MOLECULAR BIOLOGY

THE GENETIC CODE

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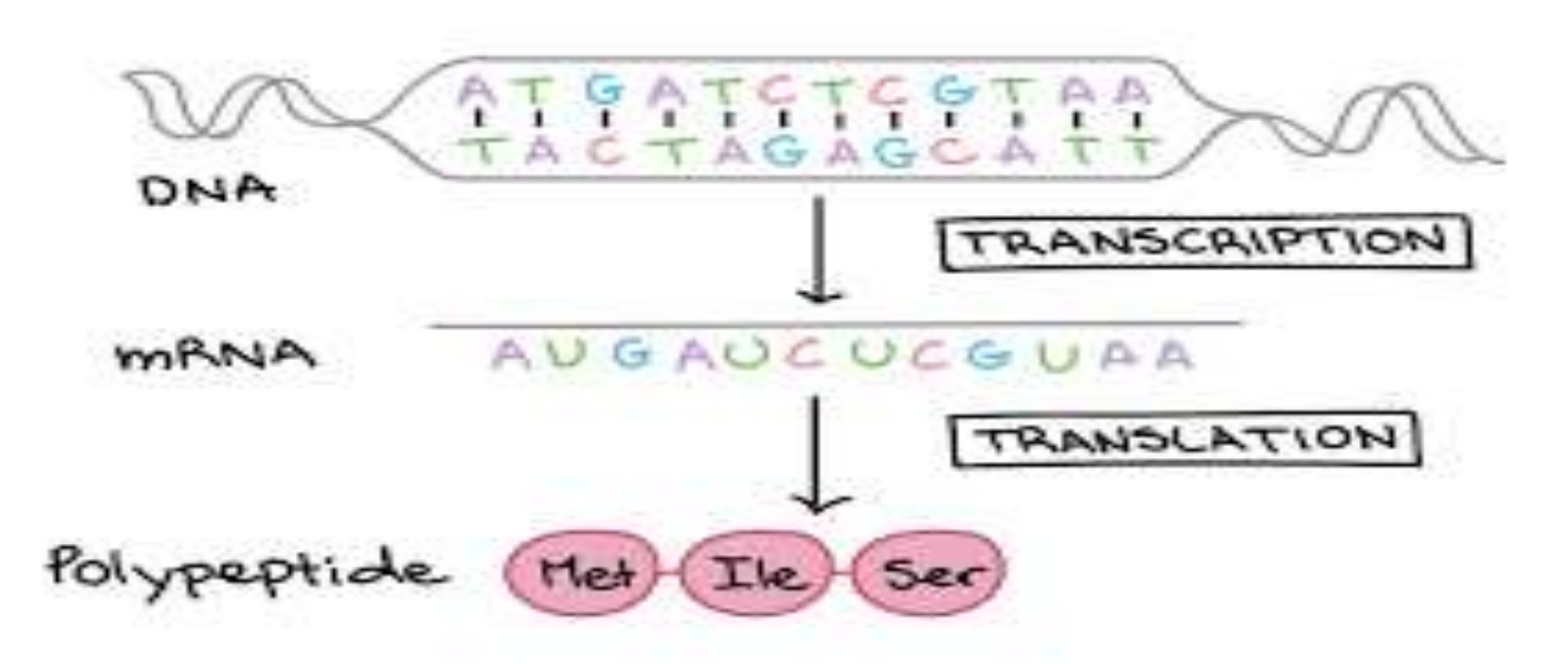
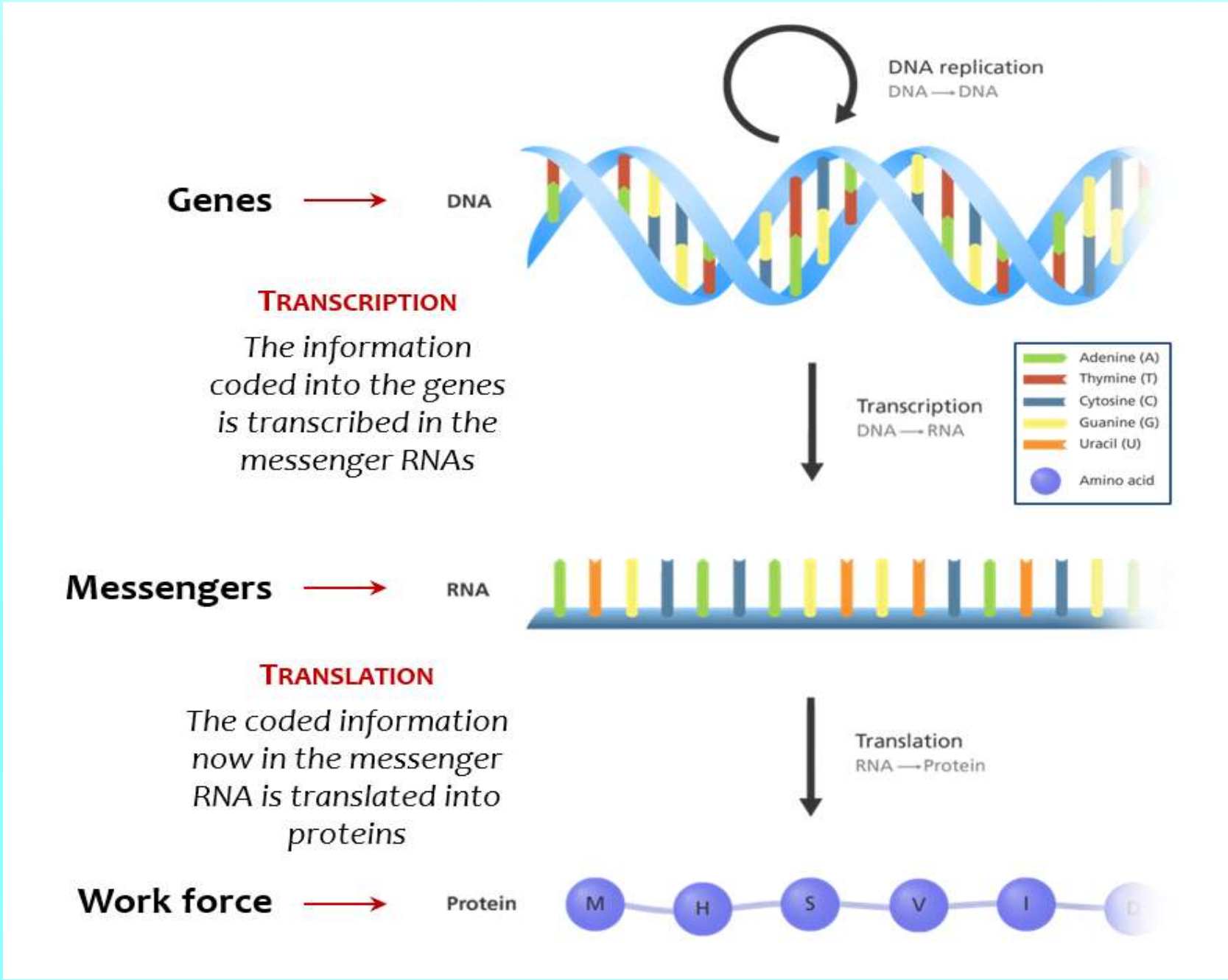
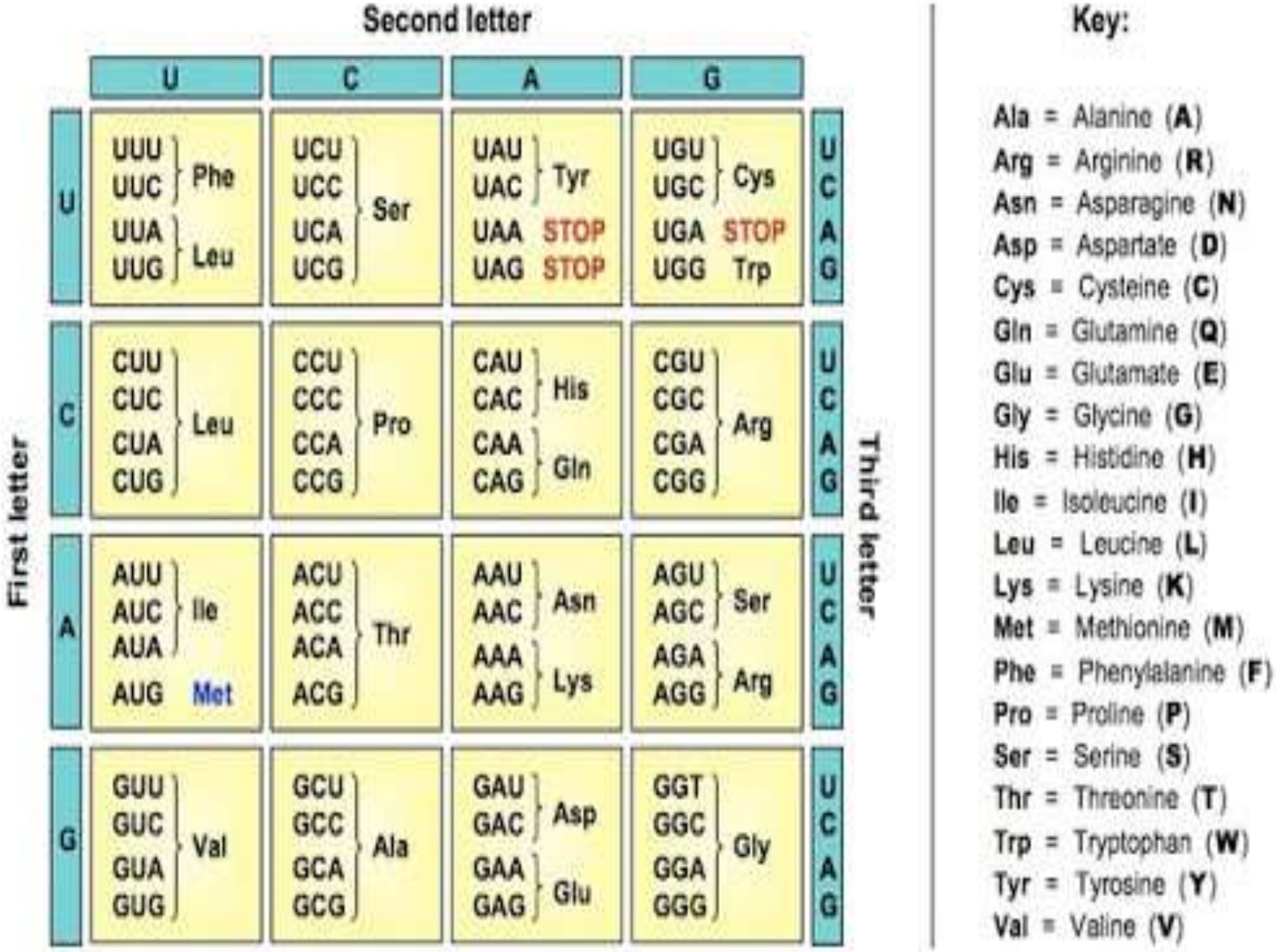
Genetic Code

- Information coding system
- Nucleotide sequence of DNA and mRNA, that specifies amino acid sequence of proteins




DNA replication
DNA → DNA
Genes → DNA
TRANSCRIPTION
The information coded into the genes is transcribed in the messenger RNAs
Transcription
DNA → RNA
Adenine (A)
Thymine (T)
Cytosine (C)
Guanine (G)
Uracil (U)
Amino acid
Messengers → RNA
TRANSLATION
The coded information now in the messenger RNA is translated into proteins
Translation
RNA → Protein
Work force → Protein
M
H
S
V
I

- **CODONS :**
- The genetic code consists of 64 triplets of nucleotides.
- These triplets are called **codons**. With three exceptions, each codon encodes for one of the 20 amino acids used in the synthesis of proteins.
- That produces some redundancy in the code: most of the amino acids being encoded by more than one codon.


Second letter
U
C
A
G
First letter
Third letter
UUU Phe
UUC Phe
UUA Leu
UUG Leu
UCU Ser
UCC Ser
UCA Ser
UCG Ser
UAU Tyr
UAC Tyr
UAA STOP
UAG STOP
UGU Cys
UGC Cys
UGA STOP
UGG Trp
CUU Leu
CUC Leu
CUA Leu
CUG Leu
CCU Pro
CCC Pro
CCA Pro
CCG Pro
CAU His
CAC His
CAA Gln
CAG Gln
CGU Arg
CGC Arg
CGA Arg
CGG Arg
AUU Ile
AUC Ile
AUA Ile
AUG Met
ACU Thr
ACC Thr
ACA Thr
ACG Thr
AAU Asn
AAC Asn
AAA Lys
AAG Lys
AGU Ser
AGC Ser
AGA Arg
AGG Arg
GUU Val
GUC Val
GUA Val
GUG Val
GCU Ala
GCC Ala
GCA Ala
GCG Ala
GAU Asp
GAC Asp
GAA Glu
GAG Glu
GGT Gly
GGC Gly
GGA Gly
GGG Gly
Key:
Ala = Alanine (A)
Arg = Arginine (R)
Asn = Asparagine (N)
Asp = Aspartate (D)
Cys = Cysteine (C)
Gln = Glutamine (Q)
Glu = Glutamate (E)
Gly = Glycine (G)
His = Histidine (H)
Ile = Isoleucine (I)
Leu = Leucine (L)
Lys = Lysine (K)
Met = Methionine (M)
Phe = Phenylalanine (F)
Pro = Proline (P)
Ser = Serine (S)
Thr = Threonine (T)
Trp = Tryptophan (W)
Tyr = Tyrosine (Y)
Val = Valine (V)

Features of genetic code

Only **61 triplets** or **codons** code for amino acids

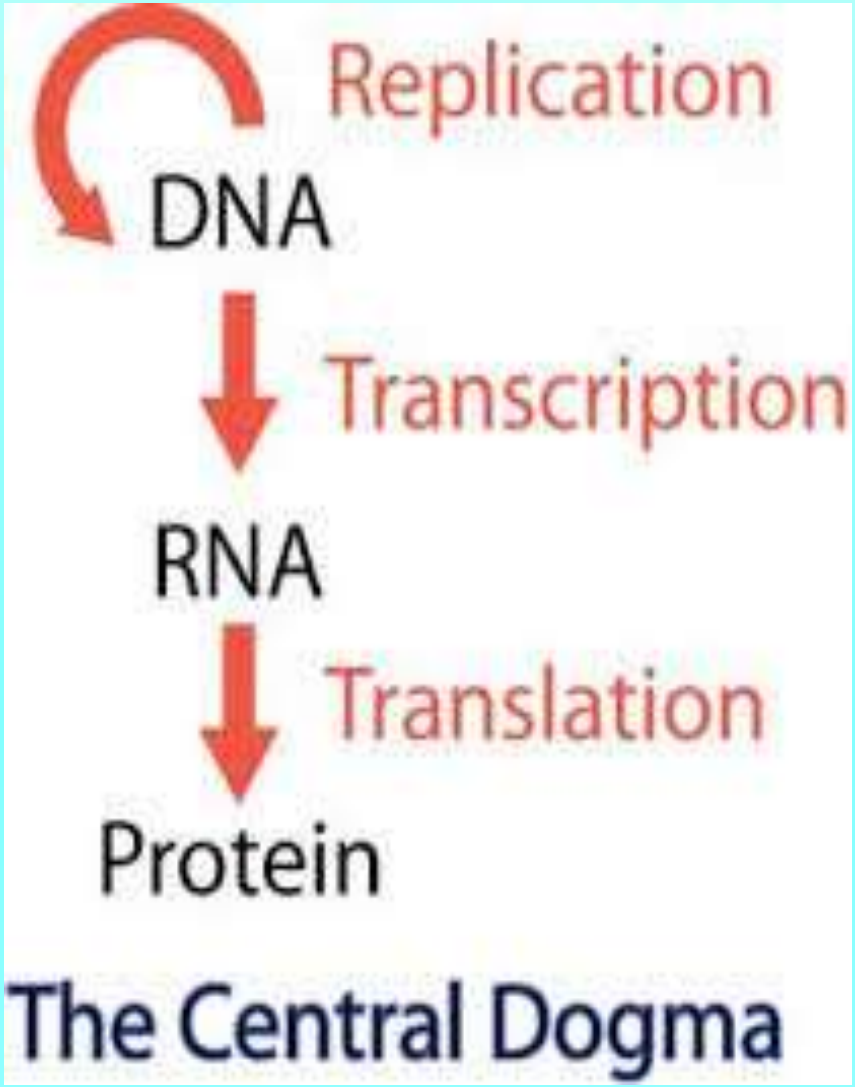
One start codon AUG

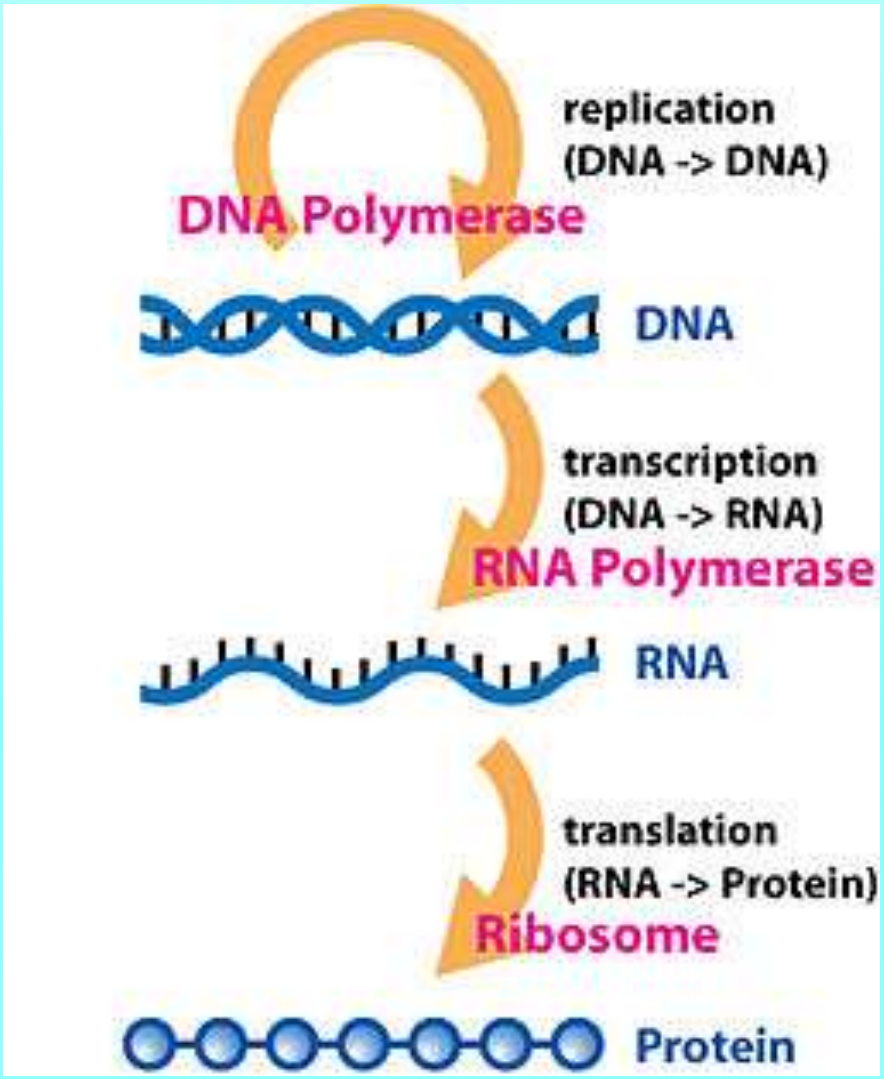
3 stop codons (nonsense codons or terminator codons) UAA UAG UGA

The code is a **degenerative code -**Several codons code for the same amino acid.

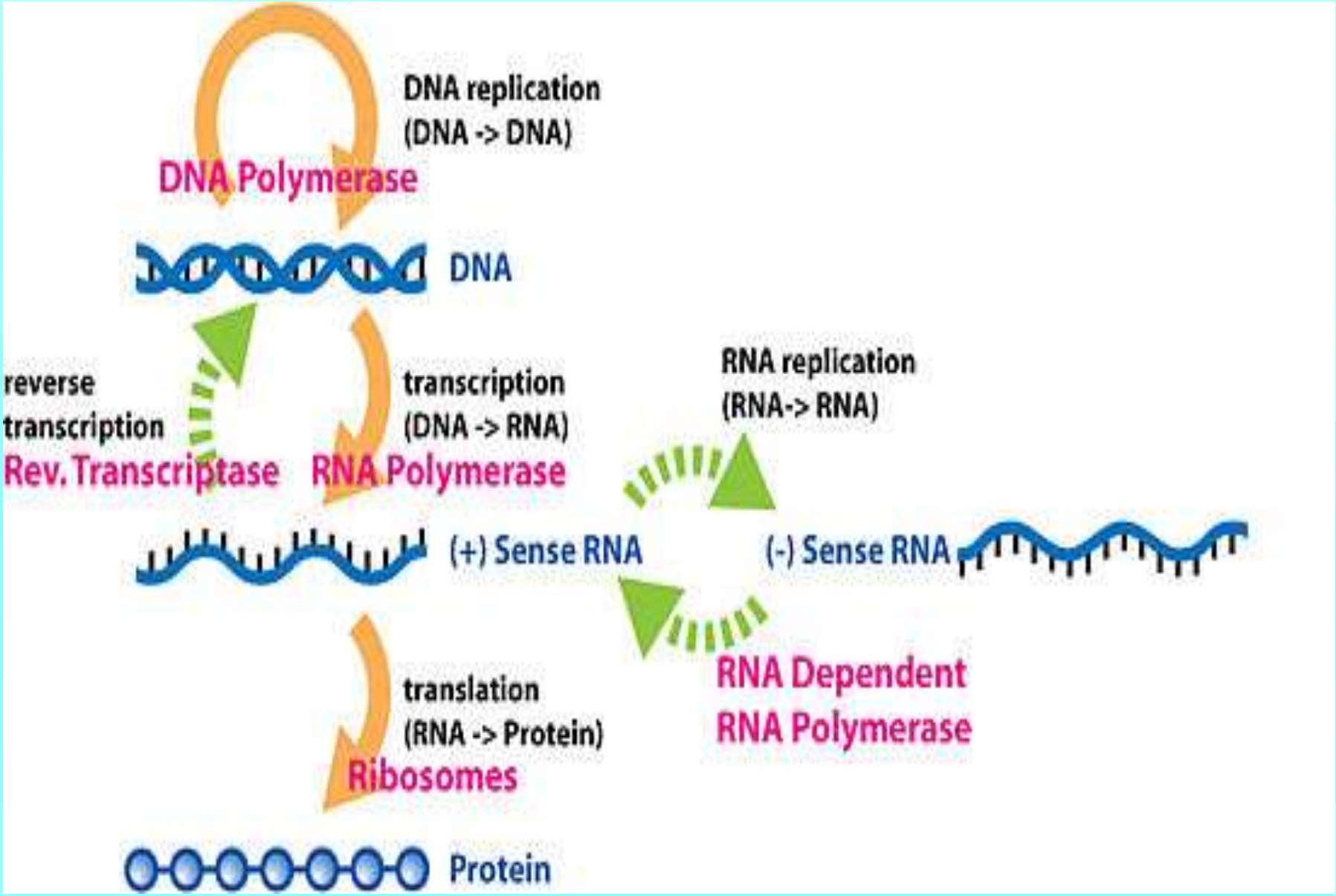
- The first two letters seem to be the most important the third one tends to be interchangeable
- The is **no punctuation** between each codon.
- **The code is universal** for all organisms.
- Genetic code is **non-overlapping**
- Genetic code has **polarity**

Mechanism of Gene Action/Protein Synthesis





CENTRAL DOGMA REVERSED



Prion Hypothesis

- Protein Directed Protein Synthesis
- 1000 molecules of prion proteins
- Normal prion-PrP^{c}
- Infectious protein-PrPsc

Thank You

This class prepared for
Fifth Semester BSc Botany Students
Little Flower College, Guruvayur
Affiliated to University of Calicut

Next class
Genetic transcription