

# DNA REPLICATION STUDY-GUIDE

## DNA REPLICATION

### 01 ENZYMES

Replication involves an assembly of enzymes, among which DNA polymerase is the most important. It is a polymerase, which means it can build a polymer out of monomers.

- DNA polymerase** (DNA pol) is the enzyme that builds the double helix by transferring nucleotides to the growing strand.
- DNA helicase** (DNA helicase) is the enzyme that unwinds the double helix by breaking hydrogen bonds between the base pairs.
- DNA primase** (DNA primase) is the enzyme that synthesizes a short RNA primer to which DNA pol can add nucleotides.
- DNA ligase** (DNA ligase) is the enzyme that joins the Okazaki fragments on the lagging strand.

**02 DIRECTIONALITY**

Because DNA polymerase (Pol) can only add nucleotides to the 3' end, the leading strand is synthesized continuously towards the replication fork. The lagging strand is synthesized discontinuously away from the fork as Okazaki fragments.

### 03 PROOFREADING

DNA polymerase (Pol) has a proofreading function. If it adds an incorrect nucleotide, it can remove it and replace it with the correct one. This ensures high fidelity of DNA replication.

### 04 NUCLEOTIDES

Nucleotides are the building blocks of DNA. Each nucleotide consists of a phosphate group, a deoxyribose sugar, and a nitrogenous base. The bases are adenine (A), thymine (T), guanine (G), and cytosine (C).

## DNA REPLICATION

### 02 DNA BASE SEQUENCE

The order of bases in a DNA molecule is its base sequence. Each triplet of bases (codon) corresponds to a specific amino acid sequence, determining the structure and function of proteins.

### 03 SEMI-CONSERVATIVE

When a cell divides, DNA replication occurs such that each new DNA molecule consists of one original strand and one newly synthesized strand. This is called semi-conservative replication.

### 05 KEY TERMS

**Nucleotide**: Basic unit of DNA, composed of a phosphate, deoxyribose sugar, and nitrogenous base.

**Complementary base pairing**: A base with T, A, and C bonds with G, C, and A respectively (A-T, C-G).

### 01 DNA STRUCTURE

DNA is a double-stranded molecule composed of nucleotides, each containing a phosphate group, a deoxyribose sugar, and a nitrogenous base.

The two strands run antiparallel (3' to 5' and 5' to 3') and are held together by hydrogen bonds between complementary base pairs (A-T, C-G). The sugar-phosphate backbone gives DNA structural stability and protects the genetic code stored in the base sequence.

**Double helix structure**

### 01 DNA STRUCTURE CONT.

**Complementary base pairing**

### 04 ENZYMES

Specialized enzymes help coordinate replication.

- Helicase**: Helicase unwinds the double helix, creating the replication fork.
- DNA polymerase**: DNA polymerase adds nucleotides to the growing strand, checking for errors as it goes.

Other enzymes support strand separation and reconnection of fragments. These proteins ensure that DNA replication is accurate and that the genome is faithfully duplicated.

**Semi-conservative replication**: Each new DNA molecule contains one original strand.

**Template strand**: The original DNA strand used to synthesize a complementary copy.

**Antiparallel**: Strands run in opposite directions (3' to 5' and 5' to 3').

**Helicase**: Unwinds DNA.

**DNA Polymerase**: Coordinates the formation of DNA by adding nucleotides.

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# 8dna Replication Study Guide

**Kenneth W. Raymond**



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