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### **Common Ancestry with DNA Evidence**

One of the most common misconceptions about evolution is seen in the statement that "humans came from apes." This statement assumes that organism evolve through a step-by-step progression from lower forms to higher forms of life and the direct transformation of one living species into another. Evolution, however, is not a progressive ladder. Modern species are derived from, but are not the same as organisms that lived in the past.

Modern research techniques allow biologists to compare DNA and make predictions about the relatedness of the organism from which they took the DNA. You will use models of these techniques to test hypotheses and determine which one is best supported by the data you develop.

# Hypothesis: Develop 2 hypotheses to explain the relatedness between Humans and Chimpanzees and Humans and Gorillas.

1.

2.

# Pre Lab:

- 1. What is DNA? How can it be used to identify organisms?
- 2. How does comparing DNA help us understand evolution?
- **3.** What could similar strands of DNA mean?

Step 1:"Synthesize" strands of DNA according to the following specifications. Each different color of paper clip represents one of the four bases of DNA:

Green= Adenine (A)	Pink = Guanine (G)
Blue= Thymine (T)	Brown/Orange/Yellow= Cytosine (C)

You will synthesize the DNA strands by connecting paper clips in the proper sequence according to specifications listed by each group member. When you have completed the synthesis, attach a label to Position 1 and lay your strands on the table with position 1 on the left.

# • HUMAN DNA

Synthesize a strand of DNA that has the following sequence: Position 1: Position 20 A-G-G-C-A-T-A-A-C-C-A-A-C-C-G-A-T-T-A

Label this strand "Human DNA." This strand represents a small section of the gene that codes for human hemoglobin protein.

### • CHIMPANZEE DNA

Synthesize a strand of DNA that has the following sequence: Position 1: Position 20 A-G-G-C-C-C-T-T-C-C-A-A-C-C-G-A-T-T-A

Label this strand "Chimpanzee DNA." This strand represents a small section of the gene that codes for chimpanzee hemoglobin protein.

### • GORILLA DNA

Synthesize a strand of DNA that has the following sequence:

Position 1: Position 20

A-G-G-C-C-C-T-T-C-C-A-A-C-C-A-G-G-C-C

Label this strand "gorilla DNA." This strand represents a small section of the gene that codes for gorilla hemoglobin protein.

# • COMMON ANCESTOR

Synthesize a strand of DNA that has the following sequence:

Position 1: Position 20

A-G-G-C-C-G-G-C-T-C-C-A-A-C-C-A-G-G-C-C

Label this strand "Common Ancestor." This strand represents a small section of the gene that codes for hemoglobin protein of a common ancestor of the gorilla, chimpanzee, and human.

**Step 2:** Compare the human DNA to the chimpanzee DNA by matching the strands base by base (paper clip by paper clip) Count the number of bases (paper clips) that are not the same. Record your data in the data table below.

**Step 3:** Repeat these steps with the human DNA and the gorilla DNA.

**Step 4:** Repeat these steps with the common ancestor DNA and the human DNA.

Human DNA Compared to:	Number of matches:	Unmatched Bases:	
Chimpanzee DNA			
Gorilla DNA			
Common Ancestor DNA			

# DATA TABLE:

#### Based on your collected data, answer the following questions in complete sentences:

1. How do the gorilla DNA and the chimpanzee DNA compare with the human DNA?

2. How does the Human DNA compare the Common Ancestor DNA?

3. What does the data suggest about the relationship between humans, gorillas, chimpanzees, and the common ancestor?

- 4. Based on your data, which of the following statements is most accurate? Explain your answer in a short paragraph.
  - a. Humans and apes have a common ancestor.
  - b. Humans evolved from apes.

- 5. According to all the data collected, which of the following statements is most accurate? Explain your answer in a short paragraph.
  - a. Chimpanzees and humans have a common ancestor.
  - b. Chimpanzees are the direct ancestors of humans.

6. A comparison of many more DNA sequences indicates that human DNA and chimpanzee DNA are 98.8 percent identical. What parts of your data support this result?

7. Map out the relatedness of the 4 species that you looked at. Start with the common ancestor and branch off with each species in order of relatedness.