

Classifying and Exploring Life

Classifying Organisms

Key Concepts

- What methods are used to classify living things into groups?
- Why does every species have a scientific name?

..... Before You Read

What do you think? Read the two statements below and decide whether you agree or disagree with them. Place an A in the Before column if you agree with the statement or a D if you disagree. After you've read this lesson, reread the statements to see if you have changed your mind.

Before	Statement	After
	3. A dichotomous key can be used to identify an unknown organism.	
	4. Physical similarities are the only traits used to classify organisms.	

Mark the Text

Identify Main Ideas As you read this lesson, underline the main idea in each paragraph.

..... Read to Learn

Classifying Living Things

There have been many different ideas about how to organize, or classify, organisms. First you will learn about some early ideas for classifying organisms. Then you will learn about the system used today.

Greek philosopher Aristotle lived more than 2,000 years ago. He was one of the first people to classify organisms. He placed all organisms into two groups—plants and animals. Animals were classified based on whether or not the animal had “red blood,” the animal’s environment, and the shape and size of the animal. Plants were classified based on structure and size and on whether the plant was a tree, a shrub, or an herb.

Determining Kingdoms

In the 1700s, Carolus Linnaeus, a Swedish physician and botanist, classified organisms based on similar structures. Linnaeus placed all organisms into two main groups, called kingdoms. For the next 200 years, people learned more about organisms and discovered new organisms. In 1969, Robert H. Whittaker, an American biologist, came up with a five-kingdom system for classifying organisms. Those kingdoms are Monera, Protista, Plantae, Fungi, and Animalia.

SCIENCE USE V. COMMON USE

kingdom

Science Use a classification category that ranks above phylum and below domain

Common Use a territory ruled by a king or queen

Determining Domains

The classification method used today is called systematics. It uses everything that is known about organisms to classify them. It looks at an organism's cell type, its habitat, the way it gets food and energy, the structure and function of its features, and the common ancestry of organisms. Systematics also uses molecular analysis—the study of molecules, such as DNA, within organisms.

Scientists using systematics found two distinct groups in Kingdom Monera. They added another classification level called domains. There are three domains—Bacteria, Archaea (ar KEE uh), and Eukarya (yew KER ee uh). They are shown below. All organisms are now classified into one of the three domains and then into one of the six kingdoms.

Key Concept Check

1. Summarize What evidence is used to classify living things into groups?

Domains and Kingdoms						
Domain	Bacteria	Archaea	Eukarya			
Kingdom	Bacteria	Archaea	Protista	Fungi	Plantae	Animalia
Characteristics	Bacteria are simple, unicellular organisms.	Archaea are simple, unicellular organisms. They often live in very hot or salty environments.	Protists are unicellular and more complex than bacteria or archaea.	Fungi are unicellular or multicellular and absorb food.	Plants are multicellular and make their own food.	Animals are multicellular and take in their food.

Scientific Names

Suppose you did not have a name. What would people call you? All organisms, just like people, have names. We still use the naming system that Linnaeus created. It is called binomial nomenclature (bi NOH mee ul • NOH mun klay chur).

Binomial Nomenclature

Linnaeus's naming system, **binomial nomenclature**, gives each organism a two-word scientific name. For example, the scientific name for the brown bear is *Ursus arctos*. This two-word scientific name is the name of an organism's species (SPEE sheez). A **species** is a group of organisms that have similar traits and are able to produce fertile offspring. In binomial nomenclature, the first word is the organism's genus (JEE nus) name, such as *Ursus*. A **genus** is a group of similar species. The second word might describe the way an organism looks or the way it acts.

Visual Check

2. Name Why is a dog in Kingdom Animalia instead of Kingdom Fungi?



Visual Check

3. Name What domain does the brown bear belong to?



Key Concept Check

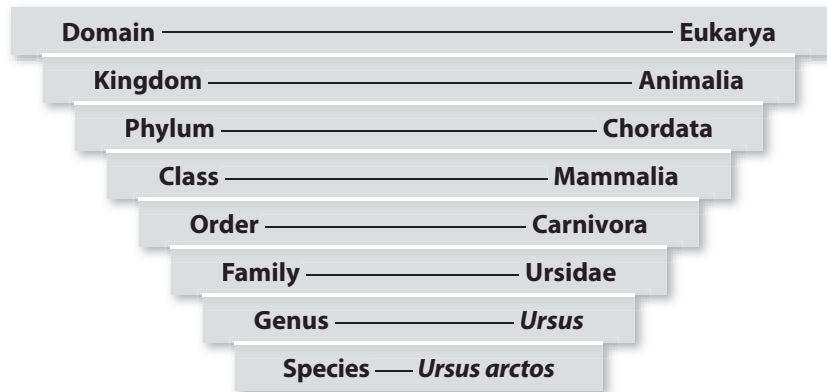
4. Explain Why does every species have a scientific name?

FOLDABLES®

Make a two-tab book to compare two of the tools scientists use to identify organisms—dichotomous keys and cladograms.




How are organisms grouped? How do genus and species fit into kingdoms and domains? Similar species are grouped into one genus. (The term for more than one genus is *genera*.) Similar genera are grouped into families. Similar families are grouped into orders. Similar orders are grouped into classes. Similar classes are grouped into phyla. Similar phyla are grouped into kingdoms. And similar kingdoms are grouped into domains. The binomial nomenclature for the brown bear is shown below.



Uses of Scientific Names

Some people would call a large brown bear a brown bear. Others would call it a grizzly bear. But it has only one scientific name: *Ursus arctos*.

A common name might also refer to more than one type of organism. Imagine two different evergreen trees. Even though they are two different species, they have the same common name—pine trees. Scientific names are important for many reasons. Each species has its own scientific name. Scientific names are the same worldwide. This makes communication about organisms easier because everyone uses the same name for the same species. 

Classification Tools

Imagine that you are fishing. You catch a fish that you have never seen before. How can you find out what type of fish you have caught? You can use several tools to identify organisms.

Dichotomous Keys

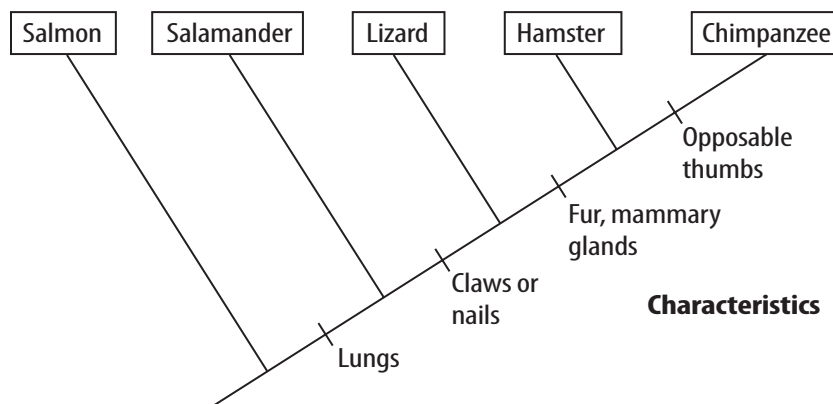
A **dichotomous key** is a series of descriptions arranged in pairs that lead the user to the identification of an unknown organism. Each chosen description leads to another description. You keep making choices until you reach the name of the organism. The dichotomous key below identifies some species of mice.

Key to Some Mice of North America	
1. Tail hair	<p>a. no hair on tail; scales show plainly; house mouse, <i>Mus musculus</i></p> <p>b. hair on tail, go to 2</p>
2. Ear size	<p>a. ears small and nearly hidden in fur, go to 3</p> <p>b. ears large and not hidden in fur, go to 4</p>
3. Tail length	<p>a. less than 25 mm; woodland vole, <i>Microtus pinetorum</i></p> <p>b. more than 25 mm; prairie vole, <i>Microtus ochrogaster</i></p>
4. Tail coloration	<p>a. sharply bicolor, white beneath and dark above; deer mouse, <i>Peromyscus maniculatus</i></p> <p>b. darker above than below but not sharply bicolor; white-footed mouse, <i>Peromyscus leucopus</i></p>

Cladograms

Have any of your relatives made a family tree? Family trees are branching charts that show how family members are related. Biologists use a similar diagram to show how species are related. It is called a cladogram. A **cladogram** is a branched diagram that shows the relationships among organisms, including common ancestors. ✓

The cladogram below has a series of branches. Each branch follows a new characteristic. Each characteristic can be seen in the species to its right. See what this cladogram tells you about the relationships among the living things that are shown. The salamander, lizard, hamster, and chimpanzee have lungs. The salmon does not have lungs. Therefore, the other animals are more closely related to each other than they are to the salmon.



Visual Check

5. Solve If you find a mouse with large ears and a hairy tail, what species might it be?

Reading Check

6. Contrast What is the difference between a cladogram and a dichotomous key?

Visual Check

7. Interpret Diagrams Of the salamander, hamster, and chimpanzee, which two are most closely related?

After You Read

Mini Glossary

binomial nomenclature (bi NOH mee ul • NOH mun klay chur): a naming system that gives each organism a two-word scientific name

cladogram: a branched diagram that shows the relationships among organisms, including common ancestors

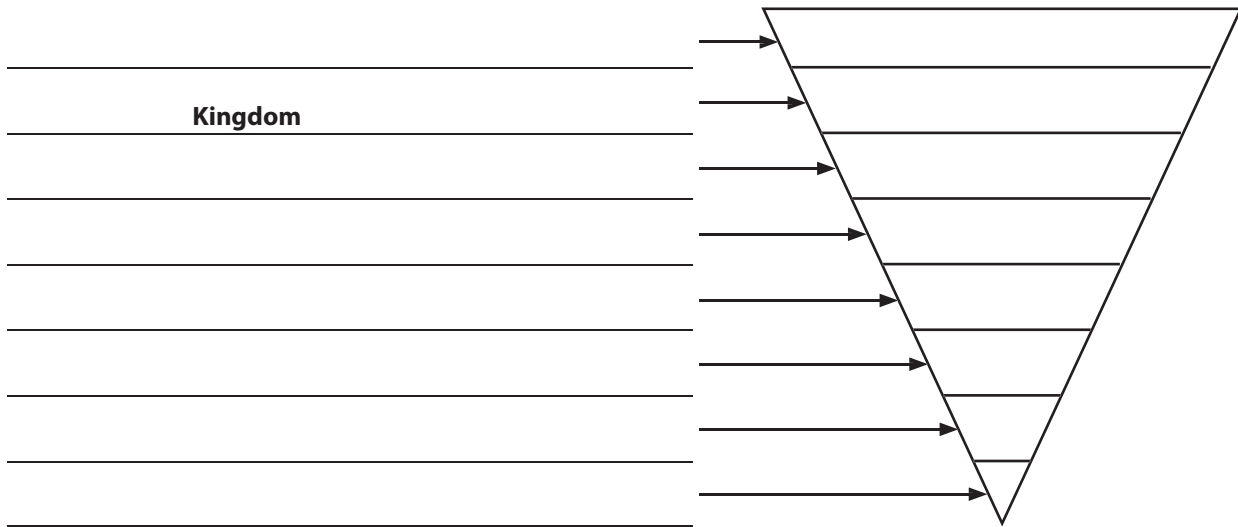
dichotomous key: a series of descriptions arranged in pairs that lead the user to the identification of an unknown organism

genus (JEE nus): a group of similar species

species (SPEE sheez): a group of organisms that have similar traits and are able to produce fertile offspring

1. Review the terms and their definitions in the Mini Glossary. Write a sentence that explains how you might use a dichotomous key while birdwatching in the woods.

2. Fill in the upside-down pyramid below to show how living things are classified.



3. How did underlining the main idea in each paragraph help you learn about classifying organisms?

What do you think **NOW?**

Reread the statements at the beginning of the lesson. Fill in the After column with an A if you agree with the statement or a D if you disagree. Did you change your mind?



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