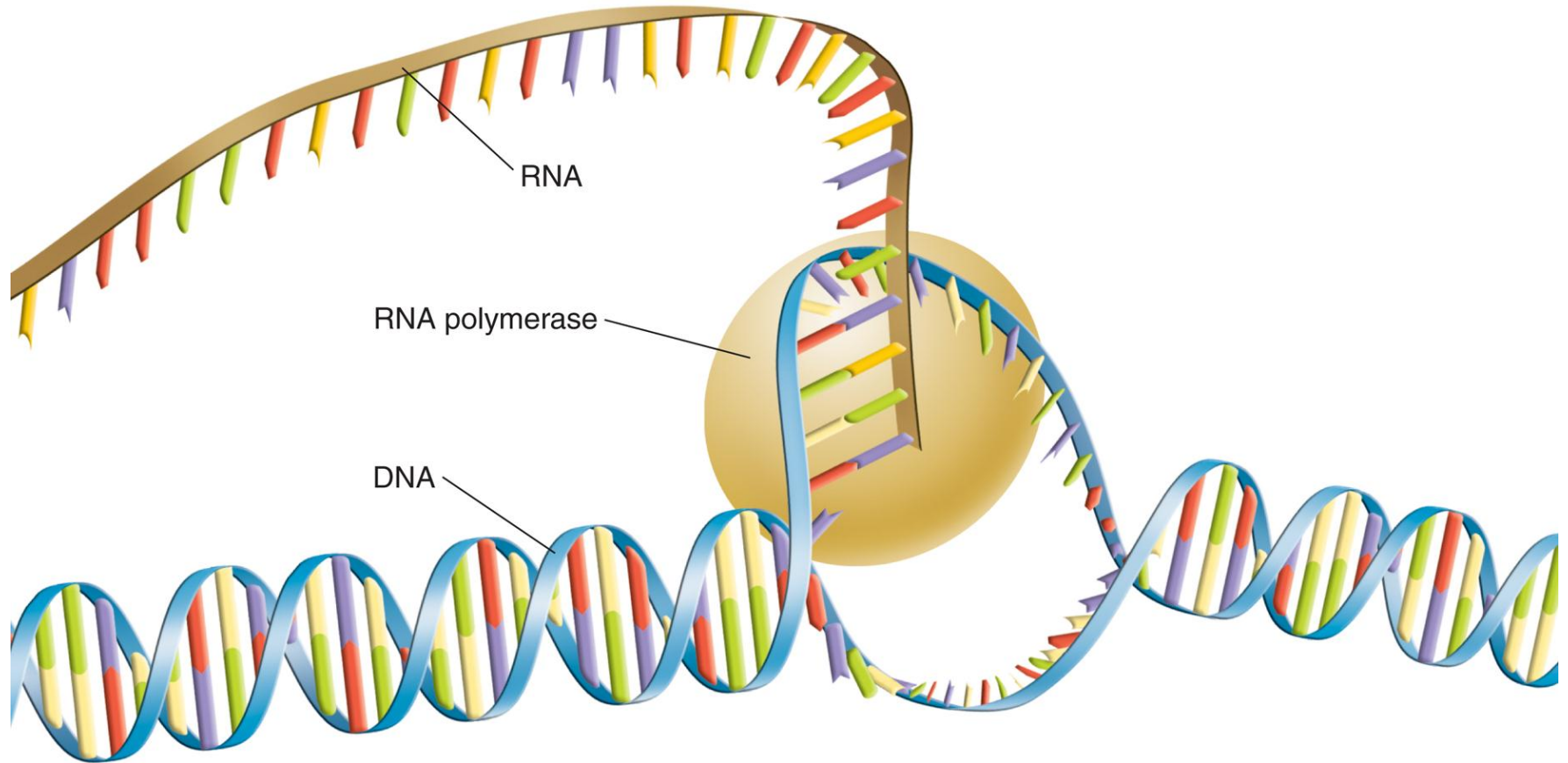


12-3 RNA and Protein Synthesis



There are three main differences between RNA and DNA:

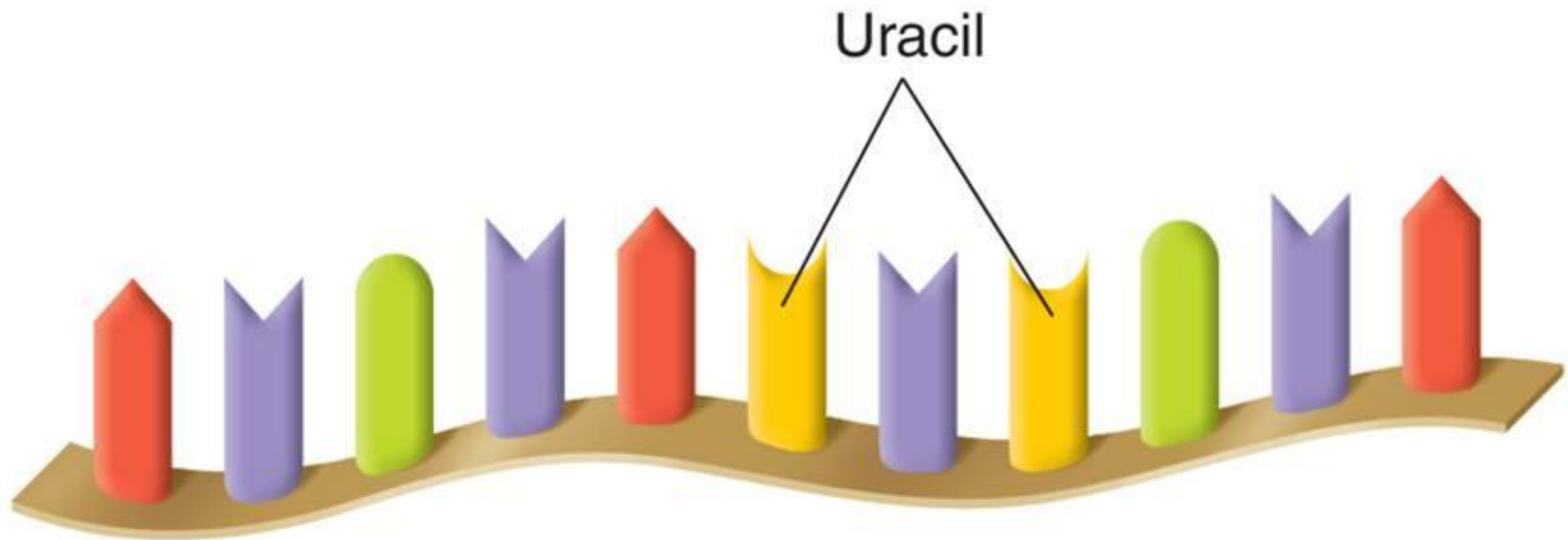
- The sugar in RNA is ribose instead of deoxyribose.
- RNA is generally single-stranded.
- RNA contains uracil in place of thymine.

Types of RNA



There are three main types of RNA:

- messenger RNA
- ribosomal RNA
- transfer RNA



Messenger RNA

Messenger RNA (mRNA) carries copies of instructions for assembling amino acids into proteins.

Ribosome



Ribosomal RNA

Ribosomes are made up of proteins and **ribosomal RNA** (rRNA).

Amino acid



Transfer RNA

During protein construction, **transfer RNA** (tRNA) transfers each amino acid to the ribosome.

Transcription

RNA molecules are produced by copying part of a nucleotide sequence of DNA into a complementary sequence in RNA. This process is called **transcription**.

Transcription requires the enzyme **RNA polymerase**.








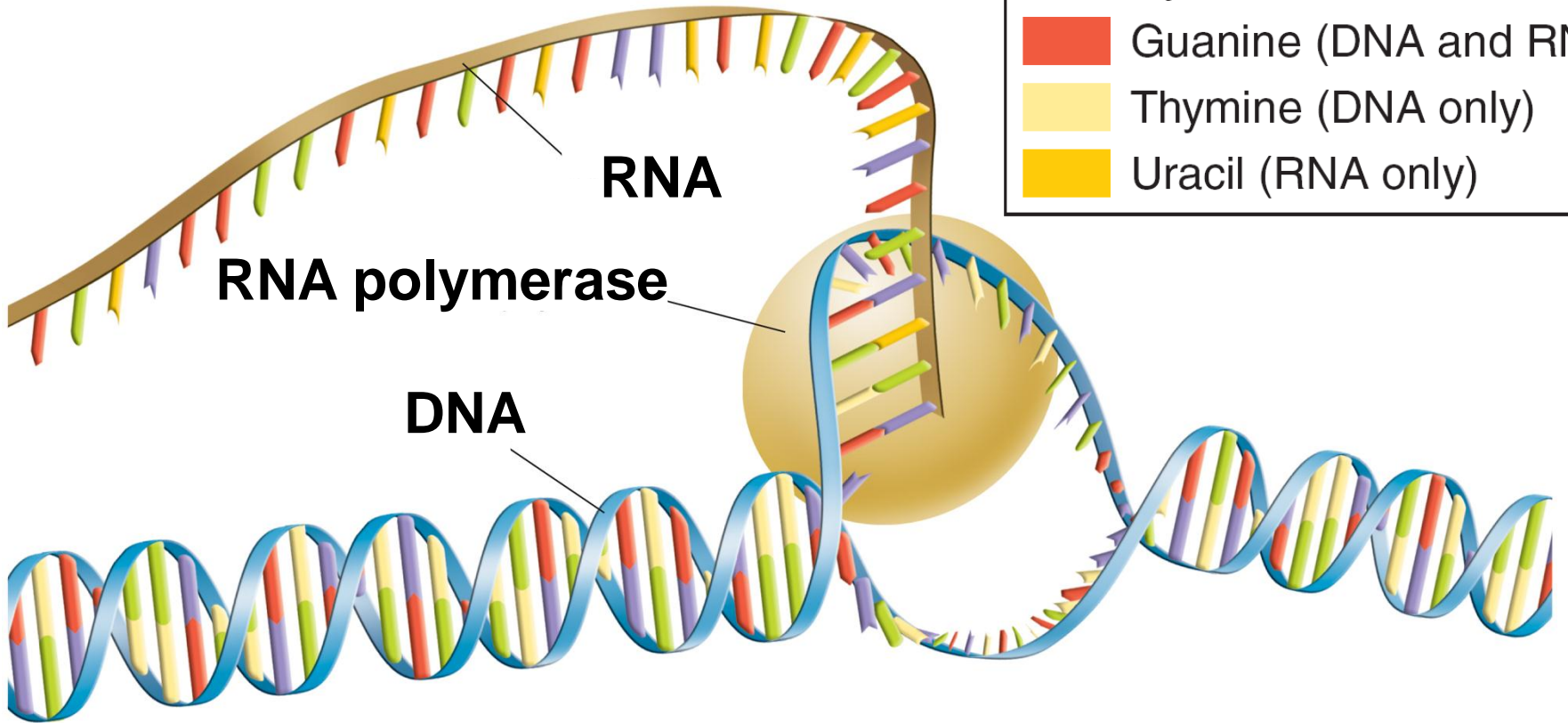
During transcription, RNA polymerase binds to DNA and separates the DNA strands.

RNA polymerase then uses one strand of DNA as a template from which nucleotides are assembled into a strand of RNA.

12-3 RNA and Protein Synthesis → Transcription

movie
click to start

	Adenine (DNA and RNA)
	Cytosine (DNA and RNA)
	Guanine (DNA and RNA)
	Thymine (DNA only)
	Uracil (RNA only)



RNA Editing

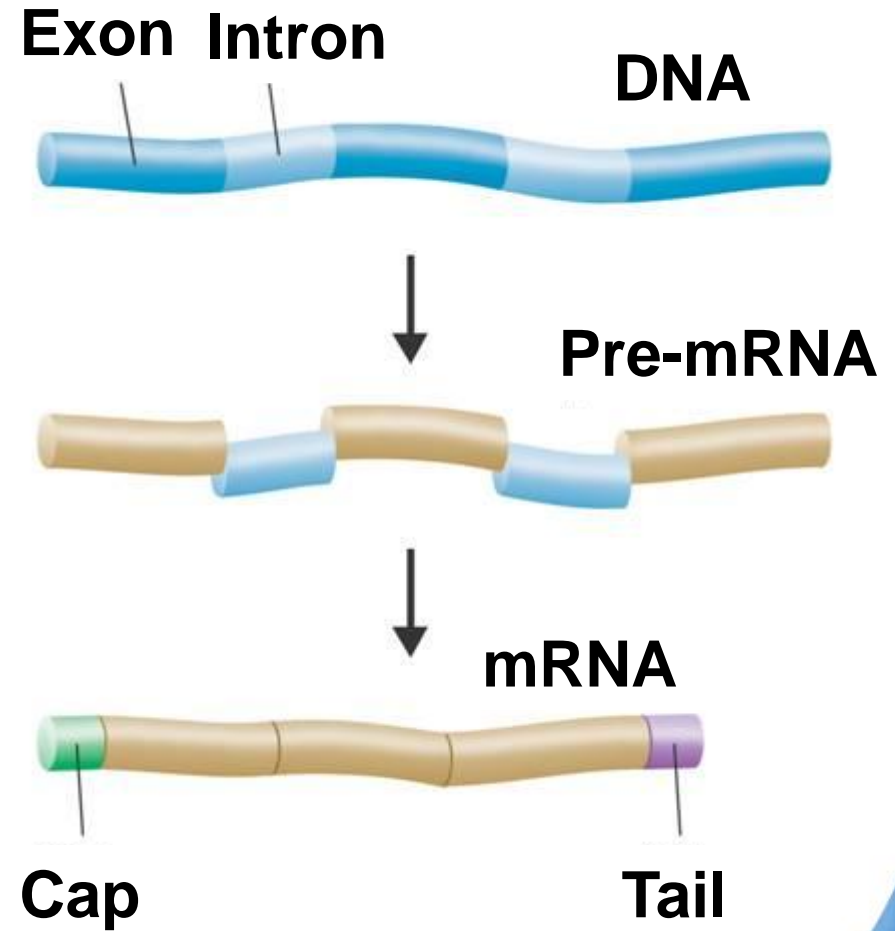
The DNA of eukaryotic genes contains sequences of nucleotides, called **introns**, that are not involved in coding for proteins.

The DNA sequences that code for proteins are called **exons**.

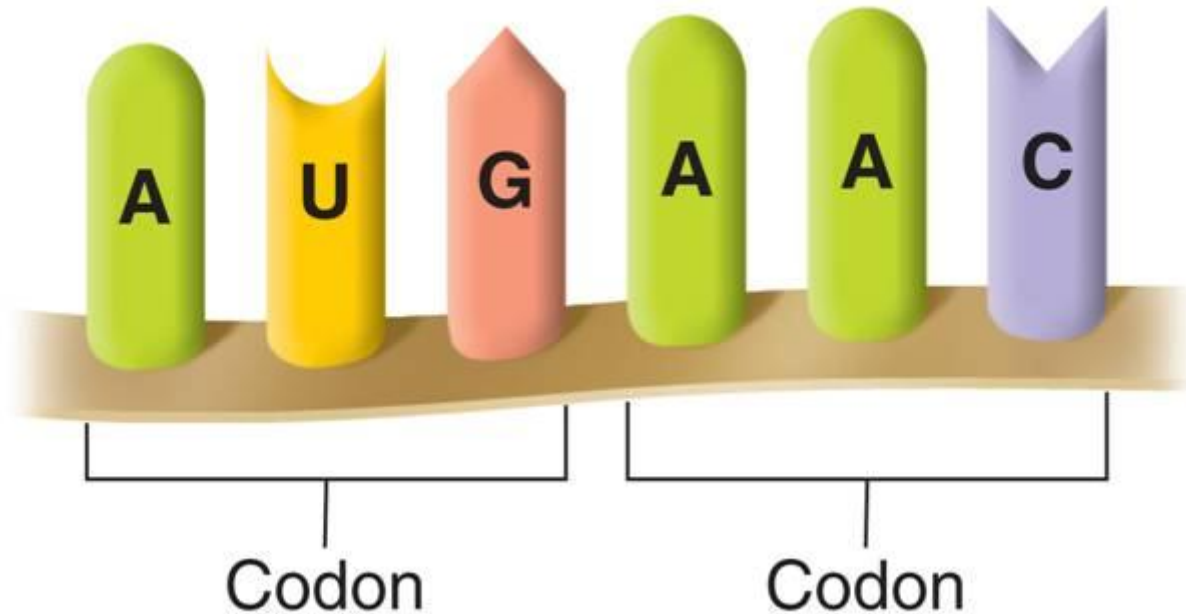
When RNA molecules are formed, introns and exons are copied from DNA.

The introns are cut out of RNA molecules.

The exons are then spliced together to form mRNA.



A **codon** consists of three consecutive nucleotides on mRNA that specify a particular amino acid.



There is one codon AUG that can either specify the amino acid methionine or serve as a “start” codon for protein synthesis.

There are three “stop” codons that do not code for any amino acid. These “stop” codons signify the end of a polypeptide.

Translation

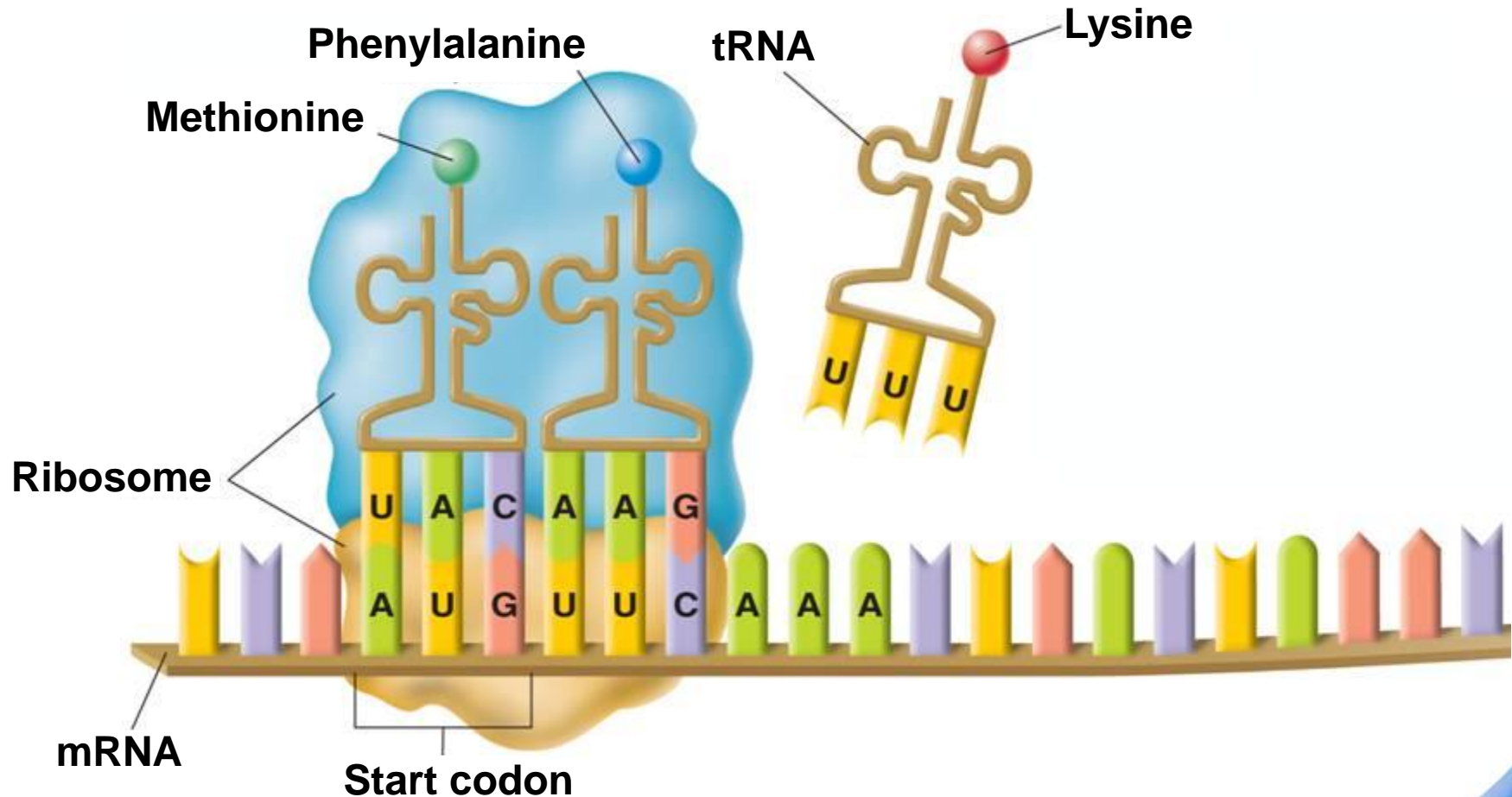
Translation is the decoding of an mRNA message into a polypeptide chain (protein).

Translation takes place on ribosomes.

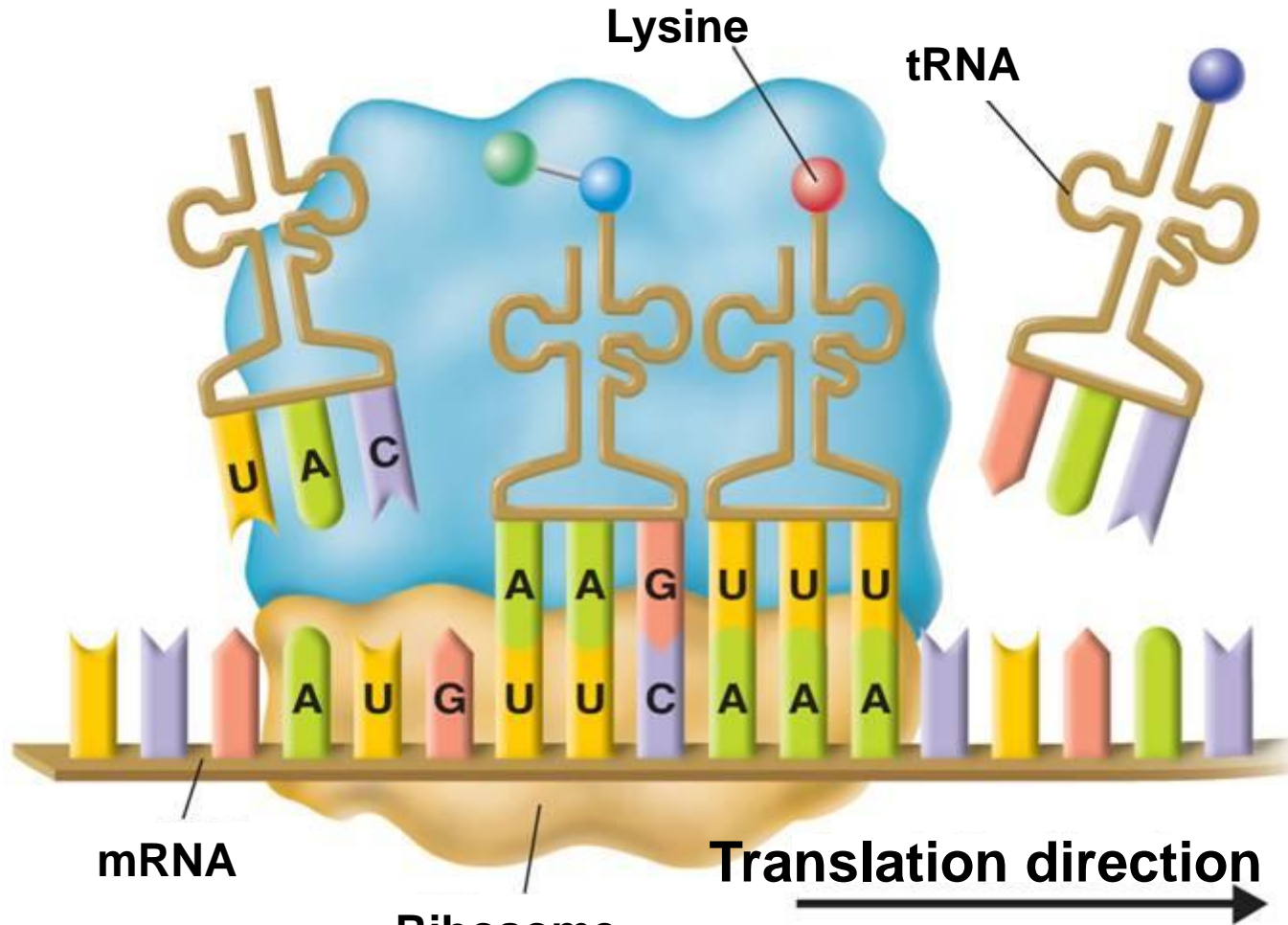


During translation, the cell uses information from messenger RNA to produce proteins.

The ribosome binds new tRNA molecules and amino acids as it moves along the mRNA.

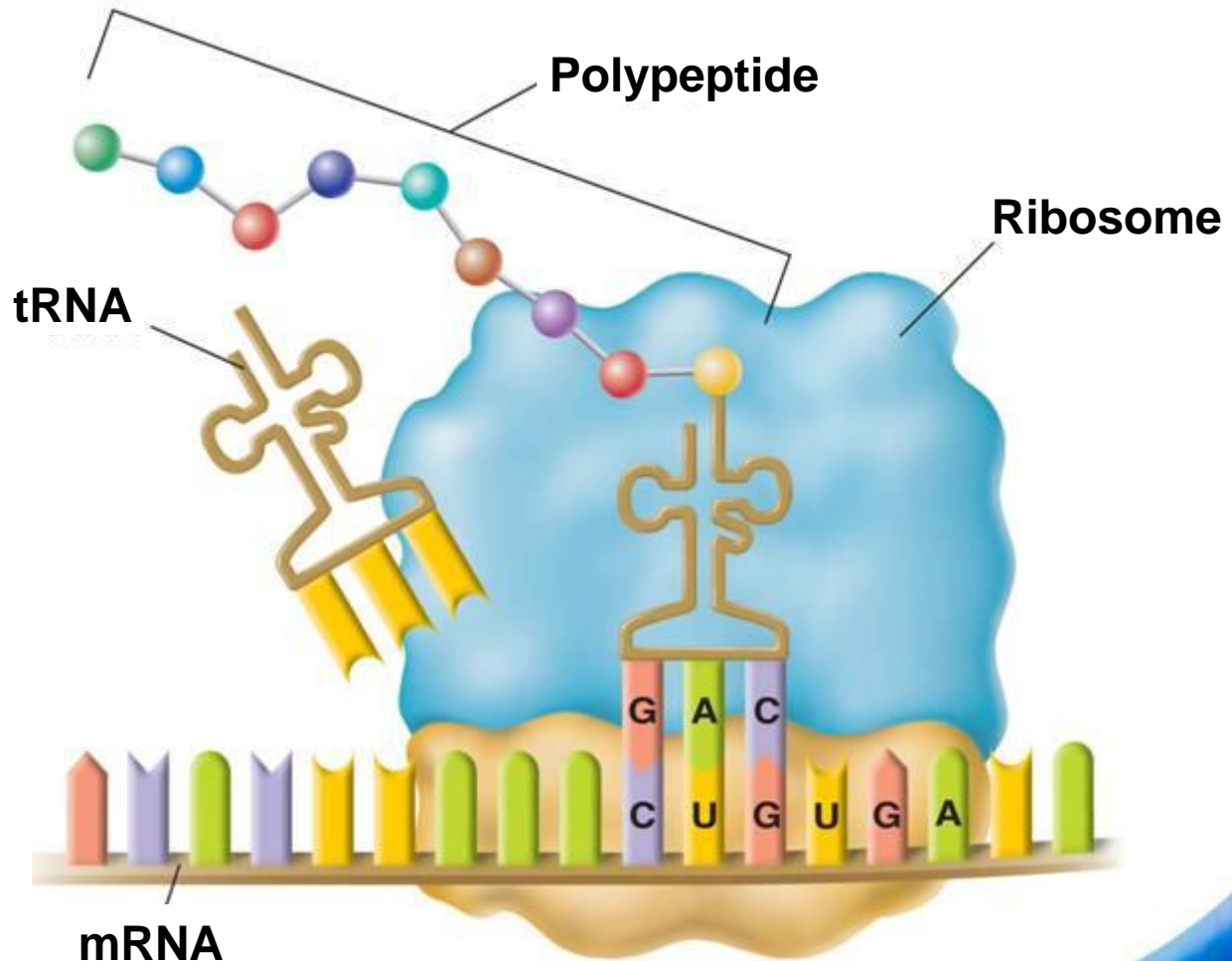


Protein Synthesis



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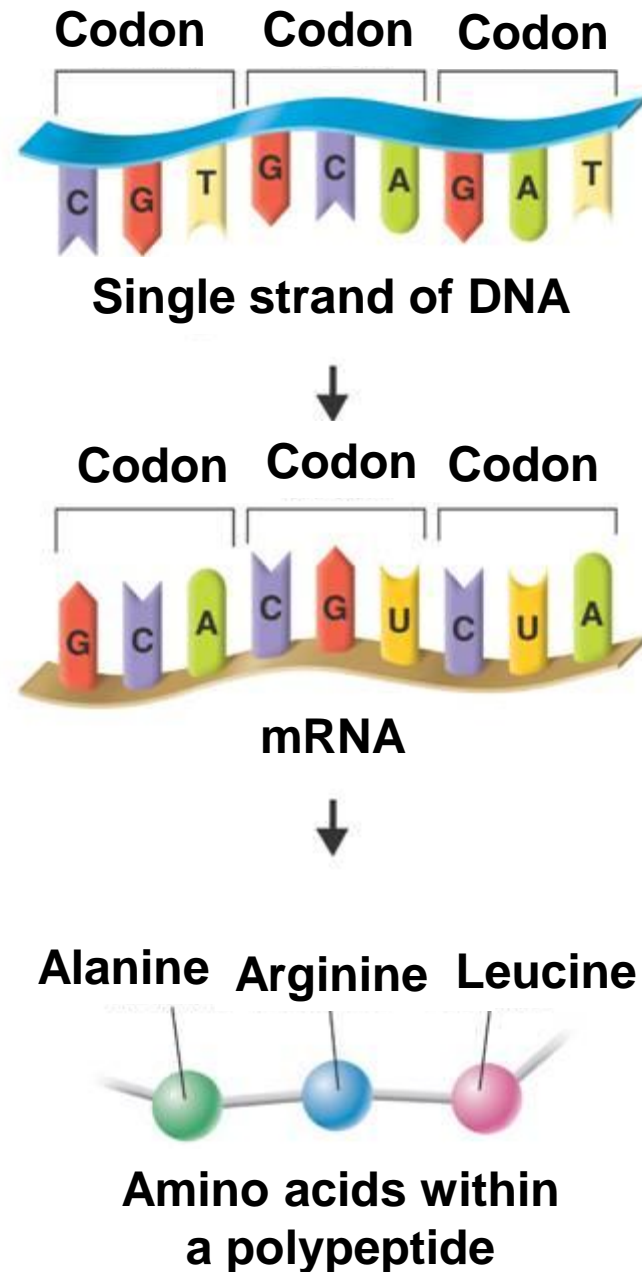
The process continues until the ribosome reaches a stop codon.



12-3 RNA and Protein Synthesis → Genes and Proteins

The sequence of bases in DNA is used as a template for mRNA.

The codons of mRNA specify the sequence of amino acids in a protein.



12-3 Section QUIZ

Continue to:

Section QUIZ

- or -

Click to Launch:



12-3 Section QUIZ

1

The role of a master plan in a building is similar to the role of which molecule?

a. messenger RNA

A

b. DNA

c. transfer RNA

d. ribosomal RNA

12-3 Section QUIZ

2 A base that is present in RNA but NOT in DNA is

a. thymine.

A b. uracil.

c. cytosine.

d. adenine.

12-3 Section QUIZ

3 The nucleic acid responsible for bringing individual amino acids to the ribosome is

- A** a. transfer RNA.
- b. DNA.
- c. messenger RNA.
- d. ribosomal RNA.

12-3 Section QUIZ

4 A region of a DNA molecule that indicates to an enzyme where to bind to make RNA is the

a. intron.

b. exon.

A c. promoter.

d. codon.

12-3 Section QUIZ

5 A codon typically carries sufficient information to specify a(an)

a. single base pair in RNA.

A b. single amino acid.

c. entire protein.

d. single base pair in DNA.

END OF SECTION