

PROTEIN SYNTHESIS

The Protein-making Process

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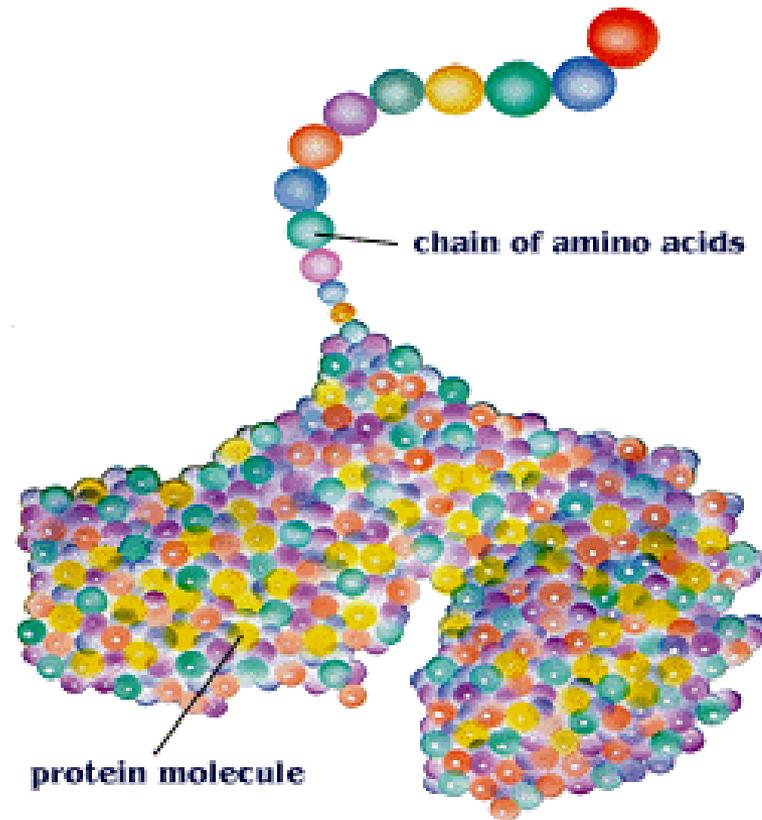
Protein Synthesis (Gene Expression) Notes

Proteins (Review)

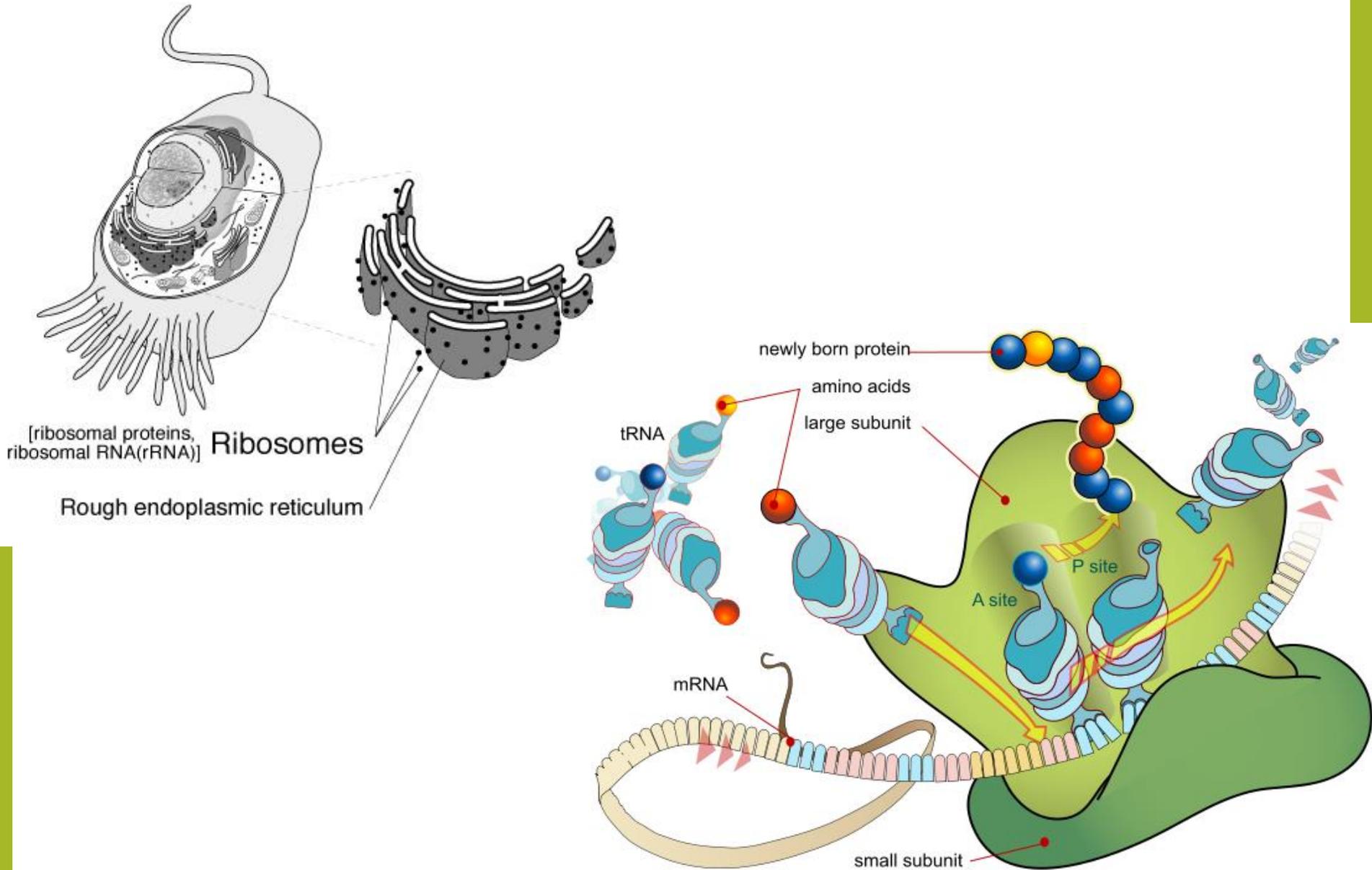
- Proteins make up all **living** materials



- Proteins are composed of amino acids – there are 20 different amino acids
- Different proteins are made by combining these 20 amino acids in different combinations



- Proteins are manufactured (made) by the ribosomes



- Function of proteins:

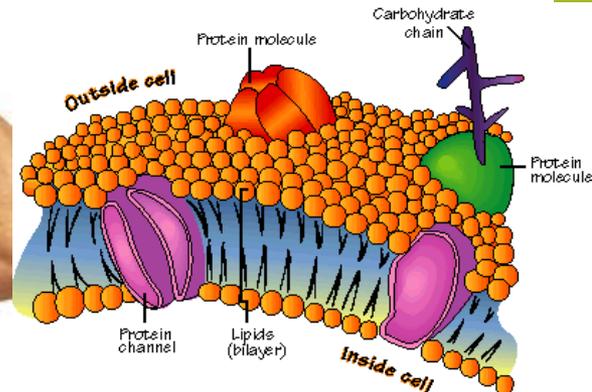
1. Help fight **disease**

2. Build new body **tissue**

3. **Enzymes** used for digestion and other chemical reactions are proteins

(Enzymes **speed up** the **rate** of a reaction)

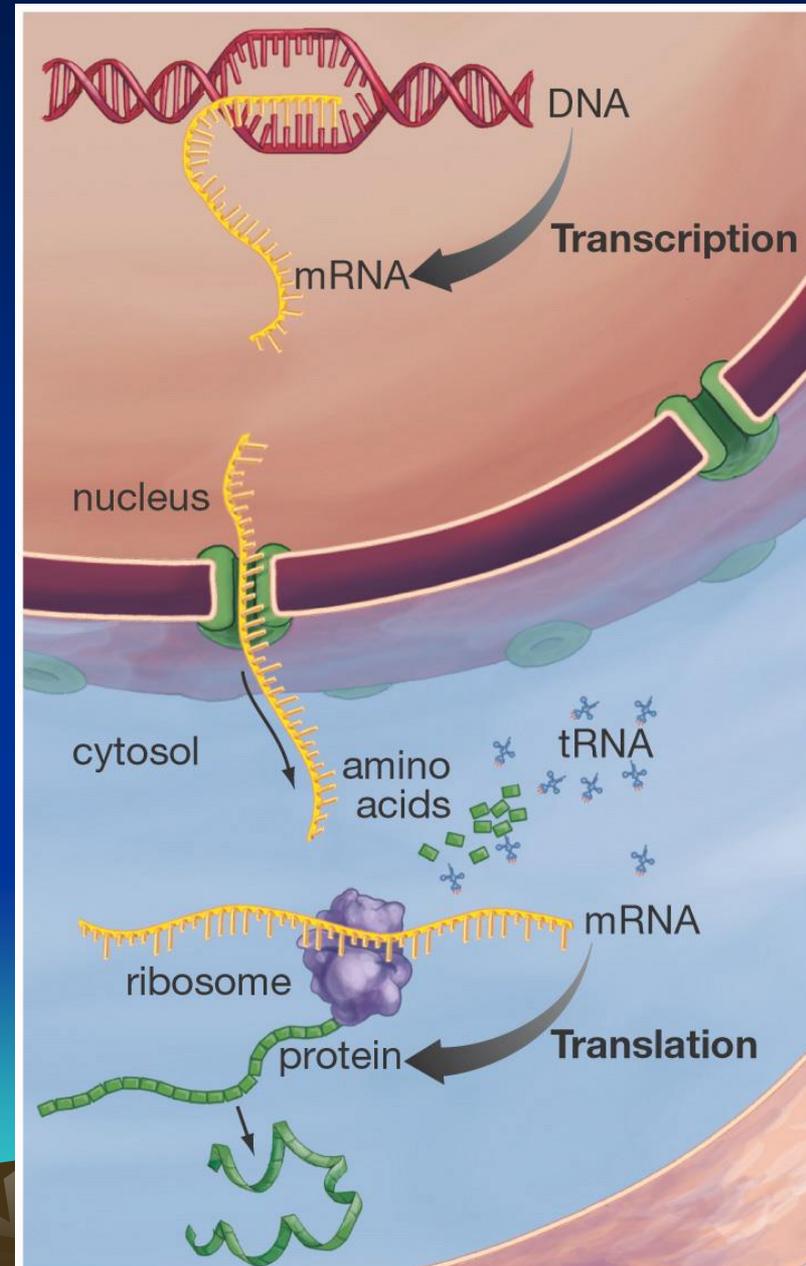
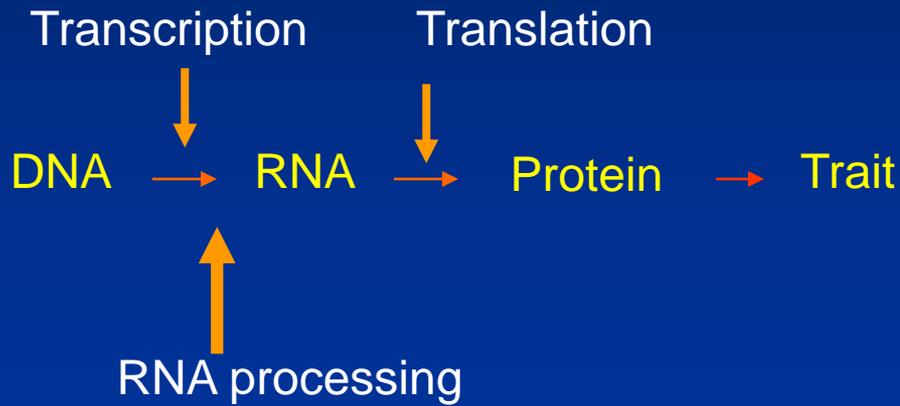
4. Component of all **cell membranes**



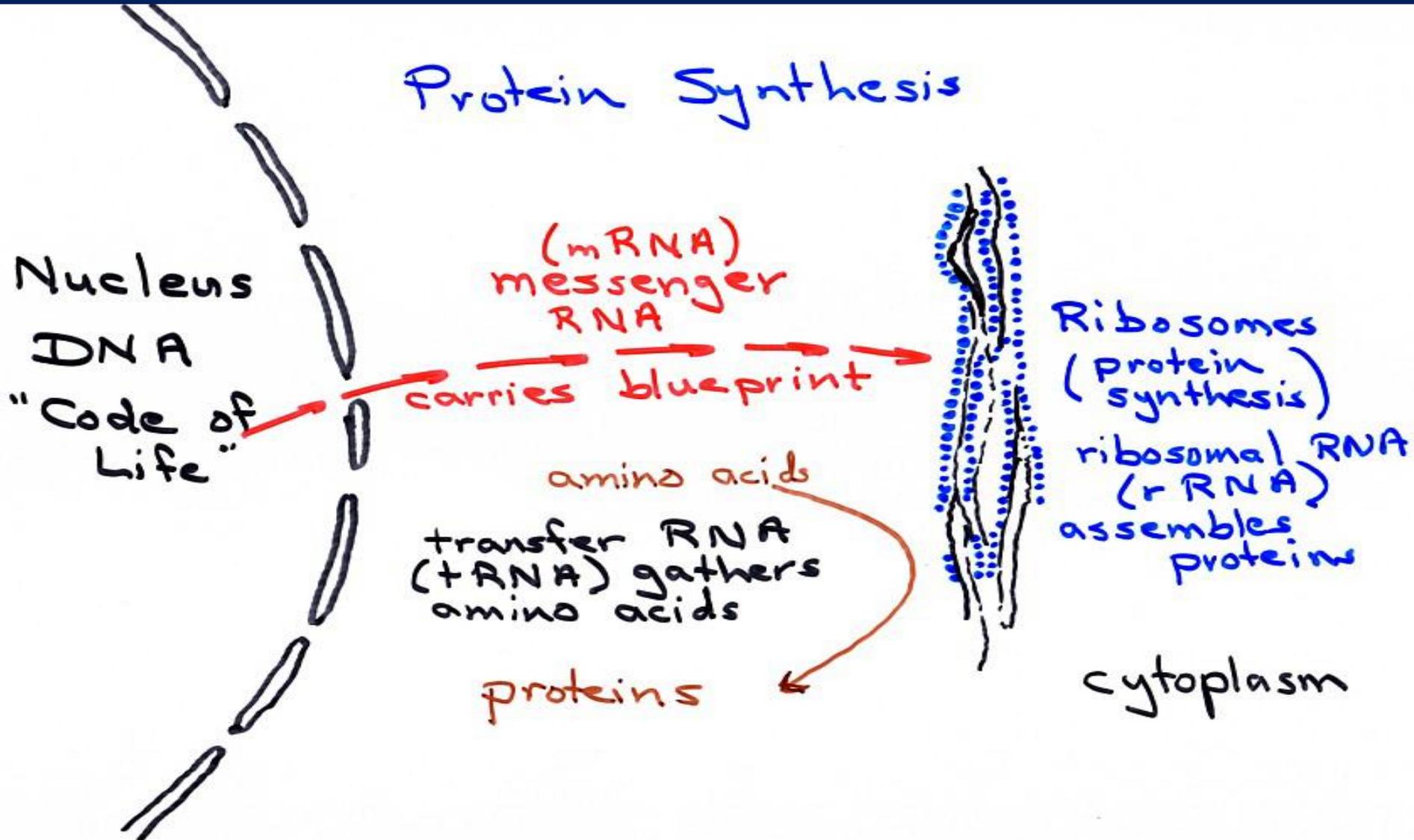
MAKING PROTEINS

Step 1: Transcription

The "Central Dogma" of Molecular Genetics



Protein synthesis

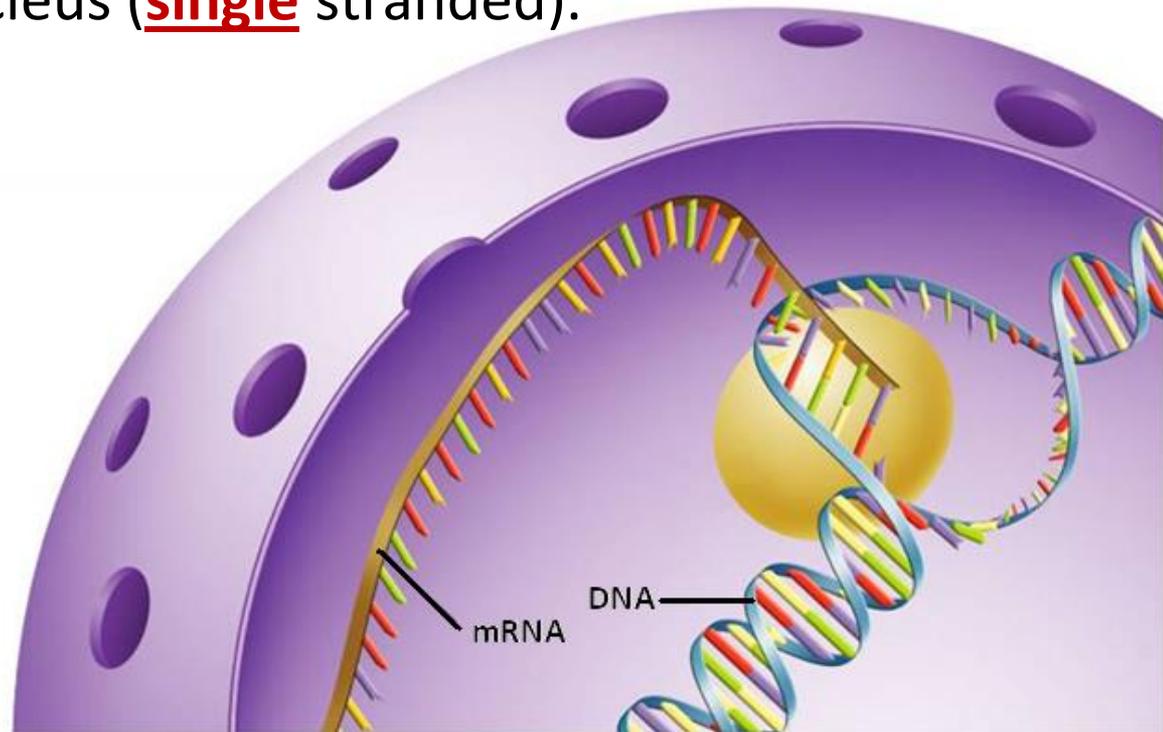


Making a Protein—Transcription

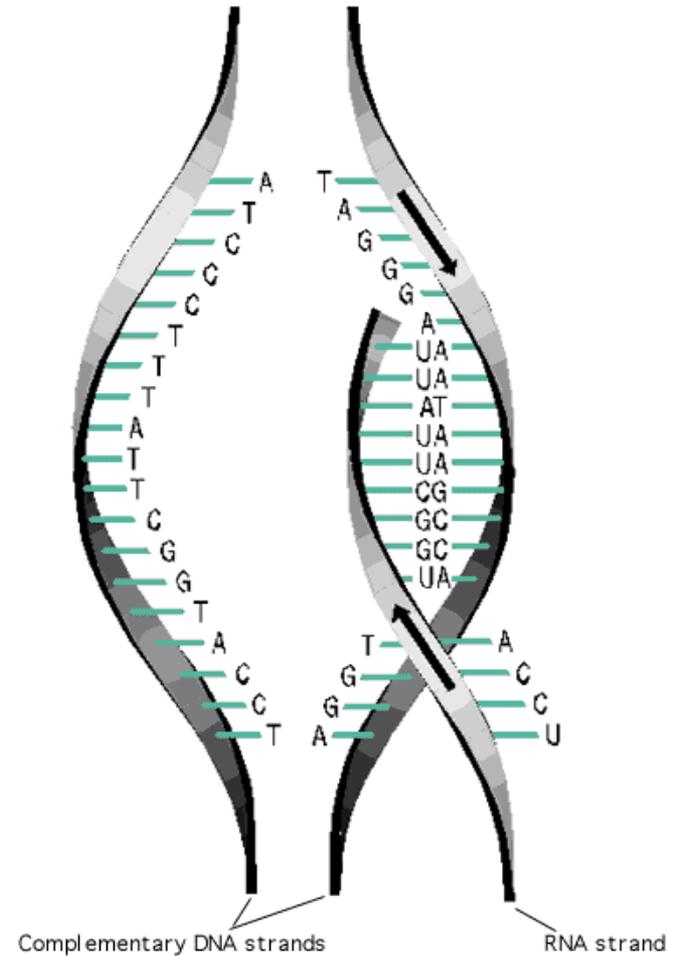
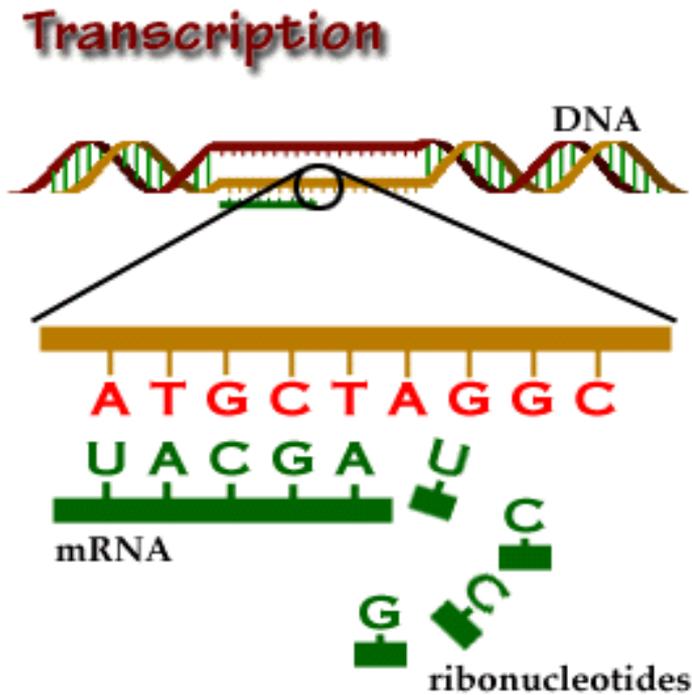
- **First Step: Copying** of genetic information from **DNA** to **RNA** called **Transcription**

Why? DNA has the **genetic code** for the **protein** that needs to be made, but proteins are made by the ribosomes—ribosomes are outside the **nucleus** in the **cytoplasm**.

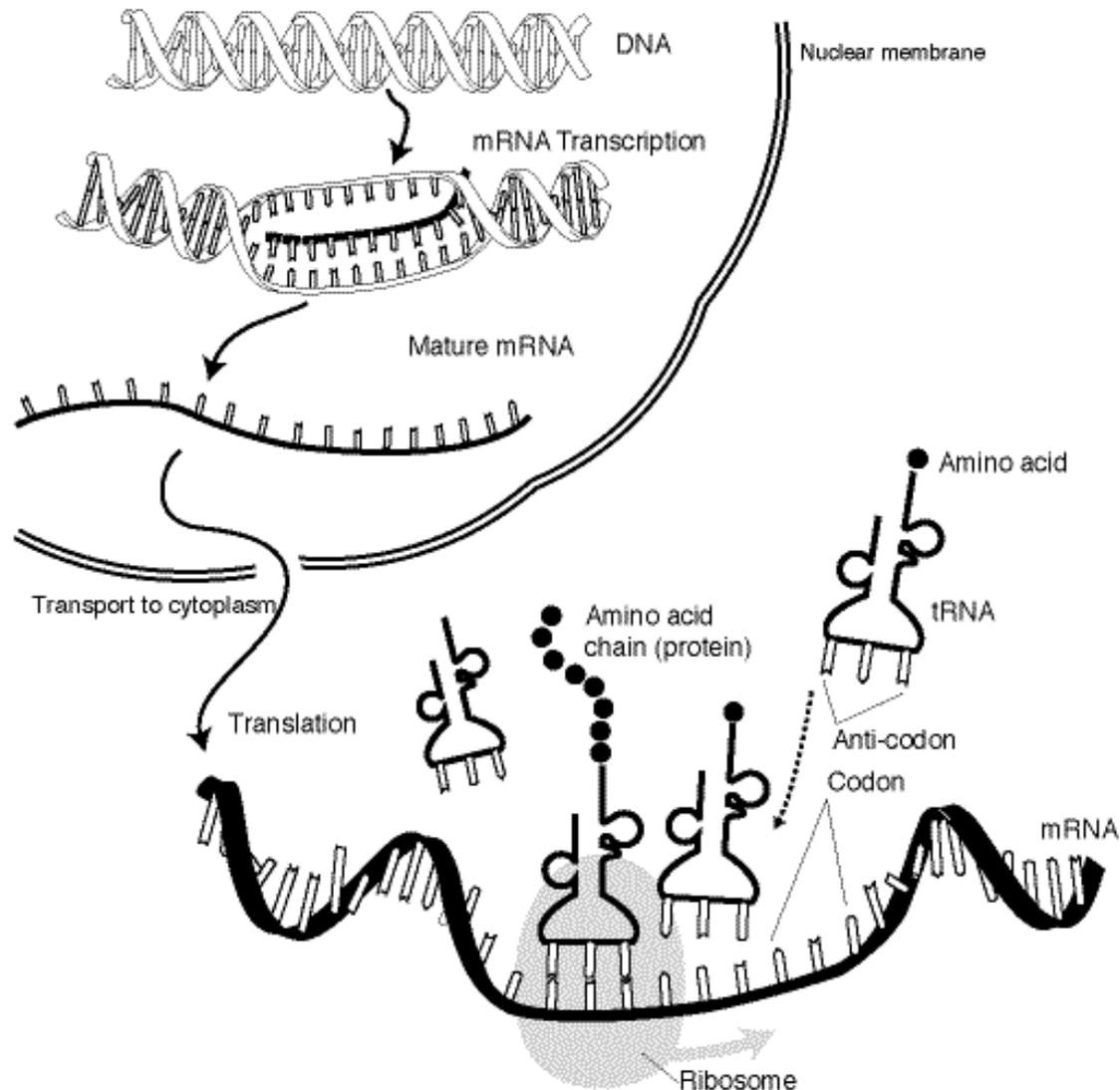
DNA is too **large** to leave the nucleus (**double** stranded), but RNA **can leave** the nucleus (**single** stranded).



- Part of DNA temporarily **unzips** and is used as a **template** to assemble **complementary** nucleotides into **messenger RNA** (mRNA).



- mRNA then goes through the **pores** of the nucleus with the DNA **code** and attaches to the **ribosome**.

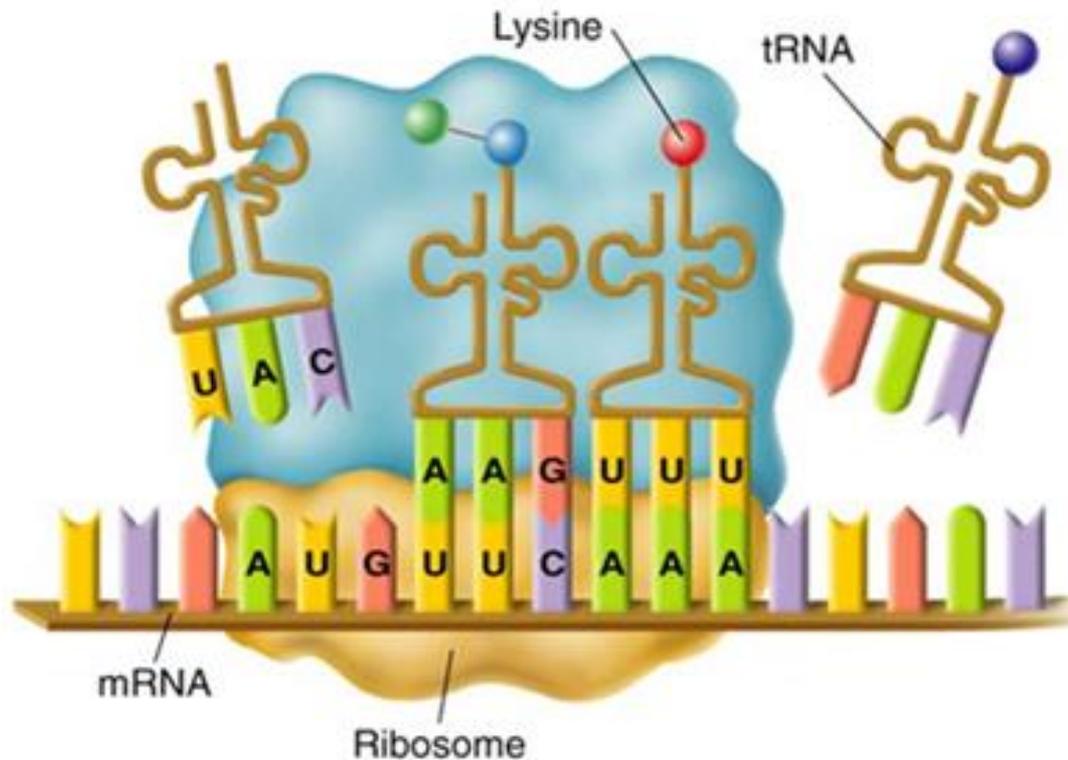


MAKING PROTEINS

Step 2: Translation

Making a Protein—Translation

- **Second Step**: **Decoding** of mRNA into a **protein** is called **Translation**.
- **Transfer RNA** (tRNA) carries **amino acids** from the cytoplasm to the **ribosome**.

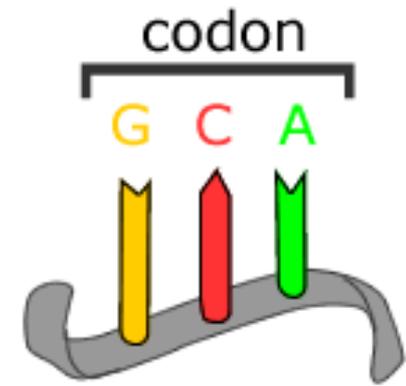


These amino acids come from the food we eat. Proteins we eat are broken down into individual amino acids and then simply rearranged into new proteins according to the needs and directions of our DNA.

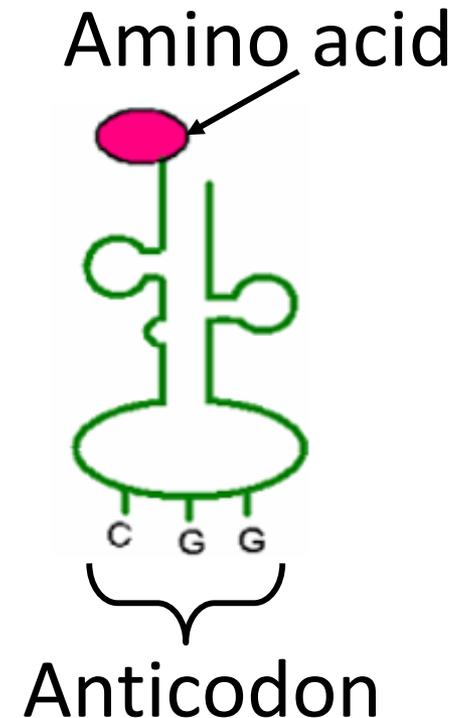
Proteins



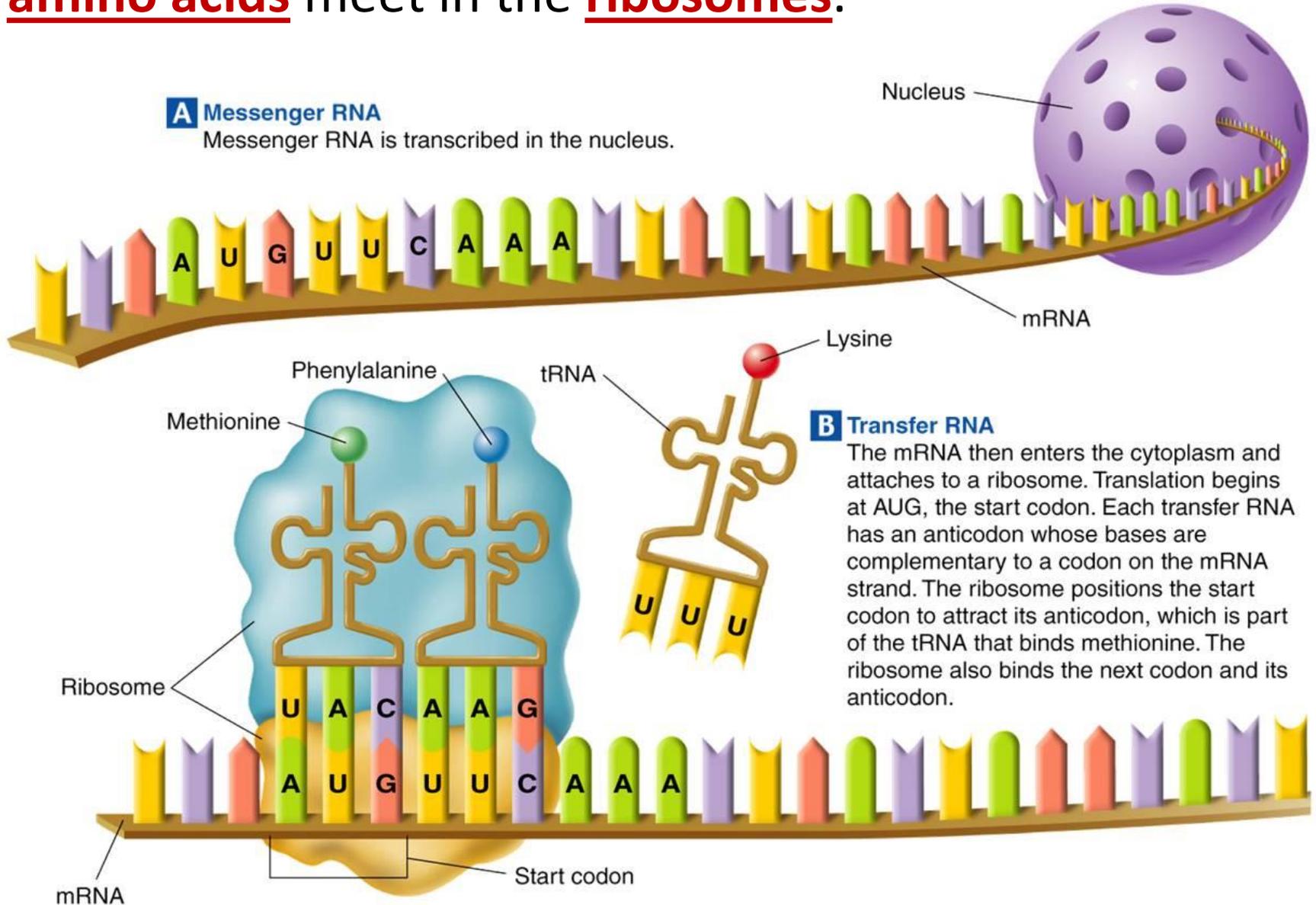
- A series of three adjacent bases in an mRNA molecule codes for a specific amino acid—called a codon.



- Each tRNA has 3 nucleotides that are complementary to the codon in mRNA.
- Each tRNA codes for a different amino acid.



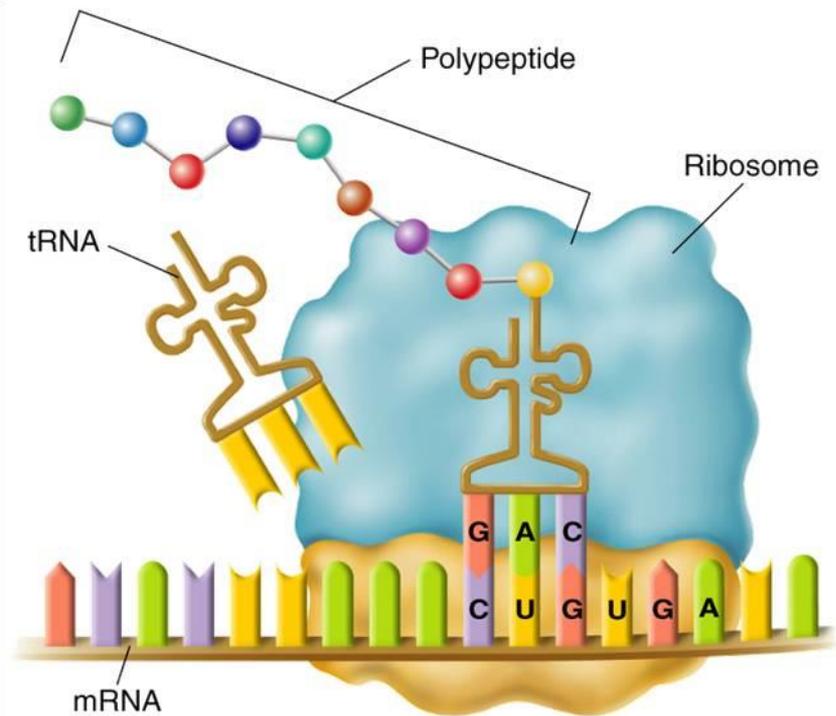
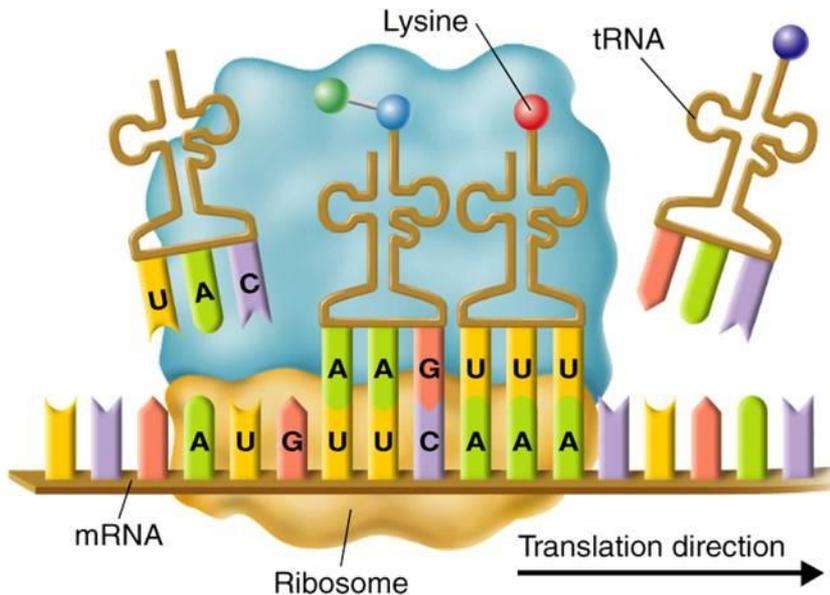
- mRNA carrying the **DNA instructions** and tRNA carrying **amino acids** meet in the **ribosomes**.



- Amino acids are joined together to make a **protein**.

C The Polypeptide “Assembly Line”

The ribosome joins the two amino acids—methionine and phenylalanine—and breaks the bond between methionine and its tRNA. The tRNA floats away from the ribosome, allowing the ribosome to bind another tRNA. The ribosome moves along the mRNA, binding new tRNA molecules and amino acids.



D Completing the Polypeptide

The process continues until the ribosome reaches one of the three stop codons. The result is a complete polypeptide.

Polypeptide = **Protein**

Use one of the codon charts on the next page to find the amino acid sequence coded for by the following mRNA strands.

CAC/CCA/UGG/UGA

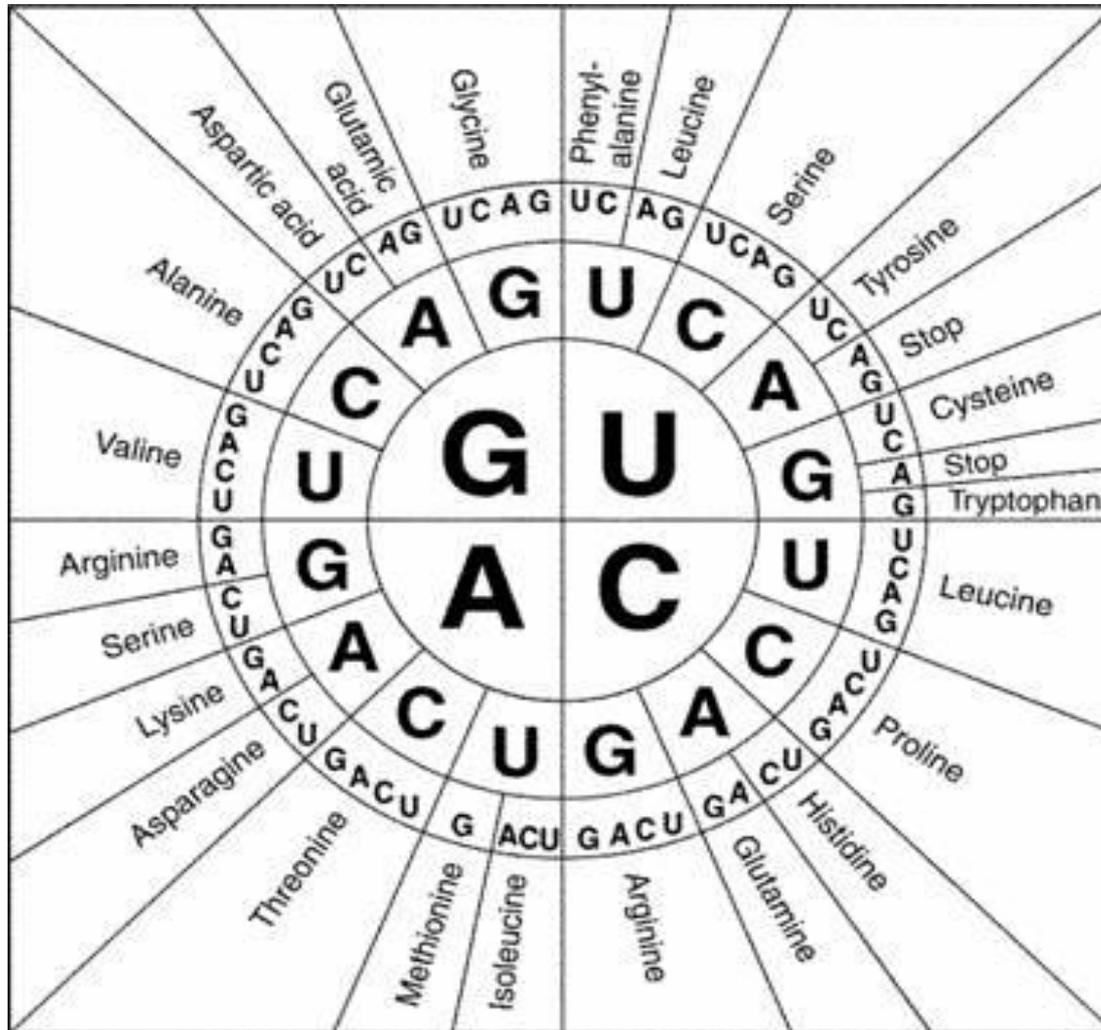


AUG/AAC/GAC/UAA



AUG/AAC/GAC/UAA

Methionine / Asparagine / Aspartic Acid / Stop



Protein Synthesis



DNA

transcription



mRNA

translation

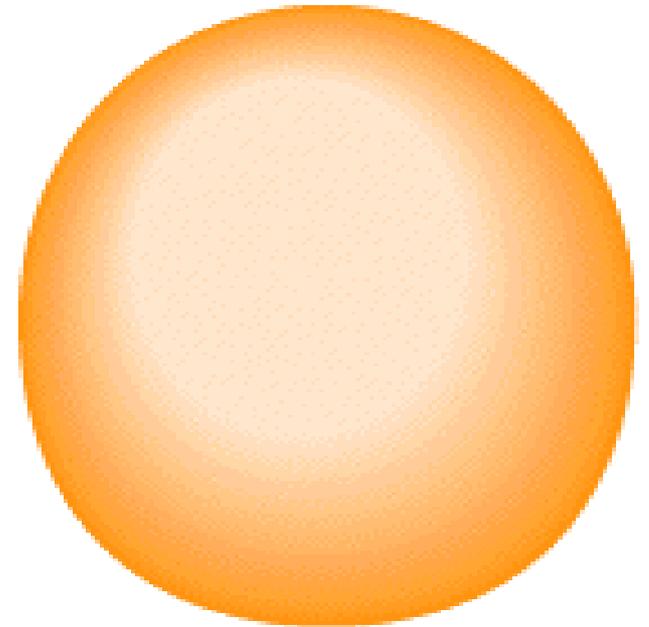
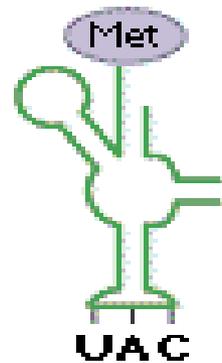


protein

The background of the slide features a semi-transparent blue overlay with faint, stylized illustrations of a DNA double helix and several protein structures. The DNA is depicted as a red and blue twisted ladder, while the proteins are shown as light blue, multi-lobed shapes. On the left side of the overlay, there are some faint, illegible text elements that appear to be part of a diagram or legend.

How Proteins Are Made

Protein synthesis in motion



PROTEIN SYNTHESIS

