



COMPETIFY HUB

BIOLOGY

GRADES 5-8

Providing Free Resources for All

HARD

Q1: The Effects of Drugs on the Nervous System

Case Report: A 50 year old develops a strange and rare case of Ageusia. When the woman consults with a doctor, she explains that she recently recovered from a mild case of COVID-19 and since then she has lost her sense of taste. The woman's symptoms include high blood pressure and the inability to taste foods. She also has diabetes running in her family history. She admits that she does not smoke or drink alcohol. Question: How does the patient's case of COVID-19 and high blood pressure connect to her condition? A. COVID-19 altered the patient's gut microbiome, which disrupted taste perception through the gut-brain axis, and hypertension caused electrolyte imbalances that interfered with taste signal transmission. B. The coronavirus triggered inflammation of the cranial nerves responsible for taste (especially the facial and glossopharyngeal nerves), while chronic high blood pressure impaired microvascular blood flow to the taste receptors, contributing to ageusia. C. COVID-19 did not cause damage to the olfactory bulb but it inflamed the nerve,

HARD

Q2: Vitamins

A patient presents the following symptoms: diarrhea, dermatitis, and dementia, as well as "necklace" lesions on the lower neck, hyperpigmentation, thickening of the skin, inflammation of the mouth and tongue, digestive disturbances, amnesia, and delirium. Which of the following is deficient in this person's system? A. Vitamin D3 (cholecalciferol) B. Vitamin B3 (niacin) C. Vitamin C (ascorbic acid) D. Vitamin B1 (thiamine)

HARD

Q3: The Immune System Response

A doctor has developed a new drug that prevents the presentation of antigens to CD4 helper T cells. She administers the drug to a lab mouse. Which one of the following immune cell types would have its functions least disrupted by the drug? A. Cytotoxic T Cell B. Memory B Cell C. Macrophage D. Neutrophil

MEDIUM

Q4: Nutrition

If you were to jog 1 km a few hours after lunch, which stored fuel would you probably tap? A. muscle proteins B. muscle and liver glycogen C. fat in the liver D. fat in adipose tissue

MEDIUM

Q5: Variation and Natural Selection

A population of moths shows variation in body color (light and dark). After a volcanic eruption, the environment becomes covered in dark ash. Before the eruption, there were 60 dark-colored insects and 45 light-colored insects. What outcome is most likely to occur in the insect population and why? A. The population of dark-colored insects will increase to 100 because they are better camouflaged. B. Light-colored insects will become extinct. C. Light-colored insects will develop a mutation that allows them to change colors, increasing their numbers to 65. D. Dark- and light-colored insects will stabilize and exhibit a grey phenotype, leading to 0 dark-colored insects and 0 light-colored insects.

MEDIUM

Q6: Diploid and Haploid Forms

Organisms that reproduce sexually exhibit zygotic, gametic, or Sporic meiosis. One way to determine the type of life cycle an organism has is by: A. observing embryonic development. B. comparing the diploid and haploid forms of the organism. C. determining when in the life cycle fertilization occurs. D. determining if gametes are multicellular or unicellular.

MEDIUM

Q7: Adaptive Immunity Response

There are 4 stages of the Adaptive Immune Response System. List the correct order by writing the correct order of the letters. Separate your answers with a comma (,). (e.g F, G, H, E) A. Different action and Attack B. Clonal Expansion C. Clonal Selection and Activation D. Antigen Encounter and Presentation

MEDIUM

Q8: Signal Transduction and Receptors

A hormone affects liver cells but not muscle cells. What best explains this? A. Muscle cells destroy the hormone B. Liver cells have specific receptors for the hormone C. Muscle cells have thicker membranes D. The hormone only travels to the liver

MEDIUM

Q9: Trophic Levels

Why is there less available energy at higher trophic levels? A. Organisms use most energy for reproduction B. Energy is lost as heat during metabolism C. Producers store little energy D. Consumers cannot digest all food

MEDIUM

Q10: Substrates and Enzymes

A competitive inhibitor is added to an enzyme-catalyzed reaction. Which change would most likely overcome the inhibition? A. Decreasing temperature B. Increasing substrate concentration C. Lowering pH D. Removing products

HARD

S1: C

Explanation:

Answer – C. THE COMPLETE ANSWER: The cranial nerves are a set of 12 nerves that send electrical impulses to the brain. The cranial nerves begin at the neck and go up to the brain, controlling everything from bodily processes to controlling tongue movements. The Glossopharyngeal nerve is the nerve responsible for providing taste sensations to the part of your tongue and controlling the muscles for swallowing. When the patient was diagnosed with COVID-19, the virus did not damage the olfactory bulb but it inflamed the nerve leaving the patient stripped of their ability to taste foods. Hypertension can also cause Ageusia. When a person has high systolic blood and arterial pressure, there are chances that their hypertension could cause nerve damages, leading to loss of taste.

HARD

S2: B

Explanation:

Answer – B. Correct Answer: B The patient's symptoms are hallmark of pellagra, which is caused by a deficiency of niacin. Pellagra's symptoms are the "three D's" (dermatitis, diarrhea, dementia). Deficiency of vitamin B1 causes similar symptoms of dementia, but it does not cause dermatitis or diarrhea.

HARD

S3: D

Explanation:

Answer – D. Correct Answer: D Neutrophils are part of the innate immune response. They do not present antigens and function through phagocytosis (eating bacteria). Their function would be the least disrupted by a drug that targets antigens.

MEDIUM

S4: B

Explanation:

Answer – B. Correct Answer: B Muscle glycogen is the primary fuel working muscles use, and liver glycogen releases glucose into your blood to keep blood sugar levels stable while working.

MEDIUM

S5: A

Explanation:

Answer – A. Correct Answer: A Natural selection favors dark-colored insects because their camouflage makes it harder for predators to spot them, making it easier for the insects to survive. These insects then survive longer and produce more offspring, leading to a greater number of dark-colored insects in the population overall.

MEDIUM

S6: B

Explanation:

Answer – B. Life cycles are characterized by the timing of meiosis and the characteristics of the diploid and haploid generations. Embryonic development, (A), does not reveal either of these characteristics, nor does fertilization, (C). All gametes are unicellular, ruling out (D).

MEDIUM

S7: D, C, B, A

Explanation:

Answer – D, C, B, A. D. Antigen Encounter and Presentation: APC's engulf pathogens and break them down. C. Clonal Selection and Activation: Naive T and B lymphocytes with specific receptors (TCRs and BCRs) that match the antigen's epitope are selected. B. Clonal Expansion: Proliferation: Activated T and B cells multiply rapidly, creating a large army of identical, antigen-specific cells (clones). A. Different action: Clones develop into Effector and Memory Cells. Antibodies neutralize pathogens, while cytotoxic T cells kill infected host cells, eliminating the threat.

MEDIUM

S8: B

Explanation:

Answer – B. Correct Answer: B Cell signaling requires a ligand (the hormone) and a matching receptor, and only cells with the correct receptor will respond. The muscle cells do not have the correct receptors, but the liver cells do.

MEDIUM

S9: B

Explanation:

Answer – B. Correct Answer: B According to the 10% rule, around 10% of energy transfers to the next trophic level because much of it is released as heat.

MEDIUM

S10: B

Explanation:

Answer – B. Correct Answer: B Competitive inhibitors compete with the substrate for the active site. If you add more substrate, the substrate will outcompete the inhibitor, increasing the reaction rate again.

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