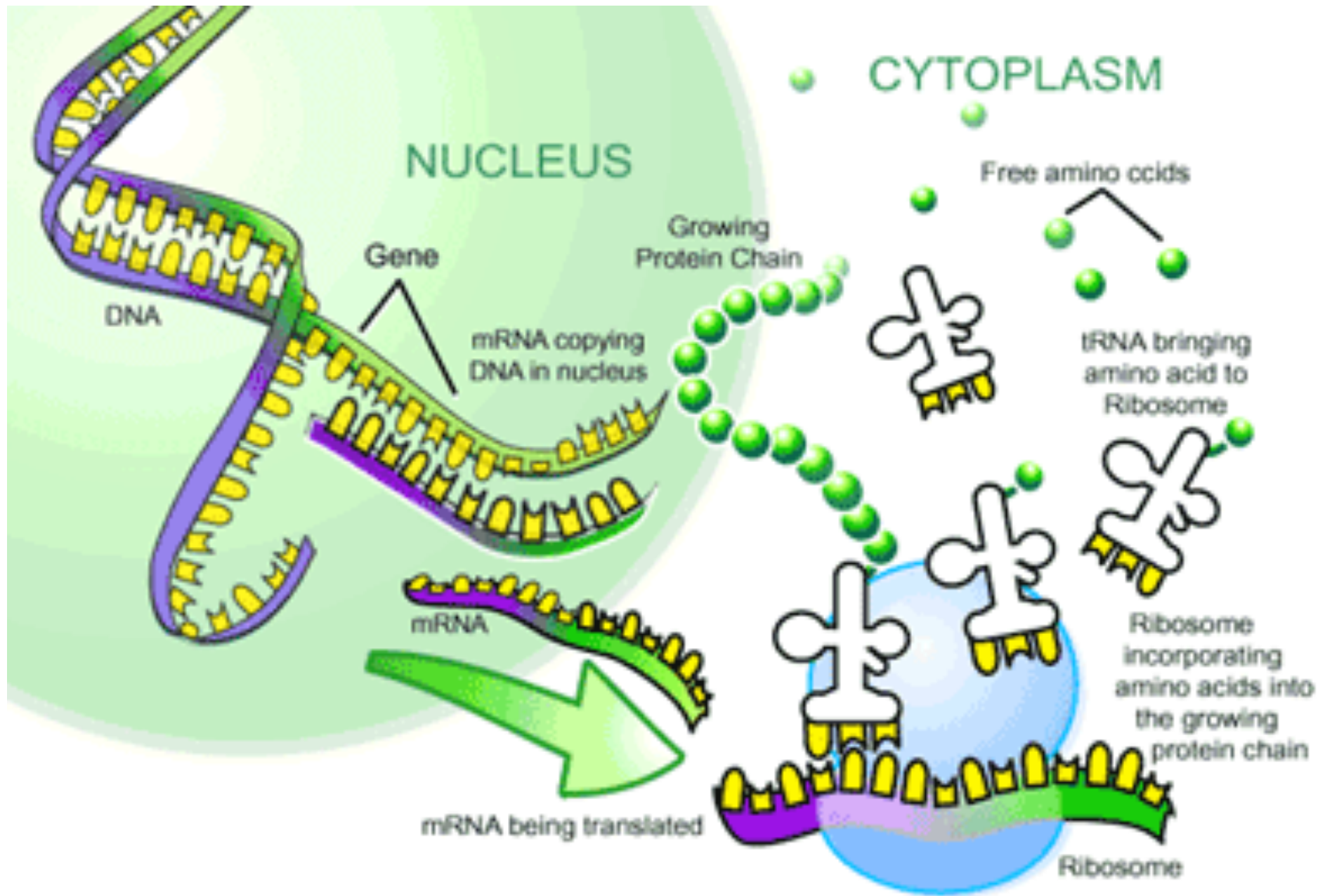


Protein synthesis

Protein Synthesis

- A **Gene** is a segment of DNA that has information on how to make a polypeptide
- DNA codes for proteins. But most DNA is found in the nucleus and proteins are made by ribosomes in the cytoplasm.
- RNA occurs in both the nucleus and the cytoplasm



RNA

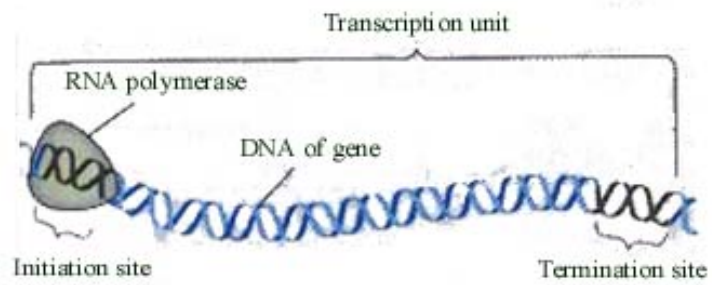
- Nitrogen bases are
 - Adenine
 - Cytosine
 - Guanine
 - Uracil
- Strands
 - Single Stranded
- Sugar Used
 - Ribose

RNA

- Three Main Types of RNA
 1. Messenger RNA → mRNA → takes a message from DNA in nucleus to the ribosomes in cytoplasm
 2. Ribosomal RNA → rRNA → this is what makes a ribosome. Two parts, one is rRNA and the other is a protein
 3. Transfer RNA → tRNA → this brings or transfers amino acids to the ribosome

Making mRNA

- An Enzyme called RNA polymerase 'unzips' the DNA.
- The RNA polymerase starts 'unzip' the DNA at a location called the initiation site.
 - The initiation site is a specific area on the DNA that has a unique sequence of nucleotides
 - This is called Initiation
- The RNA polymerase starts to create a RNA strand by using the DNA strand as a template
 - This step is called elongation
- The RNA polymerase then reaches a specific section of DNA called the termination site
 - This is called Termination



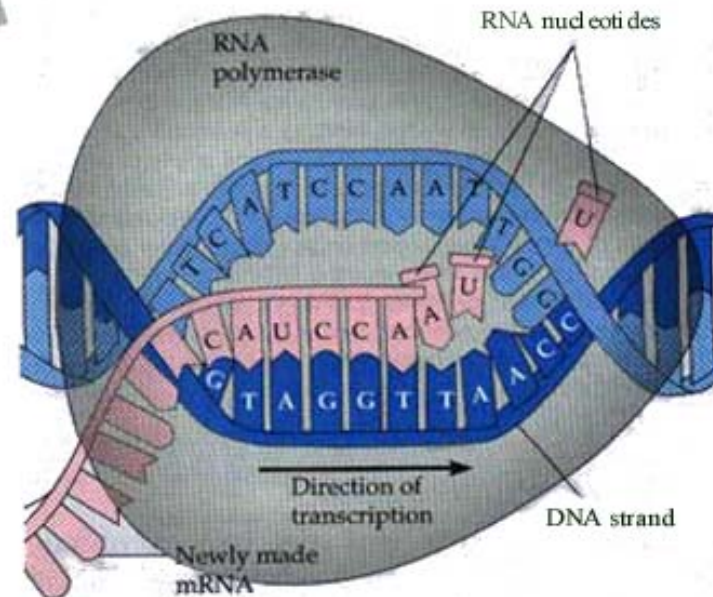
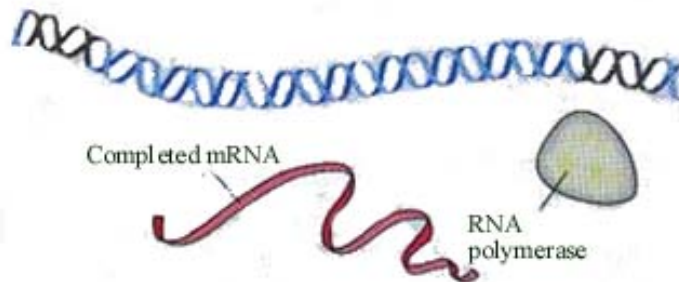
Initiation



Elongation



Termination



mRNA

- The mRNA then leaves the nucleus by going through one of the nuclear pores.
- The mRNA determines the order of the amino acids in the polypeptide

mRNA gets translated into a polypeptide

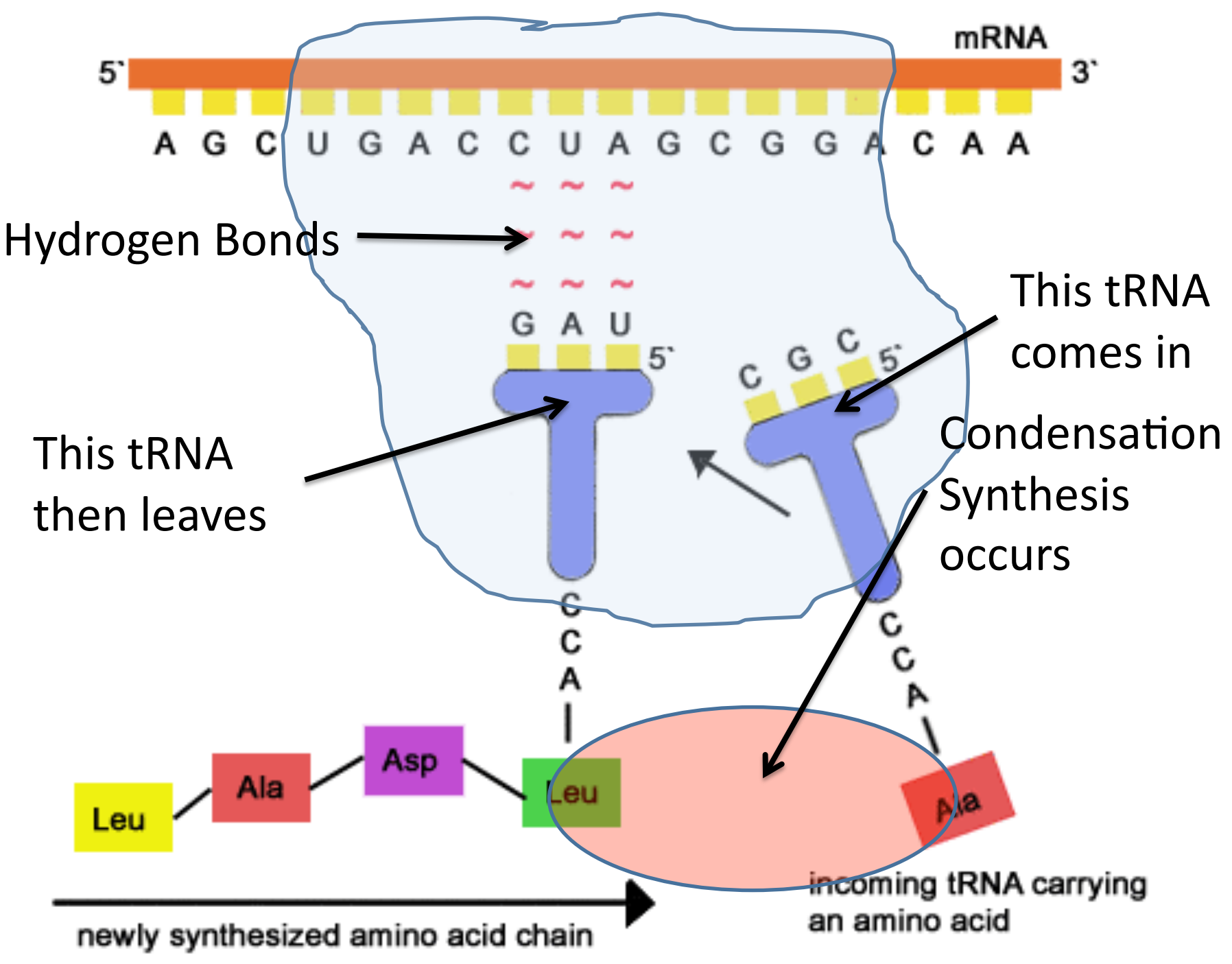
- This is called **Translation**

Step 1

- **Initiation** → the mRNA attaches to the small subunit of the ribosome. It attaches at the “start codon” AUG. The very first tRNA attaches to this start Codon

Step 2

- **Elongation** → the polypeptide lengthens. The tRNA continues to bring in amino acids. The tRNA brings in amino acids based on what the mRNA.



Hydrogen Bonds

This tRNA then leaves

This tRNA comes in

Condensation Synthesis occurs

newly synthesized amino acid chain

incoming tRNA carrying an amino acid

Codons

- Translation always start with the start codon AUG
- Every three nucleotides on the mature mRNA are called **codons**
- The tRNA has a section that combines with the codon called the **Anticodon**

Translation

Step 1

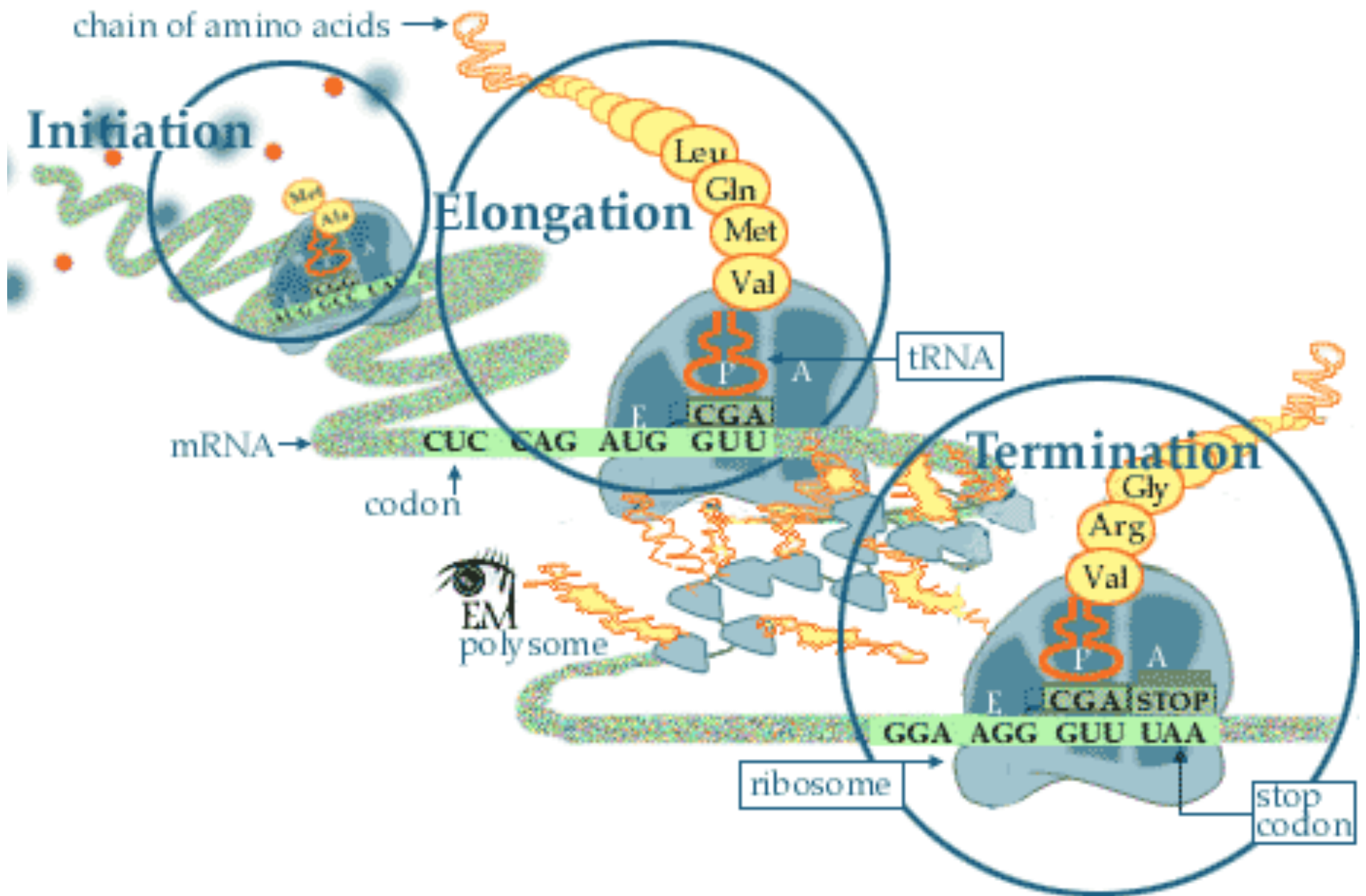
- Initiation

Step 2

- Elongation

Step 3

- Termination → the ribosome reaches a section of the mRNA that has a Stop Codon. No tRNA combines with this. The polypeptide leaves the ribosome



Question: What is the result of the translation of the DNA sequence CCACCGCCTCCC

mRNA is GGUGGCGGAGGG

Three-letter codons of messenger RNA and the amino acids specified by the codons			
AAU } AAC }	Asparagine	CAU } CAC }	Histidine
GAU } GAC }	Aspartic acid	UAU } UAC }	Tyrosine
AAA } AAG }	Lysine	CAA } CAG }	Glutamine
		GAA } GAG }	Glutamate
		UAA } UAG }	Stop
ACU } ACC } ACA } ACG }	Threonine	CCU } CCC } CCA } CCG }	Proline
		GCU } GCC } GCA } GCG }	Alanine
		UCU } UCC } UCA } UCG }	Serine
AGU } AGC }	Serine	CGU } CGC } CGA } CGG }	Arginine
AGA } AGG }	Arginine	GGU } GGC } GGA } GGG }	Glycine
		UGU } UGC }	Cysteine
		UGA — UGG —	Stop Tryptophan
AUU } AUC } AUA }	Isoleucine	CUU } CUC } CUA } CUG }	Leucine
AUG —	Methionine	GUU } GUC } GUA } GUG }	Valine
		UUU } UUC }	Phenylalanine
		UUA } UUG }	Leucine