

AAMC BIOLOGICAL AND BIOCHEMICAL FOUNDATIONS OF LIVING SYSTEMS (BB) FULL-LENGTH (FL) 4 PRACTICE TEST (SAMPLE) STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

**VISIT US ONLINE FOR
THE FULL VERSION STUDY GUIDE**

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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

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- 1. What is the probability of a child having cystic fibrosis from a woman with the disorder and a heterozygous asymptomatic man?**
 - A. 25%
 - B. 50%
 - C. 75%
 - D. 100%

- 2. Which compound is most likely to mimic the effects of exercise in undifferentiated muscle cells?**
 - A. An MYOD1-specific microRNA
 - B. An activator of NOS expression
 - C. A repressor of Cdkn1a expression
 - D. An antagonist of TNF- α signaling

- 3. Which statement is true regarding the inactive X chromosome in female mammals?**
 - A. It does not undergo replication.
 - B. It possesses a less condensed chromatin structure compared to the active X chromosome.
 - C. It's among the last chromosomes to replicate.
 - D. It is actively transcribed.

- 4. What would be the effect on fatty acid oxidation in an Acc2-/-/Cpt1-/- double knockout mouse?**
 - A. Increased triglyceride synthesis
 - B. Increased insulin secretion
 - C. Decreased fatty acid oxidation
 - D. Increased malonyl-CoA production

- 5. What is the main function of chloroplasts in plant cells?**
 - A. Photosynthesis to produce glucose.
 - B. Cellular respiration for energy production.
 - C. Storage of genetic material.
 - D. Production of proteins for cellular function.

- 6. What does an increase in plasma lactic acid indicate during exercise?**
- A. Decreased oxygen demand
 - B. Increased metabolic activity in muscles
 - C. Increased oxygen affinity of hemoglobin
 - D. Decreased glycolysis rate
- 7. What is the role of reverse transcriptase in HIV?**
- A. Converts RNA to protein
 - B. Converts DNA to RNA
 - C. Converts RNA to DNA
 - D. Converts protein to RNA
- 8. The digestion of which macromolecule is not stimulated by the action of peptidases?**
- A. Proteins
 - B. Carbohydrates
 - C. Nucleic acids
 - D. Lipids
- 9. Which of the following best describes the role of cytokines in the immune response?**
- A. They are antibodies that neutralize pathogens
 - B. They promote the production of new immune cells
 - C. They act as signaling molecules between cells
 - D. They directly kill pathogens
- 10. How do pathogens evade the immune response?**
- A. By replicating only in outside environments.
 - B. By producing enzymes that enhance immune responses.
 - C. By altering surface proteins and producing toxins.
 - D. By increasing the number of immune cells.

Answers

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

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Explanations

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1. What is the probability of a child having cystic fibrosis from a woman with the disorder and a heterozygous asymptomatic man?

- A. 25%
- B. 50%**
- C. 75%
- D. 100%

To determine the probability of a child having cystic fibrosis from a woman with the disorder and a heterozygous asymptomatic man, we have to consider how cystic fibrosis is inherited. Cystic fibrosis is an autosomal recessive disorder, which means that a person must inherit two copies of the faulty gene (one from each parent) to express the disease. In this scenario, the woman has cystic fibrosis, meaning her genotype is homozygous recessive (ff). The heterozygous asymptomatic man has one normal allele and one cystic fibrosis allele (Ff). When we create a Punnett square for these two individuals, we will evaluate the possible genotypes of their offspring. The possible combinations from the parent's genotypes are as follows: - The woman can only contribute an f (cystic fibrosis allele). - The man can contribute either F (normal allele) or f (cystic fibrosis allele). This leads to the following genotype combinations for their children: 1. Ff (normal carrier) 2. ff (cystic fibrosis). From this, we can see there are two possible genotypes for the children: 50% will be carriers of the cystic fibrosis allele (Ff) and

2. Which compound is most likely to mimic the effects of exercise in undifferentiated muscle cells?

- A. An MYOD1-specific microRNA
- B. An activator of NOS expression
- C. A repressor of Cdkn1a expression
- D. An antagonist of TNF- α signaling**

To understand why an antagonist of TNF- α signaling is likely to mimic the effects of exercise in undifferentiated muscle cells, it is essential to consider the physiological effects of exercise on muscle tissue and the role of inflammation. During exercise, there is an increase in muscle contraction, which stimulates various signaling pathways that promote muscle growth and differentiation. Exercise is known to enhance muscle hypertrophy and stimulate the expression of growth factors and cytokines that facilitate these processes. One of the key players in the inflammatory response is TNF- α (tumor necrosis factor-alpha), which can inhibit muscle regeneration and promote muscle wasting when chronically elevated. In the context of undifferentiated muscle cells, the presence of TNF- α could act as a barrier to their differentiation and functional enhancement. By using an antagonist of TNF- α signaling, the inhibitory effects of this cytokine can be mitigated, allowing for a more favorable environment that promotes muscle cell growth and differentiation, mimicking the beneficial effects of exercise. The other options, though relevant to different cellular processes, do not directly replicate the complex signaling cascades and metabolic changes initiated by exercise in muscle cells as effectively as antagonizing TNF- α . For instance, MYOD1-targeted

3. Which statement is true regarding the inactive X chromosome in female mammals?

- A. It does not undergo replication.
- B. It possesses a less condensed chromatin structure compared to the active X chromosome.
- C. It's among the last chromosomes to replicate.**
- D. It is actively transcribed.

The correct statement regarding the inactive X chromosome in female mammals is that it is among the last chromosomes to replicate. In female mammals, one of the two X chromosomes is randomly inactivated during early embryonic development, a process known as X-inactivation. This inactivated X chromosome undergoes extensive modifications that lead to its transformation into a Barr body, rendering it largely transcriptionally silent. This inactivation has several consequences for the replication timing of the chromosome. The inactive X chromosome is generally held in a more condensed state, which makes it less accessible for replication at the same time as its active counterpart. As a result, it replicates later in the S phase of the cell cycle compared to the active X chromosome, typically falling among the last regions of the genome to be replicated. Understanding this concept highlights the regulatory mechanisms in gene expression and replication associated with X-inactivation, showcasing the differences in cellular processes regarding active and inactive chromatin.

4. What would be the effect on fatty acid oxidation in an *Acc2*^{-/-}/*Cpt1*^{-/-} double knockout mouse?

- A. Increased triglyceride synthesis
- B. Increased insulin secretion
- C. Decreased fatty acid oxidation**
- D. Increased malonyl-CoA production

*The correct answer indicates a decrease in fatty acid oxidation in an *Acc2*^{-/-}/*Cpt1*^{-/-} double knockout mouse. To understand this, it's important to consider the roles of two enzymes affected by the knockouts: Acetyl-CoA carboxylase (ACC2) and Carnitine palmitoyltransferase 1 (CPT1). ACC2 is crucial for regulating fatty acid metabolism, as it converts Acetyl-CoA to malonyl-CoA. Malonyl-CoA is a key intermediate in fatty acid synthesis and, importantly, it inhibits CPT1. CPT1 is responsible for transporting long-chain fatty acids into the mitochondria for beta-oxidation, where they are broken down for energy production. In a scenario with the double knockout of both ACC2 and CPT1, the inhibition of fatty acid oxidation occurs due to the lack of CPT1 functioning. Consequently, fatty acids are unable to enter the mitochondria effectively, directly leading to decreased fatty acid oxidation despite the potential accumulation of fatty acids in the cytosol. Thus, the knockout of ACC2 eliminates the production of malonyl-CoA that inhibits CPT1, but the absence of CPT1 prevents the transportation and subsequent*

5. What is the main function of chloroplasts in plant cells?

- A. Photosynthesis to produce glucose.**
- B. Cellular respiration for energy production.
- C. Storage of genetic material.
- D. Production of proteins for cellular function.

The primary role of chloroplasts in plant cells is photosynthesis, a process that converts light energy into chemical energy stored in glucose. This occurs in two main stages: the light-dependent reactions and the light-independent reactions (Calvin cycle). During the light-dependent reactions, chlorophyll absorbs light energy, leading to the splitting of water molecules (photolysis) and the production of ATP and NADPH. In the Calvin cycle, the ATP and NADPH generated are used to fix carbon dioxide from the atmosphere into organic molecules, ultimately resulting in the production of glucose. Chloroplasts contain their own DNA and ribosomes, supporting the fact that they are semi-autonomous organelles and suggesting an evolutionary history linked to cyanobacteria. However, their main function remains focused on photosynthesis, which is essential for plant life and the production of oxygen, contributing significantly to Earth's atmosphere and supporting life processes across various ecosystems.

6. What does an increase in plasma lactic acid indicate during exercise?

- A. Decreased oxygen demand
- B. Increased metabolic activity in muscles**
- C. Increased oxygen affinity of hemoglobin
- D. Decreased glycolysis rate

An increase in plasma lactic acid during exercise indicates that there is increased metabolic activity in the muscles. When muscles are engaged in strenuous activity, the demand for energy rises and, as a result, the glycolytic pathway is upregulated to meet this need. In the absence of adequate oxygen (as can occur in high-intensity exercise), cells switch to anaerobic metabolism, which converts glucose to lactic acid instead of completely oxidizing it to carbon dioxide and water. This shift to anaerobic metabolism leads to the accumulation of lactic acid in the muscles and subsequently in the bloodstream. The presence of lactic acid serves as a marker for this anaerobic metabolic activity, reflecting that the muscles are working harder than can be sustained through aerobic respiration alone. Hence, the increase in plasma lactic acid is directly tied to the heightened energy demands of the exercising muscles.

7. What is the role of reverse transcriptase in HIV?

- A. Converts RNA to protein
- B. Converts DNA to RNA
- C. Converts RNA to DNA**
- D. Converts protein to RNA

Reverse transcriptase plays a crucial role in the life cycle of HIV by converting the viral RNA genome into DNA. This process is essential for the integration of the viral genetic material into the host cell's genome, allowing the virus to replicate effectively. Once HIV enters a host cell, the reverse transcriptase enzyme synthesizes a complementary DNA (cDNA) strand using the viral RNA as a template. This cDNA is then processed and integrated into the host cell's DNA by another viral enzyme called integrase. Once integrated, the viral DNA can be transcribed and translated using the host's cellular machinery to produce new viral particles. This function of reverse transcriptase distinguishes retroviruses like HIV from other viruses, which may carry their genetic material in the form of DNA or RNA but do not require the conversion of RNA to DNA for replication. The other options do not accurately describe the function of reverse transcriptase in the context of HIV, as the enzyme specifically facilitates the conversion of RNA to DNA.

8. The digestion of which macromolecule is not stimulated by the action of peptidases?

- A. Proteins
- B. Carbohydrates
- C. Nucleic acids

D. Lipids

Peptidases are enzymes specifically involved in the breakdown of proteins into smaller peptides and amino acids. They function by hydrolyzing the peptide bonds that link amino acids together in protein structures. Given this role, it follows that the digestion of proteins is directly stimulated by peptidases. Carbohydrates, nucleic acids, and lipids are different macromolecules with distinct enzyme classes that facilitate their digestion. For example, carbohydrates are primarily broken down by amylases and other carbohydrate-specific enzymes, while nucleic acids are digested by nucleases that target the bonds in nucleotides. Lipids, on the other hand, are mainly digested by lipases that break down triglycerides into fatty acids and glycerol. Since peptidases specifically target protein substrates, the digestion of macromolecules like carbohydrates, nucleic acids, and lipids does not involve peptidases, making lipids the correct choice for a macromolecule whose digestion is not influenced by these enzymes. This focuses on the specificity of enzymatic action in digestion processes across different types of macromolecules.

9. Which of the following best describes the role of cytokines in the immune response?

- A. They are antibodies that neutralize pathogens
- B. They promote the production of new immune cells

C. They act as signaling molecules between cells

- D. They directly kill pathogens

The role of cytokines in the immune response is best described as acting as signaling molecules between cells. Cytokines are small proteins that facilitate communication between cells in the immune system, allowing for coordination and regulation of immune responses. They can be produced by various immune cells and can influence the behavior of those cells, such as promoting cell proliferation, differentiation, and activation. For instance, cytokines can signal T cells to proliferate in response to an infection, recruit other immune cells to the site of inflammation, and modulate the activity of various immune cells, including macrophages and B cells. This signaling is crucial for orchestrating both the innate and adaptive immune responses, ensuring that the body can effectively respond to pathogens. Understanding the function of cytokines highlights their importance beyond direct pathogen elimination, emphasizing their roles in cell signaling and the broader regulatory aspects of the immune response.

10. How do pathogens evade the immune response?

- A. By replicating only in outside environments.
- B. By producing enzymes that enhance immune responses.
- C. By altering surface proteins and producing toxins.**
- D. By increasing the number of immune cells.

Pathogens have developed various strategies to evade the immune response, with one of the most effective methods being the alteration of their surface proteins and the production of toxins. By changing their surface proteins, pathogens can hinder the ability of the immune system to recognize and remember them. This is often seen in viruses and bacteria that undergo rapid genetic changes, allowing them to escape detection by antibodies and T cells that are specific to their previous protein structures. Additionally, the production of toxins can damage host tissues and disrupt normal immune functions, providing pathogens with an advantage in avoiding immune surveillance. Toxins may also suppress specific elements of the immune response, further assisting the pathogen in establishing an infection. This strategy of altering surface characteristics and utilizing toxin production is a sophisticated approach that allows pathogens to persist within a host, despite immune defenses being mounted against them.

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:

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

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