



PROTEIN SYNTHESIS

Remember:

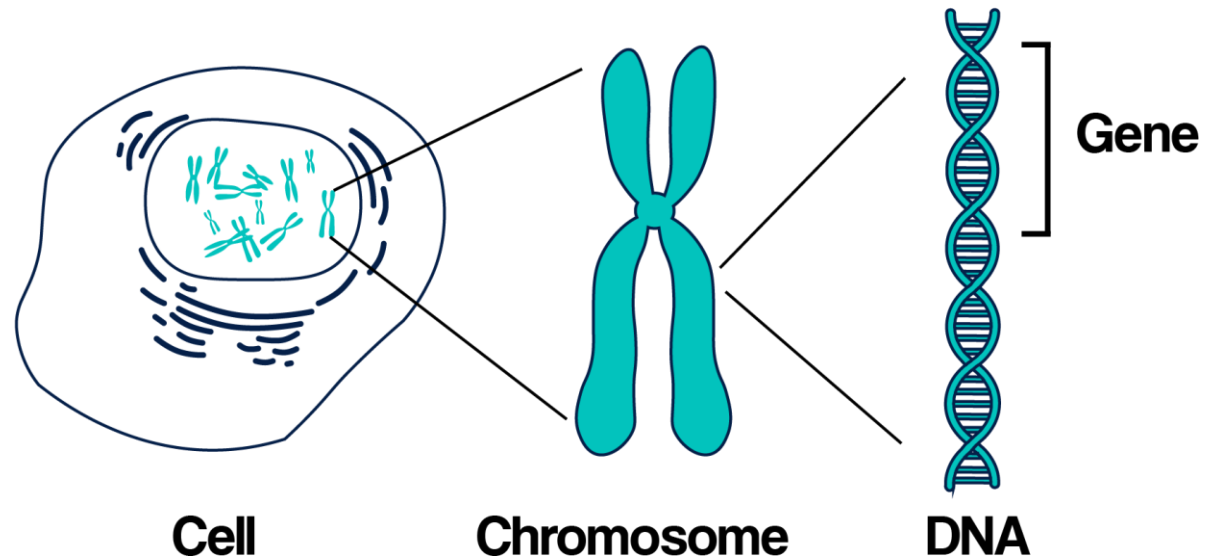
- DNA contains instructions to make all of an organism's proteins.
- RNA helps DNA make proteins.
- This idea that **DNA → RNA → Proteins** is called the Central Dogma.
- The central dogma explains how life is determined through DNA.

Central Dogma:

DNA → RNA → Protein

DNA Contains Genes

- A section of DNA that codes for a protein is called a **gene**.
- The gene is read, and the message is used to make a protein.
- Proteins then determine traits such as *eye color* or *dimples*.



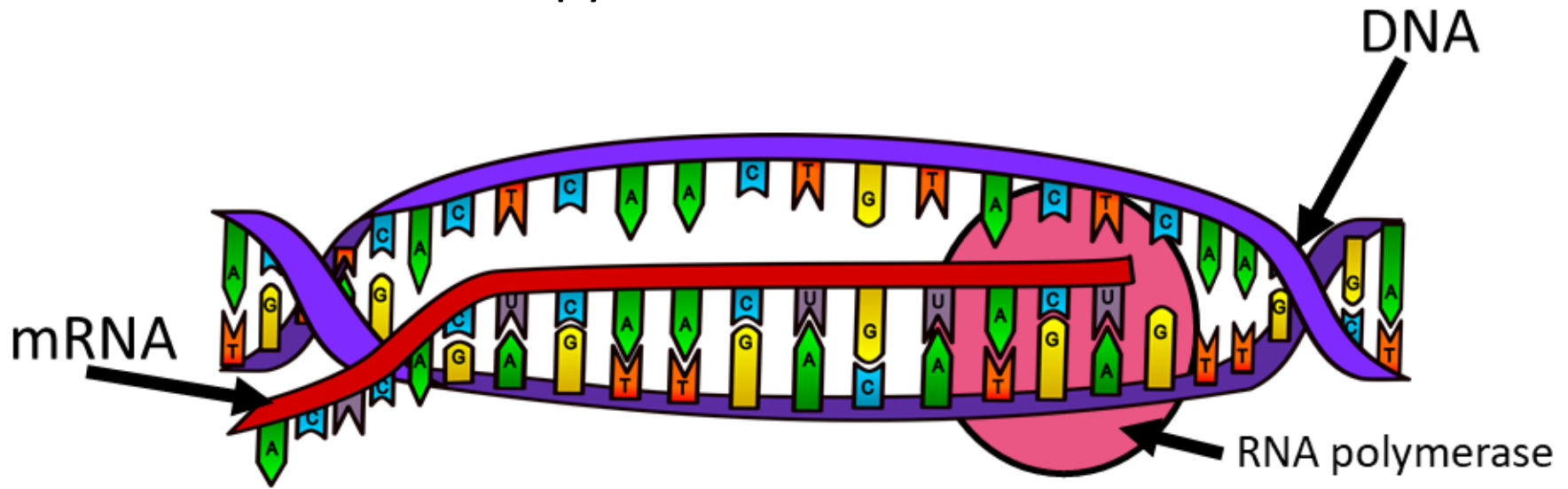
Protein Synthesis

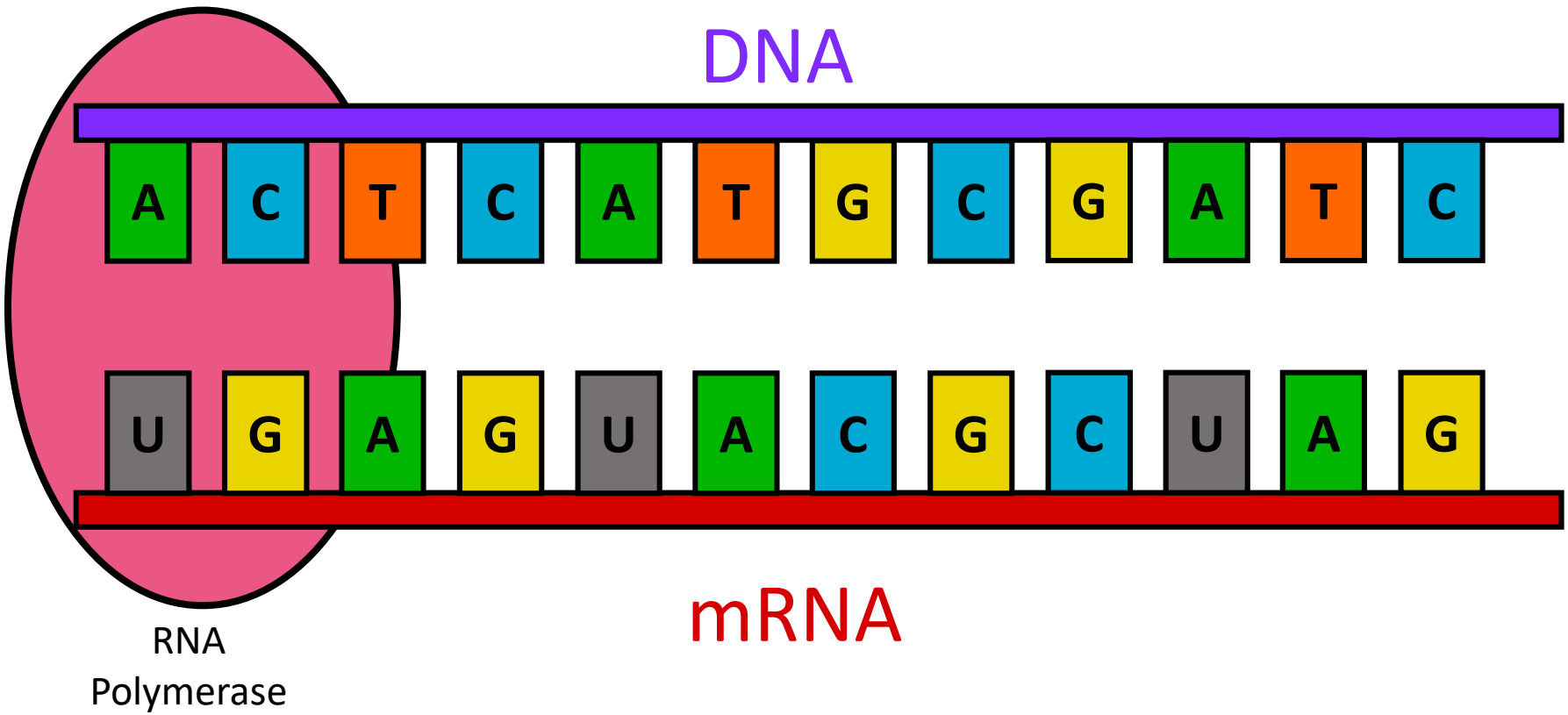
- **Protein synthesis** is the process of making proteins.
- There are two steps:
 1. Transcription- mRNA copies DNA instructions
 2. Translation- ribosomes uses mRNA to make proteins

Step 1: Transcription

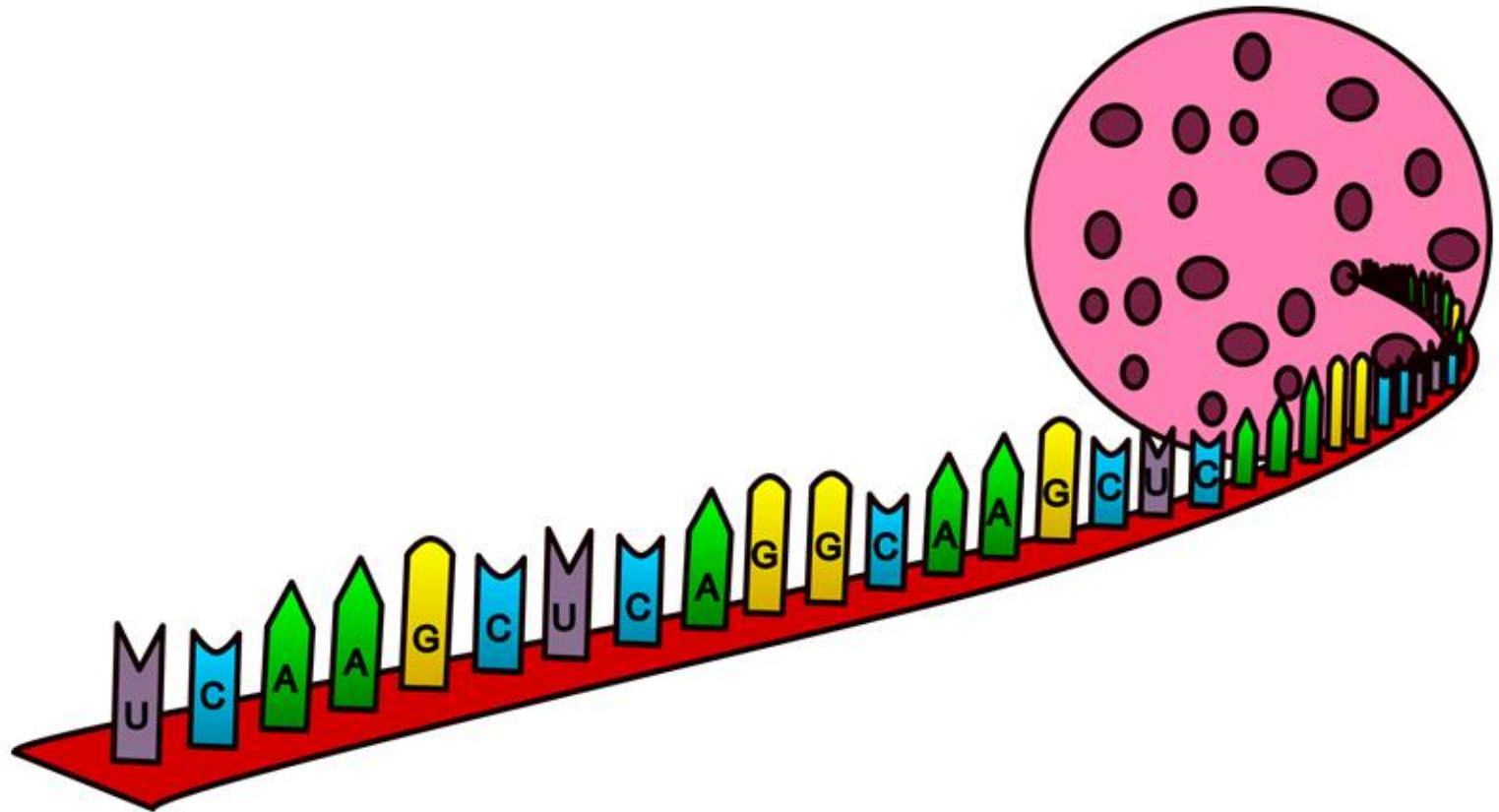
DNA → mRNA

- Location: Nucleus
- Players involved: DNA and mRNA
- What happens:
 - DNA unwinds where the gene is.
 - RNA polymerase uses DNA as a template to make an mRNA copy (transcript).
 - Now the mRNA copy can leave the nucleus.





The newly made mRNA leaves the nucleus

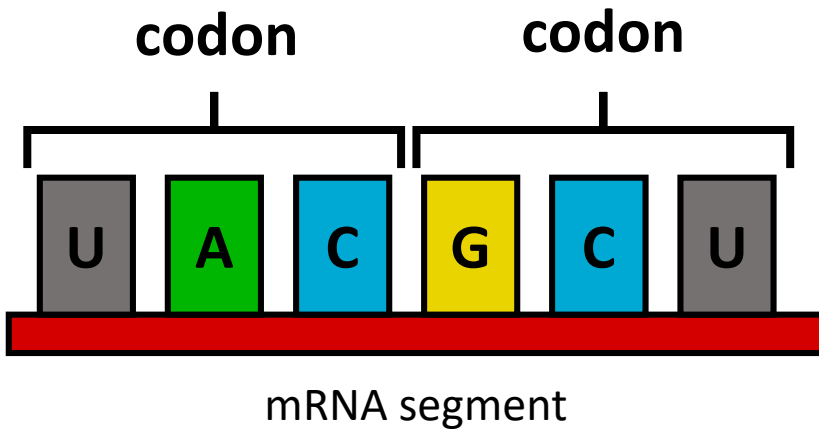


Genetic Code

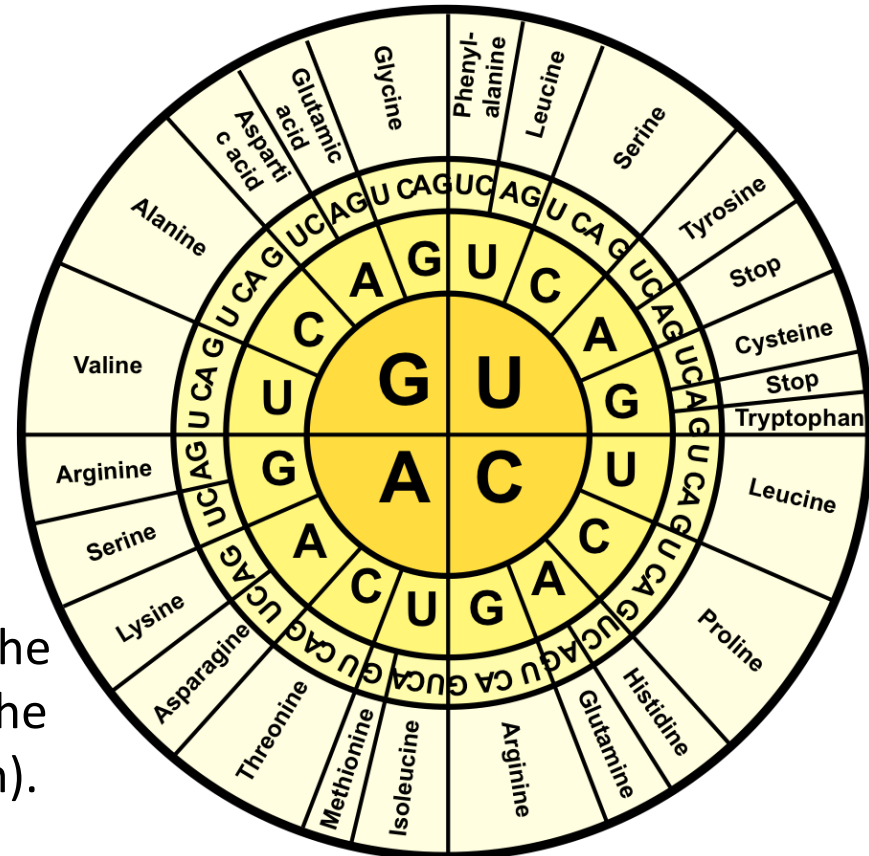
- Remember that we are trying to make a protein.
- Right now, we have an mRNA message.
- That nucleic acid “language” needs to be translated into protein “language.”
- To do that, we need to understand the code.

Genetic Code

- mRNA has **codons** - a sequence of 3 nucleotides that code for an amino acid (the building blocks of proteins)

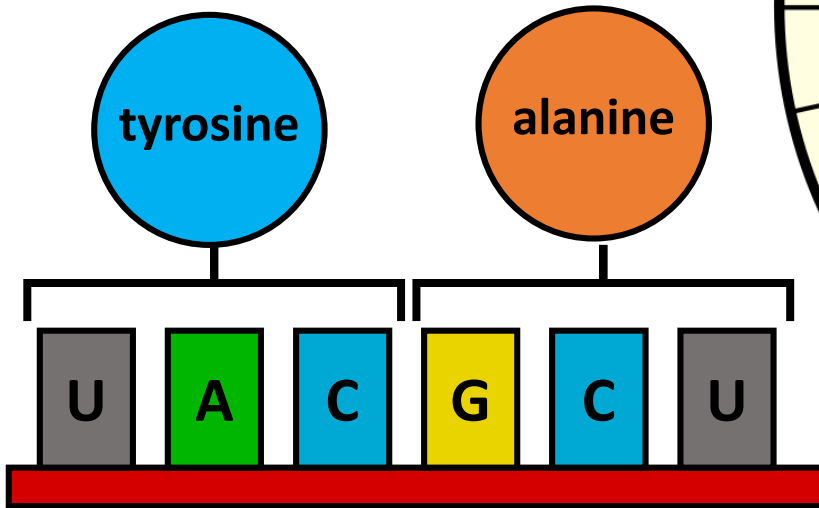


You can think of codons like the words of the genetic code. You need to translate all of the words in order to get the message (protein).

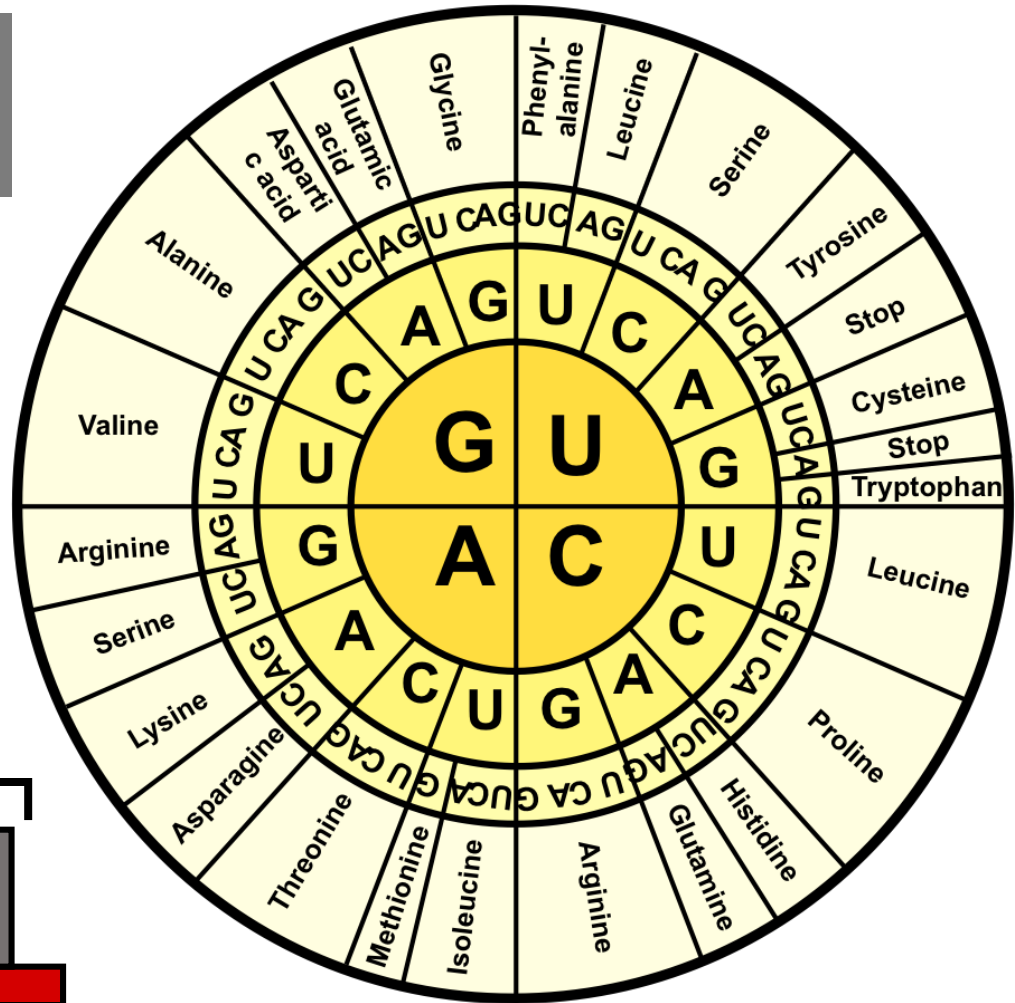


Genetic Code

Let's figure out which amino acids these codons code for:



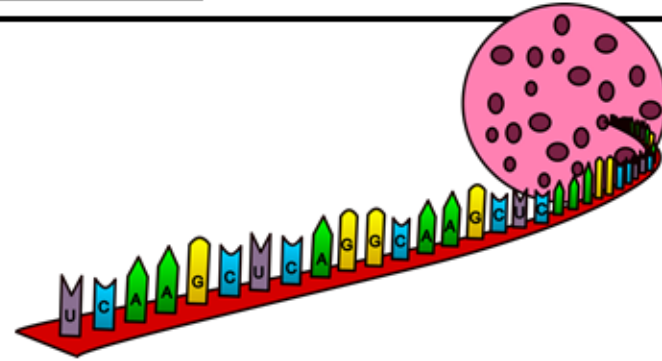
mRNA segment



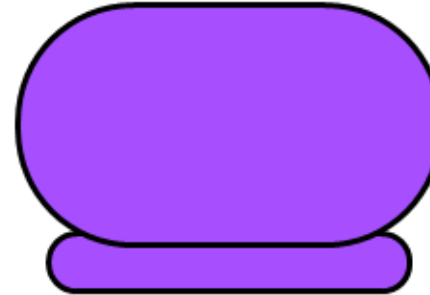
Start in the middle and work to the outside.

RNAs

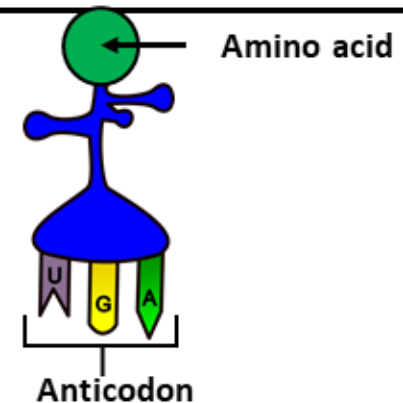
mRNA: carries DNA message as codons



rRNA: makes up ribosomes



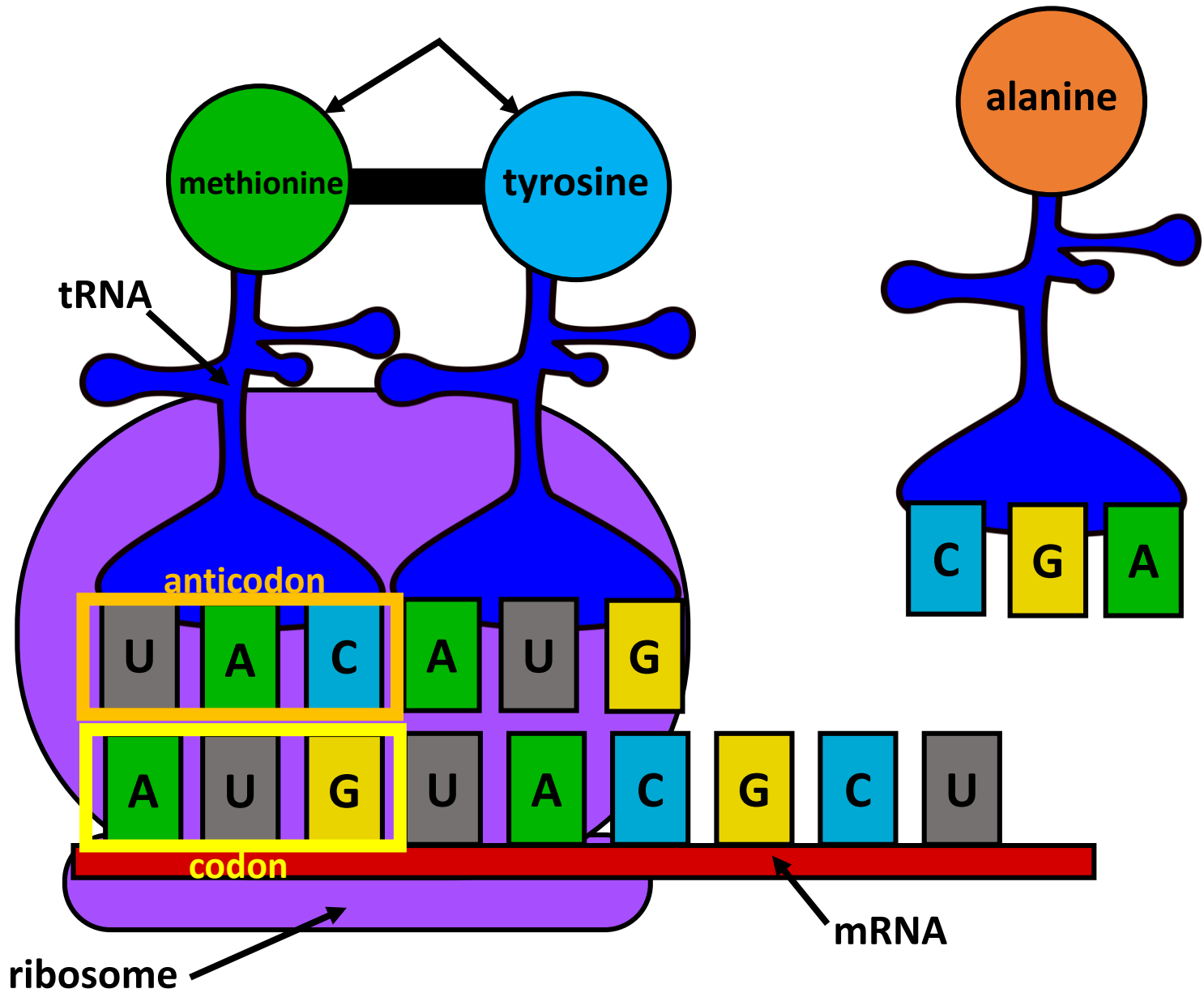
tRNA: matches anti-codon to mRNA codon to bring the correct amino acid



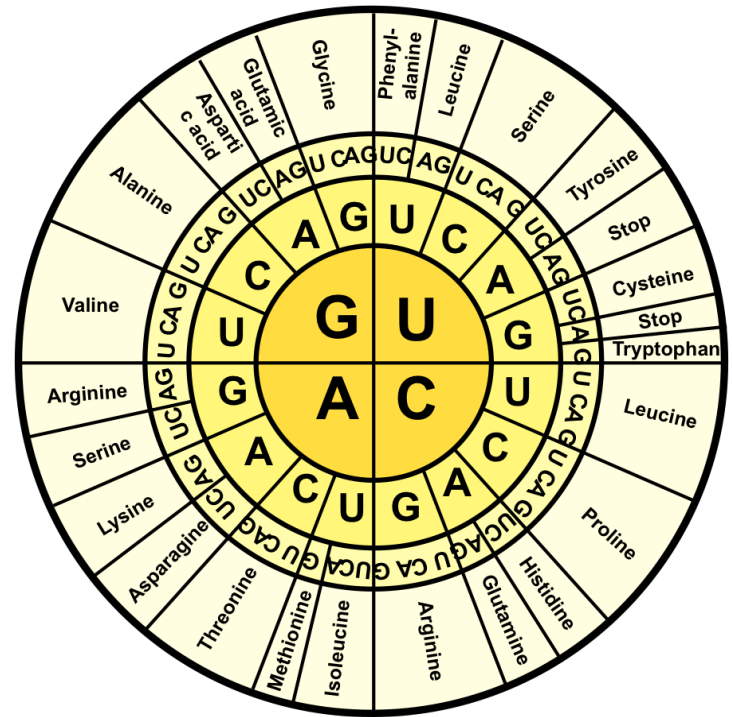
Step 2: Translation

mRNA → protein

- Location: ribosomes
- Players involved: mRNA, ribosome (rRNA), and tRNA
- What happens:
 - mRNA finds a ribosome and binds to it.
 - The mRNA codons are read by the tRNA.
 - tRNA brings in the right amino acid that matches the codon.
 - The amino acids link together to form a protein.



Practice!



DNA

TAC AGT ATA GCA GGA CTC

mRNA

AUG UCA UAU CGU CCU GAG

**Amino
Acid**

methionine serine tyrosine arginine proline glutamic acid