

Name \_\_\_\_\_

Date \_\_\_\_\_

Period \_\_\_\_\_

**Biology**  
***Pipe Cleaner Trees***

**Introduction**

Evolutionary scientists often use cladograms or phylogenetic trees to illustrate relationships between groups of organisms. However, there are several ways to create and interpret these “trees”, leading to some confusion. In this activity students will practice creating phylogenetic trees, and manipulate them to demonstrate both their usefulness and flexibility.

**Pre-Lab Questions**

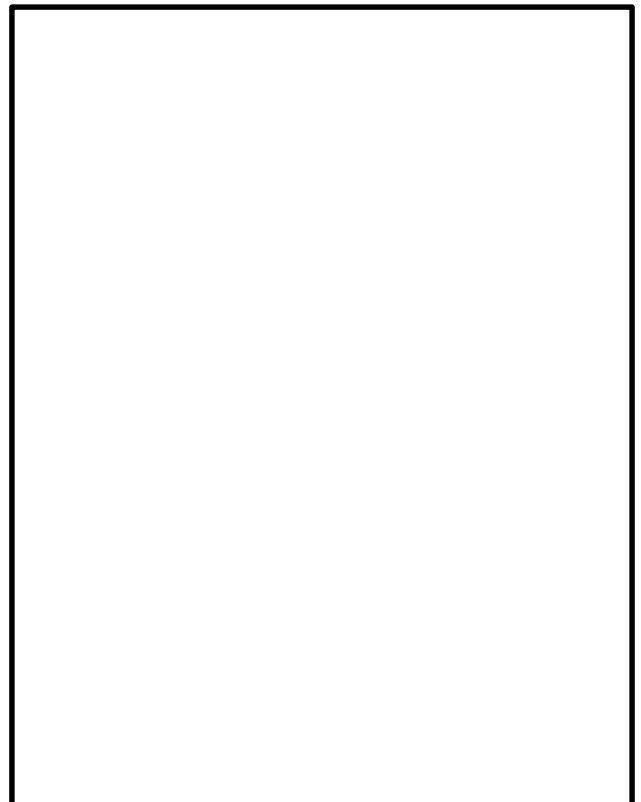
1. What does a phylogenetic tree illustrate?
  
2. What are some problems creating phylogenetic trees?
  
3. What do the nodes represent?
  
4. What occurs along the branches?
  
5. What types of evidence are used to create phylogenetic trees?

**Materials**

- 5 pipe cleaners (1each of pink, blue, orange, green, purple)
- Colored pencils that match the pipe cleaner colors

**Procedure**

1. Consider the following organisms: human, crocodile, trout, octopus, and chimpanzee.
2. Using the pipe cleaners, create a phylogenetic tree that illustrates the evolutionary relationships between the above organisms.
3. You may only twist and bend the pipe cleaners. You may not cut them, and you must use all of them.
4. Show your teacher your tree, and draw it in the space to the right. Label the nodes, 1 → 4, and label the ends of the branches with the organisms.
5. When you're finished with your tree, carefully disassemble it, and return the materials to your teacher.



## Guiding Questions

1. Does your tree look the same as other groups'? How might they differ?
2. Rotate branches D and E around the node. Did you change the interpretation of the tree? Explain.
3. Assign the following organisms to the appropriate branch on your tree: human, crocodile, trout, octopus, and chimpanzee. Record below.
  - a. Branch A: \_\_\_\_\_
  - b. Branch B: \_\_\_\_\_
  - c. Branch C: \_\_\_\_\_
  - d. Branch D: \_\_\_\_\_
  - e. Branch E: \_\_\_\_\_
4. Assign an "evolution event" (a new trait), to each node. There are several correct answers. Record below.
  - a. Node1: \_\_\_\_\_
  - b. Node2: \_\_\_\_\_
  - c. Node3: \_\_\_\_\_
  - d. Node4: \_\_\_\_\_
5. Which type of evolution occurs after each node?
6. What node # is the last common ancestor for the human and
  - a. Chimpanzee? \_\_\_\_\_
  - b. Octopus? \_\_\_\_\_
7. Do the lengths of the branches indicate anything about time?
8. Each taxon derives from a common ancestor. Is the common ancestor extinct? Explain.
9. Was the tree you created accurate? Explain.
10. How are phylogenetic trees useful in studying the evolutionary history of organisms?

## References

Halverson, Kristy (2010). *The American Biology Teacher*, Vol. 72, No. 4, pages 223-224.