

Translation Facts

Proteins are synthesized from amino acids through the process of translation

tRNA carries amino acids to ribosome for protein synthesis. Amino acids not involved in decoding - fidelity of protein synthesis requires correct charging of tRNA

Properties of genetic code: triplet(codon), non-overlapping, unambiguous(clear), degenerate, universal

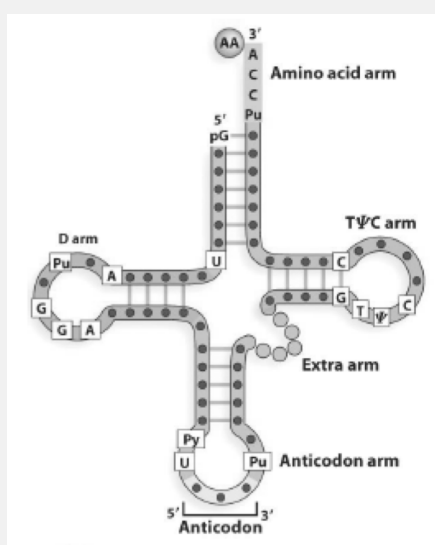
3 phases of translation: **initiation, elongation, termination**

- tRNA base-pairs with mRNA; wobble base pairing

- mRNA is read from 5' to 3', polypeptide extends from N- to C- terminus

Amino acid on tRNA is not involved in codon recognition

Structure of tRNA



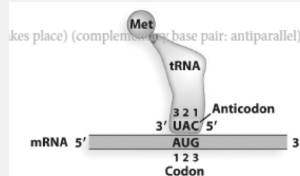
Structure of tRNA

The conformation (three-dimensional shape) of tRNA results from base pairing (hydrogen bonds) within the molecule.

The sequence on 3' end is always **CCA: the amino acid attachment site.**

Anticodon: site of base pairing with mRNA. Unique for each species of tRNA.

Anticodon



Charging a tRNA molecule

Aminoacyl-tRNA synthetases: for charging a transfer RNA with the correct amino acid

Each enzyme is specific for one amino acid

Properties of genetic code

3 bases made up a codon

Non-overlapping

Each codon specify one amino acid

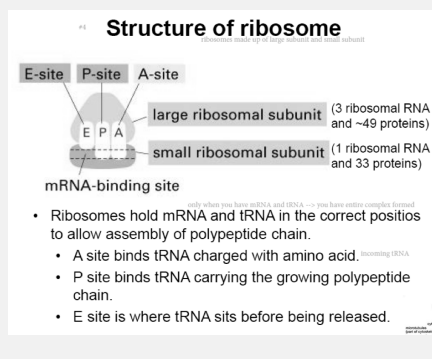
Degenerate: more than one codon for the same amino acid

Nearly universal

Codon table

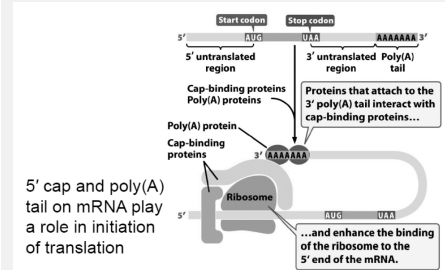
		Second base				
		U	C	A	G	
First base	U	UUU - Phenylalanine UUC - Leucine	UCU - Serine UCC - Serine UCA - Serine UCG - Serine	UAU - Tyrosine UAC - Tyrosine UAA - Stop codon UAG - Stop codon	UGU - Cysteine UGC - Cysteine UGA - Stop codon UGG - Tryptophan	U C G A G
	C	CUU - Leucine CUC - Leucine CUA - Leucine CUG - Leucine	CCU - Proline CCC - Proline CCA - Proline CCG - Proline	CAU - Histidine CAC - Histidine CAA - Glutamine CAG - Glutamine	CGU - Arginine CGC - Arginine CGA - Arginine CGG - Arginine	U C G A G
	A	AUU - Isoleucine AUA - Isoleucine AUG - Methionine start codon	ACU - Threonine ACC - Threonine ACA - Threonine ACG - Threonine	AAU - Asparagine AAC - Asparagine AAA - Lysine AAG - Lysine	AGU - Serine AGC - Serine AGA - Arginine AGG - Arginine	U C G A G
G	GUU - Valine GUC - Valine GUA - Valine GUG - Valine	GCU - Alanine GCC - Alanine GCA - Alanine GCG - Alanine	GAU - Aspartic acid GAC - Aspartic acid GAA - Glutamic acid GAG - Glutamic acid	GGU - Glycine GGC - Glycine GGA - Glycine GGG - Glycine	U C G A G	

Structure of ribosome

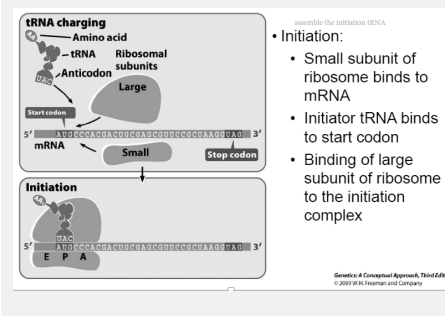


Three phases of translation

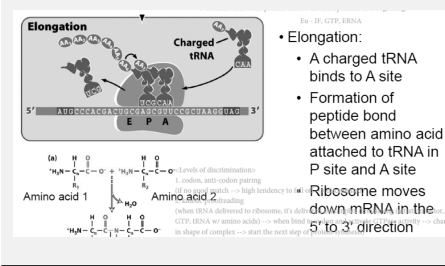
Ribosome



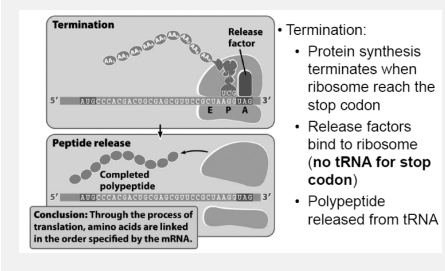
Initiation of translation



Elongation of translation



Termination of translation



Initiation

- Start codon: AUG

In eukaryotes, ribosome binds to 5' cap and moves along the mRNA to find the first start codon.

Elongation

- mRNA is read from 5' end to 3' end

- Proteins are synthesized from N-terminus to C-terminus

Termination

- Stop codons: UAA, UAG, UGA

C

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