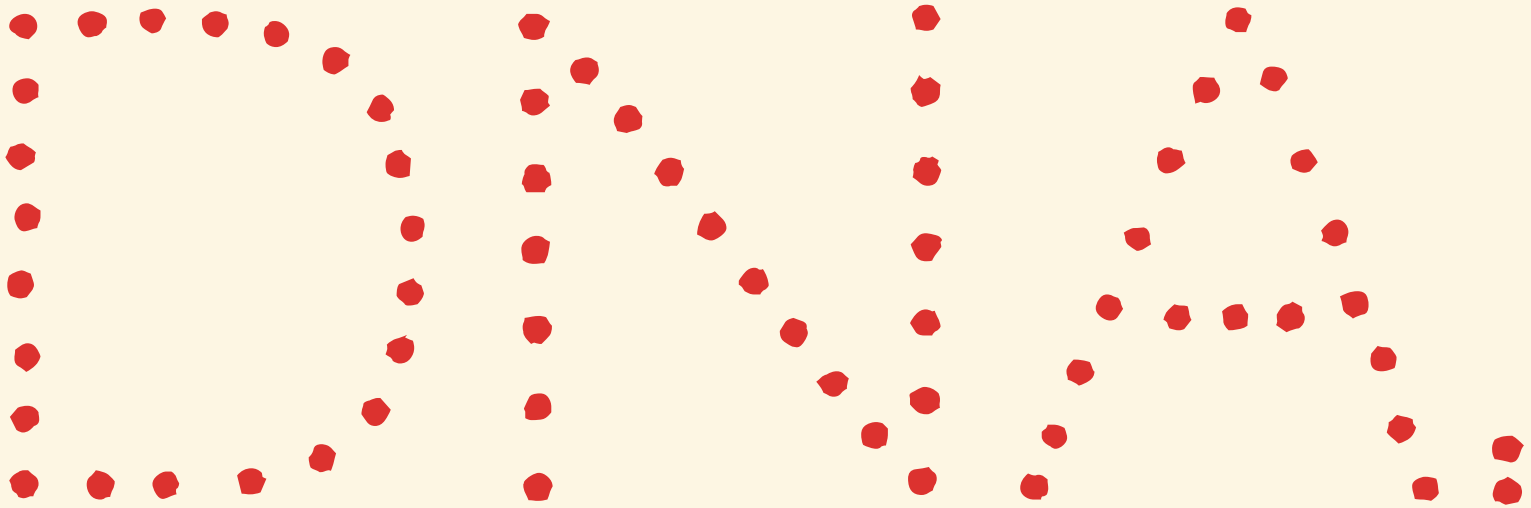
Protein Synthesis

Biology Revision Presentation

An individual's genetic code is stored in his or her



The "ONE GENE, ONE POLYPEPTIDE" theory states that each gene on a chromosome codes for a single polypeptide/protein.

PROTEIN SYNTHESIS begins with DNA in the nucleus.

The DNA acts as a template for mRNA which is made using RNA synthetase from the template DNA strand.

This process is called TRANSCRIPTION.

in TRANSCRIPTION the enzyme DNA helicase works on the cistron of the DNA breaking the hydrogen bonds between the two base strands exposing the nucleotides in the region.

RNA polymerase linked to the template strand of DNA at the start of the sequence that it intends to copy.

The DNA is unzipped and unwound at this point.

free RNA nucleotides align themselves with the template strand following the complementary pairings:

adenine – uracil,
cytosine – guanine.

the RNA polymerase molecule moves along the DNA adding RNA nucleotides to the mRNA.

Following the RNA polymerase the DNA 'zips up' and rewinds.

The mRNA then carries the DNA code out of the nucleus through a nuclear pore.

Once in the cytoplasm the mRNA attaches to a ribosome so that

TRANSLATION

can take place.

Each ribosome is made up of two subunits. Two tRNA molecules which carry amino acids can be associated with the ribosome at a time.

TRANSLATION begins with the the ribosome attaching to the start codon AUG on the mRNA.

As the ribosome reads the mRNA, tRNA molecules with anticodons complementary to the current codon set (2*3) attach to the ribosome and peptide bonds form between the amino acids forming a polypeptide chain.

This process continues until such time as the stop codon is encountered.

One ribosome produces one polypeptide at a time. Therefore more than one ribosome is likely to be reading the mRNA simultaneously – a POLYSOME SYSTEM.

tRNA is released from the ribosome as it moves along the mRNA. Once freed the tRNA is free to pick up more amino acids from the amino acid pool.

Energy is required (via ATP) to collect amino acids and the process is referred to as ACTIVATION.

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