

## TRANSLATION

- the process of assembling a.a. into proteins on the ribosome according to the code in the mRNA.

### Ribosomes

- are made up of two subunits (a large and a small subunit)
- the two parts binds together with the mRNA between them
- see Fig. 1 on pg. 250
- the **reading frame** is the area on the ribosome in which the codons are read

### The Role of Transfer RNA (tRNA)

- A single stranded nucleic acid that resembles a cloverleaf
- A three base sequence (**anticodon**) on one arm recognizes the codon on the mRNA, while the opposite arm carries the corresponding amino acid
- See Fig. 3 on pg. 251
- The sequence of a.a. (amino acids) in a protein chain determines which protein will be produced.
- A series of 3 nucleotides on the DNA molecule called a triplet, codes for one a.a. in a protein.
- The term *Genetic Code* refers to the alphabet of DNA triplets.
- eg. DNA Sequence (triplet): CGA - CCA - GGG - CGA

(transcription)

mRNA Sequence (codon): GCU - GGU - CCC - GCU

(translation)

Protein Sequence (a.a.): alanine - glycine - proline -alanine

- Since 3 bases encode 1 a.a. and there are 4 possible DNA bases for each of the 3 positions in any codon (A,C,G,T) ...  $4 \times 4 \times 4 = 64$  possible codons.
- 3 codons signal protein synthesis to stop and 61 codons signal for one of the 20 a.a. that exist in biological systems to be brought the site of protein synthesis.
- **Aminoacyl-tRNA synthetases** is the enzyme that is responsible for adding the correct aa to the tRNA.

### Elongation of the Polypeptide Chain

1. The start codon, AUG is recognized, which is methionine, so every protein starts with the aa methionine.  
The tRNA carrying Methionine binds to the ribosome at the **P (peptide)** site.  
See Fig. 4a on pg. 252
2. The next tRNA carrying the next aa enters the **A(acceptor)** site.  
See Fig. 4b on pg. 252
3. Dehydration Synthesis then occurs between adjacent a.a. and the result is the formation of a **peptide bond**.

4. The aa in the A site moves over to the P site, and the tRNA on the first aa is released.  
See Fig. 4c on pg. 252
5. This process continues until all the mRNA has been read.

#### **Termination of Protein Synthesis**

6. The stop codon is read. There are no aa for the 3 stop codons so the building process ceases.
7. A protein called a **release factor** and releases the polypeptide chain from the ribosome.  
See Fig. 4f on pg. 252.
8. The polypeptide enters the smooth ER where it is folded and modified (ie. sugars and phosphates may be added, or enzymes may cleave the chains).

#### **Seatwork**

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