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ASSIGNMENT: HIGHLIGHT THE STEPS OF DNA REPLICATION

OUTLINE THE FUNCTIONS OF DNA REPLICATION ENZYMES.

HIGHLIGT THE STEPS OF DNA REPLICATION

- Initiation
- Elongation
- Termination

Initiation: The DNA polymerase attaches to the promoter (methionine) which is the start codon to begin the initiation stage. Initiation of DNA replication involves the separation of two complementary DNA strands and the formation of replicating fork. Unwinding occurs at a single, specific site at a particular DNA sequence on circular DNA of prokaryotes. The site is called the origin of replication “Ori”, where active sentences occurs is called replication fork. Replication of double stranded DNA is bidirectional. In eukaryotes, replication begins at multiple sites composed almost exclusively of A-T base pairs along the DNA helix is referred to as a consensus sequence.

Elongation: The RNA strand grows longer in this stage of DNA replication. Once RNA primers has been synthesized at each of the replicating fork, a DNA polymerase III initiates the synthesis of new

DNA strand by adding deoxyribonucleotide to the 3’ end of the RNA primer. Thus, DNA polymerase III can synthesize a new chain only in 5’ to 3’ direction. Both the DNA strand are synthesized simultaneously but in opposite direction one is in direction towards the replication fork, the other in a direction away from the replication fork. The DNA chain which runs in the 5’—3’ direction is copied by polymerase III as a continuous strand, requiring one primer. The new strand is called leading strand. The DNA chain which runs in the 5’ – 3’ direction is copied by polymerase III as a discontinuous manner because synthesis can only proceed in the 5’ to 3’ direction. This new strand is known as the lagging strand. This requires numerous RNA primers. As the replication fork moves, RNA primers are synthesized at specified intervals. These RNA primers are extended by DNA polymerase III into short pieces of DNA called okazaki fragments. Upon completion of laggings strand synthesis, the RNA primers are removed from fragments by DNA polymerase I. DNA polymerase I also fills the gaps that are produced by removal of the primer leaving only a nick. It cannot join two polynucleotide chains together, an addition enzyme DNA ligase is required to perform this function. This enzyme catalyzes the formation of a phosphodiester bond to seal the

okazaki fragments.

Termination : The RNA polymerase reaches a segment in the DNA template called terminator which signals the end of the gene/ RNA sequence. At this point, the polymerase molecules detaches from the RNA molecule and the gene. A specific protein called ter binding protein binds these sequence and prevents the helicase from further unwinding of DNA and facilitates the termination of replication.

OUTLINE THE FUNCTIONS OF DNA REPLICATION ENZYMES

The functions of the DNA replication enzymes are:

- DNA chain elongation: The DNA enzymes join small fragments into a continuous chain and adds nucleotides to a growing chain.
- DNA repair: DNA polymerase and ligase repair DNA damaged due to harmful radiation and toxic chemicals.
- Proofreading: DNA enzymes proofreads and correct improper base pairing.