

Making a Cladogram

Introduction:

One way to discover how organisms are related to each other (phylogeny) is to compare their anatomy. When different organisms share a large number of homologous structures, it is considered strong evidence that they are related to each other. When organisms are related it means that they have a common ancestor at some point in the past. If there are specific modifications to those features shared by different groups of organisms, we say that those features are "shared derived characteristics"

When we do studies in comparative anatomy, and find different numbers of shared derived characters exist between different groups, we can draw a diagram of branching lines which connect those groups, showing their different degrees of relationship. These diagrams look like trees and are called "phylogenetic trees" or "cladograms." The more derived structures two organisms share, the closer is their evolutionary relationship -- that is, the more recently their common ancestor lived. On the cladogram, close relationships are shown by a recent fork from the supporting branch. The closer the fork in the branch between two organisms, the closer is their relationship.

Objectives : Given some groups of organisms and some of their distinguishing characteristics, you will construct a cladogram, and properly interpret and analyze that cladogram in terms of how it shows common ancestry and degrees of evolutionary relationship.

Procedure :

Step 1 .

Using your textbook and the explanations below, determine which of the characteristics each animal has. In the Data Table provided (on your Cladogram Worksheet), place an "x" in the box if the animal has the characteristic.

Explanations of Characteristics:

set #1: Dorsal nerve cord (running along the back or "dorsal" body surface) Notochord (a flexible but supporting cartilage-like rod running along the back or "dorsal" surface)

set #2: Paired appendages (legs, arms, wings, fins, flippers, antennae)
Vertebral column ("backbone")

set #3: Paired legs

set #4: Amnion (a membrane that holds in the amniotic fluid surrounding the embryo; may or may not be inside an egg shell)

set #5: Mammary glands (milk-secreting glands that nourish the young)

set #6: Placenta (structure attached to inside of uterus of mother, and joined to the embryo by the umbilical cord; provides nourishment and oxygen to the embryo)

set #7: Canine teeth short (same length as other teeth)
Foramen magnum forward (spinal cord opening, located forward, under skull)

Data Table – Step 1: (L)

Sets	Traits	Kangaroo	Lamprey	Rhesus Monkey	Bullfrog	Human	Snapping Turtle	Tuna
1	Dorsal nerve cord Notochord							
2	Paired appendages Vertebral column							
3	Paired legs							
4	Amnion							
5	Mammary Glands							
6	Placenta							
7	Canine teeth short Foramen magnum forward							
	Total # of X's →							

Step 2: Venn Diagram

Copy and answer these questions on the page where you drew your cladogram

Summary: Three types of new information shown by a cladogram:

1. Shows ...
2. Shows ...
3. Shows ...

Application: (For each new vertebrate, add its branch line and name in the appropriate place in a different color on the cladogram you have drawn).

Explain your reason for placing each branch where you did:

"Iguana-like" animal:

"Rat-like" animal:

"Goldfish-like" animal: