NYSTCE 160 – Biology Practice Exam (Sample)

Study Guide

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Questions

1. Which type of immunodeficiency might be caused by the use of prescription drugs?

A. Primary immunodeficiency

B. Acquired immunodeficiency

C. Inherited immunodeficiency

D. Autoimmune disorder

2. Which of the following is NOT a type of macro molecule?

A. Carbohydrates

B. Nucleic acids

C. Small organic molecules

D. Proteins

3. Which component of the cell is primarily responsible for controlling cellular activities?

A. Cytoplasm

B. Cell membrane

C. Nucleus

D. Ribosomes

4. Which macromolecule is characterized by a repeating pattern of N-C-C in its polypeptide chain?

A. Carbohydrate

B. Lipid

C. Protein

D. Nucleic acid

5. What is the first structure to emerge from a germinating seed?

A. Hypocotyl

B. Radicle

C. Cotyledon

D. Seed coat

6. What is the diploid phase of plants referred to as?

A. Gametophyte

B. Sporophyte

C. Life cycle

D. Prothallus

7. What is the first law of thermodynamics?

A. Energy can be created or destroyed

B. Energy is always conserved in an isolated system

C. Entropy decreases over time in isolated systems

D. Energy is transferable but not transformable

8. Which biome is characterized by high temperatures, high rainfall, and poor soil quality?

A. Desert

B. Tundra

C. Tropical rain forest

D. Temperate forest

9. What behavior guides monogamy?

A. Environmental factors

B. Societal norms

C. Genetic influence

D. Personal choice

10. Which of the following is NOT a common vector used for DNA transfer?

A. Viruses

B. Bacteria

C. Plasmids

D. Fungi

Answers

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

Explanations

1. Which type of immunodeficiency might be caused by the use of prescription drugs?

A. Primary immunodeficiency

B. Acquired immunodeficiency

C. Inherited immunodeficiency

D. Autoimmune disorder

Acquired immunodeficiency is the correct answer because it refers to situations where the immune system becomes weakened due to external factors, such as certain prescription drugs. Many medications, particularly those used in chemotherapy, immunosuppressants, or corticosteroids, can significantly impair the immune system's ability to function effectively. This can lead to increased susceptibility to infections and other health issues. In contrast, primary immunodeficiency refers to genetic or congenital disorders that result in a weakened immune system from birth. Inherited immunodeficiency also relates to genetic factors and is not influenced by external environmental factors like medications. Autoimmune disorders occur when the immune system mistakenly attacks the body's own cells, which is a different mechanism compared to deficiency in immune function caused by drugs. Thus, the focus on externally-induced factors and the role of medications are what make acquired immunodeficiency the right choice in this context.

2. Which of the following is NOT a type of macro molecule?

A. Carbohydrates

B. Nucleic acids

C. Small organic molecules

D. Proteins

The identification of small organic molecules as the correct answer to the question hinges on understanding the classification and characteristics of macromolecules. Macromolecules are large complex molecules that are essential to various biological processes and structures. They are typically polymers, which means they are made up of smaller subunits or monomers. Carbohydrates, nucleic acids, and proteins are all considered macromolecules because they consist of long chains of repeating units. Carbohydrates are built from sugar molecules (monosaccharides), forming structures like starches and cellulose. Nucleic acids such as DNA and RNA are polymers made from nucleotide monomers that store and transmit genetic information. Proteins are composed of amino acids and play crucial roles in almost all biological functions, from catalyzing metabolic reactions to providing structural support. On the other hand, small organic molecules do not fall into the category of macromolecules, as they are typically low molecular weight compounds. They include substances like amino acids, simple sugars, and fatty acids, which may serve as building blocks for macromolecules but are not themselves large enough to be classified as macromolecules. This distinction is key in understanding the structural and functional diversity present in the biochemical landscape of organisms.

3. Which component of the cell is primarily responsible for controlling cellular activities?

A. Cytoplasm

B. Cell membrane

C. Nucleus

D. Ribosomes

The nucleus is the component of the cell that plays a crucial role in controlling cellular activities. It houses the cell's genetic material, DNA, which contains the instructions for producing proteins and regulating various cellular functions. This genetic information dictates how the cell operates, grows, and responds to environmental changes. The nucleus serves as the control center, orchestrating processes such as cell division, gene expression, and metabolic activities by regulating the synthesis of proteins based on the needs of the cell at any given time. In essence, the nucleus ensures that the cell responds appropriately to internal and external signals, maintaining homeostasis and functionality. While other components such as the cytoplasm, cell membrane, and ribosomes have important roles in cellular processes, they do not have the overarching control over cellular activities that the nucleus possesses; for example, the cytoplasm is where metabolic reactions occur, the cell membrane regulates what enters and exits the cell, and ribosomes are responsible for synthesizing proteins. However, none of these structures direct the overall functions of the cell like the nucleus does.

4. Which macromolecule is characterized by a repeating pattern of N-C-C in its polypeptide chain?

A. Carbohydrate

B. Lipid

C. Protein

D. Nucleic acid

The correct answer is indeed proteins. Proteins are composed of polypeptides, which are chains of amino acids linked together by peptide bonds. The repeating pattern of N-C-C in the polypeptide chain refers specifically to the backbone structure of amino acids, where 'N' represents the nitrogen atom in the amino group, 'C' corresponds to the alpha carbon of the amino acid, and the second 'C' denotes the carbonyl carbon in the carboxyl group. This N-C-C pattern is characteristic of all amino acids, the building blocks of proteins. Each amino acid has this basic structure, with varying side chains that define the properties and functions of each specific amino acid. As polypeptides fold and combine, they create the diverse range of proteins that perform countless functions in biological systems, from catalyzing reactions as enzymes to providing structural support in cells. In contrast, carbohydrates consist primarily of sugar units, lipids are made up of fatty acid chains, and nucleic acids are polymers of nucleotides. None of these other macromolecules feature the specific N-C-C repeating pattern found in polypeptides, which is why proteins are the correct answer to this question.

5. What is the first structure to emerge from a germinating seed?

A. Hypocotyl

B. Radicle

C. Cotyledon

D. Seed coat

The radicle is the first structure to emerge from a germinating seed, playing a crucial role in establishing the plant's root system. As the seed absorbs water during germination, it triggers physiological changes leading to the growth of the radicle. The radicle develops into the primary root, anchoring the plant in the soil and facilitating the uptake of water and nutrients essential for growth. In the context of seed development, the radicle's emergence marks the beginning of the plant's life cycle, allowing it to transition from a dormant seed to an active plant. Other structures, such as the hypocotyl and cotyledons, develop subsequently from different parts of the embryo. The hypocotyl arises above the radicle and will eventually form the stem and support the cotyledons when they break through the soil. Cotyledons serve as the first leaves and provide initial energy for the plant, but they do not emerge until after the radicle has taken root. The seed coat, on the other hand, is simply the protective outer layer that remains until the seed has fully germinated.

6. What is the diploid phase of plants referred to as?

A. Gametophyte

B. Sporophyte

C. Life cycle

D. Prothallus

The diploid phase of plants is referred to as the sporophyte. In the plant life cycle, the sporophyte generation is characterized by the presence of two sets of chromosomes (diploid) and is responsible for producing spores through meiosis. These spores are haploid, meaning they contain one set of chromosomes, and will eventually develop into the gametophyte phase, which is the haploid stage. The sporophyte plays a crucial role in the alternation of generations, a fundamental process in the biology of plants. During this cycle, the sporophyte produces spores that germinate and grow into the gametophyte. This transition between the diploid sporophyte and the haploid gametophyte stages is essential for the reproductive strategy of plants, allowing them to produce offspring and adapt to their environments. In contrast, the gametophyte phase refers to the haploid generation that emerges from the spores and produces gametes. The term "life cycle" is broader and encompasses the entire series of stages a plant goes through from germination to maturity, including both the sporophyte and gametophyte phases. Prothallus specifically denotes the gametophyte structure in ferns and other non-flowering

7. What is the first law of thermodynamics?

A. Energy can be created or destroyed

B. Energy is always conserved in an isolated system

C. Entropy decreases over time in isolated systems

D. Energy is transferable but not transformable

The first law of thermodynamics states that energy cannot be created or destroyed, only transformed from one form to another, and that the total energy of an isolated system remains constant. This principle is often summarized by the concept of the conservation of energy. Therefore, the idea that energy is always conserved in an isolated system is fundamental to understanding how energy functions within that system. In this context, the notion that energy can be created or destroyed does not align with the first law, as it directly contradicts the principle of conservation. The statement regarding entropy decreasing over time is more closely related to the second law of thermodynamics, which discusses the direction of energy transformations and the tendency of systems to move toward increased disorder. Lastly, the idea that energy is transferable but not transformable misrepresents the first law, as it emphasizes only one aspect of energy movement while neglecting its ability to change forms.

8. Which biome is characterized by high temperatures, high rainfall, and poor soil quality?

A. Desert

B. Tundra

C. Tropical rain forest

D. Temperate forest

The tropical rain forest is characterized by a combination of high temperatures and high rainfall throughout the year. This biome is typically located near the equator, where warm air rises and causes heavy precipitation. The consistent warmth and moisture create an environment that supports an incredibly diverse array of plant and animal life. Despite the abundance of rainfall, the soil quality in tropical rain forests is often poor due to the rapid decomposition and nutrient cycling that occur in such warm, humid conditions. Much of the nutrient content is found in the vegetation rather than in the soil itself, as organic material decomposes quickly. Consequently, once cleared, tropical rainforest soils do not retain nutrients effectively, making them less suitable for agriculture or long-term cultivation. This ecological context highlights the unique features of tropical rain forests compared to other biomes, such as deserts, which are characterized by arid conditions, tundras, which have low temperatures and permafrost, and temperate forests, which experience seasonal temperature changes and generally richer soils.

9. What behavior guides monogamy?

A. Environmental factors

B. Societal norms

C. Genetic influence

D. Personal choice

Monogamy can be influenced by genetic factors, as certain species exhibit behaviors that promote long-term pair bonding. In many animal species, genetic predispositions can dictate social structures and mating behaviors. For example, specific genes can affect levels of hormones such as oxytocin and vasopressin, which are associated with attachment and bonding in romantic relationships. These biological factors can lead to the development of monogamous behaviors as part of a survival strategy, ensuring that offspring are raised in a stable environment by both parents. While environmental factors, societal norms, and personal choices can certainly play significant roles in the practice of monogamy, these influences often interact with underlying genetic predispositions. Thus, genetic influence provides a foundational understanding of why certain species may have evolved towards monogamous pairings as a successful reproductive strategy.

10. Which of the following is NOT a common vector used for DNA transfer?

A. Viruses

B. Bacteria

C. Plasmids

D. Fungi

The choice of fungi as not being a common vector used for DNA transfer is correct because, in genetic engineering and molecular biology, the most frequently used vectors are those that provide efficient pathways for the introduction and replication of foreign DNA in host organisms. Viruses, bacteria, and plasmids are widely used due to their established systems for gene delivery. Viruses, specifically engineered ones, can infect host cells and deliver genetic material efficiently. Bacteria can take up plasmids containing foreign DNA through processes like transformation, and plasmids themselves are small circular DNA molecules used extensively to manipulate gene expression in various organisms. Although fungi can occasionally be used in genetic studies and biotechnological applications, they are not primary vectors compared to the more conventional or efficient options like viruses and plasmids. This distinction helps clarify why fungi are not categorized as common vectors for DNA transfer in the context of genetic engineering.