ACS Biochemistry Practice Exam (Sample)

Study Guide

Everything you need from our exam experts!

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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 steps in glycolysis are primarily responsible for ATP production?

A. Steps 5 and 7

B. Steps 3 and 6

C. Steps 7 and 10

D. Steps 1 and 9

2. What characterizes a Type I integral membrane protein?

A. N-terminus is inside and C-terminus is outside

B. C-terminus is inside and N-terminus is outside

C. Contains unconnected protein helices

D. Has a glycosylated extracellular domain

3. During hydrophobic chromatography, which solvent is commonly used for elution?

A. Water

B. Acetonitrile

C. Ethyl acetate

D. Acetic acid

4. What type of linkage is used to form cellulose?

A. Alpha-1,4 linkage

B. Beta-1,4 linkage

C. Alpha-1,6 linkage

D. Beta-1,6 linkage

5. Chitin is primarily made up of which monomer?

A. Alpha-D-glucose

B. N-acetyl-ß-D-glucosamine

C. Cellulose

D. Glycogen

6. What happens during Step 1 of epinephrine signal transduction?

A. Epinephrine is degraded

B. Epinephrine binds to its specific receptor

C. GTP is hydrolyzed

D. Receptor undergoes internalization

7. Which substrate is essential for the activity of phosphofructokinase-1 (PFK-1)?

A. ADP.

B. Fructose 6-phosphate.

C. Glucose.

D. Pyruvate.

8. How does an increase in hydrogen ion concentration affect hemoglobin's binding affinity for oxygen?

A. It increases the binding affinity for oxygen

B. It decreases the binding affinity for oxygen

C. It has no effect on the binding affinity

D. It binds oxygen irreversibly

9. What does denaturation often conclude with in the context of protein structure?

A. Enhanced function

B. Irreversible alteration

C. Complete stability

D. Prevention of protein aggregation

10. What type of intermediate is involved in cholesterol synthesis?

A. Amino acids

B. Fatty acids

C. Intermediates derived from acetyl-CoA

D. Simple sugars

Answers

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

Explanations

1. Which steps in glycolysis are primarily responsible for ATP production?

A. Steps 5 and 7

B. Steps 3 and 6

C. Steps 7 and 10

D. Steps 1 and 9

In glycolysis, the steps primarily responsible for ATP production are those that involve substrate-level phosphorylation, which occurs at specific points during the pathway. Steps 7 and 10 are crucial in this context. Step 7 involves the conversion of 1,3-bisphosphoglycerate to 3-phosphoglycerate, catalyzed by the enzyme phosphoglycerate kinase. In this reaction, an inorganic phosphate (Pi) is used to add a phosphate group to ADP, resulting in the formation of ATP. This is a clear example of substrate-level phosphorylation, where ATP is generated directly from a substrate. Step 10 is another critical step in glycolysis, where phosphoenolpyruvate (PEP) is converted to pyruvate, catalyzed by pyruvate kinase. Similar to step 7, this step also results in the production of ATP through substrate-level phosphorylation. The energy released from the high-energy bond in the PEP molecule is used to convert ADP into ATP. These two steps are the only points in glycolysis where ATP is produced directly through substrate-level phosphorylation, distinguishing them as the primary contributors to ATP production within the glycolytic pathway.

2. What characterizes a Type I integral membrane protein?

A. N-terminus is inside and C-terminus is outside

B. C-terminus is inside and N-terminus is outside

C. Contains unconnected protein helices

D. Has a glycosylated extracellular domain

A Type I integral membrane protein is characterized by its orientation within the membrane, where its N-terminus is located outside the cell (extracellular) and its C-terminus is inside the cell (cytoplasmic). This structural arrangement is typical for Type I proteins, allowing them to participate in various cellular functions such as receptor activity and signal transduction. The extracellular portion can be involved in interactions with ligands or other extracellular molecules, while the cytoplasmic tail may interact with signaling cascades or cytoskeletal components. The other options refer to aspects that do not define the fundamental structure of Type I integral membrane proteins. While it's true that Type I proteins may have glycosylated extracellular domains, this feature is not exclusive to Type I proteins alone and does not describe the membrane orientation. Additionally, the presence of unconnected protein helices does not align with the stable, single-pass structure that characterizes Type I proteins. Understanding the specific orientation and structural features of these membrane proteins is crucial for comprehending their functions and roles within cellular processes.

3. During hydrophobic chromatography, which solvent is commonly used for elution?

A. Water

B. Acetonitrile

C. Ethyl acetate

D. Acetic acid

In hydrophobic chromatography, the primary goal is to separate compounds based on their hydrophobic (water-repelling) characteristics. Typically, a chromatography medium is designed with hydrophobic regions that interact strongly with non-polar molecules. During the elution process, it is essential to disrupt these interactions to selectively release the bound proteins or compounds. Acetonitrile is commonly used as an elution solvent in hydrophobic chromatography due to its relatively low polarity compared to water. It increases the solvent's ability to solvate more hydrophobic compounds, allowing them to elute from the stationary phase. The non-polar nature of acetonitrile helps decrease the interaction between the bound molecules and the stationary phase, facilitating their release. In contrast, water, being polar, would not effectively elute non-polar compounds from the hydrophobic stationary phase, as it does not weaken the hydrophobic interactions. Ethyl acetate, while it is somewhat hydrophobic, does not provide the optimal elution strength that acetonitrile does in most cases. Acetic acid, although it has some hydrophobic character, is primarily a polar solvent and similarly would not serve as an effective eluent in this context. Thus, acetonitrile stands out as the preferred el

4. What type of linkage is used to form cellulose?

A. Alpha-1,4 linkage

B. Beta-1,4 linkage

C. Alpha-1,6 linkage

D. Beta-1,6 linkage

Cellulose is a polysaccharide that serves as a structural component in the cell walls of plants. The correct mechanism for its formation involves a specific type of glycosidic linkage. In cellulose, glucose molecules are linked together through beta-1,4-glycosidic bonds. The beta configuration in the glycosidic bond allows the glucose units to form long, straight chains, which can pack closely together and form hydrogen bonds with adjacent chains. This results in a strong, rigid structure, essential for maintaining the integrity and strength of plant cell walls. The nature of the beta linkage contributes to the distinctive properties of cellulose, allowing it to be less soluble and more stable than other polysaccharides like starch, which employs alpha linkages. In contrast, alpha linkages, whether 1,4 or 1,6, would lead to a very different structure, resulting in branched configurations typical of starch and glycogen. Therefore, the use of beta-1,4 linkages is crucial for the unique characteristics of cellulose as a sturdy structural polymer in biology.

5. Chitin is primarily made up of which monomer?

A. Alpha-D-glucose

B. N-acetyl-ß-D-glucosamine

C. Cellulose

D. Glycogen

Chitin is primarily composed of N-acetyl-ß-D-glucosamine, which is a derivative of glucose. It is a polymer that features repeating units of this specific amino sugar, linked together by beta-1,4-glycosidic bonds. The presence of the N-acetyl group distinguishes chitin from cellulose, which consists solely of glucose units. This structural characteristic contributes to the unique physical properties of chitin, making it a vital component in the exoskeletons of arthropods and the cell walls of fungi. The other choices represent polysaccharides or sugars that do not specifically relate to the composition of chitin. For instance, alpha-D-glucose is the precursor unit for starch and glycogen but does not form chitin. Cellulose consists of linear chains of glucose units, and glycogen is a branched polysaccharide made of glucose as well, but neither are related in structure or function to chitin. Thus, the correct answer reflects the specific monomeric building block that constitutes chitin.

6. What happens during Step 1 of epinephrine signal transduction?

A. Epinephrine is degraded

B. Epinephrine binds to its specific receptor

C. GTP is hydrolyzed

D. Receptor undergoes internalization

During Step 1 of epinephrine signal transduction, epinephrine binds to its specific receptor, which is a crucial initial event in the signaling cascade. This interaction occurs at the cell membrane, where epinephrine acts as a ligand for the adrenergic receptors, specifically the beta-adrenergic receptors in this context. When epinephrine binds to these receptors, it induces a conformational change in the receptor that activates it, allowing it to interact with and activate the associated G-protein (Gα). This process is essential as it sets in motion a series of downstream signaling events that lead to physiological responses such as increased heart rate, blood pressure, and energy mobilization. The binding of the hormone to the receptor is akin to a key fitting into a lock, enabling the signaling pathway to be activated which ultimately results in the desired cellular response. Understanding this initial step is vital to comprehend how extracellular signals are communicated within the cell and trigger specific biological responses, making it a foundational concept in signal transduction pathways.

7. Which substrate is essential for the activity of phosphofructokinase-1 (PFK-1)?

A. ADP.

B. Fructose 6-phosphate.

C. Glucose.

D. Pyruvate.

The essential substrate for the activity of phosphofructokinase-1 (PFK-1) is fructose 6-phosphate. PFK-1 is a key regulatory enzyme in the glycolytic pathway, responsible for phosphorylating fructose 6-phosphate to fructose 1,6-bisphosphate. This reaction is a crucial point of control for the pathway, making fructose 6-phosphate integral to the enzyme's function. The activity of PFK-1 is finely tuned by various factors, including energy status in the cell; however, the direct substrate required for its catalytic action is fructose 6-phosphate, affirming its central role in glycolysis. ADP is important in the context of energy regulation but does not serve as a substrate for PFK-1. Glucose is upstream of this reaction and is converted into fructose 6-phosphate before it can enter the pathway. Pyruvate is a product of glycolysis rather than a substrate for PFK-1, as it is formed after the action of this enzyme. Thus, fructose 6-phosphate is the only correct choice that directly pertains to PFK-1's enzymatic activity.

8. How does an increase in hydrogen ion concentration affect hemoglobin's binding affinity for oxygen?

A. It increases the binding affinity for oxygen

B. It decreases the binding affinity for oxygen

C. It has no effect on the binding affinity

D. It binds oxygen irreversibly

An increase in hydrogen ion concentration, which corresponds to a decrease in pH, influences hemoglobin's binding affinity for oxygen through the Bohr effect. This physiological phenomenon describes how increased concentrations of carbon dioxide and protons (H+) promote the release of oxygen from hemoglobin. When the pH drops due to elevated hydrogen ions, the structure of hemoglobin is altered. The increased proton concentration leads to the protonation of certain amino acid residues in hemoglobin, which stabilizes the deoxygenated form of the molecule. This stabilization promotes a shift toward the T state (tense state) of hemoglobin, a conformation that has a lower affinity for oxygen. Consequently, hemoglobin is less able to bind oxygen effectively, facilitating the release of oxygen to tissues that require it, particularly in metabolically active areas where CO_2 is being produced and pH is lowered. Therefore, the answer that indicates a decrease in the binding affinity for oxygen due to an increase in hydrogen ion concentration correctly captures the relationship explained by the Bohr effect and its impact on oxygen transport in the body.

9. What does denaturation often conclude with in the context of protein structure?

A. Enhanced function

B. Irreversible alteration

C. Complete stability

D. Prevention of protein aggregation

Denaturation of a protein refers to the process where it loses its native conformation due to the breaking of non-covalent interactions that are essential for maintaining its three-dimensional structure. This can occur due to factors such as changes in temperature, pH, or exposure to chemicals. When a protein is denatured, it often results in an irreversible alteration of its structure. This is because the specific folding necessary for its functional state is lost, and many of the original weak interactions cannot spontaneously reform in the absence of the specific conditions that kept the protein folded initially. The consequences of denaturation include loss of biological function, as enzymes often depend on their unique shapes to catalyze reactions. The lack of restoration in the original structure means the protein may not regain its function, thereby leading to a long-term impairment in activity. In some cases, denatured proteins may aggregate, but this does not imply any stability or function. Therefore, in the context of protein structure, denaturation concluding with an irreversible alteration emphasizes the profound impact of this process on the protein's ability to perform its biological role.

10. What type of intermediate is involved in cholesterol synthesis?

A. Amino acids

B. Fatty acids

C. Intermediates derived from acetyl-CoA

D. Simple sugars

In the biosynthesis of cholesterol, intermediates play a crucial role in the conversion of basic building blocks into a more complex molecule. The correct answer involves intermediates derived from acetyl-CoA, specifically through the mevalonate pathway. This pathway begins with the condensation of two molecules of acetyl-CoA to form acetoacetyl-CoA, which is then converted into HMG-CoA. HMG-CoA is subsequently reduced to mevalonate, a key step in cholesterol synthesis. Acetyl-CoA itself is a pivotal metabolic molecule generated from the breakdown of carbohydrates, fats, and proteins. It serves as the starting point for various biosynthetic pathways, including the synthesis of fatty acids and cholesterol. The transformation of acetyl-CoA into mevalonate and further into isoprenoid intermediates exemplifies its central role in cholesterol biosynthesis. The other options do not accurately represent the intermediates involved in cholesterol synthesis. While amino acids can serve important roles in various metabolic pathways, they are not directly involved in the synthesis of cholesterol. Similarly, while fatty acids are significant in energy storage and membrane composition, they do not serve as direct intermediates in cholesterol synthesis. Simple sugars, while vital for energy and metabolism, also do not

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://acsbiochem.examzify.com

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