transcription is the process where the synthesis of RNA using the template of DNA.

It is the process of copying genetic information from one strand of the DNA into RNA.

Ribonucleic acid (RNA)

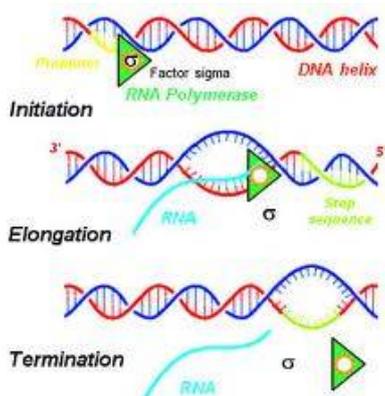
Occurrence of RNA :

RNA is present in all organisms-prokaryotes, eukaryotes, viruses and virioids. In eukaryotes, RNA is present both in cytoplasm (90%) and nucleus. In prokaryotes it is present in the cytoplasm and ribosomes. In some viruses, it is the genetic material.

Chemical composition of RNA

[RNA](#) is a polynucleotide chain with 5' phosphate and 3'-OH polarity. This polynucleotide chain is made up of repeating sequence of monomeric nucleotides arranged in a linear polynucleotide chain. Each monomeric nucleotide is made up of components.

1. A five carbon (pentose) sugar-ribose sugar
2. A phosphoric acid group
3. A nitrogenous base (either purine or pyrimidine)

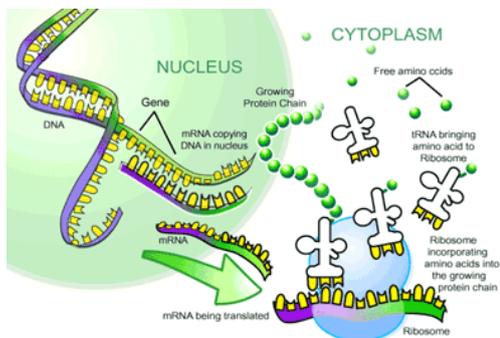


Components required for transcription

1. DNA strand
2. Ribonucleotide Triphosphates such as [ATP](#), GTP, UTP and OTP.
3. RNA polymerase
4. Divalent metal ions such as Mn^{++} or Mg^{++}
5. Protein factors such as rho

Transcription Process :

1. Transcription involves three main steps, namely initiation, elongation of RNA strand and termination of transcription.
2. In transcription, one strand of DNA functions as a template called the template strand.
3. The template strand has a special region called [promoter](#). This region is located near the 5' end. The RNA synthesis starts from the promoter.
4. The promoter region has a set of sequences which actually initiates RNA synthesis. This sequence is called initiation site.
5. During [transcription](#), the sigma factor (σ) combines with the core enzyme to form RNA polymerase. RNA polymerase moves near the template DNA,
6. The RNA polymerase recognizes the promoter site of DNA and gets attached with it. The recognition is actually done by the sigma factor.
7. In this region, the DNA strand unwinds and a gap is formed.
8. The nucleotide complementary to the first base of the initiation site of the template DNA, gets attached to the RNA polymerase.
9. The first nucleotide to be incorporated into the RNA chain is usually either ATP or GTP. This means that the first base of a gene will be a pyrimidine, either T or C.
10. Then a second nucleotide triphosphate is attached to first nucleotide through the RNA polymerase.
11. In this way, nucleotide triphosphates are added one by one and the RNA chain grows and elongates.
12. The first nucleotide forms the 5' end and hence the RNA strand elongates in the 5' - 3' direction.
13. The elongating [RNA](#) has a base sequence complementary to sense-strand of the DNA.
14. When the elongating RNA chain is about 10 base long, the sigma factor dissociates from the core enzyme and is available to bind to free core enzyme to initiate a new round of transcription.
15. As transcription proceeds, the unwound part of the DNA strand reforms its original double helix.
16. In DNA, at a particular site, the transcription is stopped. This site is called termination site or pause site. In the termination site, the sequence is poly A, ie. AAAAAA. When the RNA polymerase reaches this site, the addition of nucleotides to the RNA is stopped.
17. The stop sequence on the DNA strand is recognised by the [RNA](#) polymerase with the association of some protein factors such as rho factor (ρ) or sizing factor (SF). The rho factor was discovered by Roberts (1969) in E.coli
18. The RNA chain grows at a rate of 40 to 50 nucleotides per second in E.coli



What is the difference between a transcription and translation?

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Reference Links:

- http://en.wikipedia.org/wiki/Nucleic_acid
- http://en.wikipedia.org/wiki/Transcription_%28genetics%29
- <http://en.wikipedia.org/wiki/DNA>
- http://en.wikipedia.org/wiki/Ribosomal_RNA
- http://www.youtube.com/watch?v=OEWOZS_JTgk

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