University of Toronto (UofT) BCH210H1 Biochemistry I – Proteins, Lipids and Metabolism Midterm Practice Test (Sample)

Study Guide

BY EXAMZIFY

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. Don’t worry about getting everything right, 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, and take breaks to retain information better.

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.

7. Use Other Tools

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 happens to ATP and phosphocreatine during exercise?**
   - **A. ATP is synthesized, and phosphocreatine is broken down**
   - **B. Both ATP and phosphocreatine are consumed**
   - **C. Phosphocreatine is synthesized, and ATP is broken down**
   - **D. Neither ATP nor phosphocreatine are used**

2. **What is a complication of using BioID?**
   - **A. Highly stable proteins are not labeled**
   - **B. Highly abundant proteins can be labeled even if not interacting**
   - **C. Only low-abundance proteins can be detected**
   - **D. No complications exist with BioID**

3. **What characteristic is true for saturated fatty acids compared to unsaturated fatty acids?**
   - **A. Higher melting temperature and tighter packing**
   - **B. Lower melting temperature and tighter packing**
   - **C. Higher fluidity and lower melting temperature**
   - **D. Higher reactivity and lower metabolic stability**

4. **Phospholipids are hydrolyzed into which second messenger, notably involved in calcium signaling?**
   - **A. DAG**
   - **B. cAMP**
   - **C. IP3**
   - **D. GTP**

5. **How do you select an appropriate buffer for a solution?**
   - **A. It should have a pKa far from the required pH**
   - **B. It should be inexpensive and widely available**
   - **C. It should have a pKa close to the desired pH**
   - **D. It should be a strong acid only**

6. Which amino acids are capable of forming disulfide bonds?

- **A. Histidine**
- **B. Cysteine**
- **C. Lysine**
- **D. Glutamine**

7. What does the opening of a K+ channel face?

- **A. The inside of the cell**
- **B. The outside of the cell**
- **C. The cytoplasm only**
- **D. The extracellular matrix**

8. What is the average of hydrophobic values used for in hydropathy index determination?

- **A. To identify all amino acids**
- **B. To assign to an external residue**
- **C. To assign to the central residue in the window**
- **D. To calculate enzyme activity**

9. What is the primary messenger characterized by?

- **A. Its presence inside the cell**
- **B. Its release from the cell**
- **C. Its role in initiating cellular responses**
- **D. Its location outside the cell**

10. Which of the following is the bilayer not permeable to?

- **A. Gases like N2 and O2**
- **B. Small uncharged molecules**
- **C. Ions like K+, Mg2+, and charged polar molecules**
- **D. Water and urea**

Answers

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

Explanations

1. What happens to ATP and phosphocreatine during exercise?

- **A. ATP is synthesized, and phosphocreatine is broken down**
- B. Both ATP and phosphocreatine are consumed
- C. Phosphocreatine is synthesized, and ATP is broken down
- D. Neither ATP nor phosphocreatine are used

During exercise, the energy demands of muscle cells increase significantly, which leads to rapid consumption of ATP to fuel muscular contractions. ATP, the primary energy currency of the cell, is required for various cellular processes, particularly during high-intensity activities. As ATP is utilized, it does not get synthesized quickly enough to meet the demand, which is where phosphocreatine comes into play. Phosphocreatine serves as a quickly accessible energy reservoir in muscle cells. It can donate a phosphate group to ADP, regenerating ATP in a rapid manner. This process is facilitated by the enzyme creatine kinase. Therefore, during exercise, phosphocreatine is broken down to release energy, which is then used for ATP regeneration. This reaction effectively allows muscles to maintain energy levels for a short duration of high-intensity exercise. Thus, the correct answer is that ATP is synthesized during the breakdown of phosphocreatine. This interplay between ATP and phosphocreatine is crucial for sustaining energy during physical activity, especially in the initial stages of exercise when rapid energy production is necessary.

2. What is a complication of using BioID?

- A. Highly stable proteins are not labeled
- **B. Highly abundant proteins can be labeled even if not interacting**
- C. Only low-abundance proteins can be detected
- D. No complications exist with BioID

Using BioID, a method for studying protein interactions through proximity-dependent labeling, has inherent complications that can impact the results. The chosen answer highlights a significant issue: highly abundant proteins can be labeled even if they are not directly interacting with the protein of interest. This can lead to misleading data regarding what proteins are genuinely interacting in the biological context, as the background labeling from abundant proteins may obscure more nuanced interactions with lower-abundance proteins. In contrast, the stability of proteins (as mentioned in the first option) does not directly influence the labeling process because BioID relies on biotinylation happening in close proximity, regardless of whether the protein is stable or not. The third option incorrectly suggests that only low-abundance proteins can be detected, which misrepresents BioID's capability to label proteins across a range of concentrations. The last choice asserts that there are no complications with BioID, which is misleading since, as indicated, there are specific nuances and potential artifacts of labeling that need careful consideration. Thus, the chosen answer accurately reflects a recognized complication in utilizing the BioID technique.

3. What characteristic is true for saturated fatty acids compared to unsaturated fatty acids?

A. Higher melting temperature and tighter packing

B. Lower melting temperature and tighter packing

C. Higher fluidity and lower melting temperature

D. Higher reactivity and lower metabolic stability

Saturated fatty acids are characterized by having no double bonds between their carbon atoms, which allows them to pack closely together in a straight chain formation. This tighter packing leads to stronger van der Waals forces between the molecules, resulting in a higher melting temperature compared to unsaturated fatty acids, which contain one or more double bonds that introduce kinks in their structure. These kinks prevent the molecules from packing as closely together, resulting in lower melting temperatures and more fluidity. The higher melting temperature of saturated fatty acids makes them solid at room temperature, while unsaturated fatty acids, with their double bonds, tend to be liquid at room temperature due to their looser packing. Therefore, the correct statement highlights the relationship between the molecular structure of saturated fatty acids and their physical properties, specifically that they have a higher melting temperature and exhibit tighter packing compared to unsaturated fatty acids.

4. Phospholipids are hydrolyzed into which second messenger, notably involved in calcium signaling?

A. DAG

B. cAMP

C. IP3

D. GTP

The correct answer is in fact associated with the process of phospholipid hydrolysis, particularly phosphatidylinositol 4,5-bisphosphate (PIP2), which is cleaved by phospholipase C to produce inositol trisphosphate (IP3) and diacylglycerol (DAG). IP3 plays a crucial role as a second messenger in calcium signaling pathways. When IP3 is generated, it diffuses through the cytosol and binds to IP3 receptors on the endoplasmic reticulum, leading to the release of calcium ions into the cytoplasm. This increase in intracellular calcium is essential for various cellular processes, including muscle contraction, neurotransmitter release, and other signaling cascades. DAG, although produced concurrently, primarily activates protein kinase C (PKC) and is not as directly involved in calcium signaling compared to IP3. cAMP, another second messenger, is involved in different signaling pathways, primarily related to hormonal responses and energy metabolism, while GTP is a nucleotide involved in intracellular signaling and energy transfer but not specifically a second messenger derived from phospholipid hydrolysis. Thus, IP3 is the most relevant second messenger arising from the hydrolysis of phospholipids

5. How do you select an appropriate buffer for a solution?

- A. It should have a pKa far from the required pH
- B. It should be inexpensive and widely available
- C. It should have a pKa close to the desired pH
- D. It should be a strong acid only

Selecting an appropriate buffer for a solution is essential to maintain a stable pH, especially in biochemical experiments where reactions are pH-sensitive. The key to optimal buffering capacity lies in the relationship between the pKa of the buffering agent and the desired pH of the solution. When a buffer system is chosen, it should ideally have a pKa that is close to the desired pH of the solution you are working with. This is because the buffering capacity is greatest when the pH is within one unit of the pKa value. At this point, the concentrations of the protonated and deprotonated forms of the buffer are balanced, allowing the solution to resist changes in pH upon the addition of acids or bases. For instance, if you need a solution at pH 7.4, you would look for a buffer with a pKa around that value (e.g., around 7.2 to 8.2). This ensures that any additions of acids or bases are effectively compensated by the buffer, keeping the pH stable. In contrast, if the pKa is far from the desired pH, the buffer system will have a reduced capacity to maintain the pH, leading to fluctuations that could affect experimental outcomes

6. Which amino acids are capable of forming disulfide bonds?

- A. Histidine
- B. Cysteine
- C. Lysine
- D. Glutamine

The ability of amino acids to form disulfide bonds is primarily attributed to cysteine. Cysteine contains a thiol (-SH) group in its side chain. When two cysteine molecules come close together, they can undergo an oxidation reaction, resulting in the formation of a covalent bond between their sulfur atoms. This bond is known as a disulfide bond (–S–S–), and it plays a crucial role in stabilizing the three-dimensional structure of proteins, particularly in extracellular proteins where the environment is more oxidizing. In contrast, histidine, lysine, and glutamine do not possess the thiol group necessary for disulfide bond formation. Histidine has an imidazole side chain that does not lend itself to forming such bonds. Lysine has an amino group in its side chain, while glutamine has an amide group, neither of which can oxidize to form disulfide links. Thus, only cysteine is capable of forming these essential bonds in protein structures.

7. What does the opening of a K+ channel face?

A. The inside of the cell

B. The outside of the cell

C. The cytoplasm only

D. The extracellular matrix

The opening of a K+ channel faces the outside of the cell, which is critical for its function in maintaining the cell's membrane potential and regulating ion homeostasis. K+ channels facilitate the flow of potassium ions across the cell membrane, allowing K+ to move out of the cell when the channel is open. This movement is essential for various physiological processes, such as the generation of action potentials in neurons and muscle cells. Potassium channels are integral membrane proteins with a specific structural orientation that ensures their pore aligns with the extracellular space. When ions flow through these channels, they typically do so in response to differences in concentration and electrical gradients, and the release of K+ into the extracellular fluid helps establish and maintain the negative resting membrane potential of the cell. This functional architecture underpins many cellular processes, including signal transmission and muscle contraction. Understanding the orientation of these channels is therefore fundamental to grasping how cellular excitability and signaling are regulated.

8. What is the average of hydrophobic values used for in hydropathy index determination?

A. To identify all amino acids

B. To assign to an external residue

C. To assign to the central residue in the window

D. To calculate enzyme activity

The average of hydrophobic values in the context of the hydropathy index is used to assign a value to the central residue in a window of amino acids. This method evaluates the hydrophobic or hydrophilic nature of specific regions within a protein sequence. By calculating an average hydropathy value for a segment of amino acids, particularly focusing on the central residue, researchers can obtain insight into the potential structure and function of proteins, especially in membrane-spanning regions. The hydropathy index itself essentially quantifies how hydrophobic or hydrophilic an amino acid is, which is crucial for understanding protein folding and interaction with the lipid bilayer. The individual values contribute to a cumulative understanding of how regions in proteins will behave in biological systems. This specific usage helps in predicting which residues may be more likely to exist in the interior versus the exterior of a folded protein, aiding in structure-function analyses. The other options are less relevant to the context of hydropathy index determination, focusing on broader concepts or specific aspects that do not relate directly to the assignment of average values to residues in the manner described.

9. What is the primary messenger characterized by?

A. Its presence inside the cell

B. Its release from the cell

C. Its role in initiating cellular responses

D. Its location outside the cell

The primary messenger is best characterized by its role in initiating cellular responses. Primary messengers, such as hormones or neurotransmitters, are molecules that transmit signals from one cell to another, often triggering a specific response in the target cell. When a primary messenger binds to its receptor on the surface of a target cell, it induces conformational changes in the receptor, leading to a cascade of intracellular events (often referred to as signal transduction) that ultimately alter cell function. This is the essence of how cells communicate with one another, and the ability of primary messengers to initiate these responses is crucial for the regulation of physiological processes. In addition, the presence of a primary messenger outside the cell is significant as it allows for the interaction with receptors, but the emphasis is on how these molecules elicit a biological response, which is critical in biochemistry and cellular physiology. Thus, the defining characteristic of primary messengers relates to their function in initiating cellular responses.

10. Which of the following is the bilayer not permeable to?

A. Gases like N2 and O2

B. Small uncharged molecules

C. Ions like K+, Mg2+, and charged polar molecules

D. Water and urea

The bilayer's permeability is largely influenced by the size and charge of the molecules trying to cross it. Lipid bilayers are composed of hydrophobic (water-repelling) tails, making it more difficult for charged particles or larger polar molecules to pass through. Ions such as potassium (K+), magnesium (Mg2+), and any charged polar molecules cannot easily cross the lipid bilayer due to their charge, which interacts unfavorably with the hydrophobic core of the membrane. This electrostatic repulsion prevents these ions from moving freely across the bilayer compared to uncharged molecules. In contrast, gases like nitrogen (N2) and oxygen (O2) can readily diffuse through the cytoplasmic membrane because they are small and nonpolar. Small uncharged molecules are generally able to pass through as well, utilizing simple diffusion. Additionally, while water and urea can pass through the membrane to a certain extent, they are still more permeable than charged particles. Thus, charged ions remain the least likely to permeate the lipid bilayer, confirming that the bilayer is not permeable to them.

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://uoft-bch210h1midterm.examzify.com

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