

Biology Major Field Test Practice (Sample)

Study Guide



Everything you need from our exam experts!

Copyright © 2025 by Examzify - A Kaluba Technologies Inc. product.

ALL RIGHTS RESERVED.

No part of this book may be reproduced or transferred in any form or by any means, graphic, electronic, or mechanical, including photocopying, recording, web distribution, taping, or by any information storage retrieval system, without the written permission of the author.

Notice: Examzify makes every reasonable effort to obtain from reliable sources accurate, complete, and timely information about this product.

SAMPLE

Questions

SAMPLE

- 1. What does gross primary productivity measure?**
 - A. Total energy produced by decomposers**
 - B. Total amount of chemical energy generated by producers in a given area**
 - C. Net energy after losses are accounted for**
 - D. The energy transferred through the food chain**
- 2. Which of the following describes a neutral stimulus?**
 - A. A stimulus that elicits a response on its own**
 - B. A stimulus that will not elicit a response**
 - C. A stimulus that has been conditioned to elicit a response**
 - D. A stimulus that is always present in the environment**
- 3. Where does O₂ diffusion occur in fish?**
 - A. In the air sacs**
 - B. In the lamellae on filaments of gill arches**
 - C. Inside the opercula**
 - D. In the swim bladder**
- 4. What is the primary function of lysosomes?**
 - A. Energy metabolism**
 - B. Membrane maintenance**
 - C. Digestion of macromolecules**
 - D. Protein synthesis**
- 5. In the context of evolutionary biology, what does natural selection refer to?**
 - A. A random change in gene frequencies**
 - B. The survival and reproduction of organisms better adapted to their environment**
 - C. The introduction of new species**
 - D. Mutations that occur over time**

- 6. What defines intermediate filaments in terms of their structure?**
- A. Thick tubes**
 - B. Thin fibers wound together in tight coils**
 - C. Globular proteins**
 - D. Composite structures made of lipids**
- 7. What term refers to biomolecules that constitute the majority of lipids, carbohydrates, proteins, and nucleic acids?**
- A. Micronutrients**
 - B. Macronutrients**
 - C. Trace elements**
 - D. Organic compounds**
- 8. What is the role of the ATP synthase enzyme?**
- A. To break down glucose molecules**
 - B. To create protons across the membrane**
 - C. To convert ADP to ATP using the proton gradient**
 - D. To transport electrons through the electron transport chain**
- 9. Which of the following requires oxygen to survive?**
- A. Facultative anaerobes**
 - B. Obligate aerobes**
 - C. Obligate anaerobes**
 - D. Aerotolerant anaerobes**
- 10. Which structure is NOT found in prokaryotic cells?**
- A. Nucleus**
 - B. Cell wall**
 - C. Cytoplasm**
 - D. Cell membrane**

Answers

SAMPLE

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

SAMPLE

Explanations

SAMPLE

1. What does gross primary productivity measure?

- A. Total energy produced by decomposers
- B. Total amount of chemical energy generated by producers in a given area**
- C. Net energy after losses are accounted for
- D. The energy transferred through the food chain

Gross primary productivity (GPP) measures the total amount of chemical energy produced by primary producers, such as plants and phytoplankton, in a specific area over a certain time period. This encompasses the energy captured through photosynthesis before any of it is used by the producers for their own metabolic processes, such as respiration. By understanding GPP, ecologists can assess the energy input into an ecosystem and estimate how much energy is available to support herbivores and, subsequently, higher trophic levels. This metric is crucial for evaluating ecosystem health and productivity, giving insights into the efficiency of energy conversion in biological systems. It serves as a foundational concept in ecology, linking the flow of energy from the sun through producers to consumers.

2. Which of the following describes a neutral stimulus?

- A. A stimulus that elicits a response on its own
- B. A stimulus that will not elicit a response**
- C. A stimulus that has been conditioned to elicit a response
- D. A stimulus that is always present in the environment

A neutral stimulus is defined as one that does not initially provoke any intrinsic response from an organism. In the context of behaviorism and conditioning, this means it is a stimulus that, when presented alone, does not elicit a particular response. For instance, in classical conditioning, a sound may initially be neutral but can be paired with an unconditioned stimulus to eventually elicit a conditioned response. The nature of a neutral stimulus is significant, as it serves as the foundation for associative learning. Therefore, the option stating that a neutral stimulus will not elicit a response accurately captures its essence, making it the correct choice. While other concepts involve stimuli that can elicit responses or have been conditioned, those do not align with the definition of a neutral stimulus which inherently lacks any reactive capability on its own.

3. Where does O₂ diffusion occur in fish?

- A. In the air sacs
- B. In the lamellae on filaments of gill arches**
- C. Inside the opercula
- D. In the swim bladder

The correct answer is the lamellae on filaments of gill arches, which are specialized structures in fish gills. Gills extract oxygen from water, and this process relies on the large surface area provided by the lamellae. Each gill filament is lined with lamellae, which are thin, flat structures that facilitate efficient gas exchange. As water flows over these lamellae, oxygen dissolved in the water diffuses across the thin epithelial layer into the blood vessels within the lamellae, where it is then transported to the rest of the body. The significant surface area and the close proximity of blood and water in the lamellae enhance the diffusion process, allowing fish to meet their oxygen requirements effectively while constantly pumping water over their gills. This efficient mechanism is essential for supporting the metabolic needs of fish in an aquatic environment.

4. What is the primary function of lysosomes?

- A. Energy metabolism
- B. Membrane maintenance
- C. Digestion of macromolecules**
- D. Protein synthesis

Lysosomes serve as the cell's digestive system, with their primary function being the breakdown of macromolecules. These specialized membrane-bound organelles contain a variety of hydrolytic enzymes that can break down proteins, nucleic acids, carbohydrates, and lipids into their smaller components. This breakdown process is crucial not only for recycling cellular components but also for the digestion of pathogens and cellular debris, which helps maintain cellular health. The enzymes within lysosomes operate optimally at the acidic pH found inside these organelles, allowing for effective degradation of materials that the cell takes in from the environment or from worn-out cellular components. This digestive function facilitates important processes such as autophagy, where damaged organelles and proteins are degraded and recycled. The efficiency of lysosomes in facilitating cellular digestion and waste removal underpins their essential role in maintaining cellular and organismal homeostasis.

5. In the context of evolutionary biology, what does natural selection refer to?

- A. A random change in gene frequencies
- B. The survival and reproduction of organisms better adapted to their environment**
- C. The introduction of new species
- D. Mutations that occur over time

Natural selection is a fundamental mechanism of evolution, describing the process through which certain traits become more common in a population due to the survival and reproduction advantages they confer to individuals in their specific environments. It operates on the principle that individuals within a species exhibit variations in their traits, and these variations can impact their ability to survive and reproduce. The concept aligns with the idea that organisms best suited to their environment tend to survive and reproduce at higher rates than those less suited. This selective pressure can lead to changes in the population over generations, as beneficial traits become more prevalent. This process helps explain the adaptation of species to their environments, resulting in increased fitness, which is a measure of reproductive success. The other options describe processes related to biology but do not capture the specific mechanism of natural selection. Random changes in gene frequencies refer to genetic drift, the introduction of new species pertains to speciation, and mutations contribute to genetic variation, but they do not inherently drive the selection process that favors certain traits over others.

6. What defines intermediate filaments in terms of their structure?

- A. Thick tubes
- B. Thin fibers wound together in tight coils**
- C. Globular proteins
- D. Composite structures made of lipids

Intermediate filaments are structural components within cells that provide mechanical support and strength. Their defining characteristic is their composition, which consists of a network of thin fibers that are wound together to form strong, rope-like structures. This arrangement allows them to withstand tension and provide resilience to cells. Intermediate filaments differ from other types of cytoskeletal elements, such as microtubules and microfilaments, which have distinct structures and functions. Microtubules are hollow tubes made of tubulin, while microfilaments are composed of actin and are involved in more dynamic processes like cell movement. The unique winding of the protein subunits in intermediate filaments contributes to their stability and protective role against shear forces, making them crucial for maintaining cellular integrity and tissue architecture. Thus, the characterization of intermediate filaments as thin fibers wound together in tight coils captures their structural properties and functional significance in a way that accurately reflects their role within the cytoskeleton.

7. What term refers to biomolecules that constitute the majority of lipids, carbohydrates, proteins, and nucleic acids?

- A. Micronutrients
- B. Macronutrients**
- C. Trace elements
- D. Organic compounds

The term that refers to biomolecules constituting the majority of lipids, carbohydrates, proteins, and nucleic acids is macronutrients. Macronutrients are essential nutrients required in larger quantities for growth and development. They play critical roles in energy production, structure, and metabolism within organisms. Lipids provide energy storage and are critical components of cell membranes, carbohydrates serve as energy sources and structural elements, proteins are fundamental for enzyme function, cellular structure, and signaling, and nucleic acids, such as DNA and RNA, are vital for genetic information storage and transfer. In contrast, micronutrients refer to vitamins and minerals needed in smaller amounts, trace elements are specific micronutrients needed in very minute quantities, and organic compounds are a broader category that includes any carbon-containing compounds, not specifically tied to the major biomolecules that are categorized as macronutrients. Hence, macronutrients encompass the foundational biomolecules necessary for biological functions, clearly identifying them as the correct answer.

8. What is the role of the ATP synthase enzyme?

- A. To break down glucose molecules
- B. To create protons across the membrane
- C. To convert ADP to ATP using the proton gradient**
- D. To transport electrons through the electron transport chain

ATP synthase plays a crucial role in cellular respiration and photosynthesis by converting ADP and inorganic phosphate into ATP. This process is driven by a proton gradient established across a membrane, typically the inner mitochondrial membrane or the thylakoid membrane in chloroplasts. As protons flow back across the membrane through the ATP synthase enzyme, this movement provides the energy necessary for the phosphorylation of ADP to ATP. This mechanism is known as chemiosmosis, where the energy stored in the proton gradient is harnessed to produce ATP, the primary energy currency of the cell. The other options describe processes that either do not pertain directly to ATP synthesis or refer to functions of different components of cellular respiration. Breaking down glucose molecules is part of glycolysis and the citric acid cycle, while transporting electrons through the electron transport chain is crucial for creating the proton gradient but does not involve ATP production directly. Creating protons across the membrane is a step that leads to the proton gradient but does not describe the main job of ATP synthase itself.

9. Which of the following requires oxygen to survive?

- A. Facultative anaerobes
- B. Obligate aerobes**
- C. Obligate anaerobes
- D. Aerotolerant anaerobes

Obligate aerobes are organisms that require oxygen for their survival and growth. They rely on aerobic respiration to produce ATP, which is the energy currency of cells. In the presence of oxygen, obligate aerobes efficiently harvest energy from nutrients through processes such as glycolysis, the citric acid cycle, and oxidative phosphorylation. Without oxygen, these organisms cannot sustain their metabolic processes, leading to the inability to survive. Facultative anaerobes, on the other hand, can survive with or without oxygen. They have the ability to switch between aerobic respiration when oxygen is available and fermentation or anaerobic respiration when oxygen is absent. Obligate anaerobes, conversely, cannot tolerate oxygen at all; oxygen for them is toxic, and they rely entirely on anaerobic processes. Aerotolerant anaerobes can survive in the presence of oxygen but do not use it for metabolism; they only engage in fermentation regardless of the oxygen availability. Thus, it is the obligate aerobes that specifically require oxygen for their survival, making this choice the correct answer.

10. Which structure is NOT found in prokaryotic cells?

A. Nucleus

B. Cell wall

C. Cytoplasm

D. Cell membrane

Prokaryotic cells are characterized by the absence of a membrane-bound nucleus. Instead, their genetic material, which is typically a single circular chromosome, is located in a region called the nucleoid. The presence of a nucleus is a defining feature of eukaryotic cells, which have a more complex structure, including organelles surrounded by membranes. In contrast, prokaryotic cells do possess a cell wall, cytoplasm, and cell membrane. The cell wall is a critical structure that provides shape and protection, often made up of peptidoglycan in bacteria. Cytoplasm is the gel-like substance within the cell membrane where various cellular processes occur, and the cell membrane acts as a barrier that regulates what enters and leaves the cell, playing a vital role in maintaining homeostasis. Hence, the nucleus is the correct answer as it is not found in prokaryotic cells.