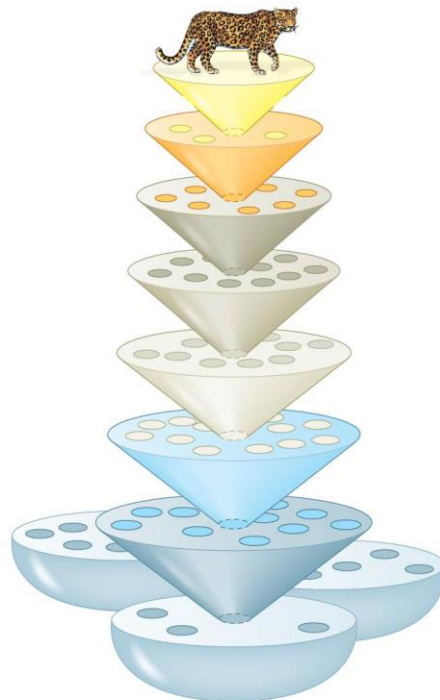
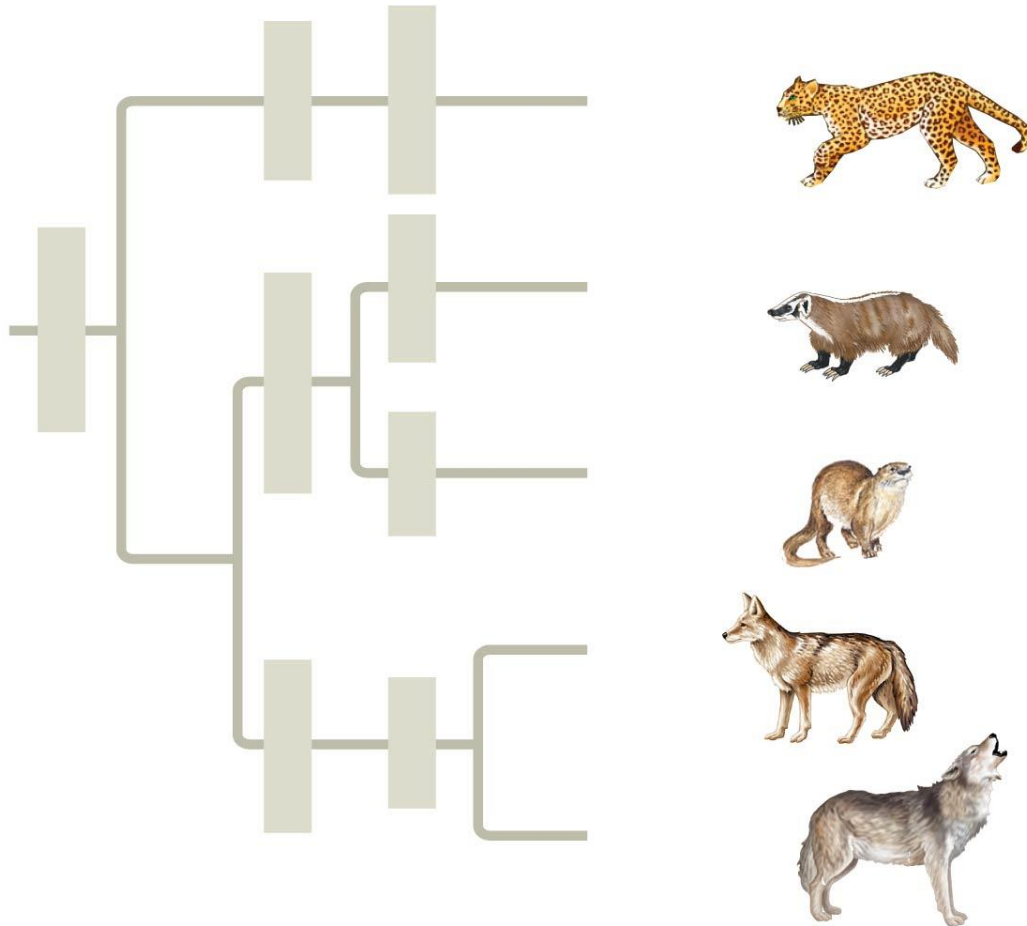


Chapter 26 Guided Reading: Phylogeny and the Tree of Life
10ed

1. What is *systematics*? How is it used to develop *phylogenetic trees*?
2. What is *taxonomy*?
3. Every organism may be referred to by a unique *binomial*, or two-part name. These are in Latin, or Latinized. What is your binomial? What does it mean?
4. What are the two components of every binomial?
5. Taxonomy uses hierarcchial categories that nest within each other, like Russian dolls. The following figures shows the categories, each called a taxon. **Label** each taxonomic category **and** then give the one that applies exclusively to this panther to the side of each level.



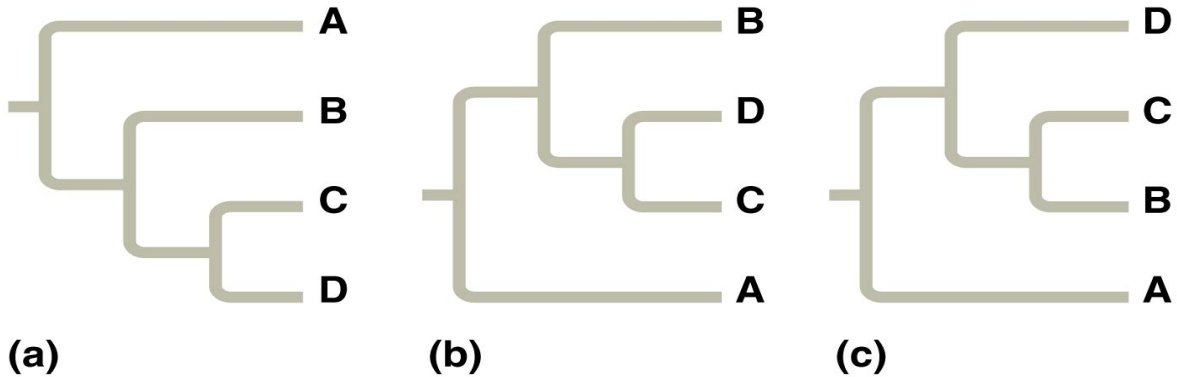
6. So, which are more closely related: organisms in the same phylum or those in the same order?
7. In a *phylogenetic tree*, recall that branch points represent common ancestors of the two lineages beyond the branch or node. **Fill in** the names. **Circle** the common ancestor of badgers and otters, and label it "A". **Circle** the common ancestor of cats and dogs, and label it "B". **Explain** the relationship between the leopard, badger and wolf.



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8. What are the three key points summarized about phylogenetic trees?
- a.
 - b.
 - c.

9. Which of the trees shown here depicts an evolutionary history different from the other two?

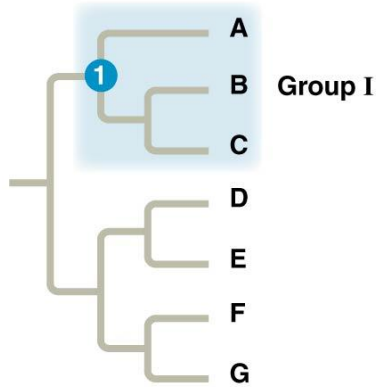


10. Why is it important to sort homologous from analogous structures? Study Figure 26.8 in your book. Mutations accumulate in similar gene sequences in different species over time. How can DNA homologies be determined after these genetic changes?

11. The WHAT IF? Question on page 553 of your textbook is a good check to see if you understand the point about molecular homologies. Suppose that two species, A and B, have similar appearances but very divergent gene sequences, whereas species B and C have very different appearances but similar gene sequences. Which pair is more likely to be closely related: A and B or B and C? **Explain.**

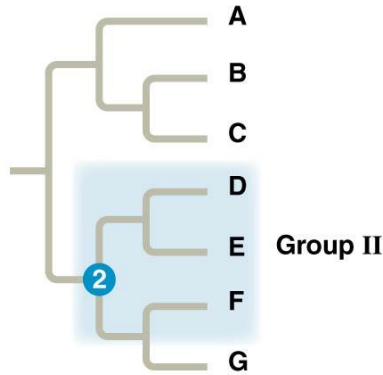
12. The following figure shows three *cladograms*. What is a *clade*? Circle a clade that is not highlighted below.

(a) Monophyletic group (clade)

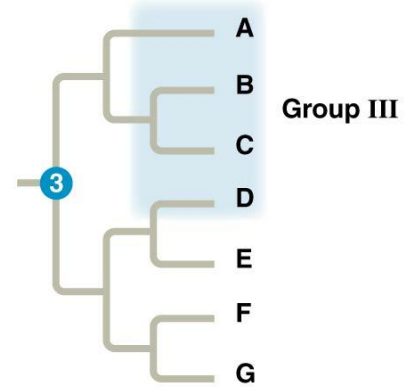


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(b) Paraphyletic group



(c) Polyphyletic group



13. Why is Group I *monophyletic*?

14. Explain why Group II is *paraphyletic*.

15. Why is Group III *polyphyletic*?

16. Clades are developed by using *shared derived characters*. What are these?

17. Explain why, for mammals, hair is a shared derived character, but a backbone is a shared ancestral character.

18. Earlier, we emphasized that the sequence of branching in a tree does not necessarily indicate the actual ages of the species. However, this is not the case for the phylogenetic tree in Figure 26.14. Explain what is different about it in comparison to the other trees you have looked at so far.

**?s 19-20 Information Summary: The rate of evolution of DNA sequences varies from one part of the genome to another; therefore, comparing different sequences helps us to investigate relationships between groups of organisms that diverged a long time ago.
Ex: Cellular DNA that codes for rRNA vs. mitochondrial (mtDNA)**

19. Which method reveals that fungi are more closely related to animals than plants?

20. Which method reveals that the Pima of Arizona and the Yanomami of Venezuela are descendents of the same Native Americans who crossed the Bering Land Bridge 15,000 years ago?

21. How do *orthologous genes* indicate descent from a common ancestor? You might use humans and mice and humans and yeast as examples.

22. A phrase that you will encounter in other contexts is that the genes for these shared biochemical and developmental pathways are *conserved*. How does this indicate descent from a common ancestor?

23. What are *molecular clocks*?

24. If we use a *molecular clock*, approximately when did HIV emerge?

25. What two domains include all prokaryotes? _____

26. Which two domains are most closely related? _____
Explain your reasoning.

27. Which kingdom is made obsolete by the three-domain system? Why?

28. Which kingdom crumbled because it is polyphyletic?

29. *Horizontal gene transfer* has played a key role throughout the evolutionary history of life. What is it?

30. Explain the role of horizontal gene transfer in the tree of life by giving **several** examples.