



## 18.1 Finding Order in Diversity

### Lesson Objectives

-  Describe the goals of binomial nomenclature and systematics.
-  Identify the taxa in the classification system devised by Linnaeus.

### BUILD Vocabulary

A. The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

Term	Definition	How I'm Going to Remember the Meaning
Binomial nomenclature	The two-word naming system in which each organism is given a genus name and species name	<i>Bi- means "two," and nom is similar to name, so I can remember that binomial nomenclature is a two-word naming system.</i>
Class	A group of similar orders	
Family	A group of similar genera	
Genus	A group of similar species	
Kingdom	The largest and most inclusive group in the Linnaean classification system	
Phylum	A group of similar classes	
Systematics	The science of naming and grouping organisms	

B. As you work through this lesson, you may find these terms in the activities. When you need to write a key term or a definition, **highlight** the term or the definition.

## BUILD Understanding

**Preview Visuals** Previewing visuals and taking notes about them can help you remember what you read and review for tests. Visuals include photographs, charts, graphs, cladograms, and diagrams. As you look at each visual, think about why it may be important to the lesson.

Look at the *From Species to Kingdom* diagram. In the chart below, write questions you have about the diagram in the left column. As you read, write answers to your questions in the right column. One has been done for you.

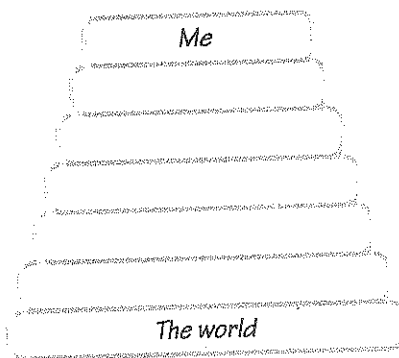
Questions	Answers
Why are all the groups, or levels, in the diagram important?	The groups show how organisms are similar or different from other organisms.

## BUILD Connections

**Levels in Your Life** The pyramid below is similar to a pyramid used to show the Linnaean classification system.

Follow the directions.

1. Think about the different levels of organization in your life—from you as an individual to you as a resident of the world.
2. Fill in the rest of the pyramid with other “taxa.”



Answer the question.

3. How are the levels in your pyramid similar to the different levels of the Linnaean classification system? \_\_\_\_\_

## Linnaean Classification System

Linnaeus developed a system of classification to name and group organisms in a logical manner. This made it easier to study the many forms of life.

In Linnaeus's system, there are seven levels: kingdom, phylum, class, order, family, genus, species. Look at the first letter in each word of the sentence "Kids prefer candy over fresh green spinach." This will help you to remember the names of the seven levels in the correct order.

The diagram at the right shows how a grizzly bear is classified in the Linnaean classification system.

Follow the directions.

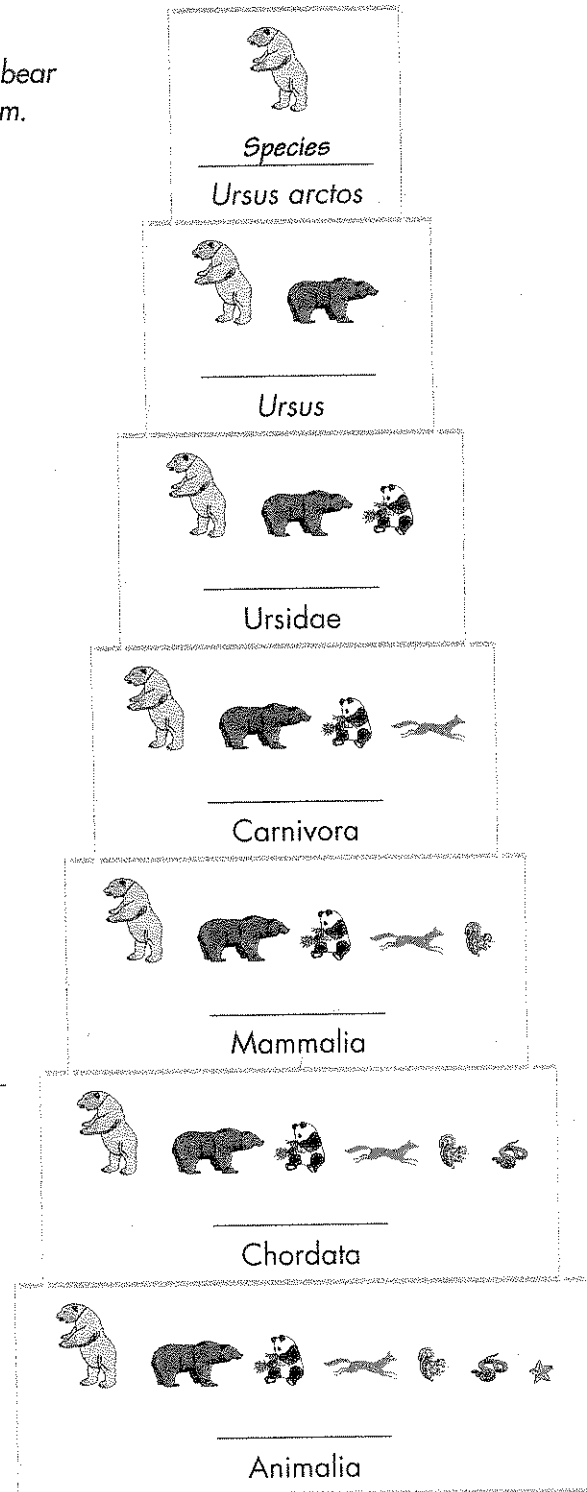
- Fill in the names of the taxa. Use the words from the box.

kingdom	order
class	genus
species	family
phylum	

- Put an X on the highest, or most specific, taxon that includes the grizzly bear and the red fox.
- Circle the taxa that include reptiles.




Answer the questions.

- Using binomial nomenclature, what is the scientific name of the grizzly bear?  
\_\_\_\_\_
- To which phylum does the grizzly bear belong? \_\_\_\_\_
- Name one other animal that belongs to the same class as the grizzly bear.  
\_\_\_\_\_
- What type of animals belong to the same family as *Ursus arctos*? \_\_\_\_\_



## 18.2 Modern Evolutionary Classification

### Lesson Objectives

-  Explain the difference between evolutionary classification and Linnaean classification.
-  Describe how to make and interpret a cladogram.
-  Explain the use of DNA sequences in classification.

### BUILD Vocabulary

A. The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

Clade	A group of species that includes a single common ancestor and all descendants of that ancestor	<i>Clade starts with the same letters as clan, which can be a group of people descended from the same ancestor.</i>
Cladogram	A picture that shows evolutionary relationships between groups of organisms	
Derived character	A trait that developed in the most recent common ancestor of a lineage and was passed down to all its descendants	
Monophyletic group	A group that includes <i>all</i> species that are descended from a common ancestor and cannot include any species that are not descended from that ancestor	
Phylogeny (fy LAHJ uh nee)	The study of how living and extinct organisms are related	

B. As you work through this lesson, you may find these terms in the activities. When you need to write a key term or a definition, **highlight** the terms or the definition.

## BUILD Understanding

**T-Chart** A T-Chart is a way to organize information while you read. One way to make a T-chart is to write the key questions in your textbook in the left column. As you read the lesson, answer the questions in your own words. Write the answers in the chart.

Key Question	Answer
<i>What is the goal of evolutionary classification?</i>	<i>The goal is to group species into larger categories that reflect lines of evolutionary descent.</i>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

## Cladograms

**Building Cladograms** A cladogram shows evolutionary relationships between species. You can think of a cladogram as a type of family tree.

*Follow the directions to draw a cladogram below showing your family tree.*

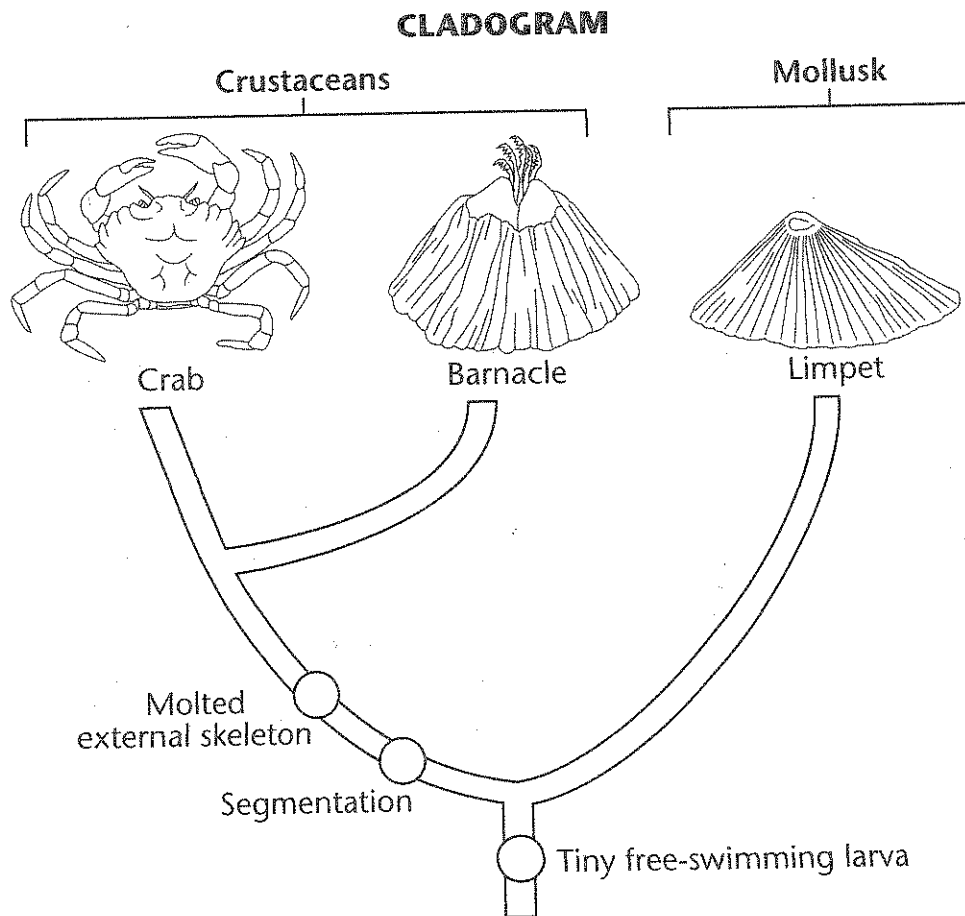
1. Choose an ancestor, such as a grandparent, on one side of your family. Draw the root of a cladogram using this person as your common ancestor.
2. How many children did this person have? Draw a red branch on the cladogram to represent each child.
3. How many children did each offspring of the common ancestor have? Off each branch, draw a blue branch to represent each child.
4. Continue drawing branches until you have drawn branches for your generation. Use a different color for each generation.

## Cladograms

**Reading Cladograms** A cladogram shows evolutionary relationships between species.

Follow the directions.

1. Use blue to color the organisms that have a molted external skeleton.
2. Use red to color the organisms without a molted external skeleton.
3. Circle the point on the cladogram that shows the most recent common ancestor of the crab and the barnacle.
4. Draw an X at the point on the cladogram that shows the most recent common ancestor of mollusks and crustaceans.



Answer the questions. Circle the correct answers.

5. Which organism, or organisms, shows segmentation?

barnacle      limpet

6. What do all three organisms have in common?

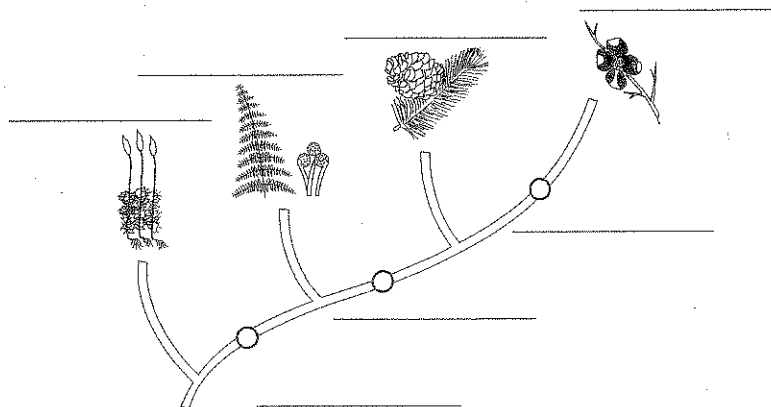
tiny free-swimming larva      molted external skeleton      segmentation

## Inquiry Into Scientific Thinking

**Constructing a Cladogram** Cladograms organize living things by how closely related they are. A cladogram includes common ancestors and all of their descendants.

1. Look at the table of plants and their traits below.
2. Write the plant names where they belong on the cladogram.
3. Write the derived characteristics next to the correct circles on the cladogram.

Plants	Derived Characteristics		
	Water-Conducting Tissue	Seeds	Flowers
Cone-bearing plant	present	present	absent
Ferns	present	absent	absent
Mosses	absent	absent	absent
Flowering plants	present	present	present





### Analyze and Conclude

1. What trait was present in the most organisms? \_\_\_\_\_
2. Which trait was present in the fewest organisms? \_\_\_\_\_
3. Which plant lacks water-conducting tissue? \_\_\_\_\_
4. Which of the following pairs of plants are more closely related? Circle your answer.  
 mosses and flowering plants                      cone-bearing and flowering plants
5. A plant called a horsetail has no seeds, but it does have water-conducting tissue. Where would you place it on the cladogram above? \_\_\_\_\_

## 18.3 Building the Tree of Life

### Lesson Objectives

-  Name the six kingdoms of life as they are currently identified.
-  Explain what the tree of life represents.

### BUILD Vocabulary

- A. The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

Term	Definition	Strategy to Remember
Archaea (AHR kee)	Domain of unicellular prokaryotic organisms that do not have peptidoglycan in their cell walls	
Bacteria	Domain of unicellular prokaryotic organisms that have peptidoglycan in their cell walls	
Domain	The most inclusive taxonomy category	<i>My "domain" contains all of my personal space. I can remember that a domain contains all other categories.</i>
Eukarya	Domain that consists of all organisms that have a nucleus	

- B. As you work through this lesson, you may find these terms in the activities. When you need to write a key term or a definition, **highlight** the term or the definition.



## BUILD Understanding

**Concept Map** A concept map can help you organize information and show how ideas are connected. The concept maps below organize information about kingdoms and domains.

As you read Lesson 3, use the terms from the box to complete the concept maps. You may use a term once or more than once.

	Animalia Fungi six kingdoms	Archaeobacteria Plantae Monera		Eubacteria Protista three domains
There were	<i>five kingdoms</i>		called	
Now there are			called	
There are	<i>three domains</i>		called	<i>Bacteria, Archaea, and Eukarya.</i>

## CHAPTER MYSTERY

**Grin and Bear It!** Are brown bears and polar bears members of the same species? What do you think? Write a hypothesis. Then, describe at least two ways you would investigate the hypothesis.

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## The Tree of Life

All organisms belong to one of three domains. An organism is placed into a domain based on its characteristics. A domain is the most inclusive taxonomic category. A single domain can contain one or more kingdoms. The domain Eukarya is made up of four kingdoms: *Animalia*, *Fungi*, *Plantae*, and *Protista*.

Follow the directions.

- Write each of the following domain names in the correct place in the chart: *Bacteria*, *Archaea*, *Eukarya*.

Domain	Organism Characteristics	Kingdoms Included in Domain
	Prokaryotes with cell walls made up of peptidoglycan	Eubacteria
	Eukaryotes	Protista, Fungi, Plantae, Animalia
	Prokaryotes whose cell walls do not contain peptidoglycan	Archaeobacteria

- Write each of the following kingdom names in the correct place in the chart: *Animalia*, *Fungi*, *Plantae*, *Protista*.

Kingdom	Cell Structures	Number of Cells	Mode of Nutrition
	Cell walls of cellulose in some; some have chloroplasts	Most unicellular; some multicellular	Autotroph or heterotroph
	Cell walls of chitin	Most multicellular; some unicellular	Heterotroph
	Cell walls of cellulose; chloroplasts	Multicellular	Autotroph
	No cell walls or chloroplasts	Multicellular	Heterotroph

Answer the questions.

- Which kingdoms contain autotrophs? \_\_\_\_\_
- To which kingdom do grizzly bears belong? \_\_\_\_\_
- In which domain would you classify a unicellular heterotroph? \_\_\_\_\_
- What do fungi and animals have in common? \_\_\_\_\_
- What do some protists and plants have in common? \_\_\_\_\_