

Name: _____ Date: _____

Answer Key: Modeling Microbes: Your 8th Grade Microbiology Mastery Quiz

Synthesize complex biological data to evaluate how metabolic diversity in extremophiles and pathogens informs modern bio-engineering and epidemiology.

1. When examining a newfound organism discovered near a deep-sea hydrothermal vent, you observe it lacks a nucleus and utilizes hydrogen sulfide for energy. How would you categorize its metabolic strategy?

Answer: B) Chemoautotrophic

Chemoautotrophs derive energy from the oxidation of inorganic compounds like hydrogen sulfide, rather than sunlight, which is absent in the deep ocean.

2. A scientist uses ____ to integrate a specific gene into a bacterial plasmid, creating a recombinant organism capable of producing human insulin.

Answer: C) Restriction enzymes

Restriction enzymes act as molecular scissors that cut DNA at specific sequences, allowing geneticists to splice new genes into a microbial genome.

3. Antibiotics are an effective primary treatment for eradicating viral infections such as Ebola or the common cold because they disrupt protein synthesis in the host cell.

Answer: B) False

Antibiotics target bacterial structures (like cell walls or 70S ribosomes); viruses lack these targets and require antivirals or vaccines instead.

4. In a scenario where a population of bacteria is exposed to a sub-lethal dose of penicillin, what is the most likely driver of the 'superbug' phenomenon in subsequent generations?

Answer: C) Horizontal gene transfer via conjugation

Conjugation allows bacteria to pass resistance plasmids directly to others, rapidly spreading survival traits through a population via horizontal gene transfer.

5. To visualize the internal 3D ultrastructure of a bacteriophage at a nanometer scale, a researcher would most likely utilize a ____.

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Answer: B) Scanning electron microscope

Scanning electron microscopy (SEM) provides high-resolution, three-dimensional images of surfaces and small structures like viruses that are below the resolution limit of light.

6. Retroviruses, such as HIV, utilize the enzyme reverse transcriptase to convert their RNA genome into DNA before integrating it into the host's genome.

Answer: A) True

This reverse flow of genetic information (RNA to DNA) is the hallmark of retroviruses, allowing them to hide within the host's own genetic material.

7. Which of the following describes the secondary role of Mycorrhizal fungi in forest ecosystems?

Answer: C) Extending root systems for phosphorus absorption

Mycorrhizae form symbiotic relationships with plant roots, significantly increasing the surface area for nutrient uptake, particularly phosphorus, in exchange for sugars.

8. During the process of ____, yeast cells convert glucose into ethanol and carbon dioxide in the absence of oxygen.

Answer: C) Anaerobic fermentation

Fermentation is an anaerobic pathway used by organisms like yeast to extract energy from sugar when oxygen levels are low or non-existent.

9. In the Lysogenic cycle of a viral infection, what is the fate of the viral DNA?

Answer: B) It remains dormant as a prophage within the host genome

In the lysogenic cycle, the viral genome is integrated into the host DNA and replicated along with it without destroying the cell, until it is triggered to enter the lytic cycle.

10. Prions are unique infectious agents because they consist entirely of misfolded proteins and contain no nucleic acids (DNA or RNA).

Answer: A) True

Prions challenge the standard definition of 'living' pathogens as they lack genetic material, causing disease by inducing normal proteins to misfold.