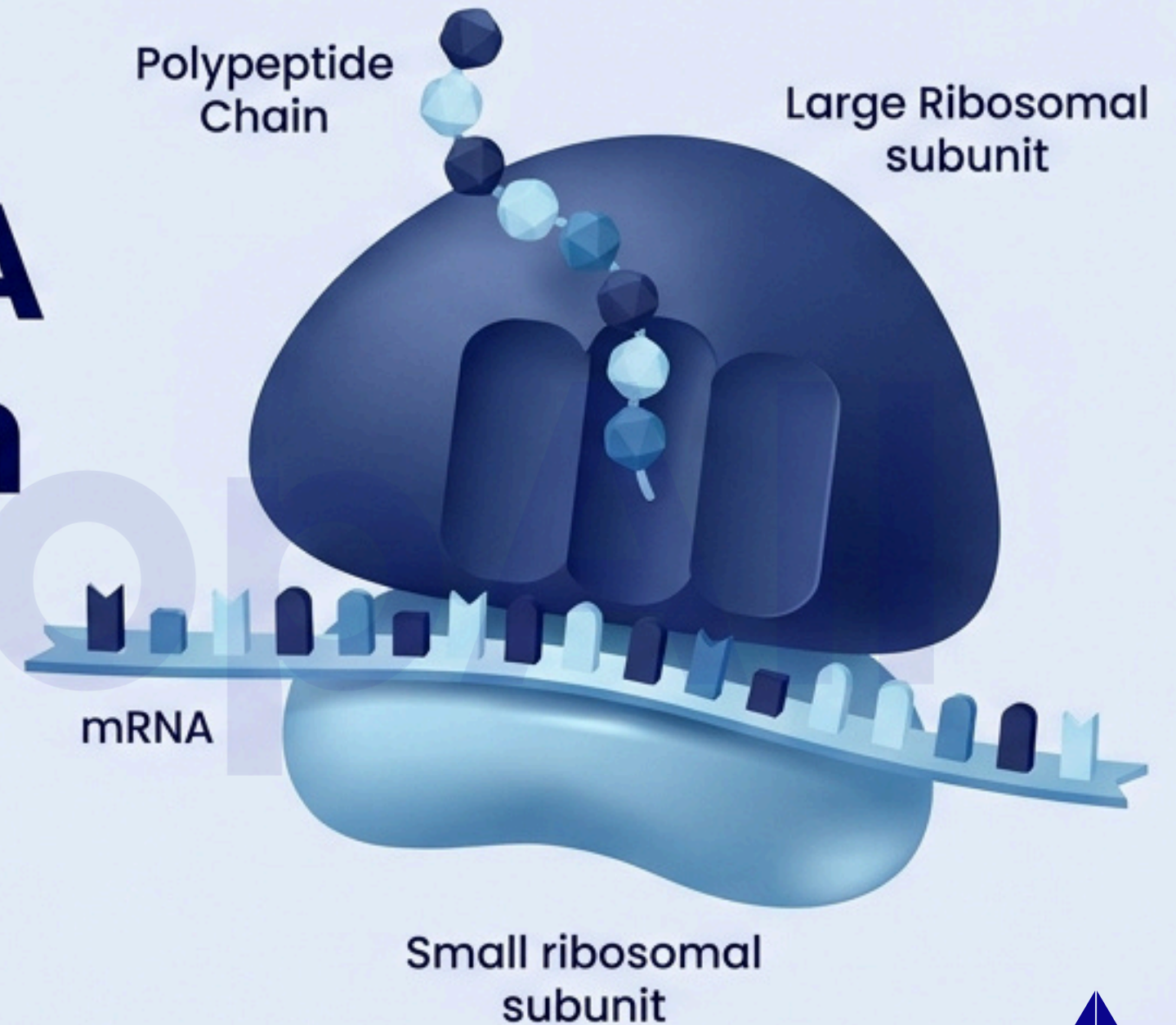
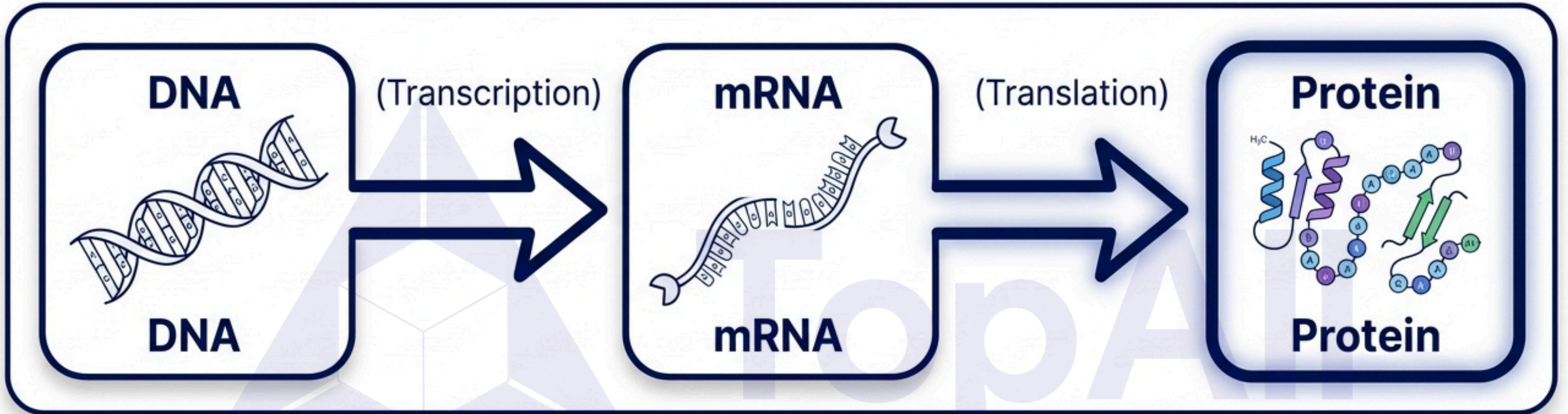


The Cellular Factory: Translating mRNA into Protein

A step-by-step
molecular blueprint of
polypeptide synthesis.



Decoding the Blueprint



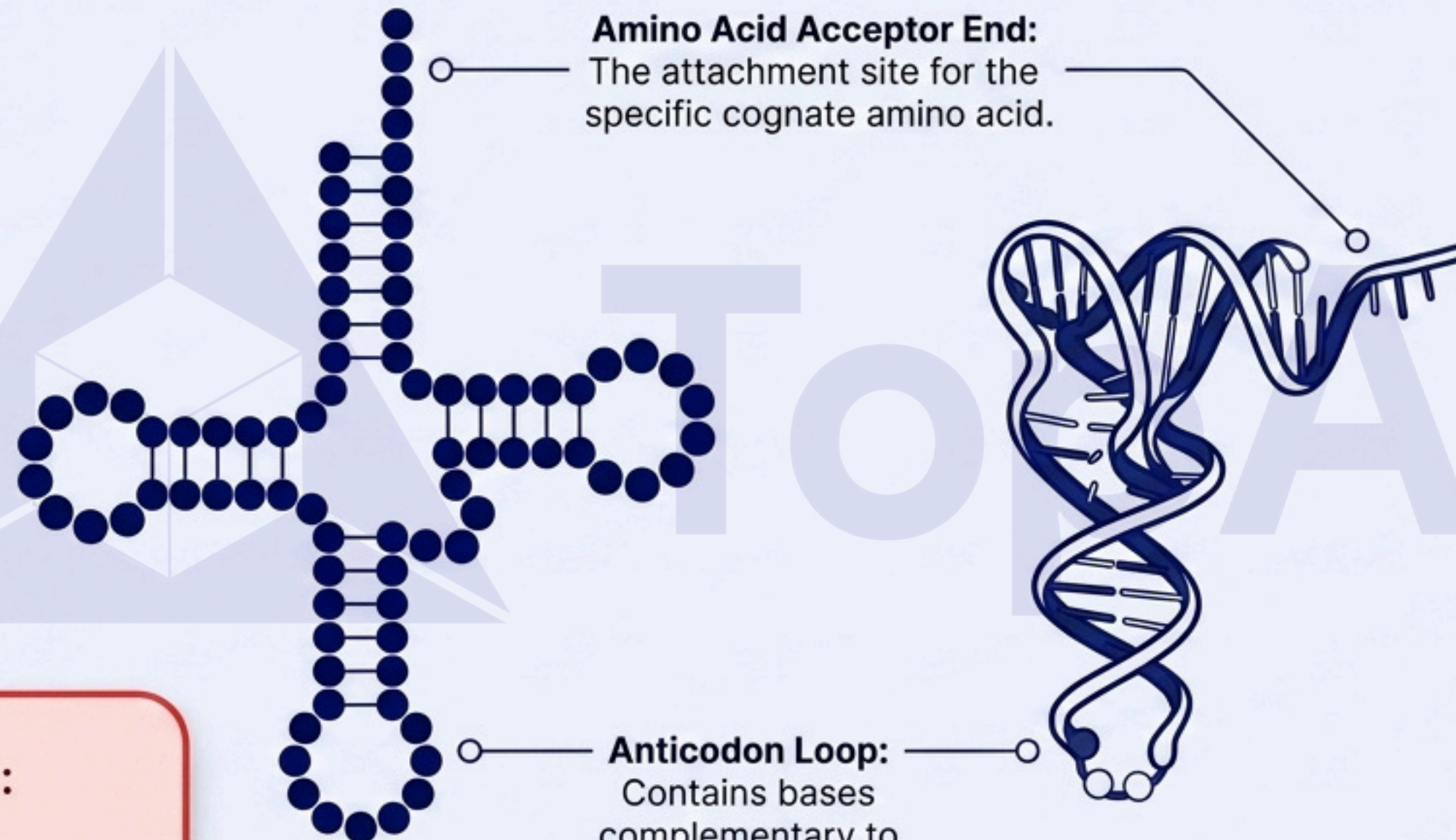
Translation Definition

Translation is the process of polymerizing amino acids to form a polypeptide. The specific order and sequence of these amino acids are strictly dictated by the sequence of bases in the mRNA.

💡 Amber Quick-Tip: The Language Barrier

Because there is no natural structural affinity between nucleotides and amino acids, the cell requires a specialized 'adapter' to read the code and fetch the correct building blocks.

Anatomy of the Adapter: tRNA



Amino Acid Acceptor End:
The attachment site for the
specific cognate amino acid.

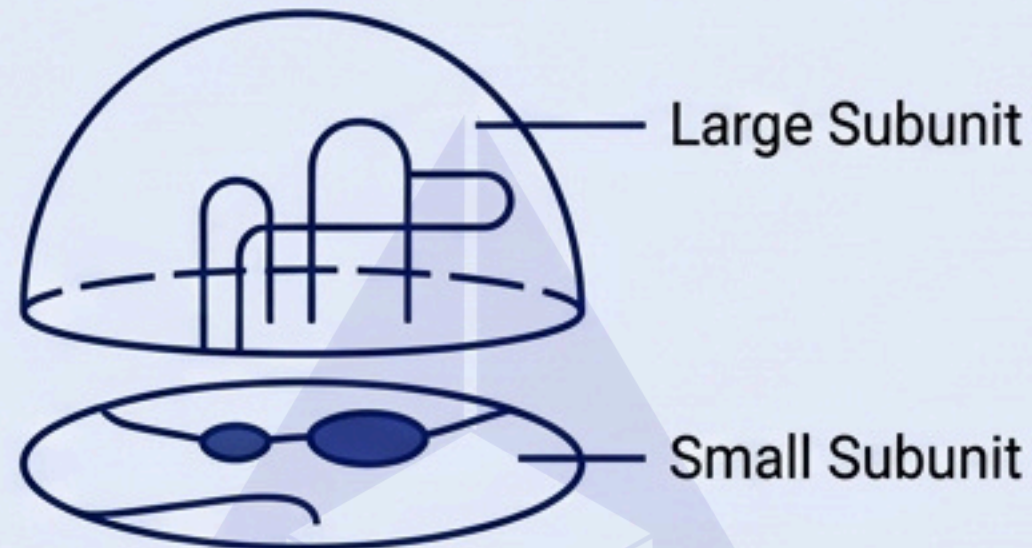
Anticodon Loop:
Contains bases
complementary to
the mRNA codon.



Crucial Exception:

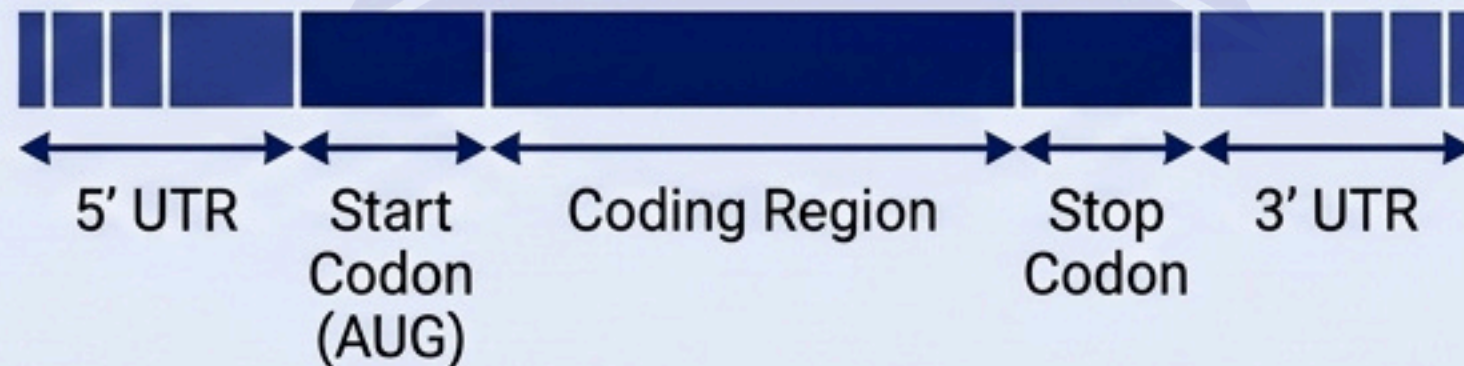
There are specific tRNAs for every amino acid and a unique Initiator tRNA. However, there are NO tRNAs for stop codons.

The Machinery and The Blueprint



The Ribosome.

Composed of structural rRNAs and ~80 different proteins. In its inactive state, it exists as two separate subunits. The large subunit contains two specific binding sites to bring amino acids close enough together to bond.



The Translational Unit.

The specific mRNA sequence flanked by a start and stop codon. The Untranslated Regions (UTRs) at the 5' and 3' ends are not translated but are required for efficient translation.

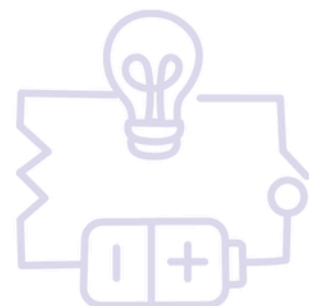


Wait, isn't the ribosome just structure?
No! 23S rRNA in bacteria acts as an enzyme (**Ribozyme**) for peptide bond formation.



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

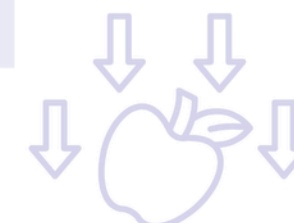
Practice Now



At prep.topall.app

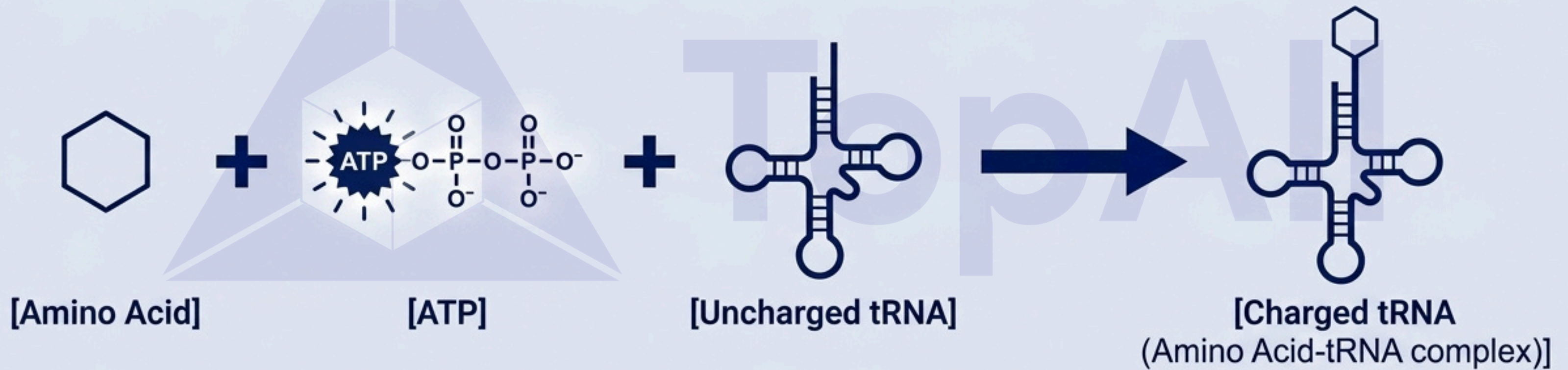
Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



Phase 0: Preparation & Fueling

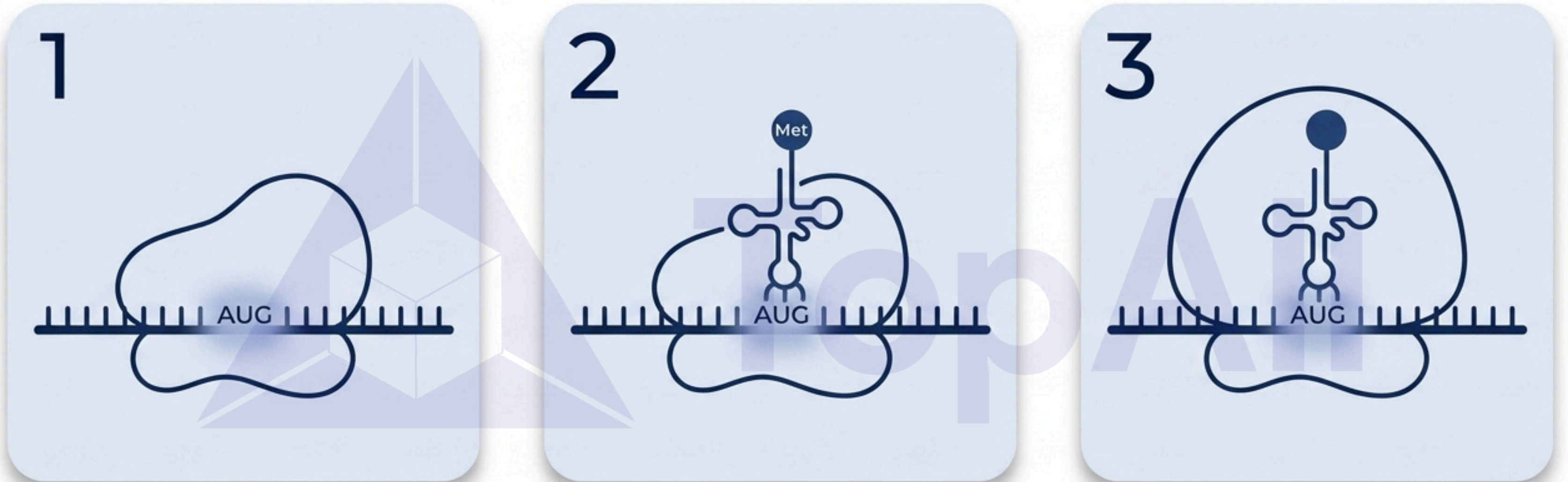
Before translation begins, amino acids must be activated and attached to their specific tRNA adapters. This process is called **aminoacylation of tRNA** (or charging).



Amber Quick-Tip Card

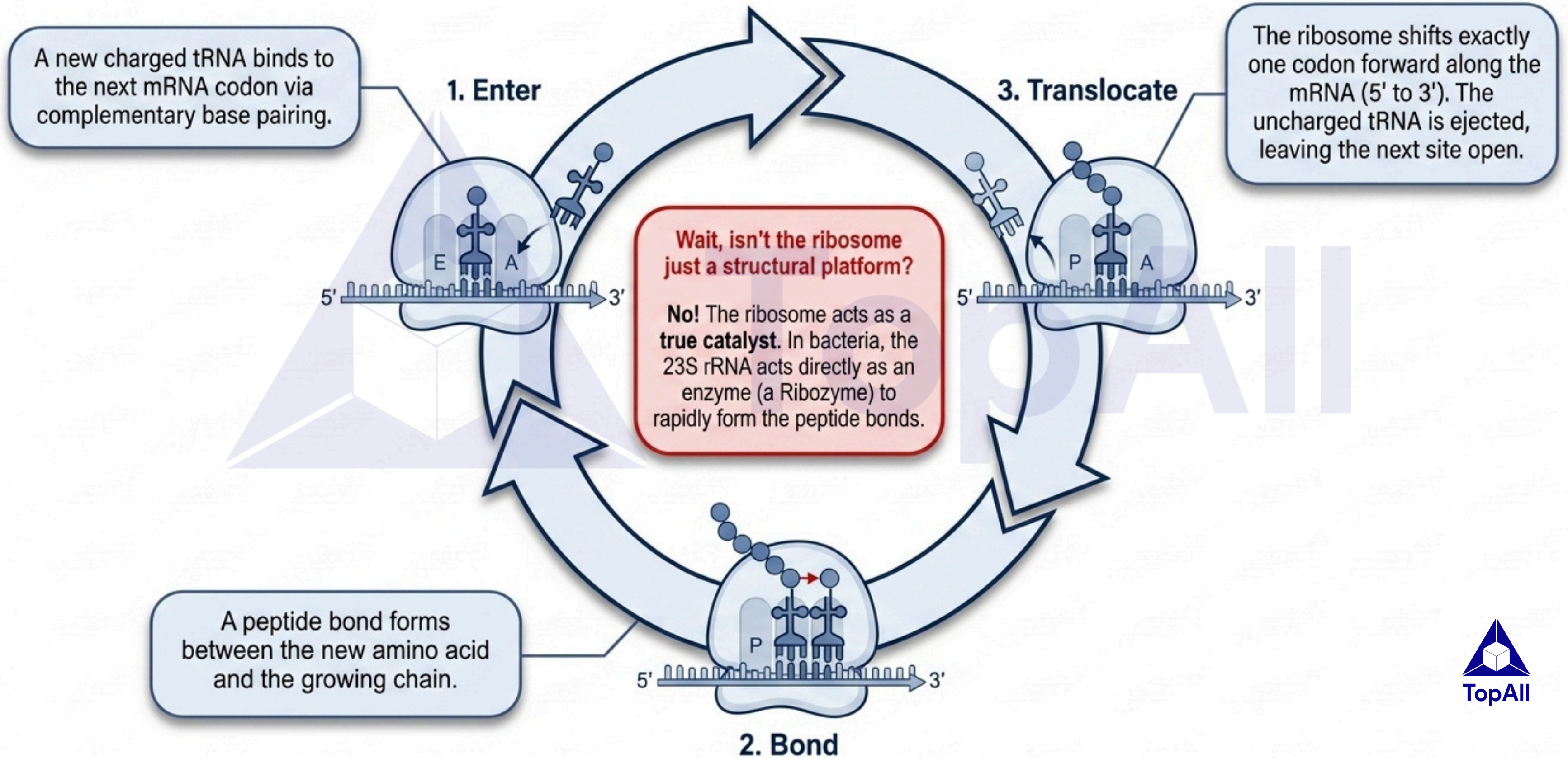
Energy Cost: Forming a peptide bond requires energy. By using ATP to 'charge' the tRNA in this preparatory phase, the subsequent formation of the peptide bond between two adjacent charged tRNAs becomes energetically favorable.

Phase 1: Initiation

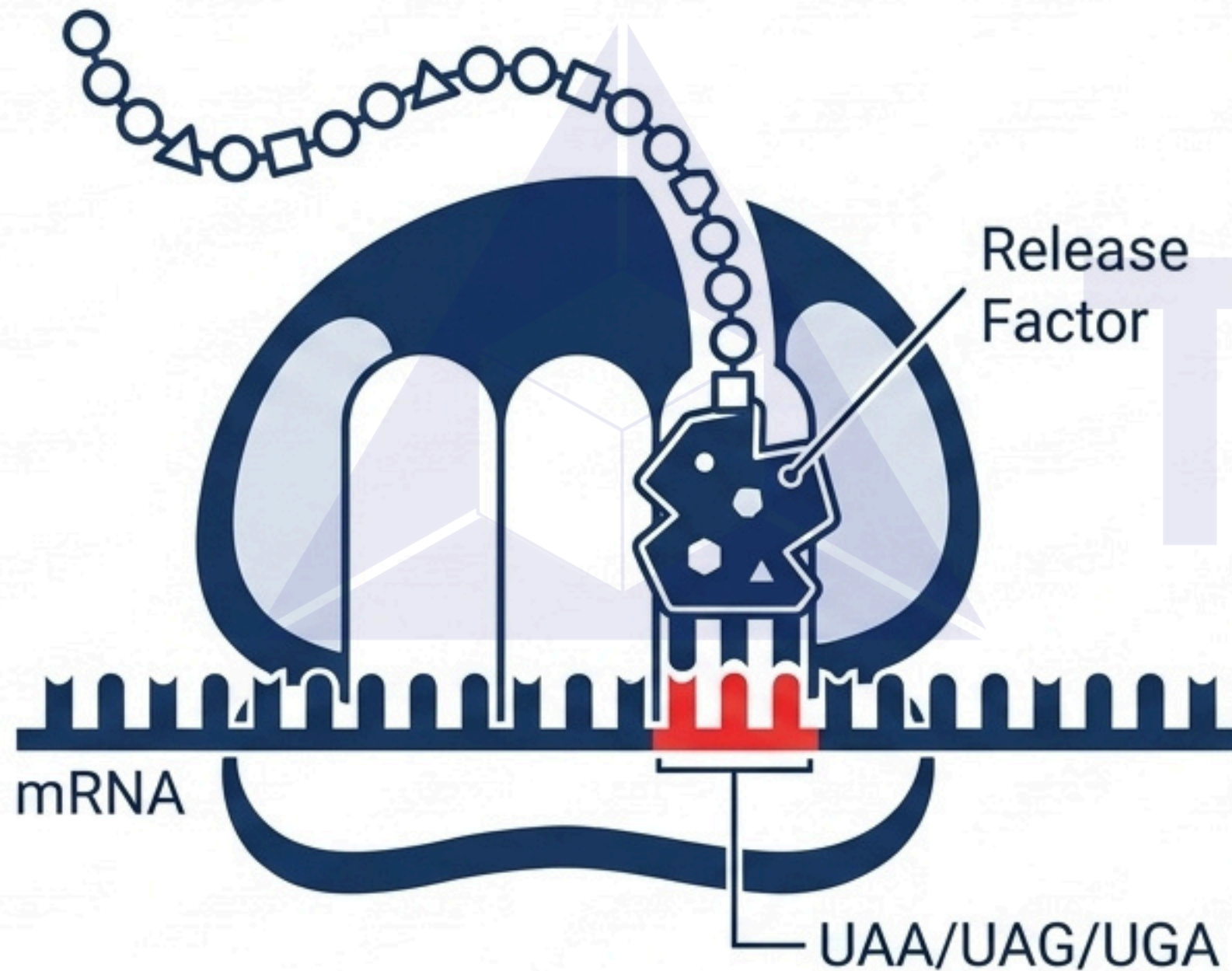


Translation strictly begins when the small ribosomal subunit encounters the AUG start codon, establishing the correct reading frame for the entire transcript.

Phase 2: Elongation



Phase 3: Termination



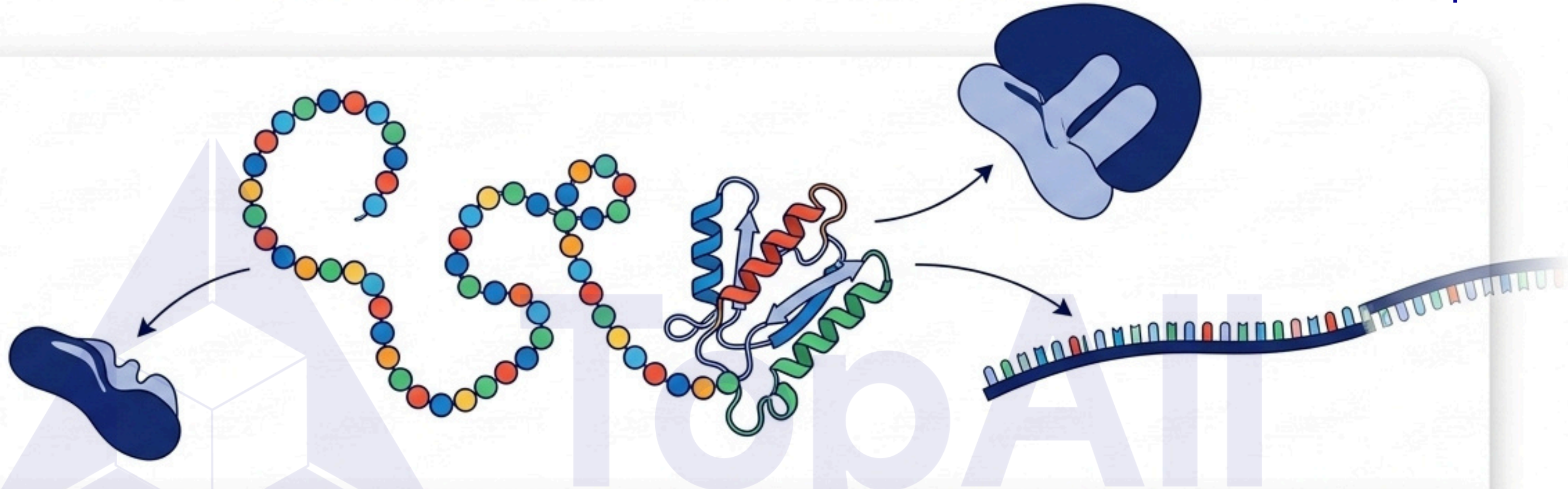
Light Navy Panel

The elongation cycle continues until the ribosome reaches a stop codon.

Amber Quick-Tip Card

Because no tRNA molecules exist that match stop codons, the assembly line stalls. A specialized Release Factor protein binds to the stop codon instead, forcing the termination of translation.

The Final Product



Translation is complete. The **exact sequence of amino acids**—originally dictated by the organism's DNA and carried by the mRNA—has been successfully assembled into a newly synthesized, **functional polypeptide** ready to serve the cell.

The Master Synthesis: Translation in Action





You've Learned the Theory.

Now Let's Test It.

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