

# **Central Dogma of Biology**

## **Procedures**

- 1. Replication**
- 2. Transcription**
- 3. Translation**

# Replication

1. **Purpose:** Replication produces two identical copies of a DNA double-stranded molecule, so that they can be inherited by the two daughter cells of a parent cell.
2. **Procedure:** Each strand serves as a template for the synthesis of its complementary strand in an antiparallel orientation, following Chargaff's rule.

# Transcription

1. **Purpose:** Transcription produces a messenger RNA (mRNA) copy of the gene's DNA coding strand. mRNAs are expendable molecules that will be translated into polypeptide chains in the cytoplasm.
2. **Procedure:** The non-coding DNA strand of the gene serves as a template for the synthesis of mRNA, according to Chargaff's rule.

# Translation

1. **Purpose:** Translation connects amino acids, forming a polypeptide chain, using the information that is stored in DNA coding regions.
2. **Procedure:** Ribosomes facilitate the formation of the peptide bonds between amino acids. Transfer RNAs (tRNAs) read the mRNA's sequence, 3 nitrogenous bases (codons) at a time. They pair their anti-codon with the next available codon, ensuring the proper positioning of the corresponding amino acid. The Codon - Anti-codon pairing, in anti-parallel orientation, follows the Chargaff's rule.

# DNA Nitrogenous Bases Table

**Table 1A: DNA Nitrogenous bases**

	<b>Name</b>	<b>Category</b>
1.	Adenine (A)	Purine
2.	Thymine (T)	Pyrimidine
3.	Guanine (G)	Purine
4.	Cytosine (C)	Pyrimidine

# RNA Nitrogenous Bases Table

**Table 1B: RNA Nitrogenous bases**

	<b>Name</b>	<b>Category</b>
1.	Adenine (A)	Purine
2.	Uracil (U)	Pyrimidine
3.	Guanine (G)	Purine
4.	Cytosine (C)	Pyrimidine

# Chargaff's Rule of Complementary Nitrogenous Bases Pairing

According to Chargaff's rule the complementary pairings are:

1. A pairs with U via 2 Hydrogen bonds.
2. A pairs with T via 2 Hydrogen bonds.
3. G pairs with C via 3 Hydrogen bonds.

# Standard Genetic Code Table

Image taken from: [sciencenotes.org](https://www.sciencenotes.org)

Genetic Codon Chart						
	U	C	A	G		
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	

Translation START codon

Translation STOP codon

Positively charged amino acids

Negatively charged amino acids

Hydrophobic amino acids

Hydrophilic non-charged amino acids

Cysteine



# Central Dogma of Biology Summary Table

**Table 2: DNA Coding Sequence Replication, Transcription and Translation (Central Dogma)**

Procedure	Macromolecule	Starting Edge	Starting Codon	Codon 1	Codon 2	Termination Codon	Ending Edge
Replication	DNA coding	5'	ATG	GAG	CTC	TAA	3'
	DNA complementary	3'	TAC	CTC	GAG	ATT	5'
Transcription	mRNA	5'	AUG	GAG	CUC	UAA	3'
Translation	Polypeptide	H <sub>2</sub> N	Met	Glu	Leu	-	COOH

