# EMCC BIOLOGY TEST 2 PRACTICE (SAMPLE)

## STUDY GUIDE

## SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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# Table of Contents

# 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. What does the second law of thermodynamics state in relation to energy systems?**

A. Energy can be created and destroyed

B. Energy tends to decrease over time

C. Energy spontaneously disperses from being localized to becoming spread out

D. Energy is always conserved

**2. In which bodily fluid is the concentration of solutes typically regulated within a narrow range?**

A. Blood plasma

B. Intracellular fluid

C. Interstitial fluid

D. All of the above

**3. Which line represents the reaction catalyzed by carbonic anhydrase that lowers activation energy?**

A. Line A; the activation energy has increased

B. Line B; the activation energy has been lowered

C. Line C; the reaction does not require a catalyst

D. Line D; there is no change in activation energy

**4. If a cuboidal shaped cell has dimensions of 1mm x 1mm x 1mm, what is its volume?**

A. 1 $mm^2$

B. 6 $mm^2$

C. 1 $mm^3$

D. 6 $mm^3$

**5. Which organelle is responsible for calcium storage linked to cardiac muscle contraction?**

A. Nucleus

B. Smooth Endoplasmic Reticulum

C. Rough Endoplasmic Reticulum

D. Golgi apparatus

6. **A scientist creates an artificial cell with a selectively permeable membrane allowing only water to pass and injects a 5 M glucose solution. What effect would you expect to observe after an hour?**

A. Glucose moves out of the cell

B. Water moves into the cell

C. Glucose concentration evens out

D. No net movement occurs

7. **The carbohydrate matrix in bacterial cell walls is linked together by what type of components?**

A. Fatty acids

B. Nucleotides

C. Amino acids

D. Monosaccharides

8. **In untreated diabetes mellitus, what happens to glucose levels in the urine?**

A. They remain constant

B. They are absent

C. They are often elevated

D. They decrease significantly

9. **In plant cells, where is the water primarily found when in a hypotonic solution?**

A. Cytoplasm

B. Cell membrane

C. Central vacuole

D. Chloroplasts

10. **In the reaction where glyceraldehyde-3-phosphate + NAD+ yields 1,3-biphosphoglycerate + NADH, what happens to NAD+?**

A. It is oxidized

B. It is reduced

C. It remains unchanged

D. It is hydrolyzed

# Answers

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

# Explanations

## 1. What does the second law of thermodynamics state in relation to energy systems?

A. Energy can be created and destroyed

B. Energy tends to decrease over time

C. Energy spontaneously disperses from being localized to becoming spread out

D. Energy is always conserved

*The second law of thermodynamics is fundamental in understanding energy systems and states that energy tends to disperse or spread out over time. This principle highlights the natural tendency of energy to move from areas of high concentration to areas of low concentration, leading to a state of equilibrium. In practical terms, this means that energy transformations are not completely efficient and that some energy is always lost, usually as heat. This concept is crucial in analyzing various processes, such as biological reactions and ecosystem dynamics, where energy input and output determine the sustainability and functionality of the system. The tendency for energy to disperse explains phenomena such as the flow of heat from warm to cool objects, the mixing of gases, and the decrease in usable energy in biological systems as organisms convert energy for metabolism. While some options discuss related concepts—like conservation of energy or the idea of energy loss over time—they do not capture the essential message of the second law concerning the natural inclination of energy to spread out and increase entropy in a system.*

## 2. In which bodily fluid is the concentration of solutes typically regulated within a narrow range?

A. Blood plasma

B. Intracellular fluid

C. Interstitial fluid

D. All of the above

*Blood plasma is the correct answer because it serves as a critical transport medium in the circulatory system, playing a vital role in maintaining homeostasis. The concentration of solutes within blood plasma, which includes electrolytes, nutrients, hormones, and proteins, is tightly regulated by various mechanisms, including kidney function, hormonal regulation, and the balance of intake and excretion. The body carefully controls the levels of various substances within blood plasma to ensure that the physiological processes function optimally. For example, the kidneys filter blood plasma, allowing for the adjustment of solute concentration through reabsorption and secretion processes. This helps maintain osmolality and pH levels within the necessary physiological range for proper cell function and overall health. While intracellular fluid and interstitial fluid also have solute concentrations that are essential for cellular functions, they are not regulated to the same extent as blood plasma. Intracellular fluid concentrations can vary widely depending on cellular activity, and interstitial fluid can change based on local conditions and the movement of fluids between blood plasma and cells. Thus, blood plasma stands out as the bodily fluid where solute concentration is typically maintained within a narrow range, ensuring stable physiological conditions.*

**3. Which line represents the reaction catalyzed by carbonic anhydrase that lowers activation energy?**

A. Line A; the activation energy has increased

B. Line B; the activation energy has been lowered

C. Line C; the reaction does not require a catalyst

D. Line D; there is no change in activation energy

*The correct choice highlights the function of carbonic anhydrase as it facilitates the conversion of carbon dioxide and water into bicarbonate and protons, which is a reaction integral to various biological processes. Enzymes like carbonic anhydrase work by lowering the activation energy necessary for a reaction to occur. This reduction in activation energy accelerates the reaction rate, allowing it to proceed more quickly than it would in the absence of the enzyme. In the context of the question, the line representing the reaction catalyzed by carbonic anhydrase would likely show a decreased activation energy compared to an uncatalyzed reaction. This change is visually represented as a dip or downward trend in the activation energy profile, indicating that the presence of the enzyme has facilitated the reaction by providing an alternative pathway with a lower energy barrier. The other options do not accurately reflect the role of carbonic anhydrase. For instance, references to increased activation energy suggest a misunderstanding of enzyme function, while stating that a reaction does not require a catalyst ignores the significant role enzymes play in biological systems. Additionally, asserting that there is no change in activation energy contradicts the fundamental principle of enzyme catalysis, which specifically involves altering activation energy.*

**4. If a cuboidal shaped cell has dimensions of 1mm x 1mm x 1mm, what is its volume?**

A. 1 $mm^2$

B. 6 $mm^2$

C. 1 $mm^3$

D. 6 $mm^3$

*To determine the volume of a cuboidal cell with dimensions of 1 mm by 1 mm by 1 mm, you use the formula for the volume of a cube, which is calculated by multiplying the length, width, and height together. In this case, since all dimensions are the same, the calculation is straightforward: Volume = length × width × height Volume = 1 mm × 1 mm × 1 mm Volume = 1 $mm^3$. The result shows that the volume of the cuboidal cell is 1 cubic millimeter, which corresponds to the choice indicating the volume in cubic millimeters. This signifies that the cell occupies a space of 1 $mm^3$, the correct answer. Understanding this relationship between dimensions and volume is crucial, especially in biology where cell sizes are often measured in cubic millimeters or micrometers.*

**5. Which organelle is responsible for calcium storage linked to cardiac muscle contraction?**

A. Nucleus

B. Smooth Endoplasmic Reticulum

C. Rough Endoplasmic Reticulum

D. Golgi apparatus

*The smooth endoplasmic reticulum is indeed responsible for calcium storage, particularly in muscle cells, including cardiac muscle. This organelle plays a vital role in the regulation of calcium ions, which are crucial for muscle contraction. During cardiac muscle contraction, calcium ions are released from the smooth endoplasmic reticulum into the cytoplasm, where they bind to proteins that initiate the contraction process. In cardiac cells, the release and reuptake of calcium ions are essential for the rhythmic contraction of the heart. The smooth endoplasmic reticulum, particularly in muscle cells, is specialized for this function, as it has the necessary structures and mechanisms to store and release calcium efficiently. This process is fundamental to the overall mechanics of heart function and ensures that contractions are timely and effective. In contrast, the other organelles do not have this specific role in calcium storage related to muscle contraction. The nucleus primarily functions in storing genetic material and controlling cellular activities. The rough endoplasmic reticulum is involved in protein synthesis due to its ribosome-studded surface and does not play a direct role in calcium storage. The Golgi apparatus is involved in modifying, sorting, and packaging proteins and lipids but also does not participate in calcium regulation.*

**6. A scientist creates an artificial cell with a selectively permeable membrane allowing only water to pass and injects a 5 M glucose solution. What effect would you expect to observe after an hour?**

A. Glucose moves out of the cell

B. Water moves into the cell

C. Glucose concentration evens out

D. No net movement occurs

*In the scenario presented, the artificial cell has a selectively permeable membrane that allows only water to pass through, while the glucose solution remains on the outside. The principle at play here is osmosis, which is the movement of water across a selectively permeable membrane from an area of lower solute concentration to an area of higher solute concentration. Since the outside solution is a 5 M glucose solution, it is hypertonic compared to the interior of the artificial cell, which likely has a lower concentration of solutes (assuming it contains mostly just water). Therefore, water will move from inside the cell, where there is a higher concentration of water (and lower concentration of solutes), to the outside where the concentration of solutes (glucose) is higher. This movement of water into the hypertonic solution will continue until there is an equilibrium reached, or until the concentration of solutes becomes equal on both sides of the membrane. Therefore, you would expect to observe that water moves into the cell from the outside environment over the course of an hour.*

## 7. The carbohydrate matrix in bacterial cell walls is linked together by what type of components?

A. Fatty acids

B. Nucleotides

C. Amino acids

D. Monosaccharides

*The carbohydrate matrix in bacterial cell walls is primarily composed of peptidoglycan, which is a polymer of sugars (specifically, N-acetylglucosamine and N-acetylmuramic acid) and short peptide chains. The carb component of this structure, the sugars, are linked together by peptide bonds that involve amino acids. This linkage between carbohydrate and peptide components forms a rigid framework essential for maintaining the structural integrity of the cell wall, allowing bacteria to withstand osmotic pressure. Thus, the presence of amino acids in these peptide chains is critical to forming these connections, making them the correct choice in regards to how the carbohydrate matrix is linked together in bacterial cell walls. While fatty acids, nucleotides, and monosaccharides play various roles in cellular structures and functions, they do not specifically provide the linking mechanism for the carbohydrate components of the bacterial cell wall, which is fundamentally characterized by its peptidoglycan structure.*

## 8. In untreated diabetes mellitus, what happens to glucose levels in the urine?

A. They remain constant

B. They are absent

C. They are often elevated

D. They decrease significantly

*In untreated diabetes mellitus, glucose levels in the urine are often elevated. This occurs when blood glucose levels exceed the renal threshold, which is the point at which the kidneys can no longer effectively reabsorb glucose back into the bloodstream. When this threshold is surpassed, excess glucose spills over into the urine, resulting in glucosuria, or the presence of glucose in the urine. The elevation of glucose in the urine is a significant indicator of poorly managed diabetes. It reflects the body's inability to utilize glucose properly due to either insufficient insulin production (as in type 1 diabetes) or insulin resistance (as commonly seen in type 2 diabetes). This condition can lead to increased urinary frequency and dehydration, as the presence of glucose draws water into the urine, exacerbating the symptoms of diabetes. Other options do not accurately describe the situation in untreated diabetes mellitus. For instance, if glucose levels were absent, it would indicate normal glucose metabolism, which is not the case in the context of untreated diabetes. The notion of glucose levels remaining constant does not account for the physiological changes occurring in response to high blood sugar levels. Additionally, a significant decrease in glucose levels in urine would be contradictory to the condition, as untreated diabetes leads to an increase rather than a decrease*

**9. In plant cells, where is the water primarily found when in a hypotonic solution?**

A. Cytoplasm

B. Cell membrane

C. Central vacuole

D. Chloroplasts

*In plant cells, when in a hypotonic solution, water primarily accumulates in the central vacuole. The central vacuole is a large, membrane-bound organelle that plays a crucial role in maintaining turgor pressure within the cell. In a hypotonic environment, where the concentration of solutes outside the cell is lower than that inside, water enters the cell through osmosis. This influx of water is stored in the central vacuole, allowing the plant cell to maintain its structure and rigidity. The central vacuole also serves other functions, including storage of nutrients and waste products, and it helps in the regulation of the cell's internal environment. Therefore, its ability to hold large amounts of water is vital for the plant's overall health and stability, particularly in hypotonic conditions. When water fills the central vacuole, it exerts pressure against the cell wall, reinforcing the plant's shape and preventing wilting.*

**10. In the reaction where glyceraldehyde-3-phosphate + NAD+ yields 1,3-biphosphoglycerate + NADH, what happens to NAD+?**

A. It is oxidized

B. It is reduced

C. It remains unchanged

D. It is hydrolyzed

*In the reaction where glyceraldehyde-3-phosphate combines with NAD+ to produce 1,3-biphosphoglycerate and NADH, NAD+ acts as an electron acceptor. During this process, NAD+ undergoes a reduction, which means it gains electrons and is converted into NADH. In biochemical terms, reduction refers to the gain of electrons or hydrogen ions, while oxidation refers to the loss of electrons or hydrogen. Here, the glyceraldehyde-3-phosphate is oxidized; as it loses electrons, these electrons are captured by NAD+, resulting in the formation of NADH. Thus, the reduction of NAD+ is a key aspect of this reaction, as it allows the transfer of energy within the cell and the regeneration of NADH, which can be utilized in various metabolic pathways, including cellular respiration. Consequently, the correct answer is that NAD+ is reduced in this reaction, as it is transformed from an oxidized state to a reduced state (NADH). This highlights the important role NAD+ plays in facilitating cellular energy metabolism and the interconnectedness of oxidation-reduction reactions in biochemistry.*

# 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://emccbiology2.examzify.com

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