

Name: _____ Date: _____ Per: _____

Chapter 25 Review: Phylogeny and Systematics

1. Explain what phylogenies are and systematics is and how biologists use each to trace evolutionary histories.
2. Describe how the fossil record and homologies (both morphological and molecular) are used to infer phylogenies.
3. Remind me of convergent vs. divergent evolution. Why is it important to distinguish between homology and analogy (similarity due to convergent evolution) when constructing phylogenies?
4. Why do scientists use computer programs such as BLAST to compare DNA sequences? Explain the concept of “molecular yardsticks”.
5. Give an example of an analogous structure homoplasy and a molecular homoplasy.
6. Do #1 and #2 in the 25.1 Concept Check on p. 495. I dare you to try them on your own before looking up the answers! Next, EXPLAIN your answers.

7. Define/give examples where appropriate of the following (use your own judgment...you can do it!): (notice the ending of each level of classification, for example, families end with -ae).
- Taxonomy
 - Binomial nomenclature
 - Species
 - Genus
 - Family
 - Order
 - Class
 - Phylum
 - Kingdom
 - The Three Domains
8. SIDE NOTE! Look at page 525 where it says “genetic annealing”. Read anything interesting about UI? Now go to page 540-541. What did Woese conclude? Crazy that a guy this impactful to the study of evolution loved right down the street from you until he passed away in 2012.
9. What is the connection between classification and phylogeny?
10. Draw and label a simple phylogenetic tree with species of your choice. I dare you to move beyond cats and dogs! Next do the same for a cladogram and compare/contrast the two.
11. Define the following and again, given examples, where appropriate:
- Clade
 - Monophyletic
 - Paraphyletic
 - Polyphyletic
 - Shared primitive character
 - Shared derived character
 - Outgroup
 - Ingroup
12. Explain how phylograms and ultrametrics trees are used to show timing.

13. How can the possibility of finding the best tree be narrowed using maximum parsimony and maximum likelihood?
14. Understand the technique used on pages 502-503. This will be our next lab!
15. Explain why these trees are hypotheses. Use the 4-chambered heart to strengthen your explanation (i.e. what is the analogy-homology issue?)
16. Why is molecular systematics most useful for evolutionary studies?
17. Define/give examples of:
- Homologous genes
 - Orthologous genes
 - Paralogous genes
18. Now, what are molecular clocks and how are they used to track evolutionary time? (Use HIV on pg. 507 to help you understand more). What are the difficulties associated with using them?
19. What is neutral theory? (SIDE NOTE: this is what husband O'Dwyer works on at UI. If you're interested in this, let's chat about you mentoring with him!)
20. What is the Universal Tree of Life and what are the 2 points made about it?