# MCAT BIOLOGICAL AND BIOCHEMICAL FOUNDATIONS OF LIVING SYSTEMS PRACTICE EXAM (SAMPLE)

## STUDY GUIDE

Prepare with structure. Pass with confidence

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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 structure in the urinary system is responsible for storing urine?**

A. Kidney
B. Urethra
C. Bladder
D. Ureter

**2. In eukaryotes, where does oxidative phosphorylation primarily occur?**

A. Nucleus
B. Ribosomes
C. Mitochondrion
D. Golgi apparatus

**3. In what protein structures is the active site found as active?**

A. Primary and secondary
B. Secondary and tertiary
C. Tertiary and quaternary
D. Quaternary and primary

**4. What is the primary process occurring in the colon?**

A. Absorption of nutrients
B. Filtration of blood
C. Water absorption
D. Protein synthesis

**5. What term describes a bacterium that cannot survive on minimal medium due to its inability to synthesize a necessary molecule?**

A. Parasite
B. Auxotroph
C. Symbiont
D. Autotroph

**6. The eukaryote plasma membrane typically contains an _____ number of carbons in its lipid molecules.**

A. odd

B. even

C. random

D. variable

**7. Which nephron segment is responsive to aldosterone and involved in salt reabsorption?**

A. Collecting duct

B. Proximal convoluted tubule

C. Descending loop of Henle

D. Ascending limb of the loop of Henle

**8. What type of muscle is found in blood vessels?**

A. Skeletal

B. Cardiac

C. Smooth

D. Striated

**9. Which type of repair mechanism addresses base errors due to DNA polymerase mistakes after replication is complete?**

A. Base excision repair

B. Nucleotide excision repair

C. Mismatch repair

D. Homologous recombination

**10. Which of the following is not a method of direct enzymatic regulation?**

A. Phosphorylation

B. Protein hydrolysis

C. Allosteric regulation

D. Variation of transcription factors

# Answers

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

# Explanations

## 1. Which structure in the urinary system is responsible for storing urine?

A. Kidney

B. Urethra

C. Bladder

D. Ureter

*The bladder is the structure in the urinary system that is responsible for storing urine. It is a muscular sac that can expand and contract; it collects urine from the kidneys, which produce urine as a waste product of metabolism. The bladder can hold a considerable volume of urine, typically around 400 to 600 milliliters in adults, and when it reaches its capacity, stretch receptors in the bladder wall signal the brain, creating the urge to urinate. The function of the bladder is crucial in maintaining homeostasis within the body. By regulating the timing and volume of urine excretion, the bladder plays a key role in fluid balance and electrolyte homeostasis. After storing the urine, the bladder facilitates its elimination from the body through the urethra during the process of urination.*

## 2. In eukaryotes, where does oxidative phosphorylation primarily occur?

A. Nucleus

B. Ribosomes

C. Mitochondrion

D. Golgi apparatus

*Oxidative phosphorylation primarily occurs in the mitochondrion, which plays a crucial role in cellular respiration. This process takes place on the inner mitochondrial membrane where the electron transport chain is located. During oxidative phosphorylation, electrons derived from nutrients such as glucose are transferred through a series of protein complexes, ultimately driving the synthesis of ATP through ATP synthase. The environment of the mitochondrion optimally supports the necessary biochemical reactions. The double membrane structure creates a distinct intermembrane space where protons are pumped, establishing a proton gradient. This gradient is essential for ATP production, as protons flow back into the mitochondrial matrix through ATP synthase, driving the conversion of ADP and inorganic phosphate into ATP. Understanding the specific location of oxidative phosphorylation within eukaryotic cells highlights the mitochondrial function as the powerhouse of the cell, making it an essential organelle for energy production.*

## 3. In what protein structures is the active site found as active?

A. Primary and secondary

B. Secondary and tertiary

C. Tertiary and quaternary

D. Quaternary and primary

*The active site of a protein is typically found in its tertiary and quaternary structures. Tertiary structure refers to the overall three-dimensional shape of a single protein molecule, which is formed by the folding of the polypeptide chain. The specific arrangement of amino acids in this folded structure creates the active site, where substrates bind and chemical reactions occur. In some proteins, the quaternary structure also plays a role in the active site. Quaternary structure involves the association of two or more polypeptide chains to form a functional protein complex. In these cases, the active site may be formed by the interaction between different subunits of the protein, allowing for complex regulation and functionality that would not be present in isolated chains. Primary structure refers to the linear sequence of amino acids, and while it is essential for determining the protein's final shape, it does not provide information about the active site. Secondary structure involves local folding, such as alpha helices and beta sheets, which contributes to overall folding but does not include the complete formation of a functional active site. Thus, the presence of the active site as operational is indeed associated with the tertiary and quaternary structures where the specific spatial arrangement necessary for enzymatic activity exists.*

## 4. What is the primary process occurring in the colon?

A. Absorption of nutrients

B. Filtration of blood

C. Water absorption

D. Protein synthesis

*The primary process occurring in the colon is the absorption of water. The colon, or large intestine, plays a crucial role in the final stages of digestion and is primarily tasked with reclaiming water and electrolytes from indigestible food matter. As the contents from the small intestine pass into the colon, they are transformed from a liquid state to a more solid form through the absorption of water, which is vital for maintaining the body's fluid balance. While the colon does have some ability to absorb vitamins and minerals, particularly those produced by gut bacteria, its main function is to concentrate waste material by reducing its water content. This process is essential for preventing dehydration and ensuring that waste is adequately formed for elimination. The other processes listed, such as nutrient absorption or protein synthesis, primarily occur in other parts of the digestive system, such as the small intestine, making water absorption the key function of the colon.*

**5. What term describes a bacterium that cannot survive on minimal medium due to its inability to synthesize a necessary molecule?**

A. Parasite

B. Auxotroph

C. Symbiont

D. Autotroph

*The term that describes a bacterium unable to survive on minimal medium because it cannot synthesize a necessary molecule is "auxotroph." An auxotroph is a mutant strain of bacteria that lacks the ability to produce a certain compound required for growth, such as an amino acid, vitamin, or nucleotide. As a result, these bacteria must be provided with the specific nutrient in their growth medium to thrive. This characteristic differentiates them from prototrophs, which can grow on minimal medium because they can synthesize all molecules needed for growth. The other terms do not apply to this situation. A parasite refers to an organism that lives on or in a host organism and derives nutrients at the host's expense, which is unrelated to the bacterium's growth requirements. A symbiont is an organism that lives in a close relationship with another, often benefiting from the interaction, but again this does not pertain to nutrient synthesis. An autotroph is an organism that can produce its own food from inorganic substances, such as carbon dioxide, and therefore does not require organic compounds from its environment, contrasting with the characteristics of an auxotroph.*

**6. The eukaryote plasma membrane typically contains an _____ number of carbons in its lipid molecules.**

A. odd

B. even

C. random

D. variable

*In eukaryotic plasma membranes, the lipid molecules, particularly phospholipids, typically contain an even number of carbon atoms. This is primarily because fatty acids, which are the building blocks of these lipids, are synthesized through a process that combines two-carbon units derived from acetyl-CoA. As a result, fatty acids generally end up with lengths that are multiples of two, leading to an even number of carbon atoms. This structural characteristic is significant for the formation of bilayers, as it influences the membrane's fluidity and permeability, contributing to the proper functioning of the cell. In contrast to this, odd or random numbers of carbons are less common in the context of eukaryotic membrane lipids and would not generally contribute to the stable, consistent structure needed for effective cellular processes. While certain organisms or circumstances may exhibit unusual lipid compositions, the standard for eukaryotic plasma membranes consistently aligns with even-numbered carbon chains.*

## 7. Which nephron segment is responsive to aldosterone and involved in salt reabsorption?

A. Collecting duct

B. Proximal convoluted tubule

C. Descending loop of Henle

D. Ascending limb of the loop of Henle

*The nephron segment that responds to aldosterone and is involved in salt reabsorption is the collecting duct. Aldosterone is a steroid hormone produced by the adrenal cortex that plays a crucial role in regulating blood pressure and sodium and potassium levels. It acts primarily on the distal tubule and collecting duct of the nephron. In response to aldosterone, the principal cells in the collecting duct increase the reabsorption of sodium ions (Na+) from the filtrate back into the bloodstream. This process also leads to water reabsorption indirectly, as the reabsorbed sodium creates an osmotic gradient that promotes water retention, ultimately contributing to an increase in blood volume and pressure. While other nephron segments like the proximal convoluted tubule and the ascending limb of the loop of Henle do play roles in reabsorption of salts and water, they are not directly influenced by aldosterone. The proximal convoluted tubule is primarily responsible for the reabsorption of a significant proportion of filtered sodium and other solutes but operates independently of aldosterone. The ascending limb of the loop of Henle reabsorbs sodium through active transport but is not responsive to aldosterone either. The descending loop does not participate in salt reabsorption at all; it*

## 8. What type of muscle is found in blood vessels?

A. Skeletal

B. Cardiac

C. Smooth

D. Striated

*The correct type of muscle found in blood vessels is smooth muscle. Smooth muscle tissue is characterized by its non-striated appearance and is involuntary, meaning it operates without conscious control. This type of muscle is specifically designed for the functions of the organs and structures in the autonomic system, such as blood vessels, where it helps regulate blood flow and pressure by contracting and relaxing. In the case of blood vessels, smooth muscle is essential for vasoconstriction and vasodilation. These processes allow the blood vessels to adjust their diameter, which directly influences blood pressure and distribution of blood throughout the body. Since blood vessels do not require the rapid, voluntary contractions associated with skeletal muscle or the coordinated contractions of cardiac muscle, smooth muscle is perfectly adapted for these vital functions. In contrast, skeletal muscle is associated with voluntary movements and is striated, while cardiac muscle is also striated but is found only in the heart and operates under involuntary control. Striated, in general, refers to the alternating light and dark bands seen in skeletal and cardiac muscles, which is not a feature of smooth muscle. Therefore, smooth muscle is the most appropriate and accurate choice for the type of muscle identified in blood vessels.*

## 9. Which type of repair mechanism addresses base errors due to DNA polymerase mistakes after replication is complete?

A. Base excision repair

B. Nucleotide excision repair

C. Mismatch repair

D. Homologous recombination

*Mismatch repair is the mechanism that specifically addresses base errors resulting from DNA polymerase mistakes after DNA replication has been completed. DNA replication is a highly precise process, but it is not infallible and can lead to mismatches where incorrect nucleotides are incorporated into the newly synthesized strand. Mismatch repair functions by recognizing these incorrect pairings of nucleotides and correcting them. This is crucial for maintaining genetic fidelity, as these errors can lead to mutations if they are not repaired. The process involves several steps: the recognition of the mismatch, the removal of the erroneous segment of DNA, and the resynthesis of the correct sequence using the complementary strand as a template. This system is vital in preventing the propagation of errors during cell division. Base excision repair and nucleotide excision repair operate on different types of DNA damage, such as single-base lesions or bulky DNA adducts, rather than directly addressing mismatches caused by polymerase errors. Homologous recombination, on the other hand, primarily functions in the repair of double-strand breaks rather than corrections of base-pair mismatches. Thus, mismatch repair specifically targets and corrects errors that arise during replication, making it the appropriate choice for this question.*

## 10. Which of the following is not a method of direct enzymatic regulation?

A. Phosphorylation

B. Protein hydrolysis

C. Allosteric regulation

D. Variation of transcription factors

*The correct answer is based on the understanding of direct enzymatic regulation mechanisms. Direct enzymatic regulation involves immediate, physical modification or interaction with the enzyme itself, impacting its activity. Phosphorylation is a prime example of this kind of regulation, where the addition of a phosphate group can enhance or inhibit enzyme function. Protein hydrolysis also directly involves the breakdown of proteins, which can activate or deactivate enzymes effectively. Allosteric regulation refers to the binding of an effector molecule at a site other than the active site, leading to a conformational change that affects enzyme activity. All of these methods involve direct changes to the enzyme or its activity. In contrast, the variation of transcription factors does not qualify as direct enzymatic regulation. Instead, it relates to gene expression regulation, where transcription factors influence the synthesis of enzymes rather than modifying enzymes directly. This regulatory process occurs at the genetic level and affects the amount of enzyme available but does not involve a direct alteration of existing enzymes. Thus, it is not categorized as a method of direct enzymatic regulation.*

# 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://mcat-bioandbiochemfoundationsoflivingsystems.examzify.com

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