

# Diversity of Life 1

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## End of Chapter Questions

### Simple Review Questions

#### 10.1 Classifying Life

1. What criteria are used to classify species in the Linnaean classification system?

#### 10.2 Evolutionary Trees

2. How did scientific ideas about evolution change the way biologists classify organisms?

3. What information do scientists use to construct evolutionary trees?

#### 10.3 Three Domains of Life

4. What are the three domains of life?



5. To which domain of life do eukaryotes belong?

#### **10.4 Bacteria**

6. Explain how bacteria that are autotrophs and chemoautotrophs obtain food.

7. How do bacteria reproduce? Do bacteria ever exchange genetic material?

8. Why is bacterial decomposition important to life?

#### **10.5 Archaea**

9. Which features of archaeans suggest they are more closely related to eukaryotes than to bacteria?

10. Why are some archaea described as “extremophiles”?

#### **10.6 Protists**

11. What are protists?



12. What is a diatom, and why are diatoms important to many other marine organisms?

13. Name three kinds of multicellular photosynthetic protists.

14. Heterotrophic protists move to capture prey. Describe some of the different ways these protists move.

15. Describe how *Plasmodium*, the protist that causes malaria, infects humans. Also describe the symptoms of the disease.

### 10.7 Plants

16. What are the two components of the plant vascular system? What is the function of each?

17. Why are mosses restricted to living in moist environments?

18. How is pollen transferred from one plant to another in conifers? In flowering plants?

**(CLICK TO CHECK YOUR ANSWERS)**



## Challenging Review Questions

### 10.1 Classifying Life

19. If two species belong to the same order, do they have to belong to the same class? Do they have to belong to the same genus?

### 10.2 Evolutionary Trees

20. Which is more arbitrary: classifying organisms based on their evolutionary relationships or based on their “similarities”? Explain your answer.

21. Is an eagle a reptile? Defend your answer.

### 10.3 Three Domains of Life

22. How are the three domains of life—Bacteria, Archaea, and Eukarya—related to one another? To which domain do humans belong?

23. Scientists are working on separating the Protists into separate groups. Explain why.



24. What is the difference between a heterotroph and an autotroph? Name a group of living things that consists exclusively of heterotrophs and one that consists exclusively of autotrophs. Name a group that includes both heterotrophs and autotrophs.

25. What is a chemoautotroph? What does a chemoautotroph have in common with a plant? How does a chemoautotroph differ from a plant in how it obtains food?

#### 10.4 Bacteria

26. Why would life on Earth be impossible without bacteria?

27. Bacteria reproduce asexually. However, they sometimes exchange DNA with other bacteria. Explain some of the ways in which this can happen.

28. The photo below shows soil bacteria (yellow) forming spores (orange). What is the advantage of being able to produce spores, as many bacteria do?



29. What are some ways in which bacteria are useful in human lives?

### **10.5 Archaea**

30. You are studying some microbes that were collected from the Pacific Ocean. So far, you can tell that the microbes are prokaryotes rather than eukaryotes. How can you tell whether they are bacteria or archaea?

31. How do certain archaea benefit animals such as sheep and cows?

32. What are some extreme environments in which certain archaea thrive?

### **10.6 Protists**

33. We saw that life on Earth would be impossible without bacteria. Would life on Earth be impossible without eukaryotes?

34. Are protists single celled or multicellular? Use examples to defend your answer.



35. Are protists autotrophs, heterotrophs, or both? Use examples to defend your answer.

36. Which protists likely gave rise to plants? Which protists likely gave rise to animals?

### 10.7 Plants

37. What are the three major groups of plants? Identify an example of each in the photo below



38. Of the three major plant groups, which is most dependent on living in a moist habitat? Why? Which is least dependent?



39. Some plants, including many grasses, have small green flowers with no petals (see photo). How do you think these flowers are pollinated?



40. Some people are allergic to pollen. Do you think bee-pollinated plants or wind-pollinated plants are more likely to cause allergies? Why?

**(CLICK TO CHECK YOUR ANSWERS)**

### **Apply & Discuss Questions**

41. Of the three domains of life, Bacteria and Archaea both consist of prokaryotes, whereas Eukarya consists of eukaryotes. Why can't we lump Bacteria and Archaea together and call them all Bacteria?

42. Bacteria generally reproduce asexually. What are some advantages of asexual reproduction?





43. Most living organisms reproduce sexually sometimes or have some other mechanism for exchanging genetic material. What is the advantage of sexual reproduction or genetic exchange?

44. Do plants have to use energy to obtain the carbon dioxide they need for photosynthesis?

**(CLICK TO CHECK YOUR ANSWERS)**



## End of Chapter Solutions

### Simple Review Solutions

1. The Linnaean system divides species into groups based on their similarities.
3. Biologists use fossils as well as information about the anatomy, behavior, and genetics of existing species to reconstruct evolutionary relationships. DNA sequences have proved to be a particularly valuable source of information.
5. Eukarya includes all eukaryotic organisms, living things whose cells have a nucleus.
7. Bacteria typically reproduce asexually by dividing. However, most species exchange genetic material at least occasionally—when they take up small pieces of naked DNA from the environment, when bacterial viruses inadvertently transfer DNA between organisms, or when two bacteria join together and one passes DNA to the other.
9. Features of archaean genetics in particular link archaea to eukaryotes—their ribosomes are like those of eukaryotes, their genes contain introns like those of eukaryotes, and their DNA is associated with histone proteins, like that of eukaryotes.
11. Eukaryotes that are not plants, animals, or fungi are lumped together in a group called Protists.
13. Some photosynthetic protists are multicellular and can grow quite large. For example, all the different kinds of seaweeds are protists. Kelp forms huge oceanic forests that are home to many unique species. Red algae are the source of some of the seaweed we eat, including Japanese nori. Green algae are a group of multicellular protists that likely gave rise to terrestrial plants.
15. Malaria is caused by *Plasmodium* protists that divide their life cycle between mosquitoes and humans. Humans contract the disease when infected mosquitoes bite them. The protists then move into our red blood cells and reproduce in huge numbers. The synchronized emergence of protists from host red blood cells causes chills, fever, and vomiting.
17. Mosses are restricted to moist habitats for several reasons. First, because mosses do not have a vascular system, every part of a moss plant must obtain water directly from the environment through diffusion. Second, male and female moss plants are usually separate, and during reproduction, sperm must swim from the male plant through a film of water in the environment to fertilize eggs in the female plant.

### Challenging Review Solutions

19. Two species that belong to the same order must also belong to the same class. However, these two species do not have to belong to the same genus – this is because an order can contain one or more families, and each family can contain one or more genera. So, two species that are in the same order could be in different genera. For example, in the order Primates, there are many different genera.
21. Birds are reptiles because the evolutionary tree of the reptiles includes the birds as one branch within the rest of the reptile tree. In other words, birds are descended from reptiles and so they are reptiles too. This means that eagles are reptiles.



23. The Protist kingdom is problematic because it includes all eukaryotes that aren't plants, animals, or fungi—that is, the group is basically a hodgepodge of species that represent many separate lineages. Scientists are working on separating out the different lineages into separate groups.

25. A chemoautotroph is an autotroph that makes food and organic molecules using chemical energy. Like plants, chemoautotrophs are autotrophs—they convert inorganic molecules into food and organic molecules. However, plants use energy from sunlight to do this, and chemoautotrophs use chemical energy.

27. Bacteria may exchange DNA when they take up small pieces of naked DNA from the environment, when bacterial viruses inadvertently transfer DNA between organisms, or when two bacteria join together and one passes DNA to the other.

29. Countless bacteria live in and on our bodies, particularly on the skin and in the mouth, respiratory tract, and intestines. A few of these are potentially harmful, but others benefit us by producing vitamins and by keeping more dangerous bacteria from invading our bodies. Bacteria are used to make foods such as cheese and yogurt, and some genetically engineered strains produce human insulin and other medically important molecules. You also learned about bacteria that clean up oil spills and hazardous waste.

31. They live in the digestive tracts of sheep, cows, and other animals. There, the archaea help their hosts digest plant material.

33. Life would go on just fine without eukaryotes. In fact, life did just fine for the several billion years before the first eukaryotes evolved.

35. Some protists are autotrophs and others are heterotrophs. Examples of autotrophic protists include diatoms and kelp. Examples of heterotrophic protists include ciliates and amoebas.

37. The three major groups of plants are mosses, ferns, and seed plants. The trees in the photo are seed plants. Mosses can be seen covering the trunks of the trees on the left side of the photo. The plants in the bottom right corner are ferns.

39. Green flowers are not particularly visible, so likely are not attracting vision-oriented pollinators. In fact, many are wind pollinated.

### Apply & Discuss Solutions

41. Because archaea are more closely related to eukaryotes than either is to bacteria, classifying archaea and bacteria together, while excluding eukaryotes, obscures the evolutionary history of the three groups. In terms of a classification based on evolutionary history, the fact that archaea and bacteria are both prokaryotes is not relevant – only the evolutionary relationships among the three groups matters in constructing biological groups.

43. The advantage of genetic exchange is genetic diversity among the offspring you produce. This way, you don't put all your eggs in one (genetic) basket. Since future environmental conditions are impossible to predict, at least some of your offspring are likely to do well no matter what the environmental conditions turn out to be.

