Replicating DNA Worksheet Questions and Answers PDF

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Part 1: Building a Foundation

What is the primary function of DNA in living organisms?

Hint: Think about the role of DNA in heredity and traits.

- ◯ A) Energy storage
- ◯ **B) Genetic information storage ✓**
- ◯ C) Structural support
- ◯ D) Enzyme activity

> The primary function of DNA is to store genetic information.

Which of the following are components of a DNA nucleotide?

Hint: Consider the basic building blocks of DNA.

- ☐ **A) Phosphate group ✓**
- ☐ B) Ribose sugar
- ☐ **C) Nitrogenous base ✓**
- ☐ D) Amino acid

> A DNA nucleotide consists of a phosphate group, a sugar, and a nitrogenous base.

Describe the base pairing rules in DNA.

Hint: Think about how bases pair with each other.

In DNA, adenine pairs with thymine, and cytosine pairs with guanine.

List the four nitrogenous bases found in DNA.

Hint: Consider the letters that represent the bases.

1. 1st base

Adenine

2. 2nd base

Thymine

3. 3rd base

Cytosine

4. 4th base

Guanine

The four nitrogenous bases in DNA are adenine, thymine, cytosine, and guanine.

What type of bond holds the two strands of DNA together?

Hint: Consider the nature of the interactions between the strands.

- ◯ A) Ionic bond
- ◯ B) Covalent bond
- ◯ **C) Hydrogen bond ✓**
- ◯ D) Metallic bond

> The two strands of DNA are held together by hydrogen bonds.

Part 2: Comprehension and Application

What does it mean that DNA replication is semi-conservative?

Hint: Think about the strands in the new DNA molecules.

- ◯ A) Each new DNA molecule has two new strands.
- ◯ **B) Each new DNA molecule has one old and one new strand. ✓**
- ◯ C) DNA replication occurs only in one direction.
- ◯ D) DNA replication requires energy.

> Semi-conservative means that each new DNA molecule consists of one old strand and one new strand.

Which enzymes are directly involved in the process of DNA replication?

Hint: Consider the key players in the replication process.

- ☐ **A) Helicase ✓**
- ☐ **B) DNA Polymerase ✓**
- ☐ **C) Ligase ✓**
- ☐ D) Amylase

> Enzymes involved in DNA replication include helicase, DNA polymerase, and ligase.

Explain the role of DNA polymerase in DNA replication.

Hint: Think about how DNA polymerase contributes to strand synthesis.

DNA polymerase synthesizes new DNA strands by adding nucleotides complementary to the template strand.

If a DNA strand has the sequence 5'-ATCG-3', what would be the sequence of the complementary strand?

Hint: Consider the base pairing rules.

- ◯ **A) 5'-TAGC-3' ✓**
- ◯ B) 5'-CGAT-3'
- ◯ C) 5'-GCTA-3'
- ◯ D) 5'-ATCG-3'

The complementary strand would have the sequence 5'-TAGC-3'.

In a laboratory setting, which conditions are necessary for DNA replication to occur?

Hint: Consider the essential components for the replication process.

- ☐ **A) Presence of nucleotides ✓**
- ☐ **B) Presence of enzymes like helicase and DNA polymerase ✓**
- ☐ C) High temperature
- ☐ **D) Presence of a template strand ✓**

Necessary conditions for DNA replication include the presence of nucleotides, enzymes, and a template strand.

Part 3: Analysis, Evaluation, and Creation

Which part of the DNA replication process is most likely to be affected by a mutation in the helicase enzyme?

Hint: Think about the stages of DNA replication.

- ◯ **A) Initiation ✓**
- ◯ B) Elongation
- ◯ C) Termination
- ◯ D) Proofreading

> A mutation in helicase would most likely affect the initiation phase of DNA replication.

Analyze the potential effects of a malfunction in DNA ligase during replication.

Hint: Consider the role of ligase in DNA synthesis.

- ☐ **A) Okazaki fragments remain unjoined ✓**
- ☐ **B) Continuous synthesis on the leading strand is disrupted ✓**
- ☐ **C) Increased mutation rate ✓**
- ☐ D) DNA strands become tangled

> A malfunction in DNA ligase could lead to unjoined Okazaki fragments and increased mutation rates.

Compare and contrast the synthesis of the leading and lagging strands during DNA replication.

Hint: Think about the direction of synthesis and the nature of the strands.

> **The leading strand is synthesized continuously, while the lagging strand is synthesized in short fragments called Okazaki fragments.**

Which scenario would most likely lead to a successful DNA replication process?

Hint: Consider the importance of all components functioning properly.

- ◯ A) All enzymes function normally, but nucleotides are limited.
- ◯ B) Helicase is non-functional, but all other enzymes are present.
- ◯ C) DNA polymerase is absent, but helicase and ligase are functional.
- ◯ **D) All necessary enzymes and nucleotides are present and functional. ✓**

> The scenario with all necessary enzymes and nucleotides present and functional would lead to successful DNA replication.

Evaluate the following statements and identify which are true regarding DNA replication accuracy.

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

- [ ] **A) Proofreading by DNA polymerase reduces errors. ✓**
- [ ] B) Mismatch repair mechanisms are unnecessary.
- [ ] **C) Errors in replication can lead to beneficial mutations. ✓**
- [ ] **D) High fidelity is crucial for genetic stability. ✓**

> True statements include that proofreading by DNA polymerase reduces errors and that high fidelity is crucial for genetic stability.

Propose a hypothetical experiment to test the effect of a new chemical on the rate of DNA replication. Include your expected outcomes and controls.

Hint: Think about how you would design an experiment to measure replication rates.

> **An experiment could involve treating cells with the chemical and measuring replication rates using a labeled nucleotide.**