University of Central Florida (UCF) MCB3020C General Microbiology Lab Midterm Practice Exam (Sample)

Study Guide

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Questions

1. This type of bacteria is described as rod-shaped. What is the term for these organisms?

   A. Cocci

   B. Bacilli

   C. Spirilla

   D. Vibrios

2. In the resolution formula, what does "NA" stand for?

   A. Nuclear Aperture

   B. Numerical Aperture

   C. Natural Apparatus

   D. National Aperture

3. What is the appearance of colonies from E. coli on EMB?

   A. Light purple to light pink

   B. Green sheen with dark purple background

   C. Colorless colonies

   D. Yellow colonies

4. What does sarcinae refer to in bacterial morphology?

   A. Clusters of cocci

   B. Packs in a cube shape

   C. Pairs of cocci

   D. Chains of cocci

5. What is the primary role of the condenser in a microscope?

   A. Adjust the brightness of the light

   B. Focus light onto the specimen

   C. Support the microscope slide

   D. Magnify the specimen

6. What is the primary purpose of the Pour Plate Method?

A. To count bacteria quantitatively

B. To isolate bacteria on the surface only

C. To treat bacteria with antibiotics

D. To dilute and grow individual colonies

7. What does deamination refer to in microbial metabolism?

A. Separation of fatty acids

B. Removal of an amino group

C. Conversion of carbohydrates

D. Production of gas

8. How does antibiotic resistance typically develop in bacteria?

A. Through environmental exposure

B. Through mutation or acquisition of resistance genes

C. Through decreased metabolic activity

D. Through the introduction of new substrates

9. What type of dyes are characterized by having a positively charged chromogen?

A. Anionic dyes

B. Cationic dyes

C. Neutral dyes

D. Acidic dyes

10. What does 'bacterial sporulation' refer to?

A. The process by which certain bacteria form spores to survive unfavorable conditions

B. The division of bacterial cells

C. The fusion of two bacterial cells

D. The process of DNA replication in bacteria

Answers

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

Explanations

1. This type of bacteria is described as rod-shaped. What is the term for these organisms?

A. Cocci

B. Bacilli

C. Spirilla

D. Vibrios

The term for bacteria that are rod-shaped is bacilli. This classification is part of the basic morphological categorization of bacteria based on their shapes. Bacilli can vary in size and can be found as single rods or in chains depending on the species. The other classifications serve different morphological characteristics. Cocci refers to spherical-shaped bacteria, spirilla describes spiral or corkscrew-shaped bacteria, and vibrios are comma-shaped bacteria. Understanding these distinctions is fundamental in microbiology, as the shape can influence the behavior and characteristics of the bacteria, including their movement and responsiveness to antibiotics.

2. In the resolution formula, what does "NA" stand for?

A. Nuclear Aperture

B. Numerical Aperture

C. Natural Apparatus

D. National Aperture

In the context of microscopy, "NA" stands for Numerical Aperture. This term defines the range of angles over which the system can accept or emit light. The numerical aperture is crucial because it influences the resolving power of an optical system. A higher NA indicates a greater capability of the lens to gather light and resolve fine specimen detail at a fixed object distance. This directly affects the clarity and detail of the images produced by the microscope. Understanding numerical aperture is essential for anyone studying microscopy, as it quantifies the light-gathering ability of the microscope objectives and is critical for optimizing imaging techniques.

3. What is the appearance of colonies from E. coli on EMB?

A. Light purple to light pink

B. Green sheen with dark purple background

C. Colorless colonies

D. Yellow colonies

The appearance of colonies from E. coli on Eosin Methylene Blue (EMB) agar is characterized by a green sheen with a dark purple background. EMB agar is a selective and differential medium that allows for the growth of Gram-negative bacteria while inhibiting Gram-positive organisms. E. coli ferments lactose present in the agar, producing acid and resulting in a color change of the medium. This fermentation can cause the colonies to appear dark purple due to the precipitation of the dyes (eosin and methylene blue) in the medium. The green sheen is particularly prominent in E. coli and is a result of the buildup of acids during fermentation, which affects the surface of the colonies. In contrast, other bacteria that grow on EMB may appear as light purple to light pink colonies or even colorless depending on their lactose fermentation activity. For example, non-lactose fermenters will produce colonies that do not alter the medium color, appearing colorless. Therefore, the distinctive combination of the green sheen and dark purple background is specifically associated with E. coli on this medium.

4. What does sarcinae refer to in bacterial morphology?

A. Clusters of cocci

B. Packs in a cube shape

C. Pairs of cocci

D. Chains of cocci

Sarcinae specifically refers to a unique arrangement of cocci bacteria that form in packs or clusters that typically resemble a cube shape. This morphology is a result of the way cocci divide in multiple planes. When cocci divide in three perpendicular planes, they can remain attached after cell division, leading to the formation of these distinctive cube-like arrangements. This is distinct from other arrangements such as clusters or chains, where the organization is based on different division patterns. Understanding this morphology is important in microbiology as it can help in the identification and classification of bacteria during laboratory practices.

5. What is the primary role of the condenser in a microscope?

A. Adjust the brightness of the light

B. Focus light onto the specimen

C. Support the microscope slide

D. Magnify the specimen

The primary role of the condenser in a microscope is to focus light onto the specimen. The condenser typically consists of a lens system located beneath the stage of the microscope, which collects and concentrates light from the light source onto the specimen being observed. This focused beam of light enhances the brightness and clarity of the image, enabling better visualization of fine details in the specimen. Proper use of the condenser is crucial for achieving optimal illumination and contrast, which are essential for effective microscopy. In contrast, while adjusting the brightness of the light can be a function of the light source or the iris diaphragm, it does not accurately describe the specific purpose of the condenser itself. The support of the microscope slide relates to the mechanical stage or slide holder, which is separate from the functions of light manipulation. Magnification is achieved primarily through the objectives and eyepiece lenses, rather than the condenser. Therefore, understanding the role of the condenser as a tool for focusing light helps clarify its importance in microscopy practice.

6. What is the primary purpose of the Pour Plate Method?

A. To count bacteria quantitatively

B. To isolate bacteria on the surface only

C. To treat bacteria with antibiotics

D. To dilute and grow individual colonies

The primary purpose of the Pour Plate Method is to dilute and grow individual colonies. This technique involves mixing a microbial sample into molten agar and then pouring it into a Petri dish, allowing the mixture to solidify. As the agar solidifies, bacterial cells become trapped within the medium, where they can grow into colonies throughout the agar. This allows for the growth of both aerobic and anaerobic bacteria, as the colonies can develop below the surface of the agar as well as on the surface. Additionally, the Pour Plate Method enables a more uniform dispersion of cells throughout the medium, which is particularly useful for estimating the total viable count of microorganisms in a sample. By examining the resulting colonies, one can determine the number of viable organisms present in the original sample based on dilution factors. Options that suggest isolating bacteria on the surface only or that involve treating bacteria with antibiotics are not aligned with the methodology or purpose of the Pour Plate Method. Instead, the core focus of this method is indeed on dilution and the growth of bacteria into individual, countable colonies throughout the agar medium.

7. What does deamination refer to in microbial metabolism?

A. Separation of fatty acids

B. Removal of an amino group

C. Conversion of carbohydrates

D. Production of gas

Deamination is a specific biochemical process that involves the removal of an amino group (-NH2) from an organic compound, particularly from amino acids. This process is essential in microbial metabolism because it allows microorganisms to utilize amino acids as a source of energy or to convert them into other compounds that can be utilized in different metabolic pathways. When microorganisms deaminate amino acids, they produce ammonia (NH3) and a corresponding keto acid, which can further enter metabolic pathways like the Krebs cycle for energy production. This process is vital for nitrogen metabolism and helps maintain nitrogen balance within cells, enabling the utilization of amino acids not just as building blocks for proteins but also as energy sources when necessary. The other options refer to different metabolic processes that don't encompass the specific action of deamination. Separation of fatty acids relates to lipid metabolism, conversion of carbohydrates pertains to carbohydrate metabolism, and production of gas typically refers to fermentation or respiration processes that produce gaseous by-products.

8. How does antibiotic resistance typically develop in bacteria?

A. Through environmental exposure

B. Through mutation or acquisition of resistance genes

C. Through decreased metabolic activity

D. Through the introduction of new substrates

Antibiotic resistance typically develops in bacteria primarily through mutation or the acquisition of resistance genes. This process involves two main mechanisms: spontaneous mutations in bacterial DNA and horizontal gene transfer, where bacteria can acquire resistance genes from other bacteria through plasmids, transposons, or bacteriophages. Spontaneous mutations occur during cell division when errors are made in DNA replication. These mutations can lead to changes in bacterial proteins that antibiotics target, rendering those drugs ineffective. On the other hand, horizontal gene transfer allows bacteria to rapidly gain resistance traits from their environment or other neighboring bacteria, enabling them to survive even in the presence of antibiotics. This ability to adapt through genetic changes is a significant factor in the increasing prevalence of antibiotic-resistant strains in various environments, complicating treatment strategies and public health efforts.

9. What type of dyes are characterized by having a positively charged chromogen?

A. Anionic dyes

B. Cationic dyes

C. Neutral dyes

D. Acidic dyes

Cationic dyes are characterized by having a positively charged chromogen. These dyes are attracted to negatively charged cell components, which is why they are often used in microbiology to stain cells, particularly bacterial cells that have a negatively charged surface due to the presence of proteins, nucleic acids, and lipopolysaccharides. The positive charge of the cationic dye allows it to bind effectively to these negatively charged components, resulting in a strong color contrast that makes cellular structures more visible under a microscope. In various staining techniques, cationic dyes can enhance the visualization of cells, cellular structures, and even staining specific components within the cells, thereby providing vital information about the morphology and arrangement of microorganisms. This property is particularly useful in differential staining methods, such as the Gram stain, where cationic dyes help differentiate between types of bacteria based on their cell wall characteristics.

10. What does 'bacterial sporulation' refer to?

A. The process by which certain bacteria form spores to survive unfavorable conditions

B. The division of bacterial cells

C. The fusion of two bacterial cells

D. The process of DNA replication in bacteria

Bacterial sporulation refers to the process by which certain bacteria, particularly some species of Bacillus and Clostridium, form spores as a means of survival under unfavorable environmental conditions. This biological process is a critical adaptation that allows these bacteria to withstand extremes such as heat, desiccation, radiation, and nutrient depletion. During sporulation, the bacterial cell undergoes a series of complex transformations to develop a highly resistant spore. This spore is metabolically inactive and can remain dormant for extended periods until favorable conditions return, allowing the bacteria to emerge from the spore and resume normal metabolic activity and growth. The other options describe different biological processes that do not pertain to sporulation. The division of bacterial cells refers to binary fission, a method of reproduction, while the fusion of two bacterial cells typically refers to processes such as conjugation. DNA replication is a fundamental process for both cell division and maintaining genetic continuity but is unrelated to the formation of spores. Therefore, the correct choice accurately captures the essence of bacterial sporulation as a survival mechanism.