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**MATRIC NO: 18/MHS07/003**

**Assignment** **Title:** MEDICAL BIOCHEMISTRY

**Course Title:** Medical Biochemistry II

**Course Code:** BCH 204

**Question**

1.HIGHLIGHT THE STEPS OF DNA REPLICATION

2.OUTLINE THE FUNCTIONS OF DNA REPLICATION ENZYMES.

**Answers**

1. DNA replication has 3 main steps which include; Initiation, Elongation and Termination.

**Initiation:** During initiation, proteins bind to the origin of replication while helicase unwinds the DNA helix and two replication forks are formed at the origin of replication.

**Elongation:** During elongation, a primer sequence is added with complementary RNA nucleotides, which are then replaced by DNA nucleotides. During elongation the leading strand is made continuously, while the lagging strand is made in pieces.

**Termination:** Termination requires that the progress of the DNA replication fork must stop or be blocked. Termination at a specific locus, when it occurs, involves the interaction between two components:

(1) a termination site sequence in the DNA, and

(2) a protein which binds to this sequence to physically stop DNA replication.

The steps of DNA replication are as follows;

* Helicase enzyme breaks the hydrogen bonds between base pairs. This unzips the double helix at a position called replication fork.
* There is an abundant supply of nucleotides in the nucleus for the formation of the new polynucleotides.
* Nucleotides base pair to the bases in the original strands with hydrogen bonds.
* DNA polymerase joins together the nucleotides together with strong covalent bonds to form a new complementary polynucleotide strand.
* The double strand reforms a double helix.
* Two copies of the DNA molecule form behind the replication fork. These are the new daughter chromosomes.

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| **Enzymes** | **Functions** |
| 1. Topoisomerase | Relaxes the super-coiled DNA |
| 1. DNA Helicase | Responsible for the unwinding of the double helix by disrupting the hydrogen bonds between the anti-parallel strands (bond that binds the nitrogenous bases.) |
| 1. DNA Gyrase | An enzyme that relieves any form of tension that’s produced after the DNA double helix is unwound. |
| 1. Single-Stranded Binding proteins (SSBs) | The protein that binds to the outside of the two single template strands and prevents the separated strands of DNA from re-attaching . |
| 1. RNA Primer | RNA primer composed of multiple bases that attached to the template strands **to initiate the DNA Replication (initiates a new complementary strand to be built** |
| 1. Primase | Builds RNA primers |
| 1. DNA Polymerase II | A repair enzyme involved in removing errors and filling in gaps in the sequence. |
| 1. DNA Polymerase III | Creates complementary strands of DNA during replication.  Attaches to an RNA Primer  Can only add nucleotides to a 3’ end of a DNA Strand. |
| 1. DNA Polymerase I | Removes RNA primers and replaces them with a appropriate DNA nucleotides. |
| 1. Okazaki Fragments | Short fragments of DNA made on the “lagging strand” |
| 1. DNA Ligase | Joins DNA Fragments together by phosphodiester bonds |
| 1. Sliding clamp | Helps to hold the DNA polymerase in place when nucleotides are being added. |