PROTEIN SYNTHESIS

The Protein-making Process

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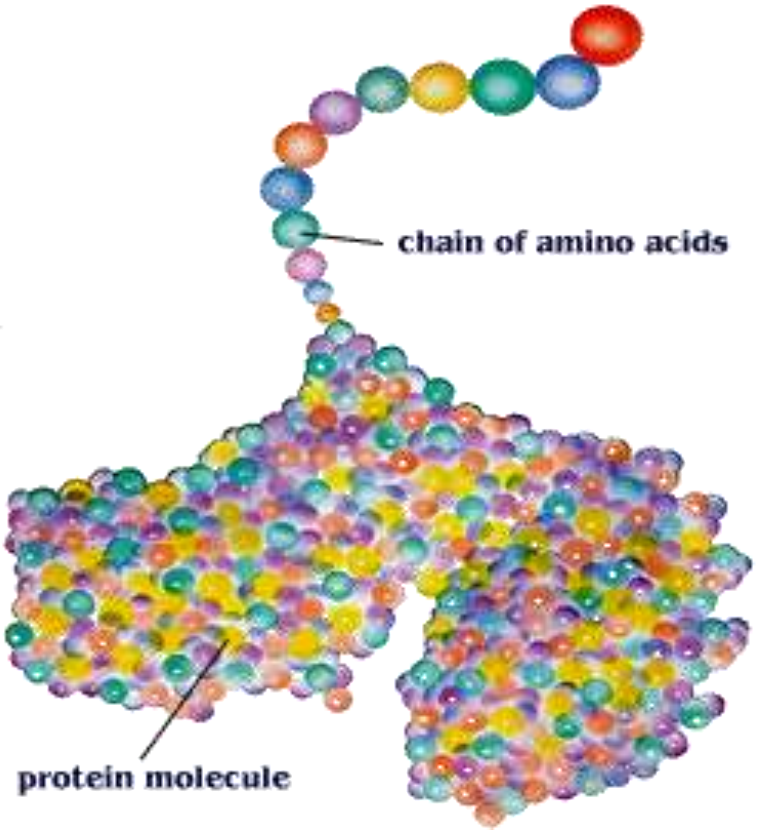
Protein Synthesis (Gene Expression) Notes

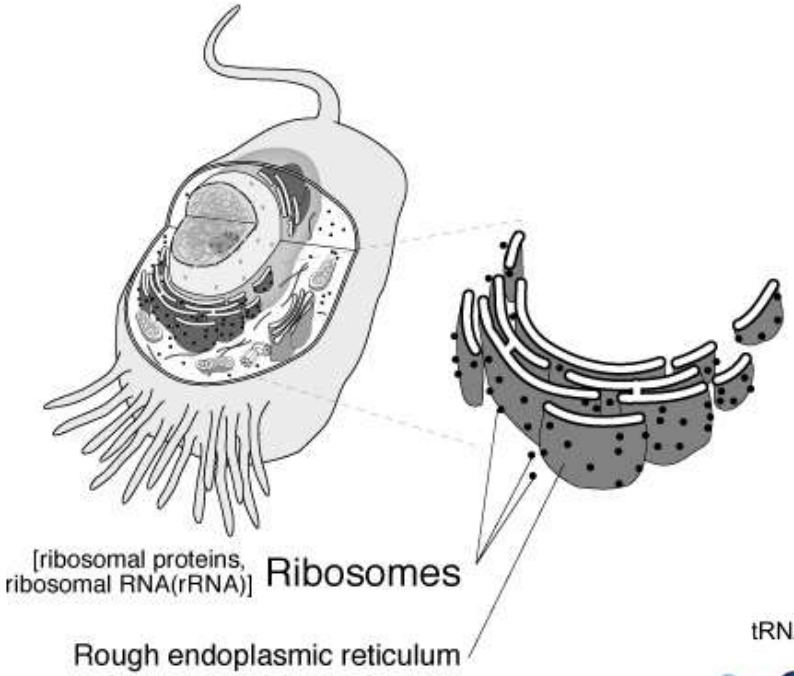
Proteins (Review)

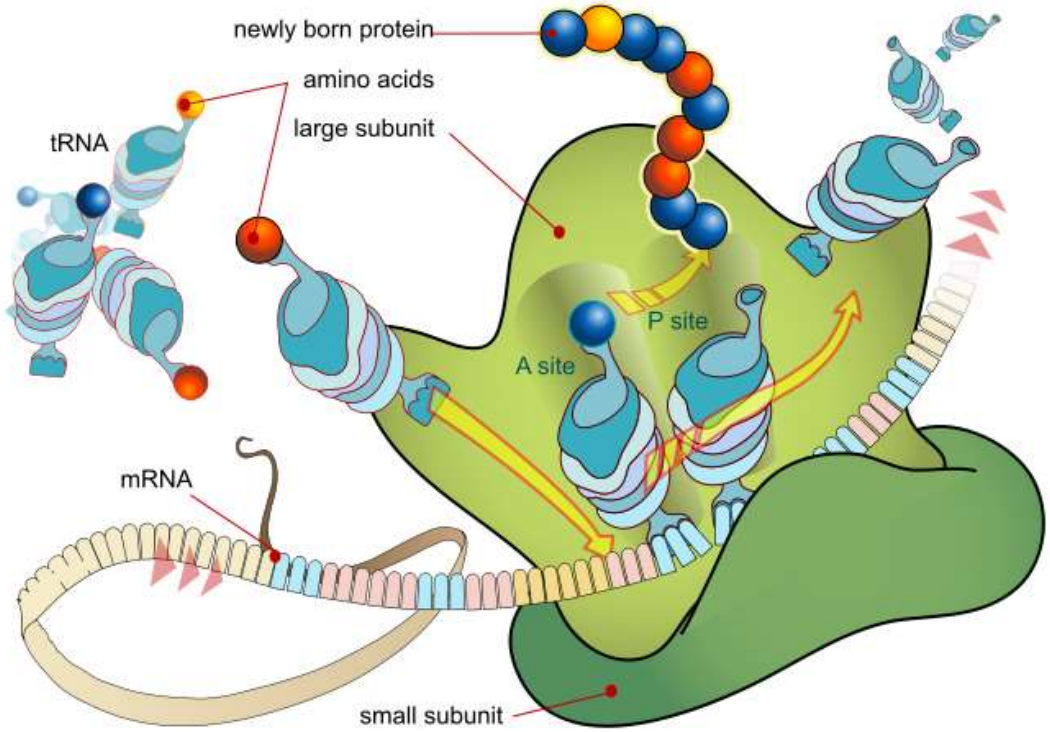
- Proteins make up all **<u>living</u>** materials

- 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



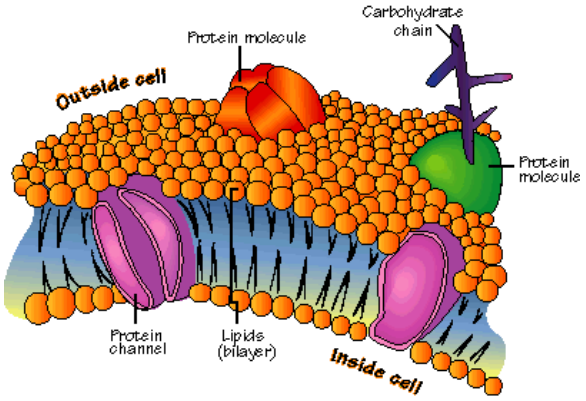
- Proteins are manufactured (made) by the ribosomes





- 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

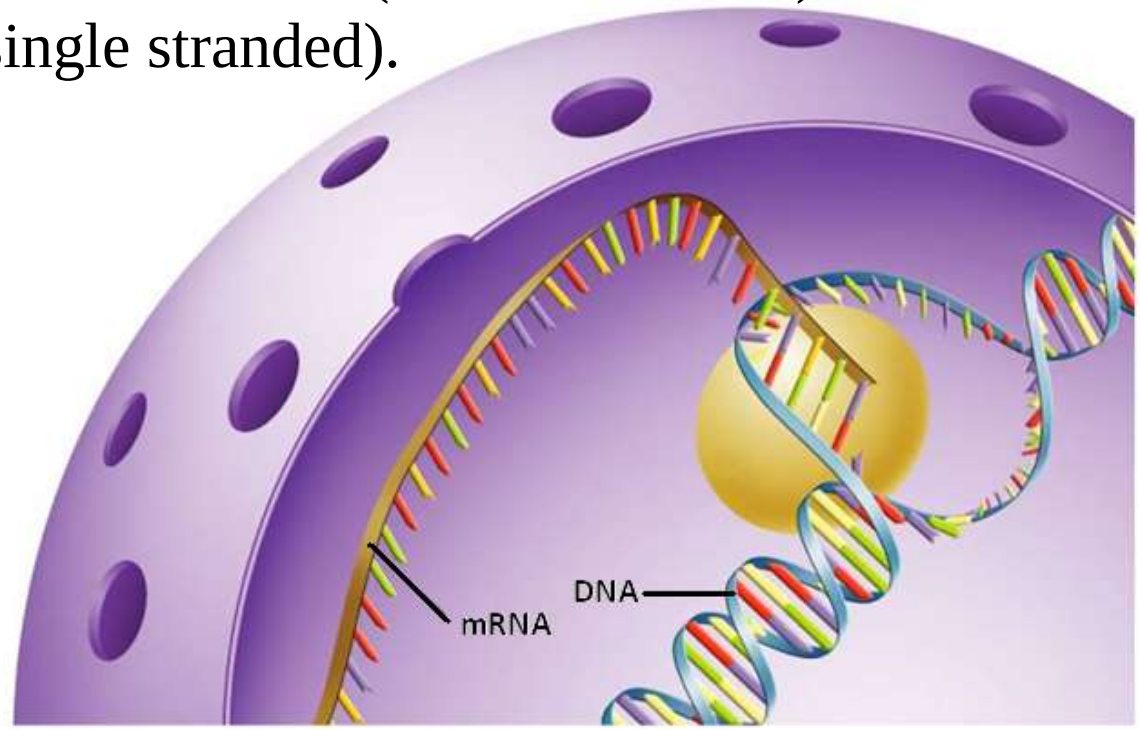
Step 1: Transcription

Making a Protein—Transcription

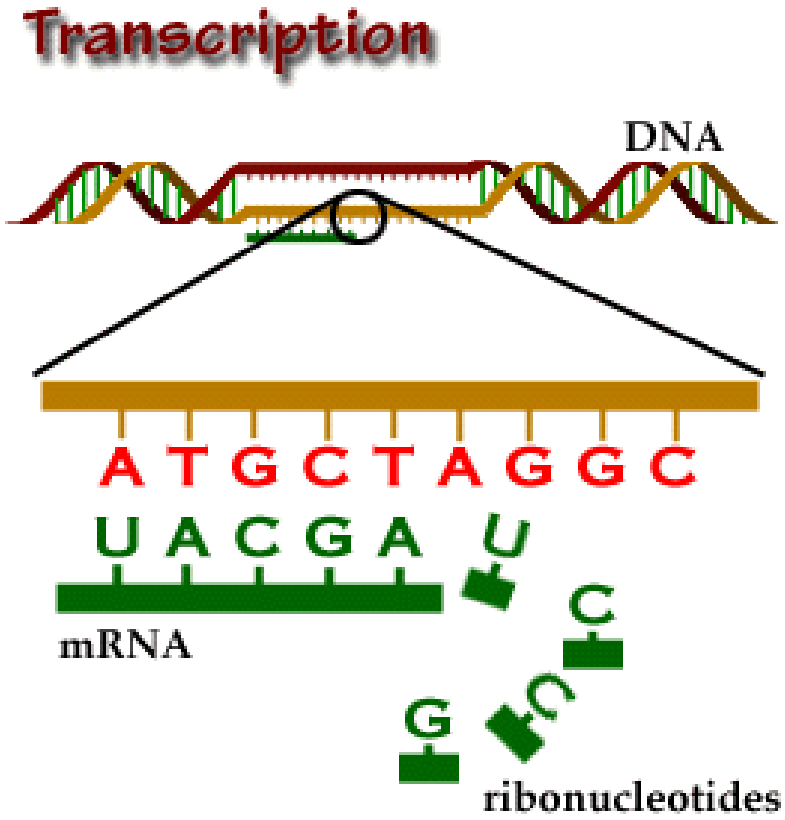
- First Step: Copying of genetic information from DNA to RNA called Transcription

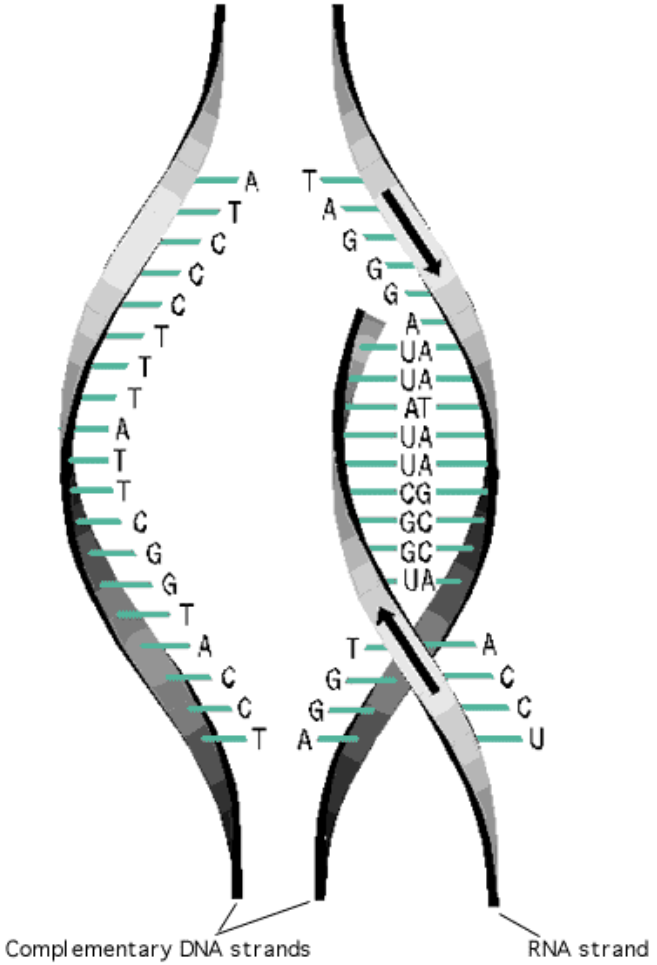
  Why? DNA has the genetic code for the protein that needs to be made, but proteins are made by the ribosomes—ribosomes are outside the nucleus in the cytoplasm.

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

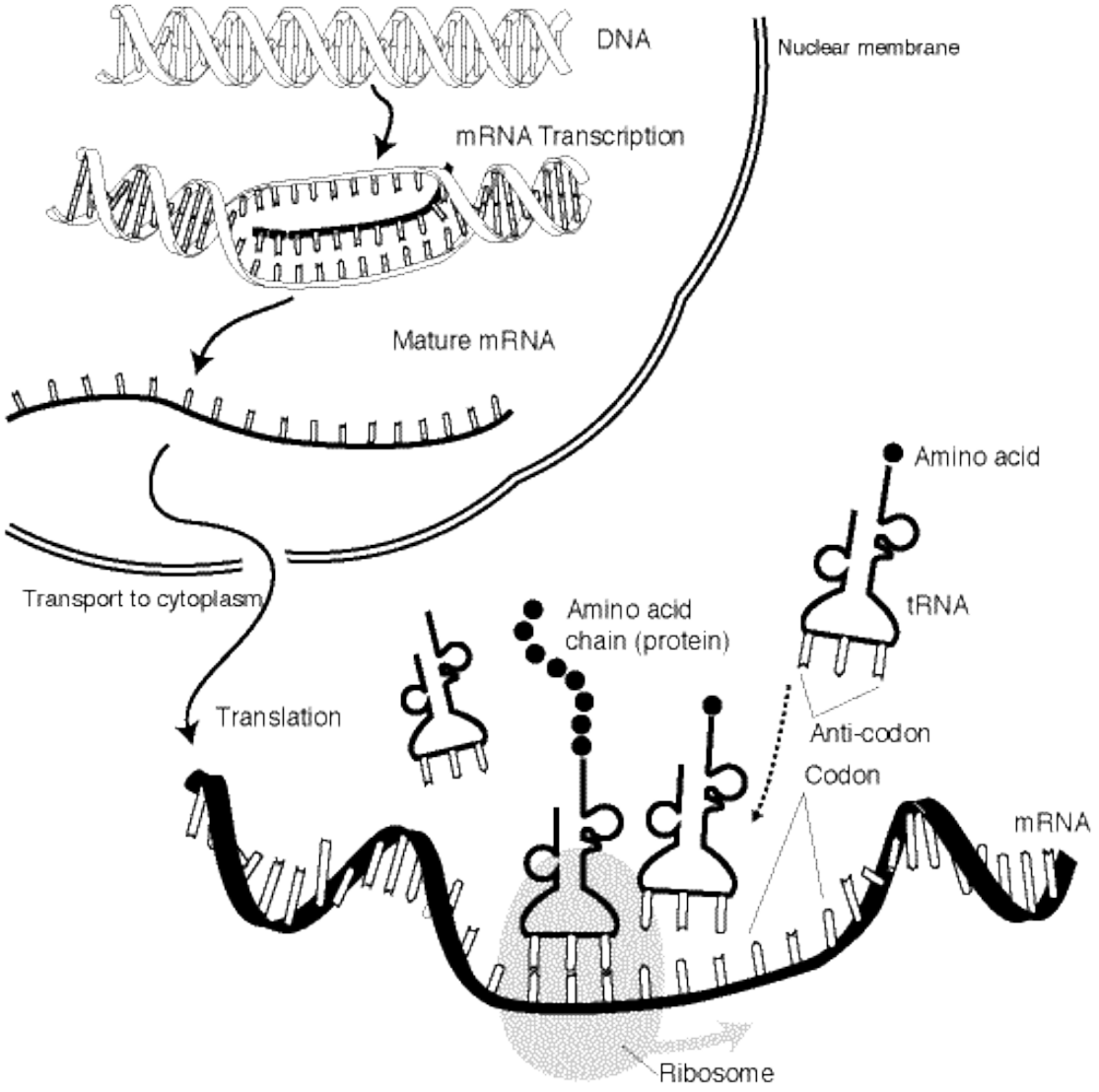


- Part of DNA temporarily unzips and is used as a template to assemble complementary nucleotides into messenger RNA (mRNA).





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

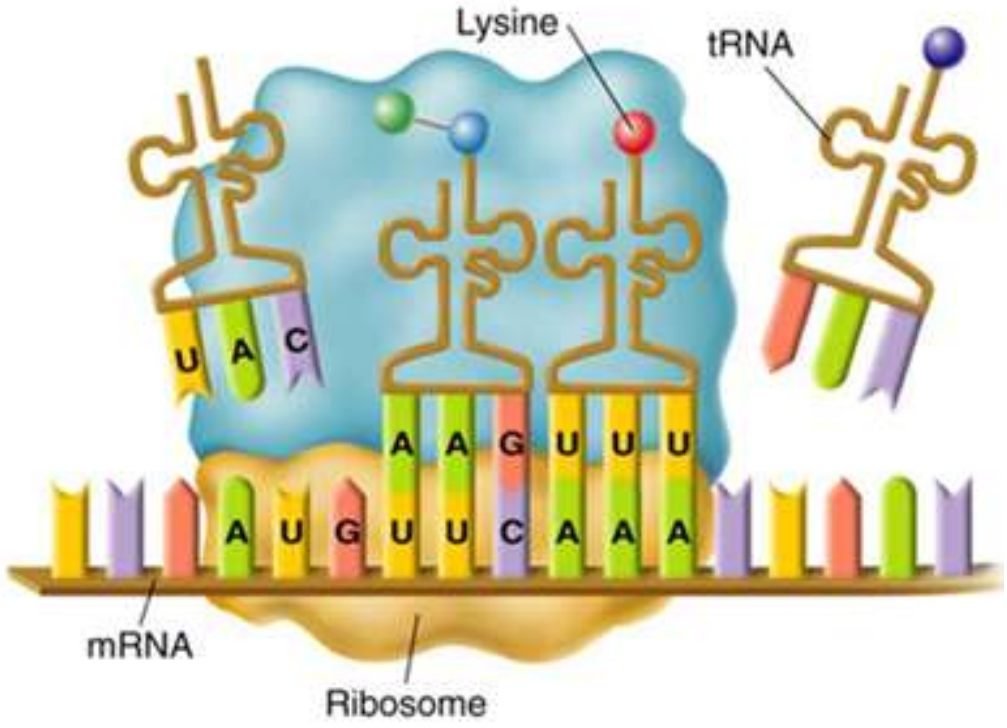


MAKING PROTEINS

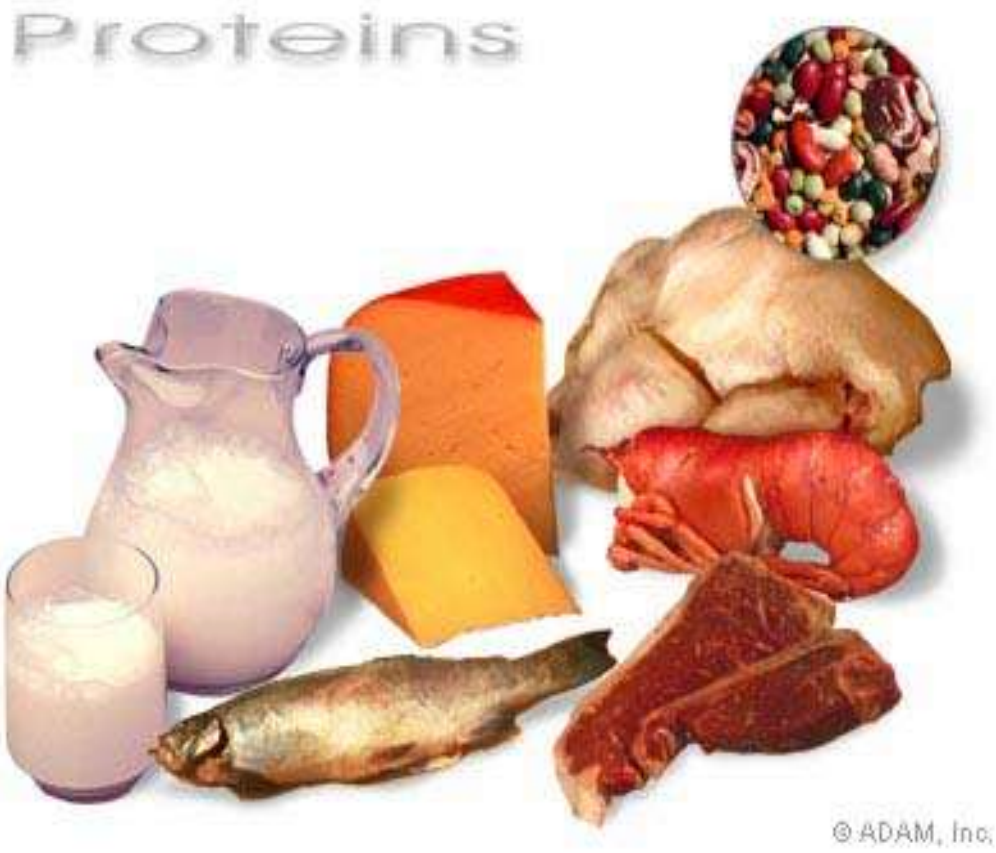
Step 2: Translation

Making a Protein—Translation

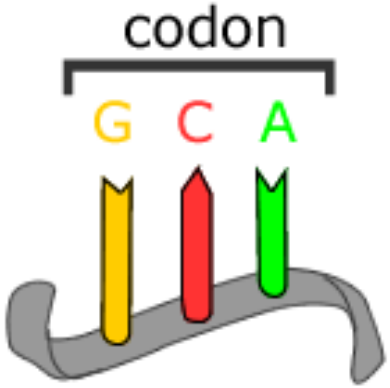
- Second Step: Decoding of mRNA into a protein is called Translation.
- Transfer RNA (tRNA) carries amino acids from the cytoplasm to the ribosome.



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.

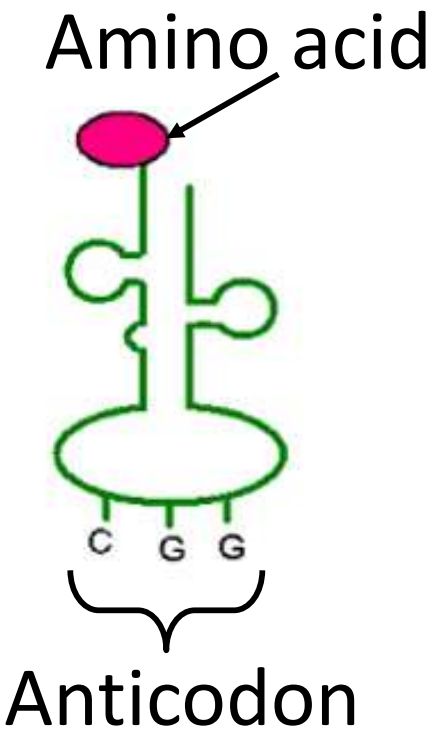


- A series of three adjacent bases in an mRNA molecule codes for a specific amino acid—called a codon.

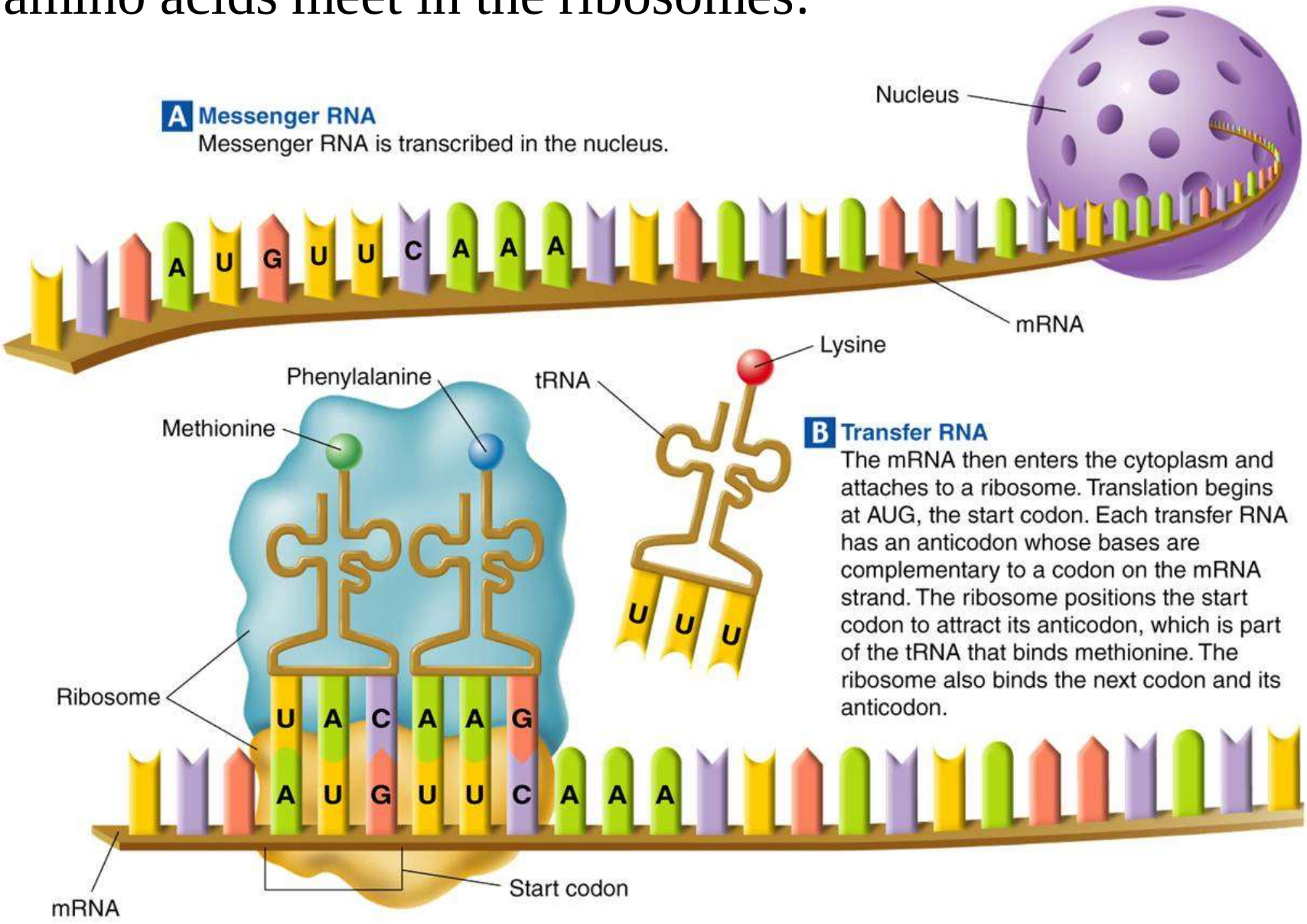


- Each tRNA has 3 nucleotides that are complementary to the codon in mRNA.

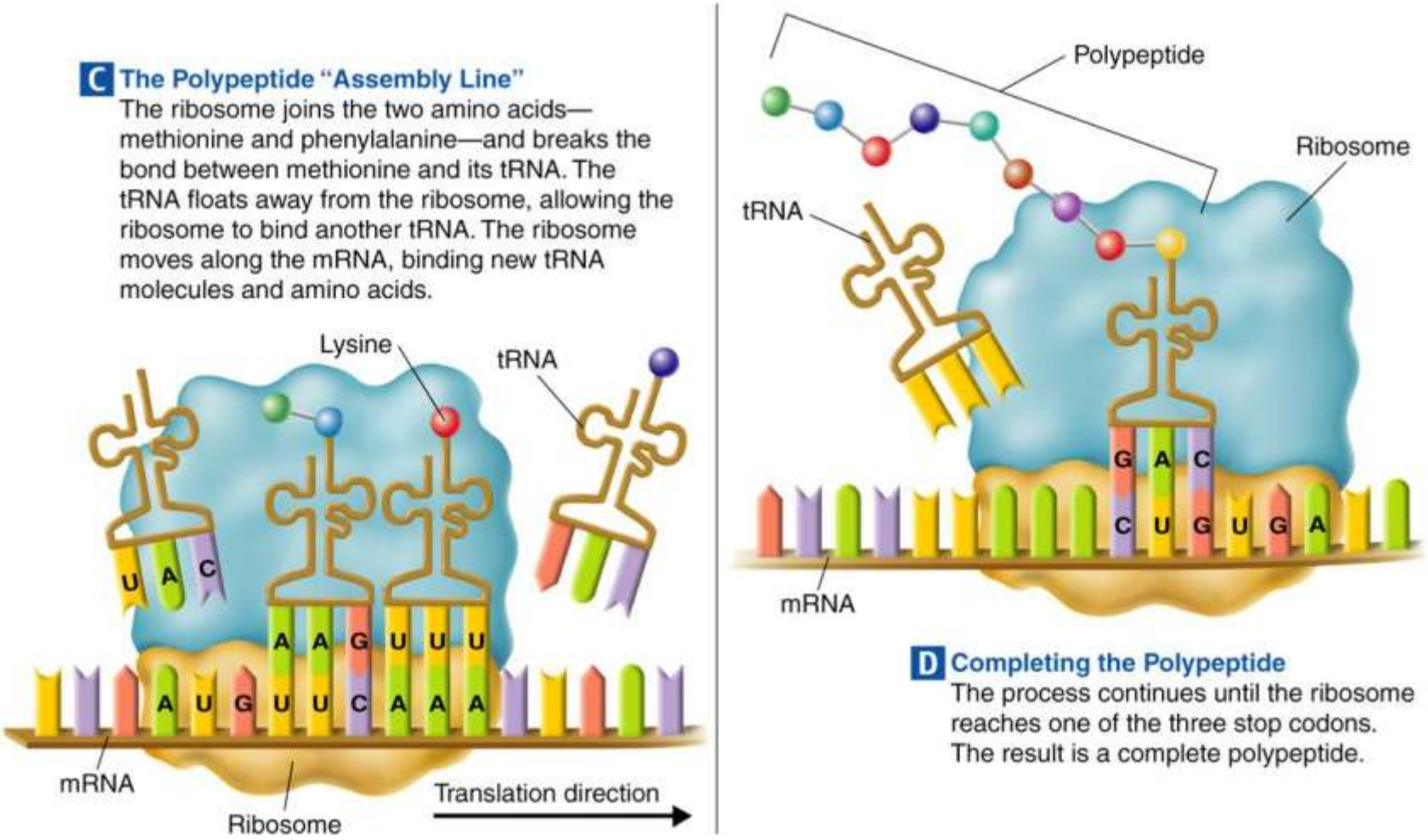
- Each tRNA codes for a different amino acid.



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



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



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

_____/_____/_____/_____

CAC/CCA/UGG/UGA

_____/_____/_____/_____

1st base

1st Base / 2nd base	U		C		A		G		3rd Base
U	UUU	Phenylalanine	UCU	Serine	UAU	Tyrosine	UGU	Cysteine	U
	UUC	Phenylalanine	UCC	Serine	UAC	Tyrosine	UGC	Cysteine	C
	UUA	Leucine	UCA	Serine	UAA	Stop	UGA	Stop	A
	UUG	Leucine	UCG	Serine	UAG	Stop	UGG	Tryptophan	G
C	CUU	Leucine	CCU	Proline	CAU	Histidine	CGU	Arginine	U
	CUC	Leucine	CCC	Proline	CAC	Histidine	CGC	Arginine	C
	CUA	Leucine	CCA	Proline	CAA	Glutamine	CGA	Arginine	A
	CUG	Leucine	CCG	Proline	CAG	Glutamine	CGG	Arginine	G
A	AUU	Isoleucine	ACU	Threonine	AAU	Asparagine	AGU	Serine	U
	AUC	Isoleucine	ACC	Threonine	AAC	Asparagine	AGC	Serine	C
	AUA	Isoleucine	ACA	Threonine	AAA	Lysine	AGA	Arginine	A
	AUG	Methionine (Start)	ACG	Threonine	AAG	Lysine	AGG	Arginine	G
G	GUU	Valine	GCU	Alanine	GAU	Aspartic Acid	GGU	Glycine	U
	GUC	Valine	GCC	Alanine	GAC	Aspartic Acid	GGC	Glycine	C
	GUA	Valine	GCA	Alanine	GAA	Glutamic Acid	GGA	Glycine	A
	GUG	Valine	GCG	Alanine	GAG	Glutamic Acid	GGG	Glycine	G

2nd Base

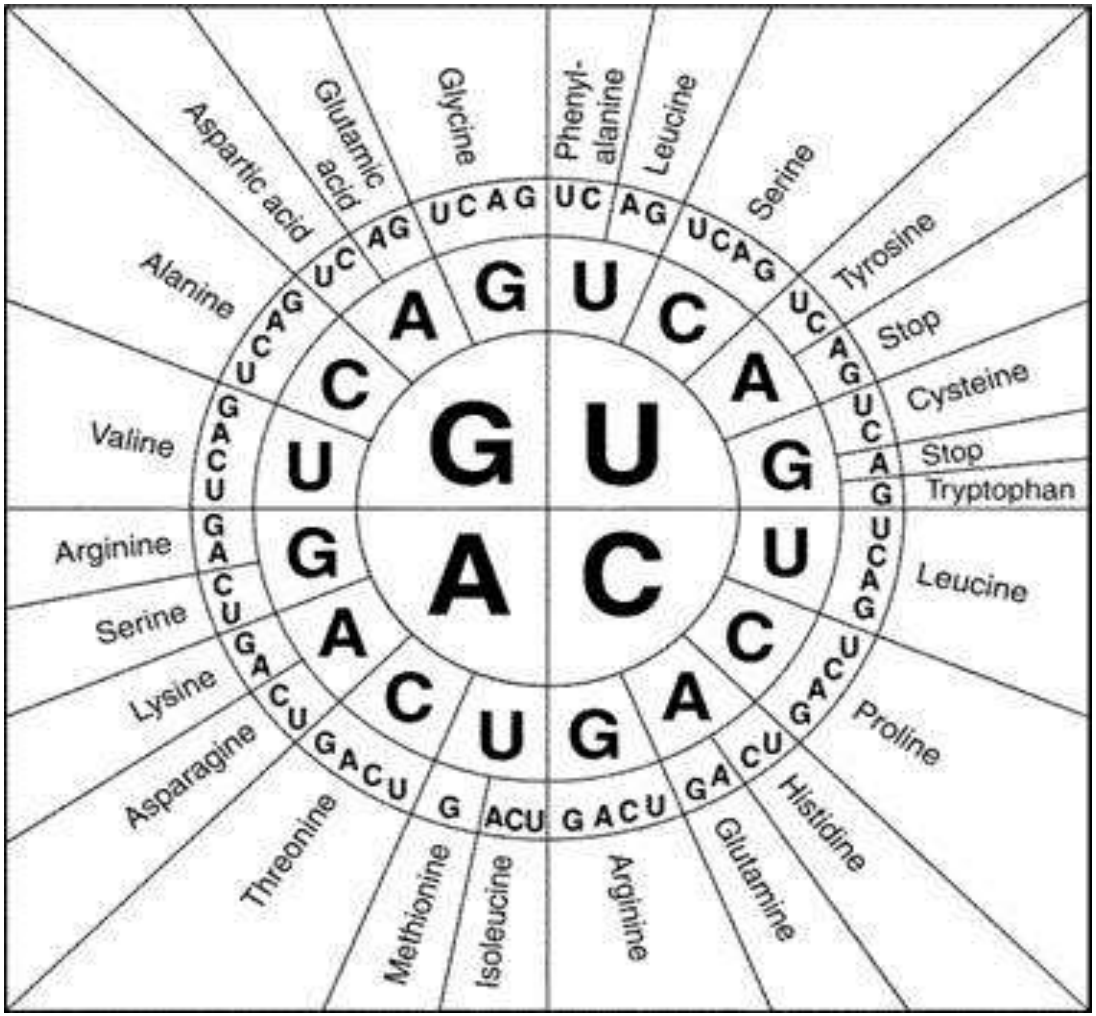
1st Base

3rd Base

Nonpolar, aliphatic Polar, uncharged Aromatic Positively charged Negatively charged

AUG/AAC/GAC/UAA

Methionine / Asparagine / Aspartic Acid / Stop



Protein Synthesis

THANK YOU