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

STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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https://mcat-bioandbiochemfoundationsoflivingsystems.examzify.com

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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.

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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!

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Questions

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1. What type of system does the kidney contain with two capillary beds in series?

A. Arterial system

B. Venous system

C. Portal system

D. Lymphatic system

2. Which molecule is NOT formed during the Citric Acid Cycle (CTA)?

A. Malate

B. Succinate

C. α-Ketoglutarate

D. Phosphoenolpyruvate

3. How many ATP molecules are produced during glycolysis per glucose molecule?

A. 1

B. 2

C. 4

D. 36

4. Bone resorption is primarily increased by which hormones?

A. Estrogen and testosterone

B. Cortisol and epinephrine

C. Parathyroid hormone and calcitriol

D. Insulin and glucagon

5. What enzymes are responsible for degradation in lysosomes?

A. Proteases

B. Acid hydrolases

C. Nucleases

D. Lipases

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6. What type of receptors are responsible for sensing chemical changes in the body?

A. Baroreceptors

B. Proprioceptors

C. Chemoreceptors

D. Thermoreceptors

7. What does the term 'direct reversal' refer to in DNA repair mechanisms?

A. A specific method of genetic recombination

B. A process of correcting mismatched base pairs

C. A mechanism used to repair DNA damage caused by UV light

D. A technique for synthesizing new DNA

8. Which type of ion channel mediates the depolarization of the muscle fiber membrane at the motor end plate?

A. Voltage-gated ion channel

B. Ligand-gated ion channel

C. Mechanically-gated ion channel

D. Leak ion channel

9. During which phase do sister chromatids separate in meiosis II?

A. Prophase II

B. Metaphase II

C. Anaphase II

D. Telophase II

10. Which of the following processes is primarily responsible for the increase in plasma glucose upon glucagon secretion?

A. Glycolysis

B. Gluconeogenesis

C. Glycogenolysis

D. Translation

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Answers

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

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Explanations

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1. What type of system does the kidney contain with two capillary beds in series?

A. Arterial system

B. Venous system

C. Portal system

D. Lymphatic system

The correct answer is the portal system because this type of system is characterized by two capillary beds connected in series by a vein. In the context of the kidney, the specific portal system involved is known as the renal portal system. This system includes the glomerular capillaries where filtration of blood occurs, and the peritubular capillaries that surround the nephron and facilitate the reabsorption and secretion of various substances. In a portal system, blood flows from one capillary bed to another before returning to the heart, allowing for specialized processing of substances, which is essential for the kidney's function in filtering blood and regulating electrolytes and waste products. The presence of two capillary beds in tandem allows for increased efficiency and regulation of renal function. Other systems mentioned, such as the arterial and venous systems, do not specifically imply the arrangement of two capillary beds in series. The lymphatic system is distinct and primarily involved in the transport of lymph, not blood filtration or renal functions. Therefore, the distinction of a portal system is crucial to understanding how the kidney efficiently manages blood filtration and homeostasis.

2. Which molecule is NOT formed during the Citric Acid Cycle (CTA)?

A. Malate

B. Succinate

C. α-Ketoglutarate

D. Phosphoenolpyruvate

During the Citric Acid Cycle (CAC), various key intermediates are produced through a series of enzymatic reactions that primarily occur in the mitochondria. The cycle begins with the combination of acetyl-CoA and oxaloacetate, leading to the formation of citrate. From there, citrate is converted through several steps into different intermediates, including malate, succinate, and α-ketoglutarate. Malate is formed when fumarate is converted into malate, a step catalyzed by the enzyme fumarase. Succinate is produced from succinyl-CoA in a reaction catalyzed by succinate thiokinase, which also produces GTP or ATP. α-Ketoglutarate is generated from isocitrate through a decarboxylation reaction catalyzed by isocitrate dehydrogenase. Phosphoenolpyruvate (PEP), however, is not a product of the Citric Acid Cycle at any point. Instead, it is a key intermediate in glycolysis and gluconeogenesis, specifically formed from 2-phosphoglycerate through the action of the enzyme enolase. Therefore, PEP is not associated with the CAC, making it the correct answer to the

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3. How many ATP molecules are produced during glycolysis per glucose molecule?

A. 1

B. 2

C. 4

D. 36

During glycolysis, a single molecule of glucose is processed to produce energy. The overall reaction of glycolysis begins with one glucose molecule and ends with two molecules of pyruvate. Throughout this process, energy is captured in the form of ATP and NADH. Glycolysis produces a total of four ATP molecules via substrate-level phosphorylation. However, it is important to consider that two ATP molecules are used during the initial steps of glycolysis to phosphorylate glucose and its intermediates. Thus, the net gain in ATP from one glucose molecule is four ATP produced minus two ATP consumed, which gives a net total of two ATP molecules. This net production of two ATP per glucose molecule highlights glycolysis as a critical first step in cellular respiration, providing a relatively quick and efficient means of generating ATP in the absence of oxygen while yielding pyruvate for further energy extraction pathways, such as the Krebs cycle and oxidative phosphorylation.

4. Bone resorption is primarily increased by which hormones?

A. Estrogen and testosterone

B. Cortisol and epinephrine

C. Parathyroid hormone and calcitriol

D. Insulin and glucagon

The correct answer is based on the roles of parathyroid hormone (PTH) and calcitriol (the active form of vitamin D) in regulating calcium levels and bone metabolism. Parathyroid hormone is secreted by the parathyroid glands in response to low blood calcium levels. It primarily acts to increase blood calcium by stimulating osteoclasts, cells that break down bone and release calcium into the bloodstream, leading to increased bone resorption. Additionally, PTH enhances renal reabsorption of calcium and stimulates the conversion of vitamin D to calcitriol in the kidneys. Calcitriol, in conjunction with PTH, further promotes bone resorption by increasing the maturation of osteoclasts and enhancing their activity. It also increases intestinal absorption of calcium, contributing to the elevation of calcium levels in the blood. Therefore, the combination of PTH and calcitriol effectively increases bone resorption, making this the correct answer. In contrast, other options include hormones that do not primarily function to increase bone resorption. For instance, estrogen and testosterone generally promote bone formation and help maintain bone density. Cortisol can increase bone resorption, but its effects are more complex and can induce osteoporosis when levels are chronically high. Ins

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5. What enzymes are responsible for degradation in lysosomes?

A. Proteases

B. Acid hydrolases

C. Nucleases

D. Lipases

The correct answer is that lysosomes primarily contain acid hydrolases, which are a group of enzymes specifically optimized to function in the acidic environment of the lysosome. These enzymes are responsible for breaking down various biomolecules, including proteins, nucleic acids, lipids, and carbohydrates. The acidic pH inside lysosomes, typically around 4.5 to 5.0, is crucial for the activity of acid hydrolases, ensuring efficient degradation processes. Lysosomes are often referred to as the cell's waste disposal system, as they digest and recycle cellular waste, damaged organelles, and macromolecules that are no longer needed. The diverse repertoire of acid hydrolases allows lysosomes to catalyze the hydrolysis of these compounds, leading to their degradation into simpler molecules that can be reused or excreted by the cell. Given this context, even though proteases, nucleases, and lipases are also important for the breakdown of specific types of biomolecules (proteins, nucleic acids, and lipids, respectively), the term "acid hydrolases" encompasses all of these activities and highlights the enzymatic function unique to the lysosomal environment. Therefore, acid hydrolases effectively describe the collective action of

6. What type of receptors are responsible for sensing chemical changes in the body?

A. Baroreceptors

B. Proprioceptors

C. Chemoreceptors

D. Thermoreceptors

Chemoreceptors are specialized sensory receptors that detect changes in chemical concentrations in the environment or bodily fluids. They play critical roles in monitoring levels of various substances, such as oxygen, carbon dioxide, and pH, which are essential for maintaining homeostasis. For instance, peripheral chemoreceptors located in the carotid and aortic bodies respond to changes in blood chemistry, helping regulate breathing and cardiovascular functions. Central chemoreceptors in the brain monitor the pH of cerebrospinal fluid, reflecting the levels of carbon dioxide in the blood, thereby influencing respiratory rates. This specialization in detecting chemical changes distinguishes chemoreceptors from other types of receptors. Baroreceptors, for example, respond to changes in blood pressure; proprioceptors detect body position and movement; and thermoreceptors sense temperature changes. Each of these receptor types serves a different physiological function, but it is the chemoreceptors that are specifically geared towards sensing and responding to chemical variations in the body.

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7. What does the term 'direct reversal' refer to in DNA repair mechanisms?

A. A specific method of genetic recombination

B. A process of correcting mismatched base pairs

C. A mechanism used to repair DNA damage caused by UV light

D. A technique for synthesizing new DNA

The term 'direct reversal' in DNA repair mechanisms specifically refers to a process used to correct damage to DNA, particularly damage caused by ultraviolet (UV) light. UV light can cause the formation of pyrimidine dimers, where two adjacent thymine bases bond together, leading to distortions in the DNA structure that can interfere with replication and transcription. In direct reversal, specific enzymes can recognize and repair these lesions without the need for DNA excision and resynthesis. For example, photolyase is an enzyme that directly reverses thymine dimers by utilizing light energy to break the covalent bonds formed between the adjacent thymines, restoring the DNA to its original state. This repair mechanism is efficient and prevents many mutations from arising due to UV-induced damage. The other options primarily focus on different aspects of DNA biology. The process of genetic recombination does not involve directly reversing DNA damage but rather involves the exchange of genetic material, which is distinct from repair mechanisms. Correcting mismatched base pairs refers to DNA mismatch repair, a different pathway that addresses errors that occur during DNA replication. Lastly, synthesizing new DNA is related to replication or repair pathways involving template copying but does not describe the specific mechanism of direct reversal in the context of repairing UV

8. Which type of ion channel mediates the depolarization of the muscle fiber membrane at the motor end plate?

A. Voltage-gated ion channel

B. Ligand-gated ion channel

C. Mechanically-gated ion channel

D. Leak ion channel

The correct option is ligand-gated ion channels. At the motor end plate, which is the junction between a motor neuron and a skeletal muscle fiber, the neurotransmitter acetylcholine is released from the motor neuron and binds to specific receptors on the muscle fiber membrane. These receptors are part of ligand-gated ion channels. When acetylcholine binds to these receptors, it causes a conformational change in the ligand-gated ion channels, allowing sodium ions (Na+) to flow into the muscle fiber. This influx of sodium ions depolarizes the muscle membrane, shifting the membrane potential in a positive direction. The depolarization is crucial for the initiation of action potentials in the muscle fiber, leading to muscle contraction. While other types of ion channels exist, they do not play a direct role in mediating the depolarization at the motor end plate in this context. Voltage-gated ion channels primarily respond to changes in membrane potential and are involved in action potentials, while mechanically-gated channels respond to physical deformation or pressure, and leak channels are generally responsible for maintaining resting membrane potential rather than initiating depolarization.

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9. During which phase do sister chromatids separate in meiosis II?

A. Prophase II

B. Metaphase II

C. Anaphase II

D. Telophase II

In meiosis II, sister chromatids separate during Anaphase II. This phase is critical because it ensures that each daughter cell will receive an equal and complete set of chromosomes. During Anaphase II, the centromeres that hold the sister chromatids together split, allowing the chromatids—now individual chromosomes—to be pulled to opposite poles of the cell by the spindle fibers. Prior to this, in Prophase II, the chromosomes condense, and the nuclear envelope breaks down again, setting up for the separation of sister chromatids. However, the actual separation does not occur until Anaphase II. Metaphase II involves the alignment of chromosomes along the metaphase plate, but this alignment does not involve the separation of sister chromatids. Finally, in Telophase II, the chromosomes reach the poles, and the nuclear envelope reforms, leading to the final division of the cells into four haploid cells, but this is after the separation has already occurred. Understanding the specific changes and processes within each phase reinforces why Anaphase II is essential for the proper distribution of genetic material during meiosis II.

10. Which of the following processes is primarily responsible for the increase in plasma glucose upon glucagon secretion?

A. Glycolysis

B. Gluconeogenesis

C. Glycogenolysis

D. Translation

The process primarily responsible for the increase in plasma glucose upon glucagon secretion is glycogenolysis. Glycogenolysis is the biochemical pathway through which glycogen, a stored form of glucose in the liver and muscle tissues, is broken down into glucose-1-phosphate. This process occurs primarily in the liver, where glucagon stimulates the conversion of glycogen to glucose. When glucagon is secreted, particularly during fasting or low blood glucose levels, it binds to its receptors on liver cells, activating signaling pathways that enhance glycogenolysis. As glycogen is degraded, glucose is released into the bloodstream, thereby raising the plasma glucose levels. Other processes mentioned, such as glycolysis, gluconeogenesis, and translation, while important metabolic pathways, do not primarily contribute to the immediate increase in plasma glucose in response to glucagon. Glycolysis involves the breakdown of glucose to produce energy, gluconeogenesis synthesizes glucose from non-carbohydrate substrates, and translation refers to protein synthesis. None of these directly increase the availability of glucose from glycogen stores in the liver in the context of glucagon's action.

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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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