

Classification of Organisms

Strand	Life Systems
Topic	Investigating the classification of organisms
Primary SOL	<p>LS.4 The student will investigate and understand how organisms can be classified. Key concepts include</p> <ul style="list-style-type: none">a) the distinguishing characteristics of domains of organisms;b) the distinguishing characteristics of kingdoms of organisms;c) the distinguishing characteristics of major animal phyla and plant divisions; andd) the characteristics that define a species. <p>LS.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</p> <ul style="list-style-type: none">b) a classification system is developed based on multiple attributes.
Related SOL	<p>LS.2 The student will investigate and understand that all living things are composed of cells. Key concepts include</p> <ul style="list-style-type: none">a) cell structure and organelles;b) similarities and differences between plant and animal cells. <p>LS.5 The student will investigate and understand the basic physical and chemical processes of photosynthesis and its importance to plant and animal life. Key concepts include</p> <ul style="list-style-type: none">a) energy transfer between sunlight and chlorophyll;b) transformation of water and carbon dioxide into sugar and oxygen; andc) photosynthesis as the foundation of virtually all food webs.

Background Information

Current classification systems now generally recognize the categorization of organisms into three domains: Archaea, Bacteria, and Eukarya. Archaea are prokaryotic cells that often live in extreme environments. Bacteria are prokaryotic cells that include other bacteria including cyanobacteria. Eukarya have eukaryotic cells and are subdivided into the following Kingdoms: Protista, Fungi, Plantae, and Animalia. There are six kingdoms that are currently recognized: Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, and Animalia.

Information about an organism's physical features and activities is arranged in a hierarchy of increasing specificity. The levels in the currently accepted hierarchy include domain, kingdom, phylum, class, order, family, genus, and species.

Materials

- Pictures of organisms
- Sandwich-size bags or envelopes
- Copies of attached handouts

Vocabulary

binomial nomenclature, decomposer, eukaryotic, hyphae, kingdoms, multicellular, parasite, photosynthesis, prokaryotic, unicellular

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

This lesson should be spread over a period of three-to-four class periods to allow students time to process and assimilate the information. The lesson may be conducted in an outdoor natural area where students can locate and classify organisms, or you may find it necessary to stay inside and use pictures of organisms.

1. If conducting the lesson outdoors, investigate the natural area to locate areas students may find organisms. If staying inside for the lesson, prepare 8–10 cards with pictures of various organisms for each group of students. Be sure to include organisms from all six kingdoms. Number the cards for quick checking for accuracy. Place the cards in a plastic bag or envelope.
2. Give students the handouts “Domains and Kingdoms” and “Key to the Kingdoms of Life.” Read and discuss the handouts.
3. Take students to the natural area so they may begin their observations and classification, or give each group of students a set of cards. Have students sort their organism cards first according to domain, and then according to kingdom. Have them record on the “Data Sheet” handout the appropriate domain, kingdom, and organism for each card.
4. When students are naming the organisms on the “Data Sheet,” introduce the concept of *binomial nomenclature*. Tell students that every living organism has a two-part scientific name, made up of the *genus* name and the *species* name.

Assessment

- **Questions**
 - How are the kingdoms Archaeobacteria and Eubacteria alike? How are they different?
 - Which kingdoms contain unicellular organisms? Multicellular organisms? Both?
 - How do the organisms from each kingdom get their energy?
- **Journal/Writing Prompts**
 - Create a mnemonic device to remember the levels of classification: Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species.
 - Explain why scientists may change the system of classification. An example might be adding more kingdoms.
- **Other**
 - Complete a table of the six kingdoms determining these factors: Prokaryotic or Eukaryotic? Unicellular or Multicellular? Autotroph or Heterotroph? (see attachment)
 - Further investigate scientific names for other organisms.

Extensions and Connections (for all students)

- Create and illustrate a booklet that describes the characteristics of each of the six kingdoms.
- Create a Web quest of the six kingdoms. Have students research characteristics and examples of each of the kingdoms.

Domains and Kingdoms

Scientists have classified living organisms into three domains and six kingdoms. Look at the following diagram.

<i>Domain:</i> Archaea ↓	<i>Domain:</i> Bacteria ↓	<i>Domain:</i> Eukarya ↓
<i>Kingdom:</i> Archaeobacteria	<i>Kingdom:</i> Eubacteria	<i>Kingdoms:</i> Protist Fungi Plant Animal

Archaea Domain: Archaea are prokaryotic cells that often live in extreme environments, such as boiling water and thermal vents, or under conditions with no oxygen or highly acidic surroundings.

Bacteria Domain: Bacteria are prokaryotic cells that include other bacteria that are found everywhere and are the ones people are most familiar with.

Eukarya Domain: Eukarya have eukaryotic cells and are subdivided into the following kingdoms: Protista, Fungi, Plantae, and Animalia.

Organisms may be further classified by a system that extends from a broad level to a more specific level:

Domain
 Kingdom
 Phylum
 Class
 Order
 Family
 Genus
 Species

Keys to the Kingdom of Life

Name: _____ Date: _____

Use this key to find the name of the kingdom to which each organism belongs.

1	<p>A. Organism is unicellular or colonial (containing many single cells). Few are multicellular with specialized structures..... Go to 2 OR</p> <p>B. Organism is multicellular..... Go to 4</p>
2	<p>A. Organism is prokaryotic, is unicellular, and has no cell organelles (no nucleus) Go to 3 OR</p> <p>B. Organism may be unicellular, colonial, or multicellular with visible nuclei Kingdom Protista</p>
3	<p>A. Thrives in very harsh environments—hot springs, deep-sea hydrothermal vents, extremely salty or acidic water Kingdom Archaeobacteria OR</p> <p>B. May be a decomposer or parasite or lives within other creatures. The prefix <i>Eu</i> means “true” Kingdom Eubacteria</p>
4	<p>A. Multicellular; cells have cell walls Go to 5 OR</p> <p>B. Multicellular; cells do not have cell walls..... Kingdom Animalia</p>
5	<p>A. Multicellular; cell walls are made of cellulose; perform photosynthesis Kingdom Plantae OR</p> <p>B. Multicellular; cell walls are made of chitin (a tough flexible carbohydrate). Get energy for growth mostly from dead organisms. Body is formed from tangled, thread-like structures called <i>hyphae</i>..... Kingdom Fungi</p>

Data Sheet for Domains and Kingdoms Lab

Name: _____ Date: _____

Card Number	Domain	Kingdom	Organism's Scientific Name
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

The Six Kingdoms

Name: _____ Date: _____

Kingdom	Prokaryote or Eukaryote	Autotrophic or Heterotrophic	Unicellular or Multicellular	Other Characteristics
Archaeobacteria				
Eubacteria				
Protists (Protista)				
Fungi				
Plants (Plantae)				
Animals (Animalia)				