

Unit 1 DNA & the Genome

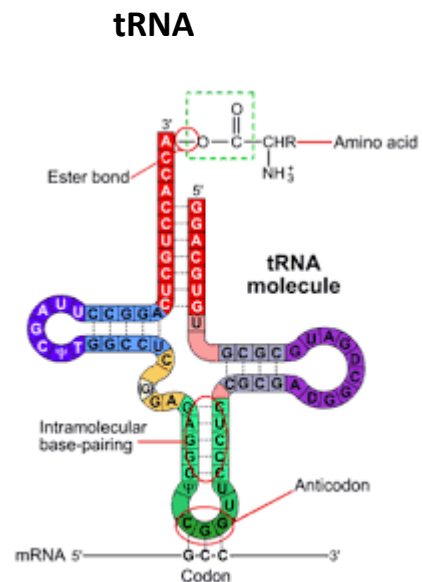
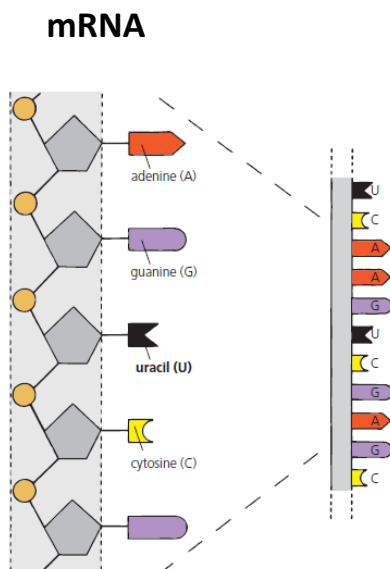
Key Area 3: Gene Expression

Gene Expression involves the **transcription and translation** of DNA sequences.

Only a fraction of the genes in a cell are expressed.

Transcription and translation involves **3 types of RNA: mRNA, tRNA and rRNA.**

RNA is **single stranded** and is composed of nucleotides containing Ribose sugar, phosphate and 1 of 4 bases : **Cytosine, Guanine, Adenine and Uracil** (there is no Thymine in RNA, Uracil replaces this).



Messenger RNA (mRNA) carries a copy of the DNA code from the nucleus to the Ribosome.

Each triplet of bases on the mRNA molecule is called a CODON and codes for a specific amino acid.

tRNA folds due to complementary base pairing. Each tRNA molecule carries its specific amino acid to the ribosome.

A tRNA molecule has an anticodon (an exposed triplet of bases) at one end and an attachment site for a specific amino acid at the other end.

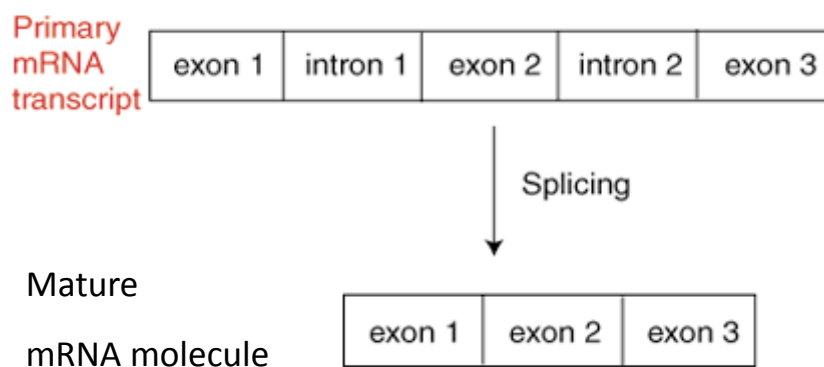
Ribosomal RNA (rRNA) and Proteins are used to form the Ribosome.

RNA SPLICING

Some of the DNA which is transcribed (copied) is **NON-CODING** (does not contain the information required to produce a protein) and therefore these regions known as **INTRONS** must be removed from the Primary mRNA Transcript.

Clue : NICE (Non-coding Introns, Coding Exons)

RNA Splicing involves the **removal of the NON-CODING INTRONS** and joining together (Splicing) of the **CODING regions known as EXONS**.

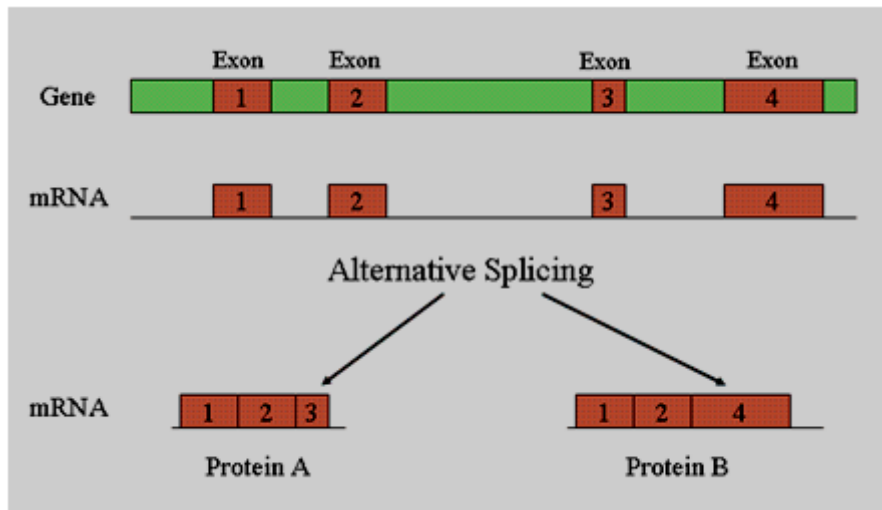


The order of Exons is **UNCHANGED** during Splicing.

ALTERNATIVE RNA SPLICING

Different Proteins can be expressed from **ONE GENE** as a result of **Alternative RNA Splicing**.

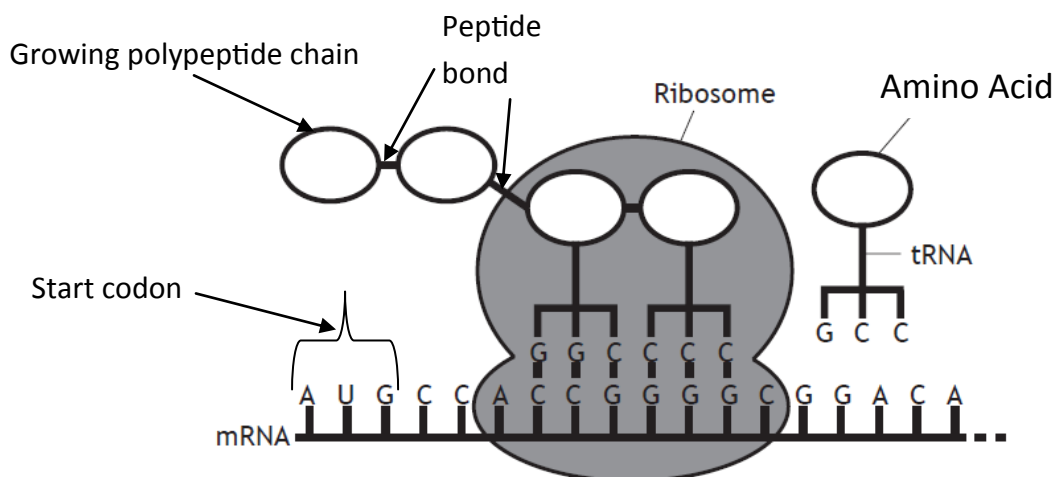
Different mature mRNA transcripts are produced from the same primary transcript **depending on which exons are retained**.



TRANSLATION

tRNA is involved in the **translation of mRNA** into a **Polypeptide** at a **Ribosome**.

Translation begins at a **START CODON** and ends at a **STOP CODON**.



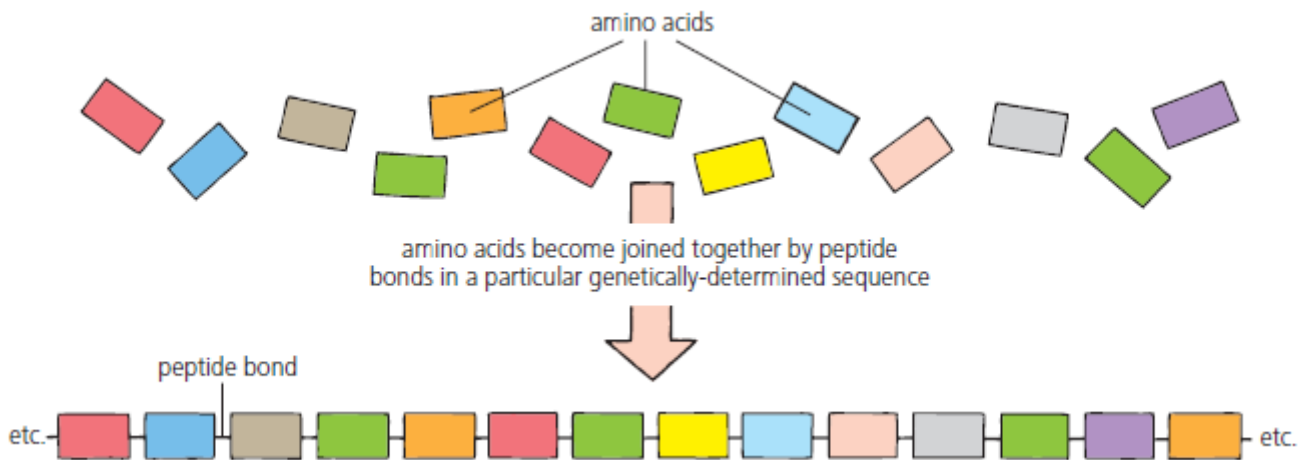
Anticodons bond to Codons by complimentary base pairing, translating the genetic code into a sequence of **Amino Acids**.

Peptide Bonds join the amino acids together.

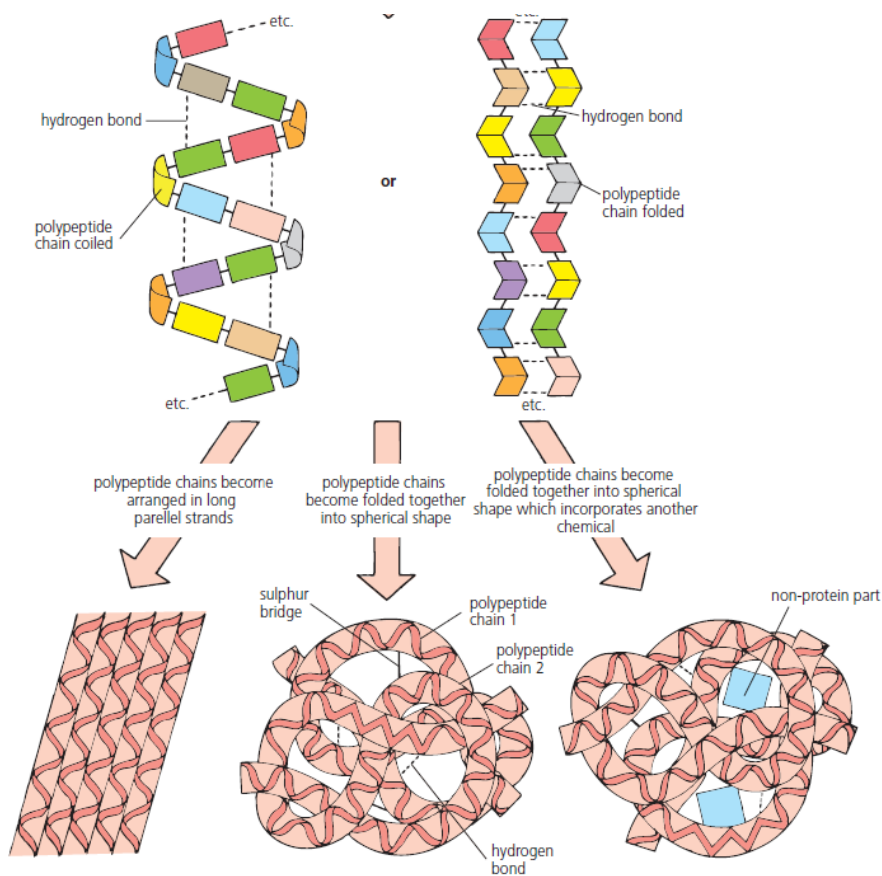
Each tRNA then leaves the Ribosome as the Polypeptide is formed.

STRUCTURE OF PROTEINS

Amino Acids are linked by **PEPTIDE BONDS** to form **POLYPEPTIDES**.



Polypeptide Chains **FOLD** to form the 3-Dimensional shape of a Protein, held together by **HYDROGEN BONDS** and other interactions between individual amino acids.



Proteins have a large variety of **shapes which determines their functions**.

Phenotype is determined by the proteins produced as the result of Gene Expression.

Environmental factors also influence phenotype.