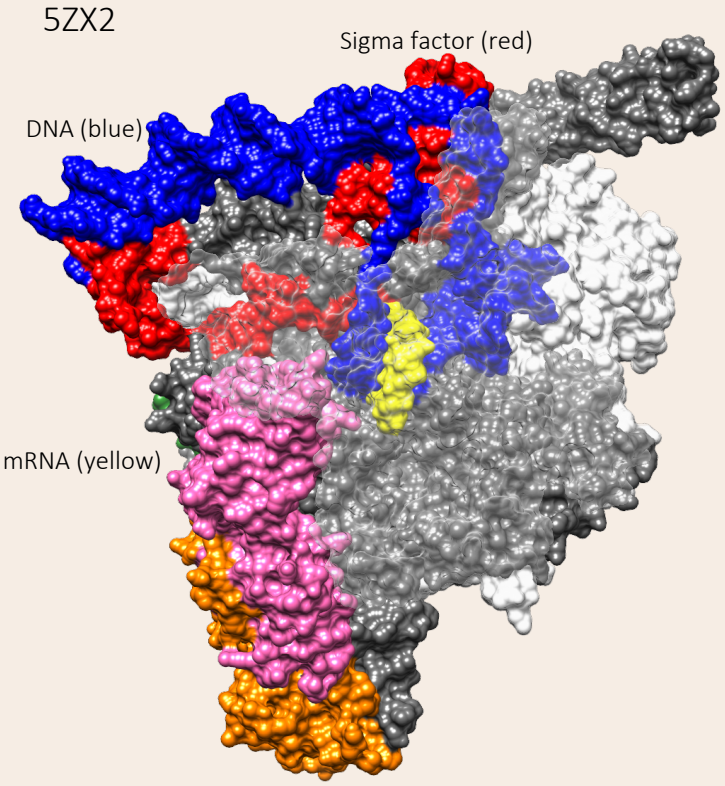
ENZYME OF RNA SYNTHESIS



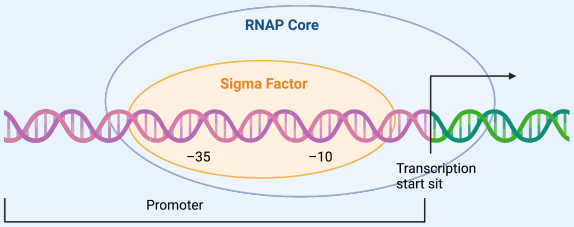
Bacterial RNAP from *Mycobacterium tuberculosis*
(C subunit (white) transparent to allow for view of the catalytic site

RNA Polymerase (RNAP)

- essential for **transcription** (synthesis of RNA)
- uses one strand of DNA as template to synthesize RNA in a 5' to 3' direction via complementary base pairing

Gene Structure

RNAP binds to promoter to begin transcription



STRUCTURE

- prokaryotic core RNAP is large enzyme consisting of five subunits
- core RNAP combines with subunit **sigma factor** to start transcription
- RNAP core plus sigma is called RNAP **holoenzyme**

FUNCTION

- sigma recognizes and binds consensus regions (-10 and -35) of **promoter** and to RNAP core
- part of DNA unwound by sigma to form a **transcription bubble**
- transcription begins; RNAP moves along the DNA
- short temporary DNA/RNA hybrid (about 8 base pairs) forms until the RNA exits the RNAP complex and DNA rewinds
- once RNAP passes beyond the promoter region of DNA, sigma factor dissociates
- RNAP core continues RNA synthesis until reaches termination point and dissociates from the DNA

Eukaryotic RNA Polymerases

- eukaryotic RNAPs are similar in function but eukaryotic transcription does not use sigma factor for initiation of transcription
- eukaryotic RNAPs recognize and bind to promoters by interacting with many different proteins called **transcription factors**
- different RNAPs for synthesis of different types of RNA: Pol I synthesizes ribosomal RNA (**rRNA**), Pol II synthesizes messenger RNA (**mRNA**), Pol III synthesizes transfer RNA (**tRNA**)

Model made in UCSF Chimera. Images made in BioRender.com.