Biology B / Classification

Your Name:_____ Per____

Lab Group Names:_____

Part A: Taxonomy of Living Caminalcules

1. Examine the drawings of living caminalcules. Start your classification by placing them in the animal kingdom. What characteristics make them (and any other animal) belong in Kingdom Animalia? (Hint: use a book)

2. Your answer above is based on some assumptions about caminalcules. Also assume the following:
   a) the pictures all show adults of separate species, shown at life size. Adults do not vary in size.
   b) you have no information about what is on their ventral surface, internal structures or the functions of their structures
   c) there is no gender differentiation in the caminalcules
   d) there is no information about their young, which may be quite different
   e) each caminalcule depicted is a separate species.
3. Each team member should open the BSCS Green textbook to the "Catalog of Living Things", Appendix 4, starting on page 729. Look through the organisms. These species were just discovered. Do you think the caminalcules would belong in an existing Phylum or, rather, to a new one?
   Name the Phylum (either give it an existing name or make one up) _____
   Describe the characteristics of the Phylum (i.e. what makes them belong in it)

4. Cut out the individual living caminalcules from Fig. 15.1. Look carefully at all the distinguishing characteristics of each.
   - Based upon your study, group similar species into Genera (plural for Genus).
   - Name each Genus and describe its characteristics.
   - Identify the species within each Genus by using its number, and then include a scientific name using Binomial nomenclature (be sure to use the Proper format!)
   - Identify your Genera and species below:

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5. Now group the Genera into one or more Families. Name each Family and describe its characteristics:

6. Assume they all belong to the same order and class (of your choice). Using the BSCS Appendix again, assign them to an existing class or create and name a new order and class.

Class: _____

Order: _____

You are now ready to continue on to Part B, where your careful classification will get challenged by new information! But don't start until you hear the scintillating introduction by your teacher...

(Staple this sheet in front of Part B and then turn it in)

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Part B: Evolutionary Relationships

10. Observe the figures of the fossil caminalcules that you and your team excavated. Each creature depicted is a full grown adult that is a separate species, designated by a number. The number in parentheses is the age of the fossil in millions of years ago. For example, the fossil depicted to the right, #32, is evidence of a species that was living 17 million years ago.

11. Keeping your large sheet of paper oriented vertically, use a meter stick to make 20 equally-spaced horizontal lines along the long side of the paper. The distance between the lines should be approximately 5cm apart. Label the bottom line "19 mya" and count down as you go up so that the top line is labelled "0 mya" (present day). Each of these lines represents intervals in a time sequence from 19 million years ago until now.

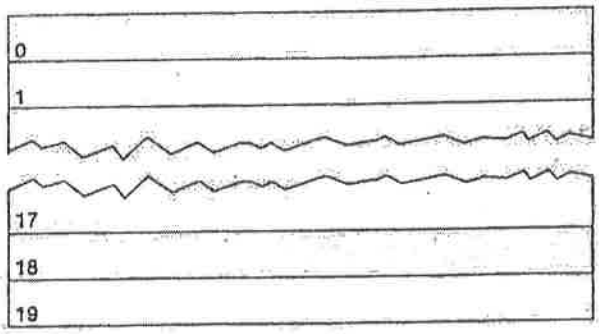

Figure 15.3 Form for making phylogenetic tree.

12. Cut out the fossil caminalcules and organize them by the age of the fossil (the number in parentheses). Place the species on the lines that match their age but do not attach them to the paper yet.

13. Next is the most important part: the relationships between the species. To determine the evolutionary relationships between the fossil species, construct a "phylogenetic tree." Start your tree like Fig 15.4 below, which shows that the oldest fossil, species 73, evolved into both species 74 and 58. (The species are numbered at random and the numbers give no clues to the relationships)

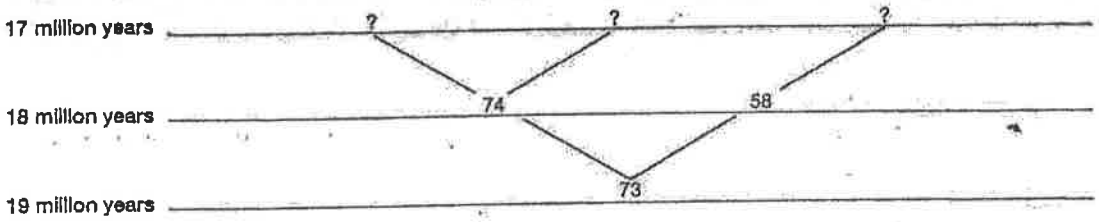

Figure 15.4 Beginning of caminalcule phylogentic tree.

14. Here comes the tricky part: *lightly* draw lines in pencil that indicate the relationships. A fossil species can be the ancestor of none, one, or two other species at a branching point, but not of three. The branching may be like that shown in Figure 15.5a but not like that shown in Figure 15.5b. Sometimes there is no branching and the transition from one species to another is like that shown in Figure 15.5c. Connect species that evolved from another species by slanted lines, not vertical lines. Use vertical lines only when the species has not evolved into a new species (ahem, species 13 and 14).

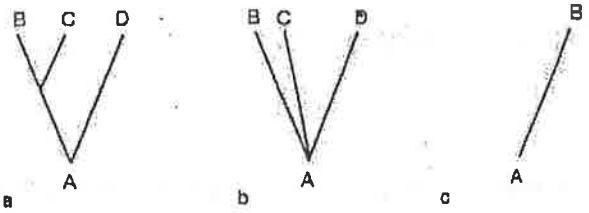

Figure 15.5 Branching can occur as shown in *a*, but *not* as shown in *b*. Sometimes there is no branching, as shown in *c*.

15. Because of the incomplete nature of the fossil record and different ways of interpreting the available fossils, more than one phylogenetic tree is possible. After you have finished, compare your tree with those of other teams. You may choose to finalize your own tree afterwards and permanently attach your fossils and darken the lines.

16. You may now compare your tree with the key provided by the teacher. Note any differences.

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Discussion after Part B

1. Do the evolutionary relationships shown in your phylogenetic tree require any changes in your original classification of living caminalcule genera? Compare the grouping on Line 0 with the way you classified the caminalcules in Part A. Revise your classification so it agrees with your phylogenetic tree. (**note** This is kinda the whole *point* of the lab). All members of a genus should have the same genus name and should share a common ancestor that is not shared by members of a different genus. The same rule applies to families, orders, classes, etc.
   ** Is revision required? (hint: it should be) Explain below.

   Describe the changes (including old and new names)

2. Define "convergent evolution," then list and describe examples of convergent evolution:

4. Define "vestigial structure," then list and describe examples of vestigial structures:

5. Is a "Successful lineage" one that has branched many times and is represented by many closely related species? Or is a lineage successful if it has changed very little through time? Defend your answer below, citing examples:

6. Define "gradualism," then describe evidence of gradualism:

7. Define "punctuated equilibrium," then describe evidence of punctuated equilibrium:

8. Propose a biological or environmental explanation for periods of time during which there was little or no change in the fossil record of caminalcules.

9. Propose a biological or environmental explanation for when there was relatively rapid changes in the evolution of caminalcules.

(staple this sheet after Part A and then turn it in)