

MCAT BIOLOGICAL AND BIOCHEMICAL FOUNDATIONS OF LIVING SYSTEMS PRACTICE EXAM (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

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- 1. Which part of the nervous system includes the vagus nerve?**
 - A. Centrally acting nervous system
 - B. Peripheral nervous system
 - C. Somatic nervous system
 - D. Autonomic nervous system
- 2. What type of side chain does cysteine have?**
 - A. Amino group
 - B. Thiol group
 - C. Hydroxyl group
 - D. Methyl group
- 3. The primary role of the chief cells in gastric physiology is to secrete what substance?**
 - A. Insulin
 - B. Gastrin
 - C. Pepsinogen
 - D. Amylase
- 4. Which condition involves impaired production of or response to insulin, leading to issues with blood glucose control?**
 - A. Hyperglycemia
 - B. Diabetes mellitus
 - C. Hypoglycemia
 - D. Insulinoma
- 5. What is released during a deamination reaction?**
 - A. CO₂
 - B. NH₄
 - C. NH₃
 - D. O₂

- 6. In which phase of urine production does secretion primarily occur?**
- A. Filtration
 - B. Secretion
 - C. Reabsorption
 - D. Excretion
- 7. Which metabolic processes require mitochondria?**
- A. Amino acid synthesis
 - B. Glycolysis
 - C. TCA and ATP production
 - D. Fatty acid synthesis
- 8. What is the role of the umbilical vein?**
- A. Carries deoxygenated blood
 - B. Carries oxygenated blood with nutrients
 - C. Carries waste products
 - D. Eliminates toxins
- 9. What is the primary function of surfactant in the alveoli?**
- A. Increase surface tension
 - B. Lower surface tension
 - C. Facilitate gas exchange
 - D. Support alveolar structure
- 10. What type of epithelial cells are exocrine glands primarily composed of?**
- A. Simple squamous cells
 - B. Cuboidal epithelial cells
 - C. Pseudostratified columnar cells
 - D. Squamous endothelial cells

Answers

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

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Explanations

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1. Which part of the nervous system includes the vagus nerve?

- A. Centrally acting nervous system
- B. Peripheral nervous system
- C. Somatic nervous system
- D. Autonomic nervous system**

The vagus nerve is a crucial component of the autonomic nervous system, which is responsible for regulating involuntary bodily functions such as heart rate, digestion, and respiratory rate. The autonomic nervous system has two main divisions: the sympathetic and the parasympathetic systems. The vagus nerve primarily functions as a part of the parasympathetic nervous system, contributing to the "rest and digest" processes of the body. Through its widespread influence, the vagus nerve innervates various organs, including the heart and gastrointestinal tract, facilitating the functions of these systems without conscious control. This is in contrast to the somatic nervous system, which controls voluntary movements and responses, and the central and peripheral nervous systems, which refer to different aspects of neural organization without specifically delineating the autonomic functions. Understanding the role of the vagus nerve within the autonomic nervous system helps clarify its importance in maintaining homeostasis and modulating various physiological processes.

2. What type of side chain does cysteine have?

- A. Amino group
- B. Thiol group**
- C. Hydroxyl group
- D. Methyl group

Cysteine is an amino acid that is distinct for having a thiol group in its side chain. The thiol group, which consists of a sulfur atom bonded to a hydrogen atom ($-SH$), is responsible for the unique properties of cysteine, particularly its ability to form disulfide bonds with other cysteine residues. These disulfide bridges can stabilize the three-dimensional structure of proteins by linking different parts of a polypeptide chain or even different polypeptide chains together. In the context of the other choices, the amino group is a fundamental part of all amino acids, but it is not specific to cysteine's side chain. The hydroxyl group is characteristic of serine and threonine, which are also amino acids, while the methyl group is a simple alkyl group found in amino acids like alanine. However, cysteine's defining feature is the thiol group, making it crucial for maintaining the integrity and functionality of many proteins.

3. The primary role of the chief cells in gastric physiology is to secrete what substance?

- A. Insulin
- B. Gastrin
- C. Pepsinogen**
- D. Amylase

The primary role of chief cells in gastric physiology is to secrete pepsinogen, which is an inactive precursor of the enzyme pepsin. Pepsinogen itself is a zymogen, meaning that it must be activated to function as an enzyme. Once pepsinogen is secreted into the stomach lumen, it is converted to pepsin in the presence of the acidic environment created by gastric acid (hydrochloric acid) secreted by parietal cells. Pepsin plays a crucial role in the digestion of proteins, facilitating their breakdown into smaller peptides. While other substances such as insulin, gastrin, and amylase are important in various physiological processes, they are not secreted by chief cells. Insulin is produced by beta cells in the pancreas, gastrin is a hormone secreted by G cells in the gastric mucosa that stimulates acid secretion, and amylase is an enzyme primarily secreted by the salivary glands and pancreas for carbohydrate digestion. Thus, the function of chief cells is specifically associated with the secretion of pepsinogen.

4. Which condition involves impaired production of or response to insulin, leading to issues with blood glucose control?

- A. Hyperglycemia
- B. Diabetes mellitus**
- C. Hypoglycemia
- D. Insulinoma

Diabetes mellitus is characterized by impaired production of or response to insulin, which is crucial for regulating blood glucose levels. In this condition, either the pancreas does not produce enough insulin (as in type 1 diabetes) or the body's cells become resistant to insulin's effects (as in type 2 diabetes). Consequently, this leads to elevated blood glucose levels, known as hyperglycemia. Understanding how diabetes mellitus impacts blood glucose control highlights its critical role in metabolism. The body's inability to effectively use insulin results in glucose remaining in the bloodstream rather than being taken up by cells for energy. This can lead to a variety of symptoms and long-term complications if not managed properly. This contrasts with hyperglycemia, which is simply a state of elevated blood glucose and not a specific condition by itself, and hypoglycemia, which involves low blood sugar levels. Insulinoma refers to a tumor of the pancreas that produces excess insulin, hence not leading to impaired production or response but rather an abnormal increase in insulin.

5. What is released during a deamination reaction?

- A. CO₂
- B. NH₄
- C. NH₃**
- D. O₂

During a deamination reaction, the amino group (-NH₂) is removed from an amino acid, which results in the production of ammonia (NH₃) and a carbon skeleton that can enter various metabolic pathways. The ammonia that is released can subsequently be converted into urea in the liver through the urea cycle, allowing for the safe excretion of nitrogen waste from the body. The process of deamination is essential for the metabolism of amino acids, especially when proteins are broken down for energy or when excess amino acids need to be removed. The CO₂ may be involved in some metabolic processes, but it is not a direct product of deamination itself; rather, it is a result of further metabolism of the carbon skeleton formed after deamination. NH₄, or ammonium, can be produced in certain conditions, but in the context of deamination, ammonia (NH₃) is the more relevant product. O₂ is not released during deamination, as this reaction does not involve the reduction or oxidation of substrates in a way that would involve oxygen as a product. Thus, the release of ammonia (NH₃) is a key aspect of the deamination process, reflecting the transformation of amino acids into components that can be utilized or excreted.

6. In which phase of urine production does secretion primarily occur?

- A. Filtration
- B. Secretion**
- C. Reabsorption
- D. Excretion

Secretion primarily occurs in the phase designated for that specific process. In the context of urine production, secretion refers to the active transport of substances from the blood into the renal tubules. This phase allows the kidneys to remove excess ions, waste products, and certain drugs that were not filtered out during the glomerular filtration process. During secretion, various ions, such as potassium and hydrogen, and metabolic by-products like urea are added to the tubular fluid. This is a critical part of the kidney's overall function to maintain homeostasis, as it helps regulate electrolyte balance and eliminate potentially harmful substances from the body. While filtration involves the initial process where blood plasma is filtered through the glomerulus to form a filtrate, and reabsorption is the phase where essential substances and water are reclaimed back into the bloodstream, secretion is distinct and specifically focused on moving additional wastes from the blood into the urine. Excretion, on the other hand, refers to the final elimination of urine from the body, rather than a phase of production in the kidneys. Thus, the correct answer highlights the specific phase involved in the active transport of additional substances into the urine.

7. Which metabolic processes require mitochondria?

- A. Amino acid synthesis
- B. Glycolysis
- C. TCA and ATP production**
- D. Fatty acid synthesis

The correct answer is C, which identifies the TCA cycle (also known as the citric acid cycle or Krebs cycle) and ATP production as metabolic processes that require mitochondria. The TCA cycle occurs in the mitochondrial matrix, where acetyl-CoA, derived from carbohydrates, fats, and proteins, is oxidized to produce electron carriers like NADH and FADH₂. These carriers are then utilized in the electron transport chain, located in the inner mitochondrial membrane, to produce ATP through oxidative phosphorylation. Mitochondria serve as the powerhouse of the cell, highlighting their critical role in energy metabolism. The process of ATP production linked to the TCA cycle is vital for cellular energy needs, making mitochondria essential for these metabolic functions. The generation of energy in the form of ATP through these pathways is a hallmark of aerobic respiration, which occurs exclusively in the presence of mitochondria. In contrast, the other choices involve processes that either occur in the cytoplasm or do not require mitochondrial involvement. Amino acid synthesis occurs primarily in the cytoplasm, where various enzymes synthesize amino acids from other substrates. Glycolysis, which breaks down glucose to pyruvate, also takes place in the cytoplasm and does not involve mitochondria.

8. What is the role of the umbilical vein?

- A. Carries deoxygenated blood
- B. Carries oxygenated blood with nutrients**
- C. Carries waste products
- D. Eliminates toxins

The umbilical vein plays a crucial role in fetal circulation by carrying oxygenated blood rich in nutrients from the placenta to the developing fetus. This vein is unique because, unlike most veins in the body that transport deoxygenated blood, the umbilical vein is responsible for supplying the fetus with oxygen and essential nutrients necessary for growth and development. The blood in the umbilical vein is enriched with oxygen and nutrients, which are critical for the fetus's metabolism and overall health, as the fetus relies on diffusion across the placenta for these vital elements. In contrast, the umbilical arteries, which branch off from the fetal circulation, carry deoxygenated blood and waste products back to the placenta for disposal. Understanding the function of the umbilical vein is essential in the context of fetal health and maternal physiology, as it highlights the unique adaptations of the circulatory system during pregnancy.

9. What is the primary function of surfactant in the alveoli?

- A. Increase surface tension
- B. Lower surface tension**
- C. Facilitate gas exchange
- D. Support alveolar structure

Surfactant plays a crucial role in the alveoli primarily by lowering surface tension. The alveoli are small air sacs in the lungs where gas exchange occurs, and their inner surfaces are lined with a thin layer of liquid. Without surfactant, the surface tension created by this liquid would be significantly high, resulting in difficulty in lung expansion during inhalation and an increased risk of alveolar collapse (atelectasis). Surfactant is a complex mixture of lipids and proteins secreted by type II alveolar cells that decreases surface tension, allowing the alveoli to remain open and stable at different lung volumes. This reduction in surface tension is vital for normal respiratory function because it enables easier inflation of the lungs, enhances lung compliance, and improves overall gas exchange efficiency by maintaining the surface area of the alveoli. In contrast to the other options, surfactant does not increase surface tension, nor does it directly facilitate gas exchange or provide structural support to the alveolar walls. Its primary and most vital function is centered around lowering surface tension to prevent collapse and maintain alveolar stability.

10. What type of epithelial cells are exocrine glands primarily composed of?

- A. Simple squamous cells
- B. Cuboidal epithelial cells**
- C. Pseudostratified columnar cells
- D. Squamous endothelial cells

Exocrine glands are primarily composed of cuboidal epithelial cells. These cells are typically arranged in a single layer, allowing for efficient secretion of various substances, including enzymes, mucus, and sweat, directly into ducts or onto surfaces. The shape of cuboidal cells, which are roughly as wide as they are tall, is well-suited for their role in secretion, providing enough space for organelles involved in synthesis and secretion, such as the endoplasmic reticulum and Golgi apparatus. In contrast to cuboidal cells, other types of epithelial cells serve different functions. Simple squamous cells, for example, are thin and flat, primarily involved in passive transport processes like diffusion and filtration. Pseudostratified columnar cells, while useful for secretion and movement (such as in the respiratory tract), are taller and often have cilia, which is not characteristic of exocrine gland structure. Squamous endothelial cells line blood vessels and are adapted for smooth surface and minimal resistance to blood flow, rather than secretion. Thus, the specific structure of cuboidal epithelial cells aligns perfectly with the needs of exocrine glands to perform their function effectively.

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.

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

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