- Transcription in eukaryotes is undertaken by different RNA polymerases.
- Eukaryotes have 3 polymerases : Pol I, II & III.
- Several initiation factors are required for efficient & promoter-specific initiation in eukaryotes, and are called as general transcription factors (GTFs).
- In vitro, the GTFs is required, together with Pol II, to initiate transcription on a DNA template.
- Sometimes the GTFs are not sufficient to promote significant expression. Rather, the additional factors are required such as mediator complex, DNA binding regulatory proteins and chromatin modifying enzymes.

CORE PROMOTER :

- It refers to the minimal set of sequence elements required for accurate transcription initiation by Pol II.
- A core promoter is about 40 nucleotides long, extending either upstream or downstream of the transcription start site.
- Relative to the transcription start site, there are 4 elements found in Pol II core promoter.
- These are the TFIIB recognition element (BRE), the TATA element, the initiator (Inr) & the downstream promoter elements (DPE).
- Promoter includes only 2 or 3 of these 4 elements.

PRE INITIATION COMPLEX FORMATION

- The GTFs help polymerase bind to the promoter and melt DNA.
- The complete set of GTFs & polymerase bound together at the promoter and poised for initiation, is called as pre-initiation complex.
- Many Pol II promoters contains TATA elements, where pre-initiation complex formation begins.
- The TATA elements recognized by GTFs called TFIID.
- The components of TFIID that binds to the TATA DNA sequence is called TBP.
- The other subunit is TAFs that control the DNA binding activity of TBP.

- The resulting TBP-DNA complex provide a platform for attachment of other GTFs & polymerase.
- The factors TFIIA & TFIIB bind to this complex.
- After that TFIIF together with polymerase also bind to the complex.
- At last, the two factors TFIIE & TFIIH bind to upstream of Pol. II resulting in the formation of pre-initiation complex.
- Formation of this complex containing these all components is followed by promoter melting.
- Promoter melting in eukaryotes requires hydrolysis of ATP and is mediated by TFIIH.
- The large subunit of Pol. II has a C-terminal domain (CTD), which extends as a 'tail'.
- The CTD contains a series of repeats of heptapeptide sequence: Tyr-Ser-Pro-Thr-Ser-Pro-Ser.