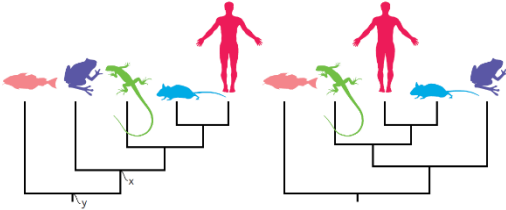


### Tree Thinking Assessment Quiz

Complete on your own without any other resources. This is just an assessment to determine your current understanding.

1. Which tree below is the most accurate?



1. They're exactly the same.

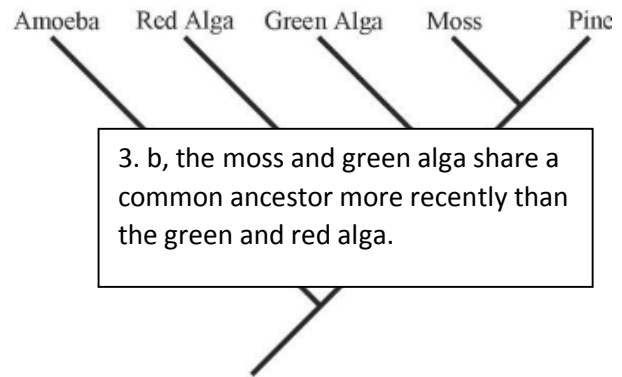
2. What is meant by common ancestry?

- a. Common species are ancestors of rare species
- b. All organisms are ancestors
- c. Very different living species descend from the same ancestor
- d. Simple living species are ancestral to more complex species
- e. There is a ladder of life with primitive and more advanced species arrayed on different rungs

2. c

3. By reference to the tree above, which of the following is an accurate statement of relationships?

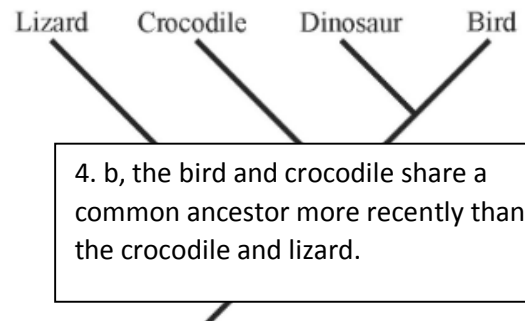
- a. A green alga is more closely related to a red alga than to a moss
- b. A green alga is more closely related to a moss than to a red alga
- c. A green alga is equally related to a red alga and a moss
- d. A green alga is related to a red alga but is not related to a moss



3. b, the moss and green alga share a common ancestor more recently than the green and red alga.

4. Which of the following is an accurate statement, based on the tree above?

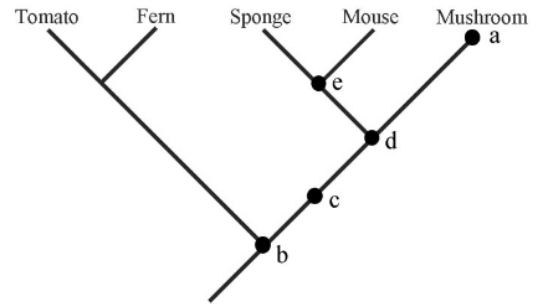
- a. A crocodile is more closely related to a lizard than to a bird
- b. A crocodile is more closely related to a bird than to a lizard
- c. A crocodile is equally related to a lizard and a bird
- d. A crocodile is related to a lizard but not related to a bird



4. b, the bird and crocodile share a common ancestor more recently than the crocodile and lizard.

5. In the tree to the side, which of the five marks corresponds to the most recent common ancestor of a mushroom and a sponge?

5. d

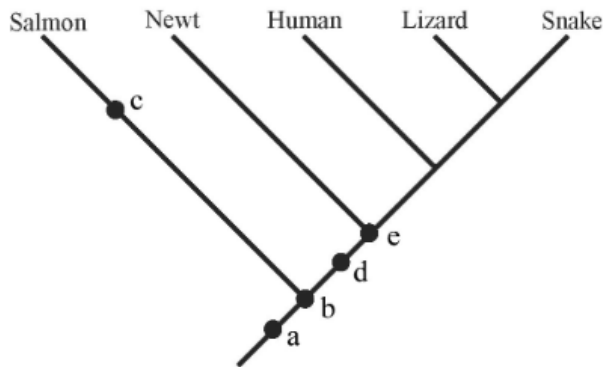


6. Which of the following observations provides the clearest evidence for common rather than separate ancestry?

- a. The coelacanth looks almost indistinguishable from fossils in 200-million year old rocks
- b. Most primates have tails, which seem to be imp
- c. Diverse cactus species are found in the American deserts
- d. Some orchid flowers are very well suited to pollination by particular kinds of insects
- e. Whale flippers and dolphin flippers have a similar bone arrangement and are used for similar function

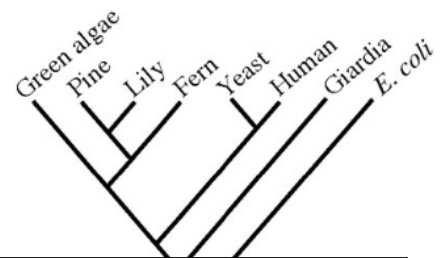
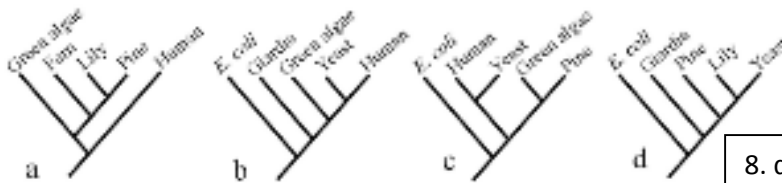
6. e

7. Attach a trout to the tree below in the appropriate place.



7. c

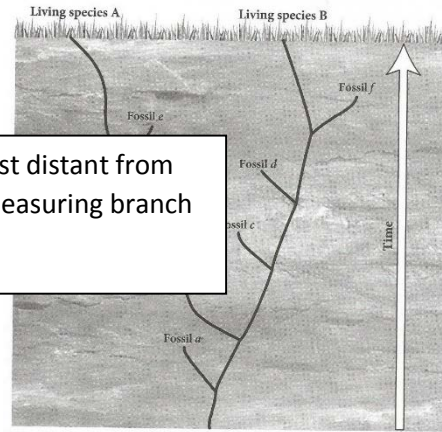
8. Given the tree to the side, which of the phylogenies below is false?



8. d, the yeast and lily are NOT more closely related to one another than yeast and human according to the reference tree.

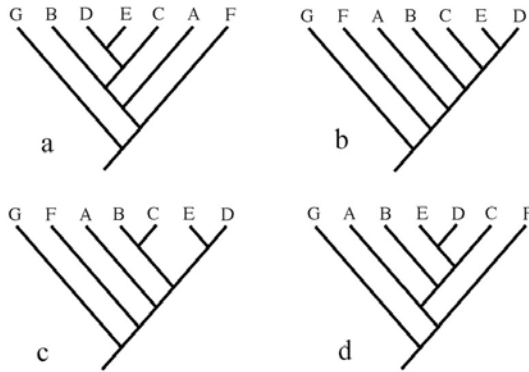
9. In the figure, which of the following pairs would you expect to have the greatest degree of difference from each other?

- a. Living species A and living species B
- b. Living species A and fossil c
- c. Living species B and fossil c
- d. Fossil b and fossil d
- e. Fossil e and fossil f



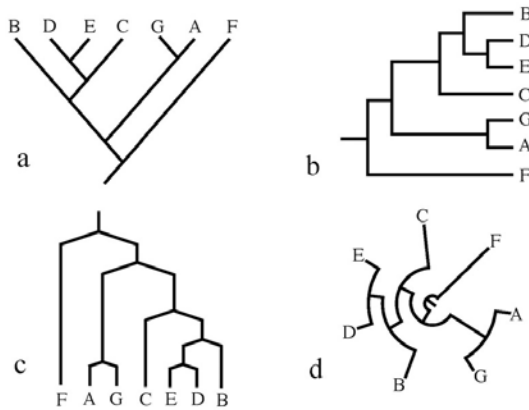
9. a, they are the most distant from one another when measuring branch length.

10. Which of the four trees below depicts a different pattern of relationships than the others?



10. c, in all other trees C is basal to D and E.

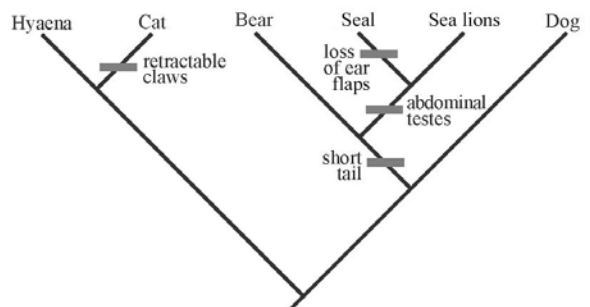
11. Which tree below depicts a different pattern of relationships than the others?



11. a, B and C are swapped compared to the others.

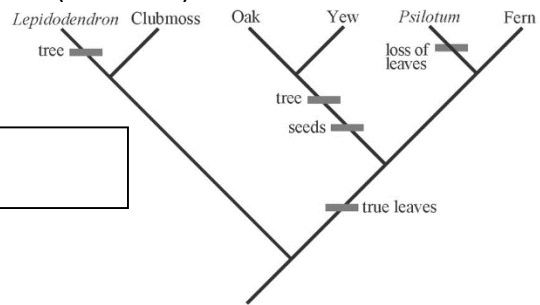
12. In the tree to the side, assume that the ancestor had a long tail, ear flaps, external testes, and fixed claws. Based on the tree and assuming that all evolutionary changes in these traits are shown, what traits does a sea lion have?

- a. long tail, ear flaps, external testes, and fixed claws
- b. short tail, no ear flaps, external testes, and fixed claws
- c. short tail, no ear flaps, abdominal testes, and fixed claws
- d. short tail, ear flaps, abdominal testes, and fixed claws
- e. long tail, ear flaps, abdominal testes, and retractable claws



12. d

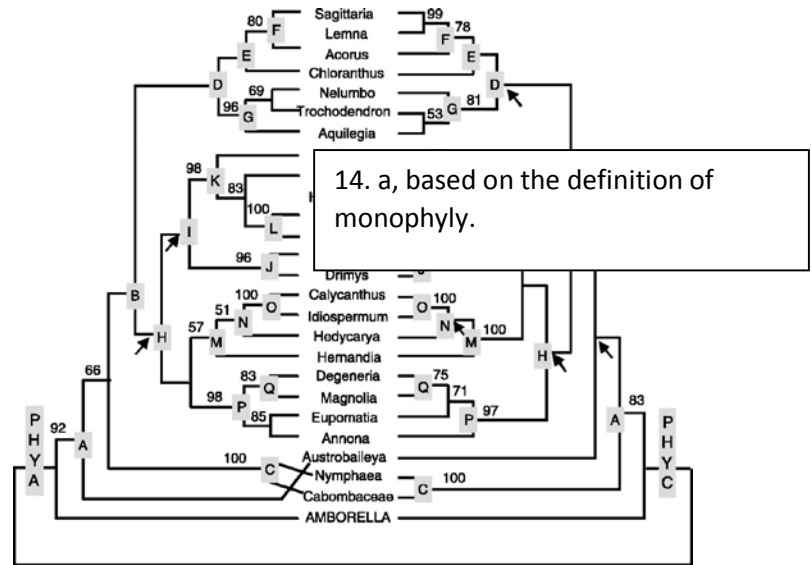
13. In the tree to the side, assume that the ancestor was a herb (not a tree) without leaves or seeds. Based on the tree and assuming that all evolutionary changes in these traits are shown, which of the tips has a tree habit and lacks true leaves?



- a. *Lepidodendron*
- b. Clubmoss
- c. Oak
- d. *Psilotum*
- e. Fern

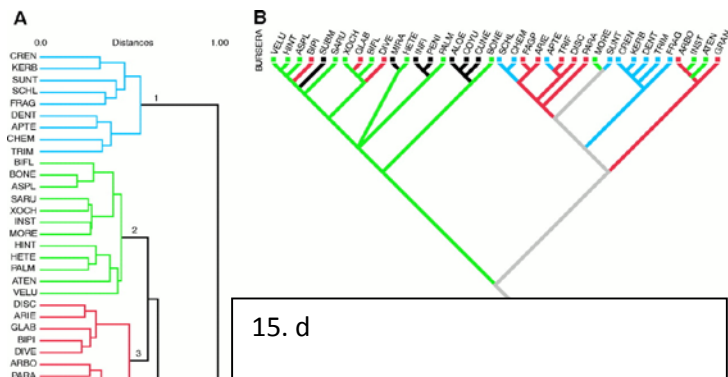
13. a

14. This figure (*Science* 286, 947 (1999)) shows the phylogeny estimated for a sample of flowering plants (angiosperms) from *PHYTOCHROME A* and *PHYTOCHROME C*, a pair of genes that duplicated prior to the origin of the angiosperms. Which of the following sets of taxa constitute a clade (=monophyletic group) on one gene tree but not on the other?



- a. *Degeneria-Magnolia-Eupomatia*
- b. All angiosperms except *Amborella*
- c. *Austrobaileya-Nymphaea-Cabombaceae*
- d. *Nelumbo-Trochodendron-Aquilegia*

15. *Science* 276, 253 (1997). The dendrogram on the left (A) clusters plant species by chemical similarity; each of the four main chemical groups is indicated with a different color. This tree does **not** depict descent relationships, just degree of chemical similarity.

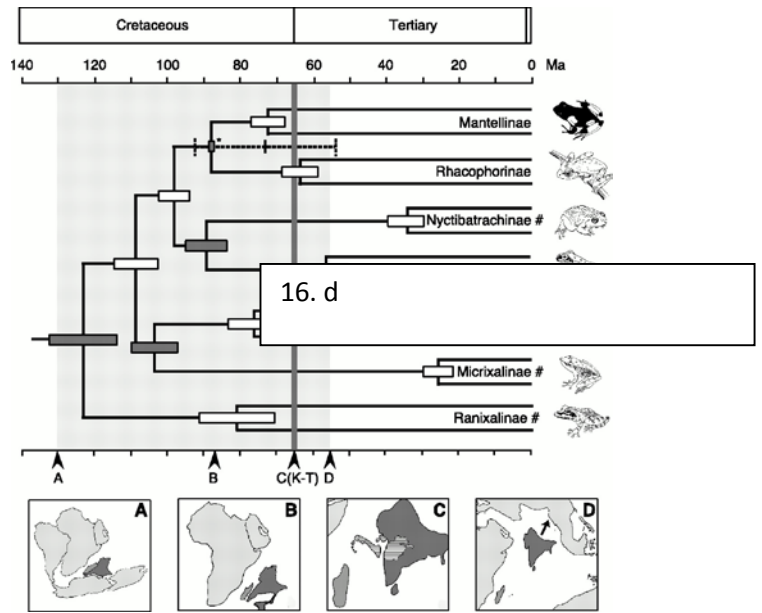


On the right, the evolution of these chemical types is reconstructed on a phylogeny of the plants (this **does** depict inferred evolutionary relationships). The colors correspond to the chemical groups on the left, and the gray branches indicate uncertainty in character reconstruction. What does a comparison of these two figures tell us about the evolution of plant secondary chemistry?

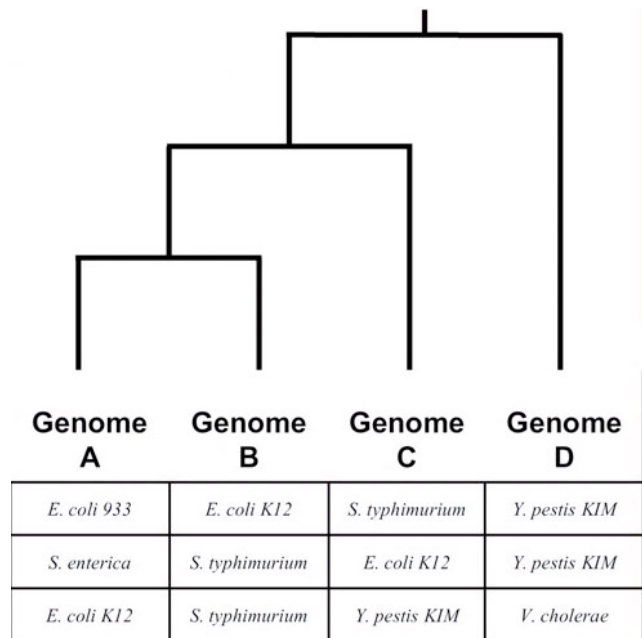
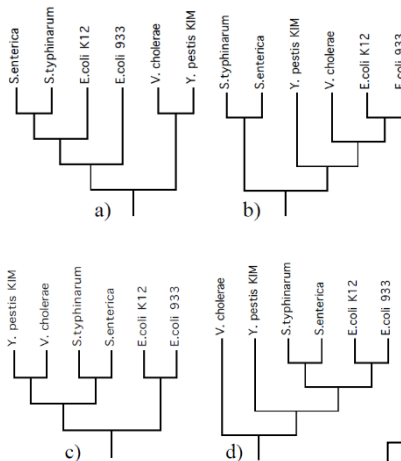
- a. The four groups of chemically similar species each constitutes a distinct evolutionary lineage
- b. The group colored "black" has the most advanced chemical defenses
- c. The red (3) and blue (1) chemical groups are most distantly related
- d. The chemical groups have each been gained and/or lost multiple times in evolution

16. *Science* 292, 93 (2001). The tree to the right depicts inferred relationships among some major frog groups with branches drawn proportional to absolute time. Error bars on internal nodes depict confidence intervals on the dates of estimated nodes. Assuming this tree and the associated ages are correct which of the following statements is true?

- a. No individual living before 70 million years ago is an ancestor of Raninae
- b. Raninae and Dicroglossinae shared a common ancestor about 75 million years ago
- c. The divergence of Raninae and Nyctibatrachinae occurred more recently than the 85 million year old separation of India from Madagascar
- d. The last common ancestor of Micrixalinae and Dicroglossinae lived before India and Madagascar separated (85 million years ago)



17. *Science* 301, 829 (2003). Each row in the table to the side lists a set of four bacterial taxa whose relationship follows the topology shown. Thus each row can be read as a four-taxon tree. Which of the four trees below is compatible with the information in the three rows of the table?

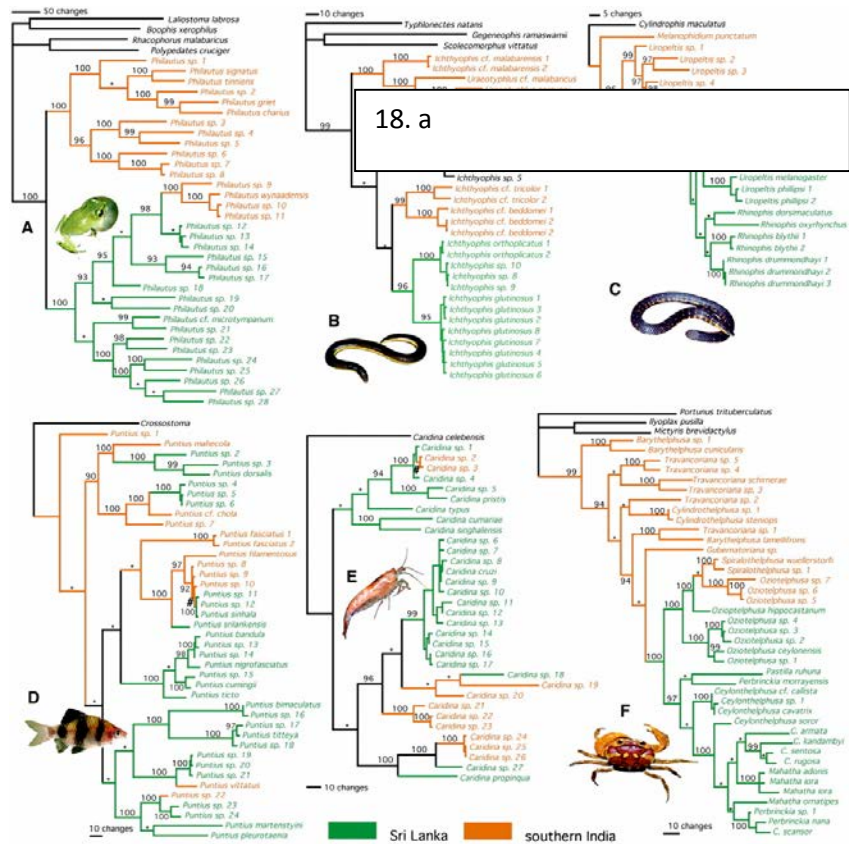


17. d

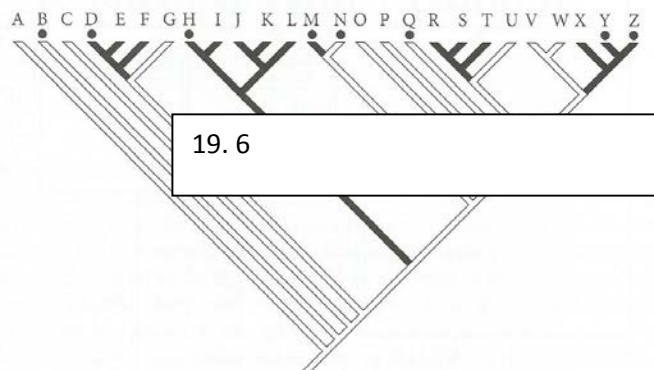
18. *Science* 306, 479 (2004).

These trees for six different groups of organisms for (A) tree frogs, (B) caecilians, (C) uropeltid snakes, (D) uropeltid snakes, (E) freshwater fishes, (F) freshwater shrimps, and (G) freshwater crabs are all colored based on whether the species come from mainland India or Sri Lanka. Assuming these trees and the reconstruction of ancestral geographic distributions are accurate, which of the trees could indicate a single well-supported migration from Sri Lanka back to southern India?

- a. A, F
- b. B, C
- c. C
- d. A, B



19. In this tree, white branches indicate lineages from Africa. Others are from South America. Taxa with black circles have pink flowers. The rest have yellow flowers. Using parsimony as your guide, how many times did pink flowers evolve?



20. Draw the tree that is provided by the parenthetical notation below:

(1,((2,(3,4)),((5,(7,8)),6),(9,((10,11),12))))

