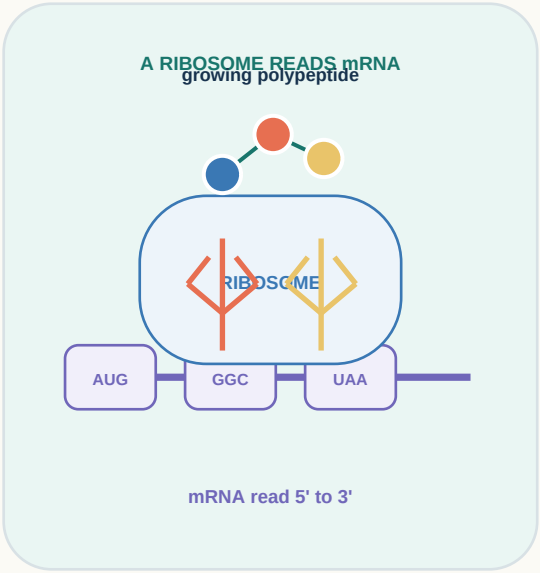
AP BIOLOGY | UNIT 6

TOPIC 6.4

Translation

A ribosome decodes mRNA codons while tRNA molecules deliver amino acids in the correct sequence for a polypeptide.



THE CORE CAUSAL CHAIN

mRNA CODONS
carry the message

→

tRNA MATCHING
anticodons pair

→

PEPTIDE BONDS
join amino acids

→

POLYPEPTIDE
folds toward function

BY THE END, YOU SHOULD BE ABLE TO...

1. Connect mRNA codons with tRNA anticodons.
2. Trace initiation, elongation, and termination.
3. Explain how translation links genotype to phenotype.

CENTRAL IDEA

The base sequence of mRNA determines the amino acid sequence of a polypeptide, helping genetic information shape cell structure and function.

1 The genetic code links codons to amino acids

Each three-base mRNA codon specifies an amino acid or a stop signal, and tRNA anticodons deliver the matching amino acids.

DECODING AN mRNA MESSAGE

READ THE mRNA IN THREE-BASE CODONS FROM 5' TO 3'

5' → mRNA CODON **AUG** — METHIONINE / START → mRNA CODON **GGC** — GLYCINE → mRNA CODON **UAA** — STOP → 3'

CODON AND ANTICODON MATCHING

mRNA 5'-AUG-3' → tRNA 3'-UAC-5'

The tRNA anticodon base pairs with the mRNA codon. The same tRNA carries the matching amino acid.

KEY CODE RULES

TRIPLET CODE

Three mRNA bases form one codon read in a fixed reading frame.

START AND STOP

AUG starts translation; stop codons end it and add no amino acid.

REDUNDANCY

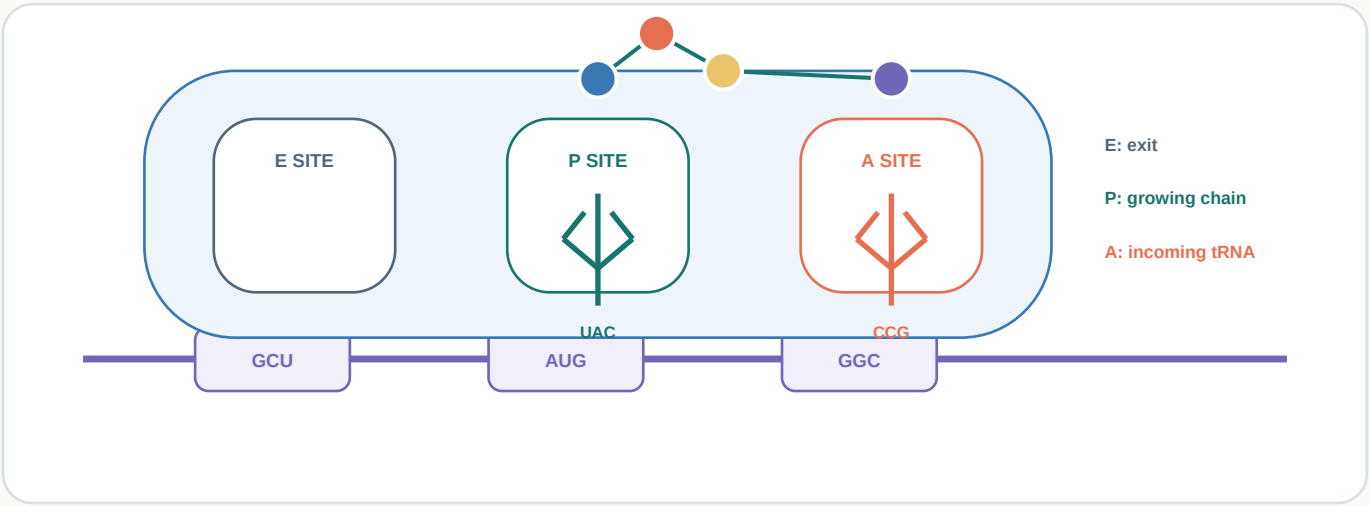
More than one codon can specify the same amino acid.

REMEMBER

Codons are on mRNA. Anticodons are on tRNA. Amino acids are joined into the growing polypeptide.

2 The ribosome builds the polypeptide

Translation begins at AUG, repeats a codon-recognition cycle, and ends when a stop codon recruits a release factor.



THREE STAGES OF TRANSLATION

1 INITIATION

The small subunit, initiator tRNA, and large subunit assemble at AUG.

2 ELONGATION

tRNAs enter, peptide bonds form, and the ribosome moves one codon.

3 TERMINATION

A stop codon recruits a release factor and the polypeptide is freed.

WHERE TRANSLATION OCCURS

Free ribosomes translate mRNA in the cytoplasm. Ribosomes attached to rough ER make many proteins destined for membranes, organelles, or secretion.

A SHARED GENETIC CODE

Nearly all organisms assign the same amino acids to the same codons. This conserved code supports the idea of common ancestry.