Name: _____ **Date:** _____

Answer Key: Invisible Frontiers: The 8th Grade Extremophile & Microbe Expedition

How do life forms survive in the most hostile environments on Earth? Analyze metabolic diversity and microscopic structures in this conceptual challenge.

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1. A team of researchers discovers a microorganism in a volcanic vent that lacks a nucleus and possesses a cell wall without peptidoglycan. Which domain does this organism likely belong to?

Answer: B) Archaea

Archaea are prokaryotic like bacteria, but their cell walls and genetic makeup are distinct, often allowing them to thrive in extreme environments like volcanic vents.

2. Bacteriophages are specialized viruses that infect and replicate specifically within bacterial cells.

Answer: A) True

Bacteriophages are a category of viruses that target bacteria, acting as a natural check on bacterial populations in various ecosystems.

3. During the process of _____, some soil-dwelling bacteria convert atmospheric nitrogen into a form that plants can absorb.

Answer: B) Nitrogen Fixation

Nitrogen fixation is a critical ecological service provided by microbes (like Rhizobium) that turns nitrogen gas into ammonia for plant use.

4. When observing a water sample from a local salt lake, you find a unicellular organism moving via pseudopods. How should this organism be categorized?

Answer: C) A protozoan

Protozoa are animal-like protists that are often motile. Using pseudopods (false feet) for locomotion is characteristic of many protozoans like amoebas.

5. All microbes are pathogenic, meaning they are primarily designed to cause disease in humans and animals.

Answer: B) False

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The vast majority of microorganisms are either harmless or beneficial, playing essential roles in digestion, nutrient cycling, and food production.

6. Scientists use _____ to view internal structures of a virus, as these entities are too small to be resolved by visible light.

Answer: C) Electron Microscopes

Visible light has a wavelength that is too large to resolve tiny viruses; electron beams have much shorter wavelengths, providing the necessary resolution.

7. In an industrial setting, a biologist utilizes Aspergillus niger to produce citric acid. Aspergillus belongs to which group of microorganisms?

Answer: C) Fungi

Aspergillus is a genus of mold, which is a type of fungus. Fungi are frequently used in biotechnology for the production of chemicals and enzymes.

8. Cyanobacteria are unique among prokaryotes because they possess the ability to perform _____.

Answer: C) Photosynthesis

Cyanobacteria contain chlorophyll and are credited with producing much of the oxygen in Earth's early atmosphere through photosynthesis.

9. Microorganisms classified as 'obligate anaerobes' can only survive in environments where oxygen is present.

Answer: B) False

Obligate anaerobes are organisms that find oxygen toxic and can only survive in environments lacking it, such as deep sediment or animal intestines.

10. A scientist is testing a new antibiotic. They notice the drug prevents the formation of cross-links in peptidoglycan. Which of the following would be most affected by this drug?

Answer: C) Gram-positive bacteria

Peptidoglycan is a primary component of bacterial cell walls. Many antibiotics work by disrupting its synthesis, leading to the collapse of the bacterial cell.