

Texas A&M University (TAMU)

BIOL206 Practice Exam 3 (Sample)

Study Guide



Everything you need from our exam experts!

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Questions

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1. Which term is used for heat-loving microbes that thrive at temperatures between 45°C and 80°C?
 - A. Mesophiles
 - B. Extreme thermophiles
 - C. Thermophiles
 - D. Psychrophiles
2. Hydrostatic pressures of greater than 200 atm generally do what?
 - A. Enhance enzyme activity
 - B. Inactivate enzymes and disrupt cell membrane and transport enzymes
 - C. Help in protein synthesis
 - D. Have no effect on organisms
3. What is anabolism?
 - A. Metabolic pathways that decompose molecules, releasing energy
 - B. Metabolic pathways that construct molecules, requiring energy
 - C. A state of energy balance in an organism
 - D. Processes that occur during digestion
4. During which phase do bacterial cells die exponentially?
 - A. Lag phase
 - B. Log phase
 - C. Stationary phase
 - D. Death phase
5. What is the primary method of division for bacterial cells?
 - A. Mitosis
 - B. Binary fission
 - C. Budding
 - D. Fragmentation

6. Which term describes the mechanism by which a virus packages bacterial DNA and transmits it to another bacterium?
- A. Conjugation
 - B. Transduction
 - C. Transformation
 - D. Mutation
7. What defines psychrophiles?
- A. Warm-loving microbes
 - B. Cold-loving microbes
 - C. Heat-resistant microbes
 - D. Microbes thriving in acidic conditions
8. Which of the following mechanisms is involved in the development of drug resistance?
- A. Genetic variation
 - B. Increased nutrient availability
 - C. Reduced pathogen virulence
 - D. Enhanced immune response
9. What happens to water activity when solutes are added to a solution?
- A. It increases
 - B. It decreases
 - C. It remains unchanged
 - D. It fluctuates
10. Which of the following trace elements is needed in microgram quantities?
- A. Calcium
 - B. Manganese
 - C. Iron
 - D. Sodium

Answers

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

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Explanations

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1. Which term is used for heat-loving microbes that thrive at temperatures between 45°C and 80°C?

- A. Mesophiles
- B. Extreme thermophiles
- C. Thermophiles
- D. Psychrophiles

The appropriate term for heat-loving microbes that thrive at temperatures between 45°C and 80°C is thermophiles. These organisms are specifically adapted to survive and grow in high-temperature environments, such as hot springs and compost heaps. Thermophiles have unique enzymatic systems and cellular structures that maintain stability and function at elevated temperatures, which is crucial for their survival in thermal conditions. In contrast, mesophiles typically prefer moderate temperature ranges, usually between 20°C and 45°C, and are not equipped to handle the extreme heat that thermophiles endure. Extreme thermophiles, a subset of thermophiles, thrive at even higher temperatures, generally above 80°C, but the term does not encompass the broader range that thermophiles cover. Psychrophiles are cold-loving organisms that thrive in extremely low temperatures, typically below 15°C, which does not align with the heat-loving characteristics being described. Thus, thermophiles is the most precise term for microbes thriving in the specified temperature range.

2. Hydrostatic pressures of greater than 200 atm generally do what?

- A. Enhance enzyme activity
- B. Inactivate enzymes and disrupt cell membrane and transport enzymes
- C. Help in protein synthesis
- D. Have no effect on organisms

Hydrostatic pressures exceeding 200 atm typically lead to the inactivation of enzymes and the disruption of cell membranes and transport mechanisms within cells. At such high pressures, the physical forces can alter the molecular structure of enzymes, affecting their active sites and impairing their ability to catalyze reactions effectively. Additionally, the increased pressure can affect lipid bilayers that make up cell membranes, causing them to become less fluid and more susceptible to damage. This disruption can interfere with cellular transport processes, further compromising the cell's homeostasis and overall function. Therefore, the consequences of high hydrostatic pressures are significant, often resulting in inactivation of essential enzymes and disturbances in membrane integrity.

3. What is anabolism?

- A. Metabolic pathways that decompose molecules, releasing energy
- B. Metabolic pathways that construct molecules, requiring energy
- C. A state of energy balance in an organism
- D. Processes that occur during digestion

Anabolism refers to the set of metabolic pathways that build larger molecules from smaller units, a process that requires energy input. In biological systems, anabolism is critical for the synthesis of complex molecules such as proteins, nucleic acids, and polysaccharides, which are essential for cell structure and function. This process often involves the use of energy derived from adenosine triphosphate (ATP) to drive the reactions necessary to create these larger, more complex structures. In contrast to catabolism, which breaks down molecules and releases energy, anabolism is focused on creating new cellular components and is essential for growth, repair, and maintenance of tissues. It is also vital for storing energy in forms like glycogen and fat. Overall, this anabolic process is essential for the overall metabolism and health of an organism, enabling it to grow and adapt to its environment.

4. During which phase do bacterial cells die exponentially?

- A. Lag phase
- B. Log phase
- C. Stationary phase
- D. Death phase

Bacterial cells undergo exponential death during the death phase. This phase follows the stationary phase, where the growth rate slows as resources become scarce and waste products accumulate. In the death phase, the number of viable cells decreases at an exponential rate due to nutrient depletion and increased toxic byproducts. This exponential decline aligns with the rapid loss of cell viability as conditions become increasingly unfavorable for survival. Understanding this phase is crucial because it highlights how environmental factors impact bacterial populations, which has significant implications in fields like microbiology, medicine, and environmental science.

5. What is the primary method of division for bacterial cells?

- A. Mitosis
- B. Binary fission
- C. Budding
- D. Fragmentation

The primary method of division for bacterial cells is binary fission. This process involves a single bacterial cell growing and then dividing into two daughter cells that are genetically identical to the original. During binary fission, the bacterial DNA is first replicated, and then the cell elongates. The cell membrane and cell wall pinch inward along the center, leading to the formation of two separate cells. This method allows bacteria to reproduce quickly and efficiently, which is key to their survival and proliferation, especially in favorable environments. In contrast, other methods such as mitosis are specific to eukaryotic cells and involve multiple phases to ensure accurate chromosome division, which is not applicable to prokaryotes like bacteria. Budding and fragmentation are alternative asexual reproduction methods seen in certain eukaryotic organisms, but they are not typically used by bacteria, thus making binary fission the predominant mode of reproduction in bacterial cells.

6. Which term describes the mechanism by which a virus packages bacterial DNA and transmits it to another bacterium?

- A. Conjugation
- B. Transduction
- C. Transformation
- D. Mutation

The mechanism by which a virus packages bacterial DNA and transmits it to another bacterium is termed transduction. In this process, a bacteriophage (a virus that infects bacteria) infects a donor bacterium and incorporates some of that bacterium's DNA into its own viral genome. Subsequently, when the virus infects a new recipient bacterium, it can introduce this packaged bacterial DNA into the new host. This transfer of genetic material can contribute to genetic diversity among bacterial populations and is a key driver of horizontal gene transfer. Conjugation refers to the direct transfer of DNA from one bacterium to another through cell-to-cell contact, often involving a structure known as a pilus. Transformation involves the uptake of free DNA from the environment by bacteria, which can then integrate this DNA into their own genome. Mutation refers to changes in the genetic sequence of an organism's DNA that occur due to various factors, but does not involve the transfer of DNA between organisms. These processes are distinct from transduction, which specifically involves a viral agent.

7. What defines psychrophiles?

- A. Warm-loving microbes
- B. Cold-loving microbes
- C. Heat-resistant microbes
- D. Microbes thriving in acidic conditions

Psychrophiles are defined as cold-loving microbes. These organisms thrive in extremely low temperatures, typically found in environments such as polar regions, deep oceans, and high altitudes. They have evolved adaptations that allow their cellular processes to function optimally at temperatures that would inhibit the growth or survival of most other organisms. These adaptations may include specialized enzymes that remain flexible and active at low temperatures and cellular structures that help maintain fluidity despite the cold. This definition sets psychrophiles apart from thermophiles, which prefer higher temperatures, and other microbial classifications based on specific environmental conditions, such as acidophiles, which thrive in acidic environments. Thus, the characterization of psychrophiles as cold-loving is essential in understanding microbial ecology and the diversity of life in extreme environments.

8. Which of the following mechanisms is involved in the development of drug resistance?

- A. Genetic variation
- B. Increased nutrient availability
- C. Reduced pathogen virulence
- D. Enhanced immune response

The development of drug resistance is primarily influenced by genetic variation. This occurs through processes such as mutation, horizontal gene transfer, and natural selection. When a population of pathogens is exposed to a drug, those with mutations that confer resistance are more likely to survive and reproduce. Over time, these resistant strains can become predominant within the population, leading to a situation where the standard treatments become ineffective. This genetic variation is a key driving force in the evolution of drug resistance, making it critical to understand in the context of treating infectious diseases. Increased nutrient availability, while it may provide a favorable environment for pathogen growth, does not directly contribute to the development of drug resistance. Similarly, reduced pathogen virulence impacts the severity of disease rather than directly affecting resistance mechanisms, and an enhanced immune response is related to the host's ability to fight infections, not the pathogens' ability to resist drugs. Thus, understanding the role of genetic variation is essential for addressing and managing drug resistance effectively.

9. What happens to water activity when solutes are added to a solution?

- A. It increases
- B. It decreases
- C. It remains unchanged
- D. It fluctuates

When solutes are added to a solution, water activity decreases. This can be explained by considering the nature of solutes and their interaction with water molecules. Water activity, which is a measure of the availability of water for chemical reactions and biological processes, is affected by the presence of solutes. When solutes enter a solution, they interact with water molecules and occupy space around them. This leads to a situation where fewer water molecules are available to participate in reactions or biological activities because some of them are bound to solute particles. As a result, the effective concentration of free water decreases, leading to a lower water activity. This concept is crucial in fields such as microbiology and food science, where understanding water activity helps predict microbial growth and the stability of food products.

10. Which of the following trace elements is needed in microgram quantities?

- A. Calcium
- B. Manganese
- C. Iron
- D. Sodium

Manganese is classified as a trace element, which means it is required by organisms in very small amounts, typically in microgram quantities. It plays a vital role in several biological processes, including enzyme function, antioxidant defense, and energy production. Manganese is essential for the activity of various enzymes, such as those involved in metabolism and cellular signaling. Calcium, while also important, is needed in much larger quantities, particularly for bone health and various cellular functions. Iron, another essential element, is required in larger amounts than trace elements, as it is crucial for oxygen transport and energy metabolism. Sodium is essential for fluid balance and nerve function, but it is also not classified as a trace element, as it is required in larger amounts. Overall, manganese stands out among the options as it is specifically required in microgram quantities, fitting the definition of a trace element.

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