

Name: _____

Date: _____

Problem Solving: Classifying Organisms

Learning goals

After completing this activity, you will be able to ...

- Classify organisms into domains.
- Use the basic characteristics of organisms to classify them into kingdoms.
































Vocabulary: autotrophic, domain, heterotrophic, kingdom, taxonomic classification

Introduction

Every organism can be classified into groups based on how closely they are related to other organisms. Biologists use a hierarchy, or ranking, to classify organisms into smaller and smaller groups of closer and closer related organisms. This form of classification is called **taxonomic classification**. There are eight levels of taxonomic classification. The broadest, most general group is called a **domain**. An organism's cell type determines which domain it belongs to. Domains can contain several **kingdoms**. Kingdoms contain phyla, phyla contain classes, and so on. Take a look at the chart below to see how this system of classification works for cats.

Cats have eukaryotic cells, so they belong to the domain Eukarya. All other eukaryotic organisms, including plants and protists belong to this domain. Cats are further classified into the kingdom Animalia, along with all other animals. Plants and protists are categorized into their own kingdoms.

As you can see, cats are further classified into smaller and smaller groups with more and more specific traits until you get to the finest level of classification: the species. All organisms that belong to the same species are able to interbreed or exchange genetic material.

DOMAIN Eukarya							
KINGDOM Animalia							
PHYLUM Chordata							
CLASS Mammalia							
ORDER Carnivora							
FAMILY Felidae							
GENUS <i>Felis</i>							
SPECIES <i>catus</i>							

Classifying organisms into kingdoms

As you learned on the previous page, organisms are classified into domains based on their cell type. Organisms are further classified into kingdoms based on several characteristics, including whether they are unicellular or multicellular, how they reproduce, and they meet their energy needs. For example, some organisms, such as plants, are **autotrophic**. This means that they are able to make their own food. Plants do this by converting the sun's energy into sugars. Other organisms are **heterotrophic**. This means that they must consume other organisms in order to get the energy they need.

Scientists use many characteristics of organisms for the purposes of classification, including type and number of cells, the structures inside cells, and the organism's modes of nutrition and reproduction. The table below shows how each of these characteristics can be used to identify the domain and kingdom of an organism. You can use the table to answer the questions below.

Domain	Bacteria	Archaea	Eukarya			
Kingdom	Eubacteria	Archaeobacteria	Protista	Fungi	Plantae	Animalia
Cell Type	Prokaryote	Prokaryote	Eukaryote	Eukaryote	Eukaryote	Eukaryote
Cell Structures	Cell walls with peptidoglycan	Cell walls without peptidoglycan	Cell walls with cellulose; some have chloroplasts	Cell walls with chitin	Cell walls with cellulose; chloroplasts	No cell walls or chloroplasts
Number of Cells	Unicellular	Unicellular	Most unicellular; some multicellular	Most multicellular, some unicellular	Multicellular	Multicellular
Mode of Nutrition	Autotroph or heterotroph	Autotroph or heterotroph	Autotroph or heterotroph	Heterotroph	Autotroph	Heterotroph
Mode of Reproduction	Asexual reproduction	Asexual reproduction	Both sexual and asexual reproduction	Both sexual and asexual reproduction	Both sexual and asexual reproduction	Both sexual and asexual reproduction
Examples	<i>E. coli</i>	halophiles	<i>Amoeba</i> , <i>Paramecium</i>	Mushrooms, yeast	Mosses, ferns, trees	Worms, insects, mammals

Biologists throughout the world use the same system of classification, which allows them to communicate easily with each other. Most names are in Latin. This classification system was originally developed by Carl Linnaeus in the 18th century.

Problems

1. What is meant by the term taxonomic classification? _____

2. What is the broadest level of taxonomic classification? _____

3. What sets the domain Eukarya apart from the other two domains? _____

4. What is the main difference between members of the domain Bacteria and members of the domain Archaea? _____
5. Name two differences between members of the kingdom Plantae and the kingdom Animalia.

6. Suppose you were examining a unicellular organism under the microscope.
- a. Which two kingdoms can you be sure the organism does *not* belong to? Why?

 - b. Suppose the organism was an autotroph. Which kingdom could you now cross off the list? Why? _____
 - c. Upon examination, you noticed the organism did not have a nucleus. Which kingdom could you now cross off the list? Why? _____

 - d. Based on what you have discovered about the organism so far, do you predict it reproduces sexually or asexually? Why? _____

 - e. Tests show that the organism's cell wall has peptidoglycan. Which kingdom does the organism belong to? _____
7. Why is it helpful that biologists throughout the world all use the same taxonomic system?

