The Classification of Organisms

Instructor's Manual

Editors:
Brian A. Jerome Ph.D.
Stephanie Zak Jerome

Assistant Editors:
Louise Marrier
Lyndsey Canfield
Heidi Berry

Graphics:
Fred Thodal
Dean Ladago

Reviewers:
Stephen Trombulak Ph.D.
Professor of Biology
Middlebury College

Gary Meffe Ph.D.
Professor of Biology
Editor, *Conservation Biology*

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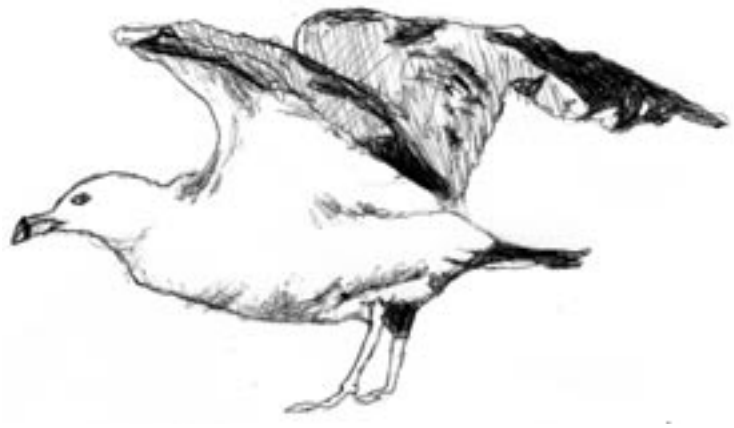


Table of Contents

Student Learning Objectives

Upon viewing the video and completing the enclosed activities, students will be able to do the following:

- Appreciate the vast number and variety of living things on the planet.
- Understand that present-day living species represent a tiny percentage of all organisms that have lived on the planet.
- Have a sense that throughout the past two thousand years people have worked to group, name, and classify living things.
- Explain that the Swedish biologist, Carolus Linnaeus, developed a two-part naming system that is still used today.
- Define binomial nomenclature as the process by which each species is given two names - a genus name and a species name.
- Understand there are eight main categories in the modern classification hierarchy. Also understand that taxonomic hierarchies and methods are continually being revised.
- Explain that each taxonomic group implies a set of characteristics and a group of organisms belonging to the taxon.
- State that each species has a specific two-part name referred to as its scientific name. Explain why scientific names are often preferable to common names.
- Understand that hereditary, or evolutionary relationships, between species play a fundamental role in describing them.
- Explain that systematic biology, also referred to as systematics, involves the study of the diversification of life and the reconstruction of evolutionary relationships between living things.
- Describe taxonomy as the process by which living things are named and placed into categories based on a number of characteristics.
- List and explain some of the characteristics used by taxonomists to describe an organism. Some of these characteristics include: physical characteristics, fossil evidence, biochemical information, cytological information, embryological evidence, and behavior.
- Briefly discuss the general characteristics of organisms in the three main domains: Archaea, Bacteria, and Eukarya.

Assessment

Preliminary Assessment (p. 14-15):

The Preliminary Assessment is an assessment tool designed to gain an understanding of students' preexisting knowledge. It can also be used as a benchmark upon which to assess student progress based on the objectives stated on the previous pages.

Post Assessment (p. 16-17):

The Post Assessment can be utilized as an assessment tool following student completion of the program and student activities. The results of the Post Assessment can be compared against the results of the Preliminary Assessment to assess student progress.

Video Review (p. 18):

The Video Review can be used as an assessment tool or as a student activity. There are two sections. The first part contains questions displayed during the program. The second part consists of a ten-question video assessment to be answered at the end of the video.

Introducing the Program

Before showing students the video ask them how many different kinds of living things they think live on the planet. Write their estimates on the board. After listing their suggestions explain to students that scientists currently estimate there are over 10 million different species of living things on the planet. Some scientists believe there may be as many as 100 million species, with many yet to be discovered.

Next, ask them how they think scientists mange to group such vast numbers of species. Ask them to list some of the various categories of living things. Briefly describe the modern taxonomic hierarchy. Explain to students that some categories in the hierarchy are quite broad such as domains and kingdoms. Other categories such as species are quite specific. Explain and list the categories in the modern taxonomic hierarchy.

Before beginning to view the video program, ask students what characteristics scientists use to place living things into groups. List some of their suggestions on the board. Tell students to pay close attention to the video to learn more about how living things are described and classified. Following the video program discuss some of the criteria and characteristics scientists use to describe and categorize organisms.

Program Viewing Suggestions

The student master "Video Review" (p. 19) is provided for distribution to students. You may choose to have your students complete this master while viewing the program or do so upon its conclusion.

The program is approximately 20 minutes in length and includes a ten-question video assessment. Answers are not provided to the Video Assessment in the video, but are included in this manual on page 13. You may choose to grade student assessments as an assessment tool or to review the answers in class.

The video is content-rich with numerous vocabulary words. For this reason you may want to periodically stop the video to review and discuss new terminology and concepts.

Video Script: The Classification of Organisms

1. Think about how many living things you're familiar with.
2. There are dozens, if not, hundreds of different organisms you can name.
3. Chances are you can identify many different vertebrate animals,…
4. …as well as several kinds of invertebrate animals.
5. You can also identify a wide variety of plants and fungi.
6. Perhaps you can even name some microscopic organisms.
7. Describing, identifying, classifying, and categorizing the millions of different kinds of living things on Earth is not an easy job.
8. So, how do scientists go about this process?
9. What are some of the ways relationships between living things are identified and described?
10. And, what are the major categories into which living things are grouped?
11. During the next few minutes we are going to answer these questions and others,…
12. …as we explore the diversity of life on Earth.
13. **Graphic Transition – Abundance of Life**
14. Our planet supports a vast and amazing diversity of life.
15. Living things come in many shapes, forms, and sizes, ranging from tiny bacteria,…
16. …to animals as large as whales and elephants…
17. …to plants like giant redwood trees that stretch over 100 meters into the sky.
18. Scientists estimate that there are over 10 million different species of living organisms on the planet,…
19. …and new species are still being discovered.
20. Throughout the history of life on Earth it is estimated that over 99% of all species that have ever lived are now extinct. Can you imagine trying to study so many different species?
21. More than 2000 years ago, early Greeks, such as Aristotl,e placed living things into two groups: plants and animals.
22. **You Decide!** What is the problem with this system?
23. Having just two groups was too broad and it didn't take into account other types of organisms that were not plants or animals.
24. In the Middle Ages, groups called genera were systematically described using the Latin language. Today scientists still use Latin to name organisms.
25. In the 1750's, the Swedish biologist, Carolus Linnaeus, developed a method to name each species using a two-part name.
26. For example, the name of the common housefly became Musca domestica. The name of the honeybee became Apis mellifera.
27. Scientists still use this two-part system to name species.
28. The process of giving each species two names – a genus name and a species name is called binomial nomenclature.
29. **Graphic Transition – Classification Hierarchy**
30. Since the time of Carolus Linnaeus scientists began grouping species into more categories.
31. There are eight main taxonomic levels in the modern taxonomic hierarchy.

Video Script: The Classification of Organisms

32. Let's highlight these levels going from the broadest, most inclusive to the most specific level.
33. Domains, of which there are three, are the broadest taxonomic categories.
34. Domains are broken down into kingdoms and there are six of these; although some scientists argue there are fewer.
35. Kingdoms are broken down into phyla, which are further divided into classes.
36. Classes are broken down into orders, families, genera, and then most specifically into species.
37. Let's see how the common housefly is classified.
38. Going from broad to specific, the housefly is in the domain Eukarya, the kingdom Animalia, the phylum Arthropoda, the class Insecta, the order Diptera, the family Muscidae, genus Musca, and species domestica.
39. Each taxonomic group implies a set of characteristics common to a group of organisms within that taxon.
40. For example, the class insecta includes insects, which are animals that have an exoskeleton, six legs, a three-part body, two antennae, and compound eyes.
41. As you know, each species has a specific two-part name, referred to as its scientific name.
42. In everyday usage, we usually don't use scientific names to describe specific organisms.
43. For example, this blue-colored bird is often called several different names including blue jay, bluecoat, nest robber, and corn thief.
44. But, this bird's scientific name, Cyanocitta cristata, makes it very clear what bird we're talking about.
45. **Graphic Transition – Basis for Classification**
46. We have already mentioned that there are about two million known living species with more species still being discovered.
47. How do scientists go about identifying, describing, naming, and classifying living things? And, how do they explain how organisms are related to each other?
48. Scientists use several characteristics to help them.
49. Among the most important is an organism's evolutionary relationship to other living things.
50. According to the theory of evolution new species arise, or evolve, from preexisting species.
51. Hereditary, or evolutionary relationships, between species play a fundamental role in describing them.
52. Generally speaking, species that share common characteristics are thought to share common ancestral species.
53. Systematic biology, also referred to as systematics, is the study of the diversification of life and the reconstruction of evolutionary relationships between living things.

Video Script: The Classification of Organisms

54. By analyzing similarities and differences between species an evolutionary or phylogenetic tree can be constructed.
55. Phylogeny is the evolutionary history of an organism that relies on numerous types of evidence.
56. Phylogeny is helpful in understanding how an organism is related to its ancestors and to other living things.
57. **Graphic Transition - Taxonomy**
58. We have already explained that systematics is the study and reconstruction of evolutionary relationships.
59. Taxonomy involves the process of naming and categorizing organisms.
60. While taxonomic categories should ideally reflect evolutionary relationships, taxonomists need to rely on other characteristics to classify organisms.
61. Carolus Linnaeus based his classification strategy primarily on physical characteristics.
62. Today, taxonomists still use physical characteristics to determine evolutionary relationships.
63. For example, foxes, coyotes, and wolves possess many similar physical structures including canine teeth, long legs, claws, and bushy tails. They are in the same family called canidae.
64. Evidence, left in the form of fossils helps scientists classify not only extinct organisms, but also helps develop phylogenetic relationships of living organisms.
65. Fossil evidence can be in the form of bones, preserved tissue, or impressions.
66. In addition to studying physical structures and fossil evidence, scientists also consider biochemical components.
67. Over the years sophisticated techniques have emerged to analyze DNA, RNA, and proteins. They help scientists to determine evolutionary relationships between living things.
68. Scientists also use cellular information, referred to as cytological information, to help classify organisms.
69. By examining cellular structures and comparing them it is possible to identify similarities and differences between species.
70. Taxonomists often use embryological evidence to help establish relationships that might not otherwise be obtained.
71. The behaviors of living things also help distinguish species from each other.
72. For example, some insects, such as certain crickets, can be identified solely on the basis of mating sounds that they make.
73. **Graphic Transition – Modern Classification Systems**
74. The earliest classification systems placed organisms into two main groups – plants and animals.
75. As people gained greater understanding of the natural world, classification categories consisted of more taxa.
76. Taxonomists continue to debate and revise the way living things are classified.
77. For many years scientists have ascribed to either a five kingdom or six kingdom classification system.
78. In the five-kingdom system, the kingdoms included bacteria, protista, plants, fungi and animals.

Video Script: The Classification of Organisms

79. In the six-kingdom system, the bacteria kingdom was subdivided into two separate kingdoms: eubacteria and archaebacteria. We will discuss these in a minute.
80. Today, many taxonomists favor using more general categories called domains over kingdoms.
81. The three domains consist of the Domain Archaea, the Domain Bacteria, and the Domain Eukarya.
82. The three general categories of archaebacteria include methanogens, extremophiles, and nonextreme bacteria.
83. Methanogens live in swamps, marshes, and the intestines of mammals.
84. They obtain energy by using hydrogen gas to reduce carbon dioxide to methane gas.
85. Extremophiles live in environments that may seem extreme to us including hot geothermal springs, salty bodies of water such as in Mono Lake California, and at great pressure deep in the oceans.
86. Nonextreme archaebacteria live in environments similar to those where bacteria live. However, they possess DNA signatures present only in archaebacteria.
87. The Domain Bacteria includes the most abundant organisms on Earth.
88. In fact, there are more living bacteria in your mouth than there are living mammals on the planet!
89. Microscopic bacteria are placed in 12 to 15 different groups.
90. They are responsible for processes such as decomposition, nitrogen fixation, and photosynthesis to name just a few.
91. While both archaea and bacteria are prokaryotes, in many ways archaea are more closely related to eukaryotes.
92. Eukaryotes, in the Domain Eukarya are organisms that possess a membrane-bound nucleus in their cells.
93. There are four kingdoms of eukaryotes: protists, fungi, plants, and animals.
94. Protists vary widely in form and structure, ranging from unicellular microscopic organisms,…
95. … to large multicellular organisms such as kelp.
96. Plants are multicellular organisms that possess cellulose, varying modes of reproduction, and are photosynthetic.
97. Fungi are not capable of photosynthesis but instead obtain energy from living or once-living things.
98. Animals, of which humans are examples, are multicellular organisms that must obtain their energy from other once living things.
99. **Graphic Transition – Video Review**
100. During the past few minutes we have explored the wide diversity of life on Earth,…
101. …while specifically focusing on how life is described, named, and classified.
102. We began by discussing some of the ways life forms were described and classified over 2,000 years ago.

Video Script: The Classification of Organisms

103. The contribution of Carolus Lineaus in developing the two-name system for each organism called binominal nomenclature was highlighted.
104. We then discussed the hierarchy of the modern classification system consisting of eight different taxa.
105. We then explored some of the ways scientists go about identifying, naming, describing, classifying and explaining how organisms are related to each other.
106. Critical to this process is systematic biology, which is the study of the diversification of life and the reconstruction of evolutionary relationships between living things.
107. We discussed phylogeny, the evolutionary history of an organism.
108. Some of the other characteristics used by scientists in understanding living things were highlighted including physical features, biochemical makeup, cytological characteristics, embryology, behavior, and fossil evidence.
109. Last, we briefly investigated the three major domains that encompass the amazing diversity of life on our planet.

110. Graphic Transition – Video Assessment

Fill in the correct word to complete the sentence.

1. Over 99% of the species that lived on Earth are _____.
2. Scientist use the ____ language to name organisms
3. Carolus Linnaeus developed a two-name system for species called ____ nomenclature.
4. The modern classification system is a _____ with broad categories broken down into smaller ones.
5. The two-part name of a species is its _____ name.
6. ____ is the study of the diversification of life and the reconstruction of evolutionary relationships.
7. Species that have many similar characteristics are thought to share common _____.
8. ____ is the evolutionary history of an organism.
9. There are three broad ____ into which all life is grouped.
10. Plants and animals are in the domain _____.

Answer Key to Student Assessments

Preliminary Assessment (p. 15-16)

1. d - 99%
2. a - Latin
3. b - binomial nomenclature
4. c - Carolus Linnaeus
5. b - taxa
6. a - domain
7. d - scientific name
8. b - evolutionary relationships
9. b - systematics
10. a - phylogeny
11. a - DNA signature
12. c - Archaea
13. a - Bacteria
14. d - membrane-bound nucleus
15. b - Bacillus
16. Binomial nomenclature is the process of giving each species a genus and species name.
17. Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species.
18. The scientific name eliminates any confusion. There can be many different common names for a single species.
19. Evolutionary relationships, physical characteristics, fossil evidence, biochemical data, embryological observations, and cytological information are some types of evidence used.
20. Archaea - includes unique forms of bacteria, such as methanogens and extremophiles. Bacteria - broad group of bacteria. Eukarya - includes organisms that possess a nucleus surrounded by a membrane. Examples include: fungi, plants, protists, and animals.

Video Review (p. 19)

1. The problem with having just two groups was it was too broad and it didn't take into account other types of organisms that were not plants or animals.

Video Assessment (p. 19)

1. extinct
2. Latin
3. binomial
4. hierarchy
5. scientific
6. systematics
7. ancestors
8. phylogeny
9. domains
10. eukarya

Post Assessment (p. 17-18)

1. a - DNA signature
2. d - scientific name
3. a - bacteria
4. a - Latin
5. b - Bacillus
6. d - 99%
7. c - Carolus Linnaeus
8. a - phylogeny
9. b - taxa
10. b - binomial nomenclature
11. d - membrane-bound nucleus
12. b - evolutionary relationships
13. a - domain
14. b - systematics
15. c - Archaea
16. Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species.
17. Evolutionary relationships, physical characteristics, fossil evidence, biochemical data, embryological observations, and cytological information are some types of evidence used.
18. Binomial nomenclature is the process of giving each species a genus and species name.
19. Archaea - includes unique forms of bacteria, such as methanogens and extremophiles. Bacteria - broad group of bacteria. Eukarya - includes organisms that possess a nucleus surrounded by a membrane. Examples include: fungi, plants, protists, and animals.
20. The scientific name eliminates any confusion. There can be many different common names for a single species.

Vocabulary (p. 20)

1. m - plants
2. j - Eukarya
3. g - taxonomy
4. d - scientific name
5. a - binomial nomenclature
6. l - fungi
7. h - Archaea
8. b - taxa
9. k - protists
10. e - systematics
11. n - animals
12. c - domains
13. f - phylogeny
14. o - Latin
15. i - Bacteria

Answer Key to Student Activities

Domains and Kingdoms (p. 21-23)

1 a. small, prokayotes (no nucleus)
b. lack peptidoglycan cell wall; distinct ribosomal RNA sequences
c. extreme environments such as hot springs, very salty water; low oxygen environments, and also non- extreme habitats.
d. some able to obtain energy from hydrogen gas or sulfur or organic compounds.
e. not entirely known, but thought to be via binary fission

2 a. very small, prokaryotic (no nucleus)
b. possess peptidoglycan cell wall
c. almost anywhere
d. very diverse
e. some are chemosynthetic and some are photosynthetic

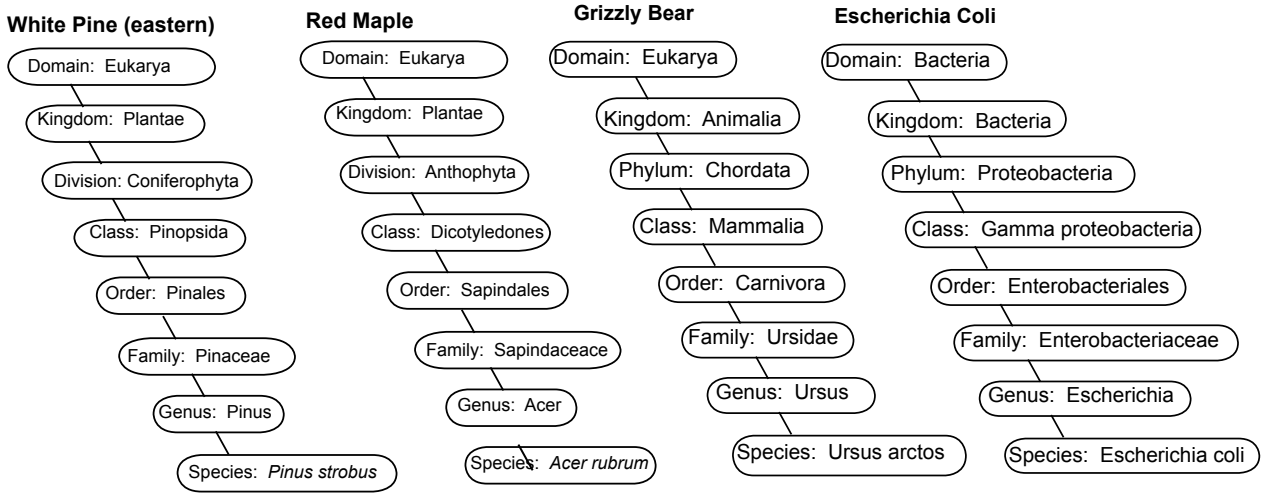
3 a. varies from unicellular to multicellular
b. most are unicellular, some are simple multicellular; some possess chloroplasts
c. many are marine or live in freshwater; some are terrestrial
d. some are photosynthetic while others are heterotrophic
e. sexual or asexual reproduction

4 a. small, can be colorful
b. most are multicellular, but some are unicellular, cell walls of chitin
c. common terrestrial, but can live in water
d. parasitic or heterotrophic; non-photosynthetic
e. sexual or asexual

5 a. most often green, variable size and shape, nonmotile
b. contain chloroplasts and cell wall
c. terrestrial or aquatic; very diverse habitats
d. mostly photosynthetic
e. sexual or asexual

6 a. vary in size, shape, and form, motile
b. multicellular
c. land, water, some can fly
d. heterotrophic
e. sexual

Taxonomic Categories (p. 24-25)



Preliminary Assessment

Name: _____

Directions: Circle the best answer for each of the following:

1. Of all the organisms that have ever lived, about what percentage are now extinct?
   a. 5%
   b. 55%
   c. 70%
   d. 99%

2. Historically, and still today, scientists use the following language to name organisms:
   a. Latin
   b. Polish
   c. English
   d. Russian

3. The process of giving each organism a genus name and a species name is referred to as:
   a. individualization
   b. binomial nomenclature
   c. systematics
   d. specific nomenclature

4. Who was the Swedish scientist credited with developing the modern classification system?
   a. Carl Swenson
   b. Charles Darwin
   c. Carolus Linnaeus
   d. Gregor Mendel

5. The categories in the modern taxonomic hierarchy are generally referred to as:
   a. groups
   b. taxa
   c. cells
   d. families

6. The broadest category in the modern classification system is a:
   a. domain
   b. genus
   c. species
   d. family

7. An organism's specific two-part name is referred to as its:
   a. common name
   b. class name
   c. generic name
   d. scientific name

8. One of the most important factors used in describing groups of organisms are:
   a. sizes
   b. evolutionary relationships
   c. colorings
   d. diets

9. The study of the diversification of life and the reconstruction of evolutionary relationships is called:
   a. ornithology
   b. systematics
   c. quantitative analysis
   d. embryology

10. The evolutionary history of an organism is referred to as:
    a. phylogeny
    b. species history
    c. fossil record
    d. paleontology

11. An example of a biochemical characteristic used to describe an organism is its:
    a. DNA signature
    b. outward appearance
    c. bone structure
    d. embryology

12. Methanogens and extremophiles are examples of bacteria in what domain?
    a. Bacteria
    b. Eukarya
    c. Archaea
    d. Echinodermata

13. The most abundant organisms on Earth belong to what domain?
    a. Bacteria
    b. Eukarya
    c. Archaea
    d. Arthropoda

14. Organisms in the Domain Eukarya are denoted by the presence of the following structure:
    a. chloroplasts
    b. cell walls
    c. cilia
    d. membrane-bound nucleus

15. Which of the following is not a kingdom in the domain Eukarya?
    a. Protista
    b. Bacillus
    c. Fungi
    d. Animalia

Preliminary Assessment

Name: _____

Directions: Answer the following using complete sentences:

16. What is binomial nomenclature?

17. List the eight main taxa in the modern taxonomic hierarchy.

18. What is the advantage of using a scientific name of an organism over its common name?

19. List a couple of characteristics commonly used to describe and categorize groups of organisms.

20. List the three main domains and briefly describe the organisms they include.

Post Assessment

Name: _____

Directions: Circle the best answer for each of the following:

1. An example of a biochemical characteristic used to describe an organism is its:
   a. DNA signature
   b. outward appearance
   c. bone structure
   d. embryology

2. An organism's specific two-part name is referred to as its:
   a. common name
   b. class name
   c. generic name
   d. scientific name

3. The most abundant organisms on Earth belong to what domain?
   a. Bacteria
   b. Eukarya
   c. Archaea
   d. Arthropoda

4. Historically, and still today, scientists use the following language to name organisms:
   a. Latin
   b. Polish
   c. English
   d. Russian

5. Which of the following is not a kingdom in the domain Eukarya?
   a. Protista
   b. Bacillus
   c. Fungi
   d. Animalia

6. Of all the organisms that have ever lived, about what percentage are now extinct?
   a. 5%
   b. 55%
   c. 70%
   d. 99%

7. Who was the Swedish scientist credited with developing the modern classification system?
   a. Carl Swenson
   b. Charles Darwin
   c. Carolus Linnaeus
   d. Gregor Mendel

8. The evolutionary history of an organism is referred to as:
   a. phylogeny
   b. species history
   c. fossil record
   d. paleontology

9. The categories in the modern taxonomic hierarchy are generally referred to as:
   a. groups
   b. taxa
   c. cells
   d. families

10. The process of giving each organism a genus name and a species name is referred to as:
    a. individualization
    b. binomial nomenclature
    c. systematics
    d. specific nomenclature

11. Organisms in the Domain Eukarya are denoted by the presence of the following structure:
    a. chloroplasts
    b. cell walls
    c. cilia
    d. membrane-bound nucleus

12. One of the most important factors used in describing groups of organisms are:
    a. sizes
    b. evolutionary relationships
    c. colorings
    d. diets

13. The broadest category in the modern classification system is a:
    a. domain
    b. genus
    c. species
    d. family

14. The study of the diversification of life and the reconstruction of evolutionary relationships is called:
    a. ornithology
    b. systematics
    c. quantitative analysis
    d. embryology

15. Methanogens and extremophiles are examples of bacteria in what domain?
    a. Bacteria
    b. Eukarya
    c. Archaea
    d. Echinodermata

Post Assessment

Name: _____

Directions: Answer the following using complete sentences

16. List the eight main taxa in the modern taxonomic hierarchy.

17. List a couple of characteristics commonly used to describe and categorize groups of organisms.

18. What is binomial nomenclature?

19. List the three main domains and briefly describe the organisms they include.

20. What is the advantage of using a scientific name of an organism over its common name?

Video Review

Name: _____

Directions: Answer the question as you watch the video:

1. **You Decide!**
   What is the problem with this system?

Video Assessment

Directions: After you watch the video, fill in the blank to complete the sentence.

1. Over 99% of the species that lived on Earth are _____.
2. Scientists use the _____ language to name organisms.
3. Carolus Linnaeus developed a two-name system for species called _____ nomenclature.
4. The modern classification system is a _____ with broad categories broken down into smaller ones.
5. The two-part name of a species is its _____ name.
6. _____ is the study of the diversification of life and the reconstruction of evolutionary relationships.
7. Species that have many similar charecteristics are thought to share common _____.
8. _____ is the evolutionary history of an organism.
9. There are three broad _____ into which all life is grouped.
10. Plants and animals are in the domain _____.

The Classification of Organisms
Vocabulary

Name: _____

Directions: Unscramble the vocabulary words in the first column. Match the words to the definitions in the second column.

____ 1) ltasnp _____

____ 2) kyuarea _____

____ 3) oxyomtna _____

____ 4) nctcifseii aemn _____
_____

____ 5) nibmiloa mcteeanlornu _____
_____

____ 6) infgu _____

____ 7) aaacehr _____

____ 8) aaxt _____

____ 9) sosttpir _____

____ 10) imssaytstce _____

____ 11) mianlas _____

____ 12) aimnosd _____

____ 13) ypnheyglo _____

____ 14) tnlia _____

____ 15) iartabec _____

a. The process of giving each species two names - a genus name and a species name.

b. Categories within the taxonomic hierarchy.

c. The broadest taxa in the classification hierarchy; there are three of these.

d. A specific two-part name given to each species.

e. The study of the diversification of life, and the reconstruction of evolutionary relationships between living things.

f. The evolutionary history of an organism.

g. The process of placing organisms into groups based on similar characteristics and relationships.

h. A domain that includes archaebacteria.

i. A domain that includes the most abundant organisms on Earth.

j. A domain in which organisms possess a membrane-bound nucleus in their cells.

k. A wide variety of eukaryotic organisms ranging from unicellular algae to multicellular organisms such as kelp.

l. The kingdom of relatively simple organisms that obtain energy from living or once living things.

m. Multicellular organisms that possess cellulose, varying modes of reproduction, and are photosynthetic.

n. Relatively complex multicellular organisms that must obtain their energy from other once-living things.

o. Language commonly used by scientists to name organisms.

Domains and Kingdoms

Name: _____

Background:

The earliest classification systems placed organisms into two main groups - plants and animals. As people gained greater understanding of the natural world, classification categories consisted of more taxa. There are eight main taxa in the modern classification system. Most taxonomists favor using general categories called domains over kingdoms, the broadest taxonic level. According to this system there are three domains: Archaea, Bacteria, and Eukarya.

Organisms in the Domain Archaea can vary greatly from each other. They share key characteristics in common including similar compounds found in cell membranes and common ribosomal RNA sequences. The three general categories of archaebacteria include methanogens, extremophiles, and nonextreme bacteria. Methanogens live in swamps, marshes, and the intestines of mammals. They obtain energy by using hydrogen gas to reduce carbon dioxide to methane gas. Extremophiles live in environments that may seem extreme to us including hot geothermal springs, salty bodies of water such as in Mono Lake California, and at great pressure deep in the oceans. Nonextreme archaebacteria live in environments similar to those where bacteria live. However, they possess DNA signatures present only in archaebacteria.

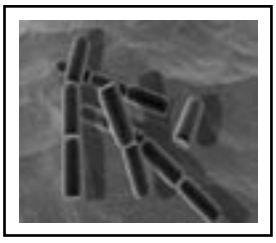
The Domain Bacteria includes the most abundant organisms on Earth. In fact, there are more living bacteria in your mouth than there are living mammals on the planet! Microscopic bacteria are placed in 12 to 15 different groups. They are responsible for processes such as decomposition, nitrogen fixation, and photosynthesis to name just a few. While both archaea and bacteria are prokaryotes, in many ways archaea are more closely related to eukaryotes.

Eukaryotes, in the Domain Eukarya are organisms that possess a membrane-bound nucleus in their cells. There are four main kingdoms of eukaryotes: protists, fungi, plants, and animals. These kingdoms of eukaryotes are broken down into more specific taxa.

Directions:

Using your knowledge about the diversity of life, textbooks, reference books, and the video titled "The Classification of Organisms", complete the following information about domains and kingdoms.

1. **Domain Archaea**



a. Physical characteristics:

b. Cellular structure:

c. Habitats:

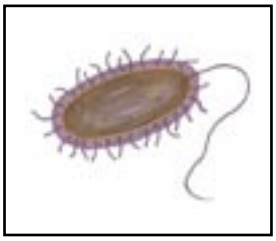
d. Metabolism:

e. Reproduction:

Domains and Kingdoms

Name: _____

2. **Domain Bacteria**



a. Physical characteristics:

b. Cellular structure:

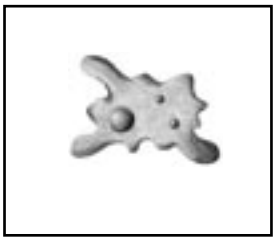
c. Habitats:

d. Metabolism:

e. Reproduction:

Domain Eukarya

3. **Kingdom Protista**



a. Physical characteristics:

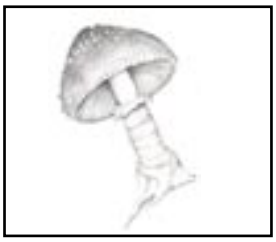
b. Cellular structure:

c. Habitats:

d. Metabolism:

e. Reproduction:

4. **Kingdom Fungi**



a. Physical characteristics:

b. Cellular structure:

c. Habitats:

d. Metabolism:

e. Reproduction:

Domains and Kingdoms

Name: _____

5. **Kingdom Plantae**

a. Physical characteristics:

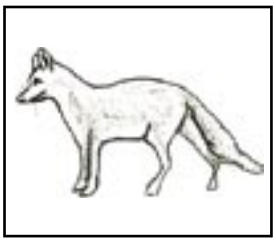
b. Cellular structure:

c. Habitats:

d. Metabolism:

e. Reproduction:

6. **Kingdom Animalia**



a. Physical characteristics:

b. Cellular structure:

c. Habitats:

d. Metabolism:

e. Reproduction:

Taxonomic Categories

Name: _____

Background:

Scientists use a two-part system to name species. Binomial nomenclature is the process of giving each species two names - a genus name and a species name. Since the time of Carolus Linnaeus, scientists began grouping species into more categories. Additional classification categories, also called taxa, were added to the classification system. Today's modern classification is hierarchical with broad divisions broken down into more specific categories. There are eight main taxa in the modern taxonomic hierarchy. Domains, of which there are three, are the broadest taxa. Domains are broken down into kingdoms, of which there are six, although some scientists argue there are fewer.

As you already know, scientists called taxonomists are responsible for classifying living things. In this activity you will categorize several examples of living things into the appropriate taxa. Below is an example of how the common dandelion is classified.

- Domain: Eukarya
  - Kingdom: Plantae
    - Division: Tracheophyta
      - Class: Angiospermae
        - Order: Asterales
          - Family: Asteraceae
            - Genus: Taraxacum
              - Species: *Taraxacum officinale*

Taxonomic Categories

Name: _____

Directions: Below are two species of plants, an animal species, and a species of bacteria. Using a textbook or other reference resource, fill in the taxa for each organism.

White Pine

Domain:
Kingdom:
Division:
Class:
Order:
Family:
Genus:
Species:

Red Maple

Domain:
Kingdom:
Division:
Class:
Order:
Family:
Genus:
Species:

Grizzly Bear

Domain:
Kingdom:
Phylum:
Class:
Order:
Family:
Genus:
Species:

Escherichia coli

Domain:
Kingdom:
Phylum:
Class:
Order:
Family:
Genus:
Species: