

Writing to Learn

Process Essay – High School Biology

DNA Replication

DNA replication is necessary to provide genetic continuity, meaning passing material from one generation to the next. In order to reproduce, a cell has to copy and send its genetic information to all of the cells it is producing. To do that, DNA replicates. Two strands of DNA are made from one, having produced two daughter molecules that are identical to each other and to the parent molecule they came from. The three stages of DNA replication are unwinding, complementary base pairing, and joining.

The first stage of replication is the unwinding of the old strands of DNA of the parent molecules. First the two strands of the double helix are separated by enzymes. Then each strand acts as a model or template for the new complementary DNA molecule. Proteins are critical in this stage. For example, single stranded binding proteins work to maintain the stability of the replication fork. There are many enzymes that help to unwind the old strands of DNA, including topoisomerase, helicase, and gyrase. Once the helix is unwound, each strand is made into a new double helix that is called the replication fork.

The second stage of replication is complementary base pairing. In this stage, new complementary nucleotides are positioned following the rules of complementary base pairing. Adenine pairs with thymine and guanine goes with cytosine. Then, the binding of free nucleotides with complementary bases is catalyzed by DNA polymerase.

The last stage (joining) involves the bonding of complementary nucleotides to each other to form new DNA strands. The nucleotides are joined to one another by hydrogen bonds. The joining continues until a new polynucleotide chain has been formed right beside the old one, forming a new double-helix molecule. This stage also involves enzymes. Polymerase links the complementary nucleotides together, making a side rail of the new DNA molecule. Ligase has helped the product be formed without nicks.

There you have the three-stage process. Unwinding, complementary base pairing, and joining are the steps. This process is crucial for ensuring continuous transmission of the genetic information through generations.