

Chapter 2: Organizing the Diversity of Life

MULTIPLE CHOICE

1. The science of systematics is used to
- predict an organism's future evolution.
 - decide when an organism died.
 - show relationships among organisms.
 - decipher an organism's DNA.

ANS: C DIF: Easy REF: 2.1 OBJ: Factual

2. Which of the following features is not convergent?
- the caudal fin of a whale and shark
 - the opposable thumb of a human and panda
 - the hand of a chimpanzee and human
 - the wing of a bat and bird

ANS: C DIF: Easy REF: 2.1 OBJ: Factual

3. If a biologist finds an insect that doesn't resemble anything seen before, it
- may be a new species.
 - may be an undescribed life history stage of an already known species.
 - may be a member of the other gender of a known species.
 - all of the above

ANS: D DIF: Easy REF: 2.1 OBJ: Factual

4. Evolutionary tree diagrams showing the relationships between various organisms can be drawn because those organisms share
- common descendants.
 - distinct lineages.
 - common cellular metabolism.
 - a common ancestor.

ANS: D DIF: Easy REF: 2.1 OBJ: Applied

5. Evolutionary trees are based on
- the principle of convergent evolution.
 - a set of shared characteristics believed to have arisen in a common ancestor.
 - similarities in function of a characteristic.
 - consensus regarding the usefulness of particular traits.

ANS: B DIF: Easy REF: 2.1 OBJ: Factual

6. Any two groups of organisms will have
- 2 most recent common ancestors.
 - no more than 4 most recent common ancestors.
 - only 1 most recent common ancestor.
 - as many as 16 most recent common ancestors.

ANS: C DIF: Medium REF: 2.1 OBJ: Applied

7. All of the following sources of information except _____ can be used to construct evolutionary trees.
- habitat preferences
 - body form
 - instinctive behavior
 - learned behaviors

ANS: D DIF: Medium REF: 2.1 OBJ: Applied

8. A set of shared derived features
- will be unique to each Linnaean taxon.
 - marks a group of species as a set of close relatives.
 - most often indicates convergences.
 - can be found only in humans.

ANS: B DIF: Medium REF: 2.1 OBJ: Factual

9. DNA analysis has become a useful tool for understanding the relationships between organisms because
- DNA codes for all traits, visible or invisible.
 - DNA is used by all organisms to collect energy.
 - only mammals have DNA.
 - knowing the DNA codes means we no longer have to use systematics.

ANS: A DIF: Medium REF: 2.1 OBJ: Factual

10. Evolutionary trees have been successfully used to
- identify those species most closely related to humans.
 - explain how evolution works.
 - explain why most carnivorous mammals have four or five toes.
 - explain the potential impact of global climate change.

ANS: A DIF: Medium REF: 2.1 OBJ: Applied

11. The emergence of each new branch on the evolutionary tree represents
- the addition of a new Linnaean taxon within that lineage.
 - the completion of a generation for that particular organism.
 - the introduction of the most important features of a group.
 - a common ancestor and the introduction of a new shared, derived feature.

ANS: D DIF: Medium REF: 2.1 OBJ: Conceptual

12. The presence of convergent features
- indicates a close evolutionary relationship.
 - indicates that two species have merged to become a single species.
 - indicates distantly related species adapting to similar environmental conditions.
 - occurs only in plants.

ANS: C DIF: Difficult REF: 2.1 OBJ: Factual

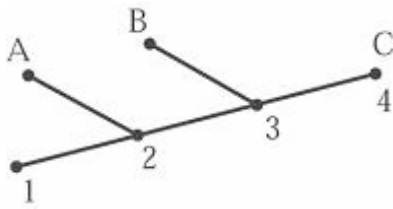
13. Descendant organisms
- do not share any features with their descendants.
 - have all the same features as their descendants.
 - share some features with their ancestors.
 - do not have features their ancestors lacked.

ANS: C DIF: Difficult REF: 2.1 OBJ: Conceptual

14. The organisms farthest from the base of an evolutionary tree are
- unrelated to the organisms separated by one or more branch points.
 - less primitive than the organisms lower on the tree.
 - those that have evolved most recently.
 - chronologically older than the organisms lower on the tree.

ANS: C DIF: Difficult REF: 2.1 OBJ: Applied

15. Examine the evolutionary tree pictured below.



In this evolutionary tree, which number represents the most recent common ancestor of A, B, and C?

- a. 1
- b. 2
- c. 3
- d. 4

ANS: B DIF: Difficult REF: 2.1 OBJ: Conceptual

16. Reconsideration of the Gobi Desert site where *Oviraptor* fossils were found has led paleontologists to hypothesize that

- a. the most recent common ancestor of the turtles and crocodilians was a dinosaur.
- b. some dinosaurs commonly ate eggs.
- c. some dinosaurs exhibited parental care.
- d. dinosaurs were driven to extinction shortly after the appearance of birds.

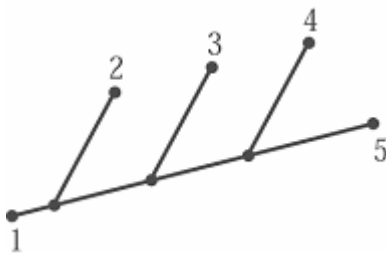
ANS: C DIF: Medium REF: 2.2 OBJ: Applied

17. To produce an evolutionary tree it is necessary to first determine

- a. which organisms are the oldest.
- b. the full DNA sequence of each organism that will be included within the tree.
- c. the shared derived features present within each group of organisms.
- d. the number of lineages in each group.

ANS: C DIF: Medium REF: 2.2 OBJ: Applied

18. Examine the evolutionary tree pictured below.



In this evolutionary tree, which groups of organisms are likely to share the most behaviors?

- a. 5 and 4
- b. 5 and 3
- c. 5 and 2
- d. 5 and 1

ANS: A DIF: Difficult REF: 2.2 OBJ: Conceptual

19. The following numbered sets of characters each represent a distinct group of organisms.

- 1. three toes per foot, feathers, cold blooded, no finger adaptations
- 2. three toes per foot, body hair, warm blooded, opposable thumbs
- 3. three toes per foot, feathers, warm blooded, no finger adaptations
- 4. three toes per foot, body hair, warm blooded, no finger adaptations

Which of the following choices is the most likely to represent the order in which these groups would appear on an evolutionary tree, from oldest to youngest group? (*Hint*: the more primitive characters are cold bloodedness, feathers, and no finger adaptations.)

- a. 1, 2, 3, 4
- b. 4, 2, 3, 1
- c. 1, 3, 4, 2
- d. 2, 1, 4, 3

ANS: C DIF: Difficult REF: 2.2 OBJ: Conceptual

20. Which of the following events occurred between each branch on an evolutionary tree?
- a. the evolution of a new derived feature
 - b. the loss of a derived feature
 - c. the evolution of a shared ancestral feature
 - d. the evolution of a convergent feature

ANS: A DIF: Difficult REF: 2.2 OBJ: Factual

21. At the base of the evolutionary tree of all life is the
- a. universal ancestor.
 - b. convergent ancestor.
 - c. derived ancestor.
 - d. descended ancestor.

ANS: A DIF: Easy REF: 2.3 OBJ: Factual

22. There are currently three recognized domains; which of the following is not included within this taxon?
- a. Archaea
 - b. Bacteria
 - c. Procarya
 - d. Eukarya

ANS: C DIF: Easy REF: 2.3 OBJ: Factual

23. *Canis latrans* is the scientific name for the coyote. The term *Canis* represents the coyotes'
- a. genus.
 - b. kingdom.
 - c. order.
 - d. species.

ANS: A DIF: Easy REF: 2.3 OBJ: Factual

24. The most inclusive category in the Linnaean classification system is
- a. order.
 - b. phylum.
 - c. kingdom.
 - d. species.

ANS: C DIF: Easy REF: 2.3 OBJ: Factual

25. The level in the Linnaean hierarchy immediately above class is
- a. phylum.
 - b. genus.
 - c. kingdom.
 - d. order.

ANS: A DIF: Easy REF: 2.3 OBJ: Factual

26. Which of the following would contain the most closely related group of phyla?
- a. class
 - b. order
 - c. genus
 - d. kingdom

ANS: D DIF: Easy REF: 2.3 OBJ: Factual

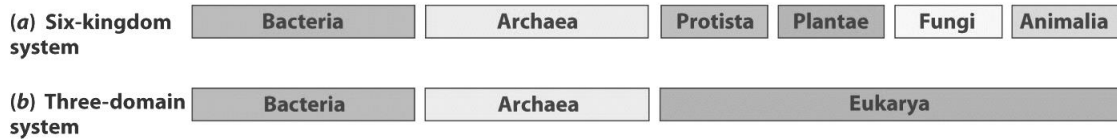
27. Which of the following taxons in the Linnaean hierarchy has the greatest number of species?
- a. family
 - c. phylum

- b. class
d. order
- ANS: C DIF: Easy REF: 2.3 OBJ: Factual
28. Species of the following kingdoms except _____ are placed within the domain Eukarya.
- a. Protista c. Bacteria
b. Plantae d. Fungi
- ANS: C DIF: Easy REF: 2.3 OBJ: Factual
29. Which of the following is a kingdom?
- a. Bacteria c. Plantae
b. Eukarya d. Archaea
- ANS: C DIF: Easy REF: 2.3 OBJ: Factual
30. The members of which of the following taxons would be most similar to one another?
- a. class c. order
b. genus d. kingdom
- ANS: B DIF: Medium REF: 2.3 OBJ: Applied
31. The most restrictive category in the Linnaean classification system is
- a. species. c. kingdom.
b. order. d. phylum.
- ANS: A DIF: Medium REF: 2.3 OBJ: Applied
32. In order to determine relationships among organisms scientists would examine
- a. DNA. c. body structures.
b. behavior. d. all of the above
- ANS: D DIF: Medium REF: 2.3 OBJ: Factual
33. Which of the following avian species are most closely related?
- a. *Picoides villosus* and *Picoides borealis*
b. *Picoides borealis* and *Phylloscopus borealis*
c. *Numenius borealis* and *Picoides borealis*
d. *Numenius americanus* and *Grus americana*
- ANS: A DIF: Medium REF: 2.3 OBJ: Applied
34. In taxonomy, individuals belonging of the same class would also belong to the same
- a. species. c. order.
b. genus. d. none of the above
- ANS: D DIF: Medium REF: 2.3 OBJ: Applied
35. Which of the following statements about modern systematics is *not correct*?
- a. Systematic studies have revealed so many errors within the Linnaean hierarchy that it is no longer reliable.
b. The number of taxons in the Linnaean hierarchy has been determined subjectively; it represents a human understanding of natural processes..
c. A complete evolutionary lineage includes all the descendants of a single common ancestor.
d. Many scientists refuse to accept classification information from newer technologies like

DNA analysis.

ANS: B DIF: Difficult REF: 2.3 OBJ: Conceptual

36. The figure below illustrates the three-domain, six-kingdom taxonomy of life.



Bacteria are equivalent at the kingdom and domain taxon; what explains this equivalency when the domain Eukarya is subdivided into four kingdoms?

- a. Bacteria are small and relatively insignificant; most systematists focus on more important biological questions.
- b. Bacteria are difficult to study, as more becomes known about them systematists will undoubtedly propose reclassifications.
- c. All living bacteria are so similar that only a handful of families have been proposed.
- d. At present, no significant shared derived features have been identified that would indicate major evolutionary divisions have occurred within the group.

ANS: D DIF: Difficult REF: 2.3 OBJ: Conceptual

37. What single feature, shared by all organisms, allows scientists to compare distantly related living organisms?

- a. most recent common ancestor
- b. universal ancestor
- c. most recent common lineage
- d. DNA

ANS: D DIF: Easy REF: 2.4 OBJ: Factual

38. Which of the following pairs of kingdoms would be included exclusively in the domain Eukarya?

- a. Plantae and Bacteria
- b. Animalia and Archaea
- c. Animalia and Fungi
- d. Protista and Bacteria

ANS: C DIF: Easy REF: 2.4 OBJ: Factual

39. Analysis of both cellular metabolism and DNA support the hypothesis that members of the _____ are the most closely related.

- a. Fungi and Bacteria
- b. Fungi and Animalia
- c. Plantae and Fungi
- d. Plantae and Animalia

ANS: B DIF: Easy REF: 2.4 OBJ: Factual

40. One unexpected result following the inclusion of DNA analysis in systematics is that

- a. fungi are more closely related to animals than to plants.
- b. plants and fungi should be regrouped to represent a single kingdom.
- c. fungi should be placed lower on the evolutionary tree than plants to reflect their appearance earlier in the history of life.
- d. DNA analysis produces inconsistent results and should not be used as a classification tool.

ANS: A DIF: Medium REF: 2.4 OBJ: Applied

41. Analysis of body morphology and DNA indicate the closest living relatives of human beings are

- a. chimpanzees.
- b. orangutans.
- c. gibbons.
- d. lemurs.

ANS: A DIF: Medium REF: 2.4 OBJ: Applied

42. Along the evolutionary tree which of the following are thought to be most closely related?
- a. an oak tree and a squirrel
 - b. a mushroom and a cactus
 - c. a honeybee and a clover plant
 - d. a clam and a mushroom

ANS: D DIF: Medium REF: 2.4 OBJ: Applied

43. There is some debate regarding the recognition of reptiles as a legitimate lineage because
- a. reptiles are no longer a dominant group nor particularly important to life on Earth.
 - b. reptiles and birds share a single common ancestor but are placed into different phyla within the Linnaean hierarchy.
 - c. reptiles reproduce using eggs, but are not grouped with other organisms sharing a similar reproductive method such as the fish and amphibians.
 - d. as a single group the reptiles contains too many species.

ANS: B DIF: Difficult REF: 2.4 OBJ: Conceptual

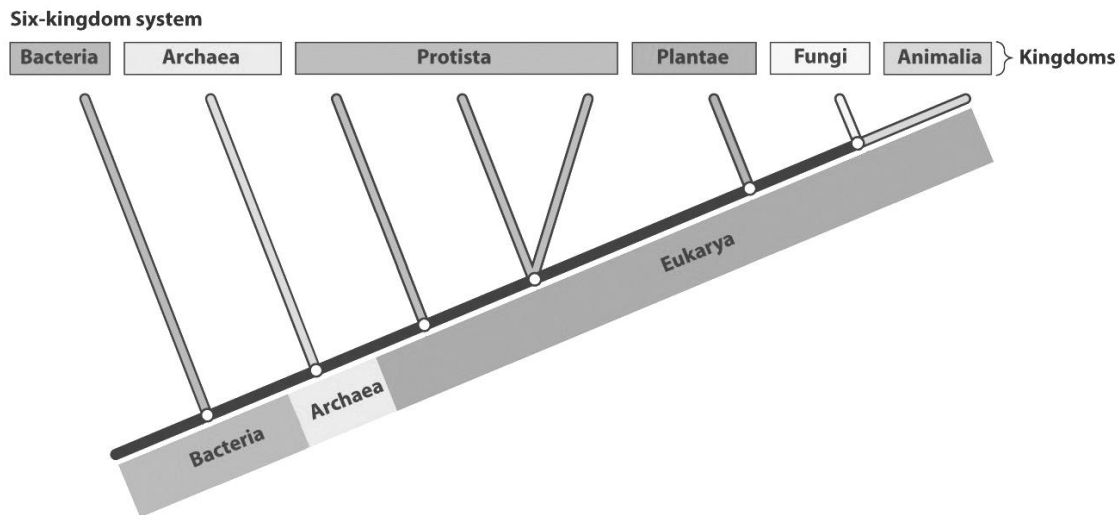
44. Protists are not considered to represent a complete evolutionary lineage because
- a. there are three lineages within the group.
 - b. they evolved long ago.
 - c. they evolved recently.
 - d. there is only one lineage within the group.

ANS: A DIF: Difficult REF: 2.4 OBJ: Conceptual

45. Classification systems are continually revised as new information becomes available from various sources such as
- a. better understanding of the details of physiological processes.
 - b. using DNA analysis to compare nonstructural features of different organisms.
 - c. the continued evolution of current Earth species.
 - d. the identification of alien species that have reached Earth via meteorites and comets.

ANS: B DIF: Difficult REF: 2.4 OBJ: Applied

46. The evolutionary tree below illustrates the hypothesized relationships among the six kingdoms and the three domains.



Many biologists have suggested revising the kingdom Protista. One current problem with the Protista, as shown in the figure, is that

- protists are single-celled organisms and should be grouped with the bacteria or archaeans.
- the cells of protists contain nuclei and organelles.
- the current classification model does not reveal that plants evolved from protist ancestors.
- the organisms currently grouped as protists do not share a recent common ancestor.

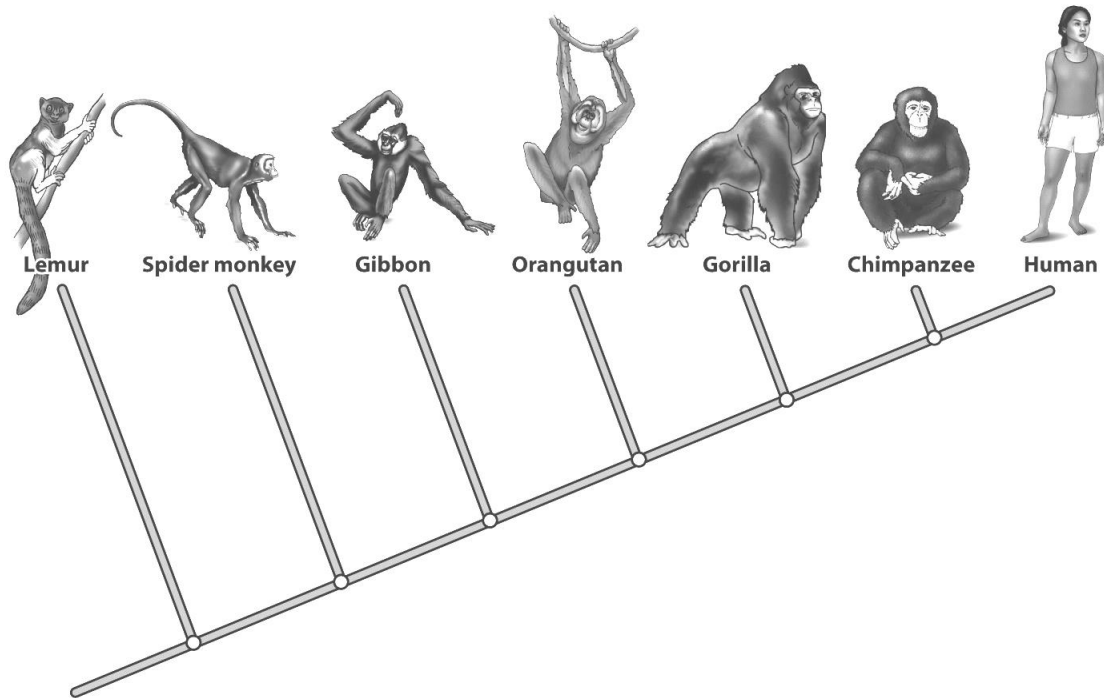
ANS: D

DIF: Difficult

REF: 2.4

OBJ: Conceptual

47. The figure below shows the primate evolutionary tree.



A close human relative, *Homo habilis*, has been identified by fossil remains. Where on the tree above should *Homo habilis* be placed?

- Homo habilis* cannot be positioned on the primate tree because it is not a currently living species.
- Without detailed information it's difficult to be precise, but definitely to the right of the branch leading to the chimpanzee.
- Since *Homo habilis* is an ancient organism and the primates represented are all currently living, the branch point should be to the left of the lemur.
- Because humans and the chimpanzee are so closely related its position should be between the gorilla and the chimpanzee.

ANS: B

DIF: Difficult

REF: 2.4

OBJ: Conceptual

48. In order to determine whether the Iceman mummy was modern or ancient, biologists studied

- his DNA.
- his tattoos.
- the construction of his stone tools.
- the ice where he was preserved.

ANS: A

DIF: Medium

REF: Applying What We Learned

OBJ: Factual

COMPLETION

1. _____ is the science of naming and classifying organisms and determining the relationships among them.

ANS: Systematics

DIF: Easy REF: 2.1 OBJ: Factual

2. Within an evolutionary tree descendants share common features because they share a common _____.

ANS: ancestor

DIF: Easy REF: 2.1 OBJ: Factual

3. Systematists can also be called _____.

ANS: taxonomists

DIF: Medium REF: 2.1 OBJ: Factual

4. The closest relatives of modern birds are the _____.

ANS: dinosaurs

DIF: Easy REF: 2.2 OBJ: Factual

5. Evolutionary trees use shared derived features to determine _____ between organisms.

ANS: relationships

DIF: Easy REF: 2.2 OBJ: Factual

6. A key shared derived feature in fish, reptiles, and humans is a(n) _____.

ANS: backbone

DIF: Easy REF: 2.2 OBJ: Factual

7. A feature may appear to be shared by an unrelated group of organisms if it independently evolved in both groups. Such features are called _____ features, and can mislead scientists who are trying to determine evolutionary relationships.

ANS: convergent

DIF: Medium REF: 2.2 OBJ: Applied

8. _____ _____ are diagrams that show the relationships between various organisms as indicated by DNA analysis or comparative studies on body form, physiology, or behavior.

ANS: Evolutionary trees

DIF: Medium REF: 2.2 OBJ: Applied

9. One unique feature that supports the hypothesis that humans and chimpanzees are closely related is the _____.

ANS: opposable thumb

DIF: Medium REF: 2.2 OBJ: Factual

10. The most recent common _____ marks the point at which a lineage diverges to begin a new evolutionary pathway.

ANS: ancestor

DIF: Medium REF: 2.2 OBJ: Applied

11. The father of modern scientific naming is _____.

ANS: Carolus Linnaeus

DIF: Easy REF: 2.3 OBJ: Factual

12. The Linnaean hierarchy goes from species to genus to family to order to _____ to phylum to kingdom.

ANS: class

DIF: Easy REF: 2.3 OBJ: Factual

13. The root of the evolutionary tree of domains begins with an unknown organism termed the _____ ancestor.

ANS: universal

DIF: Medium REF: 2.4 OBJ: Factual

14. Most evidence suggests that _____ was the first domain to emerge within the evolutionary tree of life.

ANS: Bacteria

DIF: Medium REF: 2.4 OBJ: Factual

15. The Iceman mummy was found to be a close relative of people currently living in _____.

ANS: Europe

DIF: Easy REF: Applying What We Learned OBJ: Factual

TRUE/FALSE

1. Evolutionary taxonomy is based on a scientist's educated decisions.

ANS: T DIF: Easy REF: 2.1 OBJ: Factual

2. Convergent features are good traits to use for revealing relationships.

ANS: F DIF: Medium REF: 2.1 OBJ: Conceptual

3. A lineage is a group of relatives that have a common ancestor.

ANS: T DIF: Easy REF: 2.2 OBJ: Applied

4. DNA analysis has confirmed the relationships among most species well beyond any reasonable doubt.

ANS: F DIF: Easy REF: 2.2 OBJ: Applied

5. Switching the order of the last two organisms on an evolutionary tree has no effect on how the tree is read.

ANS: T DIF: Medium REF: 2.2 OBJ: Conceptual

6. Evolutionary trees can be used to predict the behavior of organisms.

ANS: T DIF: Medium REF: 2.2 OBJ: Applied

7. The broadest classification category currently used by most biologists is the domain.

ANS: T DIF: Easy REF: 2.4 OBJ: Applied

8. Archaea, Bacteria, and Eukarya are the three biological domains.

ANS: T DIF: Easy REF: 2.4 OBJ: Factual

9. Protists are part of the domain Bacteria.

ANS: F DIF: Easy REF: 2.4 OBJ: Factual

10. Bacteria, protists, and fungi belong to the domain Archaea.

ANS: F DIF: Easy REF: 2.4 OBJ: Factual

11. Horizontal gene transfer is a hypothesis that proposes genes can move from one branch of an evolutionary tree to another.

ANS: T DIF: Medium REF: 2.4 OBJ: Factual

12. The kingdom Bacteria consists of the same species as the domain Bacteria.

ANS: T DIF: Medium REF: 2.4 OBJ: Applied