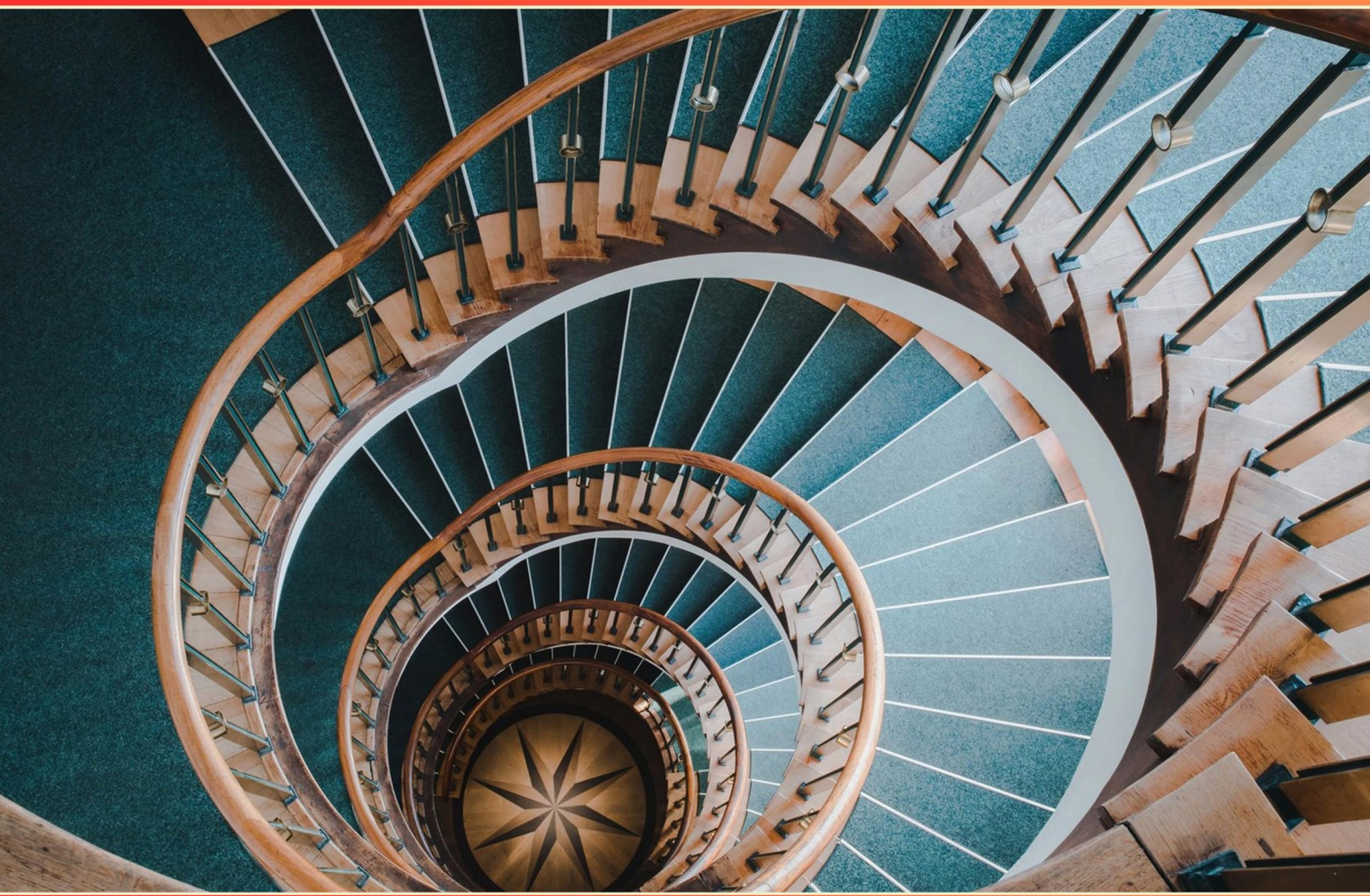
DNA AND BIOTECHNOLOGY PRACTICE TEST (SAMPLE)

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.

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!

Questions

1. What is the purpose of gel electrophoresis?

A. To separate DNA fragments by size.

B. To amplify DNA using heat.

C. To transcribe DNA into RNA.

D. To purify proteins.

2. Which statement best differentiates biotechnology from genetic engineering?

A. Biotechnology is the broader field that uses living organisms to modify products; genetic engineering is a specific technique that manipulates genetic material.

B. Genetic engineering is the broader field that uses living organisms to modify products; biotechnology is a specific technique that manipulates genetic material.

C. They are the same thing.

D. Biotechnology and genetic engineering are unrelated.

3. Which enzyme is required to transcribe from a T7 promoter in common bacterial expression strains?

A. T7 promoter works with E. coli RNA polymerase.

B. T7 RNA polymerase is required to transcribe from a T7 promoter.

C. T7 promoter can be transcribed by any bacterial RNA polymerase.

D. T7 promoter acts as a replication origin.

4. AZT is an example of which class of compounds used to terminate DNA synthesis?

A. A nucleoside analog that terminates DNA synthesis.

B. A transcription inhibitor that blocks RNA polymerase.

C. A DNA methyltransferase.

D. A ligase enzyme used in cloning.

5. Which term describes DNA produced by combining DNA from different sources?

A. GMO

B. Recombinant DNA

C. Plasmid

D. Vector

6. Which statement best describes the role of DNA in a cell?

A. DNA contains the instructions for, and controls, the production of proteins

B. DNA stores energy for metabolic reactions

C. DNA acts as enzymes in metabolic pathways

D. DNA is the primary component of cell membranes

7. Plasmid copy number mainly affects which aspect in bacterial expression systems?

A. The DNA sequence of the plasmid.

B. The host range of the plasmid.

C. Expression level of carried genes and metabolic burden.

D. The antibiotic resistance profile.

8. Which enzyme synthesizes a new DNA strand by adding nucleotides to the template during replication?

A. Ligase

B. DNA polymerase

C. Helicase

D. Topoisomerase

9. Which epigenetic modification is commonly associated with gene activation in eukaryotes?

A. Histone acetylation.

B. DNA methylation.

C. Histone deacetylation.

D. RNA methylation.

10. Which RNA processing steps occur in eukaryotes after transcription?

A. 5′ capping, 3′ polyadenylation, and splicing to remove introns.

B. tRNA charging.

C. DNA replication.

D. Protein glycosylation.

Answers

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

Explanations

1. What is the purpose of gel electrophoresis?

A. To separate DNA fragments by size.

B. To amplify DNA using heat.

C. To transcribe DNA into RNA.

D. To purify proteins.

Gel electrophoresis separates DNA fragments by size as they migrate through a gel under an electric field. DNA carries a negative charge, so when current is applied, fragments move toward the positive electrode. The gel's porous matrix acts like a sieve, slowing larger fragments more than smaller ones, so fragments separate by length and appear as bands. By comparing to a ladder of known sizes, you can estimate the length of each piece. After running, the gel is stained to visualize the DNA bands under UV or blue-light illumination. This technique is routinely used to check PCR products, analyze restriction digests, and isolate specific fragments by excising the bands. The other options describe PCR amplification, transcription, and protein purification, which are not the goals of gel electrophoresis.

2. Which statement best differentiates biotechnology from genetic engineering?

A. Biotechnology is the broader field that uses living organisms to modify products; genetic engineering is a specific technique that manipulates genetic material.

B. Genetic engineering is the broader field that uses living organisms to modify products; biotechnology is a specific technique that manipulates genetic material.

C. They are the same thing.

D. Biotechnology and genetic engineering are unrelated.

Biotechnology is the broad field that uses living organisms or their systems to modify products, processes, or technologies. Within that broad field, genetic engineering is a specific technique that directly manipulates genetic material—DNA sequences—to achieve a desired trait or outcome. Because biotechnology covers many approaches beyond gene manipulation, while genetic engineering focuses specifically on altering genes, the statement correctly identifies biotechnology as the wider discipline and genetic engineering as the particular method within it. For example, producing insulin in bacteria using recombinant DNA is an instance of genetic engineering, whereas processes like fermentation to make cheese or yogurt illustrate biotechnology in action without necessarily involving gene editing. This relationship—biotechnology as the broad field and genetic engineering as a targeted genetic manipulation technique—best captures their distinction.

3. Which enzyme is required to transcribe from a T7 promoter in common bacterial expression strains?

A. T7 promoter works with E. coli RNA polymerase.

B. T7 RNA polymerase is required to transcribe from a T7 promoter.

C. T7 promoter can be transcribed by any bacterial RNA polymerase.

D. T7 promoter acts as a replication origin.

The key idea is that transcription from a T7 promoter requires a specific enzyme: T7 RNA polymerase. This promoter is tailored for the phage enzyme and is not efficiently recognized by the host's RNA polymerase. In common bacterial expression strains, you provide T7 RNA polymerase (often from a DE3 lysogen or a plasmid under an inducible promoter) so that, when you induce, the T7 RNAP binds the promoter and drives strong transcription of the downstream gene. Without T7 RNA polymerase, the host RNA polymerase won't initiate well at the T7 promoter, so expression would be very low or absent. The T7 promoter isn't a replication origin, so it doesn't drive DNA replication.

4. AZT is an example of which class of compounds used to terminate DNA synthesis?

A. A nucleoside analog that terminates DNA synthesis.

B. A transcription inhibitor that blocks RNA polymerase.

C. A DNA methyltransferase.

D. A ligase enzyme used in cloning.

AZT works because it's a nucleoside analog designed to halt DNA synthesis. It looks enough like thymidine to be used by viral reverse transcriptase, but after it's converted inside the cell to its triphosphate form, it's incorporated into the growing DNA strand. The crucial detail is that it has a 3′ position missing a hydroxyl group, so once AZT is added, there's no 3′-OH available to form the next phosphodiester bond. That stops the chain from extending, effectively terminating DNA synthesis. This is different from blocking transcription, which would stop RNA polymerase from making RNA rather than stopping DNA chain elongation. It's also not a DNA methyltransferase or a ligase enzyme, which have distinct roles in modifying DNA bases and sealing nicks or joining fragments, respectively. So AZT is best described as a nucleoside analog that terminates DNA synthesis.

5. Which term describes DNA produced by combining DNA from different sources?

A. GMO

B. Recombinant DNA

C. Plasmid

D. Vector

DNA produced by combining sequences from different sources is called recombinant DNA. This happens when fragments from two or more organisms are joined to form a single molecule that contains genetic material from distinct origins. Enzymes like restriction endonucleases cut the DNA, and DNA ligase seals the pieces together, creating a construct that can be propagated in a host cell. Often researchers insert recombinant DNA into a vector, such as a plasmid, to transfer it into bacteria or other cells for expression. A GMO refers to the organism that carries recombinant DNA, not the DNA molecule itself. A plasmid is a small circular DNA molecule used as a carrier, and a vector is the DNA that carries foreign DNA into a host cell—plasmids are a common type of vector. Thus, recombinant DNA is the correct description of the DNA produced by combining DNA from different sources.

6. Which statement best describes the role of DNA in a cell?

A. DNA contains the instructions for, and controls, the production of proteins

B. DNA stores energy for metabolic reactions

C. DNA acts as enzymes in metabolic pathways

D. DNA is the primary component of cell membranes

Genetic information stored in DNA is used to make proteins, and this control of protein production drives most cellular activities. The sequence of nucleotides in genes provides the template for transcription into messenger RNA, which is then translated by ribosomes into specific proteins. These proteins carry out the vast majority of cellular functions, from catalyzing reactions as enzymes to forming structures and regulating processes. Because DNA sets which proteins are produced and in what amounts, it effectively directs cellular behavior and traits. DNA does not store metabolic energy (that role belongs to molecules like ATP), nor does it act as enzymes, and it is not a primary component of cell membranes.

7. Plasmid copy number mainly affects which aspect in bacterial expression systems?

A. The DNA sequence of the plasmid.

B. The host range of the plasmid.

C. Expression level of carried genes and metabolic burden.

D. The antibiotic resistance profile.

Copy number sets how many copies of the plasmid exist inside each bacterial cell, so it directly controls gene dosage. More copies mean more templates for transcription, producing higher levels of the protein encoded by the carried gene. But that boost in expression comes with a cost: maintaining and replicating many plasmid copies uses additional cellular resources, which increases metabolic burden. The cell may grow more slowly or experience stress if the demand becomes too high. This is the trade-off designers navigate when choosing plasmids for expression—high copy gives strong expression but higher burden, while low copy reduces both expression and burden but can improve stability and growth. The DNA sequence, the host range, and the presence of the resistance gene don't fundamentally change with copy number; they're determined by the plasmid's origin and gene content, with copy number mainly altering how much of the carried gene is expressed and how much burden the cell bears.

8. Which enzyme synthesizes a new DNA strand by adding nucleotides to the template during replication?

A. Ligase

B. DNA polymerase

C. Helicase

D. Topoisomerase

DNA replication relies on an enzyme that builds a new strand by adding nucleotides that pair with the template strand. DNA polymerase is the enzyme that does this synthesis. It adds nucleotides to the growing 3′ end of the new strand, extending in the 5′ to 3′ direction and using the template strand to guide correct base pairing. Many DNA polymerases also have proofreading activity to correct mistakes. A primer is needed to start synthesis, provided by primase as a short RNA sequence. Other enzymes have different roles: helicase unwinds the double helix, topoisomerase relieves torsional strain ahead of the fork, and ligase seals gaps between Okazaki fragments on the lagging strand.

9. Which epigenetic modification is commonly associated with gene activation in eukaryotes?

A. Histone acetylation.

B. DNA methylation.

C. Histone deacetylation.

D. RNA methylation.

Histone acetylation is the modification most consistently linked to activating gene expression in eukaryotes. When acetyl groups are added to lysine residues on histone tails by histone acetyltransferases, the positive charges on histones are neutralized. This weakens histone-DNA interactions, loosening the nucleosome structure and creating a more open chromatin state (euchromatin). With chromatin loosened, transcription factors and RNA polymerase can access the DNA more easily, promoting transcription. By contrast, DNA methylation at promoters is typically associated with gene silencing, histone deacetylation tightens chromatin and represses transcription, and RNA methylation mainly influences RNA processing and stability rather than directly activating transcription from the DNA. So, histone acetylation stands out as the key modification that promotes gene activation.

10. Which RNA processing steps occur in eukaryotes after transcription?

A. 5′ capping, 3′ polyadenylation, and splicing to remove introns.

B. tRNA charging.

C. DNA replication.

D. Protein glycosylation.

RNA maturation in eukaryotes requires processing of the nascent transcript into a functional mRNA. The essential steps are adding a 5′ cap early in processing, splicing out introns and joining exons, and adding a 3′ poly(A) tail. The 5′ cap helps protect the transcript and guides ribosome binding; splicing removes noncoding regions and allows different exon combinations (including alternative splicing) to generate diverse proteins; the poly(A) tail increases stability, aids export from the nucleus, and enhances translation. In contrast, tRNA charging is part of tRNA aminoacylation during translation, DNA replication is genome duplication, and protein glycosylation is a post-translational modification after protein synthesis. Therefore, the processing steps that occur after transcription are 5′ capping, splicing, and 3′ polyadenylation.

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://dnabiotechnology.examzify.com

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