Name: _____ **Date:** _____

Neon Micro-Metabolism: 10th Grade Bio-Engineers Quiz

Synthesize knowledge of metabolic diversity and horizontal gene transfer across 10 rigorous challenges designed for the next generation of microbiologists.

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1. A strain of Halobacterium is found thriving in a high-salinity environment, utilizing bacteriorhodopsin to drive ATP synthesis without a standard electron transport chain. How should this organism be classified metabolically?

A. Chemoautotroph
B. Photoheterotroph
C. Facultative Anaerobe
D. Obligate Lithotroph

2. In the process of _____, a bacteriophage acts as a vector, accidentally packaging bacterial DNA and transferring it to a new host cell, contributing to genetic recombination.

A. Conjugation
B. Transformation
C. Transduction
D. Binary Fission

3. Gram-negative bacteria possess a thick peptidoglycan layer that traps crystal violet stain, whereas Gram-positive bacteria have a thin layer and an outer lipopolysaccharide membrane.

A. True
B. False

4. Considering the Endosymbiotic Theory, which evidence best supports the claim that mitochondria evolved from proteobacteria rather than being synthesized de novo by the eukaryotic host?

A. The presence of a nucleus within the mitochondria
B. Mitochondria utilize linear DNA similar to eukaryotic chromosomes
C. Mitochondrial ribosomes resemble 70S bacterial ribosomes
D. The ability of mitochondria to survive outside of the host cell

5. When a population of microbes reaches a critical density, they coordinate gene expression via _____, allowing the colony to act as a multicellular unit to form biofilms or release toxins.

A. Chemotaxis
B. Quorum Sensing
C. Apoptosis
D. Sporulation

6. Retroviruses, such as HIV, utilize the enzyme reverse transcriptase to integrate their RNA genome into the host's DNA as a provirus.

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A. True
B. False

7. A researcher observes a microbe reducing nitrate (NO_3^-) to nitrogen gas (N_2) in an oxygen-depleted environment. This metabolic pathway is best identified as:

A. Aerobic Respiration
B. Lactic Acid Fermentation
C. Anaerobic Respiration
D. Nitrogen Fixation

8. The extremely resilient structure formed by certain bacteria like Bacillus anthracis to survive high temperatures and desiccation is called a(n) _____.

A. Capsule
B. Endospore
C. Pilus
D. Cyst

9. Prions are infectious agents composed entirely of misfolded proteins that lack any nucleic acids.

A. True
B. False

10. In the context of the Lysogenic Cycle, what characterizes the 'prophage' stage of a viral infection?

A. The rapid lysis of the host cell membrane
B. The assembly of new viral capsids in the cytoplasm
C. The viral DNA being integrated into the host's bacterial chromosome
D. The attachment of viral tail fibers to host receptors