

CONCEPT: STEPS OF TRANSCRIPTION

●The process of *transcription* consists of _____ steps:

① _____

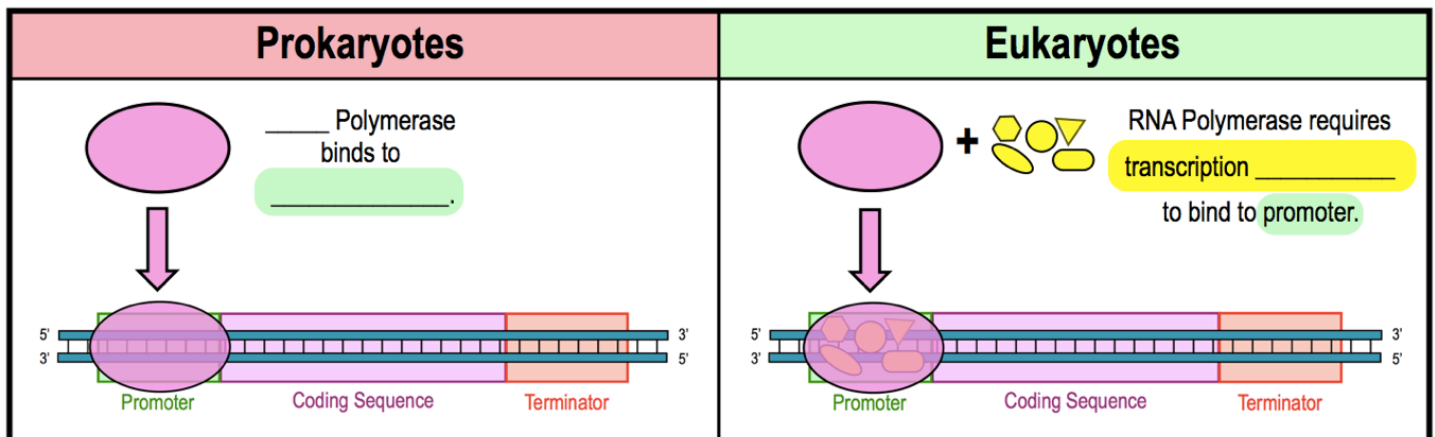
② _____

③ _____

1) Initiation of Transcription

●Initiation: RNA polymerase _____ to promoter on DNA & _____ the two DNA strands.

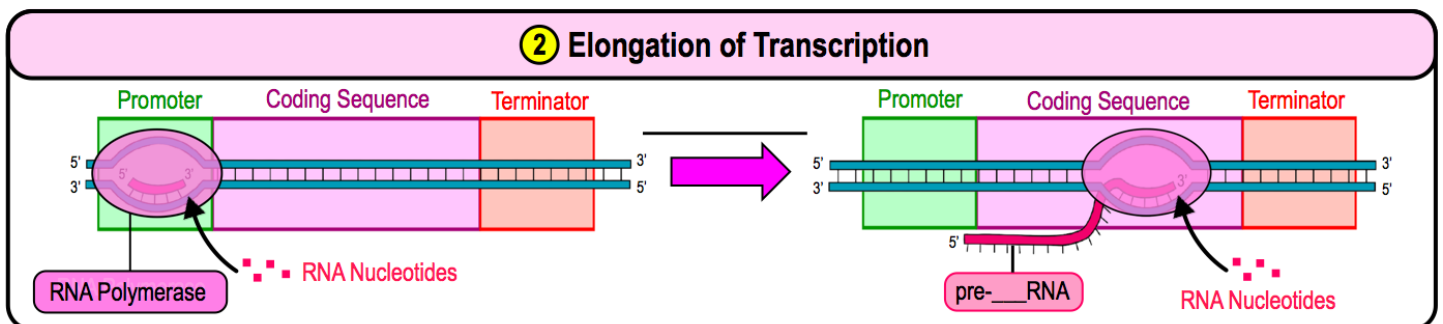
- In prokaryotes, RNA polymerase binds on its own, but in eukaryotes, **transcription factor** proteins are required.
- Unwinding of the DNA exposes the DNA *template* strand, which RNA polymerase uses as a guide to build RNA.



2) Elongation of Transcription

●Elongation: RNA polymerase _____ an RNA molecule by pairing free RNA nucleotides with the DNA template.

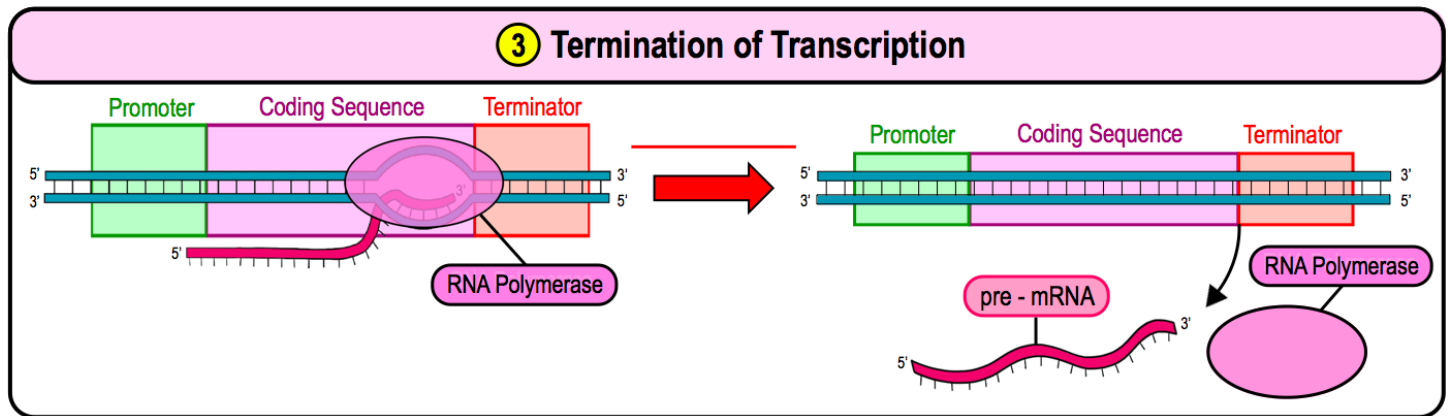
- RNA polymerase continues to move, unwinding _____ & building _____ in the 5' to _____ direction.
- A single gene can be transcribed *simultaneously* by several RNA polymerases to make more RNA.



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3) Termination of Transcription

- **Termination:** process that results in the _____ of transcription to produce an RNA molecule.
 - Prokaryotes & eukaryotes _____ in the way they terminate transcription.
 - *Eukaryotic* termination forms a _____ RNA molecule requiring further modification (*RNA processing*).



PRACTICE: During which stage of transcription do the following processes take place?

1. RNA polymerase binds to the promoter.
 2. The RNA transcript is released.
 3. The RNA transcript extended.
- a) 1-termination; 2-initiation; 3-elongation.
b) 1-initiation; 2-elongation; 3-termination.
c) 1-elongation; 2-termination; 3- initiation.
d) 1-initiation; 2-termination; 3-elongation.
e) 1-termination; 2-elongation; 3-initiation.

PRACTICE: Transcription in eukaryotes requires which of the following molecules in addition to RNA polymerase?

- a) Anticodons.
b) Ribosomes and tRNA.
c) Transcription factors.
d) Aminoacyl-tRNA synthetase.

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PRACTICE: Which of the following is the correct transcript of mRNA for the following DNA template?

DNA Template: 3'-ATGAAGCCGAGTCAT-5'.

- a) 3'-TACTTCGGCTCAGTA-5'.
- b) 3'-AUGACUCGGCUUCAU-5'.
- c) 3'-UACUUCGGCUCAGUA-5'.
- d) 3'-ATGACTCGGCTTCAT-5'.

PRACTICE: During transcription of DNA to RNA:

- a) The RNA polymerase moves along the DNA in the 5' to the 3' direction.
- b) The 3' end of the RNA molecule is produced first.
- c) The RNA polymerase must first bind to a promoter sequence.
- d) Transcription is always initiated at a "start codon".

PRACTICE: What happens during the initiation step of DNA transcription?

- a) The mRNA detaches from the RNA polymerase as the RNA polymerase leaves the DNA strand.
- b) RNA polymerase attaches to the DNA at the promoter sequence of the gene.
- c) A ribosome attaches to the initiation codon of a completed mRNA strand.
- d) RNA polymerase moves along the template strand of the DNA creating an mRNA strand.

PRACTICE: Which of the following properties is NOT shared by RNA polymerase and DNA polymerase.

- a) Can initiate strand synthesis.
- b) Dependent on a DNA sequence template.
- c) Catalyzes phosphodiester bond formation.
- d) Cannot proofread using a 3'-to-5' exonuclease activity.
- e) Polymerizes nucleotides in a 5'-to-3' direction.