DNA REPLICATION AND DNA STORAGE PRACTICE TEST (SAMPLE)

STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

- Practice answering questions under realistic conditions,
- Improve accuracy and speed,
- Review explanations to strengthen weak areas, and
- Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

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How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 – 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

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Questions

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1. Which enzyme carries out primer removal in prokaryotic DNA replication via 5' to 3' exonuclease activity?

A. DNA polymerase II

B. DNA ligase

C. DNA polymerase I

D. DNA polymerase III

2. Which statement best describes prokaryotic origins of replication?

A. They typically have a single origin of replication with a defined sequence; eukaryotes have multiple origins with licensing and cell-cycle-regulated firing.

B. They require licensing factors like ORC and Cdc6.

C. They fire origins in S-phase via CDKs.

D. They use telomerase to extend ends.

3. Which domain of organisms uses multiple origins of replication?

A. Prokaryotes

B. Eukaryotes

C. Archaea

D. Bacteria

4. What ensures that the overall data integrity in DNA storage can be recovered even if some sequences are missing or severely damaged?

A. This is achieved by using address blocks.

B. This is achieved by using RNA primers.

C. This is achieved by using robust error-correcting codes such as Reed-Solomon codes.

D. This is achieved by increasing storage temperature.

5. Which DNA replication enzyme 'glues' two strands of DNA together?

A. Ligase

B. DNA polymerase

C. Primase

D. Helicase

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6. Which enzyme is responsible for unwinding the double helix at the replication fork on the leading strand?

A. Helicase

B. DNA polymerase

C. Ligase

D. Primase

7. What are fragments produced by DNA polymerase on the lagging strand?

A. Okazaki fragments

B. Replication bubbles

C. Primer fragments

D. Telomeres

8. During DNA replication, the leading strand is best described as which of the following?

A. Synthesized 5′ to 3′ toward the fork

B. Synthesized 3′ to 5′ away from the fork

C. Made in short fragments called Okazaki fragments

D. Requires RNA primers to start each fragment

9. What is the role of topoisomerases during replication?

A. They relieve superhelical tension and tangling ahead of the fork to prevent DNA breakage and enable fork progression.

B. They synthesize RNA primers.

C. They degrade RNA primers.

D. They ligate Okazaki fragments.

10. Which DNA polymerase purely functions in replication?

A. DNA polymerase I

B. DNA ligase

C. RNA polymerase

D. DNA polymerase III

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Answers

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1. C
2. A
3. B
4. D
5. A
6. A
7. A
8. A
9. A
10. D

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Explanations

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1. Which enzyme carries out primer removal in prokaryotic DNA replication via 5′ to 3′ exonuclease activity?

A. DNA polymerase II

B. DNA ligase

C. DNA polymerase I

D. DNA polymerase III

In prokaryotic DNA replication, RNA primers must be removed and replaced with DNA. The enzyme that handles this task uses 5′ to 3′ exonuclease activity to chew away the RNA primer from its 5′ end while its own polymerase activity fills in the resulting gap with DNA—this coordinated activity is nick translation. That combination is a hallmark of DNA polymerase I, so it's the enzyme responsible for primer removal in this context. After the primer is replaced, DNA ligase seals the remaining nick. The other enzymes play different roles: DNA polymerase III primarily does the bulk DNA synthesis but doesn't remove primers with 5′ to 3′ exonuclease activity; DNA polymerase II is mainly involved in repair; and DNA ligase by itself only seals nicks without primer removal.

2. Which statement best describes prokaryotic origins of replication?

A. They typically have a single origin of replication with a defined sequence; eukaryotes have multiple origins with licensing and cell-cycle-regulated firing.

B. They require licensing factors like ORC and Cdc6.

C. They fire origins in S-phase via CDKs.

D. They use telomerase to extend ends.

Prokaryotes typically start replication at one specific location on their circular chromosome, the origin of replication, which has a defined DNA sequence recognized by initiator proteins like DnaA. This single origin is sufficient for bidirectional replication around the circle. In contrast, eukaryotic chromosomes are linear and much larger, so they rely on many origins of replication. Those origins must be licensed once per cell cycle to prevent re-activation, involving factors such as ORC, Cdc6, and Cdt1 to load the helicase, and then firing is controlled by cell-cycle kinases like CDKs. Telomerase is involved in maintaining chromosome ends in linear chromosomes, not in initiating replication. So the statement that prokaryotes have a single, defined origin while eukaryotes have multiple, licensed origins best describes the difference.

3. Which domain of organisms uses multiple origins of replication?

A. Prokaryotes

B. Eukaryotes

C. Archaea

D. Bacteria

Multiple origins of replication are needed to copy large, linear genomes efficiently. In eukaryotes, each linear chromosome is equipped with many replication origins, and replication forks emanate from several origins and move in both directions. This setup allows the entire genome to be replicated within the S phase timeframe despite its size. Prokaryotes, which usually have single, circular chromosomes, typically use a single origin of replication, so replication starts at one point and proceeds around the circle. While archaea (also prokaryotes) can vary, the pattern most emphasized is that eukaryotes employ multiple origins. Therefore, the domain that uses multiple origins is eukaryotes.

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4. What ensures that the overall data integrity in DNA storage can be recovered even if some sequences are missing or severely damaged?

A. This is achieved by using address blocks.

B. This is achieved by using RNA primers.

C. This is achieved by using robust error-correcting codes such as Reed-Solomon codes.

D. This is achieved by increasing storage temperature.

Data integrity in DNA storage is preserved by adding redundancy across the data so that the original information can be recovered even if some sequences are lost or damaged. Robust error-correcting codes, like Reed-Solomon codes, are designed for this purpose. They treat data as symbols and append parity information, enabling the decoder to reconstruct the original data from the remaining symbols even when several sequences are erased or corrupted. The amount of recovery possible depends on how much redundancy is built in, but these codes are specifically chosen because they can correct multiple errors or missing pieces. Address blocks can help locate data but don't restore it on their own, RNA primers aren't used for data recovery, and increasing storage temperature would harm rather than help data integrity.

5. Which DNA replication enzyme 'glues' two strands of DNA together?

A. Ligase

B. DNA polymerase

C. Primase

D. Helicase

Sealing the backbone to join DNA fragments during replication is the job of DNA ligase. After DNA polymerase finishes extending each fragment, ligase catalyzes the formation of phosphodiester bonds that connect adjacent fragments on the lagging strand, effectively gluing the pieces into a continuous strand. This nick sealing is essential for creating a stable, intact DNA molecule. Other enzymes have different roles: DNA polymerase builds new DNA by adding nucleotides; primase lays down the RNA primer to start synthesis; helicase unwinds the double helix to open the replication fork.

6. Which enzyme is responsible for unwinding the double helix at the replication fork on the leading strand?

A. Helicase

B. DNA polymerase

C. Ligase

D. Primase

Unwinding the double helix at the replication fork is accomplished by helicase. Helicase binds at the fork and uses energy from ATP hydrolysis to break the hydrogen bonds between base pairs, separating the two DNA strands and creating single-stranded templates. This opening allows the leading strand to be copied continuously by DNA polymerase in the 5′ to 3′ direction toward the fork, with single-strand binding proteins stabilizing the exposed strands to prevent re-annealing. Primase makes the RNA primer needed to start synthesis, but it does not unwind the helix. DNA polymerase builds the new DNA, while ligase seals nicks after synthesis. So the enzyme responsible for unwinding is helicase.

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7. What are fragments produced by DNA polymerase on the lagging strand?

A. Okazaki fragments

B. Replication bubbles

C. Primer fragments

D. Telomeres

On the lagging strand, DNA polymerase makes DNA in short bursts because synthesis must proceed 5′ to 3′ even as the fork opens. The template runs 3′ to 5′ in the direction away from the fork, so a continuous chain isn't possible. Primase lays down RNA primers at intervals, and DNA polymerase extends from each primer to create short DNA pieces. Those pieces are called Okazaki fragments. Later, another enzyme, DNA ligase, joins the fragments to form a continuous strand. The other terms don't describe these transcription-like pieces produced during lagging-strand synthesis—replication bubbles are early regions where strands separate, primer fragments isn't a standard term, and telomeres are the chromosome ends.

8. During DNA replication, the leading strand is best described as which of the following?

A. Synthesized 5′ to 3′ toward the fork

B. Synthesized 3′ to 5′ away from the fork

C. Made in short fragments called Okazaki fragments

D. Requires RNA primers to start each fragment

The main idea here is that DNA polymerases add nucleotides only to the 3′ end, so new DNA grows in the 5′ to 3′ direction. At the replication fork, the template strand that runs 3′ to 5′ toward the fork allows continuous synthesis toward the fork, producing a leading strand. This continuous, forward synthesis in the 5′ to 3′ direction toward the fork is what makes the leading strand best described as such. In contrast, the lagging strand runs opposite, so it's made away from the fork in short Okazaki fragments, each needing a new RNA primer to start, which is why that description fits the lagging strand.

9. What is the role of topoisomerases during replication?

A. They relieve superhelical tension and tangling ahead of the fork to prevent DNA breakage and enable fork progression.

B. They synthesize RNA primers.

C. They degrade RNA primers.

D. They ligate Okazaki fragments.

As replication progresses, helicase unwinds the DNA, which creates positive supercoils ahead of the fork. Topoisomerases relieve this torsional strain by making transient cuts in one (Type I) or both (Type II) strands, letting the DNA rotate to relax the supercoils, then resealing the breaks. This prevents excessive twisting that could damage the DNA and would slow or halt fork movement, allowing the replication fork to continue advancing. In addition, these enzymes help decatenate newly synthesized daughter DNA molecules so they can separate properly after replication. This is why their role is described as relieving superhelical tension and preventing any entanglement that would block fork progression.

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10. Which DNA polymerase purely functions in replication?

A. DNA polymerase I

B. DNA ligase

C. RNA polymerase

D. DNA polymerase III

The enzyme that does the bulk of DNA synthesis during replication is DNA polymerase III. It is highly processive and works on both the leading and lagging strands by adding nucleotides in the 5′ to 3′ direction, staying tied to the template as replication unfolds. On the lagging strand, it makes short fragments that are later joined, while the RNA primers are eventually removed and replaced by another enzyme. DNA polymerase I also participates in replication, but its main role is primer removal and repair, not continuous synthesis, so it isn't the purely replication-focused polymerase. RNA polymerase copies RNA for transcription, not DNA, and DNA ligase seals nicks after synthesis rather than building new DNA. So DNA polymerase III is the one that purely functions in replication.

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Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at hello@examzify.com.

Or visit your dedicated course page for more study tools and resources:

https://dnareplicationdnastorage.examzify.com

We wish you the very best on your exam journey. You've got this!

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