Worksheet DNA Replication

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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 enzymes involved in the initial steps of DNA replication.

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

Select all components that make up a nucleotide in DNA.

Hint: Consider the basic structure of DNA and its building blocks.

- ☐ A) Phosphate group
- ☐ B) Ribose sugar
- ☐ C) Deoxyribose sugar
- ☐ D) Nitrogen base

Explain the semi-conservative model of DNA replication.

Hint: Consider how the original DNA strands are used in the new DNA molecules.

List the four nitrogen bases found in DNA.

Hint: Think about the letters that represent the bases in DNA.

1. 1.

2. 2.

3. 3.

4. 4.

What is the role of DNA Polymerase in DNA replication?

Hint: Consider the functions of different enzymes during the replication process.

- ◯ A) Unwinds the DNA strands
- ◯ B) Synthesizes RNA primers
- ◯ C) Adds nucleotides to the growing DNA strand
- ◯ D) Joins Okazaki fragments

Part 2: Application and Analysis

If a mutation occurs in the gene coding for DNA Ligase, what is the most likely consequence during DNA replication?

Hint: Think about the function of DNA Ligase in the replication process.

- ◯ A) DNA strands will not unwind.
- ◯ B) Okazaki fragments will not be joined.
- ◯ C) RNA primers will not be synthesized.
- ◯ D) Nucleotides will not be added to the DNA strand.

How might errors in DNA replication be corrected?

Hint: Consider the mechanisms that ensure fidelity during DNA replication.

- ☐ A) By DNA Helicase unwinding the DNA
- ☐ B) By DNA Polymerase proofreading the DNA

- [ ] C) By DNA Ligase joining the DNA fragments
- [ ] D) By Primase synthesizing new RNA primers

Imagine a scenario where the replication fork is moving slower than usual. What could be a potential cause, and how might this affect DNA replication?

Hint: Consider factors that could influence the speed of the replication fork.

Which of the following best describes the relationship between the leading and lagging strands during DNA replication?

Hint: Think about how each strand is synthesized in relation to the replication fork.

- ◯ A) Both are synthesized continuously.
- ◯ B) Both are synthesized discontinuously.
- ◯ C) The leading strand is synthesized continuously, while the lagging strand is synthesized discontinuously.
- ◯ D) The leading strand is synthesized discontinuously, while the lagging strand is synthesized continuously.

Analyze the roles of enzymes in DNA replication. Which enzymes are directly involved in ensuring the accuracy of DNA replication?

Hint: Consider the functions of various enzymes during the replication process.

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

Discuss how the semi-conservative nature of DNA replication contributes to genetic stability.

Hint: Consider the implications of having one original strand in each new DNA molecule.

Part 3: Evaluation and Creation

Which scenario would most likely lead to a higher mutation rate during DNA replication?

Hint: Think about factors that could compromise the fidelity of DNA replication.

- ◯ A) Efficient proofreading by DNA Polymerase
- ◯ B) Lack of RNA primers
- ◯ C) Dysfunctional DNA Ligase
- ◯ D) Impaired DNA Polymerase proofreading ability

Evaluate the impact of environmental factors on DNA replication. Which factors could potentially lead to replication errors?

Hint: Consider how external conditions might affect the replication process.

- ☐ A) High radiation exposure
- ☐ B) Optimal temperature conditions
- ☐ C) Chemical mutagens
- ☐ D) Adequate nutrient supply

Propose a hypothetical experiment to test the effect of a new chemical compound on the rate of DNA replication. Describe the experimental setup and expected outcomes.

Hint: Consider how you would design an experiment to measure DNA replication rates.