**Earth 101 –Cladistics Exercise**

Write your answers on a separate sheet and turn them in at the end of class. You may want to work on a rough draft of the cladogram (in part 3) before writing a clean, final version on your answers.

**Part 1.** Examine the following cladogram and answer the questions.



1. What is the synapomorphy of the clade containing species D and E?
2. What is a plesiomorphic character of that clade?
3. What is the synapomorphy of the clade containing species A and B?
4. Which taxa have a sulfurous odor?
5. What character distinguishes species D from species E?
6. Are adorable eyelashes a synapomorphy or an autapomorphy?

**Part 2.** Use the previous cladogram to answer the questions.

1. Traditionally, the five taxa are grouped into three families. Family 1 contains species A. Family 2 contains species B and C. Family 3 contains species D and E. Determine if each family is monophyletic, paraphyletic, or polyphyletic.
2. More recently, species A has been grouped in a family with species D and E. Is this advisable? Why or why not?
3. Determine if the following groups are monophyletic, paraphyletic, or polyphyletic. Species A, B, C. Species C, D, E. Species C and D. Species A and B. Species B, D, E.

**Part 3.** Use the data matrix to construct the most parsimonious cladogram for the eight species. Species 1 (Sp 1) is the outgroup taxon.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sp 1 | Sp 2 | Sp 3 | Sp 4 | Sp 5 | Sp 6 | Sp 7 | Sp 8 |
| Circle (0)/Square (1) | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| Central circle | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| Side lobe | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| Triangle spines | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| Blue (0)/Yellow (1) color | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| Central diamond | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |

1. What is the synapomorphy of the clade defined by the most recent common ancestor of species 4 and 8 and all of its descendants?
2. List the apomorphies that distinguish species 4 from all other species.
3. What is the synapomorphy of the clade defined by the most recent common ancestor of species 6 and 7 and all of its descendants?
4. List the plesiomorphic characters found in the clade defined by the most recent common ancestor of species 3 and 4.
5. What traits would you predict in the common ancestor of species 4 and 6?
6. What character evolved independently in different clades (convergent evolution)?
7. Is the group of taxa sharing the character “triangle spines” monophyletic, paraphyletic, or polyphyletic?