

Name: _____ Date: _____

The Last of Us: Advanced Microbiology Survival Quiz for 12th Grade

Synthesize data on metabolic pathways and horizontal gene transfer to stop a hypothetical pandemic. This format forces deep analysis of microbial tactics.

1. An environmental isolate shows the ability to thrive in extremely high concentrations of arsenic by utilizing a periplasmic arsenite oxidase. What evolutionary mechanism most likely allowed for the rapid acquisition of this specialized metabolic trait in a previously sensitive population?

- A. Vertical transmission via binary fission
- B. Horizontal gene transfer via an R-plasmid
- C. Nonsense mutations in the DNA polymerase gene
- D. Antigenic drift within the viral capsid

2. Retroviruses, such as HIV, utilize a high-fidelity DNA polymerase to ensure genomic stability during the integration process into the host genome.

- A. True
- B. False

3. In the presence of both glucose and lactose, E. coli will prioritize glucose metabolism through a process called catabolite repression, which is mediated by the signaling molecule _____.

- A. ATP
- B. tRNA
- C. cAMP
- D. cGMP

4. You are treating a patient with a suspected Mycoplasma pneumoniae infection. Why would prescribing a Beta-lactam antibiotic, such as Penicillin, be an example of poor clinical judgment?

- A. Mycoplasma are eukaryotes and lack peptidoglycan
- B. Mycoplasma naturally lack a cell wall, the target of Beta-lactams
- C. Penicillin only targets viral reverse transcriptase
- D. The bacteria's outer membrane is impermeable to large molecules

5. Archaeal membranes differ significantly from bacterial membranes because they contain _____ linkages connecting glycerol to isoprenoid chains, allowing for greater stability in extreme heat.

- A. Ester
- B. Peptide
- C. Ether
- D. Phosphodiester

6. In Quorum Sensing, bacteria release autoinducers that only trigger a response once a specific population density threshold is reached.

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- A. True
- B. False

7. An obligated anaerobic bacterium is placed in a high-oxygen environment. Death occurs because the microbe lacks which specific set of neutralized enzymes?

- A. ATP Synthase and Rubisco
- B. Superoxide Dismutase (SOD) and Catalase
- C. RNA Polymerase and Helicase
- D. Nitrogenase and Reverse Transcriptase

8. During the lysogenic cycle of a bacteriophage, the viral genome is integrated into the bacterial chromosome and is referred to as a _____.

- A. Plasmid
- B. Prophage
- C. Viroid
- D. Prion

9. Endospores are reproductive structures produced by fungi to survive harsh environmental conditions such as extreme desiccation.

- A. True
- B. False

10. How does the CRISPR-Cas9 system function naturally in prokaryotic cells?

- A. As a mechanism for metabolic energy storage
- B. As an adaptive immune system against viral DNA
- C. As a structural protein used in flagellar motility
- D. To synthesize essential amino acids from nitrogen