Name _____ Period _____ Date _____

Topic 5.4: Cladistics Reading Guide

5.4.U1 A clade is a group of organisms that have evolved from a common ancestor.

1. Define the term clade.
2. Define the term cladogram.
3. Draw a generic cladogram consisting of one ancestral species branching into three different species (A, B and C).

5.4.U2 Evidence for which species are part of a clade can be obtained from the base sequences of a gene or the corresponding amino acid sequence of a protein.

4. What kind of evidence is needed to help identify if two species belong to the same clade?
5. If you were looking at two species in the same clade that had diverged millions of years ago, what could you deduce about the number of differences you would find between their DNA sequences?
6. Describe the source of these differences between the two species in the above question.

5.4.U3 Sequence differences accumulate gradually so there is a positive correlation between the number of differences between two species and the time since they diverged from a common ancestor.

7. Explain the phrase "molecular clock" in relation to DNA mutations and evolution.
8. Based on Figure 2 (page 271) which two groups are more closely related?
   A. Gorilla and Bonobo B. Orang-utan and Bonobo C. Chimpanzee and Bonobo

5.4.U4 Traits can be analogous or homologous.

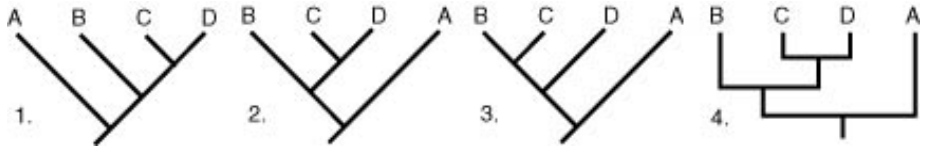
9. Use your Topic 5.1 Reading Guide to review the terms analogous and homologous structures.
10. What is the difference between homologous and analogous structures?
11. Are the eyes of a bee and the eyes of a lion analogous or homologous structures? Outline your reasons.
12. Which type of structure is more important in establishing a relationship between two species?
13. Explain why molecular evidence is favored over morphological evidence in establishing clades.

5.4.U5 Cladograms are tree diagrams that show the most probable sequence of divergence in clades [5.4.A1 and 5.4.A2].

14. Describe the principle of parsimony.
15. Label a node on the generic cladogram in question number four.
16. What does the node represent?
17. Are cladograms "proof" of evolutionary relationships of species that share a clade? Explain your reasoning.
18. Complete the "Activity: A cladogram for the great apes" on page 273.

5.4.U6 Evidence from cladistics has shown that classifications of some groups based on structure did not correspond with the evolutionary origins of a group or species (NOS) [5.4.S1].

19. Define the term cladistics.
20. How has modern technology change the study of cladistics?
21. Based on the information in Topic 5.3, how technology has changed how we classify bacteria?
22. Study the boxes "Cladograms and falsifications" and "Classification of the figwort family" on pages 275 and 276. Explain why it important that theories are continually revised.
23. Study the figure to the right. State which cladogram shows an evolutionary history that is different from the others. Explain your answer.



(geol.umd.edu)