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

ANSWERS
1. The steps of DNA replication are :

1. Replication fork formation

2. prime binding

3. Elongation

4. Termination

1. Replication Fork Formation: Before DNA can be replicated, the double stranded molecule must be “unzipped” into two single strands. DNA has four bases called adenine (A), thymine (T), cytosine (C) and guanine (G) that form pairs between the two strands. Adenine only pairs with thymine and cytosine only binds with guanine.

2. Primer Binding: The leading strand is the simplest to replicate. Once the DNA strands have been separated, a short piece of RNA called a primer binds to the 3' end of the strand. The primer always binds as the starting point for replication. Primers are generated by the enzyme DNA primase.

3. Elongation: Enzymes known as DNA polymerases are responsible creating the new strand by a process called elongation. There are five different known types of DNA polymerases in bacteria and human cells.

4. Termination: Once both the continuous and discontinuous strands are formed, an enzyme called exonuclease removes all RNA primers from the original strands. These primers are then replaced with appropriate bases. Another exonuclease “proofreads” the newly formed DNA to check, remove and replace any errors. Another enzyme called DNA ligase joins Okazaki fragments together forming a single unified strand.

2. The functions of DNA replication enzymes are :

1. Topoisomerase:

Function: Relaxes the super-coiled DNA.

2. DNA helicase:
Function : Unwinds the double helix at the replication fork.

3. Primase:
Function :Provides the starting point for DNA polymerase to begin synthesis of the new strand.

4. DNA polymerase:
Function : Synthesizes the new DNA strand; also proofreads and corrects some errors.

5. DNA ligase:
Function : Re-joins the two DNA strands into a double helix and joins Okazaki fragments of the lagging strand.

6. DNA clamp:
Function : A protein which prevents DNA polymerase III from dissociating from the DNA parents strand.

7. Single strand binding (SSB) protein :
Function : Binds to ssDNA and prevents the DNA double helix from re-annealing after DNA helicase Unwinds it, thus maintaining the strands separation.

8. DNA gyrase:
Function : Release strain of unwinding by DNA helicase ; this is a specific type of topoisomerase.

9. Telomerase:
Function : Lengthnes telomeric DNA by adding repetitive nucleotide sequence to the end of eukaryotic chromosomes.