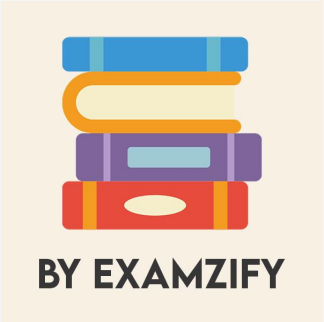
Texas A&M University (TAMU) BIOL206 Introductory Microbiology Exam 4 Practice Exam (Sample)

Study Guide



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Questions

1. What is the definition of dysbiosis?

A. Excessive diversity of microorganisms

B. Normal flora is disrupted

C. Complete absence of microorganisms

D. Reduction of harmful bacteria only

2. What function do ribosomes serve in a cell?

A. To store genetic information

B. To perform cellular respiration

C. To synthesize proteins

D. To maintain cell shape

3. What type of cells do B cells produce when triggered?

A. Plasma cells

B. Helper T cells

C. Memory cells

D. Regulatory T cells

4. Why are monoclonal antibodies important in research?

A. They can only bind to non-specific antigens

B. They provide a cheap source of antibodies

C. They are produced from a single clone for specific targeting

D. They eliminate the need for animal testing

5. What is the role of antibiotics in microbial ecology?

A. They promote growth of all bacteria

B. They selectively reduce the abundance of susceptible bacteria

C. They enhance the reproduction rate of bacteria

D. They have no impact on microbial communities

6. What role does secretory IgA (sIgA) play in the lungs?

A. It neutralizes toxins

B. It acts as an antibody in body secretions

C. It promotes pathogenic growth

D. It enhances microbial adhesion

7. What distinguishes prokaryotic cells from eukaryotic cells?

A. Prokaryotic cells have a nucleus

B. Prokaryotic cells lack membrane-bound organelles

C. Prokaryotic cells are larger than eukaryotic cells

D. Prokaryotic cells contain chloroplasts

8. Which part of the body is the most diverse and contains 3 distinct microbiomes?

A. The mouth

B. The gut

C. The skin

D. The respiratory system

9. What type of agents are designed based on the principle of selective toxicity?

A. Antimicrobial agents

B. Analgesic agents

C. Antipyretic agents

D. Antidepressant agents

10. What type of fiber promotes the growth of probiotics?

A. Digestible dietary fiber

B. Soluble fiber

C. Non-digestible dietary fiber

D. Insoluble fiber

Answers

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

Explanations

1. What is the definition of dysbiosis?

A. Excessive diversity of microorganisms

B. Normal flora is disrupted

C. Complete absence of microorganisms

D. Reduction of harmful bacteria only

Dysbiosis refers specifically to a microbial imbalance or disruption in the natural flora of the body. This can occur when there is a significant change in the composition of the microbial communities, often resulting in a shift from healthy to potentially harmful microorganisms. Such imbalances can be caused by various factors including diet, stress, antibiotic use, and diseases, leading to health issues. In the context of dysbiosis, "normal flora is disrupted" accurately encapsulates the idea that a healthy microbial community has been altered, potentially impacting various biological processes and contributing to disease states. Understanding this definition is crucial, particularly in fields like microbiology and health sciences, as it emphasizes the importance of maintaining a balanced microbial ecosystem for overall health.

2. What function do ribosomes serve in a cell?

A. To store genetic information

B. To perform cellular respiration

C. To synthesize proteins

D. To maintain cell shape

Ribosomes play a crucial role in the process of protein synthesis, which is essential for cellular function and structure. They act as the site where amino acids are assembled into polypeptide chains according to the instructions encoded in messenger RNA (mRNA). During translation, ribosomes read the sequence of the mRNA, facilitating the binding of transfer RNA (tRNA) molecules that carry specific amino acids. This assembly occurs in a way that the sequence of nucleotides in the mRNA is translated into a specific sequence of amino acids, ultimately leading to the formation of functional proteins. Given their central role in translating genetic information into functional molecules, ribosomes are known as the "workbenches" of the cell for protein synthesis.

3. What type of cells do B cells produce when triggered?

A. Plasma cells

B. Helper T cells

C. Memory cells

D. Regulatory T cells

When B cells are triggered by the presence of an antigen, they primarily differentiate into plasma cells. Plasma cells are specialized cells responsible for producing antibodies that can target specific antigens, marking them for destruction or neutralization. This ability to produce large quantities of antibodies is crucial for the adaptive immune response, as it helps the body to effectively combat pathogens. In addition to plasma cells, some B cells can also develop into memory cells after activation. Memory B cells are important for the immune system's ability to recognize and respond more rapidly to future exposures to the same antigen. However, the immediate and primary outcome of B cell activation is the production of plasma cells, making this the correct answer for the question regarding what type of cells B cells produce when triggered. The other cell types listed, such as helper T cells and regulatory T cells, are derived from T cell lineages and are not products of B cell activation. Therefore, they don't directly relate to the functionality of B cells in the adaptive immune response.

4. Why are monoclonal antibodies important in research?

A. They can only bind to non-specific antigens

B. They provide a cheap source of antibodies

C. They are produced from a single clone for specific targeting

D. They eliminate the need for animal testing

Monoclonal antibodies are important in research primarily because they are produced from a single clone of B cells, allowing them to bind specifically to one unique epitope on an antigen. This specificity is key for many applications, including diagnostics, therapeutic treatments, and in various research settings. By targeting a specific molecule or pathogen, researchers can study biological processes with greater accuracy, develop targeted therapies, and enhance the effectiveness of diagnostic tools. This specificity distinguishes monoclonal antibodies from polyclonal antibodies, which are a mixture of antibodies that can bind to multiple epitopes, potentially leading to less precise outcomes. The production process ensures that all the antibodies in a monoclonal preparation are identical, which provides consistency and reproducibility in experiments and clinical applications.

5. What is the role of antibiotics in microbial ecology?

A. They promote growth of all bacteria

B. They selectively reduce the abundance of susceptible bacteria

C. They enhance the reproduction rate of bacteria

D. They have no impact on microbial communities

The role of antibiotics in microbial ecology is to selectively reduce the abundance of susceptible bacteria within a community. Antibiotics are designed to target specific bacterial species, disrupting their cellular functions, which leads to decreased population sizes of these microbes. This selective pressure can significantly alter the composition and dynamics of microbial communities. When certain bacterial populations are reduced, it can lead to changes in interactions among the remaining microbes, such as competition and cooperation. This can affect the overall diversity and functionality of the microbial ecosystem. In some cases, the removal of sensitive bacteria can allow for the proliferation of resistant strains or different species that were previously outcompeted, showcasing the dynamic and interconnected nature of microbial ecosystems. Understanding this selective impact is crucial, as it underlines the importance of antibiotic use in both clinical and environmental contexts, influencing microbial diversity, resistance development, and ecological balance.

6. What role does secretory IgA (sIgA) play in the lungs?

A. It neutralizes toxins

B. It acts as an antibody in body secretions

C. It promotes pathogenic growth

D. It enhances microbial adhesion

Secretory IgA (sIgA) plays a crucial role in the immune defense of mucosal surfaces, including those in the lungs. As an antibody that is primarily found in mucosal secretions, sIgA is essential for protecting epithelial surfaces by binding to pathogens and preventing their adherence to mucosal tissues. This action helps to neutralize viruses and bacteria, effectively reducing the risk of infection. In the context of the respiratory system, sIgA is secreted in the airway secretions and can capture pathogens before they penetrate deeper into the tissues. By acting as a first line of defense, sIgA not only maintains the integrity of the mucosal barrier but also aids in the clearance of potential pathogens through mechanisms such as agglutination. Hence, emphasizing its role as an antibody found in body secretions highlights its protective functions in the lungs and other mucosal areas. The other choices do not accurately represent the primary function of sIgA in the lungs. For example, while neutralizing toxins is an important role for some antibodies, sIgA is more specific to blocking pathogen interaction with epithelial surfaces. Promoting pathogenic growth contradicts the protective role of sIgA, and enhancing microbial adhesion would undermine its role in preventing infections

7. What distinguishes prokaryotic cells from eukaryotic cells?

A. Prokaryotic cells have a nucleus

B. Prokaryotic cells lack membrane-bound organelles

C. Prokaryotic cells are larger than eukaryotic cells

D. Prokaryotic cells contain chloroplasts

The distinguishing feature of prokaryotic cells when compared to eukaryotic cells is that prokaryotic cells lack membrane-bound organelles. This characteristic is fundamental in understanding cellular structure and function. Prokaryotic cells, which include bacteria and archaea, have a simpler structure; their genetic material is not enclosed within a nucleus, and instead, it exists in a region called the nucleoid. Furthermore, prokaryotic cells do not possess organelles such as mitochondria, endoplasmic reticulum, or golgi apparatus, which are found in eukaryotic cells. This absence of membrane-bound structures means that many cellular processes in prokaryotes occur directly in the cytoplasm. In contrast, eukaryotic cells, which make up organisms such as plants, animals, fungi, and protists, have a complex structure with various organelles surrounded by membranes, allowing for compartmentalization of cellular functions. Understanding these differences between prokaryotic and eukaryotic cells is crucial for studying microbiology and cellular biology.

8. Which part of the body is the most diverse and contains 3 distinct microbiomes?

A. The mouth

B. The gut

C. The skin

D. The respiratory system

The skin is recognized as the most diverse part of the body, featuring three distinct microbiomes based on the unique habitats created by various factors such as moisture, temperature, and sebaceous secretions. These microbiomes include the dry skin microbiome, the moist skin microbiome, and the sebaceous skin microbiome. Each of these areas hosts a unique community of microbes that have adapted to the specific conditions of their environment. For instance, the dry skin microbiome is primarily inhabited by bacteria that thrive in lower moisture levels, while the moist skin microbiome supports different microbial communities due to higher humidity. The sebaceous microbiome, influenced by oil-producing glands, houses microbes that utilize sebum as a nutrient source. In contrast, while the gut indeed harbors an extensive and complex microbiome, it is primarily characterized as a single microbiome that undergoes variations in composition along its length but does not feature distinct and separately defined microbiomes like the skin does. The mouth and respiratory system also have associated microbiomes, but they do not exhibit the same level of diversity or compartmentalization seen in the skin.

9. What type of agents are designed based on the principle of selective toxicity?

A. Antimicrobial agents

B. Analgesic agents

C. Antipyretic agents

D. Antidepressant agents

Selective toxicity is a key principle in the development of antimicrobial agents, which are specifically designed to target and destroy pathogens such as bacteria, fungi, and viruses without harming the host's cells. This principle is crucial because it allows for effective treatment of infections while minimizing damage to the body's own cells and tissues. Antimicrobial agents exploit differences between the microbial cells and the host cells, such as differences in cell wall structure, biochemical pathways, and ribosomal differences, to selectively attack the invader. In contrast, analgesic agents primarily aim to relieve pain and do not necessarily possess selective toxicity as they do not target infectious organisms. Antipyretic agents are intended to reduce fever and are not directed at pathogens either. Antidepressant agents are used to treat mood disorders and function by modulating neurotransmitter levels in the brain, which does not relate to the concept of selectively targeting pathogenic cells. Thus, the focus on targeting specific microbial features makes antimicrobial agents the appropriate choice in the context of selective toxicity.

10. What type of fiber promotes the growth of probiotics?

A. Digestible dietary fiber

B. Soluble fiber

C. Non-digestible dietary fiber

D. Insoluble fiber

The growth of probiotics is primarily supported by non-digestible dietary fiber, often referred to as prebiotics. These fibers are not broken down by human digestive enzymes and instead pass through the gastrointestinal tract where they can be fermented by beneficial bacteria. By providing a food source, non-digestible dietary fibers encourage the growth of these probiotics, which play a crucial role in maintaining a healthy gut microbiome. In contrast, digestible dietary fiber, soluble fiber, and insoluble fiber do not have the same prebiotic effect. Digestible fibers are broken down and absorbed, while soluble fibers can aid in digestion and can have beneficial effects on cholesterol levels but do not specifically promote probiotic growth. Insoluble fiber adds bulk to the stool and aids in movement through the digestive system, but does not specifically act as a nutrient for probiotic bacteria.