Texas A&M University (TAMU) BIOL111 Introductory Biology I Exam 3 Practice Exam (Sample)

Study Guide

BY EXAMZIFY

Everything you need from our exam experts!

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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. Which type of replication allows part of the parent DNA strand to be included in each new helix?

A. Conservative replication

B. Semi-conservative replication

C. Dispersive replication

D. Continuous replication

2. How many hydrogen bonds are formed between adenine and thymine in DNA?

A. 1

B. 2

C. 3

D. 4

3. What experiment did Frederick Griffith conduct to discover transformation?

A. Injecting mice with live S cells

B. Injecting mice with heat-killed R cells

C. Injecting mice with heat-killed S cells with living R cells

D. Injecting mice with DNA alone

4. Why do eukaryotic chromosomes experience shortening during replication?

A. Due to the linear nature of chromosomes

B. Because RNA primers cannot be replaced with DNA

C. Because they are subjected to rigid structure

D. Due to lack of telomeres

5. Which process is directly involved in cell division in prokaryotes?

A. Mitosis

B. Meiosis

C. Binary fission

D. Cloning

6. What describes the general purpose of RNA splicing?

- **A. To enhance the stability of RNA**
- **B. To create mature mRNA from the primary transcript**
- **C. To increase the size of mRNA strands**
- **D. To assist in protein degradation**

7. Which process relies on the solar energy captured by chlorophyll?

- **A. Cellular respiration**
- **B. Fermentation**
- **C. Photosynthesis**
- **D. Protein synthesis**

8. Translation occurs on which cellular structures?

- **A. Nuclei**
- **B. Mitochondria**
- **C. Ribosomes**
- **D. Endoplasmic reticulum**

9. What are stem cells primarily characterized by?

- **A. Ability to photosynthesize**
- **B. Ability to differentiate into various cell types**
- **C. Ability to produce oxygen**
- **D. Ability to replicate DNA**

10. What does the 5' end of a DNA strand contain?

- **A. A hydroxyl group on the 5th carbon**
- **B. A phosphate group on the 5th carbon**
- **C. A nitrogenous base**
- **D. The start of replication**

Answers

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

Explanations

1. Which type of replication allows part of the parent DNA strand to be included in each new helix?

A. Conservative replication

B. Semi-conservative replication

C. Dispersive replication

D. Continuous replication

Semi-conservative replication is a key concept in DNA replication that ensures each new double helix retains one strand from the original parent DNA molecule. During this process, the two strands of the double helix are separated, and each serves as a template for the synthesis of a new complementary strand. As a result, each of the two resulting DNA molecules consists of one parent strand and one newly synthesized strand. This mechanism is crucial for maintaining genetic fidelity, as it allows for accurate copying of the genetic information. By incorporating one original strand, the newly formed DNA helixes can preserve the sequence of nucleotides, while the new strand is synthesized based on the template of the parent strand. In contrast, conservative replication would result in one molecule containing both original strands and another molecule with both new strands, which does not align with the actual biological process. Dispersive replication suggests that parental DNA is broken up and mixed with new DNA, which is not how DNA replication occurs. Continuous replication does not accurately describe the discrete nature of the replication process. Thus, semi-conservative replication is the correct mechanism that underlines how genetic information is accurately passed on during cell division.

2. How many hydrogen bonds are formed between adenine and thymine in DNA?

A. 1

B. 2

C. 3

D. 4

Adenine and thymine are two of the four nucleotide bases found in DNA. They pair with each other through hydrogen bonds, which are crucial for the stability of the DNA double helix structure. Specifically, adenine forms two hydrogen bonds with thymine. This pairing is essential for the complementary base pairing principle, which is fundamental to DNA structure and function. The presence of two hydrogen bonds is important because it helps ensure the fidelity of DNA replication and transcription processes. Additionally, this type of base pairing contributes to the overall stability of the DNA molecule while allowing for the necessary flexibility in the double helix structure. In contrast, guanine pairs with cytosine through three hydrogen bonds, making the adenine-thymine pairing less stable than the guanine-cytosine pairing. Understanding the specific number of hydrogen bonds between these bases is vital for comprehending DNA structure, stability, and the mechanisms of genetic information storage and transmission.

3. What experiment did Frederick Griffith conduct to discover transformation?

A. Injecting mice with live S cells

B. Injecting mice with heat-killed R cells

C. Injecting mice with heat-killed S cells with living R cells

D. Injecting mice with DNA alone

Frederick Griffith's experiment aimed to investigate the phenomenon of transformation, where genetic material from one organism could be taken up by another organism, leading to a change in its phenotype. In his pivotal study, he used two strains of the bacterium Streptococcus pneumoniae: the virulent S strain (which has a smooth capsule and causes disease) and the non-virulent R strain (which has a rough appearance and does not cause disease). By injecting mice with heat-killed S cells alongside living R cells, Griffith discovered that the R cells were transformed into virulent S cells. This unexpected outcome demonstrated that some "transforming principle" from the heat-killed S cells was taken up by the living R cells, leading to their transformation into a pathogenic form. This experiment provided foundational evidence for the understanding of genetic material and paved the way for later discoveries regarding DNA. The correct selection illustrates how Griffith was able to prove the transfer of genetic information between the two strains under specific experimental conditions, highlighting the significance of transformation in microbiology and genetics.

4. Why do eukaryotic chromosomes experience shortening during replication?

A. Due to the linear nature of chromosomes

B. Because RNA primers cannot be replaced with DNA

C. Because they are subjected to rigid structure

D. Due to lack of telomeres

Eukaryotic chromosomes experience shortening during replication primarily because of the challenges associated with the linear nature of chromosomes and the way DNA replication occurs. Specifically, when DNA is replicated, the replication machinery cannot fully replicate the very ends of linear chromosomes. This is largely due to the presence of RNA primers at the beginning of the replication process. During DNA replication, an RNA primer is synthesized to provide a starting point for DNA polymerase, which then extends the new DNA strand. When the primer at the end of the chromosome is removed, there is no way for DNA polymerase to fill in the gap left at the end of the chromosome because there is no upstream 3' hydroxyl group available for polymerase to extend from. As a result, with each round of replication, a small segment of the chromosome is lost, leading to progressive shortening. Moreover, telomeres, repetitive nucleotide sequences at the ends of linear chromosomes, are crucial in addressing this issue by protecting the ends from degradation and providing some buffer to accommodate this shortening. However, they do not prevent the overall shortening completely. The inability to replace the RNA primer with DNA at the terminal ends is therefore a key factor in the observed shortening of chromosomes during replication. This understanding clarifies why

5. Which process is directly involved in cell division in prokaryotes?

A. Mitosis

B. Meiosis

C. Binary fission

D. Cloning

The process that is directly involved in cell division in prokaryotes is binary fission. This method of asexual reproduction allows a single prokaryotic cell to divide into two genetically identical daughter cells. During binary fission, the prokaryotic cell's circular DNA is replicated, and the cell grows in size until it eventually splits into two, with each daughter cell receiving one copy of the DNA. This process is crucial for the reproduction and population growth of prokaryotic organisms such as bacteria. In contrast, mitosis and meiosis are processes associated with cell division in eukaryotic cells. Mitosis leads to the formation of two identical diploid cells, whereas meiosis results in four genetically varied haploid cells, typically involved in sexual reproduction. Cloning refers to creating a genetically identical copy of an organism or cell but does not describe the basic process of cell division itself. Hence, binary fission is the correct process to identify for prokaryotic cell division.

6. What describes the general purpose of RNA splicing?

A. To enhance the stability of RNA

B. To create mature mRNA from the primary transcript

C. To increase the size of mRNA strands

D. To assist in protein degradation

The general purpose of RNA splicing is to create mature mRNA from the primary transcript. During this process, introns, which are non-coding sequences, are removed from the pre-mRNA transcript, and the remaining exons, which are coding sequences, are joined together. This modification is essential for the proper expression of genes, as it ensures that only the necessary coding information is retained for translation into proteins. Mature mRNA is then transported from the nucleus to the cytoplasm, where it serves as a template for protein synthesis. The splicing process also plays a critical role in the regulation of gene expression and the diversity of proteins, as alternative splicing can generate different mRNA variants from a single gene, potentially leading to different protein isoforms.

7. Which process relies on the solar energy captured by chlorophyll?

A. Cellular respiration

B. Fermentation

C. Photosynthesis

D. Protein synthesis

Photosynthesis is the process that relies on solar energy captured by chlorophyll, which is a green pigment found in the chloroplasts of plant cells. During photosynthesis, chlorophyll absorbs light energy, primarily from the sun, and uses it to convert carbon dioxide and water into glucose and oxygen. This process is crucial for plants as it not only provides them with the energy needed for growth and development but also produces oxygen, which is essential for the survival of most life forms on Earth. Cellular respiration and fermentation are processes related to energy production but do not utilize solar energy directly; instead, they break down glucose and other organic molecules to release energy. Protein synthesis involves the formation of proteins from amino acids, which is separate from energy capture and usage. Thus, photosynthesis is uniquely identified by its dependence on solar energy through chlorophyll.

8. Translation occurs on which cellular structures?

A. Nuclei

B. Mitochondria

C. Ribosomes

D. Endoplasmic reticulum

Translation is the process by which messenger RNA (mRNA) is decoded to produce a specific polypeptide or protein. This critical process occurs at ribosomes, which are the cellular structures responsible for synthesizing proteins. Ribosomes can either be found freely floating in the cytoplasm or bound to the endoplasmic reticulum, creating what is known as rough endoplasmic reticulum. During translation, ribosomes facilitate the assembly of amino acids based on the sequence of codons in the mRNA, using transfer RNA (tRNA) to bring the appropriate amino acids in line with the mRNA sequence. The ribosome moves along the mRNA, reading the code and catalyzing the formation of peptide bonds between amino acids, ultimately leading to the formation of functional proteins that are vital for various cellular functions. While the endoplasmic reticulum is involved in the process of protein synthesis (particularly when considering post-translational modifications and protein folding), the actual translation phase occurs at the ribosomes themselves. Therefore, ribosomes are the primary site of translation, making it the correct answer to the question.

9. What are stem cells primarily characterized by?

A. Ability to photosynthesize

B. Ability to differentiate into various cell types

C. Ability to produce oxygen

D. Ability to replicate DNA

Stem cells are primarily characterized by their ability to differentiate into various cell types. This unique property allows stem cells to give rise to specialized cells that perform specific functions in the body, such as muscle cells, nerve cells, and blood cells. Stem cells play a crucial role in development, tissue repair, and regeneration. Their capacity for differentiation is essential in both embryonic development, where they contribute to forming all different types of tissues, and in adult organisms, where they help maintain and repair damaged tissues. The other options are not relevant to the defining characteristics of stem cells. Photosynthesis is a process carried out by plants and certain microorganisms, not a feature of stem cells. The production of oxygen is also associated with photosynthetic organisms. While replicating DNA is a common function of all cells, including stem cells, it does not specifically define them as stem cells. The hallmark feature that distinguishes stem cells is indeed their potential to differentiate and form the diverse cell types that make up an organism.

10. What does the 5' end of a DNA strand contain?

A. A hydroxyl group on the 5th carbon

B. A phosphate group on the 5th carbon

C. A nitrogenous base

D. The start of replication

The 5' end of a DNA strand contains a phosphate group attached to the fifth carbon of the sugar molecule in the DNA backbone. In a DNA nucleotide, the sugar (deoxyribose) has a phosphate group attached to the 5' carbon, which is essential for the formation of the DNA chain. This phosphate group is key for creating the phosphodiester bonds that link one nucleotide to another, allowing for the growth of the DNA strand during replication and transcription. In summary, the presence of the phosphate group at the 5' end is critical for the structural integrity of DNA as it establishes the directionality of the DNA molecule, indicating the start of the strand. The nature of the structure at the 5' end is foundational for understanding how DNA molecules are synthesized and interact with other molecules, such as during various cellular processes.

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://tamu-biol111exam3.examzify.com

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