

Name: _____ Date: _____

Tracing the Tangled Tree: 12th Grade Advanced Phylogeny Quiz

Examine 10 complex scenarios regarding horizontal gene transfer, cladistic parsimony, and the role of molecular clocks in modern systematic biology.

1. When constructing a cladogram for a group of vertebrates, you encounter 'homoplasy' regarding the presence of wings in birds and bats. Which principle must be applied to resolve the most likely evolutionary path?

- A. Maximum Parsimony
- B. The Biological Species Concept
- C. Adaptive Radiation
- D. Stabilizing Selection

2. Horizontal Gene Transfer (HGT) is a phenomenon primarily restricted to Prokaryotic domains and does not significantly complicate the phylogenetic mapping of Eukaryotic evolution.

- A. True
- B. False

3. In the context of modern systematics, a group that includes an ancestral species and all of its descendants is characterized as being _____.

- A. Polyphyletic
- B. Paraphyletic
- C. Monophyletic
- D. Analogous

4. Which molecular tool is most appropriate for determining the Divergence Time between two species that shared a common ancestor roughly 500 million years ago?

- A. Mitochondrial DNA (mtDNA) sequencing
- B. Ribosomal RNA (rRNA) analysis
- C. Microsatellite mapping
- D. Carbon-14 isotope dating

5. Biological classification has shifted from Phenetics (similarity-based) to Phylogenetics. The fundamental unit of character differentiation used in modern cladistics is the _____.

- A. Shared ancestral character
- B. Shared derived character
- C. Convergent trait
- D. Morphological archetype

6. The Three-Domain system (Archaea, Bacteria, Eukarya) relies more heavily on biochemical and molecular evidence than on gross anatomical structures.

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- A. True
- B. False

7. Consider the evolution of Cetaceans. If a taxonomist groups whales and hippos together because they share a common ancestor not shared by other hooved mammals, this group is:

- A. A valid clade
- B. A paraphyletic grade
- C. An outgroup
- D. A convergent assembly

8. To calibrate a molecular clock, researchers must frequently rely on _____ to provide absolute dates for specific evolutionary branch points.

- A. Gene flow statistics
- B. The fossil record
- C. Punctuated equilibrium
- D. Artificial selection

9. Phylogenetic trees are definitive proof of evolutionary history rather than hypotheses subject to revision.

- A. True
- B. False

10. What is the primary significance of the 'Ring of Life' model compared to the 'Tree of Life' model in early evolutionary history?

- A. It suggests all life evolved from a single eukaryotic cell.
- B. It accounts for the fusion of genomes through endosymbiosis.
- C. It eliminates the need for the domain Archaea.
- D. It proves that viruses were the first living organisms.