

Name: _____ Date: _____

Systematic Secrets: Sorting Species for Sophomores

Phylogenetic analysis, horizontal gene transfer, and molecular clocks — essential frameworks for evaluating transitional evolutionary relationships.

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

- A. Domain Bacteria
- B. Domain Archaea
- C. Domain Eukarya
- D. Kingdom Protista

2. When constructing a cladogram, biologists focus on _____ characters, which are traits that evolved in the immediate ancestor of a group and were passed down to its descendants.

- A. Ancestral
- B. Analogous
- C. Derived
- D. Vestigial

3. Under the Phylogenetic Species Concept, a species is defined as the smallest group of individuals that share a common ancestor and form one branch on the tree of life.

- A. True
- B. False

4. Two organisms belong to the same Class but different Orders. Which of the following statements regarding their taxonomic relationship is most accurate?

- A. They must belong to the same Family.
- B. They must belong to the same Phylum.
- C. They belong to different Kingdoms.
- D. They share more traits than organisms in the same Genus.

5. The process of _____ complicates the 'Tree of Life' model because it involves the movement of genes between different species, particularly among prokaryotes, rather than simple vertical inheritance.

- A. Meiosis
- B. Binary Fission
- C. Horizontal Gene Transfer
- D. Convergent Evolution

6. Why is the use of 'Kingdom Protista' frequently debated and increasingly replaced by the concept of 'Supergroups' in modern systematic biology?

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- A. Protists are all prokaryotic.
- B. The kingdom is paraphyletic and lacks a single common ancestor.
- C. Protists do not contain DNA.
- D. All protists have transitioned into the Fungi kingdom.

7. Molecular clocks use the rate of mutations in highly conserved genes, such as those coding for ribosomal RNA, to estimate the time of divergence between two lineages.

- A. True
- B. False

8. Organisms like the Venus Flytrap are problematic for simple classification because they are _____; they can produce their own food via photosynthesis but also digest insects for nitrogen.

- A. Saprobes
- B. Mixotrophs
- C. Obligate Anaerobes
- D. Chemoautotrophs

9. A systematist discovers that a group of organisms has similar body shapes and hunting patterns but lacks a recent common ancestor. This similarity is likely due to:

- A. Homology
- B. Convergent Evolution
- C. Shared derived traits
- D. Taxonomic hierarchy

10. In the Binomial Nomenclature system, the species epithet is always capitalized and can be used alone to identify a specific organism in a scientific paper.

- A. True
- B. False