The Genetic Code

Presented by:
Yomna Hamouda (2720)
Nour Tarhoni (2890)

Objectives:

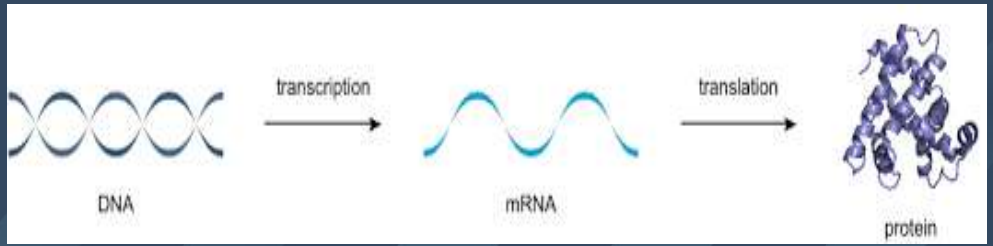
01 Define the genetic code.

02 Discuss the procedure of the genetic code.

03 List the features of the genetic code.

Introduction

- **The Flow of genetic information** is described in two-step process, transcription and translation, by which the information in genes flows into proteins: DNA → RNA → protein.
- The process by which DNA is copied to mRNA is called **transcription**.
- and that by which mRNA is used to produce proteins is called **translation**.



What is the Genetic code ?

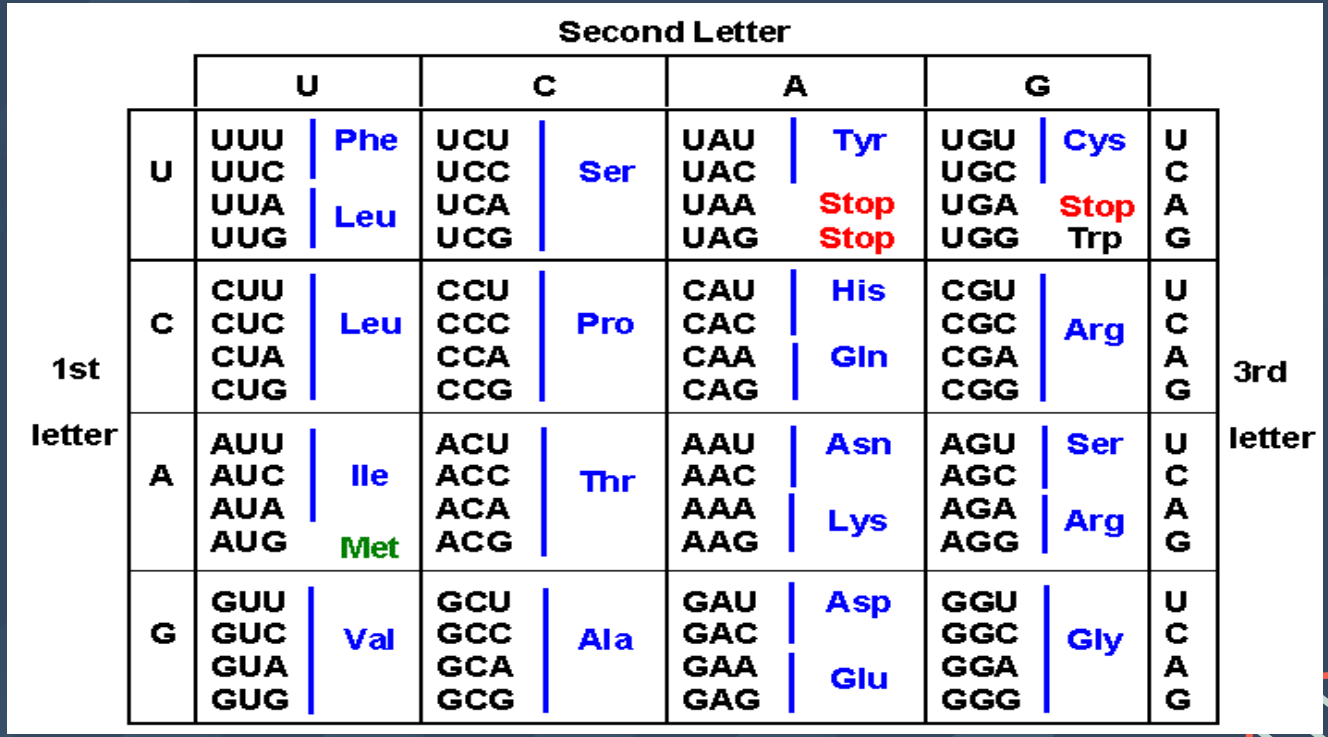
* Is the relationship between the bases sequence of the DNA, base sequence of mRNA and the sequence of the amino acid in polypeptide.

* The 4 nucleotide bases of DNA are: adenine (A), cytosine (C), guanine (G), and thymine (T), are transcribed to form a sequence of 4 nucleotide bases in mRNA (adenine (A), uracil (U), guanine (G), and cytosine (C), that must specify the sequence of the 20 amino acid used to make protein

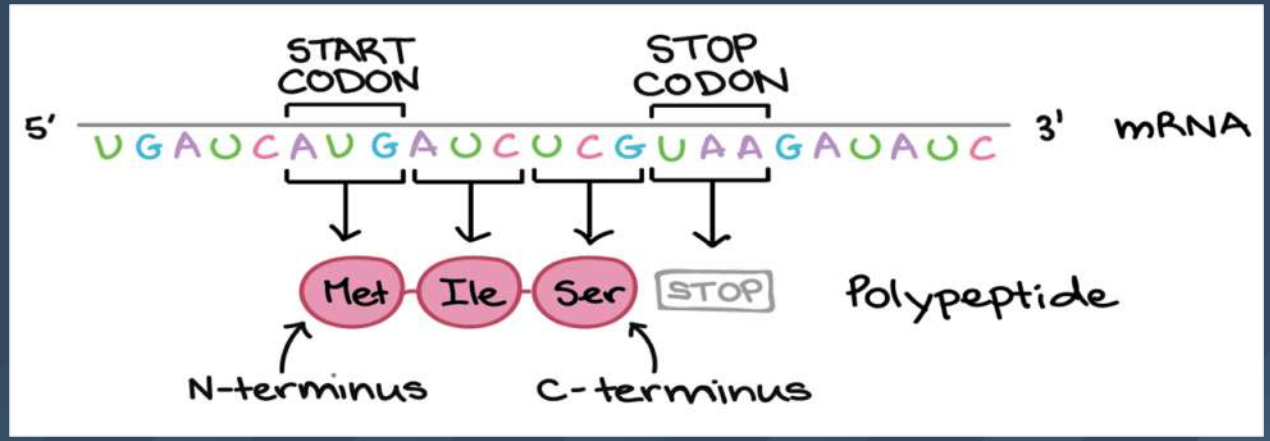
Procedure of the Genetic Code

* The 4 nucleotide bases (A,G,C and U) in mRNA are used to produce the three base codons therefore, 64 codons code.
* Each codon is a triplet of nucleotides and codes for one Amino acid.
* 64 codons in total and three out of these are Non Sense codons.
* 61 codons for 20 amino acids.

Table of the Genetic Code



* It begins with a start codon and continuing until a stop codon is reached. mRNA codons are read from 5' to 3' , and they specify the order of amino acids in a protein from N-terminus (methionine) to C-terminus.



Features of the genetic code

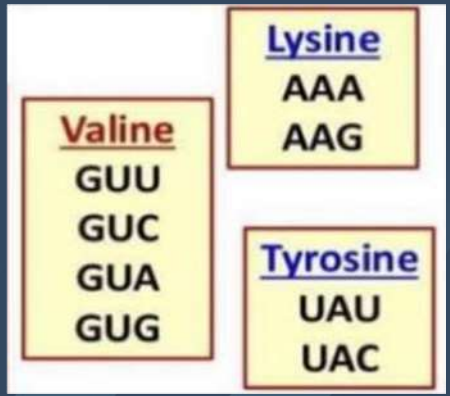
1- Triplet nature:

Singlet and doublet codes are not adequate to code for 20 amino acids; therefore, it was pointed out that triplet code is the minimum required.

2- Degeneracy:

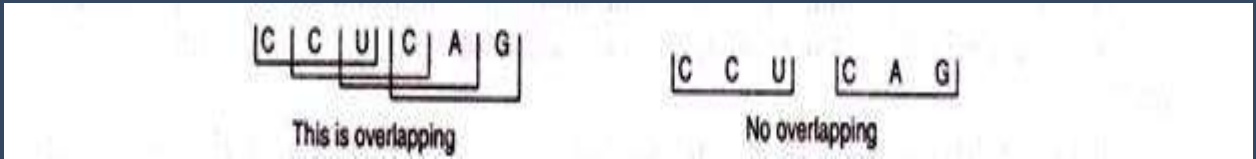
The code is degenerate which means that the same amino acid is coded by more than one base triplet.

.



3- Non-overlapping:

nonoverlapping code means that the same letter is not used for two different codons. In other words, no single base can take part in the formation of more than one codon.



4- Polarity:

The genetic code has polarity, that is, the code is always read in a fixed direction, i.e., in the 5′ → 3′ direction.

5- Non-ambiguity:

Non-ambiguous code means that there is no ambiguity about a particular codon.

A particular codon will always code for the same amino acid.

While the same amino acid can be coded by more than one codon (the code is degenerate), the same codon shall not code for two or more different amino acids (non-ambiguous).

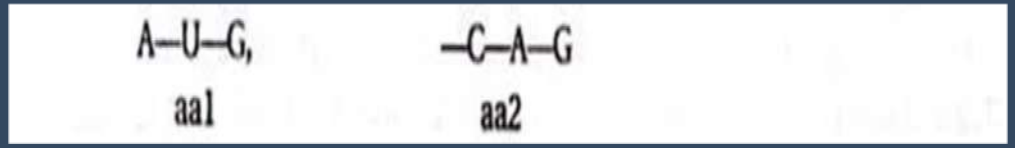
6- Universality:

Universality of the code means that the same sequences of 3 bases encode the same amino acids in all life forms from simple microorganisms to complex, multicelled organisms such as human beings.

7- Commaless:

The genetic code is commaless (or comma-free). There is no signal to indicate the end of one codon and the beginning of the next.

There are no intermediary nucleotides (or commas) between the codons.



Summary

* **Genetic code** is a set of rules by which the genetic material is translated into proteins
* **Codon** is a sequence of three nucleotides which together form a unit of genetic code in a DNA or RNA molecule.
* UAG, UGA and UAA are stopping codons.
* AUG is the start codon.
* Genetic code is unambiguous, universal, degenerate, commaless and non overlapping.

References

- https://www.khanacademy.org/science/in-in-class-12-biology-india/xc09ed98f7a9e671b:in-in-the-molecular-basis-of-inheritance/xc09ed98f7a9e671b:in-in-translation/a/the-genetic-code
- https://www.biologydiscussion.com/genetics/genetic-code/genetic-code-8-important-properties-of-genetic-code/15550
- https://www.genome.gov/genetics-glossary/Genetic-Code
- https://microbenotes.com/characteristic-of-genetic-code/

Thank you all for listening!