To ensure the stability of the genome, eukaryotic cells have multiple mechanisms to repair damaged DNA. These mechanisms include proofreading by DNA polymerase, mismatch repair, and nucleotide excision repair.

Structure and Function of Chromosomes

Chromosomes are thread-like structures located in the nucleus of eukaryotic cells, which carry genetic information in the form of DNA. They are crucial for the reproduction and inheritance of genetic traits.

Structure of Chromosomes

Chromosomes are made up of DNA and proteins, called histones, which help to compact and organize the DNA into a more manageable form. Each chromosome contains one long DNA molecule, which can be millions of base pairs in length.

In eukaryotic cells, chromosomes are present in pairs, with each pair consisting of one chromosome from the mother and one from the father. These pairs are called homologous chromosomes.

Function of Chromosomes

The primary function of chromosomes is to carry genetic information from one generation to the next. They also play a crucial role in the process of cell division, ensuring that each new cell receives a complete set of genetic information.

Chromosomes are also involved in the regulation of gene expression. The histone proteins that make up the chromosome can be modified in various ways, which can either activate or repress the expression of nearby genes.

Mitosis is a fundamental process in biology that results in the faithful duplication of cells. It is a complex series of events that ensures the accurate transmission of genetic information from one cell to two identical daughter cells. However, there is a catch.

During DNA replication in eukaryotic cells, an issue arises with the replication of the ends of chromosomes, known as telomeres. Telomeres are repetitive nucleotide sequences that protect the ends of chromosomes from degradation and fusion with other chromosomes. However, each time a cell undergoes mitosis, the telomeres shorten due to the "end replication problem," where the enzymes responsible for DNA replication, DNA polymerase, cannot fully replicate the ends of the chromosomes.

This telomere shortening leads to a problem known as the "Hayflick limit," where after a certain number of cell divisions, the telomeres become too short, and the cell can no longer divide, eventually leading to cell death. This is a crucial mechanism for preventing the uncontrolled cell division seen in cancer.

methionine. The stop codons are UAA, UAG, and UGA, which do not correspond to any amino acid.

Peptide Bond Formation and Enzymes Involved

During translation, the ribosome moves along the RNA sequence and reads the codons. When it encounters a codon that corresponds to an amino acid, it adds that amino acid to the growing protein chain. This is done through a process called peptide bond formation.

Peptide bond formation is catalyzed by an enzyme called peptidyl transferase, which is part of the ribosome itself. The amino acids are added to the growing protein chain in a specific order, determined by the sequence of codons in the RNA.

When the ribosome encounters a stop codon, it releases the completed protein chain and terminates the protein synthesis process.

Overall, the process of protein synthesis is a complex and highly regulated process that is essential for the functioning of all living organisms. Understanding the mechanisms involved in protein synthesis is crucial for developing new therapies and treatments for a variety of diseases

Codons, Start, and Stop Codons

In the process of protein synthesis, the genetic code contained within DNA and RNA is translated into the sequence of amino acids that make up a protein. This is accomplished through the use of codons, which are sequences of three nucleotides that specify a particular amino acid. There are 64 possible codons, which can be divided into two categories: sense codons and stop codons.

Sense codons specify the 20 different amino acids, while stop codons indicate the end of the protein-coding sequence. There are three stop codons: UAA, UAG, and UGA. Start codons, which are also sense codons, indicate the beginning of the protein-coding sequence and specify the amino acid methionine. The start codon is always the AUG codon.

Once the ribosome has assembled the correct sequence of amino acids, the process of peptide bond formation begins. Peptide bonds are formed between the carboxyl group of one amino acid and the amino group of the next, resulting in the formation of a chain of amino acids known as a peptide. This process is facilitated by several enzymes, including peptidyl transferase, which is responsible for catalyzing peptide bond formation. These enzymes work together to accurately synthesize proteins according to the instructions encoded in the genetic material.

Peptide Bond Formation and Enzymes Involved