

**Changes Over Time** ▪ *Skills Lab*

# Telltale Molecules

## Problem

What information can protein structure reveal about evolutionary relationships among organisms?

## Skills Focus

interpreting data, drawing conclusions

## Procedure

1. Examine the table below. It shows the sequence of amino acids in one region of a protein, cytochrome c, for six different animals.
2. Predict which of the five other animals is most closely related to the horse. Which animal do you think is most distantly related?

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3. Compare the amino acid sequence of the horse to that of the donkey. How many amino acids differ between the two species? Record that number in your notebook.
4. Compare the amino acid sequences of each of the other animals to that of the horse. Record the number of differences in your notebook.

Section of Cytochrome c Protein in Animals															
Animal	Amino Acid Position														
	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Horse	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Donkey	A	B	C	D	E	F	G	H	Z	J	K	L	M	N	O
Rabbit	A	B	C	D	E	Y	G	H	Z	J	K	L	M	N	O
Snake	A	B	C	D	E	Y	G	H	Z	J	K	W	M	N	O
Turtle	A	B	C	D	E	V	G	H	Z	J	K	U	M	N	O
Whale	A	B	C	D	E	Y	G	H	Z	J	K	L	M	N	O



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**Telltale Molecules** *(continued)*

**Analyze and Conclude**

*Write your answers in the spaces provided.*

1. **Interpreting Data** Which animal's amino acid sequence was most similar to that of the horse? What similarities and difference(s) did you observe?

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2. **Drawing Conclusions** Based on these data, which species is most closely related to the horse? Which is most distantly related?

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3. **Interpreting Data** For the entire protein, the horse's amino acid sequence differs from the other animals' as follows: donkey, 1 difference; rabbit, 6; snake, 22; turtle, 11; and whale, 5. How do the relationships indicated by the entire protein compare with those for the region you examined?

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4. **Communicating** Write a paragraph explaining why data about amino acid sequences can provide information about evolutionary relationships among organisms.

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**More to Explore**

Use the amino acid data to construct a branching tree that includes horses, donkeys, and snakes. The tree should show one way that the three species could have evolved from a common ancestor.