

Name _____ Period _____

Classification & Cladograms!

Introduction: All members of the Animalia kingdom are multicellular, and all are heterotrophs (they rely on other organisms for their food). Most ingest food and digest it in an internal cavity like a stomach. Animal cells lack the rigid cell walls that plant cells have. The bodies of most animals are made up of cells, tissues and organs. Most animals are capable of complex and relatively rapid movement compared to plants and other organisms. Most reproduce sexually, by means of egg and sperm.

Somewhere around 9 or 10 million species of animals inhabit the earth; the exact number is not known and even estimates are very rough. Animals range in size from no more than a few cells to organisms weighing many tons, such as blue whales and giant squid. By far, most species of animals are insects and ants make up the majority of insects. By this measure our own group, the vertebrates, is relatively small in number.

In this activity, you will see how animals are classified and named scientifically. Many people develop a mnemonic device to remember the steps of scientific classification. Take a minute and try it. As you work look for relationships between animals that seem alike.

Domesticated Dog	Red Fox	Grey Wolf
Kingdom: Animalia Phylum: Chordata Class: Mammalia Order: Carnivora Family: Canidae Genus: Canis Species: Canis lupus Subspecies: C.l.familiaris	Kingdom: Animalia Phylum: Chordata Class: Mammalia Order: Carnivora Family: Canidae Genus: Vulpes Species: vulpes	Kingdom: Animalia Phylum: Chordata Class: Mammalia Order: Carnivora Family: Canidae Genus: Canis Species: Canis lupus

1. Why is observation so important when classifying organisms?
2. What do we base classification groups on?
3. Scientists define a species as an interbreeding population of like organisms. Given this definition, what do you predict about the ability of dogs, wolves and foxes to interbreed?
4. Which organisms would be more closely related, the dog, fox or wolf?
5. . DNA studies have allowed scientists to know more detail about genetic similarities between organisms. What would DNA analysis of the fox, dog and wolf reveal about their DNA?

6. Looking at the data above, which organisms are most closely related?

Least?

7. A “prairie dog” is classified in order *Rodentia*. Why are common names for organisms confusing?

8. Modern classification is much different than that of 100 years ago. What does this show about the nature of scientific knowledge?

MAKING CLADOGRAMS:

Concept: Modern classification is based on evolution theory.

Background: One way to discover how groups of organisms are related to each other (phylogeny) is to compare the anatomical structures (body organs and parts) of many different organisms. Corresponding organs and other body parts that are alike in basic structure and origin are said to be homologous structures (for example, the front legs of a horse, wings of a bird, flippers of a whale, and the arms of a person are all homologous to each other). 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 to each other, it means they must have had a common ancestor at some time in the past. If there are specific modifications of those features shared by different groups of organisms, we say that those features are “shared derived characters”.

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" (CLAY-doe-grams). The organisms are at the tips of the stems. The shared derived features of the homologous structures are shown on the cladogram by solid square boxes along the branches, and common ancestors are shown by open circles. 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.

Step 1: DATA TABLE (This has been done for you)

Animals

Traits	Kangaroo	Lamprey	Rhesus Monkey	Bullfrog	Human	Snapping Turtle	Tuna
Dorsal Nerve Cord	X	x	x	x	x	x	X
Paired Appendages; Spinal Column	x		x	x	x	x	X
Paired Legs	x		x	x	x	X	
Amnion (Amniotic Sac)	x		x		x	X	
Mammary Glands	x		x		x		
Placenta			x		X		
Canine Teeth Short; Forament Magnum Forward					x		
Total # of X's							

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)

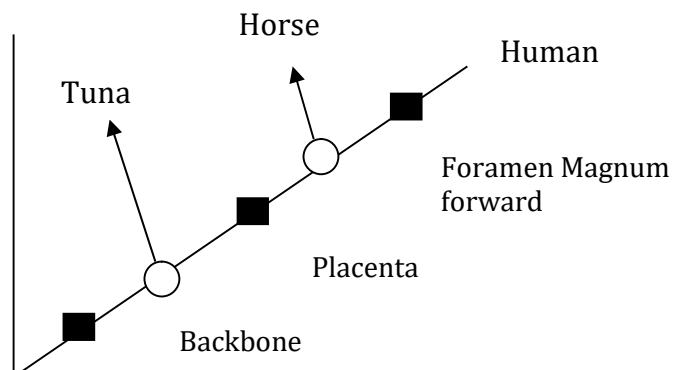
Foramen magnum forward (spinal cord opening, located forward, under skull)

Step 2: Venn Diagram:



Step 3: Cladogram:

Example:



Draw your cladogram here:

1. Give two types of information which can be obtained from this cladogram:

2. Three previously unknown vertebrate have been discovered in a rain forest in South America. One animal is very similar to an iguana lizard. The second animal is resembles a large rat. The third is similar to a goldfish. **Place these animals on your cladogram and explain WHY you placed them where you did.**

3. Based on the reading above, what is a homologous structure?
 - a. Give an example:

4. According to your cladogram, who is more closely related to a Monkey? Snapping Turtle or Bull-Frog?