

DNA Replication Practice Worksheet

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Part 1: Building a Foundation

Which enzyme is responsible for unwinding the DNA double helix during replication?

Hint: Think about the enzyme that opens up the DNA strands.

- A) DNA Polymerase
- B) Helicase
- C) Ligase
- D) Primase

Which of the following statements about DNA replication are true? (Select all that apply)

Hint: Consider the characteristics of DNA replication.

- A) DNA replication is semi-conservative.
- B) DNA polymerase synthesizes DNA in the 3' to 5' direction.
- C) Okazaki fragments are formed on the leading strand.
- D) Primase synthesizes RNA primers.

Describe the role of DNA ligase in DNA replication.

Hint: Think about how DNA fragments are joined together.

List the three main stages of DNA replication and briefly describe each.

Hint: Consider the overall process of DNA replication.

1. What is the first stage?

2. What is the second stage?

3. What is the third stage?

Part 2: Comprehension and Interpretation

During DNA replication, what is the function of single-strand binding proteins (SSBs)?

Hint: Think about the role of SSBs in maintaining DNA structure.

- A) They synthesize RNA primers.
- B) They prevent the re-annealing of DNA strands.
- C) They join Okazaki fragments.
- D) They unwind the DNA helix.

Which enzymes have proofreading capabilities during DNA replication? (Select all that apply)

Hint: Consider which enzymes are involved in correcting errors.

- A) Helicase
- B) DNA Polymerase
- C) Ligase
- D) Primase

Explain why DNA replication is considered semi-conservative.

Hint: Think about how the new DNA strands are formed.

Part 3: Application and Analysis

If a mutation occurs in the gene encoding helicase, what is the most likely effect on DNA replication?

Hint: Consider the role of helicase in the replication process.

- A) RNA primers will not be synthesized.
- B) The DNA strands will not separate.
- C) Okazaki fragments will not be joined.
- D) DNA will be synthesized in the wrong direction.

In a laboratory setting, you are observing DNA replication. Which observations would indicate an issue with the lagging strand synthesis? (Select all that apply)

Hint: Think about the characteristics of lagging strand synthesis.

- A) Continuous synthesis without fragments.
- B) Accumulation of unjoined Okazaki fragments.
- C) Lack of RNA primers.
- D) Presence of single-strand binding proteins.

Predict the consequences of a malfunction in DNA ligase during replication.

Hint: Consider the role of ligase in joining DNA fragments.

Which of the following best describes the relationship between DNA polymerase and RNA primers?

Hint: Think about how DNA synthesis is initiated.

- A) DNA polymerase degrades RNA primers.
- B) DNA polymerase requires RNA primers to initiate synthesis.
- C) DNA polymerase synthesizes RNA primers.
- D) DNA polymerase is inhibited by RNA primers.

Part 4: Evaluation and Creation

Evaluate the following statement: "DNA replication can occur without the presence of primase." Is this statement true or false, and why?

Hint: Consider the role of primase in the replication process.

- A) True, because DNA polymerase can initiate synthesis independently.
- B) False, because primase is essential for synthesizing RNA primers.
- C) True, because ligase can substitute for primase.
- D) False, because helicase performs the function of primase.

Consider a scenario where a new drug inhibits DNA polymerase. What potential effects might this have on a rapidly dividing cancer cell? (Select all that apply)

Hint: Think about the role of DNA polymerase in cell division.

- A) Inhibition of DNA replication.
- B) Increased mutation rate.
- C) Cell cycle arrest.
- D) Enhanced DNA repair mechanisms.

Propose a hypothetical experiment to test the effect of a new chemical compound on the efficiency of DNA ligase during replication.

Hint: Consider how you would design an experiment to measure ligase activity.

