D1.1

DNA Replication (HL)

Steps

1. DNA double helix is unwound and separated using **HELICASE**. Forming the **REPLICATION FORK**.
2. **SSBPs** stabilize the two single strands by keeping the two strands from forming hydrogen bonds.
3. **RNA PRIMASE** adds a **PRIMER** (a short RNA sequence) for **DNA POLYMERASE III** to bind to and start adding nucleotides.
4. **DNA POLYMERASE III** discontinuously synthesizes the new strand by catalyzing the addition of **DNA NUCLEOTIDES** in the 5' to 3' direction, it also removes mismatched nucleotides (proofreads).
5. Once DNA polymerase III meets another primer, this sequence of DNA is called an **OKAZAKI FRAGMENT**.
6. **DNA POLYMERASE I** removes primers (made of RNA) and replaces them with DNA Nucleotides.
7. **LIGASE** seals up each break between the Okazaki fragments.

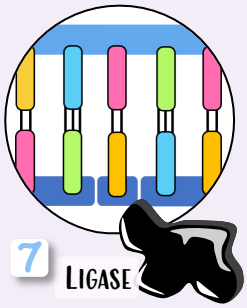
LEADING STRAND (see bottom)

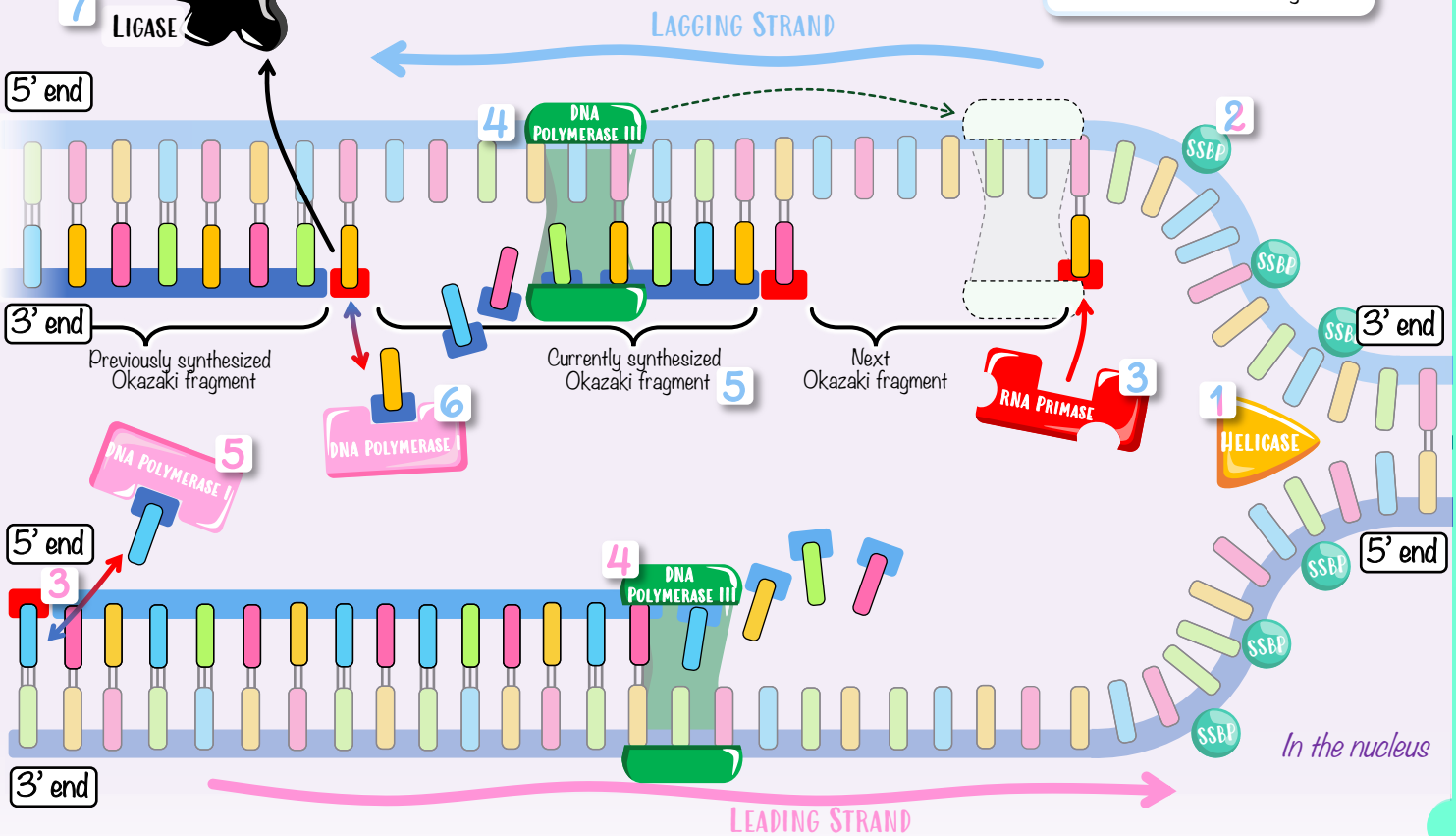
LAGGING STRAND

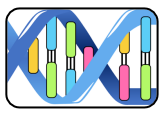
NOTES

Review the **STRUCTURE OF DNA** as we learned in section **A1.2 HL** with special emphasis on the directionality of the strands (5' and 3').

The mechanism of DNA replication as we know it is used by prokaryotes (eukaryotes use different enzymes)







REMINDER: After DNA replication, the strands will recoil back into a double helix!

3. **RNA PRIMASE** adds a **PRIMER** for **DNA POLYMERASE III** to bind to and start adding nucleotides.
4. **DNA POLYMERASE III** continuously synthesizes the new strand by catalyzing the addition of **DNA NUCLEOTIDES** in the 5' to 3' direction (added to the 3' end of the primer), it also removes mismatched nucleotides (proofreads).
5. **DNA POLYMERASE I** removes primers (made of RNA) and replaces them with DNA Nucleotides.

DNA Replication (HL)

Summary of Functions

Enzyme / Protein		Function
Helicase		Unwinds the DNA double helix at the replication forks.
DNA Primase		Synthesize RNA primer.
RNA Primer		A short RNA sequence which marks the beginning of the replication process. They are later replaced with DNA nucleotides by DNA polymerase I.
DNA Polymerase I		Removes RNA primer at the end of replication and replaces it with DNA nucleotides.
DNA Polymerase III		Synthesize the new strand by catalyzing the addition of nucleotides in the 5' to 3' direction. Also removes mismatched nucleotides.
DNA Ligase		Joins the ends of DNA segments and Okazaki fragments.
Single-stranded binding protein		Keeps bases from reforming hydrogen bonds between them after helicase action.

notes