

Chapter 18 Study Guide

Study Tip

Suggest that students review the chapter by studying the figures and their captions.

Thinking Visually

- Classes
- 6. Archaeobacteria, Protista, Plantae, Fungi, Animalia (in any order)

Chapter 18 Assessment

Reviewing Content

- b
- d
- c
- a
- a
- d
- d
- c
- b
- c

Understanding Concepts

- Biologists assign each organism a universally accepted name to provide consistency and avoid confusion.
- Evolutionary relationships are used as well as structural similarities of the organisms.
- Binomial nomenclature is useful to all scientists because each name is unique, a combination of the genus name and a term that is different for each species in the genus. Each scientific name is assigned to only one species, so different species are not confused.
- The seven taxonomic groups are: species, genus, family, order, class, phylum, and kingdom.
- The goal of evolutionary classification is to group organisms based on their evolutionary history instead of grouping only according to physical similarities.
- A derived character is a characteristic that appears in recent parts of a lineage but not in its older members; a molted exoskeleton in crustaceans is an example; this trait was not present in early crustacean ancestors.
- A cladogram is an attempt to trace the process of evolution in a group of organisms by focusing on unique shared derived features that appear in some organisms but not in others.

Chapter 18 Study Guide

18-1 Finding Order in Diversity

Key Concepts

- To study the diversity of life, biologists use a classification system to name organisms and group them in a logical manner.
- In binomial nomenclature, each species is assigned a two-part scientific name.
- Linnaeus's hierarchical system of classification includes seven levels. They are—from smallest to largest—species, genus, family, order, class, phylum, and kingdom.

Vocabulary

taxonomy, p. 447
binomial nomenclature, p. 448 • genus, p. 448
taxon, p. 449 • family, p. 449 • order, p. 449
class, p. 449 • phylum, p. 449 • kingdom, p. 449

18-2 Modern Evolutionary Classification

Key Concepts

- Organisms are now grouped into categories that represent lines of evolutionary descent, or phylogeny.
- The genes of many organisms show important similarities at the molecular level. Similarities in DNA can be used to help determine classification and evolutionary relationships.

Vocabulary

phylogeny, p. 452
evolutionary classification, p. 452
derived character, p. 453
cladogram, p. 453
molecular clock, p. 455

18-3 Kingdoms and Domains

Key Concepts

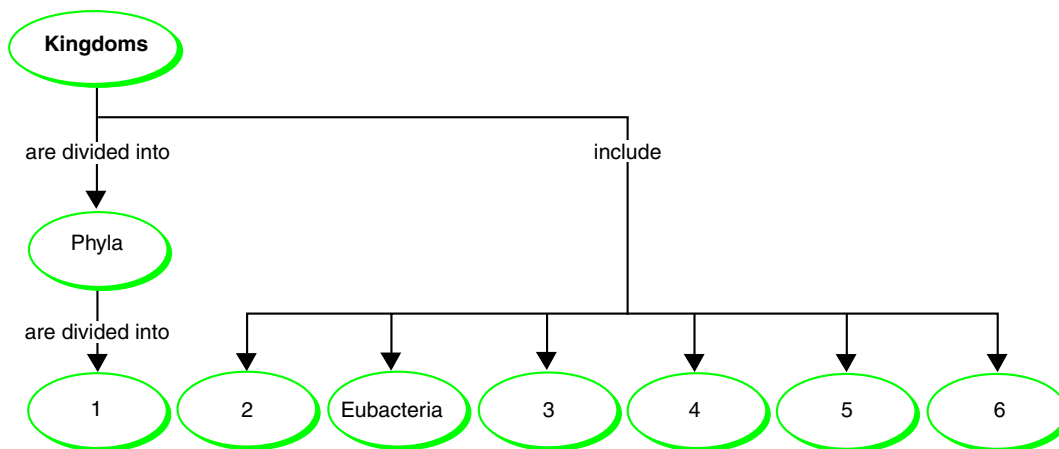
- The six-kingdom system of classification includes the kingdoms Eubacteria, Archaeobacteria, Protista, Fungi, Plantae, and Animalia.
- The three domains are the domain Eukarya, which is composed of protists, fungi, plants, and animals; the domain Bacteria, which corresponds to the kingdom Eubacteria; and the domain Archaea, which corresponds to the kingdom Archaeobacteria.

Vocabulary

domain, p. 458 • Bacteria, p. 459
Eubacteria, p. 459 • Archaea, p. 459
Archaeobacteria, p. 459 • Eukarya, p. 460
Protista, p. 460 • Fungi, p. 460
Plantae, p. 461 • Animalia, p. 461

Thinking Visually

Use taxonomic nomenclature to complete the model of a hierarchical classification system below.



CHAPTER RESOURCES

Print:

- **Teaching Resources**, Chapter Vocabulary Review, Graphic Organizer
- **Chapter Tests: Levels A and B**, Chapter 18 Test
- **Laboratory Assessment**, Laboratory Assessment 5

Technology:

- **Computer Test Bank**, Chapter 18 Test
- **iText**, Chapter 18 Assessment

Chapter 18 Assessment

Reviewing Content

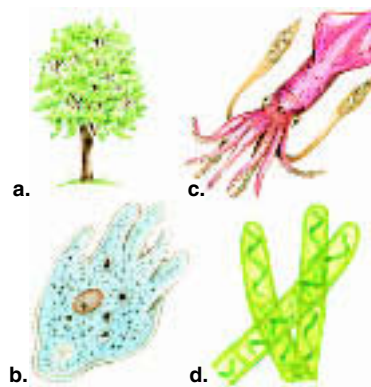
Choose the letter that best answers the question or completes the statement.

- The science that specializes in the classification of organisms is
 - anatomy.
 - taxonomy.
 - botany.
 - paleontology.
- Solely from its name, you know that *Rhizopus nigricans* must be
 - a plant.
 - an animal.
 - in the genus *nigricans*.
 - in the genus *Rhizopus*.
- A useful classification system does NOT
 - show relationships.
 - reveal evolutionary trends.
 - use different scientific names for the same organism.
 - change the taxon of an organism based on new data.
- In classifying organisms, orders are grouped together into
 - classes.
 - phyla.
 - families.
 - genera.
- The largest and most inclusive of Linnaeus's taxonomic categories is the
 - kingdom.
 - order.
 - phylum.
 - species.
- Which of the following shows the evolutionary relationships among a group of organisms?
 - taxon
 - domain
 - binomial nomenclature
 - cladogram
- A unique trait that is used to construct a cladogram is called a
 - taxon.
 - molecular clock.
 - domain.
 - derived character.
- The three domains are
 - Animalia, Plantae, Archaeobacteria.
 - Plantae, Fungi, Eubacteria.
 - Bacteria, Archaea, Eukarya.
 - Protista, Bacteria, Animalia.
- A kingdom that includes only heterotrophs is
 - Protista.
 - Fungi.
 - Plantae.
 - Eubacteria.

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10. Which organism belongs in the kingdom Animalia?



Understanding Concepts

- Why do biologists assign each organism a universally accepted name?
- What criteria are used to classify an organism?
- What features of binomial nomenclature make it useful for scientists of all nations?
- Sequence Linnaeus's seven taxonomic categories from smallest to largest.
- Explain the goal of evolutionary classification.
- What is a derived character? Give an example of a derived character.
- How is a cladogram used in classification?
- How do biologists use DNA and RNA to help classify organisms?
- What is phylogeny?
- Describe how a molecular clock is used to estimate the length of time that two related species have been evolving independently.
- How do domains and kingdoms differ?
- What characteristics are used to place an organism in the domain Bacteria?
- Which domain consists of prokaryotes whose cell walls lack peptidoglycan?
- Describe the four kingdoms that comprise the domain Eukarya.
- What characteristic(s) differentiate the kingdom Animalia from the kingdom Plantae?



If your class subscribes to the iText, your students can go online to access an interactive version of the Student Edition and a self-test.

(Continued from page 464)

- Biologists choose segments of DNA and RNA that are similar in all or many organisms, and compare the sequences within those molecules. The more similar the DNA or RNA between species, the more closely related the species are assumed to be. Such comparisons can provide information that supports or refutes inferences based on visible structural characteristics.
- Phylogeny is the study of evolutionary relationships among organisms.
- A molecular clock relies on a repeating process, a mutation, to estimate the length of time that two species have been evolving independently. A comparison of DNA sequences in two species indicates how alike or dissimilar the genes are. The degree of dissimilarity is, in turn, an indication of how long ago the species shared a common ancestor.
- A domain is more inclusive and larger than a kingdom.
- Members of domain Bacteria are all unicellular and prokaryotic. Cell walls contain peptidoglycan.
- They are placed in the kingdom Archaea.
- The four kingdoms making up the domain Eukarya are Protists, Fungi, Plantae, and Animalia.
- Unlike members of the Plantae kingdom, members of the Animalia kingdom are heterotrophic, do not have cell walls, and are motile.



HOMEWORK GUIDE

Section:	Questions:
Section 18-1	1-5, 11-14, 26, 28, 33, 34
Section 18-2	6, 7, 15-20, 27, 31, 32
Section 18-3	8-10, 21-25, 29, 30

Critical Thinking

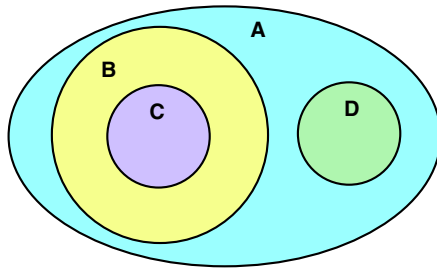
26. Taxonomic classification emphasizes both. Similarities place organisms together in large groups, and differences separate organisms into smaller groups.
27. Students' answers should indicate that the internal structures would have to be examined for similarities and that the organisms would have to be examined for genetic similarities and differences.
28. A is labeled *All Animals*, B is labeled *Animals With Backbones*, C is labeled *Mammals*, and D is labeled *Insects*.
29. This organism would be placed in the kingdom Protista because it is unicellular, contains a nuclear membrane, and has chloroplasts.
30. Organism A belongs in the kingdom Plantae. Organism B belongs in the kingdom Archaeobacteria. Organism C belongs in the kingdom Protista.
31. If the DNA of beetles A and B is more similar than that of beetle C to either, you could conclude that beetles A and B are more closely related to each other than to beetle C.
32. Natural selection brings about the evolutionary changes that explain phylogenetic relationships.
33. The two groups of organisms are closely related, although not as closely as species within a genus.
34. Gene mutations would probably be more useful because chromosomal mutations may cause abnormalities that can be harmful. Gene mutations are more likely to be neutral and thus suitable for use as molecular clocks.

Writing in Science

Students should explain that similarities in the DNA of two different organisms suggest that the organisms recently shared a common ancestor and that the more recently they shared a common ancestor, the more closely related they are. Students might use the example of African and American vultures and storks that is described on page 454.

Critical Thinking

26. **Applying Concepts** Does taxonomic classification place emphasis on the similarities between organisms, the differences between organisms, or both? Explain your reasoning.
27. **Applying Concepts** Both snakes and worms are tube-shaped, with no legs. How could you determine whether the similarity in shape means that they share a recent common ancestor?
28. **Classifying** Venn diagrams can be used to make models of hierarchical classification schemes. A Venn diagram is shown below. Four groups are represented by circular regions—A, B, C, and D. Each region represents a collection of organisms or members of a taxonomic level. Regions that overlap, or intersect, share common members. Regions that do not overlap do not have members in common. Use the following terms to label the regions shown in the diagram: All Animals, Animals That Have Backbones, Insects, Mammals.



29. **Classifying** Suppose you discovered a new single-celled organism. This organism has a nucleus, mitochondria, and a giant chloroplast. In which kingdom would you place this organism? What are your reasons?
30. **Classifying** Study the descriptions of the following organisms and place them in the correct kingdom.
- Organism A:** Multicellular, photosynthetic autotrophs, with cell walls that contain cellulose.
- Organism B:** Their cell walls lack peptidoglycan, and their cell membranes contain certain lipids that are not found in any other organisms. Many live in some of the most extreme environments and can survive only in the absence of oxygen.
- Organism C:** Unicellular, eukaryotic organisms that have chloroplasts.

Performance-Based Assessment

Some students may present ethical reasons that organisms in rain forests should be protected. Other students may focus on the potential benefits to humans of learning about and classifying organisms. Students also may mention economic benefits, medicines, or new sources of food.

31. **Applying Concepts** You are a biologist who is searching for new species in the Amazon jungle. You find two new species of beetles, beetle A and beetle B, that resemble each other closely but have somewhat different markings on their wings. In addition, both beetle A and beetle B resemble a species of beetle, beetle C, that has already been identified. How could you use DNA similarities and differences to determine whether beetle A and beetle B are more closely related to each other than to beetle C?
32. **Inferring** What is the relationship between natural selection and phylogeny?
33. **Applying Concepts** Two groups of organisms are in different genera, but they are included in the same family. What does this information tell you about the phylogenetic relationship of the two groups?
34. **Connecting Concepts** Refer back to Chapter 12 to help you answer the following question: Which type of mutations would be more useful to scientists as molecular clocks—gene mutations or chromosomal mutations? Explain.

Writing in Science

Write a short explanation of the way in which taxonomists use similarities and differences in DNA to help classify organisms and infer evolutionary relationships. (*Hint:* Use a specific example to help clarify your explanation.)

Performance-Based Assessment

Illustrate Storyboards It has been estimated that there are more unknown species in the tropical rain forests than there are known species in the world. Scientists are concerned that these rain forests might be destroyed before the species in them can be classified. Illustrate storyboards for a television news program explaining this issue to the general public. Show your storyboards to the class.

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