NAME: AKINBAMI JENNIFER OGECHI

MATRIC NUMBER: 18/MHS07/004

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**ASSIGNMENT**

1. Highlight the steps of DNA replication
2. Outline the functions of DNA replication

ANSWER

1. DNA (deoxyribonucleic acid) is the self-replicating material which is present in nearly all living organisms as the main constituent of chromosomes. It is the fundamental carrier of genetic information, present in virtually every cell in your body. In molecular biology, DNA replication is the biological process of producing two identical replicas of DNA from one original DNA molecule. DNA replication occurs in all living organisms acting as the basis for biological inheritance. The cell possesses the distinctive property of division, which makes replication of DNA essential.

**DNA REPLICATION STEPS**

There are three main steps to DNA replication: initiation, elongation, and termination.

**Step 1: Initiation**

The point at which the replication begins is known as the Origin of Replication (oriC). Helicase brings about the procedure of strand separation, which leads to the formation of the replication fork.

**Step 2: Elongation**

The enzyme DNA Polymerase III makes the new strand by reading the nucleotides on the template strand and specifically adding one nucleotide after the other. If it reads an Adenine (A) on the template, it will only add a Thymine (T).

**Step 3: Termination**

When Polymerase III is adding nucleotides to the lagging strand and creating Okazaki fragments, it at times leaves a gap or two between the fragments. These gaps are filled by ligase. It also closes nicks in double-stranded DNA.

1. The process of DNA replication ensures that each cell contains a copy of these instructions and is, accordingly, able to function correctly within the organism. At the most basic level, the purpose of this process is to duplicate the DNA within each cell during every cycle of cell division.

DNA replication is a crucial process; therefore, to ensure that mistakes, or mutations, are not introduced, the cell proofreads the newly synthesized DNA. Once the DNA in a cell is replicated, the cell can divide into two cells, each of which has an identical copy of the original DNA.

* DNA polymerases are a family of enzymes that carry out all forms of DNA replication. DNA polymerases in general cannot initiate synthesis of new strands, but can only extend an existing DNA or RNA strand paired with a template strand. To begin synthesis, a short fragment of RNA, called a primer, must be created and paired with the template DNA strand.
* DNA polymerase adds a new strand of DNA by extending the 3′ end of an existing nucleotide chain, adding new nucleotides matched to the template strand one at a time via the creation of phosphodiester bonds. The energy for this process of DNA polymerization comes from hydrolysis of the high-energy phosphate (phosphoanhydride) bonds between the three phosphates attached to each unincorporated base. Free bases with their attached phosphate groups are called nucleotides; in particular, bases with three attached phosphate groups are called nucleoside triphosphates. When a nucleotide is being added to a growing DNA strand, the formation of a phosphodiester bond between the proximal phosphate of the nucleotide to the growing chain is accompanied by hydrolysis of a high-energy phosphate bond with release of the two distal phosphates as a pyrophosphate. Enzymatic hydrolysis of the resulting pyrophosphate into inorganic phosphate consumes a second high-energy phosphate bond and renders the reaction effectively irreversible