Name: _____ **Date:** _____

Answer Key: Invisible Empires, Global Impacts: College Microbiology Quiz

Analyze metabolic diversity and pathogenic mechanisms through 10 rigorous questions focusing on horizontal gene transfer and microbial ecology.

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1. Which of the following describes a chemolithoautotroph's primary method of energy acquisition and carbon fixation?

Answer: C) Oxidizing inorganic molecules like H2S for energy and fixing CO2.

Chemolithoautotrophs are unique to the microbial world, deriving energy from inorganic electron donors (lithotrophy) and fixing their own carbon from CO2 (autotrophy).

2. The process by which a bacteriophage transfers DNA from one host cell to another is known as _____.

Answer: B) Transduction

Transduction is a mode of horizontal gene transfer mediated by viral vectors (bacteriophages) during the lytic or lysogenic cycles.

3. Gram-negative bacteria possess a thick peptidoglycan layer that retains crystal violet stain during the decolorization step.

Answer: B) False

Gram-negative bacteria have a thin peptidoglycan layer and an outer membrane; it is the Gram-positive bacteria that possess the thick peptidoglycan layer.

4. In the context of the nitrogen cycle, which genus is primarily responsible for symbiotic nitrogen fixation in legume root nodules?

Answer: C) Rhizobium

Rhizobium species form mutualistic relationships with legumes, converting atmospheric N2 into ammonia which the plant can utilize.

5. The metabolic pathway used by many microbes to oxidize glucose to pyruvate, specifically yielding 2 ATP and 2 NADH per mole of glucose, is the _____ pathway.

Answer: C) Embden-Meyerhof-Parnas

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The Embden-Meyerhof-Parnas (EMP) pathway is the most common form of glycolysis used by many bacteria and eukaryotes.

6. Archaeal plasma membranes can contain ether-linked lipids with branched isoprenoid chains, distinguishing them from Bacterial ester-linked lipids.

Answer: A) True

This biochemical distinction in membrane lipids is a key evolutionary difference between the domains Archaea and Bacteria.

7. Which component of the lipopolysaccharide (LPS) layer in Gram-negative bacteria is responsible for its endotoxin activity?

Answer: C) Lipid A

Lipid A is the inner-most component of LPS and triggers a strong immune response (endotoxic shock) when released into the bloodstream.

8. In microbial genetics, a set of structural genes regulated by a single promoter and operator is termed a(n) _____.

Answer: B) Operon

The operon model, exemplified by the lac operon, allows bacteria to coordinate the expression of enzymes in the same metabolic pathway.

9. Prions are infectious agents composed entirely of misfolded DNA molecules that cause neurodegenerative diseases.

Answer: B) False

Prions are infectious proteins; they contain no nucleic acids (DNA or RNA).

10. During the stationary phase of a bacterial growth curve, which of the following is occurring?

Answer: C) The reproductive rate is roughly equal to the death rate due to nutrient depletion.

Stationary phase occurs when the growth rate slows and matches the death rate, often due to limiting resources or toxic byproduct accumulation.