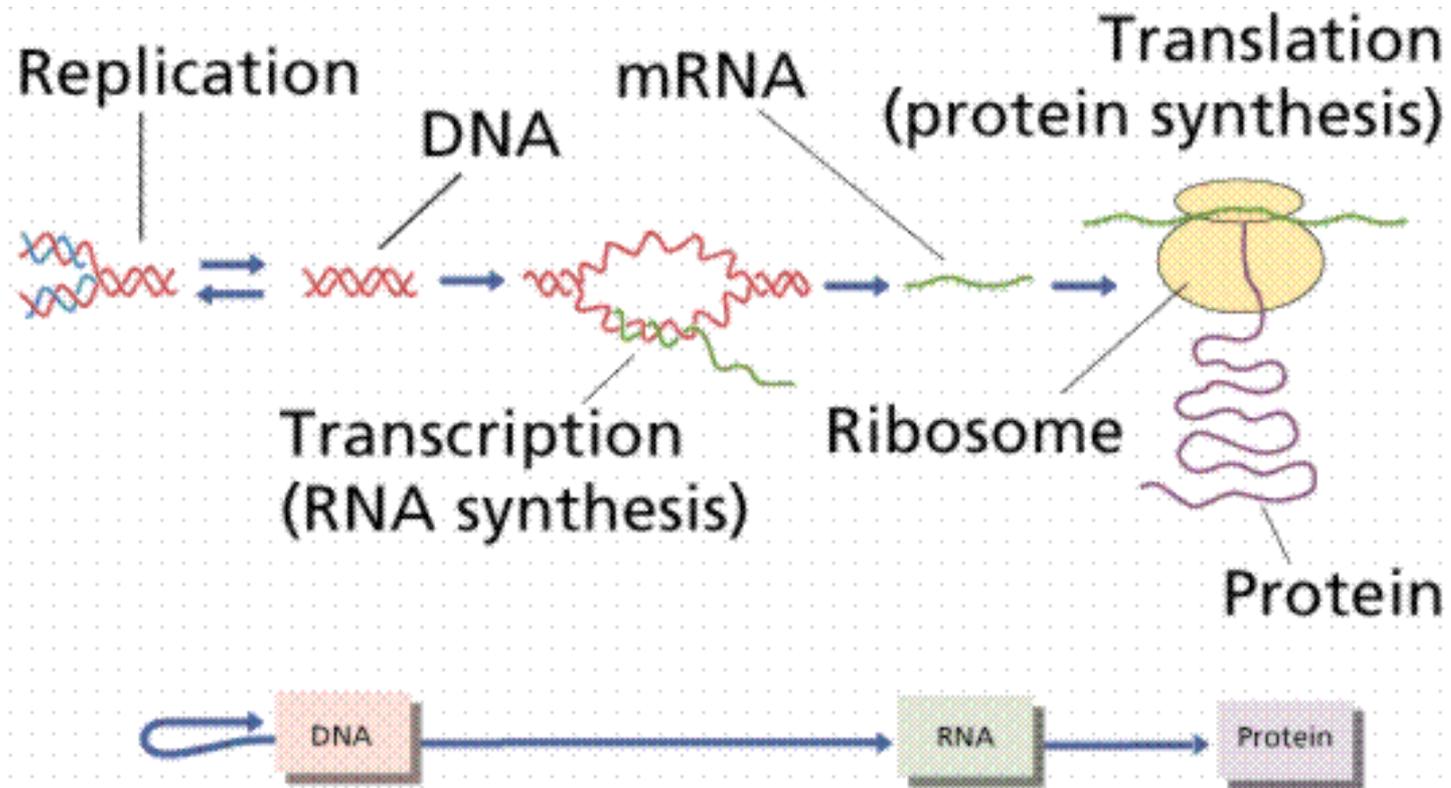


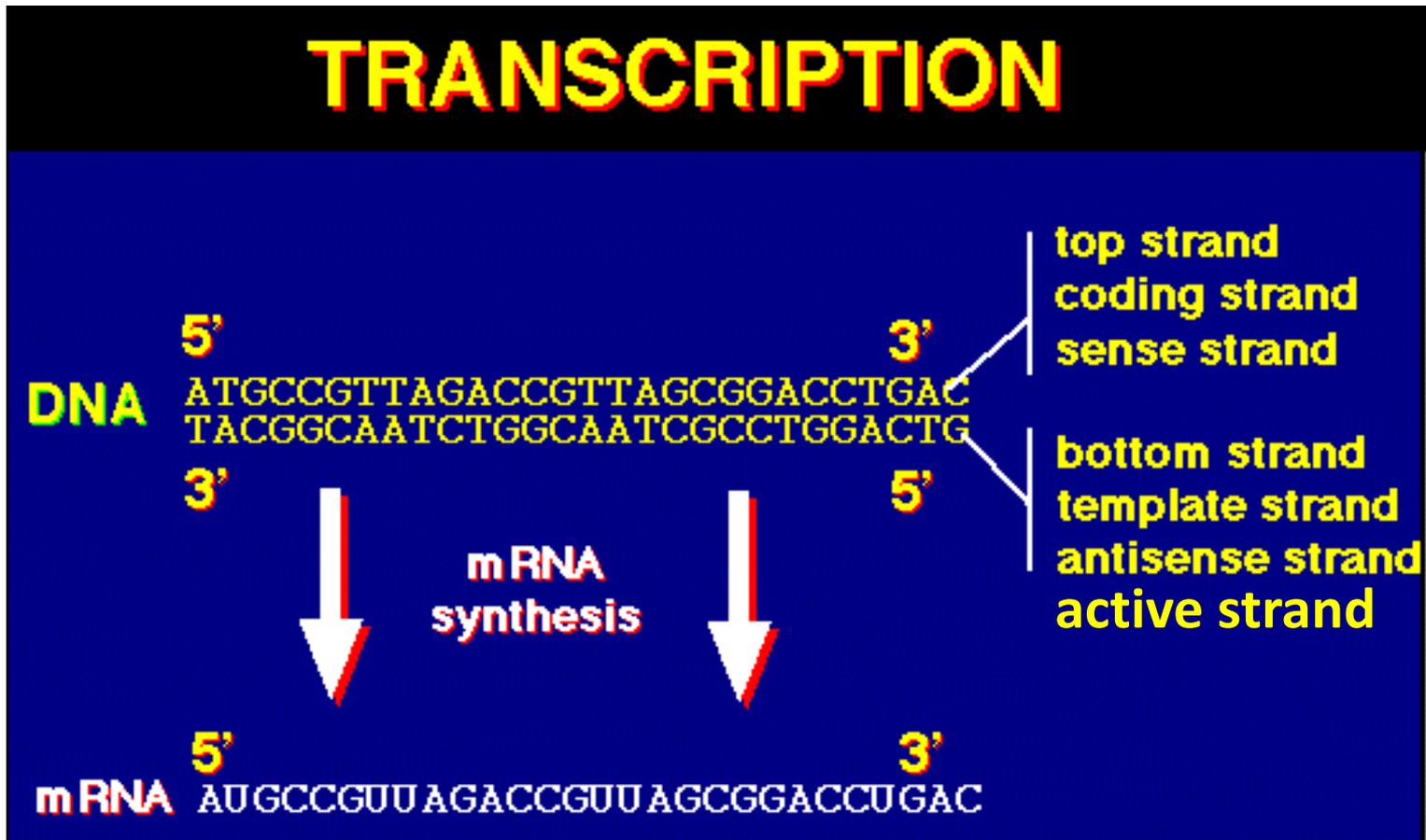
Transcription:

Synthesis of RNA

- The flow of information in the cells (the central dogma of molecular biology):

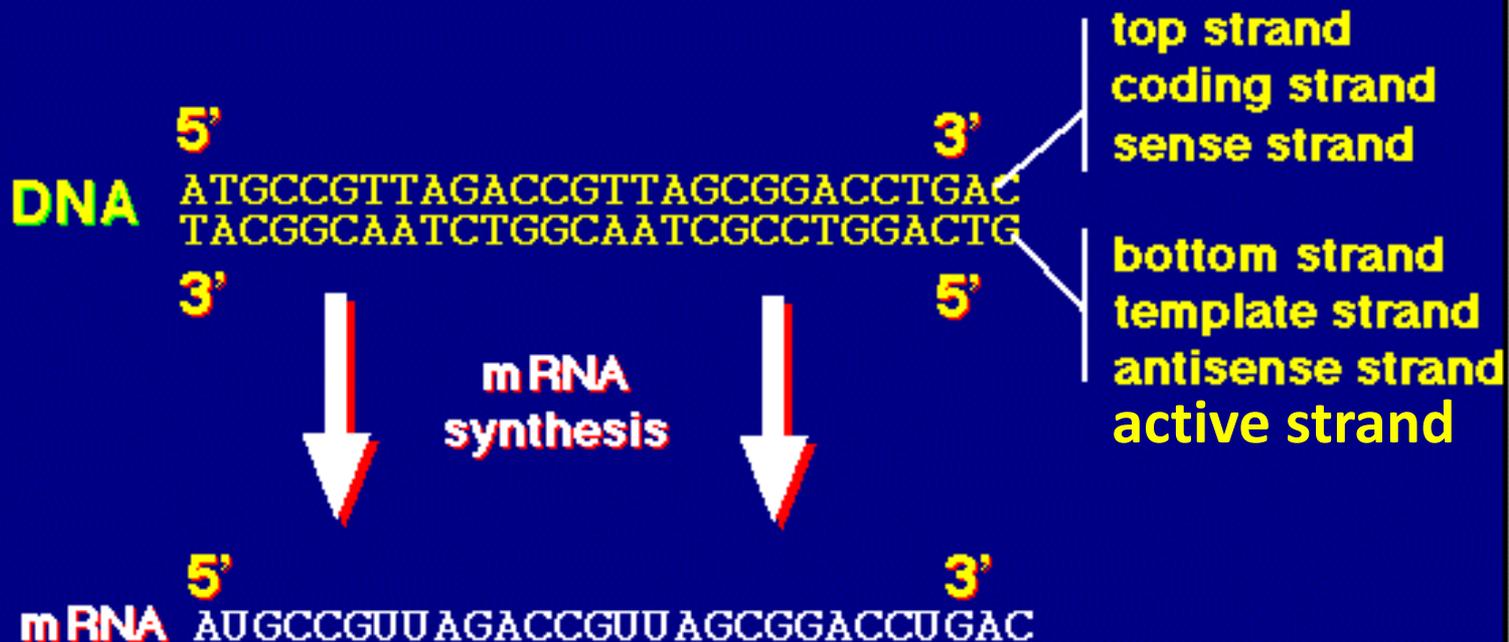


- Transcription = RNA synthesis on a DNA template. The mRNA will provide the information for assembling proteins.

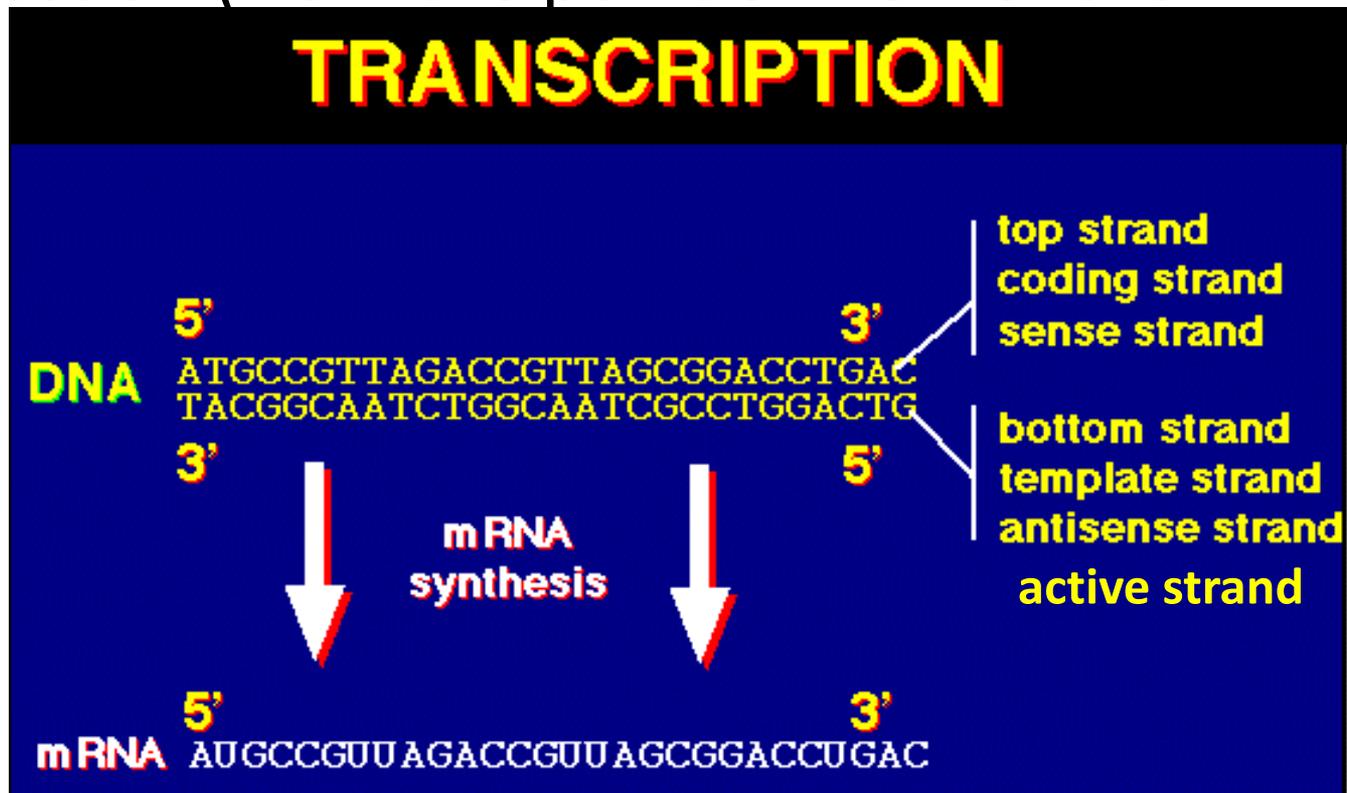


- Only one of the DNA strands are used to copy from: this is the active (antisense) strand.
- The other strand is inactive. (Note: this is not true for all DNAs: E.g.: Mitochondria)

TRANSCRIPTION

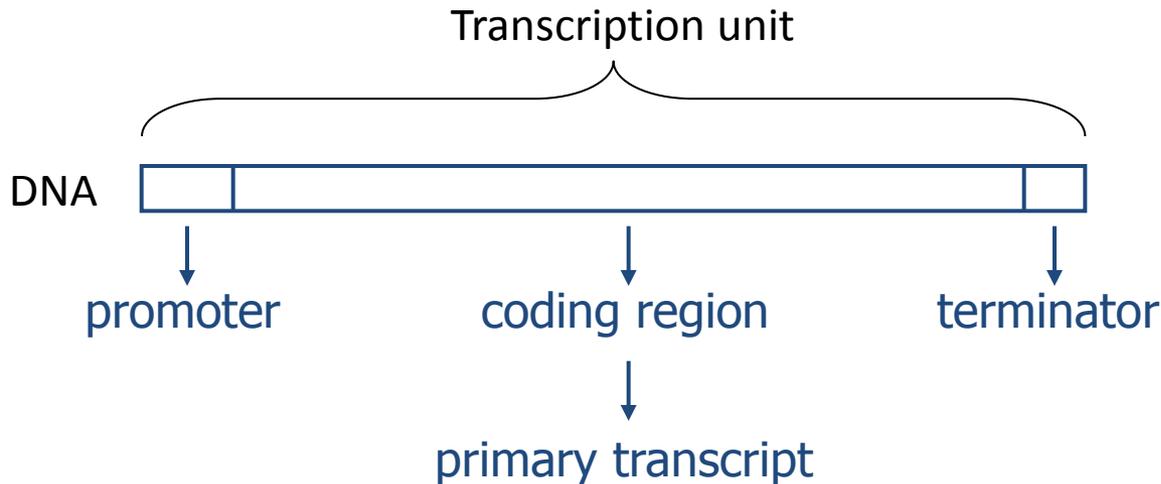


- The RNA is assembled according to the rules of complementary base pairing:
- $G \equiv C, A = U, (A=T)$
- The RNA is synthesized in the $5' \rightarrow 3'$ direction (from the point of view of the RNA)



The mechanism of transcription

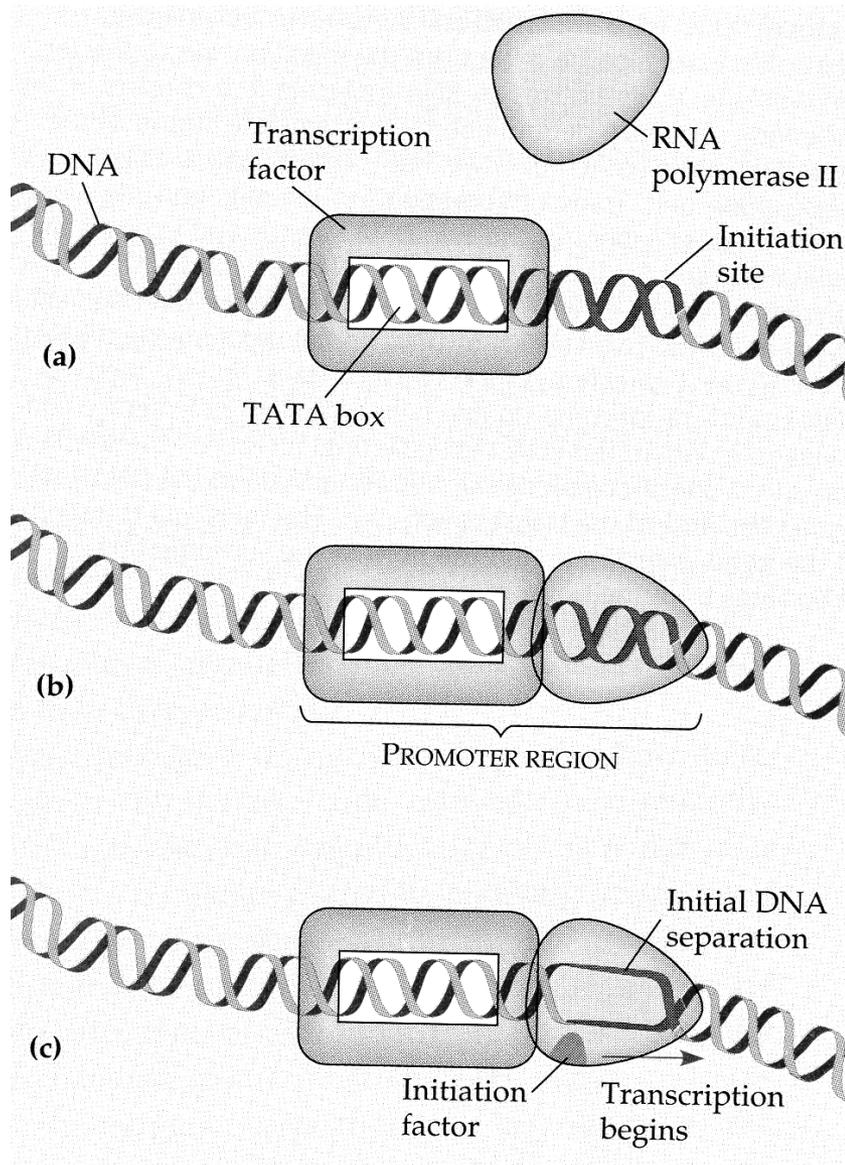
- RNA synthesizing enzyme: RNA polymerase.
- Transcription unit: the part of DNA which is used for the synthesis of **one** RNA molecule.



The mechanism of transcription

- The 3 stages of transcription:
 1. Initiation
 2. Elongation
 3. Termination

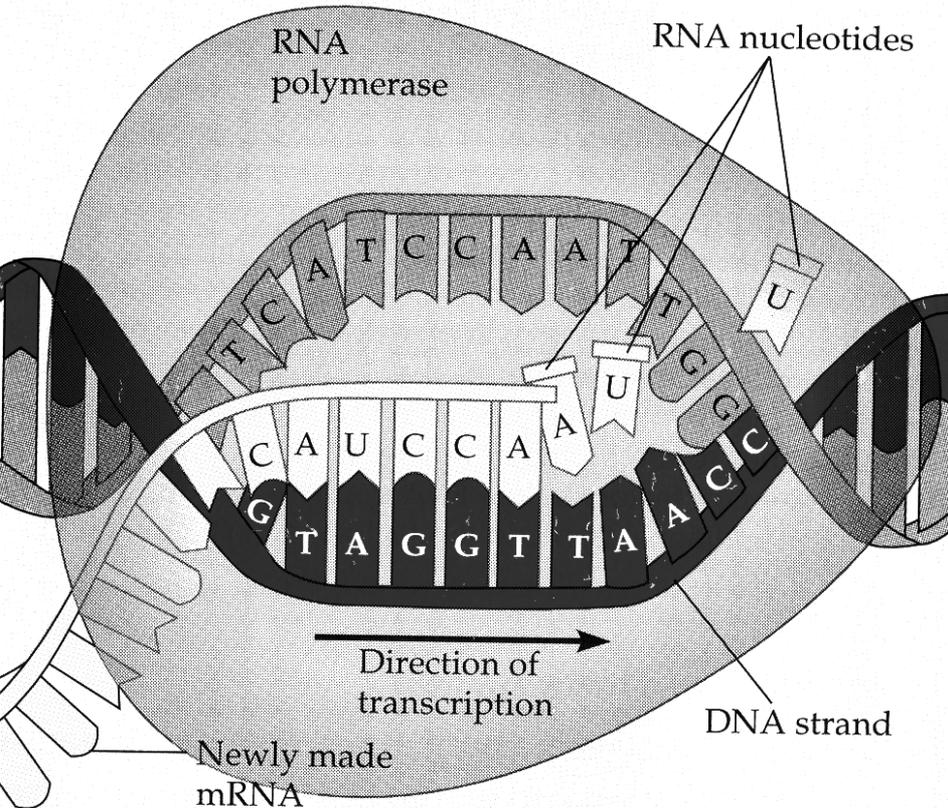
Initiation



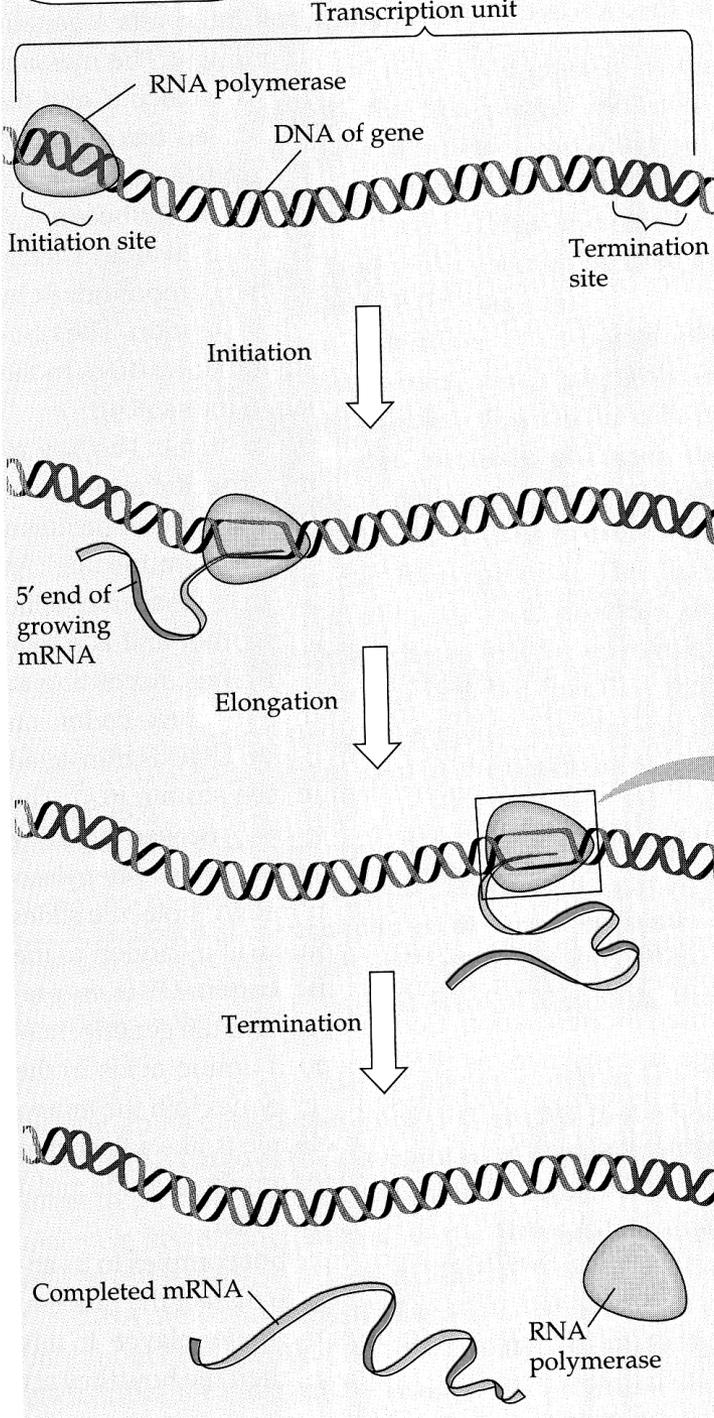
The RNA polymerase binds to the promoter (this is the sequence on DNA, which is the beginning of the transcription unit). In eukaryotes transcription factors help with this binding.

Figure: Campbell: Biology 4th ed.

Elongation



- RNA polymerase binds together the ribonucleotides which are able to base-pair with the active strand. Hydrogen bonds are created between the bases, phosphodiester bonds between the ribonucleotides.



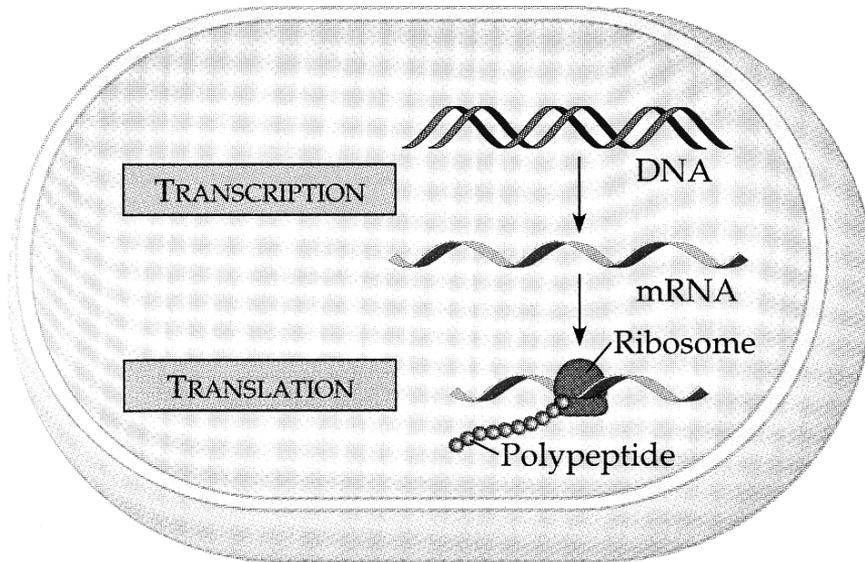
Termination

- special sequences on DNA (A, T rich)

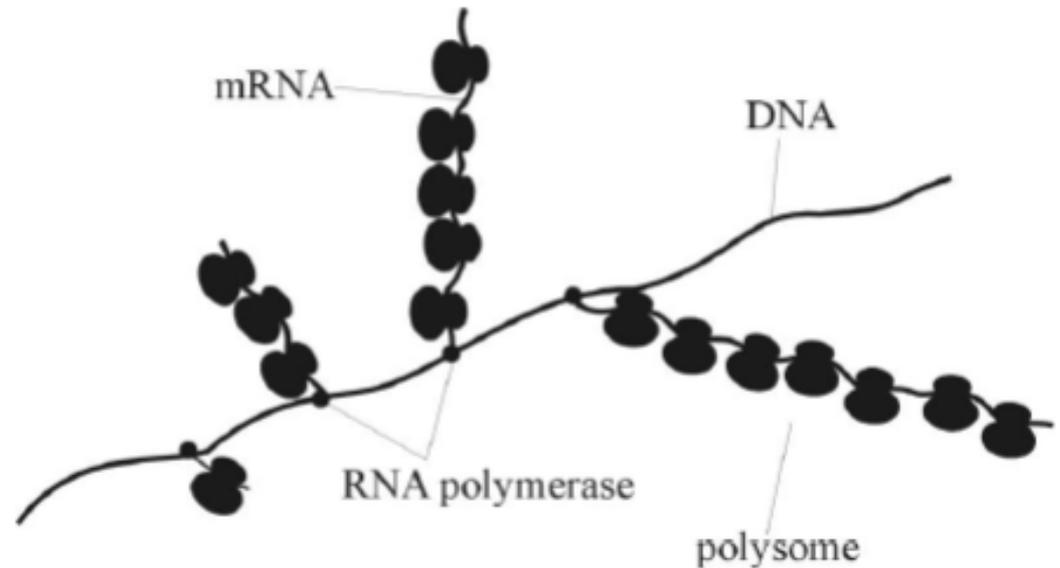
RNA processing

- tRNAs and rRNAs are modified
- mRNA:
 - - in prokaryotes not processed → coupled transcription and translation.
 - - in eukaryotes: modifications on 5' and 3' – end, and: **Splicing** (= some sequences, called introns are cut out)

Transcription in Prokaryotes

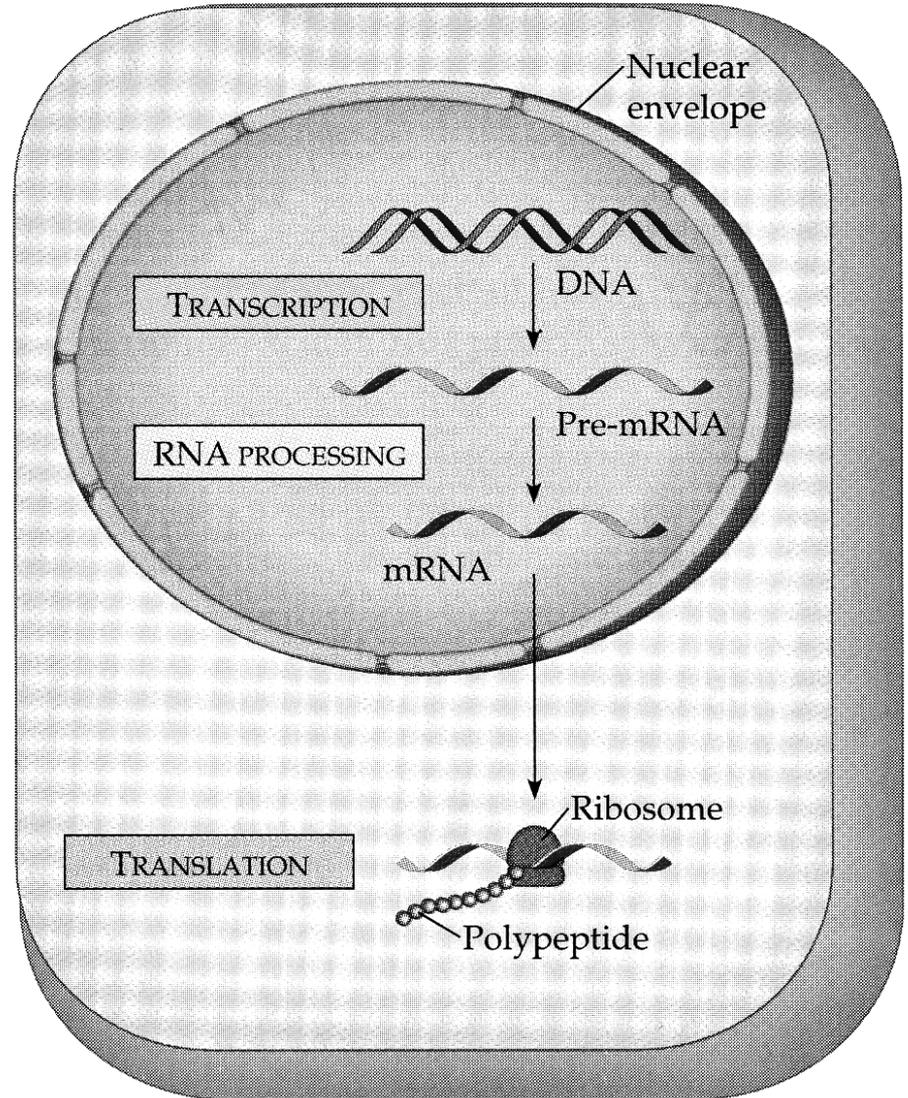


(a) Prokaryotic cell



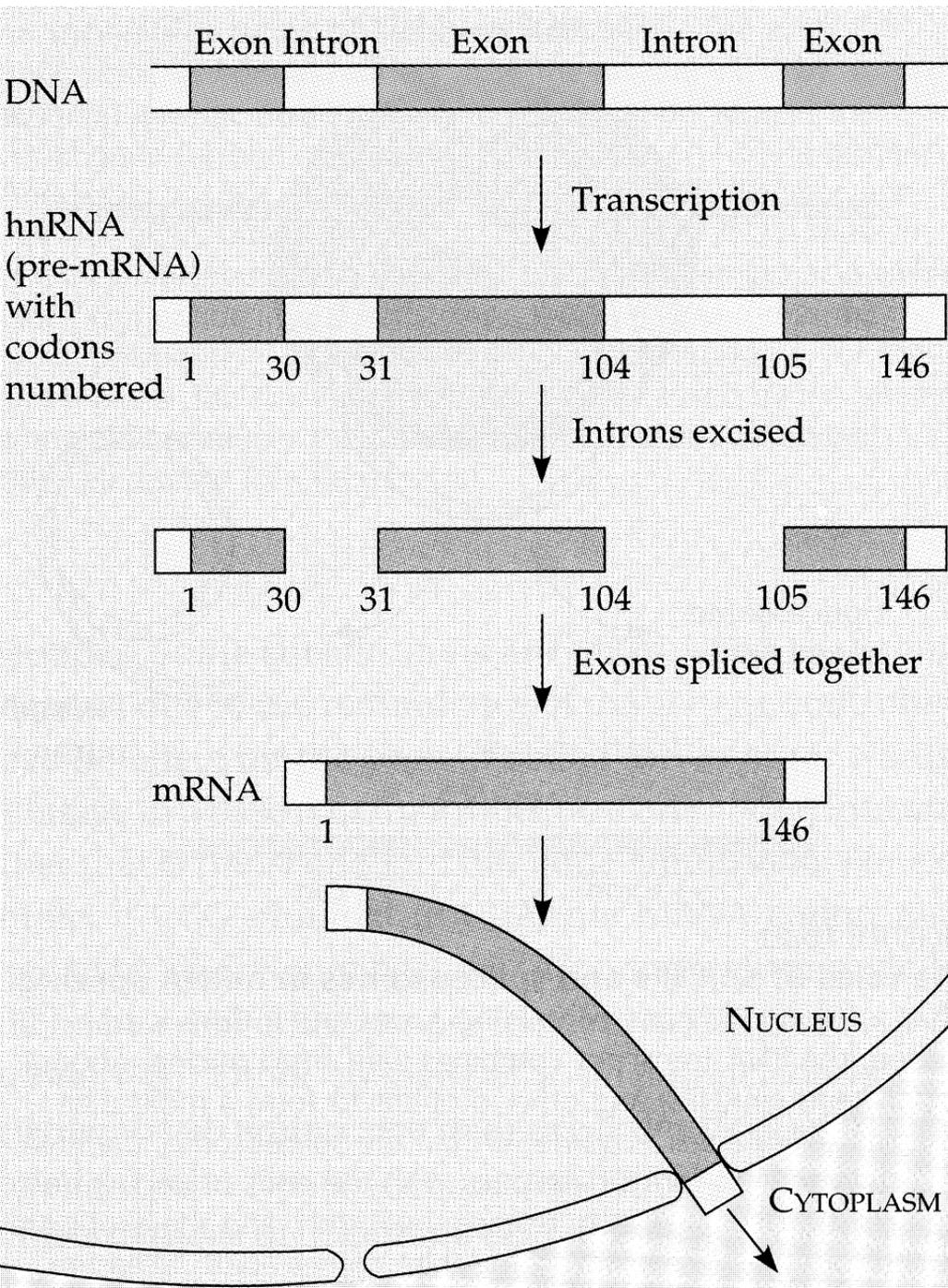
- coupled transcription-translation → chromosome-polysome complex

Transcription in Eukaryotes



(b) Eukaryotic cell

Splicing



MCQ types

1. Five-choice Completion

- (This type of question consists of a question or incomplete statement followed by five suggested answers or completions. Select the **one** best answer.)

MCQ types

2. Multiple Completion

A question or incomplete statement is followed by four numbered completions, one or more of which are correct. Select:

- A: if 1, 2 and 3 are correct;**
- B: if 1 and 3 are correct;**
- C: if 2 and 4 are correct;**
- D: if only 4 is correct;**
- E: if all four are correct.**

___ Which of the following are needed for transcription?

1. promoter
2. RNA polymerase
3. Active strand of DNA
4. deoxyribonucleoside-triphosphates

3. *Four-choice Association*

In this type of question a set of lettered headings is followed by a list of numbered words or phrases.

- Select:
- A: if the word or phrase is associated with A only;**
 - B: if the word or phrase is associated with B only;**
 - C: if the word or phrase is associated with A and B;**
 - D: if the word or phrase is associated with neither A nor B.**

- A. Sense strand of DNA
- B. Antisense strand of DNA
- C. both of them
- D. neither of them

_____ It has the same sequence, as the mRNA transcribed from it.

4. *Variation Relationship*

This type of question consists of pairs of phrases which describe conditions or quantities which may or may not vary in relation to each other.

- Select:
- A: if increase in the first is accompanied by increase in the second or if decrease in the first is accompanied by decrease in the second;**
 - B: if increase in the first is accompanied by decrease in the second or if decrease in the first is accompanied by increase in the second;**
 - C: if changes in the second are independent of changes in the first.)**

- _____ A. The number of G bases in a DNA molecule
 B. The number of C bases in the same DNA molecule

5. *Relationship Analysis*

This type of question consists of a sentence with two main parts: an assertion and a reason for that assertion. Select: **A: if both assertion and reason are true statements and the reason is a correct**

explanation of the assertion;

B: if both assertion and reason are true statements but the reason is not a correct explanation of the assertion;

C: if the assertion is true but the reason is a false statement;

D: if the assertion is false but the reason is a true statement;

E: if both assertion and reason are false statements.)

_____ In prokaryotes transcription and translation is coupled, BECAUSE prokaryotes have a nuclear membrane.

6. *Quantitative Comparison*

In this type of question paired statements describe two entities that are to be compared in a quantitative sense. Select:

A: if A is greater than B;

B: if B is greater than A;

C: if the two are equal or very nearly equal.

- _____ A. The number of introns in a eukaryotic primary transcript
 B. The number of introns in a prokaryotic primary transcript

Further MCQ types:

Text/Figure/Table analysis

(The following statements are related to the information presented above.

Based on the information given, select:

A if the statement is supported by the information given;

B if the statement is contradicted by the information given;

C if the statement is neither supported nor contradicted by the information given.)

Five-choice association

(This type of question consists of a list of lettered headings followed by a list of statements, words or phrases. For each statement, word or phrase, select the *one* heading which is most closely related to it.)