

Biology and Scientific Research Practice Test (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

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- 1. What is one of the key characteristics of lysosomes?**
 - A. Energy production**
 - B. Digestion of waste materials**
 - C. Synthesis of proteins**
 - D. Storage of genetic material**

- 2. Which of the following substances are classified as lipids?**
 - A. Proteins and carbohydrates**
 - B. Amino acids and nucleic acids**
 - C. Fats, oils, waxes, and steroids**
 - D. Simple sugars**

- 3. What are large biomolecules made up of amino acids primarily called?**
 - A. Lipids**
 - B. Proteins**
 - C. Carbohydrates**
 - D. Nucleotides**

- 4. Why is carbon essential in biological molecules?**
 - A. It can only form single bonds**
 - B. It is a good conductor of electricity**
 - C. It forms stable bonds with many elements**
 - D. It is highly reactive with water**

- 5. What term describes the loss of structure and function in proteins due to external factors?**
 - A. Aggregation**
 - B. Denaturation**
 - C. Hydration**
 - D. Degradation**

6. What is the term for the attraction between molecules of the same substance?

- A. Adhesion**
- B. Surface Tension**
- C. Cohesion**
- D. Capillarity**

7. What is the primary focus of mass spectrometry in biological research?

- A. To visualize proteins**
- B. To measure concentrations of chemicals**
- C. To determine the mass of particles**
- D. To analyze genetic sequences**

8. What type of transport uses energy from one molecule's movement to transport another against its gradient?

- A. Passive Transport**
- B. Facilitated Diffusion**
- C. Secondary Active Transport**
- D. Synthetic Diffusion**

9. What is a common function of the bright green organelles within plant cells?

- A. Energy storage**
- B. Photosynthesis**
- C. Cell division**
- D. Respiration**

10. What is the fundamental structure of nucleic acids composed of?

- A. Sugar, phosphate, base**
- B. Amino acids, sugars, phosphates**
- C. Fatty acids, glycerol, phosphates**
- D. Cholesterol, triglycerides, phosphates**

Answers

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

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Explanations

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1. What is one of the key characteristics of lysosomes?

- A. Energy production
- B. Digestion of waste materials**
- C. Synthesis of proteins
- D. Storage of genetic material

Lysosomes are membrane-bound organelles that play a crucial role in cellular digestion and waste management. One of their key characteristics is their ability to break down various biomolecules, including proteins, lipids, carbohydrates, and nucleic acids. This process is facilitated by the presence of hydrolytic enzymes contained within the lysosomes, which are active at the acidic pH inside these organelles. By digesting waste materials and cellular debris, lysosomes help maintain cellular health by recycling components that can be reused and eliminating potentially harmful substances. This function is essential for cellular homeostasis, especially in response to damage or surplus materials that need to be processed. In contrast, energy production is primarily the role of mitochondria, while protein synthesis occurs in ribosomes. The storage of genetic material is a function of the nucleus, where DNA is maintained and regulated. Thus, the digestion of waste materials stands out as the defining characteristic of lysosomes.

2. Which of the following substances are classified as lipids?

- A. Proteins and carbohydrates
- B. Amino acids and nucleic acids
- C. Fats, oils, waxes, and steroids**
- D. Simple sugars

Lipids are a diverse group of hydrophobic organic compounds that play crucial roles in biological systems, primarily in cell membranes, energy storage, and signaling. The substances classified as lipids include fats, oils, waxes, and steroids, which all share common characteristics like being insoluble in water and soluble in nonpolar solvents. Fats and oils, also known as triglycerides, are composed of glycerol and fatty acids and serve as major energy storage molecules. Waxes, which are long-chain fatty acids esterified to long-chain alcohols, are important for protective coatings in plants and animals. Steroids, which include hormones such as cholesterol, have a characteristic structure that allows them to function effectively in cellular signaling and membrane structure. The other options listed do not fall under the lipid category. Proteins and carbohydrates are fundamentally different classes of biomolecules with distinct structures and functions. Amino acids are the building blocks of proteins, and nucleic acids (like DNA and RNA) are involved in genetic information storage and transfer, making them separate from lipid classification. Simple sugars are carbohydrates and serve as a primary energy source but do not possess the properties that define lipids. Therefore, the substances classified as lipids are specifically fats, oils, waxes,

3. What are large biomolecules made up of amino acids primarily called?

- A. Lipids
- B. Proteins**
- C. Carbohydrates
- D. Nucleotides

Large biomolecules made up of amino acids are referred to as proteins. Proteins are fundamental macromolecules in all living organisms and are crucial for a variety of biological functions. They are composed of long chains of amino acids linked together by peptide bonds, which fold into specific three-dimensional shapes that determine their function. Each protein's unique sequence of amino acids, determined by the genetic code, dictates its structure and function, allowing proteins to perform diverse roles such as catalyzing biochemical reactions (as enzymes), providing structural support (like collagen), facilitating communication (like hormones), and aiding in immune responses (such as antibodies). In contrast, lipids consist of fats and oils, carbohydrates are primarily composed of sugars, and nucleotides serve as the building blocks for nucleic acids like DNA and RNA. These distinct groups of biomolecules serve different functions but do not directly involve amino acids in their structures. Thus, the specific association of amino acids with protein formation makes this the correct answer.

4. Why is carbon essential in biological molecules?

- A. It can only form single bonds
- B. It is a good conductor of electricity
- C. It forms stable bonds with many elements**
- D. It is highly reactive with water

Carbon is essential in biological molecules primarily because it forms stable bonds with many elements, including hydrogen, oxygen, nitrogen, and other carbon atoms. This unique bonding capability allows carbon to serve as a fundamental building block of life. Carbon has four valence electrons, which enables it to form four covalent bonds, allowing for a diverse array of complex and stable molecular structures, such as carbohydrates, proteins, lipids, and nucleic acids. The versatility of carbon allows for both the formation of simple structures, like methane, and complex macromolecules, like DNA and proteins, which are critical for the functioning of living organisms. This ability to form chains, branched structures, and rings is crucial for the complexity and diversity of biological molecules, making it possible for life as we know it to exist. Factors such as reactivity with water or electrical conductivity do not directly contribute to carbon's role as a fundamental building block in biological systems, nor does its limitation to only forming single bonds. The stability and versatility of carbon's bonding behavior are what establish its essential role in biology.

5. What term describes the loss of structure and function in proteins due to external factors?

- A. Aggregation**
- B. Denaturation**
- C. Hydration**
- D. Degradation**

The term that describes the loss of structure and function in proteins due to external factors is denaturation. This process occurs when proteins lose their three-dimensional structure, which is crucial for their biological function, as a result of exposure to various environmental changes such as extreme temperatures, pH levels, or chemical agents. During denaturation, the interactions that hold the protein's specific shape together—including hydrogen bonds, ionic bonds, and hydrophobic interactions—are disrupted. As a consequence, the protein may unfold or misfold, leading to a loss of its native structure and thereby impairing its function. Denatured proteins may no longer be able to catalyze reactions, bind to substrates, or participate in cellular processes to the same extent as their properly folded counterparts. In contrast, aggregation typically refers to the clumping together of proteins rather than their structural loss, hydration involves the association of water molecules with solutes, and degradation pertains to the breakdown of the molecule into smaller fragments, rather than a loss of structure while remaining intact in a functional sense.

6. What is the term for the attraction between molecules of the same substance?

- A. Adhesion**
- B. Surface Tension**
- C. Cohesion**
- D. Capillarity**

Cohesion refers to the attraction between molecules of the same substance, which is a fundamental concept in biology and chemistry. This property arises due to intermolecular forces, such as hydrogen bonds in water, causing molecules to stick together. Cohesion is responsible for several important phenomena, including the ability of water to form droplets, the movement of water through plant veins, and its high surface tension. The other terms describe different interactions. Adhesion refers to the attraction between molecules of different substances, which allows materials like water to spread on surfaces. Surface tension describes the elastic-like force at the surface of liquids caused by cohesive forces, which allows some objects to float on a liquid's surface, despite being denser than the liquid. Capillarity, or capillary action, is the phenomenon where liquid rises or falls in a narrow space against gravity, resulting from both cohesion and adhesion interacting in the context of narrow tubes or porous materials. Thus, cohesion specifically focuses on the molecular attraction within the same substance.

7. What is the primary focus of mass spectrometry in biological research?

- A. To visualize proteins**
- B. To measure concentrations of chemicals**
- C. To determine the mass of particles**
- D. To analyze genetic sequences**

Mass spectrometry is primarily focused on determining the mass of particles, which is crucial in various applications within biological research. This technique provides detailed information about the molecular weight and structure of biomolecules, including proteins, lipids, and metabolites, by ionizing chemical species and then analyzing the ions based on their mass-to-charge ratios. In biological contexts, understanding the mass of particles allows researchers to identify and quantify different biomolecules accurately, investigate molecular interactions, and study metabolic pathways. Through this precise measurement, researchers can infer structural and functional information about biological molecules, which is essential for advancing knowledge in fields such as proteomics and metabolomics. While other methods may focus on visualizing proteins, measuring concentrations of chemicals, or analyzing genetic sequences, mass spectrometry uniquely excels in quantifying and characterizing biomolecules based on their mass, making it a fundamental tool in biological research.

8. What type of transport uses energy from one molecule's movement to transport another against its gradient?

- A. Passive Transport**
- B. Facilitated Diffusion**
- C. Secondary Active Transport**
- D. Synthetic Diffusion**

The correct answer is rooted in the concept of secondary active transport, which is an essential mechanism in cellular physiology. Secondary active transport does not use ATP directly, but instead utilizes the energy created from the movement of one molecule down its electrochemical gradient to drive the movement of another molecule against its gradient. In this process, a primary active transport system first establishes a gradient, usually through the use of ATP to pump ions like sodium (Na⁺) or hydrogen (H⁺) out of the cell. Then, as these ions move back into the cell, often through specific transport proteins, they harness their kinetic energy to facilitate the co-transport of another substance, such as glucose or amino acids, against its concentration gradient. This method is crucial for nutrient uptake in many cells, particularly in the intestines and kidneys. Other options like passive transport and facilitated diffusion do not use energy to move substances against their gradients but rather allow movement down a concentration gradient without any added energy expenditure. Synthetic diffusion is not a recognized biological transport process, which eliminates it as a valid choice. Thus, the concept of harnessing energy from one molecule's movement to assist another is what defines secondary active transport accurately.

9. What is a common function of the bright green organelles within plant cells?

- A. Energy storage**
- B. Photosynthesis**
- C. Cell division**
- D. Respiration**

The bright green organelles within plant cells are chloroplasts, which play a vital role in the process of photosynthesis. Photosynthesis is the biochemical process through which plants, algae, and some bacteria convert light energy, usually from the sun, into chemical energy stored in glucose, using carbon dioxide and water. This process not only allows plants to produce their own food but also generates oxygen as a byproduct, which is essential for the survival of aerobic organisms. Chloroplasts contain chlorophyll, the pigment that captures light energy, giving these organelles their distinctive green color. The reactions that occur in chloroplasts transform solar energy into a form that can be used by plants for growth and energy, making their function crucial not only for the plant itself but also for the entire ecosystem, as it supports life on Earth by providing energy and oxygen.

10. What is the fundamental structure of nucleic acids composed of?

- A. Sugar, phosphate, base**
- B. Amino acids, sugars, phosphates**
- C. Fatty acids, glycerol, phosphates**
- D. Cholesterol, triglycerides, phosphates**

The fundamental structure of nucleic acids, such as DNA and RNA, is indeed composed of a sugar, a phosphate group, and a nitrogenous base. This combination forms what are known as the nucleotides, which are the building blocks of nucleic acids. In this context, the sugar provides the backbone of the nucleic acid strand. In DNA, this sugar is deoxyribose, while in RNA, it is ribose. The phosphate group links the sugars of adjacent nucleotides together, forming a strong backbone that is essential for the structural integrity and function of the nucleic acid. The nitrogenous base is responsible for the genetic information; each base pair interacts in specific ways that allow for the storage and transmission of genetic information. This structure is critical for processes such as replication and transcription, where the sequence of bases encodes genetic instructions that are necessary for life. The options discussing amino acids, fatty acids, glycerol, cholesterol, and triglycerides represent components of proteins and lipids, which are not part of nucleic acids.

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://bioscientificresearch.examzify.com>

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

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