EUKARYOTIC TRANSCRIPTION

Eukaryotic transcription occurs inside the nucleus. It begins with initiation wherein transcription factors bind to the promoter region, namely -19 TATA or -70 CAAT which are AT-rich regions that are easy to break and are located before the transcribed regions, and recruit the RNA polymerase to attach to the same region. Elongation then follows where a protein dimer unwinds the DNA ahead of RNA Pol II while the latter synthesizes mRNA in a 5' to 3' direction by adding a complementary nucleotide that enters through the NTPs channel to each nucleotide in the template strand. Meanwhile, the rest of the synthesized RNA molecule falls off the template allowing the DNA behind it to rewind, forming a transcription bubble. The mRNA will then be nearly identical to the non-template, or coding, strand; however, mRNA will have the base uracil in place of thymine. Afterwards, RNA Pol II will continue to transcribe past the actual end of the gene, and termination only happens when the transcript is cleaved at an internal site before transcription is even finished which releases its upstream portion. The remainder of the transcript is then digested by a 5′-exonuclease while it is still being transcribed. When the 5′- exonuclease catches up to the polymerase, it helps the latter disengage from the template strand thus terminating the transcription. Finally, the mRNA undergoes processing in which a cap is added to its 5' end by a phosphate linkage, and a string of A nucleotides, called the poly (A) tail, is added to its 3′ end by the poly (A) polymerase for protection from degradation while it is processed and exported out of the nucleus. Introns, intervening sequences that do not encode functional proteins, are also removed from the transcript. This process results to a mature mRNA that is ready for translation.