



Name \_\_\_\_\_ Date \_\_\_\_\_

# Let's Build a Cladogram!

**Introduction:** *Cladistics* is one of the newest trends in the modern classification of organisms. This method shows the relationship between different organisms based on the presence or absence of certain characteristics called “derived characters.” *Derived characters* are the unique characteristics of a particular group of organisms. These characteristics are “evolutionary innovations” that arose in one group of organisms, but are not found in the older members of the lineage. Based on these derived characters, cladistics is used to determine the sequence in which different groups of organisms evolved. The organisms and their derived characters are then illustrated on a diagram called a cladogram. A *cladogram* shows the evolutionary relationships among groups of organisms. Organisms that are grouped more closely on a cladogram share a more recent common ancestor than those farther apart.

- Purpose:**
- 1) To make careful observations to determine the derived characters of a group of organisms.
  - 2) To arrange the derived characters into a cladogram showing the relationships between the organisms.

**Materials:** Pictures of lamprey, trout, caecilian, tortoise, cat, gorilla, and human

**Procedure:**

1. Make careful observations of the animals in the pictures you have been given. As you study each picture, determine if the animal has any of the characteristics that you see in the data table below.
2. If the characteristic is present in the animal, place a “ + ” in the correct column, indicating that the animal has that particular characteristic.
3. If the characteristic is absent in the animal, place a “ - ” in the correct column, indicating that the animal does not have that particular characteristic.

**Table of Derived Characters:**

Organism	Characteristic					
	Jaws	Limbs	Hair	Lungs	Opposable thumb	Upright, erect posture
Lamprey						
Trout						
Caecilian						
Tortoise						
Cat						
Gorilla						
Human						
<b>Total</b>						

4. Fill in the line of the data table marked “total.” Count how many organisms possess each characteristic. For example: How many organisms have jaws? List this number for the total. Determine the total for each characteristic.



**Final Observations:**

1. What is cladistics? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. What are “derived characters”? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. What is a cladogram? \_\_\_\_\_  
\_\_\_\_\_
4. What does a cladogram show? \_\_\_\_\_  
\_\_\_\_\_
5. In the introduction, the term “evolutionary innovation” was used. What does this mean?  
\_\_\_\_\_  
\_\_\_\_\_
6. How is the out-group determined in a cladogram? \_\_\_\_\_  
\_\_\_\_\_
7. Why is the out-group needed on a cladogram? \_\_\_\_\_  
\_\_\_\_\_
8. What is the in-group in a cladogram? \_\_\_\_\_  
\_\_\_\_\_
9. Which derived character is placed immediately after the out-group on a cladogram?  
\_\_\_\_\_  
\_\_\_\_\_

10. What must be true of organisms that have the most shared derived characters? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
11. What trait on your cladogram separates the least closely related organism from the other organisms?  
\_\_\_\_\_
12. What is a “branch point” on a cladogram? \_\_\_\_\_  
\_\_\_\_\_
13. According to your cladogram, the cat most recently shared a common ancestor with what organism?  
\_\_\_\_\_
14. What are the derived characters of a tortoise? \_\_\_\_\_
15. A derived character found in birds is feathers. Where would this be placed in the cladogram that you drew? Explain your answer. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
16. Which organism on your cladogram was the first to evolve? \_\_\_\_\_
17. Which organism on your cladogram is the most recently evolved? \_\_\_\_\_
18. Which derived character is unique to gorillas and humans? \_\_\_\_\_
19. Which two organisms on the cladogram are the most closely related? Why are they the most closely related? \_\_\_\_\_  
\_\_\_\_\_