Name: _____ **Date:** _____

Answer Key: Taxonomic Tailgate: 9th Grade Biodiversity Buffet Quiz

Decode the complexities of phylogenetic lineages and metabolic pathways to categorize organisms in this advanced molecular phylogeny challenge.

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1. A newly discovered organism lacks a nucleus and possesses membrane lipids with branched hydrocarbons linked to glycerol by ether bonds. In which domain should this organism be categorized?

Answer: C) Archaea

Archaea are distinguished from Bacteria by their unique membrane chemistry, specifically the presence of ether-linked lipids and branched hydrocarbons which provide stability in extreme environments.

2. In the cladistic approach to classification, a _____ group consists of an ancestral species and all of its descendants.

Answer: B) Monophyletic

A monophyletic group, or clade, is the gold standard of modern taxonomy because it accurately reflects the complete evolutionary history of a lineage.

3. Horizontal gene transfer (HGT) complicates the 'Tree of Life' model because it involves the movement of genetic material between different species rather than just from parent to offspring.

Answer: A) True

HGT occurs frequently in prokaryotes through mechanisms like conjugation and transformation, making the universal tree of life look more like a web than a simple branching tree.

4. Which of the following biochemical characteristics would definitely exclude an organism from Kingdom Fungi?

Answer: C) Cell walls composed mainly of cellulose

Fungi are defined by cell walls made of chitin; cellulose cell walls are the primary diagnostic feature of Kingdom Plantae.

5. If you are using the biological species concept, the primary criterion for classifying two populations as the same species is _____.

Answer: C) Reproductive compatibility

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The biological species concept defines a species as a group of populations whose members have the potential to interbreed in nature and produce viable, fertile offspring.

6. When comparing the classification of a Redwood tree and a Moss, at which taxonomic level do they first diverge?

Answer: B) Phylum

Both are in Kingdom Plantae, but they belong to different Phyla (or Divisions); Redwoods are in Coniferophyta (vascular) while Mosses are in Bryophyta (non-vascular).

7. The term 'Protista' is considered a valid monophyletic kingdom in modern phylogenetic systematics.

Answer: B) False

Kingdom Protista is paraphyletic; some protists are more closely related to plants, animals, or fungi than they are to other protists, leading systematists to abandon it in favor of supergroups.

8. To determine the evolutionary relationships between very distantly related organisms, such as a human and a bacterium, scientists compare sequences of _____.

Answer: B) Ribosomal RNA (rRNA)

rRNA changes very slowly over millions of years, making it an ideal 'molecular clock' for tracking deep evolutionary history across different domains.

9. An organism is found in a volcanic vent. It is unicellular, lacks a nuclear envelope, and its RNA polymerase is more similar to Eukaryotes than to Bacteria. It should be classified as:

Answer: B) An extremophilic Archaeon

Archaea share several molecular traits with Eukarya, such as similar RNA polymerases and the presence of introns in some genes, despite their prokaryotic cell structure.

10. In binomial nomenclature, the species epithet is always capitalized and can stand alone to identify the organism.

Answer: B) False

In binomial nomenclature (e.g., Homo sapiens), only the Genus name is capitalized. The species epithet is lowercase and must always follow the Genus name to be meaningful.