

Translation and Genetic Code

Translation Process

The diagram illustrates the translation process. A ribosome, composed of a 60S Large Subunit and a 40S Small Subunit, is shown translating a messenger RNA (mRNA) strand. The mRNA is oriented 5' to 3' and contains codons: AUG, GCA, UUC, GAA, CGU, and UAA. The ribosome is positioned over the first three codons (AUG, GCA, UUC). The P site (Peptidyl transferase center) is where amino acids are joined by peptide bonds. The A site (Amino acid site) is where new amino acids are added. The E site (Exit site) is where tRNAs exit the ribosome. Amino acids are represented by green triangles: Met (AUG), Ala (GCA), Phe (UUC), Glu (GAA), and another Phe (UUC). A red circle labeled 'RF' represents the Release Factor at the UAA stop codon. Arrows indicate the movement of the ribosome along the mRNA strand. The steps of translation are listed below:

Steps:

1. Initiation: Ribosome assembles at AUG
2. Elongation: tRNAs bring amino acids
3. Peptide bonds form in P site
4. Ribosome translocates 3 nucleotides
5. Termination: Release at stop codon

Genetic Code

The diagram shows the genetic code, which consists of 64 codons. The codons are organized into three concentric circles. The innermost circle contains the 3 stop codons: UAA, UGA, and UAG. The middle ring contains the 61 amino acid codons, and the outer ring contains the remaining 64 codons. Specific codons and their meanings are listed:

- AUG → Met
- UUC/UUC → Phe
- UCU → Ser
- UGG → Trp
- UAA → Stop
- UGA → Stop

- 61 amino acid codons
- 3 stop codons
- Degenerate code

Ribosome Structure

- Large subunit (60S in eukaryotes)
- Small subunit (40S in eukaryotes)
- rRNA and ribosomal proteins
- Three tRNA sites: A, P, E

tRNA Function

- Anticodon pairs with codon
- Carries specific amino acid
- Wobble base pairing
- Aminoacyl-tRNA synthetases

Translation Steps

- **Initiation:** AUG start codon

- **Elongation:**peptide formation
- **Termination:**UAA, UAG, UGA
- Energy: 2 GTP per amino acid