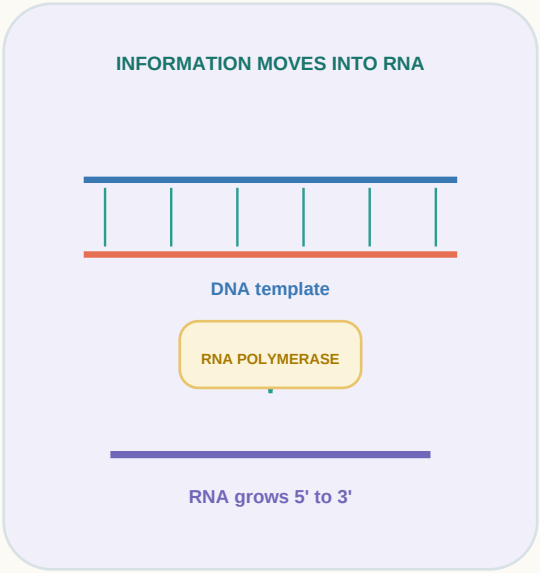
AP BIOLOGY | UNIT 6

TOPIC 6.3

Transcription and RNA Processing

Cells transcribe selected DNA sequences into RNA, then eukaryotic cells process pre-mRNA into a mature message.



THE CORE CAUSAL CHAIN

DNA TEMPLATE
one strand is read

→

TRANSCRIPTION
RNA is synthesized

→

PROCESSING
cap, tail, and splice

→

MATURE mRNA
ready for translation

BY THE END, YOU SHOULD BE ABLE TO...

1. Trace transcription from DNA template to RNA.
2. Distinguish mRNA, tRNA, and rRNA roles.
3. Explain capping, tailing, and RNA splicing.

CENTRAL IDEA

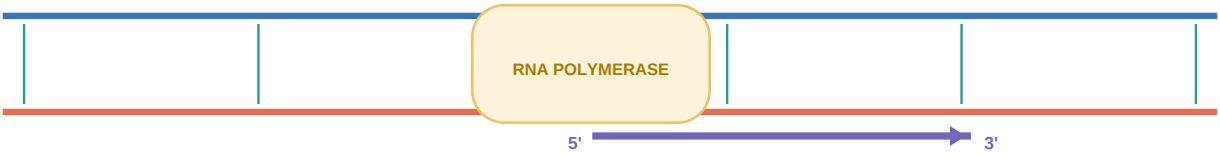
RNA polymerase copies information from one DNA strand into complementary RNA. Processing then prepares eukaryotic mRNA for translation.

1 Transcription transfers DNA information

RNA polymerase reads one DNA strand and builds a complementary RNA molecule without changing the DNA sequence.

THE COPYING MECHANISM

RNA POLYMERASE USES ONE DNA TEMPLATE STRAND



template strand read 3' to 5'

RNA synthesized 5' to 3'

RNA BASE PAIRING: DNA A -> RNA U | DNA T -> RNA A | G <-> C

THREE STAGES

1 INITIATION

Polymerase binds near the promoter and opens a short DNA region.

2 ELONGATION

Polymerase moves along the template and extends the RNA strand.

3 TERMINATION

The RNA transcript is released when a termination signal is reached.

THREE IMPORTANT RNA TYPES

mRNA

Carries codons from DNA information to a ribosome.

tRNA

Carries amino acids and pairs anticodons with codons.

rRNA

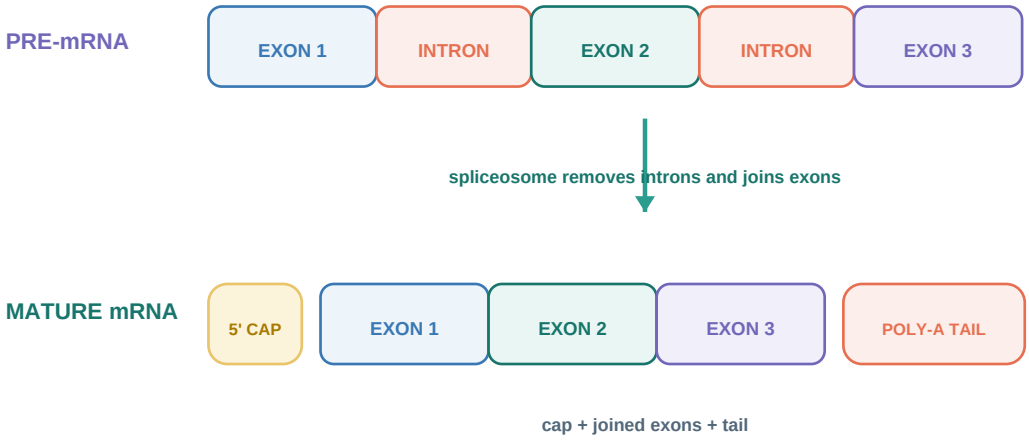
Forms structural and catalytic parts of ribosomes.

2

Eukaryotic pre-mRNA is processed

A 5' cap, poly-A tail, and splicing transform the initial transcript into mature mRNA before translation.

FROM PRE-mRNA TO MATURE mRNA



THREE PROCESSING EVENTS

5' CAP

A modified guanine helps protect mRNA and supports ribosome recognition.

POLY-A TAIL

A chain of adenines helps stabilize mRNA and supports export from the nucleus.

RNA SPLICING

Introns are removed and exons are joined to form the coding message.

ALTERNATIVE SPLICING

Different combinations of exons can be joined, allowing one gene to produce more than one mature mRNA and potentially different proteins.

FINAL MAP

DNA template -> pre-mRNA -> 5' cap + poly-A tail + splicing -> mature mRNA -> translation.