Laboratory Animal Technician (LAT) Practice Exam (Sample)

Study Guide

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Questions

1. Which of the following is a common dry heat sterilization method?

A. Autoclave

B. Hot air oven

C. Steam sterilizer

D. Cold sterilization

2. What is a centrosome also known as?

A. Protein factory

B. Microtubule organizing center

C. Cell membrane

D. Genetic material

3. What are the two primary components within each half of the heart?

A. Atrium and ventricle

B. Vein and artery

C. Aorta and vena cava

D. Endocardium and epicardium

4. Which blood collection technique requires justification and is considered controversial?

A. Cardiac puncture

B. Retro-orbital

C. Tail transection

D. Saphenous

5. What period precedes the estrus phase in the estrous cycle?

A. Proestrus

B. Anestrus

C. Mestrus

D. Diestrus

6. What is the standard temperature range recommended for laboratory animal housing?

A. 10°C to 18°C

B. 19°C to 26°C

C. 27°C to 35°C

D. 36°C to 44°C

7. Which of the following is considered a direct cost in an animal facility?

A. Physical plant expenses

B. Heating rooms

C. Salaries and supplies

D. Depreciation costs

8. How is a monogamous breeding system characterized?

A. One male mates with multiple females

B. One female breeds with one male

C. Several males mate with one female

D. Many females breed with many males

9. What is the primary mode of classification for diseases that affect the entire body?

A. Local

B. Acute

C. Chronic

D. Systemic

10. Which type of muscle contractions are involuntary?

A. Skeletal muscle contractions

B. Smooth muscle contractions

C. Cardiac muscle contractions

D. Both smooth and cardiac muscle contractions

Answers

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

Explanations

1. Which of the following is a common dry heat sterilization method?

A. Autoclave

B. Hot air oven

C. Steam sterilizer

D. Cold sterilization

The hot air oven is a recognized method of dry heat sterilization. This process typically involves using hot air that is circulated in the oven to achieve the sterilization of items at elevated temperatures, usually between 160°C to 180°C, for a specific period. The principle behind dry heat sterilization lies in the oxidation of cell components and denaturation of proteins, which effectively kills microorganisms. The method is particularly suitable for sterilizing glassware, oils, and powders that may be compromised by moisture, making it an essential technique in laboratories. This contrasts with the autoclave and steam sterilizer methods, which utilize moist heat to achieve sterilization through steam under pressure — not considered dry heat. Cold sterilization involves the use of chemical agents to sterilize equipment and does not involve heat at all, further distinguishing it from the hot air oven method.

2. What is a centrosome also known as?

A. Protein factory

B. Microtubule organizing center

C. Cell membrane

D. Genetic material

A centrosome is primarily recognized as a microtubule organizing center (MTOC) within cells. This structure plays a crucial role in the organization and regulation of microtubules, which are components of the cytoskeleton. Microtubules are essential for various cellular functions, including maintaining cell shape, enabling intracellular transport, and facilitating cell division. The centrosome is responsible for the proper arrangement and anchoring of microtubules, ensuring that they can effectively contribute to the formation of the mitotic spindle during cell division. In contrast, the other options do not describe the centrosome. For instance, while the cell membrane serves as a protective barrier for the cell, it does not function as a microtubule organizing center. Similarly, the term "protein factory" typically refers to ribosomes or the endoplasmic reticulum, which are involved in protein synthesis, rather than the centrosome. Genetic material pertains to DNA and its associated structures, which are fundamentally distinct from the organizational role a centrosome plays within the cytoskeletal framework.

3. What are the two primary components within each half of the heart?

A. Atrium and ventricle

B. Vein and artery

C. Aorta and vena cava

D. Endocardium and epicardium

The two primary components within each half of the heart are the atrium and ventricle. Each side of the heart is divided into these two sections, which play crucial roles in the circulatory system. The atrium serves as the receiving chamber, where blood enters the heart from the body or lungs, while the ventricle is responsible for pumping blood out of the heart to either the lungs for oxygenation (right ventricle) or to the rest of the body (left ventricle). This structured division allows for efficient circulation of blood throughout the body, making it essential for maintaining effective cardiovascular function. The other options do not accurately describe the internal structure of the heart. Veins and arteries refer to blood vessels associated with the heart rather than components within it. The aorta and vena cava are important blood vessels connected to the heart but do not represent the heart's chambers. Lastly, the endocardium and epicardium are layers of tissue that comprise the heart's anatomy but are not chambers involved in the heart's pumping action. Thus, the distinction of atrium and ventricle as fundamental components is critical for understanding heart function.

4. Which blood collection technique requires justification and is considered controversial?

A. Cardiac puncture

B. Retro-orbital

C. Tail transection

D. Saphenous

The technique of tail transection is considered controversial and requires justification primarily due to ethical and welfare concerns associated with the procedure. Tail transection involves the removal of a portion of an animal's tail, which can cause significant pain and distress. This practice is viewed critically within the fields of veterinary medicine and animal ethics, as it may not be necessary for research purposes and alternatives should be considered whenever possible. In laboratory settings, ethical guidelines often emphasize the importance of minimizing animal suffering and refining techniques to be as humane as possible. When tail transection is proposed as a blood collection method, detailed justification is required to demonstrate that the benefits of such a procedure outweigh the potential harm to the animal. This includes establishing that there are no viable alternatives that could achieve the same scientific objectives with less or no suffering. Other blood collection techniques, while they also have their own considerations, do not typically carry the same weight of ethical debate as tail transection. For instance, cardiac puncture and retro-orbital blood collection can be controversial as well, but they are often justified in specific research contexts where the need for quality samples outweighs the risks involved, provided they are performed by trained personnel. Saphenous vein sampling is generally considered a less invasive technique and thus tends

5. What period precedes the estrus phase in the estrous cycle?

A. Proestrus

B. Anestrus

C. Mestrus

D. Diestrus

The period that precedes the estrus phase in the estrous cycle is proestrus. During proestrus, the female's body undergoes significant hormonal changes that prepare it for mating. This phase is characterized by the development of ovarian follicles, increased estrogen production, and physical signs that indicate readiness for mating, such as swelling of the vulva and behavioral changes like increased restlessness or vocalization. Understanding the estrous cycle is vital for those working with laboratory animals, as it influences breeding programs and animal behavior management. The proestrus phase establishes the necessary conditions that lead into estrus, the phase where the female is fertile and receptive to mating. This foundational knowledge is crucial for effective breeding management and the overall well-being of breeding animals in a laboratory setting.

6. What is the standard temperature range recommended for laboratory animal housing?

A. 10°C to 18°C

B. 19°C to 26°C

C. 27°C to 35°C

D. 36°C to 44°C

The recommended standard temperature range for laboratory animal housing is 19°C to 26°C. This range is considered optimal for the welfare of many laboratory animals, as it reduces stress and promotes normal physiological functions. Maintaining this temperature range helps ensure that animals remain healthy, are able to exhibit natural behaviors, and have a stable environment that reflects their natural habitat. Temperature outside this range can lead to various health issues. For instance, temperatures that are too low can cause hypothermia or stress responses, while excessively high temperatures can lead to heat stress, dehydration, and increased mortality rates. Thus, adhering to the recommended temperature range is crucial for maintaining the overall well-being of laboratory animals used in research and experimentation.

7. Which of the following is considered a direct cost in an animal facility?

A. Physical plant expenses

B. Heating rooms

C. Salaries and supplies

D. Depreciation costs

Salaries and supplies are classified as direct costs in an animal facility because they can be directly attributed to the operations involving the care and use of laboratory animals. This includes the wages paid to animal care staff and researchers, as well as the cost of supplies necessary for their daily care, such as food, bedding, and veterinary supplies. Direct costs are expenses that can be directly traced back to specific activities or departments. In an animal facility, all costs associated with the personnel directly involved in animal care, along with the materials used to maintain the animals' health and well-being, are considered direct costs. On the other hand, physical plant expenses, heating rooms, and depreciation costs are categorized as indirect costs. These expenses support the overall operation of the facility but are not exclusively tied to any single activity regarding animal care. Indirect costs contribute to the general functioning of the facility rather than specific programs or projects, which is why they are not classified as direct costs.

8. How is a monogamous breeding system characterized?

A. One male mates with multiple females

B. One female breeds with one male

C. Several males mate with one female

D. Many females breed with many males

A monogamous breeding system is characterized by one female breeding exclusively with one male. This means that in this system, the pairing is typically stable and one-to-one, which can lead to a more coordinated approach to reproduction, raising of young, and territorial advantages for both parents. In such a system, both the male and female may share responsibilities in caring for their offspring, which can improve survival rates. Monogamy is often observed in species where parental investment from both sexes is crucial for the nurturing of the young. The other options describe different breeding systems. For example, having one male mate with multiple females is indicative of a polygamous system, more specifically a polygynous system. Several males mating with one female suggests a polyandrous structure, and many females breeding with many males characterizes a promiscuous arrangement. Each of these alternatives highlights different reproductive strategies and social structures within animal populations, underscoring the distinct nature of a monogamous system.

9. What is the primary mode of classification for diseases that affect the entire body?

A. Local

B. Acute

C. Chronic

D. Systemic

The primary mode of classification for diseases that affect the entire body is systemic. Systemic diseases are those that impact the overall functioning of an organism, as opposed to localized diseases, which are confined to a specific area or organ. This classification addresses the widespread effects of certain diseases that can influence multiple systems, organs, and tissues throughout the body. In the context of laboratory animal care and medical terminology, systemic conditions can encompass a variety of illnesses, such as infections, autoimmune disorders, and metabolic disorders, all of which require comprehensive diagnostic and management approaches because of their potential to affect numerous bodily functions. Understanding this classification is crucial for laboratory animal technicians, as it helps in identifying the appropriate interventions and monitoring of affected animals.

10. Which type of muscle contractions are involuntary?

A. Skeletal muscle contractions

B. Smooth muscle contractions

C. Cardiac muscle contractions

D. Both smooth and cardiac muscle contractions

Involuntary muscle contractions are those that occur without conscious control, and both smooth and cardiac muscles fit this description. Smooth muscle is found in various internal structures such as the digestive tract, blood vessels, and airways. It is responsible for movements that are automatic and help regulate functions like digestion and blood flow. The contractions of smooth muscle are generally slow and rhythmic, allowing for sustained contractions without tiring quickly. Cardiac muscle, on the other hand, makes up the heart tissue and is responsible for pumping blood throughout the body. Similar to smooth muscle, cardiac muscle operates involuntarily and has its own intrinsic rhythmic contraction patterns regulated by the heart's pacemaker cells. The contractions of cardiac muscle are powerful and rapid, ensuring efficient blood circulation. Skeletal muscle contractions are the only ones that are voluntary, allowing for conscious control over movements, like those seen in walking or lifting. Thus, the correct answer encompasses both smooth and cardiac muscle contractions, as these are the muscle types that operate involuntarily.