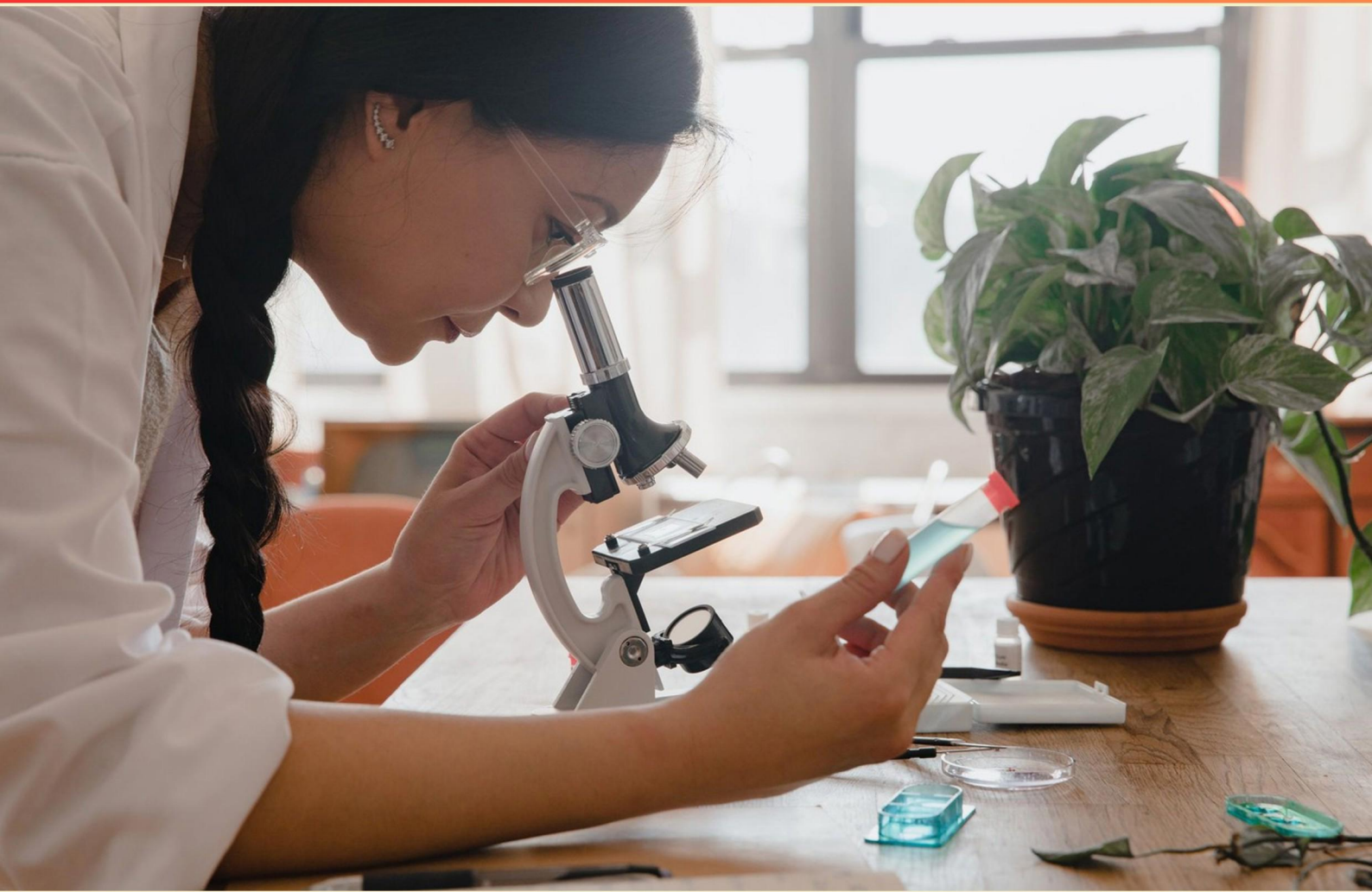


USA BIOLOGY OLYMPIAD (USABO) PRACTICE EXAM (SAMPLE)

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

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- 1. Which of the following is an effect of insulin release?**
 - A. Increased blood glucose levels
 - B. Decreased glycogen stores in liver cells
 - C. Increased glycogen synthesis
 - D. Increased fat breakdown
- 2. Which phase of the cell cycle is characterized by cell growth and preparation for division?**
 - A. G1 phase
 - B. S phase
 - C. G2 phase
 - D. M phase
- 3. What symptom would most likely be present in a patient suffering from kidney failure?**
 - A. Low blood pressure
 - B. Higher salt concentration in the blood
 - C. Improved urine production
 - D. Decreased thirst
- 4. Which of the following compounds is a product of the Calvin cycle?**
 - A. ATP
 - B. PGA
 - C. Glucose
 - D. Oxygen
- 5. What is the significance of obtaining telomeres during chromosome functionality assessment?**
 - A. They regulate gene expression
 - B. They protect chromosome ends from degradation
 - C. They assist in centromere formation
 - D. They are sites of DNA transcription

- 6. How do steroid hormones differ from most polypeptide hormones regarding cellular permeability?**
- A. Cannot cross cell membranes
 - B. Are stored in vesicles
 - C. Diffuse across cell membranes
 - D. Bind to surface receptors
- 7. What is a likely consequence of replacing a lysine with a glycine in a protein?**
- A. Loss of a negatively charged side chain
 - B. Increased binding affinity for substrates
 - C. Altered protein folding and stability
 - D. Improved enzymatic activity
- 8. Which hormone's production is decreased when a person takes cortisol medication?**
- A. CRF
 - B. ACTH
 - C. Insulin
 - D. Adrenaline
- 9. What role do sclerenchyma cells play in plant structure?**
- A. Transport of nutrients
 - B. Photosynthesis
 - C. Providing support for the plant body
 - D. Water storage
- 10. What is the likely result if a chemical inhibits proton diffusion out of the thylakoid through ATP synthase?**
- A. The proton motive force decreases
 - B. The light reaction rate increases
 - C. The proton motive force increases
 - D. No effect on ATP production

Answers

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

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Explanations

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1. Which of the following is an effect of insulin release?

- A. Increased blood glucose levels
- B. Decreased glycogen stores in liver cells**
- C. Increased glycogen synthesis
- D. Increased fat breakdown

The correct choice illustrates the role of insulin in regulating glucose and energy metabolism. Insulin is a hormone produced by the pancreas that primarily lowers blood glucose levels when they are elevated, such as after eating. One of the key effects of insulin is to promote glycogen synthesis in the liver and muscle tissues. When insulin is released, it encourages the conversion of glucose into glycogen, which is then stored in the liver and muscles. This action directly contradicts the idea of decreased glycogen stores; instead, insulin facilitates the increase in glycogen stores. The hormone activates various enzymes that aid in glycogen synthesis while inhibiting glycogenolysis, the breakdown of glycogen. This process is crucial because it helps to regulate energy storage and maintain blood glucose homeostasis after food intake. Moreover, insulin also contributes to lipid metabolism by promoting fat storage and inhibiting fat breakdown, further emphasizing its role as an anabolic hormone that builds up energy stores. This is why increased fat breakdown would not be a correct answer, as insulin functions to promote energy storage rather than its mobilization for immediate use. In summary, the correct choice reflects the fundamental metabolic effects of insulin in promoting glycogen synthesis and storage.

2. Which phase of the cell cycle is characterized by cell growth and preparation for division?

- A. G1 phase**
- B. S phase
- C. G2 phase
- D. M phase

The G1 phase, or Gap 1 phase, is a crucial part of the cell cycle characterized primarily by cell growth and preparation for DNA synthesis. During this phase, the cell increases in size, synthesizes a variety of proteins, and generates the necessary organelles and resources required for DNA replication. The G1 phase is essential for ensuring that the cell is adequately prepared for the subsequent S phase, where DNA synthesis occurs. It involves various checkpoints that assess the cell's conditions, such as size and nutrient availability, which help decide whether the cell will continue to the next phase. If conditions are not favorable, the cell may enter a quiescent state known as G0. In contrast, the S phase is where DNA replication takes place, and the G2 phase is focused on further growth and preparation for mitosis, including the synthesis of proteins necessary for mitosis. The M phase, or mitosis, is the phase where the actual division of the cell occurs, leading to the formation of two daughter cells. Hence, the defining feature of the G1 phase as a preparatory period emphasizes its importance in the cell cycle.

3. What symptom would most likely be present in a patient suffering from kidney failure?

- A. Low blood pressure
- B. Higher salt concentration in the blood**
- C. Improved urine production
- D. Decreased thirst

In cases of kidney failure, the kidneys are unable to effectively filter waste products from the blood, leading to an accumulation of various substances, including salts and other electrolytes. The kidneys normally play a critical role in regulating the body's salt balance, and when they fail, the ability to excrete excess sodium and other solutes is impaired. As a result, this can cause a higher concentration of salt in the blood, referred to as hypernatremia. This accumulation occurs because the kidneys are not able to remove the salt consumed through diet, which is significant given that the body relies on the kidneys to maintain homeostasis of electrolyte levels. Patients with kidney failure often exhibit symptoms related to fluid overload, hypertension, and imbalances in electrolytes, including an increased concentration of salt in their blood. Other options do not align with the typical presentations of kidney failure. For instance, low blood pressure can be a consequence of fluid overload or other factors but is not as definitive as high salt concentration. Improved urine production is generally not observed during kidney failure since the kidneys are compromised, leading to decreased urine output. Decreased thirst is also not a common symptom; patients might actually experience increased thirst due to imbalances and excess retention of fluids and electrolytes.

4. Which of the following compounds is a product of the Calvin cycle?

- A. ATP
- B. PGA
- C. Glucose**
- D. Oxygen

The Calvin cycle, also known as the dark reactions or light-independent reactions of photosynthesis, primarily takes place in the stroma of chloroplasts. This cycle is vital for converting carbon dioxide and other compounds into glucose, which serves as a fundamental energy source for plants. During the Calvin cycle, the enzyme RuBisCO catalyzes the fixation of carbon dioxide, and the resulting 3-carbon molecule is 3-phosphoglycerate (PGA). However, while PGA is an intermediate in the cycle, it is not the final product. Instead, through a series of reduction and regeneration steps, ATP and NADPH (produced in the light-dependent reactions) drive the conversion of these intermediates into glucose, a crucial carbohydrate that plants can store and utilize for energy. Glucose is ultimately produced from the carbon fixation occurring in the Calvin cycle, making it the correct answer to the question. Other incorrect options include ATP, which is involved as an energy source but is not a product of the cycle; PGA, which is an intermediate formed during the process but not the end product; and oxygen, which is a byproduct of the light-dependent reactions rather than the Calvin cycle.

5. What is the significance of obtaining telomeres during chromosome functionality assessment?

- A. They regulate gene expression
- B. They protect chromosome ends from degradation**
- C. They assist in centromere formation
- D. They are sites of DNA transcription

The significance of obtaining telomeres during chromosome functionality assessment lies primarily in their role of protecting chromosome ends from degradation. Telomeres are repetitive nucleotide sequences located at the ends of chromosomes, serving as protective caps that prevent the loss of important genetic information during DNA replication. When cells divide, the replication process cannot completely duplicate the very ends of linear chromosomes, which can lead to the gradual shortening of chromosomal DNA. Telomeres mitigate this issue by acting as buffers; they ensure that essential coding DNA remains intact. Additionally, without intact telomeres, chromosomes are at risk of fusion, degradation, or activation of DNA damage responses, all of which can lead to genomic instability and various cellular dysfunctions, such as senescence and apoptosis. This protective function is crucial for maintaining chromosome stability, which in turn is essential for proper cell division and function. Therefore, understanding telomeres can provide insights into cellular aging, cancer biology, and genetic disorders, making their assessment a vital component of chromosome functionality evaluation.

6. How do steroid hormones differ from most polypeptide hormones regarding cellular permeability?

- A. Cannot cross cell membranes
- B. Are stored in vesicles
- C. Diffuse across cell membranes**
- D. Bind to surface receptors

Steroid hormones differ from most polypeptide hormones in their structure and, consequently, their ability to interact with cell membranes. Steroid hormones are derived from cholesterol and are lipophilic (fat-soluble) in nature. This characteristic allows them to easily diffuse across the lipid bilayer of cell membranes without the need for transport mechanisms. Once inside the target cell, steroid hormones can bind to specific intracellular receptors, and the hormone-receptor complex can then influence gene expression by interacting with the DNA in the nucleus. This mechanism stands in contrast to most polypeptide hormones, which are generally hydrophilic (water-soluble) and cannot pass through the lipid bilayer of cell membranes. Instead, polypeptide hormones typically bind to receptors on the surface of the cell, triggering a series of intracellular responses without entering the cell. Thus, the ability of steroid hormones to diffuse across cell membranes is a fundamental aspect of their function, enabling them to initiate physiological responses directly within the cell.

7. What is a likely consequence of replacing a lysine with a glycine in a protein?

- A. Loss of a negatively charged side chain**
- B. Increased binding affinity for substrates
- C. Altered protein folding and stability
- D. Improved enzymatic activity

The replacement of lysine with glycine in a protein typically leads to altered protein folding and stability. Lysine has a positively charged side chain due to its amino group, which can participate in various interactions, including ionic bonds and hydrogen bonds. This characteristic plays a critical role in maintaining the protein's structure and function. On the other hand, glycine is the smallest amino acid with a simple hydrogen side chain, providing flexibility without the charge. This replacement can disrupt existing interactions crucial for maintaining the protein's conformation, potentially leading to changes in folding and overall stability. Depending on the context of the protein and its function, this alteration can have significant consequences in biological processes. Whereas one could consider the aspect of electrostatic interactions by pointing out that a positively charged side chain is lost with the substitution of glycine, the more pronounced effect is usually on the protein's folding and stability. Thus, the changes in properties and interactions due to this modification make altered protein folding and stability a more compelling outcome.

8. Which hormone's production is decreased when a person takes cortisol medication?

- A. CRF
- B. ACTH**
- C. Insulin
- D. Adrenaline

The choice is based on how the body regulates hormone levels through feedback mechanisms. When a person takes cortisol medication, the external supply of cortisol leads to an increase in circulating cortisol levels in the body. The hypothalamus responds to elevated cortisol levels by reducing the production of corticotropin-releasing factor (CRF), which is the hormone that stimulates the anterior pituitary gland to release adrenocorticotrophic hormone (ACTH). As cortisol levels remain elevated due to medication, the pituitary gland senses this increase and subsequently decreases the secretion of ACTH. Lower ACTH levels reduce stimulation of the adrenal glands, which in turn lowers the production of cortisol from the adrenal cortex. The decrease in ACTH is a critical part of the negative feedback loop that regulates hormone levels in the hypothalamic-pituitary-adrenal (HPA) axis. This mechanism helps maintain homeostasis and ensures that cortisol levels do not become excessively high, which can be detrimental to health. Therefore, the correct answer is that the production of ACTH is decreased when a person takes cortisol medication.

9. What role do sclerenchyma cells play in plant structure?

- A. Transport of nutrients
- B. Photosynthesis
- C. Providing support for the plant body**
- D. Water storage

Sclerenchyma cells play a critical role in supporting the plant body due to their structural characteristics. These cells are typically thick-walled and often contain lignin, which provides rigidity and strength. There are two main types of sclerenchyma cells: fibers, which are long and slender, and sclereids, which are typically shorter and more irregular in shape. By providing mechanical support, sclerenchyma cells enable plants to maintain their structure, resist external stresses, and support the weight of larger structures, such as leaves and flowers. This support is essential for plants to grow upright and reach towards sunlight, which is vital for their photosynthesis process. Additionally, the robustness provided by sclerenchyma cells allows plants to withstand various environmental conditions, such as wind and gravity, thus contributing significantly to plant survival and overall fitness. In contrast, other options do not align with the primary function of sclerenchyma. For example, while some cells are involved in nutrient transport or water storage, these functions are typically associated with other specialized cell types, such as parenchyma or xylem and phloem cells. Similarly, photosynthesis is carried out mainly by mesophyll cells in leaves, not by sclerenchyma

10. What is the likely result if a chemical inhibits proton diffusion out of the thylakoid through ATP synthase?

- A. The proton motive force decreases
- B. The light reaction rate increases
- C. The proton motive force increases**
- D. No effect on ATP production

Inhibiting proton diffusion out of the thylakoid through ATP synthase would prevent protons from moving back into the stroma, which is crucial for ATP synthesis during the light reactions of photosynthesis. Normally, as protons flow down their concentration gradient via ATP synthase, this process drives the conversion of ADP and inorganic phosphate into ATP, fueled by the proton motive force. When the diffusion of protons is inhibited, the buildup of protons inside the thylakoid lumen would increase, leading to a greater concentration gradient across the thylakoid membrane. The increased concentration of protons would enhance the proton motive force, as it is dependent on both the difference in proton concentration and electrical charge across the membrane. Although ATP synthase would be inhibited and unable to utilize this gradient effectively for ATP production, the actual force driving protons across the membrane would be heightened due to the increased proton concentration. This scenario highlights that while ATP production may be impaired, the fundamental components and driving forces behind proton transport are affected in a way that increases the proton motive force. Understanding the relationship between proton concentration, the functionality of ATP synthase, and the implications on the proton motive force is essential in grasping how inhibiting proton diffusion impacts photosynthesis

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://usabiologyolympiad-usabo.examzify.com>

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

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