Biology

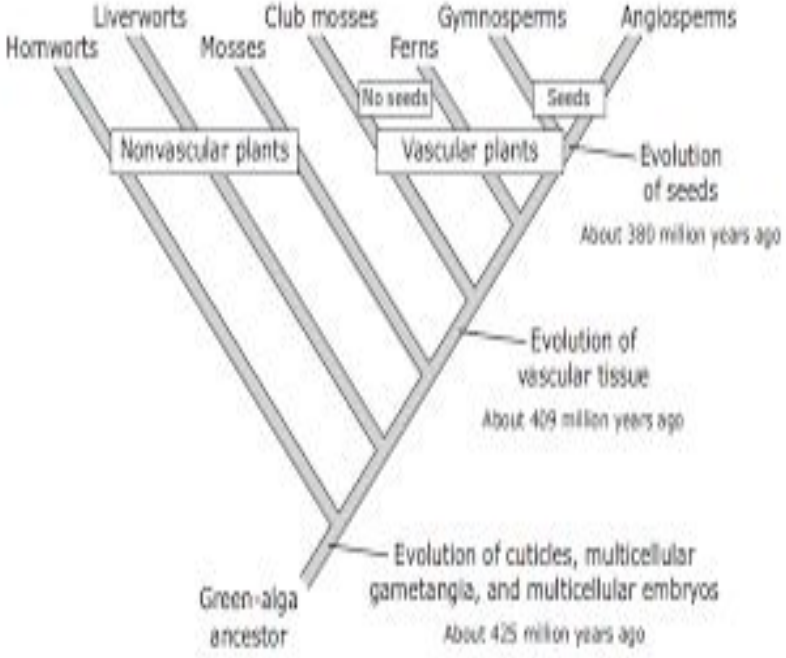
April 8, 2020
Review of Phylogenetic Trees

Getting prepped to learn

1. Which plants are the oldest?

2. Which are the most recent to evolve?

3. Which came first: Vascular plants or Nonvascular plants?



Getting prepped to learn

1. Which plants are the oldest?

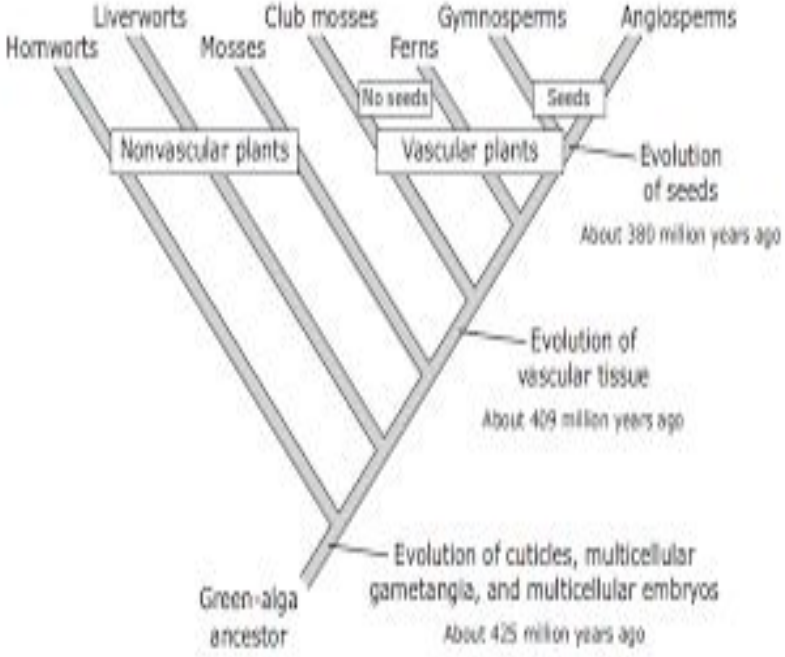
Hornworts

2. Which are the most recent to evolve?

Angiosperms

3. Which came first: Vascular plants or Nonvascular plants?

Nonvascular plants came first



Lesson Activity

Speciation Interactive Follow this link and answer the following questions as you proceed through.

1. What do nodes show?
2. What does the timing of the splits in lineage tell us about relationships to organisms?
3. How are trees constructed?
4. How is uncertainty in split of two species clarified?
5. Where can a small number of genes be found?
6. Where does Mitochondrial DNA come from?
7. Why do scientists need to look at a variety of evidence to determine lineage?

Lesson Activity answers

1. What do nodes show? When species lineages split from a common ancestor
2. What does the timing of the splits in lineage tell us about relationships to organisms? The more recent the split, the more closely related the two species are.
3. How are trees constructed? On the basis of scientific evidence
4. How is uncertainty in split of two species clarified? Using DNA, genes
5. Where can a small number of genes be found? mitochondria
6. Where does Mitochondrial DNA come from? mothers
7. Why do scientists need to look at a variety of evidence to determine lineage? Each kind tells a different part of the story and all pieces are part of the species history.

Practice- complete the following activities

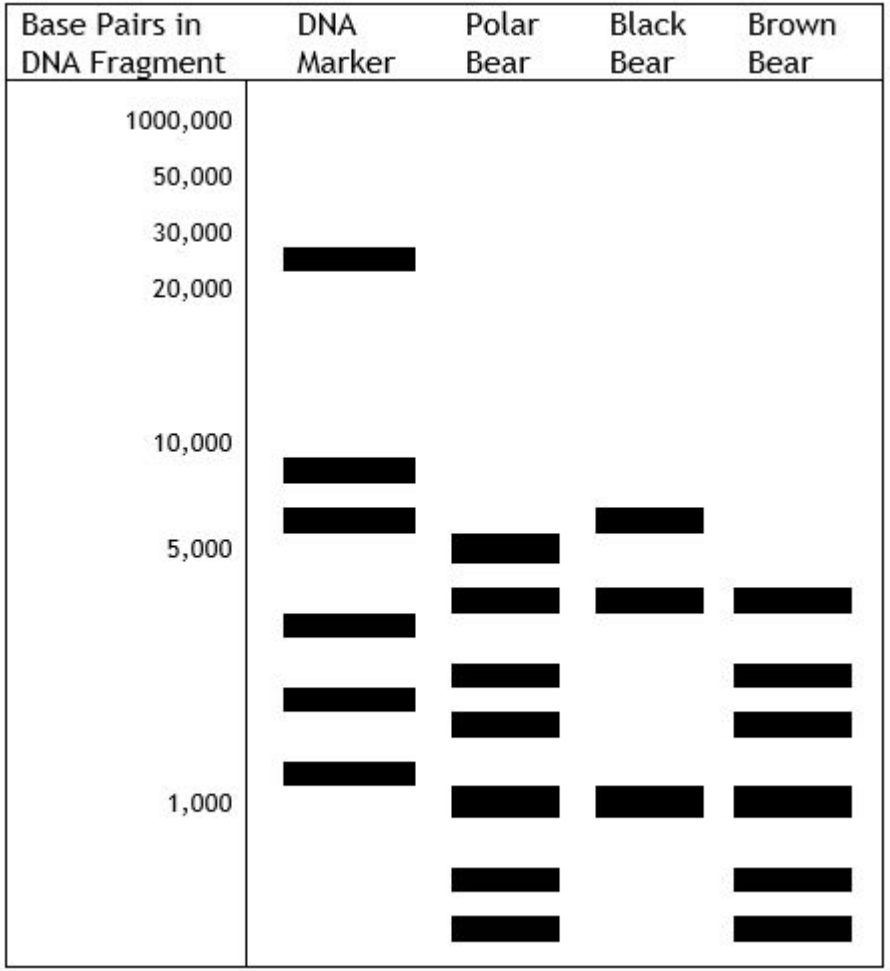
Bear Branch in the Tree of Life

Below are the results of a gel electrophoresis for three types of bears. Gel electrophoresis is a type of DNA analysis that can be used to determine how closely living organisms are related to one another based on their DNA. ***A small sample of DNA is greatly amplified using PCR so that there is enough DNA fragments to be visible on a stained gel***. For example, on the gel below, the band at 25,000 base pairs has *many* fragments this size. The next fragment has many 8,000 base pair fragments.

Analyze and compare the DNA bands in the diagram to determine how closely the bears are related. The more bands that organisms have in common the more closely related they are. The bands represent the several DNA fragments of each size that result when a restriction enzyme breaks the bonds between the nucleotides of the DNA of a polar bear, black bear and a brown bear.

1. Which are the largest size bands on this gel? Which are the shortest?

2. Explain what each band on the gel is composed of.



3. Complete Table 1 below by writing in the blanks how many bands differ between each species of bear. For example, in examining the bands of the black and polar bears there is a difference of six (6) bands

Table 1

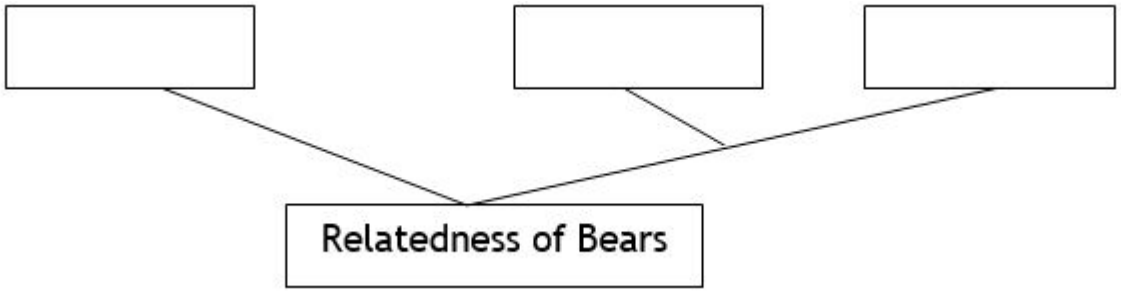
Bear Comparison	**Number of Different Bands**
Polar Bear/ Black Bear	6
Black Bear / Brown Bear	
Brown Bear/ Polar Bear	

4. Complete Table 2 below. To determine the total number of bands, count the number of bands on the diagram for each bear in the pair and then add the two numbers together. To determine the percent difference, divide the number of different bands by the total number of bands.

Table 2

Bear Comparison	Total number of bands between the two bears	Number of Different bands (from Table 1)	Percent Difference
Polar Bear/Black Bear	10	6	60%
Black Bear/Brown Bear			
Brown Bear/Polar Bear			

5. Using the information from Table 2, complete this cladogram showing the relationship of the polar bear, black bear, and brown bear.



6. Two of these species of bears have been known to produce fertile hybrids when allowed to breed with each other in captivity. Which two are they? Why do they not mate in the wild?6.

Answers to practice

1. Largest bands are at the top, shortest are at the bottom
2. Each band is composed of fragments of DNA
3. Table 1

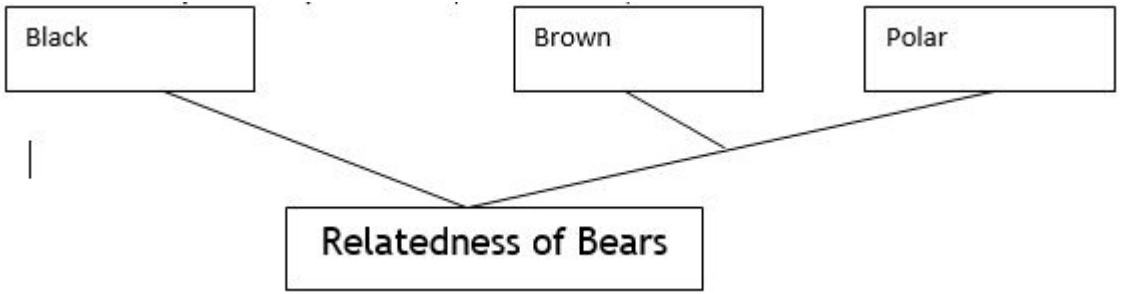
Bear Comparison	Number of Different Bands
Polar Bear/ Black Bear	6
Black Bear / Brown Bear	5
Brown Bear/ Polar Bear	1

4.

Table 2

Bear Comparison	Total number of bands between the two bears	Number of Different bands (from Table 1)	Percent Difference
Polar Bear/Black Bear	10	6	60%
Black Bear/Brown Bear	9	5	56%
Brown Bear/Polar Bear	13	1	8%

5.



6. Brown Bear and Polar Bears can and have mated due to their close proximity while in captivity. They don’t mate in the wild because their geographic locations are relatively far apart and the two rarely come in contact with each other. Now with the Polar Ice melting, Polar Bears are being found further south and Brown Bears are being found further North. The two have interacted in Alaska while fighting over food from a beached whale--could they possible mate in the wild now?

More practice

Phylogenetic Tree Worksheet

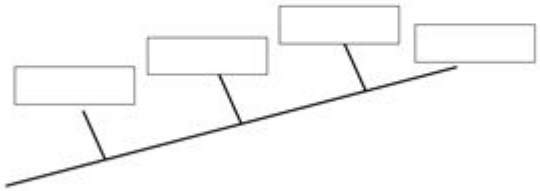
Name: _____
Date: _____

1. Fill in the following table. Mark an "X" if an organism has the trait.

	cells	legs	6 legs	wings
Worm				
Spider				
Carpenter Ant (black)				
Fly				

2. Add each of these organisms to the cladogram below: worm, spider, ant, fly

3. USING complete sentences, explain why you put each organism where you did on the cladogram.



4. On the cladogram above, add traits that make the organisms different from each other.

5. According to your cladogram, which two species are more closely related: worms and spiders or spiders and ants? How do you know?

6. According to your cladogram, what species are flies most closely related to? How do you know?

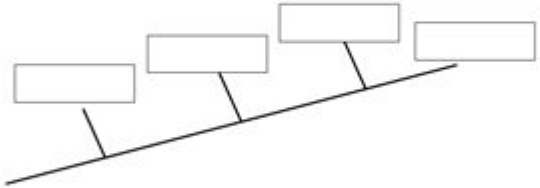
Answer the following on your paper

7. Fill in the following table. Mark an "X" if an organism has the trait.

	hair	legs	no tail	eyes
Human				
Snake				
Monkey				
Lizard				

8. Add each of these organisms to the cladogram below: human, snake, monkey, lizard

9. USING complete sentences, explain why you put each organism where you did on the cladogram.



10. On the cladogram above, add traits that make the organisms different from each other.

11. According to your cladogram, which two species are more closely related: humans or snakes or humans or monkeys? How do you know?

12. According to your cladogram, what species are humans most closely related to? How do you know?

Practice answers

Phylogenetic Tree Worksheet

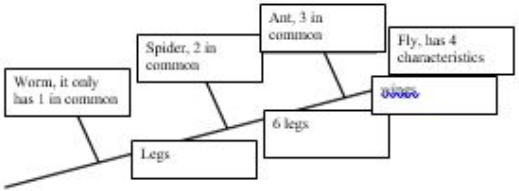
Name: _____
Date: _____

1. Fill in the following table. Mark an "X" if an organism has the trait.

	cells	legs	6 legs	wings
Worm	x			
Spider	x	x		
Carpenter Ant (black)	x	x	x	
Fly	x	x	x	x

2. Add each of these organisms to the cladogram below: worm, spider, ant, fly

3. USING complete sentences, explain why you put each organism where you did on the cladogram.



4. On the cladogram above, add traits that make the organisms different from each other.

5. According to your cladogram, which two species are more closely related: worms and spiders or spiders and ants? How do you know? Worms and spiders because each is made of cells

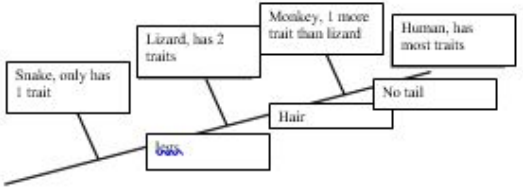
6. According to your cladogram, what species are flies most closely related to? How do you know? Flies are more closely related to ants because of they both have 6 legs

7. Fill in the following table. Mark an "X" if an organism has the trait.

	hair	legs	no tail	eyes
Human	x	x	x	x
Snake				x
Monkey	x	x		x
Lizard		x		x

8. Add each of these organisms to the cladogram below: human, snake, monkey, lizard

9. USING complete sentences, explain why you put each organism where you did on the cladogram.



10. On the cladogram above, add traits that make the organisms different from each other.

11. According to your cladogram, which two species are more closely related: humans or snakes or humans or monkeys? How do you know? Humans and Monkeys, they have the most in common with each other

12. According to your cladogram, what species are humans most closely related to? How do you know?

Monkeys, because we share more of the same characteristics

Common misconceptions when working with phylogenetic trees. Open the presentation and read.

Prezi on misconceptions

Additional practice/resources

Phylogenetic tree practice

More Phylogeny practice