

Name: _____ Date: _____

Answer Key: The Genetic Kaleidoscope: Senior Biology Phylogeny Quiz

Examine the intricate boundaries between Archaea and Eukaryota while analyzing synapomorphies that move classification beyond simple morphological observation.

1. Which molecular evidence is most critical for distinguishing between the domains of Archaea and Bacteria, given that both are prokaryotic?

Answer: B) The composition of 16S ribosomal RNA sequences

Pioneered by Carl Woese, 16S rRNA sequencing revealed that Archaea are phylogenetically distinct from Bacteria, despite sharing a prokaryotic cell plan.

2. In phylogenetic systematic analysis, a shared derived character that defines a specific clade is known as a _____.

Answer: C) Synapomorphy

A synapomorphy is a trait that is unique to a specific group and its common ancestor, allowing taxonomists to define evolutionary branches.

3. The Endosymbiotic Theory suggests that Kingdom Protista is a monophyletic group because all members share a direct, exclusive common ancestor.

Answer: B) False

Kingdom Protista is considered paraphyletic or polyphyletic; it is a 'catch-all' group for eukaryotes that do not fit into plants, animals, or fungi.

4. Consider the classification of the Ginkgo biloba. To which kingdom does it belong, and what unique cellular characteristic supports this placement?

Answer: C) Plantae; presence of large central vacuoles and cellulose

Ginkgo biloba is a gymnosperm within Kingdom Plantae, characterized by photoautotrophy and cellulose-based cell walls.

5. Organisms like Halobacterium, which thrive in high-salinity environments such as the Dead Sea, are classified under the Domain _____.

Answer: C) Archaea

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Halobacterium are extreme halophiles, a group of organisms belonging to Domain Archaea that possess specialized membranes for high-salt conditions.

6. Horizontal Gene Transfer (HGT) complicates the 'Tree of Life' model by allowing exchange of genetic material between different domains.

Answer: A) True

HGT occurs when genes are transferred non-reproductively between species, making evolutionary history look more like a web than a simple branching tree.

7. Which of the following describes the fundamental distinction between the nutritional modes of Kingdom Fungi and Kingdom Animalia?

Answer: B) Fungi exhibit absorptive heterotrophy; Animals exhibit ingestive heterotrophy

Fungi secrete enzymes into their environment to break down organic matter externally before absorption, whereas animals typically ingest food internally.

8. The hierarchical taxons move from general to specific. Following 'Class', the next most specific level of classification is _____.

Answer: C) Order

The standard hierarchy is Kingdom, Phylum, Class, Order, Family, Genus, Species. Order follows Class.

9. The use of binomial nomenclature ensures that a species like the *Sequoia sempervirens* has a unique, globally recognized identifier.

Answer: A) True

Binomial nomenclature, established by Linnaeus, uses Genus and species epithet to provide a standardized universal name for every organism.

10. In a cladogram, what does a 'node' represent in terms of evolutionary history?

Answer: C) The most recent common ancestor of descending clades

Nodes represent speciation events where a single ancestral lineage splits into two or more descendant lineages.