Arizona State University (ASU) BIO360 Animal Physiology Exam 1 Practice (Sample)

Study Guide

Everything you need from our exam experts!

Questions

1. Which of the following hormones is known to have a tropic effect?

   A. Insulin

   B. Adrenocorticotropic hormone (ACTH)

   C. Testosterone

   D. Thyroxine

2. What physiological change occurs during the fight-or-flight response?

   A. Decreased heart rate

   B. Reduced blood pressure

   C. Increased heart rate

   D. Decreased energy availability

3. What feature is common among G-protein-coupled receptors?

   A. Activated by a kinase molecule phosphorylating them

   B. Activated by GTP release from the G protein

   C. Activated by GTP binding to the G protein

   D. Activated when the α subunit binds to β and γ subunits

4. Tropic hormones often exhibit feedback inhibition. What does this mean?

   A. They support the growth of other hormones.

   B. They decrease the secretion of their own stimulating hormones.

   C. They have no autoregulatory control.

   D. They continuously stimulate their target glands.

5. How does the microbiome contribute to digestive health?

   A. Increases food intake

   B. Synthesizes vitamins and aids digestion

   C. Completely breaks down all food particles

   D. Produces digestive enzymes exclusively

6. What is one of the major challenges faced by terrestrial organisms?

A. Escape from predators

B. Survive food shortages

C. Reduce water loss

D. Find shelter

7. What would be a likely effect of increased body mass on metabolic rate?

A. Increased metabolic rate due to more energy demands.

B. Decreased metabolic rate due to energy conservation.

C. No effect on metabolic rate.

D. Inconsistent effects.

8. How can adaptation influence the genetic composition of a population?

A. Environmental stressors favor survival of certain genotypes.

B. Individuals possessing favorable genes tend to produce more offspring.

C. Genes are passed on only if offspring are produced.

D. All of the above.

9. What is the advantage of storing energy as glycogen compared to lipids?

A. It contains more energy per unit mass

B. It does not prevent physical functions of a cell

C. It can be mobilized very rapidly

D. Both A and B

10. What role do tropic hormones play in the body?

A. They regulate metabolic rate

B. They control growth and development

C. They coordinate activities of other glands

D. They provide energy for cellular activities

Answers

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

Explanations

1. Which of the following hormones is known to have a tropic effect?

A. Insulin

B. Adrenocorticotropic hormone (ACTH)

C. Testosterone

D. Thyroxine

Adrenocorticotropic hormone (ACTH) is considered a tropic hormone because it specifically targets the adrenal cortex, stimulating it to produce glucocorticoids, particularly cortisol. Tropic hormones are defined by their ability to regulate the activity of other endocrine glands, thereby exerting an influence on hormone secretion rather than having a direct effect on non-endocrine tissues. Insulin primarily regulates glucose levels in the blood and has metabolic effects on tissues rather than acting as a tropic hormone. Testosterone is a steroid hormone that influences the development of male characteristics and reproductive functions but does not primarily act on another endocrine gland. Thyroxine, while important for metabolism and growth, is also not classified as a tropic hormone since its main functions are not dependent on signaling other endocrine glands to release other hormones.

2. What physiological change occurs during the fight-or-flight response?

A. Decreased heart rate

B. Reduced blood pressure

C. Increased heart rate

D. Decreased energy availability

During the fight-or-flight response, which is mediated by the sympathetic nervous system, the physiological changes are primarily aimed at preparing the body for a rapid response to stress or danger. One of the most notable changes is the increase in heart rate. This occurs due to the release of catecholamines, such as adrenaline (epinephrine), which stimulate the heart to pump more blood. The increased heart rate enhances blood flow to the muscles and vital organs, thereby improving oxygen and nutrient delivery necessary for quick, intense physical activity. These adaptations are crucial for survival, as they equip the organism to either confront a threat or escape from it efficiently. The increased heart rate is accompanied by other changes, such as increased respiration and heightened alertness, all contributing to the overall state of readiness during the fight-or-flight response.

3. What feature is common among G-protein-coupled receptors?

A. Activated by a kinase molecule phosphorylating them

B. Activated by GTP release from the G protein

C. Activated by GTP binding to the G protein

D. Activated when the α subunit binds to β and γ subunits

G-protein-coupled receptors (GPCRs) are a large family of membrane receptors that play a key role in signal transduction. The correct answer is that they are activated by GTP binding to the G protein. When a ligand, such as a hormone or neurotransmitter, binds to the GPCR, it causes a conformational change in the receptor that allows it to interact with an associated G protein. This interaction leads to the exchange of GDP for GTP on the α subunit of the G protein. The binding of GTP activates the G protein, which then dissociates into the active α subunit and the βγ dimer, each of which can then go on to interact with downstream effector proteins. This process is crucial for propagating the signal initiated by the ligand-receptor interaction and can lead to various cellular responses. The activation mechanism involving GTP is fundamental to GPCR signaling pathways, and it's important to understand that the G protein is inactive when bound to GDP and becomes active only when GTP binds. This is a key element in the role of GPCRs in numerous physiological processes.

4. Tropic hormones often exhibit feedback inhibition. What does this mean?

A. They support the growth of other hormones.

B. They decrease the secretion of their own stimulating hormones.

C. They have no autoregulatory control.

D. They continuously stimulate their target glands.

Tropic hormones are specialized hormones that stimulate other endocrine glands to release their own hormones. Feedback inhibition refers to a regulatory mechanism where the output of a process inhibits its own production or the production of related substances. In the context of tropic hormones, when they are released and subsequently raise the levels of the hormones they stimulate in their target glands, this surge can provide negative feedback to the original gland that secretes the tropic hormone. This means that as the levels of the stimulated hormones rise, they act on the pituitary gland or hypothalamus to decrease the secretion of the tropic hormones that initiated their release. Thus, there's a regulatory balance maintained within the endocrine system, preventing excessive hormone production and ensuring homeostasis. While other options might suggest supporting hormone growth or lack of control, they do not accurately capture the essence of the feedback mechanism in hormone regulation. Feedback inhibition highlights the importance of keeping hormone levels within a functional range, which is critical for maintaining overall physiological balance.

5. How does the microbiome contribute to digestive health?

A. Increases food intake

B. Synthesizes vitamins and aids digestion

C. Completely breaks down all food particles

D. Produces digestive enzymes exclusively

The contribution of the microbiome to digestive health primarily revolves around its ability to synthesize vitamins and aid in digestion. The diverse community of microorganisms present in the gut, including bacteria, plays a crucial role in the fermentation of dietary fibers and the breakdown of complex carbohydrates that the human body itself cannot digest. This fermentation results in the production of short-chain fatty acids, which are beneficial for gut health and serve as an energy source for colonic cells. Additionally, certain bacteria in the microbiome are responsible for synthesizing essential vitamins, such as vitamin K and some B vitamins, which are important for various bodily functions including blood clotting and energy metabolism. The interaction between these microbial communities and the host can also enhance the gut barrier function, modulate the immune response, and protect against pathogens, emphasizing the microbiome's integral role in maintaining overall digestive health. In contrast, while increasing food intake, completely breaking down all food particles, and exclusively producing digestive enzymes might involve aspects of digestion, they do not accurately reflect the multifaceted contributions of the microbiome. The microbiome is not solely responsible for these functions, nor does it guarantee complete digestion of all food components, as some substances, like fiber, are intentionally not fully degraded to nourish the beneficial bacteria themselves

6. What is one of the major challenges faced by terrestrial organisms?

A. Escape from predators

B. Survive food shortages

C. Reduce water loss

D. Find shelter

Terrestrial organisms face a significant challenge in reducing water loss due to their exposure to the atmosphere, which is typically drier than their aquatic counterparts. Unlike aquatic organisms, which are surrounded by water and can absorb it through their skin or gills, terrestrial animals must actively conserve water to prevent dehydration. Adaptations such as efficient kidneys that concentrate urine, specialized skin that minimizes evaporation, and behaviors like seeking shade or being active during cooler parts of the day are crucial for maintaining water balance. This challenge is paramount in many terrestrial environments, especially arid regions, where water availability can be a limiting factor for survival and reproduction.

7. What would be a likely effect of increased body mass on metabolic rate?

A. Increased metabolic rate due to more energy demands.

B. Decreased metabolic rate due to energy conservation.

C. No effect on metabolic rate.

D. Inconsistent effects.

Increased body mass generally leads to an increased metabolic rate because larger bodies have a higher demand for energy to maintain physiological functions such as cellular respiration, tissue growth, and the maintenance of body temperature. As an organism grows or gains mass, it typically requires more energy to support its greater muscle mass, organ function, and other metabolic activities. This relationship is often described in metabolic scaling laws, where metabolic rate does not just increase linearly with mass but follows a power function, typically increasing at a rate that is less than proportional to mass but still overall resulting in greater energy demands for larger animals. Thus, the increased metabolic activity associated with a larger body mass reflects the enhanced energy requirements necessary for sustaining life processes and physical activity.

8. How can adaptation influence the genetic composition of a population?

A. Environmental stressors favor survival of certain genotypes.

B. Individuals possessing favorable genes tend to produce more offspring.

C. Genes are passed on only if offspring are produced.

D. All of the above.

Adaptation can significantly influence the genetic composition of a population through several interconnected mechanisms, all of which are reflected in the provided options. Firstly, environmental stressors create selective pressures that favor individuals with certain genotypes, leading to an increased likelihood of survival for those individuals. This means that specific traits that confer advantages in a given environment become more prevalent within the population over time, thereby shifting the overall genetic makeup toward those advantageous traits. Secondly, individuals with favorable genetic traits are often more successful in reproducing, known as differential reproductive success. This means that these individuals tend to produce more offspring than those without such traits. As a result, the genes associated with these advantageous traits are more likely to be passed on to future generations, further altering the genetic landscape of the population. Lastly, the basic principle of genetics states that genes can be passed to the next generation primarily through successful reproduction. Therefore, if certain genotypes lead to higher reproductive success, it naturally follows that these will become more common in the gene pool. By acknowledging that all of these processes work together, it becomes clear how adaptation can lead to significant changes in the genetic composition of a population over time. Each of the individual mechanisms provides insight into the broader phenomenon of natural selection and evolution.

9. What is the advantage of storing energy as glycogen compared to lipids?

A. It contains more energy per unit mass

B. It does not prevent physical functions of a cell

C. It can be mobilized very rapidly

D. Both A and B

Storing energy as glycogen offers the significant advantage of rapid mobilization when the body needs energy quickly. Glycogen is a polysaccharide that can be broken down into glucose rapidly through glycogenolysis, providing a swift source of glucose for energy, especially important during high-intensity exercise or stress. This quick availability of energy is crucial for maintaining performance and metabolic functions in situations where immediate energy is required. While lipids do contain more energy per unit mass, they require more time to break down and mobilize for use compared to glycogen. This slower process makes lipids less efficient for quick energy demands, even though they are a more energy-dense form of storage. Additionally, glycogen's storage form, being in a readily accessible state, does not prevent physical functions of the cell in the same way that excessive lipid storage could. However, the primary reason glycogen is favored for quick energy needs is its rapid mobilization capability, which is the essence of being able to access energy quickly and efficiently when necessary.

10. What role do tropic hormones play in the body?

A. They regulate metabolic rate

B. They control growth and development

C. They coordinate activities of other glands

D. They provide energy for cellular activities

Tropic hormones are key players in the endocrine system, primarily functioning to stimulate other glands to release their hormones. This regulatory role is crucial for maintaining homeostasis and ensuring that various physiological processes are coordinated across the body. For instance, tropic hormones like adrenocorticotropic hormone (ACTH) stimulate the adrenal glands to produce cortisol, which plays a vital role in stress response and metabolism. Similarly, thyroid-stimulating hormone (TSH) triggers the thyroid gland to secrete thyroid hormones, which are essential for regulating metabolism, growth, and development. Understanding this function highlights the importance of tropic hormones in the broader context of hormone signaling and regulation, making their role in coordinating activities of other glands a central aspect of their function in animal physiology.