



Student Name: _____

Period: _____ COOK

Darwin wrote about common descent. He hypothesized that all species on Earth have a common ancestor. Modern DNA techniques have given scientists the opportunity to support Darwin's hypotheses. Today, you will analyze pieces of DNA as a model used to support Darwin's hypothesis of common descent.

Pre-lab: DNA is the instructions for making proteins. Four nitrogen bases make up the code used in DNA to create amino acid sequences and thus proteins. What are the four nitrogen bases?

- 1. _____
- 2. _____
- 3. _____
- 4. _____

In the lab, you will be given segments of DNA that are 20 nitrogen bases in length. You will make a specific, testable hypothesis regarding how many of these nitrogen bases humans, chimpanzees, and gorillas will have in common with one another by ranking the following statements as most true to least true.

_____ The DNA sequences of humans and chimpanzees are the most alike.

_____ The DNA sequences of humans and gorillas are the most alike.

_____ The DNA sequences of chimpanzees and gorillas are the most alike.

Hypothesis: (Which two organisms are most closely related, which is least closely related, i.e. Flamingos and penguins are more closely related than Ducks because they are more DNA sequences in common.)

Procedure, Part I: You will use the DNA Sequence page to analyze the relationships between the represented species. Each column represents a 20-base DNA sequence of each of the different species.

1. You will color the DNA sequence page following colors to determine the differences in DNA sequence between the human, gorilla, and chimpanzee. *(Leave the common ancestor column blank for now.)*
 blue = adenine white = thymine green = guanine red = cytosine
2. Compare the human DNA to the chimpanzee DNA by matching the strands base by base.
3. Record the number of differences between the two species in Data Table #1 below.
4. Repeat the above steps comparing human DNA and gorilla DNA.

Data Table #1

Comparisons	Number of DNA Base Pair Differences
human and chimpanzee	
human and gorilla	
gorilla and chimpanzee	

Analysis of Data:

1. What is more closely related, organisms that have the most DNA base pairs in common or organisms that have the least number of base pairs in common?

2. In Data Table #1, in what ways do the DNA of gorillas and the DNA of chimpanzees compare to the DNA of humans?

3. Using data to confirm your results, which species are most closely related to one another, humans and gorillas or humans and chimpanzees? (USE DATA!)



4. Based on the data, were your hypotheses supported or rejected? _____

Procedure, Part II:

1. Assume the common ancestor DNA segment on the DNA sequence sheet represents a section of the gene that codes for the hemoglobin protein of a *hypothetical* common ancestor.
2. Read the following passage regarding DNA and mutations and then compare this common ancestor DNA to the other three nitrogen base segments, one sample at a time by coloring in the bases according to the key in Part I.

Scientists have determined that some mutations in DNA occur at a regular rate. This rate of mutation can be used as a "molecular clock" to infer when two organisms separated from a common ancestor. Most evolutionary biologists agree that humans, gorillas, and chimpanzees shared a common ancestor at one point in their evolutionary history. Scientists disagree, however, in the specific relationships among these three species.

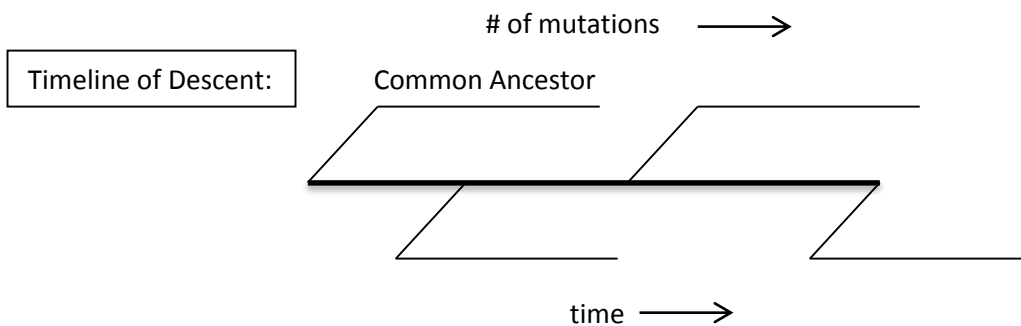
3. Record the number of differences between the common ancestor DNA and the DNA of the human, gorilla, and chimpanzee.

Data Table #2

DNA Sample	Number of Differences with Common Ancestor DNA
human	
gorilla	
chimpanzee	

Analysis of Data:

1. Which species had a DNA sequence most similar to the common ancestor? What does this tell you about how closely related they are?
2. Which species had a DNA sequence least similar to the common ancestor? What does this tell you about how closely related they are?
3. Answer parts A and B and then fill in the Timeline of Descent to demonstrate your answers.



- a. Which species evolved from the common ancestor first? USE DATA IN YOUR ANSWER!
 - b. Which species evolved from the common ancestor last (most recently)? USE DATA IN YOUR ANSWER!
4. Using data from your lab, explain whether or not humans descended from apes (which include chimps and gorillas).
 5. Which of the following statements is true? (USE DATA TO EXPLAIN WHY ONE STATEMENT MUST BE FALSE.)
 - a. Humans and chimpanzees have a common ancestor.
 - b. Chimpanzees are the direct ancestors of humans.



Evolution 1: Common Descent Lab

Color the bases as follows: A – blue, G – green, C – red, T – leave white

Human	Chimp	Gorilla	Common Ancestor
A	A	A	A
G	G	G	G
G	G	G	G
C	C	C	C
A	C	C	C
T	C	C	G
A	C	C	G
A	T	T	C
A	T	T	T
C	C	C	C
C	C	C	C
A	A	A	A
A	A	A	A
C	C	C	C
C	C	C	C
G	G	A	A
A	A	G	G
T	T	G	G
T	T	C	C
A	A	C	C