Genetic code

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Introduction of genetic code

The letters A,G,T and C correspond to the nucleotides found in DNA. They are organized into codon.

The collection of codons is called Genetics code.

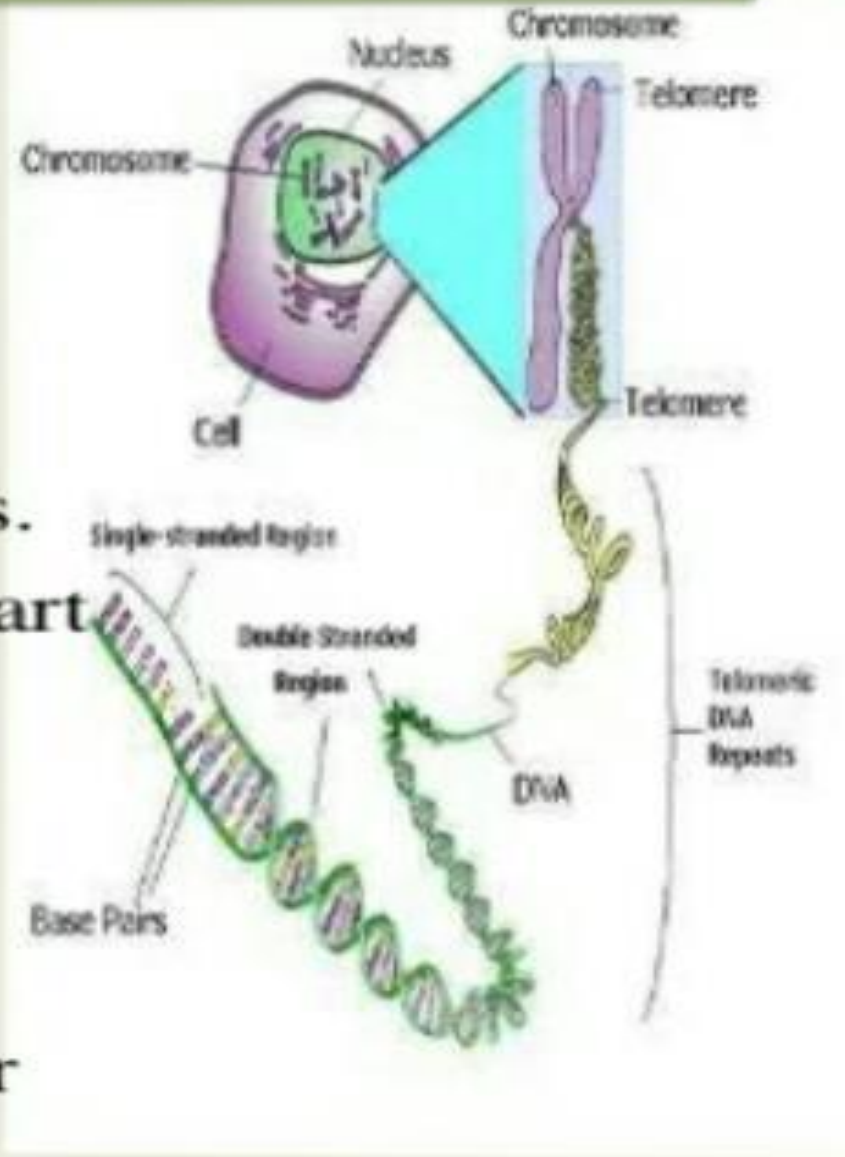
For 20 amino acids there should be 20 codons.

Each codon should have 3 nucleotides to impart specificity to each of the amino acid for a specific codon.

1 nucleotide – 4 combinations

2 nucleotide-16 combinations

3nucleotide- 64 combinations(most suited for 20 amino acids)



What is Genetic code???

- Genetic code is a dictionary that corresponds with sequence of nucleotides and sequence of amino acids.
- Genetic code is a set of rules by which information encoded in genetic material(DNA or RNA sequences) is translated into proteins by living cells.
- Term given By " Goerge Gamow "

DISCOVERY

- To understand how proteins are encoded began after the structure of DNA was discovered by James Watson and Francis Crick.

James Watson & Crick

- George Gamow postulated that a three-letter code must be employed to encode the 20 standard amino acids used by living cells to build proteins.

Codon and its type

- Genetic code is a Dictionary consists of "Genetic words" called CODONS.
- Each codon consists of three bases (triplet)
- There are 64 codons.
- 61 codons code for 20 amino acids found in protein.
- 3 codons do not code for any amino acid.

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Type of codon

- Sense Codons
- Signal Codons
  - Start codons
  - Stop codons
- Sense codon:- The codon that code for amino acid are called sense codon.
- Signal codon:- Those codons that code for signal during protein synthesis are called signal codons.
  For Example:- AUG, UAA, UAG & UGA
- There are Two types of signal codons
  Terminating Codon
  Initiating Codon.

"Terminating Codons"

UAA, UAG & UGA are termination codons or nonsense codons & are often referred to as amber, ochre & opal codons.

"Initiating codon"

AUG is the initiation codon. It codes for the first amino acid in all proteins.

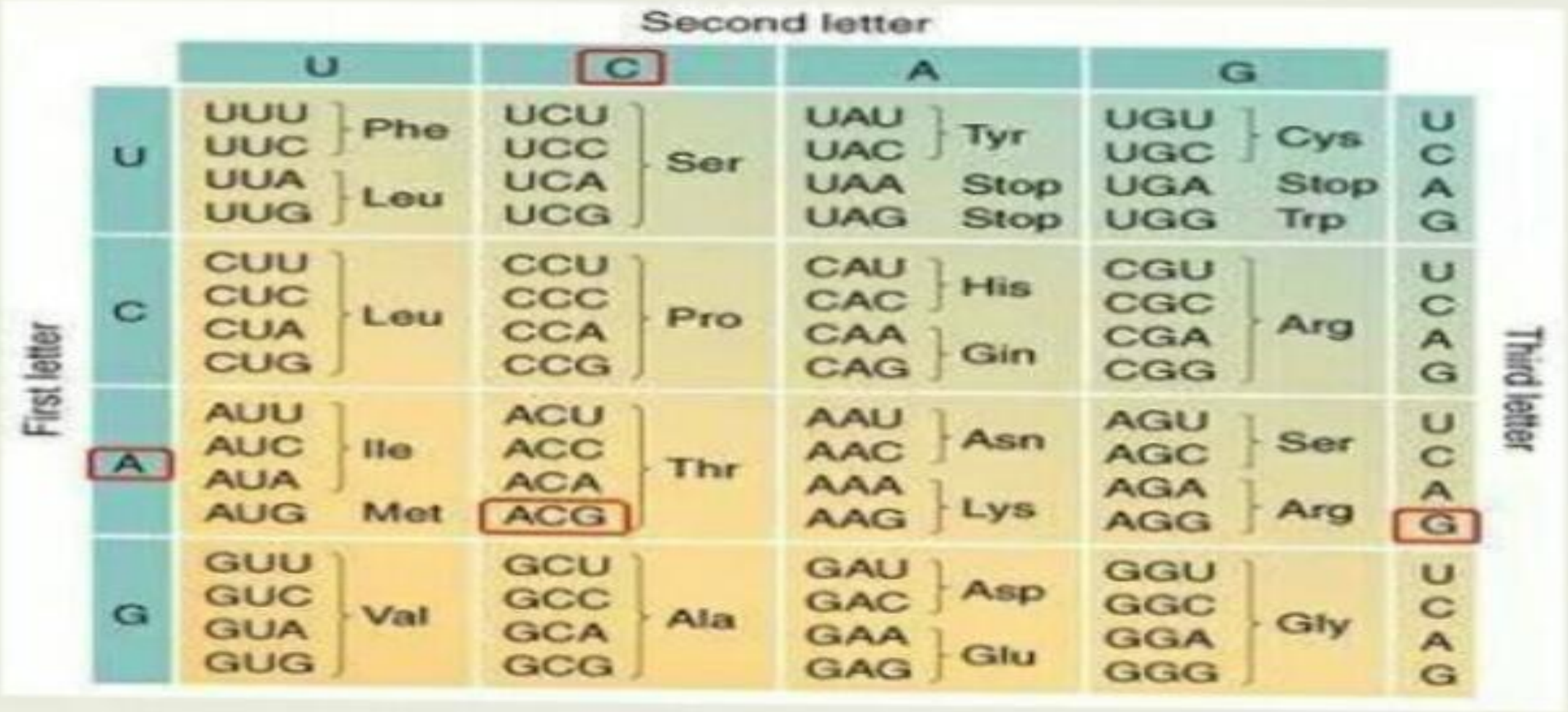
At the starting point it codes for methionine in eukaryotes & formyl methionine in prokaryotes.

Characteristic of the genetic code

1. Triplet code
2. Comma less
3. Nonoverlapping code
4. The coding dictionary
5. Degenerate code
6. Universality of code
7. Non ambiguous code
8. Chain inition code
9. Chain termination codons

“Genetic code is triplet”

- The genetic code is triplet. There are 64 codons.



First letter	Second letter: U	Second letter: C	Second letter: A	Second letter: G	Third letter
U	UUU Phe	UCU Ser	UAU Tyr	UGU Cys	U
	UUC Phe	UCC Ser	UAC Tyr	UGC Cys	C
	UUA Leu	UCA Ser	UAA Stop	UGA Stop	A
	UUG Leu	UCG Ser	UAG Stop	UGG Trp	G
C	CUU Leu	CCU Pro	CAU His	CGU Arg	U
	CUC Leu	CCC Pro	CAC His	CGC Arg	C
	CUA Leu	CCA Pro	CAA Gln	CGA Arg	A
	CUG Leu	CCG Pro	CAG Gln	CGG Arg	G
A	AUU Ile	ACU Thr	AAU Asn	AGU Ser	U
	AUC Ile	ACC Thr	AAC Asn	AGC Ser	C
	AUA Ile	ACA Thr	AAA Lys	AGA Arg	A
	AUG Met	ACG Thr	AAG Lys	AGG Arg	G
G	GUU Val	GCU Ala	GAU Asp	GGU Gly	U
	GUC Val	GCC Ala	GAC Asp	GGC Gly	C
	GUA Val	GCA Ala	GAA Glu	GGA Gly	A
	GUG Val	GCG Ala	GAG Glu	GGG Gly	G

"Universality"

- The genetic code is universal.
- AUG is the codon for methionine in mitochondria. The same codon (AUG) codes for isoleucine in cytoplasm. With some exceptions noted the genetic code is universal.

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“ Non-Ambiguous”

- The genetic code is non-ambiguous.
- Thus one codon can not specify more than one amino acid.

"Non-overlapping"

- One base cannot participate in the formation of more than one codon.
- This means that the code is non-overlapping.

"Continuous Translation"

- The gene is transcribed & translated continuously from a fixed starting point to a fixed stop point.
- Punctuations are not present between the codons.

“The code has polarity”

- The code has a definite direction for reading of message which is referred to as polarity.
- Reading of message from left to right & right to left will specify for different amino acids.
- For Example UUG stands for leucine, & from right to left it is GUU which stands for valine.