

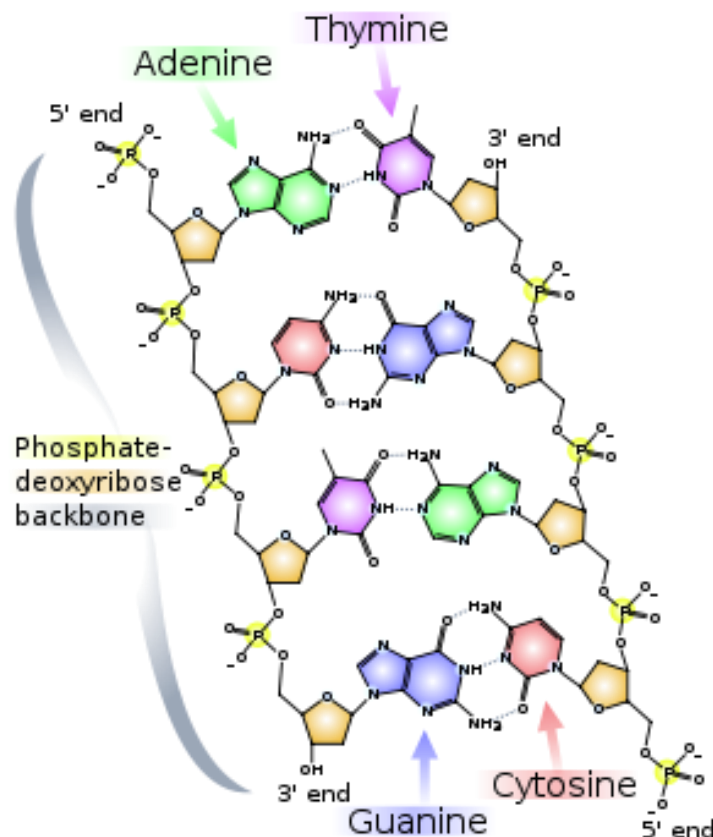
AS91156

Demonstrate understanding of life processes at the cellular level

Steps in DNA replication

NOTE:

- DNA replication is the copying of the DNA before the cell divides so that each generation receives a complete set of genetic information.
- DNA replication occurs during the S stage (synthesis stage) of the cell cycle.
- DNA replication is semi-conservative because one side of the final DNA molecule is made up of original DNA and one strand is new.
- DNA strands are anti-parallel: this means that the two sides of the DNA run in opposite directions. Head to Tail (3' to 5') and Tail to Head (5' to 3'). This anti-parallel nature is due to the numbering of the carbons in the sugar (see diagram below)



Steps in DNA replication.

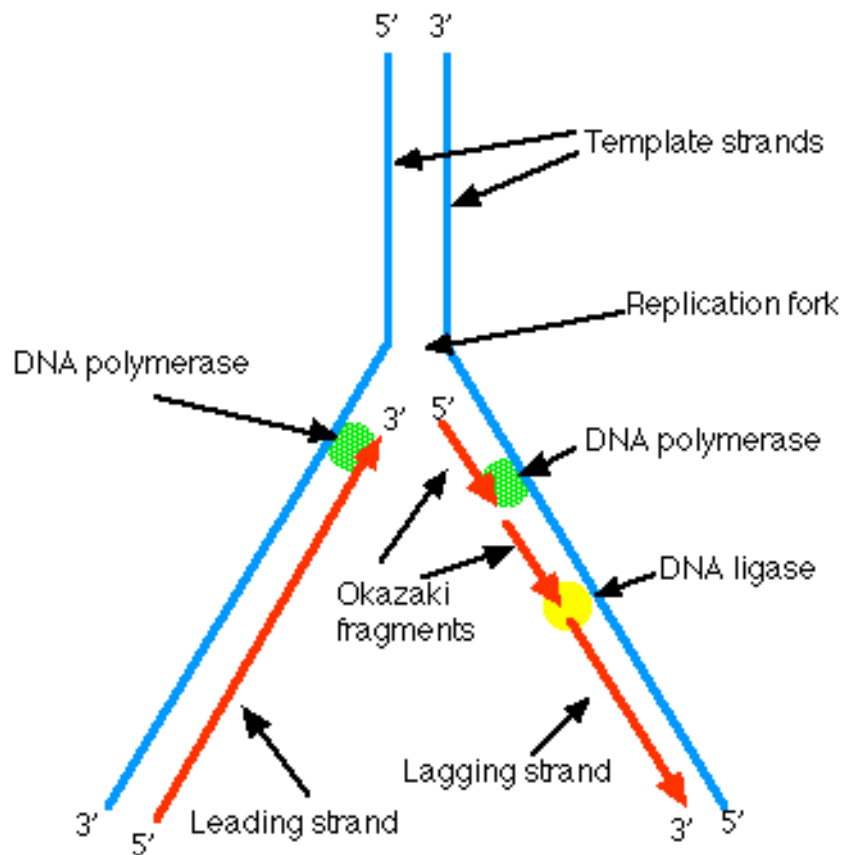
- DNA molecule is unzipped by the enzyme **helicase** breaking the hydrogen bonds between the complementary base pairs.
- Nucleotides from within the nucleus are used to produce the new strands of DNA.

Leading Strand:

- As the DNA is unzipped the enzyme **DNA polymerase III** adds new nucleotides (A bonds with T and C bonds with G) to the 3' end of the original strand producing a continuous strand.

Lagging strand:

- DNA polymerase can only add nucleotides to the 3' end of the original strand therefore DNA polymerase must work from the replication fork down the strand producing small fragments – Okazaki that are later joined together.



- As the DNA molecule unwinds a **RNA primer** is produced so the DNA polymerase can attach to the strand and copy.
- **DNA polymerase III** adds nucleotides using the complementary base pairing rule until it reaches a primer where it is released. The piece of DNA is now known as an Okazaki fragment.
- **DNA polymerases I** comes in and removes the primer and fills the gap with nucleotides, ready for **DNA ligase** to join the fragments together.
- This process continues until the whole strand of DNA has been copied.

Factors that effect DNA replication:

- Because this process is controlled by enzymes, any factor that affect enzymes will affect the rate-temperature, amount of nucleotides present (substrate), amount of enzymes present.
- Plants grow more in spring (cells divide more) because its warm with unlimited resources for all cell processes including DNA replication.
- Animals grow more at certain stages of their life cycle e.g. foetus.