● BIOLOGY

Demonstrate understanding of gene expression

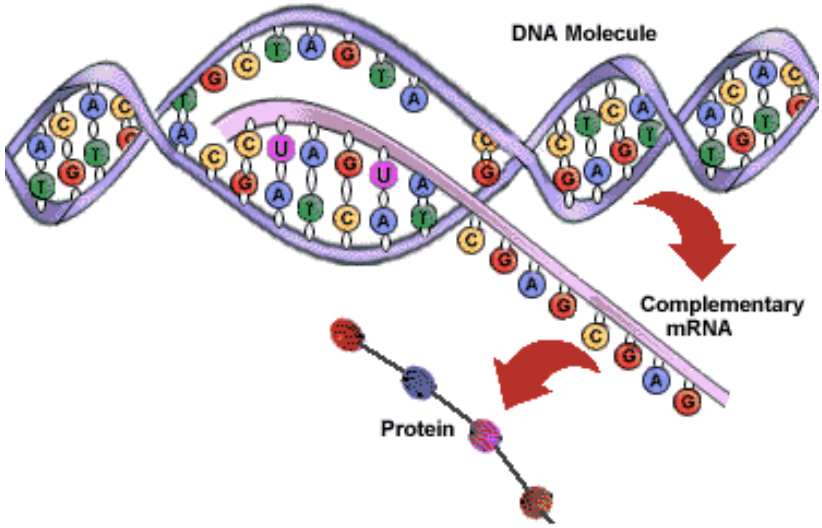
Key steps in Protein Synthesis

IN NUCLEUS:

Transcription

DNA → mRNA

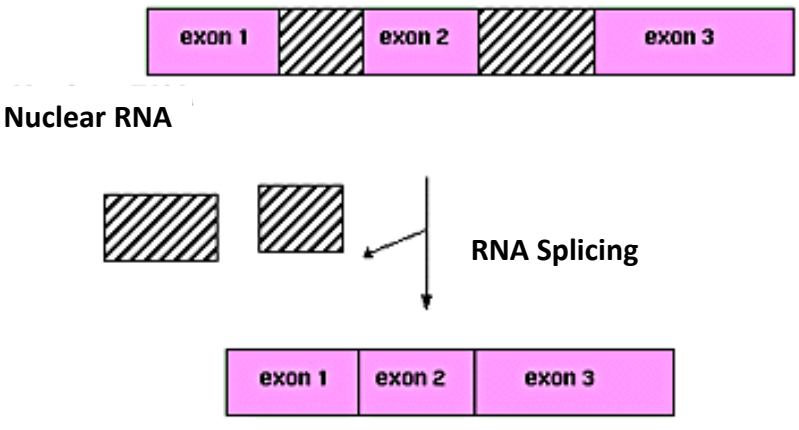
- The enzyme RNA polymerase unwinds the section of DNA which codes for the polypeptide chain.
- This unwound piece is made into a copy called mRNA.
- The section of DNA then rewinds.



NOTE: DNA contains the nucleotide bases A, T, C and G but when an RNA is made it contains A, **U**, C and G

RNA Processing

Before the mRNA leaves the nucleus the non-coding **introns** are removed and the coding **exons** are joined together. The number of exons joined together and the way they are joined together may not always be the same. This means that the same piece of DNA can code for different polypeptide chains.

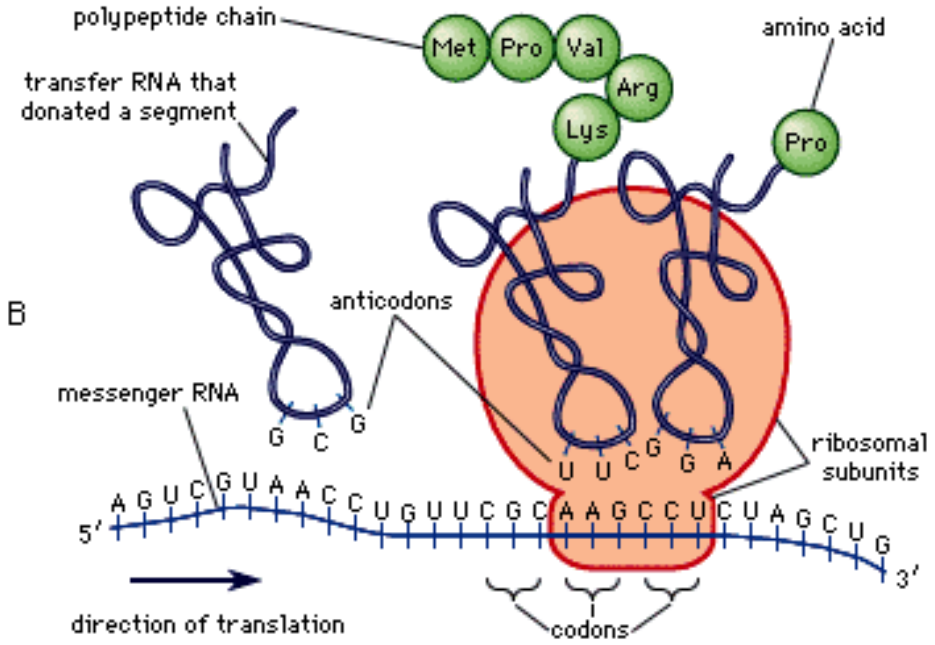


IN CYTOPLASM:

Translation

mRNA → polypeptide chain

- The mRNA joins with a ribosome at a **start** codon (AUG) and covers TWO **codons**.
- tRNA bring in the correct **anticodons** (with their amino acids).
- when TWO amino acids are side by side a **peptide bond** forms between them.
- The ribosome moves along a codon, the first tRNA leaves the ribosome (without its amino acid).
- The next matching tRNA brings in its amino acid, peptide bond forms, ribosome moves along etc.
- This process of reading the mRNA and building the polypeptide chain carries on occurring until the ribosome meets a **termination codon** where the ribosome leaves the mRNA.



Protein Folding

- After the polypeptide chain has been produced it is still not a functional protein, as the chain needs to be folded in a specific way.
- Most proteins are either **fibrous** and are folded in regular secondary structures, where the polypeptide chains form either a zigzag or spiral helix OR are globular.
- **Globular** are folded into a tertiary or quaternary structure.
    - Tertiary folding involves a polypeptide chain being folded into an irregular ball shape.
    - Quaternary folding involves two or more polypeptide chains being loosely held together.